

## Factsheet #506

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### BLUE ORCHARD MASON (OSMIA) BEE

A number of species of Orchard Mason Bees are native to North America. They occur in different climatic environments but are particularly well adapted to the northern ranges of blooming fruit trees. The common Blue Orchard Mason Bee, *Osmia lignaria*, is found in the B.C.'s southern interior and coastal areas. It goes under various names including Blue Orchard Bee, Orchard Mason Bee, Orchard Bee, and Osmia Bee.

The Orchard Mason Bee belongs to the family *Megachilidae* which is comprised of a large number of solitary pollinators. Leafcutter bees such as the Alfalfa Leafcutter Bee *Megachile roduntata*, widely cultivated in North America for alfalfa pollination, are included in this family.

In North America, the most important members of the genus *Osmia* are the sub-species *Osmia lignaria propingua*, found west of the Rockies, and *Osmia lignaria lignaria*, widely distributed east of the Rockies. Other native sub-species have limited distribution ranges. Osmia Bees have also proven to be effective in other parts of the world. In Japan, the species *Osmia cornifrons* has been used as the primary pollinator in apple cultivation.

#### Physical Appearance

The Orchard Mason Bee appears black but is actually dark metallic green/blue in color. The female is approximately 14 mm in length, robust in appearance, resembling a black fly. The male is smaller and more slender, about 11-12 mm in length. Males are characterized by their long antennae and a tuft of light coloured hair on the front of the head. At rest, the bee has its wings flush with its body. Osmia Bees are effective pollinators because of their *pubescence* or hairiness. This enables them to carry pollen grains from flower to flower, allowing pollination to take place.



### **Foraging Behaviour**

Orchard Mason Bees occur in woodlands and forest edges. They appear in early spring when the first bushes and trees bloom. Cherry, pear and apple are particularly attractive but other nectar and pollen sources include quince, *Laburnum* spp and blueberry. Osmia Bees are fast flyers and display a high bloom visitation rate. The high activity even under poor weather conditions make this insect pollinator particularly attractive for early blooming crops.

Orchard Mason Bees are shy and fly away when disturbed. Even at their nests, female bees will not display defensive behaviour despite their capability to sting. Similarly to honeybees, Orchard Mason Bees gather nectar in their 'honey sac' while foraging. The nectar is used as energy source and to provision the tubular nest.

Unlike honeybees, Orchard Mason Bees do not have specially modified hind legs to store and carry pollen. Instead, pollen is packed into rows of stiff hairs under the abdomen.

### **Nest Sites and Breeding Behaviour**

Osmia Bees are solitary insects and complete their lifecycle on their own. Most species are gregarious in that they nest close together. This behaviour offers several advantages such as lower predation pressures, increased mating opportunity, and optimized genetic variability through cross breeding. It is this gregarious behaviour that has offered the opportunity to "domesticate" the Orchard Mason Bee.

Mated females will use existing holes in wood for a nest. Nests with 7-8 mm diameter holes are favoured. The female will place a mud plug at the end of the tubular nest and then deliver up to 20 loads of nectar and pollen to the end of the tube. When sufficient food has been deposited, an egg is laid and the cell is sealed with a thin layer of mud. The whole process is repeated for each egg until the tube is filled. Often the last cell is left empty to discourage predators. The tube is then closed with a thick mud plug at the entrance. Some wasp species also use tubular nests but their end plugs are often smooth, while the plug of the Mason Bee is always rough.

The female Mason Bee lives for about one month in the spring, producing one or two eggs a day. One tubular nest contains 7-11 cells. Eggs laid first (in the back of the tube) will develop into females, while the few cells nearest to the entrance will produce males.

### **Brood Development**

A few days after the egg has been laid, the larva will hatch and start feeding on the nectar and pollen reserves. It grows very rapidly and consumes most food stores in 10-14 days. The larva will then spin a cocoon and pupate. Later in the summer, the pupa will develop into an adult, staying in its cocoon throughout the winter.

In early spring when the first warm days occur, male Osmia Bees will emerge first, chewing their way through the mud plug with their strong mandibles. The males will stay near the tubular nests and wait for females to emerge. As soon as females appear, the males will attempt to mate. There is fierce competition between males and sometimes a female is covered by a number of struggling males.

### **Developing your own Osmia Bee Population**

Osmia Bees occur in many parts of southern British Columbia. Local populations are often limited by the availability of suitable nesting sites and forage sources. Providing suitable nest sites will attract Osmia Bees and allow for the establishment of a sizable Osmia Bee population in an area.

Alternatively, there are various commercial sources available in British Columbia where a "starter population" comprised of a few filled tubes can be purchased and installed in the garden along with a larger number of empty tubes for nesting sites.

Nests can be made from blocks of wood, 2x4's and 4x4's, with holes of 7-8 mm in diameter. The length of the hole is approx. 10-15 centimeters. It is recommended to use pine or fir but not cedar since the latter contains resins that repel insects. Alfalfa Leafcutter Bee boards with holes of at least 6 mm can also be used.

Suitable nests can also be created with cardboard and paper straws. Cardboard straws can be bundled together and wrapped in weather resistant tarpaper or inserted into a large plastic tube. Wooden blocks can also be used more efficiently by drilling larger holes of 9-10 mm and inserting paper sleeves, which can be removed in winter.

In October, store blocks or tubular nests in garden shed or garage, away from predators and temperature extremes. When using paper sleeves, remove these from the wooden block and place in a tray. The tray should be netted or screened and stored in refrigerator or in a cool, dry place until spring. In mid-March, nest blocks should be placed outside and exposed to morning sun.

#### **Mud Availability**

As their name indicates, Mason Bees need access to mud. If a source is readily available near the nests, the females can be spared a great deal of time and labour. A patch of soil can be kept moist or a small bucket or tray can be filled with wetted soil.

#### **Pollen Mites**

Emerging male and female Osmia Bees sometimes have a brown coloured, mottled covering on their thorax and abdomen. These are large numbers of pollen mites that feed on the pollen that was left after the bee larva entered its pupal stage. These pollen mites are not believed to be injurious to the bees but could possibly limit food availability to the bee larva in spring, and pose a physical hindrance to the adult bee in flight.

Cardboard and paper inserts may offer an effective means to lower the effects of the pollen mites. In winter, tubes can be carefully cut lengthwise or unraveled and the bees and nesting material can be dipped in a cleansing solution. Unlike wooden blocks without inserts, cardboard and paper inserts are not reused, helping to prevent pollen mite buildup.

#### **Orchard Pollination**

The Osmia Bees have proven to be very effective pollinators of tree fruit orchards. Their high activity level and tendency to visit different trees optimizes cross pollination. Effective crop pollination can be attained with a much smaller number of Osmia Bees as compared to an equal number of honeybees. Yet, monocultural practices demand huge numbers of pollinating insects in blooming crops.

For an apple orchard, it is recommended to provide 500-1000 filled holes per acre. Assuming an occupancy level of 1.5 females per hole, this would supply up to 1000 female bees. Females are the primary pollinators as they are the sole nest builders. Males also pollinate but their foraging is only done for nourishment.

Osmia Bees often disperse after emergence and seek nesting holes in other areas. For this reason, population increase in a locality may be slow and insufficient to meet the pollination requirements of a crop or orchard. With proper management, a sizable population can be established over several years.

#### **Reference**

Bosch, J. and W. Kemp. 2001. How to Manage the Blue Orchard Bee. Sustainable Agriculture Network, Beltsville, MD. ISBN 1-888626-06-2