



COMMON BEES & WASPS OF OHIO field guide

DIVISION OF WILDLIFE



COMMON BEES AND WASPS OF OHIO

Text by: **Eric R. Eaton**

Bees and wasps are essential to the healthy functioning of natural ecosystems, agricultural lands, and your own yard or garden. It is our hope that this pocket guide will help people better understand, appreciate, and tolerate these amazing animals.

Eric Eaton is a writer and entomologist who has contributed articles and photographs to numerous publications, and is coauthor of the *Kaufman Field Guide to Insects of North America*.

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BEES AND WASPS OF OHIO

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EASTERN BUMBLEBEE

on butterfly milkweed | PHOTO BY JIM MCCORMAC

INTRODUCTION

There are thousands of species of wasps and bees in Ohio, all in the order Hymenoptera, which also includes ants. Often referred to as “social insects,” in actuality most bees and wasps are solitary, with each female fashioning her own nest. While some species can deliver a painful defensive sting, the overwhelming majority of bees and wasps are tiny stingless creatures. Very few species account for the majority of stings, and such stings are nearly always delivered in defense of nests or in cases where the insect is bothered, either intentionally or accidentally.

Bees and wasps share many characteristics, and bees are essentially hairy vegetarian wasps. Both groups have two pairs of wings as adults; with some exceptions such as “velvet ants” (females in this family are wingless). Bees are generally hairier than wasps, and the individual hairs of bees are plumose (branched or feather-like). Female bees usually sport a “scopa,” or dense brush of long hairs on each hind leg or the underside of the abdomen, for collecting pollen. The social honeybees and bumblebees have a “pollen basket:” wide, flattened tarsal segments on the hind legs, fringed with long hairs, to collect balls of pollen and nectar. Bees also drink nectar and store it in a special internal organ called the “crop.”

While honeybees provide us with honey and beeswax, their pollination services are priceless.

So dependent are we on these insects, introduced by our European ancestors in 1622, that many orchard and field crops would fail completely without migratory apiculturists (beekeepers) trucking their colonies across the country. Increasingly, we are recognizing the even greater value of native pollinators, and making strides to preserve or restore their habitats. We are also learning more about

the roles and value of solitary wasps, which prey on stink bugs, flies, grasshoppers, caterpillars and other insects in the course of providing for their larval offspring. Most wasps are flower visitors that also provide pollination services as they seek nectar to fuel their energetic daily activities.



EUROPEAN PAPER WASP
© ERIC R. EATON

WHY BEES AND WASPS MATTER

The need to protect and preserve pollinators is center stage these days. Butterflies and hummingbirds often take the spotlight, but bees and wasps work tirelessly in the background, their collective labors far exceeding those of the flashy poster children. Many wildflowers rely on only a few pollinator species. Milkweeds require strong insects like large butterflies (Monarch, swallow-tails), large wasps, and bumble bees to dislodge the pollen packet (“pollinarium”) from a blossom. Smaller insects may become hopelessly entangled, and even die. A pollinarium successfully extricated and attached to a wasp foot, for example, dries and changes orientation as the insect flies to another plant. The pollinarium “key” is then able to fit in the “lock” of another milkweed blossom.

In the long view, pollinating insects are major drivers in the evolution of flowers, and much of the fantastic diversity in flowering plants is due to their interaction with pollinating insects, most importantly the bees. “Long-tongued” bees like bumble bees, honey bees, carpenter bees, long-horned bees, leafcutter bees, and mason bees, have evolved to reach into deep flower corollas; short-tongued sweat bees and others are adapted to shallow corollas.

In addition to pollination services, bees and wasps play huge roles in the food web. Scores of pollinators are food for assassin bugs, mantids, spiders, birds, lizards, and other predators.

Wasps are flower visitors (for nectar), but also chief predators of other insects, including those that damage crops and forests. The Smoky-winged Beetle Bandit wasp (*Cerceris fumipennis*) has been employed in some areas as an agent for detecting the Emerald Ash Borer, an introduced beetle from Asia that is decimating North America’s ash trees. Females of this solitary species find, paralyze, and cache beetles in underground burrows to feed their larval offspring. Many species of wasps are so specific in their choice of hosts that they are sometimes reared in the laboratory and released into fields and orchards for toxin-free control of agricultural pests.

The venoms and glandular products of Hymenoptera are of increasing value in medicine and industry. Many patients swear by “bee venom therapy” for various illnesses, especially of the joints, even if such treatments are relegated to the category of alternative medicine by the healthcare establishment.



SOLITARY OR SOCIAL

In Ohio, our only highly social bees are the Honeybee, *Apis mellifera*, and native bumble bees in the genus *Bombus*. Other native bees exhibit varying degrees of sociality, and/or communal activity. Individual female digger bees, genus *Anthophora*, will often nest in dense aggregations in suitable soils, as will plasterer bees in the genus *Colletes*. Males of some solitary bees may gather at a “lek” for purposes of finding mates, and/or in loose sleeping clusters where they spend the night. Our social wasps include paper wasps, yellowjackets, and the European Hornet. Some wasps that are normally solitary will, like the bees mentioned above, congregate in sleeping clusters. These masses of wasps can be all males, or represent both genders.

Many solitary wasps and bees are attracted in great numbers to colonies of aphids, scales, and related insects that produce a sweet liquid waste called “honeydew.” Many wasps seem to prefer honeydew to flower nectar. Fermenting sap oozing from wounds in trees is another source of carbohydrates that wasps crave. Lastly, many plants possess “extrafloral nectaries” apart from flowers that produce sugary substances coveted by certain bees and wasps.

HONEYBEES
© NICK PITTSAS, CSIRO

LIFE CYCLES

All bees and wasps, whether solitary or social, go through complete metamorphosis: they begin life as an egg, from which emerges a larva that molts several times, and in turn becomes the pupa or “resting” stage in which the larva is transformed into the adult insect. The seemingly inactive pupa is bustling on the inside as some genes are turned off, others turned on, and the cellular structure rearranged for life as a winged insect. Many solitary wasps and bees overwinter as dormant larvae, or in the pupal stage. Female social wasps and bees spend the cold months as adults, insulated inside rotten logs, or other sheltered niches.



RED-HEADED PINE SAWFLY LARVAE (*NEODIPRION LECONTEI*)
FEEDING ON VIRGINIA PINE
© JIM MCCORMAC

STINGING OR STINGLESS?

Only female wasps and bees can sting. The stinger is actually a modified egg-laying organ called an ovipositor. In some cases, the ovipositor can be used as a defensive weapon that delivers venom from a gland inside the abdomen. Stingers are retractable, and not evident until they are deployed, by which time you are feeling the pain anyway. Long, spear- or tail-like “stingers” extending from the rear end of ichneumon wasps (page 53) are not stingers at all, but true ovipositors used to insert eggs into host insects. Harmless as these wasps may be, they do look intimidating and the sight of one often causes panic.

Even though only a small group – a fraction of a percent of the Hymenoptera found in Ohio – regularly cause painful stings, stings are probably what most people first think of when bees or wasps come to mind. For some people, bee and wasp stings are serious business due to severe reactions. They must – or should – carry epinephrine pens in case of stings. The pen’s quick release dose of epinephrine combats severe anaphylactic shock reactions. For most people, stings mean only a short term immersion into the world of insect-induced pain. Stings might be thought of as entomological aversion therapy – the female bee or wasp is letting you know to avoid her nest, or otherwise refrain from harming her or her mates.

An entomologist (scientist who studies insects) named Justin Schmidt devised a pain scale for

many of the more notorious stinging Hymenopterans. Known as the Schmidt Insect Sting Pain Index, this scale compares the relative degree of discomfort caused by various stinging insects. Not one to accept secondhand reports, Schmidt induced 78 species of bees, wasps, and ants to sting him, then rated the pain on a scale ranging from 0 to 4. The lowest score, 0, is given to stings that cause no pain and are completely ineffective against humans. The highest score, 4, are those that cause traumatic pain. No “4’s” occur in Ohio, which outdoorspeople should be grateful about. An example of a 4 is the Tarantula Hawk wasps in the genus *Pepsis*, some of which occur in the southwest U.S. The sting is described thusly: “Blindingly fierce, shockingly electric. A running hair drier has been dropped into your bubble bath.” Conversely, a sting from a “1” such as a sweat bee (many Ohio species), is stated to be “Light, ephemeral, almost fruity. A tiny spark has singed a single hair on your arm.” A handful of insects rated as 2 or 3 in Schmidt’s pain index are commonly found in Ohio. These stings range from painful to sharp and seriously painful. We have noted those in their accounts, along with the description of the sting.

While painful stings have brought bees and wasps great notoriety, we must reiterate that only a tiny number of species regularly sting people, and such stings rarely cause lasting damage. The value of bees and wasps far outweighs any harm done to people by stings.



ARCHITECTURE



Many wasps and bees are master architects, turning mud, paper, and other materials into exquisite nests. It is often easy to tell some of the bees and wasps that you have in your area by their nests, whether occupied or not. Mud daubers and paper wasps build under the eaves of buildings (and natural rock formations), but one of the strangest tendencies is the use of window tracks by the cavity-nesting grass-carrier wasps in the genus *Isodontia* (page 51). Opening a sliding window may reveal a tangle of dried grass, paralyzed katydids or tree crickets, and wasp grubs. By this time, the female wasp is long gone, although the homeowner may not be pleased with the nest that she's left.

BALD-FACED HORNET NEST
© JIM MCCORMAC

MIMICRY

Because some wasps and bees sting, a great many harmless insects have evolved to look like them. By doing so, the mimics gain a measure of protection from predators by resembling creatures that pack a punch. Convincing mimics can be found among flies, moths, true bugs, and even beetles. Not only do they resemble their stinging “models,” many of these mimics also behave like them. Many times the author has been fooled until a specimen could be caught and closely examined. Flies are the most common mimics and can be difficult to distinguish from bees or wasps. Note that flies have one pair of wings whereas bees and wasps have two pairs (usually connected, though, so this can be difficult to discern). The antennae of flies are usually very short in contrast to the longer antennae of wasps and bees, but some flies wave their front legs in front of their faces to mimic longer antennae. Flies also tend to have much larger eyes than wasps or bees, though patterns on the eyes of some flies break up the boundary where the eye ends and the rest of its face begins. Lastly, bees and wasps have chewing mouthparts, the mandibles evident and opening in opposition to each other. Flies have a sponging or piercing-sucking proboscis which is often syringe-like, although it is often retracted when not in use.



MANTIDFLY

The bizarre mantidfly, *Climaciella brunnea*, greatly resembles a paper wasp.



EUPATORIUM BORER

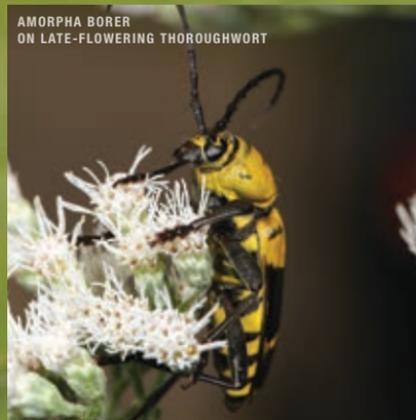
Certain borer moths, such as this eupatorium borer, *Carmenta bassiformis*, look like hornets.

There are numerous flower fly species in the family Syrphidae, many of which resemble bees.



One of the most stunning wasp mimics is the mantidfly, *Climaciella brunnea*, a dead-ringer for a paper wasp. Related to lacewings and antlions, this member of the order Neuroptera even flares its wings like an aroused wasp when it perceives a threat. Many species of flower flies are incredibly convincing hornet or wasp mimics, even mirroring their behavior by twitching the abdomen when feeding or at rest. One very large species of flower fly, *Milesia virginiensis*, creates a loud hornet-like drone with its wings and fools many people – and presumably predators – into thinking it is dangerous. An inspection of flowers in summer and fall should reveal a diversity of flower flies.

ALL PHOTOS ON PAGES 10 AND 11 BY JIM MCCORMAC



Beetles in the genus *Megacyllene* such as this Amorpha Borer, *M. decora*, resemble hornets

Although a harmless moth, the squash vine borer, *Melittia cucurbitae*, looks like a wasp, especially in flight.



SQUASH VINE BORER ON INDIAN-HEMP



LAPHRIA GROSSA

Bumblebee robberflies, such as *Laphria grossa*, bear an uncanny resemblance to bumblebees

WESTERN HONEY BEE

Apis mellifera (Ape-is • mel-if-er-ah)

FAMILY: APIDAE (BEES)

HABITAT: abundant in all habitats from urban to agricultural to wilderness.

LIFE CYCLE: Honey bees are highly social insects. Colonies are founded by “swarming” in which part of an existing colony leaves with a queen to seek a new location for a hive. Swarms are harmless, as there are no honey stores or brood (eggs, larvae, pupae) for worker bees to defend. Scout bees find a suitable space, such as a hollow tree, to set up house, then report to the swarm and perform a “dance” that indicates the location. Worker bees construct combs made of wax that they secrete from glands between their abdominal segments. Colonies persist through the winter thanks to honey stored in hexagonal cells in the comb. Only the queen lays eggs.

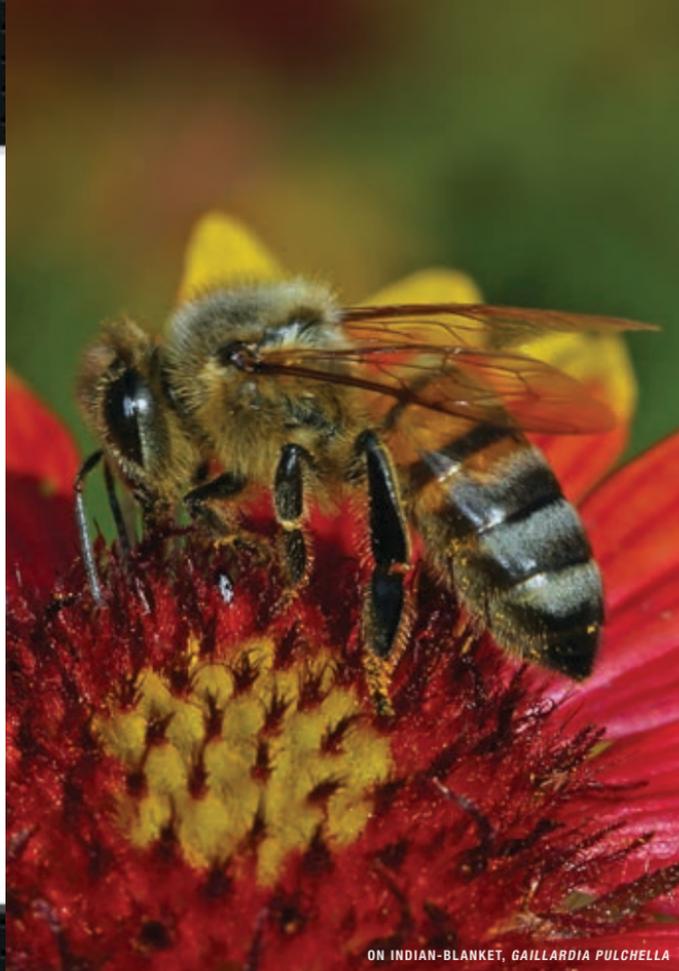
REMARKS: Also known as the “European Honey Bee,” this species was brought to North America by settlers to Jamestown in 1622. Our forefathers had no idea whether native bees could pollinate their crops; plus, the bees furnished honey and beeswax. “Colony Collapse Disorder” likely represents a combination of impacts from parasitic mites, malnutrition over the winter, perhaps poor genetics from inbreeding, and other factors. It is causing substantial bee losses in many areas. When a worker bee stings, barbs on the stinger hold it fast. As the bee pulls away, vital organs are ruptured and it eventually dies. Honey bees rate a “2” on the Schmidt Pain Index (page 8), the sting described as “Like a match head that flips off and burns on your skin.”

SIZE: (BODY LENGTH)

FEMALE 12 mm

MALE 15- 16 mm

QUEEN 16- 20 mm



COMMON EASTERN BUMBLE BEE

Bombus impatiens (Bom-bus • im-pay-shens)

FAMILY: APIDAE (BEES)

HABITAT: Common in gardens, parks, fields, vacant lots, and along forest edges.

