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Xylocopa virginica, Eastern Carpenter Bee
(Hymenoptera: Apidae)

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Description

The eastern carpenter bee, *Xylocopa virginica*, is a large black and yellow bee measuring around ¾ of an inch (2 cm) in length. The adult bee has a thorax covered with yellow hairs and a black, relatively hairless abdomen. Male carpenter bees may have a white or yellow spot on the face. While carpenter bees appear similar in size and color to bumble bees, carpenter bees are easily distinguished by their black, relatively hairless and shiny abdomens. Bumble bees, in contrast, possess hairy abdomens with patches of dense yellow hairs. The eastern carpenter bee is widely distributed throughout eastern North America. Another species, *Xylocopa micans*, or the southern carpenter bee, is found in the same region, but it is less common in Louisiana. Adults of the latter species are solid, glossy black insects that are otherwise similar in appearance to the eastern carpenter bee. The genus *Xylocopa*, to which the eastern carpenter bee belongs, includes over 400 species worldwide, with nine species in the United States. In older literature, the group is classified in the families Xylocopidae or Anthophoridae but is currently placed in the family Apidae, which includes honey bees and many other bee species.

Adult eastern carpenter bee resting on Sedum spp. (Ansel Oommen, Bugwood.org).

Life Cycle

The life cycle of the eastern carpenter bee begins when overwintered adults bees emerge to mate. This usually takes place in the months of March or April. Males become active slightly earlier than females and will wait outside the nest for females to emerge. After the females emerge, males only mate with them while in flight. Males will cease mating if the female lands. Some evidence suggests that the eastern carpenter bee is polygynous, meaning that one male may mate with multiple females. Mated female bees begin laying eggs in the summer, often in July.

If the mated female does not choose to inhabit a previously constructed nest, it is necessary for her to excavate a new site prior to egg laying. The female bees construct linear, longitudinal nests in solid wood, inspiring the name "carpenter bee." These nests are often constructed in pine or cedar. Carpenter bee nests may be solitary (containing only a single mature adult female) or social (containing multiple females of varying social positions), with social nests being far more common. Nests commonly possess a single entrance, running perpendicular to the grain of the host wood, followed by one to several tunnels that run parallel to the grain of the wood. These nests may be occupied during several seasons by multiple generations of related or unrelated eastern carpenter bees.

After a nest site is chosen, egg laying may begin. Female bees source pollen and nectar from local flowers and form the mixture into a ball within the nest cavity. An egg is laid on or near one of these balls at the far end of a nest tunnel. The female then seals off this section of

the nest by constructing a partition made from chewed wood fibers. This process is repeated several more times, moving from the far end of the nest tunnel toward the entrance. Eggs mature in reverse order, with the last-laid egg reaching maturity first so that mature individuals will not have to crawl over their immature siblings. After hatching, the larvae remain inside the nest, where they will be brought nectar by their mother or other mature female bees. After completing development, the larvae transform into pupae within their nest cells and then develop into adults. After emerging as adults, young carpenter bees are capable of flight within four days. Although capable of flight, these young bees remain relatively inactive throughout their first season, waiting until they have overwintered and emerged the following spring in order to mate. Upon mating during the second spring, the life cycle of the carpenter bee begins anew.

Eastern carpenter bee galleries and chambers in a branch (USDA Forest Service, Wood Products Insect Lab, Bugwood.org).

While eastern carpenter bees can form solitary nests, it is far more common for groups of bees to reside in one nest and partake in a primitive form of social behavior. Communal nests have a loosely organized hierarchy, with three roles for female bees. The primary female bee is responsible for egg laying as well as pollen and nectar foraging to provide sustenance for developing larvae. Primary females have usually overwintered twice and show considerable wear on their mandibles (mouthparts) and wings. Secondary females may engage in some egg laying as well as some brood care and foraging. The secondary females have usually overwintered once and are waiting for the opportunity to supersede the primary female. If a secondary female is excessively active during her second season, it is unlikely that she will overwinter again. The tertiary caste contributes the least to the nest. They mainly reside in the nest, waiting for the next season in order to mate and reproduce.

In addition to their role in mating, male carpenter bees may vigorously defend the nest where they have taken residence. Although males do not have a sting, they will hover and chase intruders, including other carpenter bees, away from their area of defense. In contrast, female carpenter bees do possess a sting but require extreme agitation in order to elicit a stinging response.

Parasites

The tiger bee fly, *Xenox tigrinus* (formerly *Anthrax tigrinus*), in the fly family Bombyliidae, is the most commonly observed natural enemy of carpenter bees in Louisiana. These large, strikingly patterned flies can often be seen hovering and exploring areas where carpenter bees are active. The larvae of the flies feed on the bee's stored pollen, then attach to and consume developing bees.

Ecological and Pest Significance

Carpenter bees naturally pollinate many wildflower species in their native range. Recent studies have shown that they can also pollinate some commercial crops with even greater efficiency than honey bees. These crops include passion fruit, tomato and melon. Additionally, the flower-cutting behavior of carpenter bees has been shown to increase honey bee pollination efficacy in rabbit-eye blueberries. Carpenter bees may be of particular use in greenhouse pollination because they function better at high temperatures than other bees because of their enhanced thermoregulatory ability. While carpenter bees serve beneficial roles as agricultural pollinators, their tendency to build nests in milled lumber can make them pests of manmade structures. After nests are constructed in these structures, they may be attacked by insectivorous birds, such as the woodpecker, leading to further structural damage.

Control

Most flying insect sprays ("wasp and bee sprays") are suitable for managing this species and the damage that they inflict on manmade wooden structures. Insecticide products should be sprayed into the nest entrance, and product label instructions should always be followed. Remember, the insecticide label carries the force of law and should be followed carefully. Check the label of any potential product to ensure it is labeled for use against carpenter bees prior to use. It may also be useful to plug vacated nest holes with steel wool or caulk. Carpenter bees prefer to inhabit unpainted or unstained wood, so coating or recoating inhabited wood may deter future infestation. A combination of insecticide application, plugging or caulking, and painting may provide a greater measure of control.

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