LIFE CYCLE: This social species is one of few native bees that seem to be prospering. Mature colonies are exceptionally large, with up to 450 workers at season's end. Nests are built underground, in an abandoned rodent burrow or similar cavity. Bumble bees secrete wax from glands in the abdomen and use it to craft brood cells and "honeypots" for storing small quantities of nectar. Each brood cell can contain more than one larva, and is expanded as the larvae grow. The colony collapses at the end of autumn after new queens and males have been reared. Only queens survive the winter in hibernation.

REMARKS: There are 16 species of *Bombus* bumble bees in Ohio. The Common Eastern Bumble Bee can be confused with the Two-spotted Bumble Bee, *Bombus bimaculatus*, but the latter species is brighter yellow in most specimens. *B. impatiens* is employed widely in commercial greenhouses, particularly for pollination of hothouse tomatoes. Bumble bees "buzz pollinate," vibrating their wing muscles at a frequency that dislodges pollen, causing the grains to rain down on the bee. Look for queens and workers on red clover flowers especially. Males, which appear later in the year, seem to prefer asters and goldenrod. This bee has an unusually long flight season, from at least April through October in Ohio. Bumble bees rank high among our most important pollinators.

SIZE: (BODY LENGTH)

FEMALE 8.5 -16 mm

MALE 12 -17 mm

QUEEN 17 -21 mm



EASTERN CARPENTER BEE

Xylocopa virginica (Zy-lo-ko-pa • ver-jin-ih-ka)

FAMILY: APIDAE (BEES)

HABITAT: Common in gardens, parks, forest edges and openings, and around wooden structures.

LIFE CYCLE: Females are solitary, and chew nests in wood. The entrance is short, the tunnel making an abrupt perpendicular turn to continue with the grain for 30-45 centimeters. A ball of pollen and nectar is placed at the bottom and an egg laid on it. The female bee then fashions a partition of sawdust and saliva before provisioning a new cell. Six or eight cells, one atop the other, thus fill the tunnel. One generation is produced each year, but offspring mature in autumn and overwinter in the nest, or in nests abandoned by others of their kind. Nests are re-used, and sometimes extended, over many generations. Female offspring will bore nests near their parent's, resulting in an ever-expanding population in one beam or log.

REMARKS: Males, with white faces and big gray or greenish eyes, do not sting. Still, when near nesting females, they are territorial and aggressive towards other males, other insects, even birds. They may hover menacingly in front of your face, but not to fear, they're all bark and no bite. The tunnels bored by females rarely cause structural damage. Both genders resemble bumblebees, but note the round, hairless faces of carpenter bees. Carpenter bees have short tongues and practice "nectar robbing," biting holes in the base of tubular flowers to reach nectar reservoirs without pollinating the flower.

SIZE: (BODY LENGTH)

FEMALE 19 -23 mm

MALE 17 -21 mm



FEMALE ON TALL BONESET, *EUPATORIUM ALTISSIMUM*

SMALL CARPENTER BEES

Ceratina spp. (Ser-at-ee-n-ah)

FAMILY: APIDAE (BEES)

HABITAT: Common in gardens, parks, fields, thickets, vacant lots, and forest edges.

LIFE CYCLE: Females bore in the soft pith of broken or pruned twigs or canes, especially sumac, elderberry, blackberry, lilac, and rose. The initial excavation is made in autumn, and the female overwinters there. The tunnel is expanded the following spring, and is usually 15-18 centimeters in depth. The shaft is divided into several cells, each provisioned with a ball of pollen and nectar for a single larval bee. After finishing the nest, the female bee occupies the last chamber near the entrance, guarding against parasites until her offspring are ready to emerge. A female offspring may re-use the nest, cleaning it out beforehand. Occasionally, *Ceratina* will use pre-existing cavities such as beetle borings in wood, instead of tunneling in twigs. One generation is produced each year.

REMARKS: Small carpenter bees (4 Ohio species) are easily confused with small sweat bees or yellow-faced bees, but can be recognized by a weak metallic sheen, and small ivory marks on the face. Also note the club-shaped abdomen. These bees are "polylectic," meaning they will visit many species of plants for pollen.

SIZE: (BODY LENGTH)

FEMALE 5 - 8 mm

MALE 4.5 - 7 mm



ON WEDGE-LEAVED WHITLOW-GRASS, *DRABA CUNEIFOLIA*

CUCKOO BEES

Nomada spp. (No-mad-ah)

FAMILY: APIDAE (BEES)

HABITAT: Common on flowers in gardens, parks, riparian areas, forest edges - wherever their hosts nest.

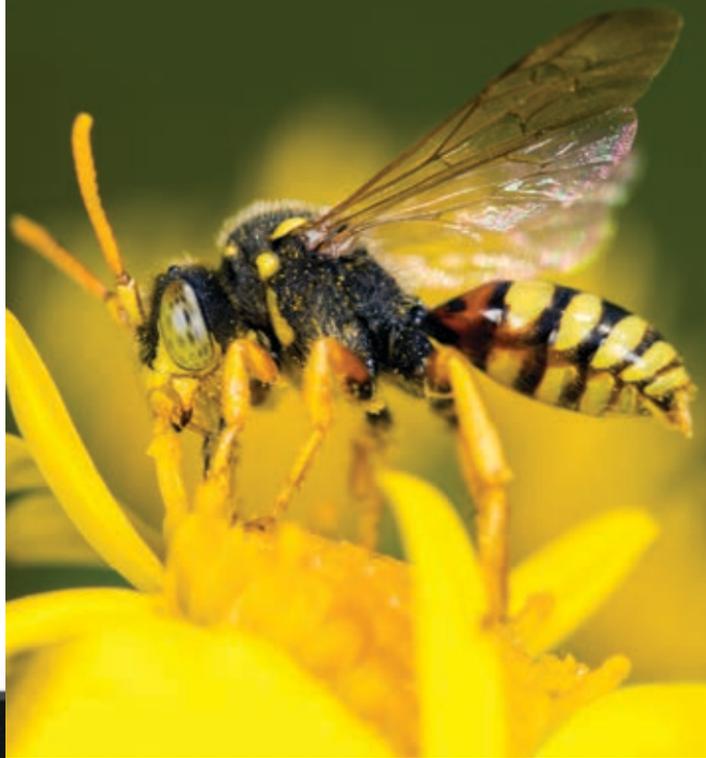
LIFE CYCLE: These are solitary bees which are kleptoparasites of solitary ground-nesting bees, especially mining bees in the genus *Andrena*. Other hosts include sweat bees in the genera *Agapostemon*, *Halictus*, and *Lasioglossum*; and longhorned bees in the genus *Eucera*. The female *Nomada* sneaks into the nest of its host when the occupant is out foraging for nectar and pollen. She then lays an egg in the underground cell. The first instar *Nomada* larva bears sickle-shaped jaws that it uses to dispatch the host egg. It then molts into a "normal" bee larva and consumes the pollen and nectar cache intended for the host's offspring.

REMARKS: Thirty-six species are known from Ohio. This is a complex genus with great variation even within one species. For some species only one gender is known. They greatly resemble small wasps at first glance, with sparse body hair and often bold yellow or ivory markings. Look for *Nomada* cuckoo bees from March to September. Some species are found strictly in the spring, others only in fall. While they visit flowers such as willow catkins for nectar, they do not collect pollen. Watch for sleeping individuals just before dusk, or on overcast days. They cling to the tip of a leaf or twig by their mandibles alone.

SIZE: (BODY LENGTH)

FEMALE 5 -13 mm

MALE 4.5 -13.5 mm



HIBISCUS BEE

Ptilothrix bombiformis (Ty-lo-thrix • bom-bih-for-mis)

FAMILY: APIDAE (BEES)

HABITAT: Uncommon in gardens, parks, and open areas adjacent to water.

LIFE CYCLE: The adult bees fly from June to August. Females are solitary, but will nest in fairly dense aggregations in favored haunts. The entrance to each underground burrow has a mud turret, and the surrounding vicinity may be covered in tiny mud pellets extracted by the bees during the excavation process. The bees can land on the surface of standing water to drink, then regurgitate droplets to help soften the soil. The burrow is vertical and ends in one or two cells provisioned with a ball of pollen that will be food for a single larva. The larva, before pupating, coats the walls of its cell with fecal material. It overwinters as a pre-pupal larva, then spins a cocoon the following spring.

REMARKS: This bee specializes in pollinating flowers of Hibiscus. It has also been recorded taking nectar from blossoms in the morning-glory genus *Ipomoea*, plus rose-mallow, thistles, buttonbush, vervain, and ironweed. Males are territorial, often resting on leaves or flowers where they can intercept passing females or chase off competing males. This may be a more common species than realized, being overlooked or confused with small bumblebees. It is sometimes known as the Rose-mallow Bee.

SIZE: (BODY LENGTH)

FEMALE 13 -17.5 mm

MALE 12.5 -17.5 mm



SQUASH BEE

Peponapis pruinosa (Pep-oh-nap-is • pru-in-oh-sa)

FAMILY: APIDAE (BEES)

HABITAT: Common in fields, vegetable gardens, and pumpkin patches, but associated only with plants in the Cucurbitaceae family.

LIFE CYCLE: Look for the adult bees mostly in July and August. They are solitary, but females may dig their nest burrows in close proximity to one another in suitable habitat. The tunnels are vertical, and can be more than two feet deep. The bottom of the shaft branches into a series of small individual cells. Each cell will serve as the nest of one larval offspring. The female bee provisions each nursery chamber with a pea-sized pollen ball. Look for the burrows in places with sparse vegetation, and also under the foliage of squash plants.

REMARKS: These bees are primary pollinators of the squash vines in your vegetable garden. Female bees apparently visit the blossoms mostly in the early morning, even in the pre-dawn hours. The males seek females inside the flowers and can be found there day and night. This species is thought to have originated where pumpkins are native: the desert southwest, Mexico, and Central America. Widespread transport of squash has allowed these bees to colonize most of the United States. Literally, if you plant it, they will come!

SIZE: (BODY LENGTH)

FEMALE 12.5 -14 mm

MALE 11 -13 mm



TWO-SPOTTED LONG-HORNED BEE

Melissodes bimaculatus (Me-lis-oh-dees • bi-mak-u-late-us)

FAMILY: APIDAE (BEES)

HABITAT: Common in gardens, parks, prairies, fields, and other open habitats.

LIFE CYCLE: The 20 Ohio species of long-horned bees are solitary ground-nesters, but females of some species can nest in dense aggregations in suitable locations with flat topography and appropriate soils. A few species are communal, several females sharing a single nest entrance but tending only their offspring in separate subterranean burrows and cells.

REMARKS: Most species of *Melissodes* found in Ohio have extensive pale markings, such as tawny or gray hair on the thorax, and complete bands across the abdomen, which makes the nearly all-black Two-spotted Long-horned Bee unique. Long-horned bees are named for the males' extra-long antennae, which are bicolored: dark on top and pale underneath. These bees are pollinators of composite flowers, especially sunflowers, although many species are aster or daisy specialists. Consequently, *Melissodes* are most abundant in mid- to late summer and fall when these flowers are in bloom. Females have an exceptionally bushy scopa on each hind tibia, which helps identify them in the field. Males often spend the night in loose sleeping clusters, clinging to plants by their jaws and legs. Longhorned bees seen in spring and early summer are likely to be in the genus *Eucera* (aka *Synhalonia*).

SIZE: (BODY LENGTH)

FEMALE 13 -15 mm

MALE 11 -13 mm



GIANT RESIN BEE

Megachile sculpturalis (Meg-ah-chi-le • sculp-tur-al-iss)

FAMILY: MEGACHILIDAE (SOLITARY BEES)

HABITAT: Becoming increasingly common in gardens, parks, and fields, especially in urban areas.

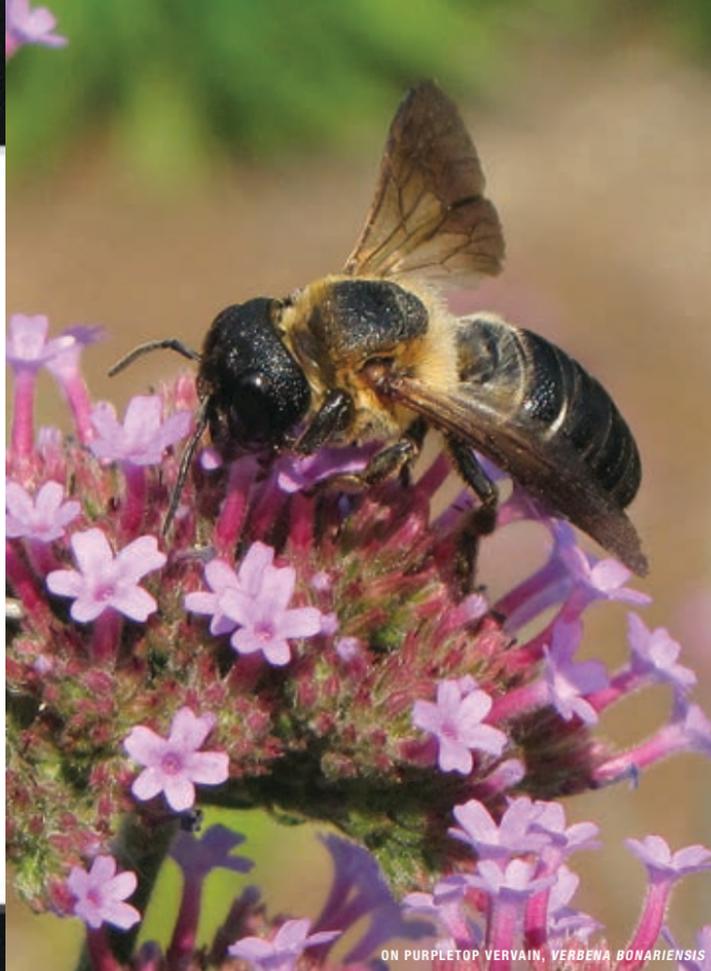
LIFE CYCLE: This is a solitary bee, and females use pre-existing cavities for nesting. They often take over abandoned nests of the Eastern Carpenter Bee, though there is at least one record of a female Giant Resin Bee usurping an active carpenter bee nest. The bee builds a series of up to ten cells along the length of the tunnel, back to front. Each cell contains a ball of pollen and nectar as food for a single larval bee. The Giant Resin Bee collects plant or tree resins to incorporate into partitions between cells, and the final nest closure can also contain wood particles and mud. This differs from a carpenter bee closure that is strictly compacted sawdust.

REMARKS: The Giant Resin Bee is native to Asia, and apparently introduced accidentally to North America. The first documented record came from North Carolina in 1994, and by 1999 it had reached central Ohio. It resembles a slenderized version of an Eastern Carpenter Bee, or a bumblebee with mange. However, the brushes of pollen-collecting hairs on the underside of the abdomen easily identify females of this species as members of the Megachilidae family. Not surprisingly, this bee prefers to visit flowers of non-native plants, especially Goldenrain Tree (*Koeleruteria paniculata*), a commonly used urban landscaping tree.

SIZE: (BODY LENGTH)

FEMALE 21 -25 mm

MALE 19 -22 mm



ON PURPLETOP VERVAIN, *VERBENA BONARIENSIS*

WOOL-CARDER BEE

Anthidium manicatum (An-thid-ee-um • man-ik-u-late-um)

FAMILY: MEGACHILIDAE (SOLITARY BEES)

HABITAT: Common in gardens, parks, and along forest edges. Frequent in urban areas.

LIFE CYCLE: These are solitary insects, females utilizing pre-existing cavities in wood or hollow stems. The female bee fills the tunnel with a series of cells constructed of plant fibers she “cards” by scraping the material from leaves with her mandibles. The hairy foliage of lamb’s ear plants is a favorite source. Each cell contains a ball of pollen that the female collects in a brush of hairs beneath her abdomen. She also regurgitates nectar to hold the pollen ball together.

REMARKS: Native to Europe, this species was probably introduced accidentally to New York in the early 1960’s. It was documented in Ohio in the vicinity of Akron in 1996. Males are larger than females; and they are aggressively territorial, driving off rival males, other insects, even hummingbirds. Large teeth on the abdominal segments can sometimes inflict fatal wounds on other bees. Males alight on foliage where females are foraging, and attempt to mate with females collecting pollen and nectar. Look for this bee around lamb’s ear, basil, catmint, foxgloves, oregano, cosmos, African blue basil, and Mexican sunflower, and other garden flowers. Flight period is from May to September.

SIZE: (BODY LENGTH)

FEMALE 11 -13 mm

MALE 14 -17 mm



CUCKOO LEAFCUTTER BEES

Coelioxys spp. (See-le-ox-is)

FAMILY: MEGACHILIDAE (SOLITARY BEES)

HABITAT: Common in fields, vacant lots, parks, and along forest edges.

LIFE CYCLE: These are solitary bees (16 Ohio species) in the family Megachilidae that are kleptoparasites of true leafcutter bees in the genus *Megachile*. A heavily armored exoskeleton protects the bees from attack by their hosts. A female *Coelioxys* enters the tunnel of a leafcutter bee when the adult bee is out foraging for nectar or nesting material. She uses the chisel-like tip of her abdomen, equipped with short, saw-like teeth, to penetrate the leaf-lined walls of the host cell and lay her own egg in the cell wall, or conceal it beneath or behind the pollen and nectar ball stored by the host for its own offspring. When her larva hatches, it kills the leafcutter larva and then feeds on the food ball.

REMARKS: Cuckoo leafcutter bees are easily recognized by the conical or triangular abdomen, sharply pointed in the female, and with terminal teeth in the male. The hind corners of the scutellum (top rear segment of the thorax) usually bear a sharp tooth as well. They are sparsely hairy, so might be mistaken for wasps. Both sexes visit a variety of flowers for nectar, especially members of the Compositae (aster family), plus white sweet clover, milkweed, sumac, and others. Look for them on the wing from June to August.

SIZE: (BODY LENGTH)

FEMALE 8 -16 mm

MALE 7 -12 mm



MASON BEES

Osmia spp. (Os-me-ah)

FAMILY: MEGACHILIDAE (SOLITARY BEES)

HABITAT: Common in gardens, parks, orchards, forest edges and under-story.

LIFE CYCLE: Mason bees are moderately hairy and dark metallic blue or green, occasionally black or brown. The females nest singly, with most species making nests in crevices, pre-existing cavities in wood, hollow twigs, or soft-centered branches. At least one species, *O. conjuncta*, uses empty snail shells. The tunnel is partitioned into several cells, constructed from back to front. Typically, cell partitions are made of mud, but several species use chewed-up leaves, or chewed leaves and mud. Females collect pollen on a dense brush of hairs on the underside of the abdomen. A ball of pollen and nectar is placed in each cell as food for a single larval bee.

REMARKS: The flight period for mason bees is mostly in spring, but some of the 22 Ohio species fly through August. Males of some species have modified tarsi ("feet") on the middle legs, which they use during courtship and mating to restrain the female. Females of some species have a short "horn" on each mandible that probably helps them in boring a nest or gathering mud for cell partitions. The Blue Orchard Bee, *O. lignaria*, is a valuable pollinator of fruit trees. Special "bee blocks" are widely available to offer them artificial housing.

SIZE: (BODY LENGTH)

FEMALE 8 -16 mm

MALE 7 -14 mm



LEAFCUTTER BEES

Megachile spp. (Meg-ah-chi-le)

FAMILY: MEGACHILIDAE (SOLITARY BEES)

HABITAT: Common in gardens, parks, meadows, prairies, and along forest edges.

LIFE CYCLE: Females of these solitary bees collect pollen in dense brushes of hairs (scopa) on the underside of the abdomen. The scopa can often be orange, red, or yellow. Most species nest in pre-existing cavities, but others nest in the ground. Females fashion barrel-shaped vessels from oval pieces snipped from leaves, or sometimes flower petals. Perfectly round pieces are cut for the "lid." Cutting a piece of leaf takes mere seconds, the bee rolling her cargo as she goes so she can fly away immediately. She completes one cell at a time, placing a ball of pollen and nectar inside as food for a single larval offspring. Several of these barrels are stacked along the length of the tunnel or burrow.

REMARKS: Leafcutter bees fly from May to September. Twenty-nine species, some of them introduced, are known in Ohio. They typically visit a variety of flowers for nectar, but may harvest pollen from only a few. The Alfalfa Leafcutter Bee, *M. rotundata*, is employed to pollinate lowbush blueberry in the eastern U.S., alfalfa in the west. Males of some *Megachile* species have enlarged hairy tarsi ("feet") on their front legs. They cover the eyes of the female during courtship and mating. Odor glands produce a seductive scent dispersed by the fringe of hairs.

SIZE: (BODY LENGTH)

FEMALE 8 -20 mm

MALE 6 -15 mm



CUCKOO BEES

Sphecodes spp. (Sphe -ko-dees)

FAMILY: HALICTIDAE (CUCKOO BEES & SWEAT BEES)

HABITAT: Common in gardens, parks, fields, open forest understory.

LIFE CYCLE: These solitary bees are kleptoparasites of other solitary bees, mostly sweat bees in the family Halictidae, to which *Sphecodes* also belongs. Less frequently they invade the nests of *Andrena* and *Perdita* mining bees. The female cuckoo bee sneaks into the nest burrow of her host when the host bee is away. Entering an underground cell, the *Sphecodes* female destroys the egg of the host and replaces it with her own. Her larval offspring will then consume the pollen and nectar that the host has stocked for her now deceased offspring.

REMARKS: There are about 25 species in Ohio. Cuckoo bees are not very hairy because they do not collect pollen for their offspring. Consequently, they are often mistaken for small wasps. They are seen mostly in spring (April, May and June), and/or late summer and fall. Some *Sphecodes* species have an all-black, or black-tipped, abdomen, especially in the males. Both sexes visit flowers for nectar. This is a complex and confusing genus of bees and the true number of species has yet to be resolved.

SIZE: (BODY LENGTH)

FEMALE 4 -10 mm

MALE 4 -10 mm



SWEAT BEE

Agapostemon virescens (Ag-ah-post-eh-mon • veer-es-ens)

FAMILY: HALICTIDAE (CUCKOO BEES & SWEAT BEES)

HABITAT: Common in gardens, parks, fields, and vacant lots. May nest in bare patches in lawns.

LIFE CYCLE: Females nest communally in the soil, up to thirty individuals sharing a common entrance. The main burrow may reach a depth of 42 centimeters. Each female digs her own tunnel off the main shaft, terminating in one or more cells. After the cells are provisioned with pollen and nectar, and an egg laid in each, the lateral tunnel is sealed with soil. At least one female acts as sentry for the nursery labyrinth, guarding the entrance against invading parasites. Adult bees fly from May through August. Females overwinter underground in branching burrows they dig in established nests. Generations can overlap in a nest.

REMARKS: This bee (there are 3 other Ohio species in the genus *Agapostemon*) is easily recognized by the metallic green head and thorax, and black-and white-banded abdomen (females). The male has a black-and yellow-banded abdomen and yellow legs. Females of other *Agapostemon* species are wholly metallic green, but are larger and more hairy than other metallic sweat bees.

SIZE: (BODY LENGTH)

FEMALE 11 mm

MALE 10 mm



SWEAT BEE

Augochlora pura (Aug-oh-klor-ah • pur-ah)

FAMILY: HALICTIDAE (CUCKOO BEES & SWEAT BEES)

HABITAT: Common on flowers in gardens, parks, fields, vacant lots, and forest edges.

LIFE CYCLE: Females overwinter under bark and in decaying logs and stumps in deciduous forests. Come springtime, they bore nests in rotten wood, often using existing beetle excavations as a starting point. Cells are fashioned from sawdust held together with secretions from the bee. Each cell is reserved for a single larval offspring. The female bee excavates these cells at night, forages for pollen and nectar mostly in the morning hours, and provisions the cells in the afternoon. At least two generations are produced each year. The adult bees fly from mid-April through early October.

REMARKS: This is one of several wholly metallic green sweat bees that look superficially alike in the field, *Augochlorella*, and *Augochloropsis* being very similar genera. *Augochlora pura* is perhaps the most common, and can be copper or bronze, as well as green or blue-green. Males are more slender than females, with longer antennae. The bees visit a wide variety of flowers and also seek honeydew generated by aphid colonies.

SIZE: (BODY LENGTH)

FEMALE 8 mm

MALE 8 mm



SWEAT BEE

Augochloropsis spp. (Aug-oh-klor-op-sis)

FAMILY: HALICTIDAE (CUCKOO BEES & SWEAT BEES)

HABITAT: Fairly common on flowers in gardens, parks, prairies, and meadows.

LIFE CYCLE: Females excavate nests in the soil, consisting of a vertical shaft with tunnels that branch laterally. At the end of these tunnels is a room in which clusters of vertical cells are formed, at least in the case of *Augochloropsis sumptuosa* (one of two Ohio species in this genus). Pollen and nectar are formed into a rectangular “loaf” that is placed against the side of each cell. A single bee larva develops in each cell. There may be 6-16 cells per nest, and one to three female bees creating each nest. The adult bees are commonly seen from May to September.

REMARKS: This is one of several wholly metallic green sweat bees that look superficially alike in the field, *Augochlora*, and *Augochlora* being the other two genera. Females of some *Agapostemon* species are also entirely green. The genus *Augochloropsis* is most diverse in the New World tropics.

SIZE: (BODY LENGTH)

 FEMALE 9 -11 mm

 MALE 9 -11 mm



SWEAT BEE

Halictus spp. (Hal-ik-tus)

FAMILY: HALICTIDAE (CUCKOO BEES & SWEAT BEES)

HABITAT: Abundant in gardens, parks, meadows, prairies, and other open habitats.

LIFE CYCLE: Most North American *Halictus* species are considered “primitively eusocial.” Each female nests alone initially, and her first generation of offspring is females only. These daughters remain to help their mother rear a second generation. They are thus de facto workers since they are unmated; and their mother the “queen.” Nests are burrows in sandy loam soil on flat terrain with little or no vegetation. The shafts are vertical, with brood cells arranged at varying depths along the length. Depths range from 25-70 centimeters, with the second generation expanding the burrow to deeper depths. Brood cells are coated with a glandular secretion that waterproofs the walls. A pollen and nectar ball serves as food for one larva in each cell.

REMARKS: *Halictus* sweat bees (four Ohio species) have a long flight period, from late March through at least September. They can be easily mistaken for other sweat bees in the genus *Lasioglossum*, mining bees in the genus *Andrena*, and polyester bees in the genus *Colletes*. Differences in wing venation and head shape separate them, but those attributes are difficult to see in the field. *Halictus* bees generally visit a diversity of flowers. Look for groups of nesting females along paths and dirt roads.

SIZE: (BODY LENGTH)

FEMALE 7 -13 mm

MALE 7 -11 mm



SWEAT BEE

Lasioglossum spp. (Las-ee-oh-glos-um)

FAMILY: HALICTIDAE (CUCKOO BEES & SWEAT BEES)

HABITAT: Abundant in gardens, meadows, prairies, and other open habitats.

LIFE CYCLE: The diversity of this genus (71 Ohio species) also reflects a variety of lifestyles and nesting habits. Some species are solitary, each female excavating a burrow in the soil and providing for her own offspring. Others are communal, with several females sharing a common nest entrance, but caring for their own larvae. Still others are eusocial, the daughters helping their mothers raise a second generation. They expand the nest burrow and add cells to accommodate their future siblings. A few are social parasites that deceive other *Lasioglossum* females into rearing their offspring. Mating usually takes place in late summer or fall, with mated females overwintering inside the nests. Colonies may occupy the same nesting location for several years.

REMARKS: There are several subgenera, the most common of which is *Dialictus*. These are small bees, weakly metallic or brassy, often with a “five o’clock shadow” pattern of short hairs on the abdomen. Species of *Lasioglossum* look nearly identical to *Halictus* in size and color. Additional subgenera are *Hemihalictus* (mostly blackish), *Leuchalictus*, *Sphecodogastra*, and *Evylaeus*. These bees are collectively on the wing from March to October. Look for them on flowers, and at aphid colonies where they lap up honeydew. They may also drink perspiration from your skin.

SIZE: (BODY LENGTH)

FEMALE 3.36 -10 mm

MALE 2.9 -8 mm



POLYESTER BEES

Colletes spp. (Col-lee-tees)

FAMILY: COLLETIDAE (POLYESTER BEES & YELLOW-FACED BEES)

HABITAT: Common in open woodlands, gardens, parks, and sandy areas.

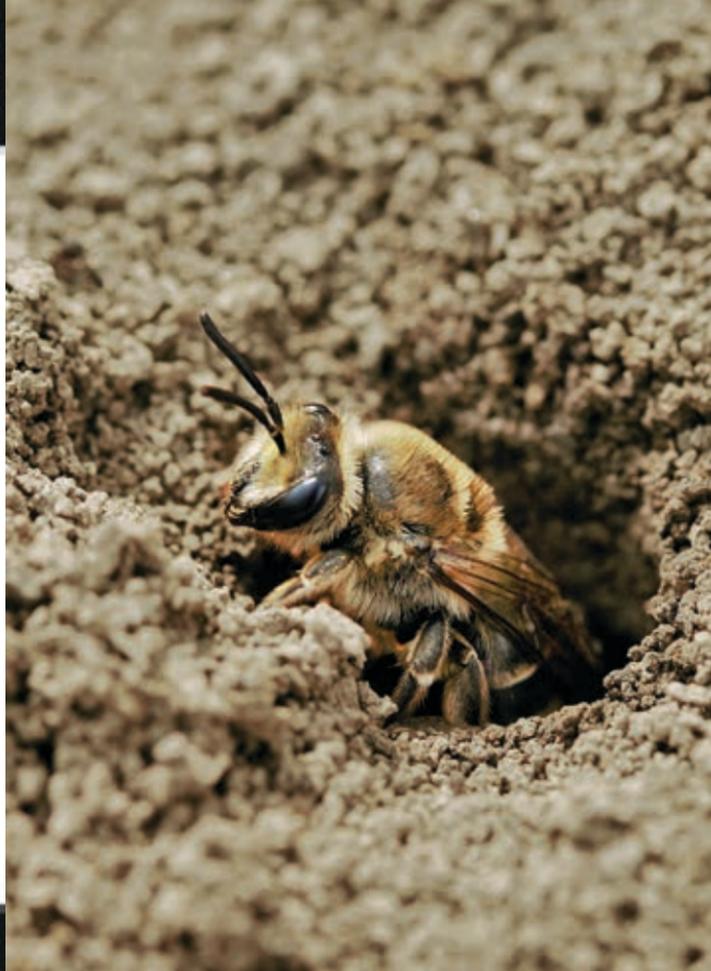
LIFE CYCLE: The 25 Ohio species of *Colletes* are solitary, but females may dig their burrows in large aggregations in suitable habitat, usually bare patches of sandy soil. Burrows are 10-15 centimeters deep on average. They are also known as “cellophane bees,” for the ability of females to produce polymerized macrocyclic lactones (natural plastic) from abdominal glands. This material, which contains nutrients for the larvae, is used to line the walls of their brood cells. The female bees also manufactures a fungicide and anti-bacterial compound called linalool in glands near her jaws. She squirts this chemical over an empty cell before starting the provisioning process. The egg is laid on the wall of the cell above the liquid food mass.

REMARKS: Polyester bees closely resemble mining bees in the genus *Andrena*, and some sweat bees in the genera *Halictus* and *Lasioglossum*. Polyester bees are generally larger, about the size of a honeybee, with a heart-shaped face when viewed head-on. They are most obvious in early spring, though some species fly in summer and fall. Many species visit flowers of plants in only one genus or family. Look for nest “villages” of *Colletes* in sandy situations.

SIZE: (BODY LENGTH)

 FEMALE 9 -13 mm

 MALE 7 -10 mm



YELLOW-FACED BEES

Hylaeus spp. (Hy-lee-us)

FAMILY: COLLETIDAE (POLYESTER BEES & YELLOW-FACED BEES)

HABITAT: Common in a variety of habitats from fields and gardens to forest openings.

LIFE CYCLE: These solitary bees make their nests in hollow twigs; others nest in old beetle borings in dead wood. You can attract them by drilling small holes into wooden blocks and hanging them in sheltered locations. The female does not collect pollen on her body, but ingests small amounts along with nectar, storing the mixture internally. At the nest, she regurgitates the food into a brood cell. The cells are lined with a thin, transparent membrane of natural polymer produced from a gland in her abdomen. This plastic container keeps the food fresh. A single egg is laid on the wall of the cell, and the larva feeds on the stored food. Ten or eleven cells may occupy a cavity, with separating partitions made of chewed wood fibers.

REMARKS: Also known as “masked bees,” these insects are nearly hairless, and black with yellow or ivory markings. Males have a mostly pale face, while females have less conspicuous white or yellow markings on the head. Differentiating them from small wasps can be tricky. Males patrol patches of flowers in search of females. May to September is the flight period. There are 14 species in Ohio, one of which is introduced.

SIZE: (BODY LENGTH)

 FEMALE 3.5 -8 mm

 MALE 3.5 -7.5 mm



MINING BEES

Andrena spp. (An-dre-na)

FAMILY: ADRENIDAE (MINING BEES)

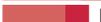
HABITAT: Abundant in gardens, parks, meadows, prairies, and forest understorey.

LIFE CYCLE: This is a diverse genus (509 species north of Mexico; 100 Ohio species), so generalizations are risky. Though solitary, many females may nest in close proximity in favored sites. Nests can be in bare spots in the lawn, at the base of shrubs, or beneath leaf litter. Burrows are basically vertical but forked with lateral branches, each tunnel ending in one or two brood cells. Females line the cells with a waxy substance that soaks into the soil and prevents the walls from crumbling. Each cell is provisioned with a ball of pollen and nectar that feeds a single larva. Winter is passed as a prepupa or pupa. There is usually one generation annually.

REMARKS: Mining bees resemble *Halictus* and *Lasioglossum* bees (family Halictidae), and polyester bees (*Colletes*, family Colletidae), but female *Andrena* have a distinctive band of pale hairs on the inner margin of each eye. Those hairs may wear off in older specimens, but the underlying depressions (facial foveae) are still discernible. These bees can fly at cooler temperatures than other bees. Many species can only be identified by association with the flowers they visit. Males may form aerial leks at the tips of tree branches, attracting the attention of females. Most *Andrena* fly March to June, but some occur in late summer or fall.

SIZE: (BODY LENGTH)

 FEMALE 10 -14 mm

 MALE 8 -11 mm



EASTERN YELLOWJACKET

Vespula maculifrons (Ves-pew-la • mak-u-li-frons)

FAMILY: VESPIDAE (HORNETS, WASPS, & YELLOWJACKETS)

HABITAT: Common nearly everywhere, even urban parks and gardens.

LIFE CYCLE: Queens of this species spend the winter in decaying logs and other niches insulated from the cold, and start seeking nesting sites in the spring. The underground nests harbor 1,000-3,000 workers or more by late summer or early autumn. Males and queens are produced in the fall. The colony collapses in late fall, males and remaining workers dying by the first hard frost. Worker wasps feed the larvae protein they scavenge, in the form of other insects, carrion, or your picnic or barbecue meats.

REMARKS: Identified by the black “anchor” mark on the first segment of the abdomen. Adults are fond of sweets, so be wary of drinking beverages from cans when outdoors, lest you accidentally swallow a wasp. Nests are built in abandoned rodent burrows and other natural cavities, but also in rock walls, even between the walls of buildings. Be vigilant such that you don’t run a lawnmower over a nest entrance, or drive a garden stake into one. This species scores a 2 on the Schmidt Pain Index (page ?), and the sting is described thusly: “Hot and smoky, almost irreverent. Imagine W.C. Fields extinguishing a cigar on your tongue.” The similar German Yellowjacket, *Vespula germanica*, an import from Europe, is even more pestiferous. It has a black “diamond” mark on the first segment of the abdomen.

SIZE: (FOREWING LENGTH)

	FEMALE 7 -11 mm
	MALE 11 -13 mm
	QUEEN 12 -13.5 mm



BALD-FACED HORNET

Dolichovespula maculata (Dol-ik-oh-ves-pul-ah • mak-u-late-ah)

FAMILY: VESPIDAE (HORNETS, WASPS, & YELLOWJACKETS)

HABITAT: Common along forest edges, suburbs, and sometimes in urban sites.

LIFE CYCLE: These are social wasps. Queens overwinter under bark, in rotten logs, and other snug niches, and start building their paper nests in late spring. The worker wasp population peaks at 100-400 in late summer. Males and a new generation of queens are produced at that time. The colony abandons the nest after that, with males and workers perishing with the first hard frost, if not sooner. Inside the nest, paper combs are composed of hexagonal cells, each one a nursery for an egg that hatches into a larva. Larvae are fed other insects, such as flies and even yellowjackets, which are killed and chewed-up by the worker wasps. Eventually the larva pupates, spinning a white silken dome over its cell. A week or so later an adult wasp chews its way out.

REMARKS: These are not true "hornets," but simply large yellowjackets that build their nests in trees, shrubs, or amid berry canes, but sometimes under the eaves of homes and buildings. Nests are not re-used from year to year and eventually disintegrate due to weathering. The occupants of active nests are not aggressive unless the nest itself is disturbed. Defensive wasps do pack a painful albeit short-lived punch. Female wasps deliver the sting in flight; a quick flyby stinging that happens so quickly you may not realize what hit you. Bald-faced Hornets rate a 2 on the Schmidt scale, and their sting has been described as "Rich, hearty, slightly crunchy. Similar to getting your hand mashed in a revolving door."

SIZE: (FOREWING LENGTH)

	FEMALE 11 -15 mm
	MALE 13.5 -16 mm
	QUEEN 15 -18 mm



NORTHERN PAPER WASP

Polistes fuscatus (Pol-is-tees • fus-kay-tus)

FAMILY: VESPIDAE (HORNETS, WASPS, & YELLOWJACKETS)

HABITAT: Widespread and ubiquitous in most habitats, suburban and rural locations.

LIFE CYCLE: Any female Northern Paper Wasp can found a colony after emerging from hibernation. More than one female may establish a nest, but eventually one will assert dominance and be the sole egg-layer. The paper catacomb nests hang under eaves of buildings, inside barns, or suspended from branches and twigs in dense shrubs. Larval wasps are fed mostly pulverized caterpillars, but sometimes other insects, especially grasshoppers, small katyids, and crickets. Nests usually contain well under 100 adults. Females and males visit flowers for nectar and aphid colonies for honeydew. Nests are abandoned in autumn and not re-used the following year.

REMARKS: This is our most common native paper wasp, but is highly variable and can be mistaken for several different species. Further, recent studies have revealed two previously unrecognized species nearly identical to the Northern Paper Wasp. One of these, *Polistes parametricus*, has been collected in Franklin and Vinton counties, and probably ranges elsewhere in Ohio. Male *P. fuscatus* have all-yellow, square faces and hooked antennae. They do not sting. Watch the body language of wasps on the nest. Females on tiptoe with splayed wings are saying "Back off!"

SIZE: (FOREWING LENGTH)

FEMALE 13 -17 mm

MALE 11 -17 mm



EUROPEAN PAPER WASP

Polistes dominula (Pol-is-tees • dom-in-u-la)

FAMILY: VESPIDAE (HORNETS, WASPS, & YELLOWJACKETS)

HABITAT: Abundant in urban yards, gardens, and parks, but also rural areas.

LIFE CYCLE: Paper wasps do not have true queens like yellowjackets. Any female can become a “foundress” and start a colony in spring after overwintering in a protected niche. Nests are uncovered paper combs, each hexagonal cell containing one egg, larva, or pupa. Pupal cells are capped in white silken domes. Workers hunt caterpillars, chewing their prey into a pulp that’s fed to the growing larvae. Typical colonies have a peak population of a few dozen to over 100 wasps. Adult wasps feed on flower nectar, the honeydew produced by aphids, and other sweets. They may store droplets of honey in vacant cells in the nest.

REMARKS: This insect is native to Eurasia and northern Africa. It was first noticed in the U.S. in Massachusetts in the 1970s. It arrived in Cincinnati about 1990 and quickly becoming the second most common urban paper wasp behind the Northern Paper Wasp (page 36). Watch out for nests inside bird boxes, electrical boxes, overturned flowerpots, unused water spigots, and other enclosed spaces. This species is rated a “2” on the Schmidt Pain Index (page 8), and the sting has been described as “Caustic & burning. Distinctly bitter aftertaste. Like spilling a beaker of hydrochloric acid on a paper cut.” Males, which cannot sting, are recognized by a nearly all-yellow, squarish face and hooked antennae.

SIZE: (FOREWING LENGTH)

FEMALE 9.5 -13 mm

MALE 8.5 -12 mm



ON QUEEN ANNE'S LACE, *DAUCUS CAROTA*

EUROPEAN HORNET

Vespa crabro (Ves-pa • crab-ro)

FAMILY: VESPIDAE (HORNETS, WASPS, & YELLOWJACKETS)

HABITAT: Uncommon, found mostly in wooded areas.

LIFE CYCLE: Hornets are social wasps. Queens survive the winter in protected situations, emerging to start scouting for nesting sites in late April or May. A mature colony has anywhere from 200-400 worker wasps by about mid-September, though larger colonies of 1,000 workers have been documented. The nests are usually built inside hollow trees, but sometimes in hollow walls in buildings, old beehives, and other man-made cavities. The paper envelope enclosing the combs is usually rudimentary unless the nest is in a somewhat exposed circumstance. This wasp is unusual in that workers can be active at night, often attracted to outdoor lights. Hornets kill other insects to feed to the larvae in the nest. They will sometimes raid honeybee hives to rob nectar and plunder the brood cells.

REMARKS: This species is a true hornet, much larger than yellowjackets. Native to Europe, it was introduced to the New York City area between 1840 and 1860 and has since spread as far west as the Dakotas, and south to Georgia and Alabama. The adult wasps crave sap and can girdle the branches of lilacs, dogwoods, and other trees and shrubs. Note that all social and mason wasps can be recognized by the longitudinally folded wings when the insects are at rest.

SIZE: (FOREWING LENGTH)

FEMALE 16 -20 mm

MALE 22 mm

QUEEN 22 -24 mm



POTTER WASP

Eumenes fraternus (Ew-me-nees • fra-ter-nus)

FAMILY: VESPIDAE (HORNETS, WASPS, & YELLOWJACKETS)

HABITAT: Common in fields and forest edges, and even urban situations.

LIFE CYCLE: Potter wasps are solitary, each female constructing an elegant mud urn, into which she deposits several small, paralyzed caterpillars. A single egg is laid on the last victim before the wasp seals the entrance. The grub that hatches then consumes the cache of caterpillars. Eventually the grub pupates, and an adult wasp chews its way out of the mud fortress to freedom. At least two generations are produced annually, between late spring and early autumn. A single female can produce several nests in her lifetime. Winter is passed as a mature larva within the nest.

REMARKS: These wasps have a long petiole connecting the abdomen to the thorax, but not as long and narrow a stalk as the thread-waisted wasps.

Males are recognized by their white faces and the hooked tips of their antennae. Look for potter wasps on flowers foraging for nectar. Nests, about the size of a marble, can often be found around the edges of recessed window frames and other sheltered locations. Cankerworm caterpillars are apparently a favorite for provisioning nests.

SIZE: (FOREWING LENGTH)

FEMALE 10 -12.5 mm

MALE 8 -10.5 mm



FOUR-TOOTHED MASON WASP

Monobia quadridens (Mon-oh-bee-ah • quad-rih-dens)

FAMILY: VESPIDAE (HORNETS, WASPS, & YELLOWJACKETS)

HABITAT: Common near forest edges, sometimes nesting in exterior wood beams of buildings.

LIFE CYCLE: This is a solitary wasp. For nests, females utilize pre-existing cavities in wood, hollow twigs, old mud dauber nests, and, rarely, the soil. They are especially fond of abandoned tunnels bored by carpenter bees. The female wasp mostly hunts leaf-rolling caterpillars, stashing several paralyzed victims in the bottom of the nest and laying a single egg. She then makes a partition of mud, leaves an empty space (“intercalary cell”), then another partition, and finally another cell she will stock with caterpillars. She repeats this sequence until the longitudinal space is filled. A final vacant cell is left before the entrance is sealed. The empty “room” may fool parasites into thinking their host is not home. One female wasp may create several nests.

REMARKS: These big wasps are sometimes mistaken for Bald-faced Hornets. Males are distinguished by the large white spot on their faces. Both genders visit flowers such as goldenrod, thoroughwort, and sumac. There are at least two generations each year. Larvae do not spin cocoons in which to pupate, but secrete a “varnish” with which they coat the walls of their cell before entering a pre-pupal stage. The fall generation spends winter in this stage. This species will use artificial “trap nests”: wooden blocks with holes drilled in them and hung under eaves or other protected situations.

SIZE: (FOREWING LENGTH)

FEMALE 14 -18 mm

MALE 11 -14.5 mm



ON RATTLESNAKE-MASTER, *ERYNGIUM YUCCIFOLIUM*

40

ODNR DIVISION OF WILDLIFE | COMMON BEES AND WASPS OF OHIO
PHOTO BY: ©JIM MCCORMAC

EASTERN CICADA KILLER

Sphex speciosus (Sph-e-see-us • spe-se-oh-sus)

FAMILY: CRABRONIDAE (SOLITARY WASPS)

HABITAT: Common along forest edges, parks, and other open areas, especially with sandy soil.

LIFE CYCLE: Ohio's largest wasp is solitary, but many females may nest in close proximity. The nonstinging males patrol the periphery of such colonies, driving off intruders. The female digs a tunnel that extends up to three feet, and a depth of two feet. Individual cells branch off near the end. Prey is annual cicadas (genus *Neotibicen*). The wasp flies into the tree canopy and combs branches until she bumps into a cicada. She grabs it, stinging it into paralysis. She flies it directly to her burrow, or glides from the tree to the ground, climbs another vertical object to launch again, and so on. She dives down the burrow entrance, hauling her prize to one of the underground chambers. Each cell holds one to three cicadas, and a single wasp egg. The egg hatches in a day or two, and the larva starts feeding on the cicadas, maturing in about ten days. The larva then spins a cocoon, inside of which it turns into a pupa. Pupae overwinter, the adult wasps emerging the following summer.

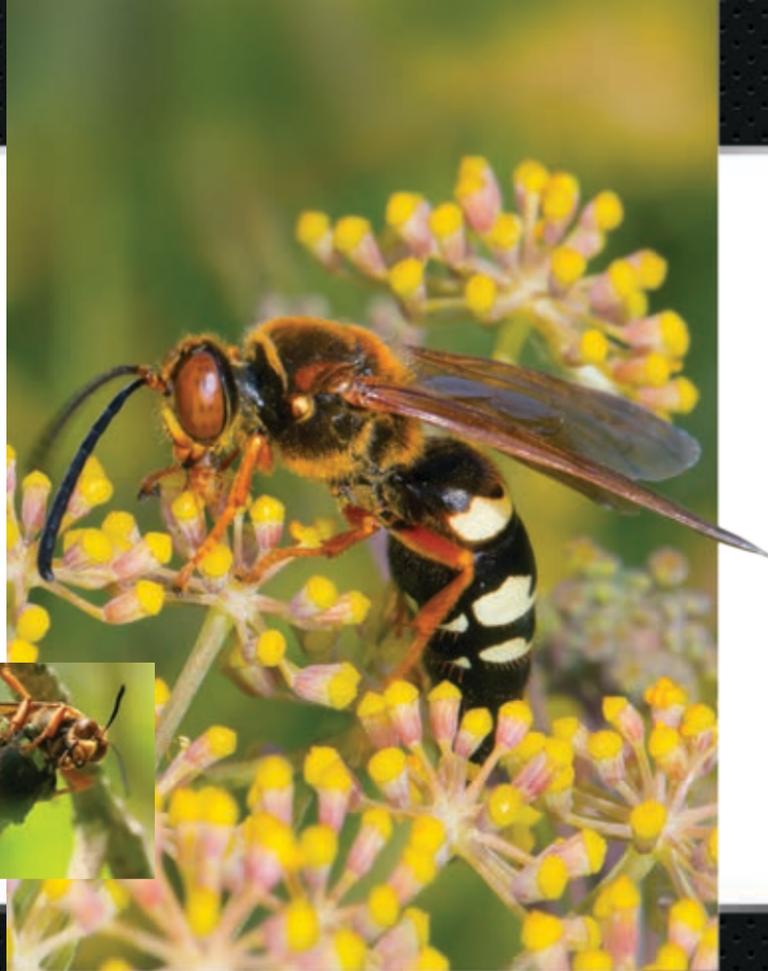
REMARKS: Adult wasps can be seen from July through mid-September. Both sexes sip nectar from flowers, but also eat fermenting sap oozing from tree trunks. The drama of an active colony is highly entertaining.

SIZE:

FEMALE (forewing) 24 -32 mm

MALE (forewing) 21 -24 mm

(body length) up to 40 mm



PIPE ORGAN MUD DAUBER

Trypoxylon politum (Tri-pox-ih-lon • po-lee-tum)

FAMILY: CRABRONIDAE (SOLITARY WASPS)

HABITAT: Common in wide variety of open habitats, both urban and rural.

LIFE CYCLE: Females of this solitary species construct linear tubes of dried mud of varying lengths, resembling the pipes of an old-fashioned organ. Each “pipe” can be up to six inches long, and is typically divided into three or four cells. The female wasp hunts spiders as food for her offspring, paralyzing each victim and stashing several in the cell before laying an egg and closing the chamber with a mud partition. Orbweaver spiders are the preferred prey. Look for the adult wasps from mid-June through early September.

REMARKS: These wasps are somewhat unusual in that the male cooperates in housekeeping and guarding the nest while the female is away. A hook on the underside of his abdomen, near the front, helps anchor him as he repels parasites, predators, and other female wasps bent on usurping the nest. He mates with the female just before she lays an egg in a cell. Old nests are frequently used by other solitary wasps and bees. Many parasites such as satellite flies (family Sarcophagidae), bee flies (Bombyliidae), cuckoo wasps (Chrysididae), and ultra-tiny *Melittobia* wasps (Eulophidae) infiltrate mud dauber nests.

SIZE:

FEMALE (forewing) 14.8 -16.2 mm

MALE (forewing) 11.8 -14.8 mm



STINK BUG HUNTER

Bicyrtes quadrifasciatus (Bi-ser-tees • quad-rih-fas-ee-ate-us)

FAMILY: CRABRONIDAE (SOLITARY WASPS)

HABITAT: Common in vacant lots, fields, and forest edges where it visits flowers.

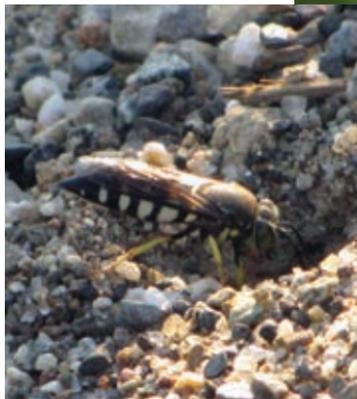
LIFE CYCLE: This is one of the “sand wasps” in the family Crabronidae. Females nest in sandy areas, digging burrows with the help of a “tarsal rake” on each front “foot.” They excavate a 15-20 centimeter long tunnel that includes a pair of cells. Each cell is provisioned with the paralyzed nymphs of stink bugs, although leaf-footed bugs and shield bugs are also used occasionally. An egg is laid on the first victim, with usually 6-8 more bugs added before the underground cell is plugged.

REMARKS: Look for these wasps on the blooms of dogbane as well as milkweeds, sweet clover, Queen Anne’s lace, and a variety of other flowers. Stink Bug Hunters can be told from similar wasps by the boxy appearance of the back of the thorax. The angular hind corners of the thorax are white. The white bands on the abdomen become increasingly separated along the middle from front to back, which is another distinguishing character.

SIZE: (FOREWING LENGTH)

FEMALE 17 -20 mm

MALE 17 -20 mm



BEEWOLF

Philanthus gibbosus (Fil-an-thus • gib-oh-sus)

FAMILY: CRABRONIDAE (SOLITARY WASPS)

HABITAT: Common in parks, fields, gardens, and other open habitats.

LIFE CYCLE: Females excavate nursery chambers in coarse sandy soil. A typical burrow extends 15-24 centimeters, although some burrows reach a meter or more. These may represent expansion of the nest by a succeeding generation. Individual cells at the end of short tunnels radiate from the main burrow along its length. Thirty-five species of bees and wasps have been recorded as prey. The majority are sweat bees in the family Halictidae; but yellow-faced bees in the family Colletidae, and a couple species in the Andrenidae are known, too. A victim is stung and paralyzed by a potent neurotoxin. The wasp then carries the bee to its burrow. It takes several bees to rear one larval beewolf.

REMARKS: Male beewolves (7 species occur in Ohio) are territorial, perching near the ground where they can intercept a female or chase off a competing male. Males scent-mark twigs and foliage, using brushes of hairs on the underside of the abdomen. By doing this, they “paint” an odor that communicates their ownership of a territory. *Philanthus gibbosus* is known to engage in burrow sharing, whereby sibling females may occupy their birth nest for a short time before dispersing. Look for both sexes on flowers.

SIZE: (BODY LENGTH)

10 - 12 mm



BLACK-&-YELLOW MUD DAUBER

Sceliphron caementarium (Sel-ih-fron • see-men-tar-ee-um)

FAMILY: SPHECIDAE (MUD DAUBERS & THREAD-WAISTED WASPS)

HABITAT: Common in a variety of open habitats, including urban areas. Often seen around buildings, which are frequent nest sites.

LIFE CYCLE: The female wasp builds linear mud cells that she stocks with 6-15 or more paralyzed spiders per cell as food for her future offspring. One larva develops in each cell. Several cells can be constructed adjacent to and/or atop each other with the finished product resembling a shapeless clod. Nests are often seen under bridges and the eaves of houses, in the rafters of barns, and on other manmade structures. The wasps hunt a variety of spiders, but prey primarily on orbweavers. At least two generations can be produced annually.

REMARKS: The Black and Yellow Mud Dauber is one of our showiest and most conspicuous solitary wasps. Adults visit flowers such as Queen Anne's lace for nectar, and aphid colonies for honeydew. Females fashion mud balls along the shores of puddles, ponds or rivers for nest construction. Nests are parasitized by certain ichneumon wasps, cuckoo wasps, velvet ants, bee flies, and other insects. Unoccupied nests are recognized by the round exit hole at the end of each cell. Holes elsewhere along the length of a cell represent the exits of parasites. Nests may not remain empty for long, as they are "renovated" by the Blue Mud Dauber and various mason wasps. Some are used as retreats by spiders.

SIZE: (BODY LENGTH)

24 -28 mm



BLUE MUD DAUBER

Chalybion californicum (Cha-lib-ee-on • cal-ih-forn-ih-kum)

FAMILY: SPHECIDAE (MUD DAUBERS & THREAD-WAISTED WASPS)

HABITAT: Common in fields, along forest edges, in parks, gardens, even urban settings. Often seen around old barns and other structures, which can serve as nesting sites.

LIFE CYCLE: The female wasp does not create her own nest. She refurbishes the old nests of a related species, the Black-and-yellow Mud Dauber. Instead of gathering mud, the Blue Mud Dauber is a “water carrier,” spitting water on the old mud nest and re-forming it. The result is a lumpy mud clod. After cleaning out the empty cells of the former occupant, she then hunts for her own spider prey. Blue Mud Daubers are adept at landing on a spider web, vibrating the snare to mimic an entangled insect, and then grabbing the spider when it dashes out to investigate. The spider is paralyzed and flown back to the nest. Several spiders provision each cell, fueling the growth of the wasp larvae.

REMARKS: The Blue Mud Dauber is well-known as a hunter of black widow spiders (*Latrodectus* spp.). Despite their normally solitary behavior, males will gather in large “bachelor parties” where they spend the night, often causing alarm when they choose to cluster under an eave or other location around a home. Adult wasps of both genders visit flowers for nectar, but prefer honeydew from aphids and related insects.

SIZE: (LENGTHS / FEMALE)

FORWING 12.2 - 15.9 mm

BODY 16.9 - 22.5 mm

SIZE: (LENGTHS / MALE)

FORWING 10.8 - 15.2 mm

BODY 13 - 16.5 mm



GREAT BLACK WASP

Sphex pensylvanicus (Sfex • pen-sil-van-ih-kus)

FAMILY: SPHECIDAE (MUD DAUBERS & THREAD-WAISTED WASPS)

HABITAT: Fairly common in fields, meadows, gardens and other open areas.

LIFE CYCLE: Female wasps dig a burrow for a nest, usually in soft, often sandy soil. Some have been observed nesting in dirt floors of old barns. Several underground cells radiate from the end of the shallow, diagonal tunnel. The female wasp places 2-6 large, paralyzed katydids into each "room." The Greater Anglewing and Fork-tailed Bush Katydid are the most common prey species. The comatose katydids will serve as food for a single larval offspring. There are two generations each year, one of which overwinters as pre-pupal larvae. Several individual wasps may nest in the same vicinity, giving the illusion that they are social.

REMARKS: This is a very large, imposing wasp, all black with wings that reflect blue or violet. The adults are commonly seen on flowers, especially milkweeds, thoroughworts, goldenrod, grape, buttonbush, and sweet clover. Females are routinely harassed into dropping their katydid victims by House Sparrows and Gray Catbirds, according to a study in Rhode Island. Up to one-third of the wasp's successful hunting forays can result in pirated prey. The Great Black Wasp was the first North American digger wasp to be the subject of a scientific paper. John Bartram, a Pennsylvania Quaker, published his notes on this species in 1749.

SIZE: (BODY LENGTH)

FEMALE 28 - 38 mm

MALE 22 mm



ON SWAMP MILKWEED,
ASCLEPIAS INCARNATA



ON TROPICAL MILKWEED, *ASCLEPIAS CURASSAVICA*

GREAT GOLDEN DIGGER

Sphex ichneumoneus (Sfex • ik-new-mo-nee-us)

FAMILY: SPHECIDAE (MUD DAUBERS & THREAD-WAISTED WASPS)

HABITAT: Fairly common in fields, meadows, and flower gardens. Nests in sandy soil.

LIFE CYCLE: The female of this large, solitary wasp is fossorial (burrowing). She excavates a burrow in the soil by using her jaws and “tarsal rake,” a series of spines on each front leg. She carries loads of soil particles with her front legs and “chin” as she backs out of the hole during her tunneling activities. A finished burrow is nearly vertical, and ends in an anteroom from which radiates two to seven subterranean cells, each one a chamber in which a single larva develops. The female wasp hunts katydids and paralyzes them, provisioning each cell with 2 to 6 victims.

REMARKS: Sometimes many of these beautiful wasps can be found nesting in the same vicinity. They can be quite particular about soil texture, and may use favored locations year after year. One documented aggregation persisted for at least 25 years. Males and females can often be seen sipping nectar from flowers, flitting quickly from one bloom to the next. The golden pubescence, and bi-colored abdomen of this species makes it impossible to mistake for any other wasp of this size, including other Ohio *Sphex* species.

SIZE: (BODY LENGTH)

FEMALE 23 - 27 mm

MALE 19 mm



THREAD-WAISTED WASP

Ammophila procera (Am-oh-fil-ah • pro-ser-ah)

FAMILY: SPHECIDAE (MUD DAUBERS & THREAD-WAISTED WASPS)

HABITAT: Uncommon, most often seen in open, sandy areas including beaches.

LIFE CYCLE: Females of this slender but imposing wasp hunt caterpillars as food for their offspring. The female digs a burrow in compact sand, plugging and covering the entrance when finished. She then locates and attacks a large caterpillar, stinging it into paralysis, and lugs it back to the nest. She grips the caterpillar with her jaws and middle legs in a manner that allows her to run rapidly. She can also fly with the caterpillar slung beneath her. Known hosts are mostly caterpillars of the moth family Notodontidae, which is a large group of forest-dwelling moths. Arriving at her nest, she unplugs the burrow and drags the caterpillar into the underground cell. A single egg is laid on the victim, and the burrow is sealed. She thoroughly erases all aboveground traces of the nest, and then proceeds to start another nest.

REMARKS: Watch for these wasps on flowers of white sweet clover, goldenrod, milkweeds, and other flowering plants. There are at least ten species of *Ammophila* in Ohio, but this is our largest species.

SIZE: (BODY LENGTH)

FEMALE 20 - 35 mm

MALE 15 - 31 mm



ON WHITE SWEET CLOVER, *MELILOTUS ALBA*

THREAD-WAISTED WASP

Eremnophila aureonotata (Er-em-nof-il-ah • ar-ee-oh-no-tay-ta)

FAMILY: SPHECIDAE (MUD DAUBERS & THREAD-WAISTED WASPS)

HABITAT: Commonly seen on flowers in fields, and along forest edges.

LIFE CYCLE: The females of this handsome, solitary species hunt caterpillars as food for their larval offspring. The female digs a shallow, vertical burrow in the soil that terminates in a single, horizontal underground chamber. She closes the entrance temporarily, and then searches for prey. Caterpillars of the moth family Notodontidae are the only recorded hosts. A single caterpillar is paralyzed by the wasp's sting, and cached in the cell at the bottom of the burrow. An egg is laid on the victim and the burrow entrance filled in and then camouflaged. The wasp actively drags fallen leaves over the burrow to further conceal it. The larval wasp that hatches consumes the caterpillar, pupates, and eventually emerges as an adult wasp.

REMARKS: This species is adept at finding concealed caterpillars, possibly by chemical cues emitted by the caterpillar. These wasps are frequently observed flying in tandem, male atop the female, either simply riding on her, or copulating with her. Look for them on flowers such as goldenrod and thoroughworts (*Eupatorium* spp.), especially in late summer. Nests are often at the edges of woodlands in sand or hard-packed loam.

SIZE: (BODY LENGTH)

FEMALE 19 - 23 mm

MALE 16 - 19 mm



WITH CAPTURED VARIABLE OAKLEAF CATERPILLAR,
LOCHMAEUS MANTEO



GRASS-CARRYING WASPS

Isodontia spp. (I-so-don-tee-ah)

FAMILY: SPHECIDAE (MUD DAUBERS & THREAD-WAISTED WASPS)

HABITAT: Common to abundant in fields and along forest edges, vacant lots, suburban subdivisions, and other open habitats.

LIFE CYCLE: Five species occur in Ohio. Grass-carrying wasps are solitary, each female making her own nest in a pre-existing cavity such as a hollow sumac stem, rolled leaf, or inside abandoned borings of carpenter bees. Grass-carriers sometimes utilize window tracks as nesting sites. Most species divide a longitudinal tunnel into a series of cells, each one provisioned with paralyzed tree crickets or meadow katydids. One species, *Isodontia auripes*, constructs a communal brood chamber in which 2-12 larvae live and grow together. The cell divisions, and final closure of the nest, are made with pieces of dry grass. A hole with a bundle of grass blades and stems sticking out of it is the work of one of these wasps.

REMARKS: Grass-carrying wasps are usually distinguished from similar wasps by the fact that their wings are splayed, not folded over the back, when the insect is at rest. Look for them on flowers of grape, goldenrod, thoroughworts, milkweeds, and sweet clover. Grass-carriers will readily nest in artificial "bee boxes" designed for solitary bees, provided the holes are of sufficient diameter.

SIZE: (BODY LENGTH)

FEMALE 17 - 23 mm

MALE 16 - 18 mm



I. philadelphica is at the high end of the spectrum, most other species the lower end



STEEL BLUE CRICKET HUNTER

Chlorion aerarium (Klor-ee-on • e-rar-ee-um)

FAMILY: SPHECIDAE (MUD DAUBERS & THREAD-WAISTED WASPS)

HABITAT: Common in fields, vacant lots, and other open habitats.

LIFE CYCLE: These wasps are solitary nesters. Females dig burrows in the soil, sometimes excavated from inside the entrance of a Cicada Killer (page 41) burrow. The tunnel ends in one or more cells. Once the nesting chambers are prepared, the female wasp goes hunting for field crickets (*Gryllus* spp.). She stings the cricket into paralysis and drags or flies it back to the nest. Up to seven crickets are placed in each cell, and a single egg is laid on one of the crickets. Once the nest is complete, it is closed permanently and the wasp may go on to make several more nests.

REMARKS: This wasp is easily confused with the Blue Mud Dauber (page 46), but is more robust, less hairy, and brighter metallic blue (or violet). The head is wide and shiny, the antennae originate low on the face, and the mandibles have a tooth (the jaws of the Blue Mud Dauber are untoothed). This species seems to rarely visit flowers, but is fond of fermenting sap oozing from wounds on shrubs.

SIZE: (BODY LENGTH)

25 - 30 mm



GIANT ICHNEUMON WASP

Megarhyssa macrurus (Meg-ah-ry-sa • mak-rur-us)

FAMILY: ICHNEUMONIDAE (ICHNEUMON WASPS)

HABITAT: Common in hardwood forests, but seldom noticed.

LIFE CYCLE: Three species of these spectacular parasitic wasps occur in Ohio. The female does not sting, but uses her incredibly long, whip-like egg-laying organ (ovipositor) to penetrate solid wood and reach the host: a larva of the Pigeon Tremex (page 63). The ovipositor is encased inside a pair of sheath-like filaments that brace the organ during its deployment. How the wasp finds her concealed target remains a mystery, but once she does she “oozes” a long, slender egg onto the host grub or pupa. The ichneumon larva feeds as an external parasite, and will wait patiently for a small host to reach a large size, or pupate. Watch for adult giant ichneumons May-October, especially in spring and fall.

REMARKS: The male lacks an ovipositor and could be mistaken for an entirely different species of wasp. Males of *M. macrurus*, *M. greenei*, and *M. atrata* are attracted to virgin females still chewing their way out of a log or tree trunk. Apparently the noise of her gnawing draws them. Once she breaks the surface, she emits a pheromone (scent) that is species-specific, and the “wrong” males leave the scene.

SIZE: (BODY LENGTH)

25 - 38 mm



including OVIPOSITOR 120 mm

SHORT-TAILED ICHNEUMON WASP

Ophion spp. (Oh-fee-on)

FAMILY: ICHNEUMONIDAE (ICHNEUMON WASPS)

HABITAT: Found mostly in forested environments. Often attracted to lights at night.

LIFE CYCLE: Several species of this solitary wasp occur in Ohio. Females use their short, sharp ovipositor to sting a caterpillar into temporary paralysis, after which she lays an egg inside it. The hatchling wasp larva feeds as an internal parasite, maturing at about the same time as its caterpillar host. The still living caterpillar pupates, and the wasp larva pupates inside it, emerging later as an adult wasp. The host ultimately perishes. Hosts are caterpillars of giant silkmoths as well as cutworms, armyworms, and owl moth caterpillars.

REMARKS: Watch for these wasps at night lights, from March to September. Be advised there are several other genera of ichneumon wasps that are also nocturnal and resemble *Ophion*. Female *Ophion* wasps are among the few ichneumons capable of stinging. Note the “horse’s head” cell in the front wing, near the middle, a key character for identifying all ichneumon wasps. The ocelli, or “simple eyes”, arranged in a triangle between the compound eyes, are greatly enlarged in *Ophion*, perhaps due to its nocturnal lifestyle. As most caterpillars are active nocturnally, it makes sense that some of the wasps that hunt them would also be active at night.

SIZE: (BODY LENGTH)

10 - 21 mm



ICHNEUMON WASP

Genus *Charops* (Char-ops) and other small Ichneumons

FAMILY: ICHNEUMONIDAE (ICHNEUMON WASPS)

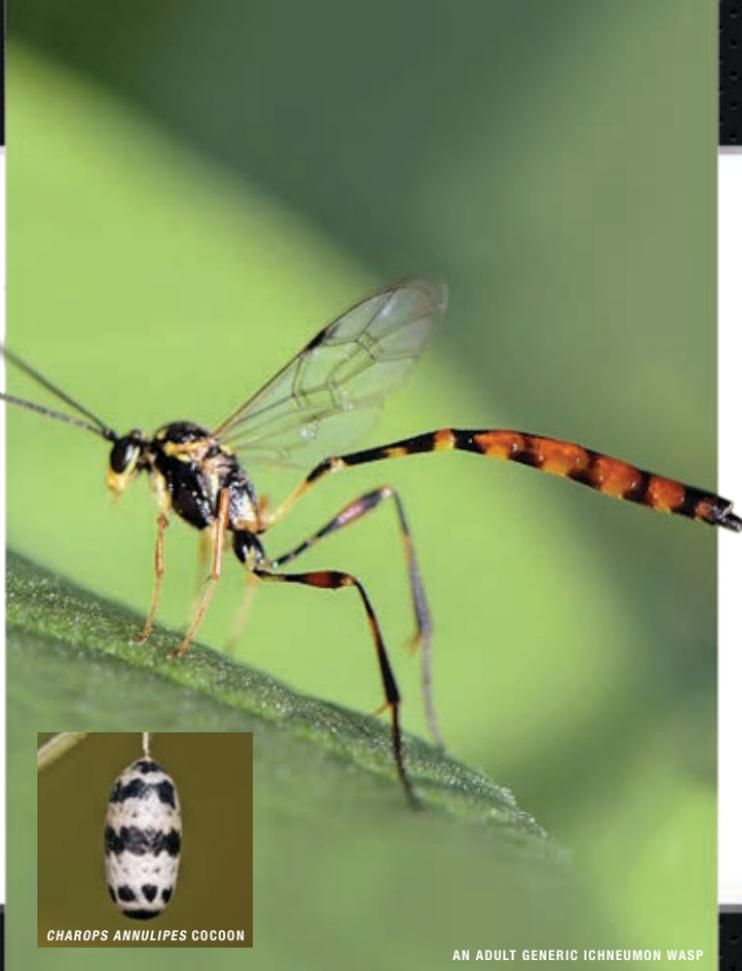
HABITAT: Occurs in forest understory, forest edges, and agricultural fields.

LIFE CYCLE: Charops is a solitary wasp, parasitic on caterpillars of moths. The female locates a host caterpillar and stings it into temporary paralysis using her short ovipositor. She then injects a single egg into the caterpillar. The egg hatches inside the caterpillar and the wasp larva feeds as an internal parasite. Once it matures it exits the host and spins a cocoon in which it transforms into the pupa stage. The cocoon is an ornate oval object resembling a decorated Easter egg, suspended from foliage on a silken thread. Eventually, an adult wasp chews its way out of the cocoon to begin the cycle anew. The cocoons draw more attention than the wasp.

REMARKS: Charops annulipes is the only species in this largely tropical genus in North America. The name “annulipes” translates roughly to “ringed feet,” an apt description of the leg markings of this showy little wasp. Among its host caterpillars is the Green Cloverworm, *Hypena scabra*, a notable agricultural pest in alfalfa, soybeans, and other crops. Adult ichneumon wasps have shorter and more numerous antennal segments than stinging wasps. There are scores of small Ichneumon wasp species, and many are very hard to identify. The species in the primary photo remains unidentified.

SIZE: (BODY LENGTH)

7 - 10 mm



CHAROPS ANNULIPES COCOON

AN ADULT GENERIC ICHNEUMON WASP

BLUE-WINGED WASP

Scolia dubia (Skol-ee-ah • do-be-ah)

FAMILY: SCOLIDAE (SCOLIID WASPS)

HABITAT: Commonly seen on flowers in fields, prairies, and other open areas.

LIFE CYCLE: Females are robust, hairy, solitary stinging wasps. The female wasp flies low over the surface of the ground in search of buried scarab beetle grubs. When she divines the location of one, she lands. Her strong legs are heavily spined to facilitate digging. An exposed grub will attempt to rebury itself immediately, so the wasp stings it into paralysis. She may leave the grub *in situ*, or tunnel below it, excavating a small chamber where she deposits the beetle larva and lays an egg on it. She then seals the chamber and leaves to start the process again, often staying underground and digging her way to the next grub.

REMARKS: These wasps may sting several grubs without laying eggs on them. The paralysis of the beetle larva is usually permanent, so the victims are unable to complete their life cycle. This is a good thing if you happen to have an infestation of “white grubs” in your lawn or garden. Males have much longer antennae than females and have a short, three-spined “pseudostinger” at the tip of the abdomen. Look for both genders on goldenrod and thoroughwort (*Eupatorium* spp.) flowers in late summer and fall. Striations in the wings of these wasps reflect bright blue, giving the species its name.

SIZE: (BODY LENGTH)

FEMALE 20 - 25 mm

MALE 20 - 25 mm



DOUBLE-BANDED SCOLIID

Scolia bicincta (Skol-ee-ah • bi-sink-ta)

FAMILY: SCOLIDAE (SCOLIID WASPS)

HABITAT: Common in prairies, fields, vacant lots, and similar open habitats.

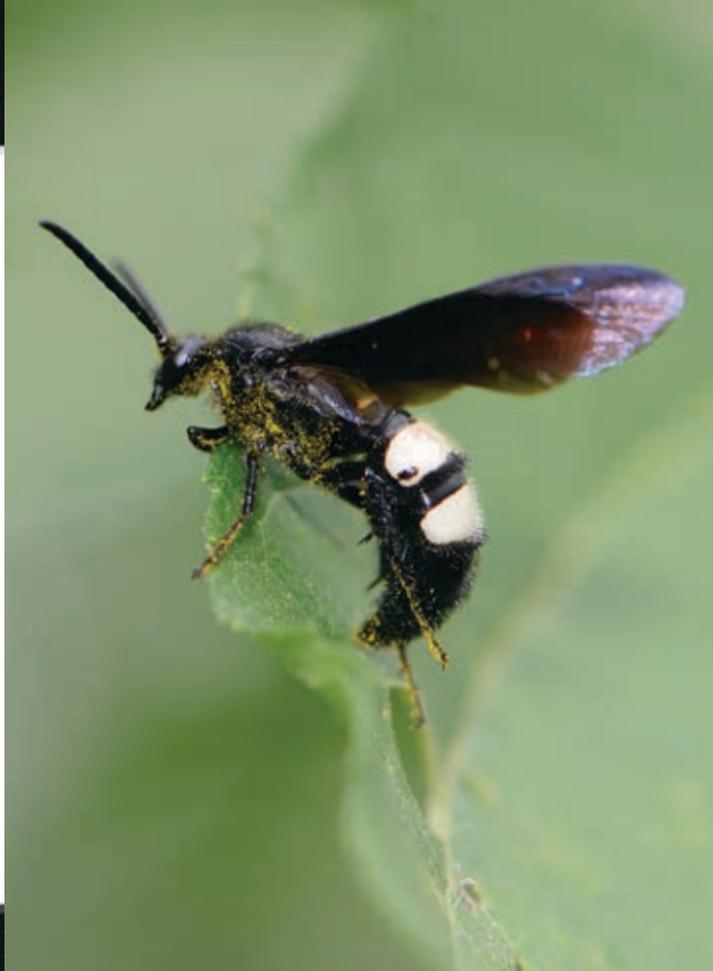
LIFE CYCLE: This species is related to the Blue-winged Wasp (page 56). Although there are no confirmed host records, it is suspected to also be a parasitoid of scarab beetle grubs. An adult female somehow divines the presence of a buried beetle larva, digs down to it, and paralyzes the grub with her stinger. She uses the grub's existing burrow as its eventual tomb, or carries it deeper and fashions a crude cell-like crypt. She then lays a single egg on the grub and abandons it. The wasp larva that hatches feeds as an external parasite for roughly two weeks. When finished, the larva spins a cocoon and overwinters in the burrow. Come spring it forms a pupa, completing its metamorphosis into an adult wasp shortly thereafter.

REMARKS: Adult wasps are on the wing mostly in late summer and fall. Males fly close to the ground in a lazy figure-eight pattern. They emerge first and eagerly seek mates, even if the females have not yet surfaced from the pupal chambers. Males roost for the night individually or in loose groups, curling themselves around stems or twigs. Scoliid wasps should be considered beneficial. They eradicate large numbers of grubs that attack lawns, gardens, and other crops.

SIZE: (BODY LENGTH)

FEMALE 15 - 20 mm

MALE 15 - 20 mm



BRACONID WASP

Cotesia congregata (Ko-te-se-ah • con-gre-gate-ah)

FAMILY: BRACONIDAE (BRACONID WASPS)

HABITAT: Can be common on host caterpillars along forest edges and on ornamental trees or garden vegetable plants.

LIFE CYCLE: The female wasp finds caterpillar hosts in part by sensing chemicals given off by plants that are being eaten by caterpillars. She then homes in on chemical stimuli coming from the caterpillar itself, and uses her ovipositor to insert multiple eggs, venom, and a symbiotic virus into the caterpillar. The virus suppresses the host's immune system and, along with the venom and hormone-producing cells in the eggs, prevents the caterpillar host from molting. The wasp larvae that hatch roam the host's body, feeding on its blood. The wasp grubs molt into a second instar, continue growing, and then erupt synchronously through holes they tear in the caterpillar's exoskeleton. They molt again into the third instar, then begin spinning silk cocoons. Depending on how many female wasps laid eggs, there may be anywhere from a handful to more than 300 grubs bursting from the caterpillar. Eventually, adult wasps chew the tops off their cocoons and exit. From egg to adult, the life cycle typically takes 15-24 days.

REMARKS: This species (there are several other *Cotesia* wasps in Ohio) specializes in parasitizing sphinx moth caterpillars. Look for the white cottony cocoons ballooning from Catalpa Sphinx caterpillars, or as many a tomato grower knows, Tomato Hornworm larvae. Adult male *Cotesia* perform elaborate acoustic courtship displays to win a mate.

SIZE: (BODY LENGTH)

■ 2 - 3 mm



BRACONID WASP

Atanycolus cappaerti (A-tan-i-col-us • cap-ert-i)

FAMILY: BRACONIDAE (BRACONID WASPS)

HABITAT: Found mostly in forested environments on logs, stumps, or dead, standing trees.

LIFE CYCLE: Solitary parasites of wood-boring insects, especially native buprestid beetles in the genus *Agriilus*. The female wasp uses her long ovipositor to reach beetle larvae boring in the sapwood at a shallow depth. Grubs that bore deeper into the tree are beyond the reach of the wasp. The wasp stings the grub into temporary paralysis and lays a single egg upon it. The wasp larva that hatches then feeds as an external parasite on the beetle grub. It reaches maturity in about two weeks, detaches from the host, and pupates inside a cocoon. The cocoon is within the tunnel bored by the host grub. An adult wasp emerges in another two weeks or so and chews its way to freedom. At least two generations are produced annually, one of which overwinters in the pupa stage.

REMARKS: This species is being investigated as a potential biocontrol agent against the Emerald Ash Borer, *Agriilus planipennis*, an invasive buprestid beetle that is decimating ash trees across much of the eastern U.S. The genus *Atanycolus* resembles similar braconid genera so closely that it is impossible to make identifications from images alone. Actual specimens must be placed under the microscope.

SIZE: (BODY LENGTH)

4 mm

including OVIPOSITOR 5 - 7 mm



SPIDER WASP

Entypus unifasciatus (En-tih-pus • u-nih-fas-ee-ate-us)

FAMILY: POMPILIDAE (SPIDER WASPS)

HABITAT: Common in fields, prairies, and other dry, open habitats; also forest edges.

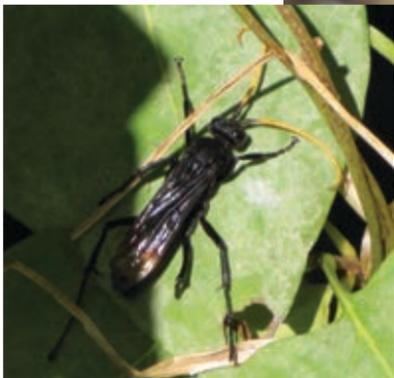
LIFE CYCLE: The female wasp digs a burrow in the soil, often concealed by a rock or other object. Five to ten individual cells branch off the main tunnel. Next, she goes hunting for large spiders. Recorded hosts include the wolf spiders *Rabidosa rabida* (as shown in the image here) and *Tigrosa georgicola*. The spider is paralyzed by the wasp's sting, and she drags it backwards to her nest, periodically dropping her victim and exploring the path ahead. Once the nest entrance is reached, she drags the spider into its crypt. One spider will serve as food for one larval wasp.

REMARKS: Watch for these wasps from late July through mid-September. They visit flowers for nectar, and aphid colonies for honeydew, especially on catalpa trees. When antagonized, these large wasps adopt a menacing posture with wings raised and abdomen curled under. The similar *Entypus fulvicornis* lacks the orange spots on the wings, but is otherwise identical.

SIZE: (FOREWING LENGTH)

FEMALE 10 - 21 mm

MALE 9 - 17 mm



SPIDER WASP

Tachypompilus ferrugineus (Tak-ee-pom-pil-us • fer-oo-gin-ee-us)

FAMILY: POMPILIDAE (SPIDER WASPS)

HABITAT: Common in forest understory, forest edges, rock walls, and on flowers in fields.

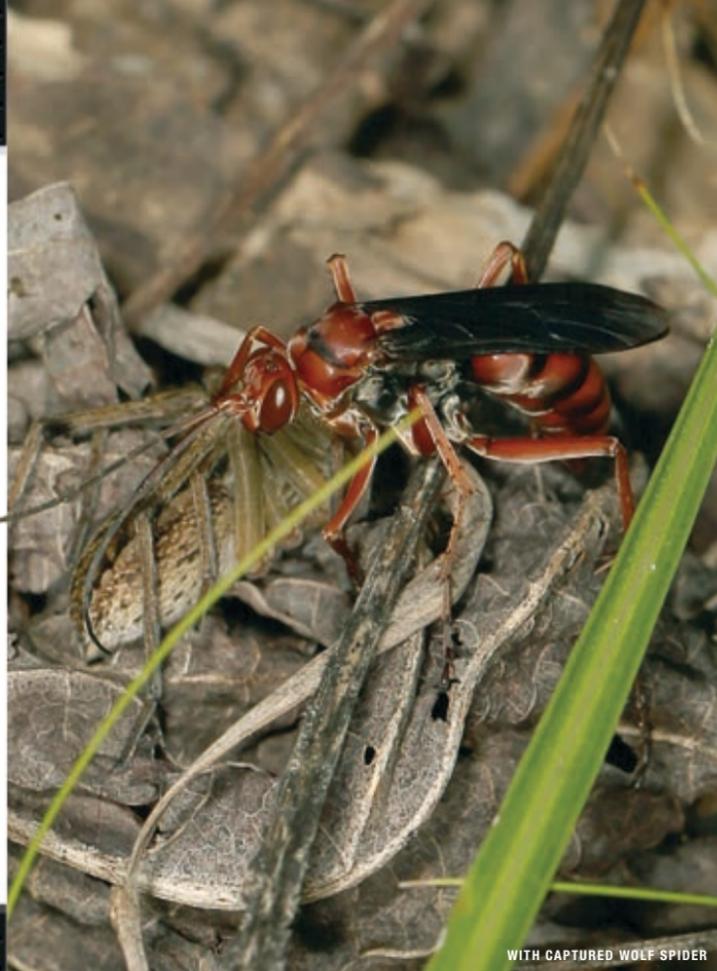
LIFE CYCLE: These beautiful, brightly-colored solitary wasps hunt large spiders as food for their offspring. Females are known to attack various wolf spiders and the fishing spider *Dolomedes tenebrosus*. The wasp stings her prey into paralysis then drags the victim backwards to a suitable nesting site. Rather than excavating a burrow, this wasp uses pre-existing cracks and crevices as places to conceal its brood. The female wasp crawls beneath the spider to lay an egg on the side of its abdomen. She then kicks soil across the opening, or otherwise fills in the crevice.

REMARKS: Watch for male and female wasps taking nectar from flowers, or lapping honeydew from the vicinity of aphid colonies. Males pursue females near nesting sites, and display for them by fanning their wings and rapidly waving their antennae. Look for this wasp from late June through early September.

SIZE: (BODY LENGTH)

FEMALE 15 - 22 mm

MALE 8 - 17 mm



WITH CAPTURED WOLF SPIDER

American Pelecinid

Pelecinus polyturator (Pel-ih-see-nus • pol-ee-tur-ate-or)

FAMILY: PELECIDINIDAE (PELECIDINID WASPS)

HABITAT: Common in the understory of hardwood forests.

LIFE CYCLE: The stingless females are the “stretch-limos” of the parasitic wasp world. The abdomen is greatly elongated, to better probe the soil in search of subterranean scarab beetle grubs, the host for her larval offspring. May beetle grubs (genus *Phyllophaga*) migrate vertically in the soil and are nearest the surface when pelecinids are most active (August, but also in July and September). The wasp lays an egg on the beetle grub and her larva feeds as a parasite. The adult wasps sometimes show up at night at sheets set up by moth collectors.

REMARKS: Pelecinids might be mistaken for ichneumon wasps at first glance, but wing venation is different, and the hind legs of *Pelecinus* have a “bell-bottom” look due to the swollen hind tibia segment. Male specimens are seldom encountered. In fact, males account for only 4% of collection records for this species in North America. It is assumed that females reproduce without the benefit of mating, a phenomenon known as parthenogenesis. Thanks to haplodiploidy, unmated females of most Hymenoptera can produce viable male offspring; but thelytoky, the development of a female wasp from an unfertilized egg, is rather rare. The American Pelecinid ranges all the way to Argentina.

SIZE: (BODY LENGTH)

MALE 12 - 25 mm

FEMALE 51 - 62 mm



PIGEON TREMEX

Tremex columba (Tre-mex • col-um-ba)

FAMILY: SIRICIDAE (HORNTAILS)

HABITAT: Common in hardwood forests.

LIFE CYCLE: The female wasp uses a rod-like ovipositor to insert eggs 2-20 millimeters deep into dead, dying, or weakened hardwoods. Maple, beech, elm, and many other tree species are utilized. When she lays an egg, she also deposits a fungus known as *Cerrina unicolor*. The fungus breaks down cellulose in the wood, enriching the larval wasp's diet, and allowing it to bore more easily. The larval tunnels meander for 15 centimeters to two meters through the sapwood and into the heartwood, eventually terminating in a pupal chamber near the surface. Larvae destined to become females store the fungus in special pouches inside certain abdominal segments. The pupal stage lasts 3-6 weeks, and an adult wasp chews a perfectly round exit hole to escape. Adult wasps are most often seen from July to October.

REMARKS: This is one of the "horntails," so named for a knob-like process at the tip of the abdomen in both females and males. The major enemy of this species is another wasp, the giant ichneumon (page 53). Horntails are not pests, but merely exploit trees already damaged by environmental stress, diseases, or other insects. They are important to forest ecology and there is no need to control them.

SIZE: (BODY LENGTH)

FEMALE 37 - 50 mm

MALE 18 - 37mm



ELM SAWFLIES

Cimbex americana (Sim-bex • ah-mer-ih-kan-ah)

FAMILY: CIMBICIDAE (CIMBICID SAWFLIES)

HABITAT: Uncommon in hardwood forests and riparian corridors.

LIFE CYCLE: These large insects are more commonly seen as larvae, which are usually assumed to be caterpillars of moths or butterflies. Sawfly larvae in general are recognized by the seven pairs of prolegs, knob-like appendages along the length of the abdomen. Caterpillars of Lepidoptera have a maximum of five pairs of prolegs. The larvae coil up when disturbed, and may excrete a liquid in self-defense. They feed on the leaves of willow in addition to elm, and occasionally on basswood, birch, poplar, alder, and maple. Pupation is inside a tough silken cocoon amid leaf litter or just beneath the soil surface. The female wasp uses her saw-like ovipositor to insert eggs into the foliage of the host tree.

REMARKS: The adult wasps are recognized by their short, clubbed antennae. Males have beefy hind femora (“thighs”). Both genders have strong jaws that they use to strip the bark off of twigs to reach the sap. The adults differ in color. Shown here is a male. Females have yellow horizontal bands interrupted in the middle. There is some variation in color and pattern from one geographic area to another. Look for them in June and July.

SIZE: (BODY LENGTH)

20 - 25 mm



SAWFLIES

Symphyta (misc.)

FAMILIES: ARGIDAE (ARGID SAWFLIES), TENTHREDINIDAE (COMMON SAWFLIES), PAMPILIIDAE (WEB-SPINNING AND LEAF-ROLLING SAWFLIES), DIPRIONIDAE (CONIFER SAWFLIES), PERGIDAE (PERGID SAWFLIES), XYELIDAE (XYELID SAWFLIES), AND CEPHIDAE (STEM SAWFLIES)

HABITAT: Common, especially in spring and early summer. Forest edges, understory vegetation in deciduous woodlands, forest openings, and open fields.

LIFE CYCLE: All sawflies are solitary as adults, but larvae are often found in groups. The larvae resemble caterpillars of butterflies and moths to a great degree, and feed on plants. Stem sawflies bore in stems of grasses, berry canes, or shrubs. Web-spinning sawflies create silken webs for protection. Some argid sawflies feed on ferns, and at least one eats poison ivy. The larvae spin silken cocoons in which they pupate.

REMARKS: How do you tell sawfly larvae from caterpillars? Sawfly larvae have seven pairs of prolegs - the knob-like legs that run the length of the abdomen. Caterpillars of moths and butterflies have a maximum of five pairs of prolegs, and usually only four. Many sawfly larvae spit up a glob of repulsive liquid if disturbed, and/or rear up in threat postures. Some species are covered in a waxy coating that repels predators and insulates the larva from desiccation. A few species are slug-like. Adult sawflies lack the "wasp waist" of other wasps (and bees). The abdomen is broadly joined to the thorax. Many sawflies are colorful, and may mimic the behavior of their stinging cousins.

SIZE: (BODY LENGTH)

4 - 15 mm



EASTERN VELVET ANT

Dasymutilla occidentalis (Das-ih-mu-til-ah • ox-ih-den-tal-is)

FAMILY: MUTILLIDAE (VELVET ANTS)

HABITAT: Can be common in areas with barren sandy soil, sand blowouts, or beaches.

LIFE CYCLE: Velvet “ants” are solitary parasitic wasps, the females of which are wingless, hairy, and ant-like. They run rapidly over the ground by day in search of the nests of other wasps or bees, breaking in and laying an egg in any cell occupied by a host larva or pupa. The velvet ant larva feeds on the prepupa or pupa stage of the host.

REMARKS: Females are flightless, while males are winged and fly well. Look for the latter flying low over the ground in places where they are likely to encounter females. These wasps have an extra-thick exoskeleton, the better to deflect the bites and stings of the hosts whose nests they invade.

Both genders produce an audible squeaking sound by rapidly rubbing their abdominal segments together. This is probably an auditory warning to complement their black and orange warning coloration. All of this serves to advertise the incredibly painful sting of the female. A nickname is “cow killer” which gives an idea as to the painfulness of the sting.

SIZE: (BODY LENGTH)

MALE 6 - 20 mm



GALL WASPS

Amphibolips, Andricus, Acraspis, Callirhytis, Neuroterus, & Zopheroterus

FAMILY: CYNIPIDAE (GALL WASPS)

HABITAT: Abundant in deciduous forests, especially oak woodlands.

LIFE CYCLE: Solitary. The female uses her ovipositor to inject an egg into plant tissue. The larva that hatches secretes potent enzymes that stimulate abnormal growth of the plant around it. Many species have an “alternation of generations” life cycle. One generation develops during the summer into females that emerge in fall or early winter. These females are parthenogenetic (agamic generation). The eggs they lay cause entirely different galls, on a different part of the plant. Inside those galls, both males and females develop, emerging in early summer to begin the cycle anew. Some species areinquilines (“guests”) in the galls of other gall-makers. Galls rarely harm the host plant, but are both food and shelter for the larval wasp.

REMARKS: Wasp-caused plant galls are often very conspicuous and often commented on. Few people have ever seen their creators, or would suspect that tiny wasps are the culprit. More than 80% of gall wasp species in North America are associated with oak trees. Gall wasps are besieged by a variety of parasites, most of which are other tiny wasps. Some galls have historically been used to produce inks used in tanning and dyeing. Famed sexologist Alfred Kinsey started out studying gall wasps.

SIZE: (BODY LENGTH)

2 - 5 mm



CARROT WASPS

Gasteruption spp. (Gas-ter-up-shen)

FAMILY: GASTERUPTIDAE (CARROT WASPS)

HABITAT: Relatively common in forest understory and on flowers in fields and prairies.

LIFE CYCLE: Gasteruptionids are parasites of solitary wasps and bees that nest in holes in wood or hollow twigs. The female wasp uses her long ovipositor to reach the depths of a host's tunnel and deposit an egg. Upon hatching, the larval carrot wasp finds and feeds on the pollen, nectar, or prey stored as food for the host larva. The few recorded hosts for *Gasteruption* include yellow-faced bees (*Hylaeus* spp.), leafcutter bees (*Megachile rotundata* and *Hoplitis sambuci*), aphid wasps (Pemphredoninae in the family Crabronidae), keyhole wasps (*Trypoxylon* sp. in the Crabronidae), and mason wasps (*Leptocheilus ornatus*, family Vespidae).

REMARKS: These wasps (4 species in Ohio) get their common name by routinely feeding on the nectar of parsley flowers such as wild carrot. They could easily be mistaken for ichneumon wasps, but note the “neck” between the head and thorax; the insertion of the abdomen high up on the rear of the thorax; and the “bell-bottom” look of the swollen hind legs. Carrot wasps also have only thirteen (female) or fourteen (male) segments in each antenna. Ichneumon wasps have far more antennal segments. The ovipositor of many female *Gasteruption* species has a white tip. Look for these wasps on the wing in June, July, and August.

SIZE: (BODY LENGTH)

10 -14 mm (not including OVIPOSITOR)



ON WHITE SWEET CLOVER, *MELILOTUS ALBA*

COCKROACH EGG PARASITOID

Evania appendigaster (E-van-ee-ah • ap-end-ih-gas-ter)

FAMILY: EVANIIDAE (ENSIGN WASPS)

HABITAT: Can be common in urban settings, seen inside buildings and greenhouses where large cockroaches are present.

LIFE CYCLE: The female of this stingless species seeks out the egg cases (oothecae) of cockroaches. She uses her needle-like ovipositor to insert a single egg into an ootheca. Host species include the American Cockroach, Australian Cockroach, and Oriental Cockroach. The larval wasp that hatches goes through five molts, and consumes all the cockroach eggs. It then pupates inside the now empty ootheca, eventually chewing its way out when it emerges as an adult wasp. The adult female wasps live about 2-3 weeks.

REMARKS: This species is one of the ensign wasps. The common name is derived from the tiny, flattened, flag-like abdomen that is habitually “waved” as they walk. The abdomen is stalked, the petiole being inserted high on the rear of the thorax. These wasps have a start-and-stop gait, bobbing their abdomens as they go, and may be mistaken for large ants at first glance. The blue eyes of this species are distinctive. *Evania appendigaster* is probably native to Asia. The first U.S. record was likely June 5, 1879, from Washington, DC, as represented by a specimen in the collection of the Smithsonian. Ensign wasps should be regarded as highly beneficial agents of pest control. Parasitism rates have been recorded as high as 29%. Outdoors, this species sometimes feeds on the honeydew secreted by aphids.

SIZE: (FOREWING LENGTH)

MALE 5.5 - 7 mm



CUCKOO WASPS

COMMON GENERA: *Elampus*, *Hedychrum*, *Holopyga*, *Pseudomalus*, *Omalus*, *Caenochrysis*, *Chrysis*, *Chrysura*, and *Parnopes*

FAMILY: CHRYSIDAE (CUCKOO WASPS)

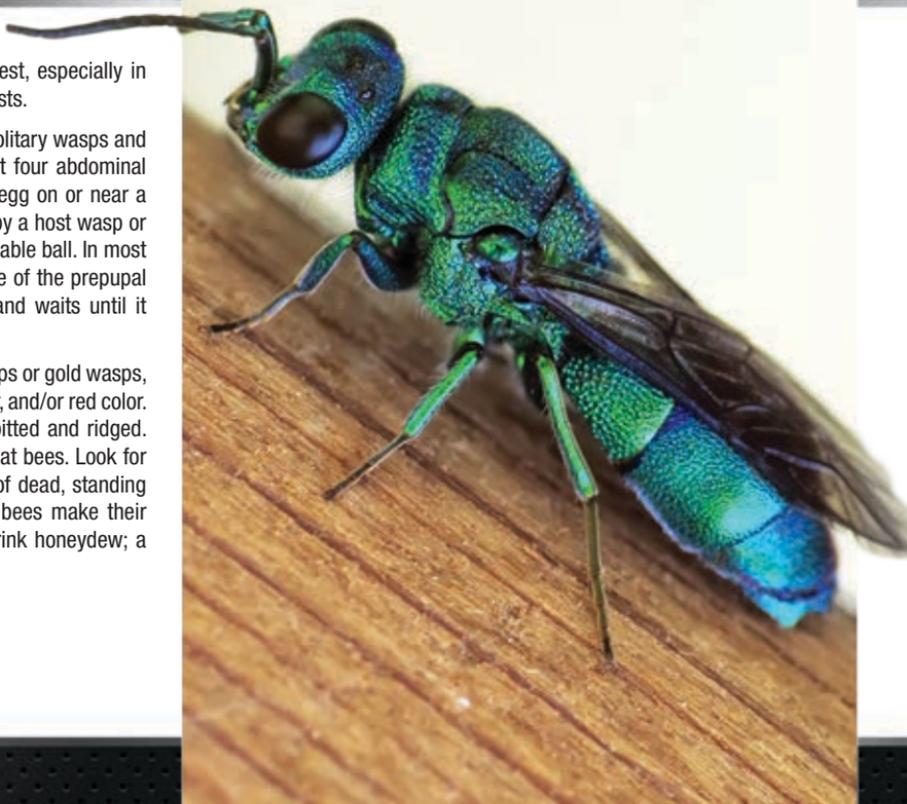
HABITAT: Common in a variety of habitats from field to forest, especially in locations where other solitary wasps and bees make their nests.

LIFE CYCLE: The majority of species are parasitic on other solitary wasps and bees. Females in this family are stingless. The female's last four abdominal segments form a telescoping ovipositor used to deposit an egg on or near a prepupa host, deep inside the nest. Should she be attacked by a host wasp or bee, the female chrysidid can curl into a tight, nearly impregnable ball. In most species, the cuckoo wasp larva feeds as an external parasite of the prepupal host. In some species, the larva attaches to a host larva and waits until it reaches the prepupa stage before consuming and killing it.

REMARKS: Cuckoo wasps are also known as ruby-tailed wasps or gold wasps, owing to their remarkably brilliant metallic green, blue, copper, and/or red color. They are heavily armored, their thick exoskeleton densely pitted and ridged. This rough texture helps to separate them from metallic sweat bees. Look for these colorful insects on the walls of old barns, the trunks of dead, standing trees, logs, and other situations where solitary wasps and bees make their nests. Cuckoo wasps come to aphid colonies where they drink honeydew; a few species visit flowers for nectar.

SIZE: (BODY LENGTH)

11 mm



THYNNID WASP

Myzinum spp. (My-zee-num)

FAMILY: THYNNIDAE (THYNNID WASPS)

HABITAT: Common in fields and vacant lots, usually seen on flowers.

LIFE CYCLE: Females are solitary, and capable of stinging if bothered. A female somehow locates a scarab beetle grub underground, digs down to it, stings it into temporary paralysis, and lays an egg on it. She then leaves to go searching for another grub, repeating the process several times. The hatchling wasp larva feeds as an external parasite of the host larva, eventually killing it. Upon completing development they spin a cocoon in which they overwinter, pupating the following spring. Adult wasps are seen from July through September. Three species occur in Ohio, and females are recognized by the round head with very short, often curled antennae, spiny legs, and swollen hind femur (“thigh” segment).

REMARKS: The harmless male *Myzinum* look very different from females, having a much more slender body, longer antennae, and a wicked-looking, hooked “pseudo-stinger” at the tip of the abdomen. Males often gather in large numbers on vegetation at dusk, early morning, and during inclement weather. Adult wasps of both genders have been recorded from twenty-two different species of flowers, mostly in the parsley and sunflower families. Until recently, this genus was placed in the family Tiphidae, and this is reflected in older reference material.

SIZE: (BODY LENGTH)

FEMALE 11 - 24 mm

MALE 7 - 16 mm

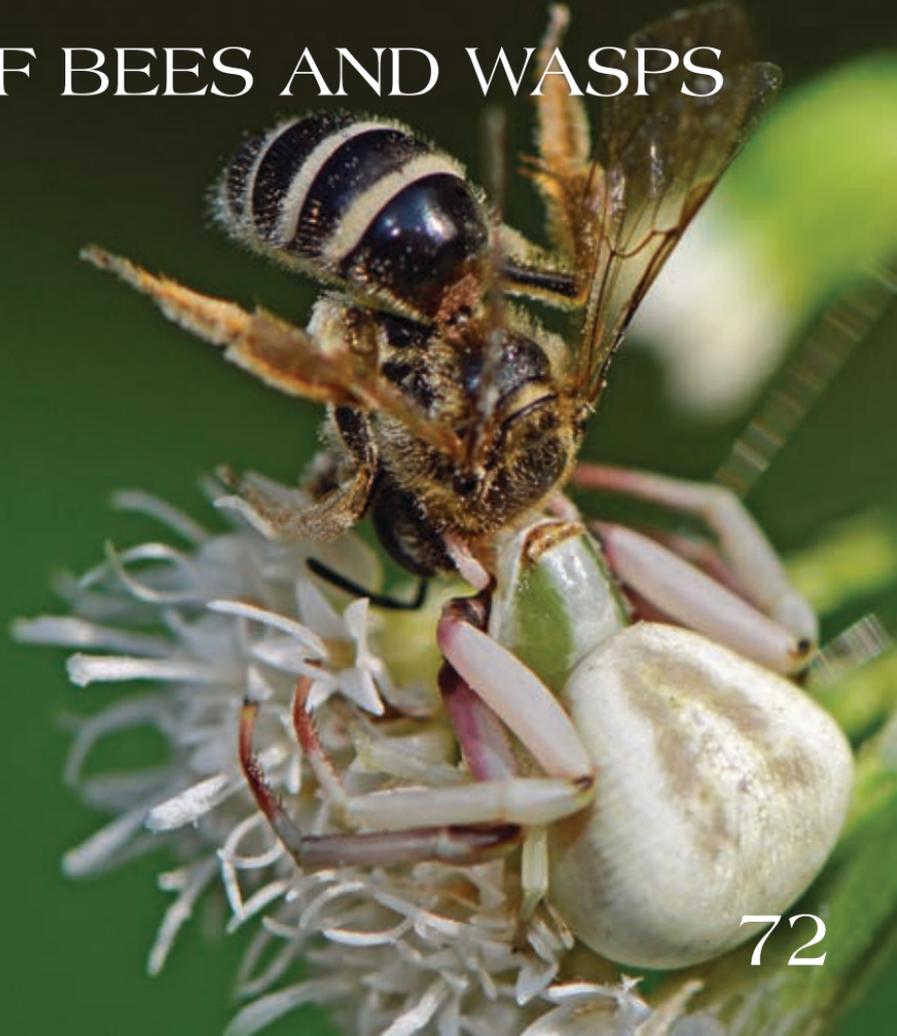


ENEMIES OF BEES AND WASPS

Bees and wasps have many enemies, including each other. Yellowjackets sometimes kill bees to feed on the honey in the bee's crop. In turn, Bald-faced Hornets will prey on yellowjackets. European Hornets raid entire honeybee hives on occasion. Beewolf wasps in the genus *Philanthus* hunt tiny solitary bees and stockpile the paralyzed pollinators in underground burrows as food for their larval offspring. The ichneumon wasp *Pachysomoides* is a parasite of paper wasps, sneaking into the nests to lay its eggs inside the cells of its host. Brilliant metallic cuckoo wasps in the family Chrysididae earn their living as parasites of other solitary wasps, especially those that build mud nests or use pre-existing cavities in wood. An armor-plated exoskeleton allows the invading cuckoo wasp to survive the attacks of the nest defenders.

Crab spiders, assassin and ambush bugs, robber flies, and praying mantises also take their toll on stinging insects, often lying in wait on flowers where pollinating bees and wasps come for fuel and food. Skunks and bears are not above tearing into a beehive or yellowjacket nest to feed on the succulent wasp larvae and pupae, enduring a great number of stings in return for their plunder. Some songbirds, perhaps most notably the beautiful Summer Tanager, also regularly feed on bees and wasps.

RED-BANDED CRAB SPIDER WITH A SWEAT BEE (LASIOGLOSSUM)
© JIM MCCORMAC



POLLINATORS IN DECLINE

The natural resources of Ohio have changed dramatically since the first European settlers arrived. At the time Ohio was granted statehood in 1803, nearly 95% of the state was forested. Most of the regions that lacked trees were prairies, which are among the most botanically diverse habitats in North America. Today, Ohio is only about one-third forested, and we've lost over 99.9% of our prairies. These large-scale habitat shifts have undoubtedly caused profound changes in some of our bee and wasp populations. Unfortunately, unlike many well-studied groups of organisms like birds, fishes, and mammals, most insects are not well studied. While some generalist bees and wasps that favor open habitats have probably prospered, specialists that are tied to narrow ecological niches have undoubtedly suffered. One perplexing decline involves the Rusty-patched Bumble Bee, *Bombus affinis*. This charismatic insect once occurred widely throughout the Upper Midwest, but experts with the Xerces Society believe that it has vanished from nearly 90% of the former range. Nobody is quite sure why, but we do know that other pollinators are also declining. It is likely that a suite of factors is adversely affecting the bumblebee, and other pollinators. Introduced fungal pathogens, loss of host plants and core habitats, and increased pesticide use have undoubtedly all contributed to pollinator declines.



SWEAT BEE (AUGOCHLORELLA)
© JIM MCCORMAC

HOW TO HELP AND WHY



Bees and wasps are extraordinarily valuable as pollinators and agents of pest control, and of limited threat to people and pets. Even a paper wasp or yellowjacket nest under the eaves is not an issue if it is undisturbed by your daily activities. Mud dauber nests may be visually unappealing, but let them be until the next generation has emerged (watch for exit holes chewed by the emerging wasps).

Native solitary bees and wasps face a housing shortage because many suitable nesting sites are cut down, plowed under, or paved over. With a little effort, you can help provide them with artificial residential units placed in your yard or garden where the insects can do you some good. Simply drill holes of varying diameters into a block of wood, to a depth of, say, four inches, and post the block under the eaves of the garage, woodshed, or other location where you won't be disturbing them. If you are more ambitious, try packing short sections of PVC pipe with clay, and stacking them

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PHOTO COURTESY: JIM MCCORMAC

in a frame to support soil-nesting bees that would normally use a natural clay bank. You could also bundle hollow twigs of sumac, or even paper straws. There are now many commercial outlets that sell ready-made “bee boxes” or “bee boards” for attracting mason bees, leafcutter bees, and related solitary bees (and wasps, though they won’t advertise that fact). Please see the back of this book for potential sources.

Finally, GO NATIVE! Native plants support far more valuable insects than do nonnative species. Native plants tend to produce flowers that are better sources of pollen and nectar for bees and wasps (and other pollinators). Indigenous plant species are integral to establishing a functional food web, as most of our insects have evolved specific relationships with plants native to their region. Most nurseries offer a selection of plants native to their area, and many nurseries that specialize in native plants have sprung up in recent years.

PHOTOS COURTESY: BETSY BETROS



GLOSSARY

ABDOMEN - The rear-most body section of insects, where most major organ systems are located.

AGAMIC - Refers to the parthenogenic generation of female gall wasps.

ANTENNA - A segmented appendage on the face of an insect that is used for chemo-tactile assessment of the environment (touch and smell). Plural: antennae.

BEE BREAD - The ball or loaf of combined pollen (protein) and nectar (carbohydrate) provided by female bees for consumption by their larval offspring.

BROOD - The term covering the immature population of bees and wasps inside a nest: eggs, larvae, and pupae.

CLASS - The level of taxonomic classification above "order." Class Insecta here.

CLEPTOPARASITE - An organism that "steals" the food provided by the host for its own offspring, with or without killing the host's offspring outright. Also "kleptoparasite."

EUSOCIAL - Colonies created from an overlap of generations: Daughters as "workers" that rear a second generation of their mother's offspring.

FAMILY - The level of taxonomic classification under "order" and above "genus."

LARVA - An immature insect that hatches from the egg and is the "eating-and-growing" stage that molts several times, the last molt transforming it into the pupa stage.

LEK - A gathering of male animals of the same species for the purpose of displaying to females.

MANDIBLES - The jaws of an insect. Each mandible works in opposition to the other.

MOLTING - The shedding of the exoskeleton to permit growth in larval insects.

OCELLI - "Simple eyes," usually arranged in a triad at the crown of the head between the compound eyes.

OLIGOLECTIC - Specialist pollinator that harvests pollen from only closely-related flowers, such as those in the same genus or family.

ORDER - The level of taxonomic classification below "class" and above "family."

OVIPOSITOR - An egg-laying organ in female insects, often represented by a spear-like, whip-like, sword-shaped, or knife-like appendage jutting from the rear of the abdomen.

PARASITOID - A wasp that feeds as a larva on a host insect that has been incapacitated (paralyzed) by the mother wasp.

POLYLECTIC - Generalist pollinator that harvests pollen from a diversity of flowers.

PREPUPA - A mature, dormant larva just prior to pupating.

PUPA - The "resting stage" in the life cycle between larva and adult, in which much cellular reorganization takes place, and genes are turned on or off.

QUEEN - A caste in social bees and wasps that is the sole reproducing female.

SCOPA - Dense brush of hairs for collecting and transporting dry pollen, located on the hind legs, or underside of the abdomen, in most female solitary bees.

SOCIAL INSECT - A species in which there are morphologically different castes (queen, drone, worker for example), and explicit division of labor.

SPECIES - The most specific level of taxonomic classification that represents individuals capable of viable reproduction.

STINGER - A modified ovipositor in some female wasps, bees, and ants, used to inject venom into prey, and sometimes for self-defense. This is a retractable organ normally not visible.

TARSUS - The series of segments representing the "foot" of an insect. (Plural: tarsi).

FEMUR - The leg joint of an insect comparable to the human thigh.

FLOWER VISITOR - An organism that comes to flowers specifically for nectar, not pollen.

GENUS - The level of taxonomic classification under "family" and above "species."

GYNE - Female social bee or wasp that has the potential to become a queen.

HAPLODIPLOIDY - A condition in many Hymenoptera whereby males have a haploid number of chromosomes and can be produced from unfertilized eggs.

HEAD - The front body segment of insects that serves as the sensory center: Compound eyes, ocelli, antennae, mouthparts, and brain are located here.

HONEYDEW - The sweet, liquid waste product of aphids, psyllids, scales, and related insects.

HOST - The organism exploited by a parasite or parasitoid.

HYMENOPTERA - The order to which all families of bees and wasps belong.

INQUILINE - An animal sharing the living space created by another animal, with or without detriment to its host.

INSTAR- The interval between molts in an insect's larval stage.

PARTHENOGENIC - The ability of a female to produce viable eggs without fertilization.

POLLEN BASKET - A modification of the hind tibia and tarsus in workers of social bees that functions to transport quantities of pollen grains stuck together with nectar.

POLLINATOR - An organism that effects floral reproduction through mechanical manipulation of a flower's reproductive parts.

THORAX - Middle body segment in insects that serves as the locomotion center. All three pairs of legs, and wings (if present) are attached here and operated by large muscle groups that take up most of the interior of the thorax.

TIBIA - The leg joint of an insect comparable to the human shin or calf.



GREAT GOLDEN DIGGER
ON BUTTERFLY MILKWEED, *ASCLEPIAS TUBEROSA*
© JIM MCCORMAC

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HOW TO BUILD A BEE HOUSE:

www.nwf.org/How-to-Help/Garden-for-Wildlife/Gardening-Tips/Build-a-Bee-House.aspx

POLLINATOR PARTNERSHIP: www.pollinator.org

THE XERCES SOCIETY:

www.xerces.org/enhancing-habitat-for-native-bees

**IDENTIFICATION ATLAS OF THE VESPIDAE
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OHIO POLLINATOR HABITAT INITIATIVE:

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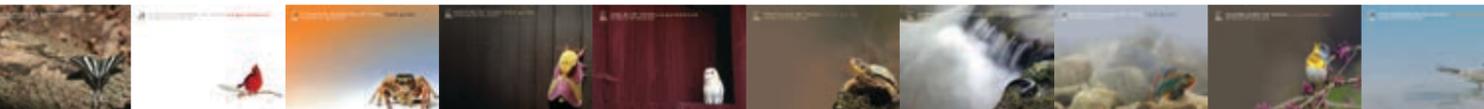
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DIVISION OF WILDLIFE

OHIO DEPARTMENT OF NATURAL RESOURCES



MISSION STATEMENT

To conserve and improve fish and wildlife resources and their habitats for sustainable use and appreciation by all.

The ODNR Division of Wildlife is the state agency responsible for managing Ohio's fish and wildlife resources. The primary source of funding for the division comes from the sale of hunting and fishing licenses, federal excise taxes on hunting, fishing, and shooting equipment, and donations from the public. We care about all wildlife and maintaining stable, healthy wildlife populations. Our challenge is to balance the needs of wildlife, habitat, and people.

EASTERN CARPENTER BEE
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