

Solitary Pollinating Bees

Gentle and Efficient Orchard Pollinators

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Information Courtesy of
Dr. Suzanne Batra (Retired)
USDA Beltsville MD

Hornfaced Bees (*Osmia cornifrons*) are solitary bees native to Japan, where they have been used as orchard pollinators for apples, cherries, plums, peaches and pears for over 40 years. They are quite unlike honeybees in behavior, and thus they must be managed differently. Like other solitary bees they have no queens, workers, hives, wax, or stored honey. The adult bees forage and pollinate only during spring. Most of the year they lie dormant in nesting cells. Just one generation of bees is produced each year, and they are no bigger than a common horse fly. After mating in early spring, each female constructs rows of cells made of mud inside tubes supplied by the beekeeper. Each cell is provisioned by the female with a mixture of nectar and pollen, on which she lays an egg. The cell is sealed with mud, and the larva feeds and develops without further attention from its mother.

These bees are valued only because of their superior ability to pollinate. Few of them are needed per acre because they are so efficient. For example, **an individual Hornfaced Bee can set an average of 2,450 apples per day, but an individual honeybee sets only 30 per day.** For apples, one Hornfaced bee equals about 80 honeybees in efficiency of pollination. The difference occurs because Hornfaced Bees work faster than honeybees, stay within the orchard, contact flower stigmas consistently, and prefer orchard flowers to those of weeds or other crops. Hornfaced bees are more efficient. However, a small container (i.e. bucket) of them is going to have far less bees than a honeybee nest (which can contain up to 50,000 bees, though typically less). Bumblebees and other pollinators contribute significantly to effective pollination.

THE BRIEF LIFE CYCLE OF A SOLITARY BEE

WINTER: During this time the Hornfaced Bee lives in a cell in a nesting tube, quietly transforming from an egg to a larva, pupa, and then to an adult by spring. During the winter store the filled nesting tubes on their side in an unheated garage, barn or carport. Protect the container from mice nibbling with window screen wire. It is OK for them to be in freezing weather in a protected place. Storage in a heated area will cause bees to hatch out months too soon.

AVOID STORING BEES IN THE REFRIGERATOR!

It is too dry. If you must refrigerate, provide 75% humidity; i.e. via damp paper towels

EARLY SPRING: In our area Hornfaced Bees come out of winter's sleep about one to two weeks before tree fruits begin to bloom. Place the filled tubes back outside in their shelter anytime between mid-February and mid-March. The bees need room to multiply, so add two new empty tubes for every filled tube. You may want to place the new tubes bundled in front of those from which bees are hatching. Hopefully the bees returning from their maiden flights will set up housekeeping in the new disease-free tubes. In mid-spring, after the bees are done hatching, discard used tubes in poor condition.

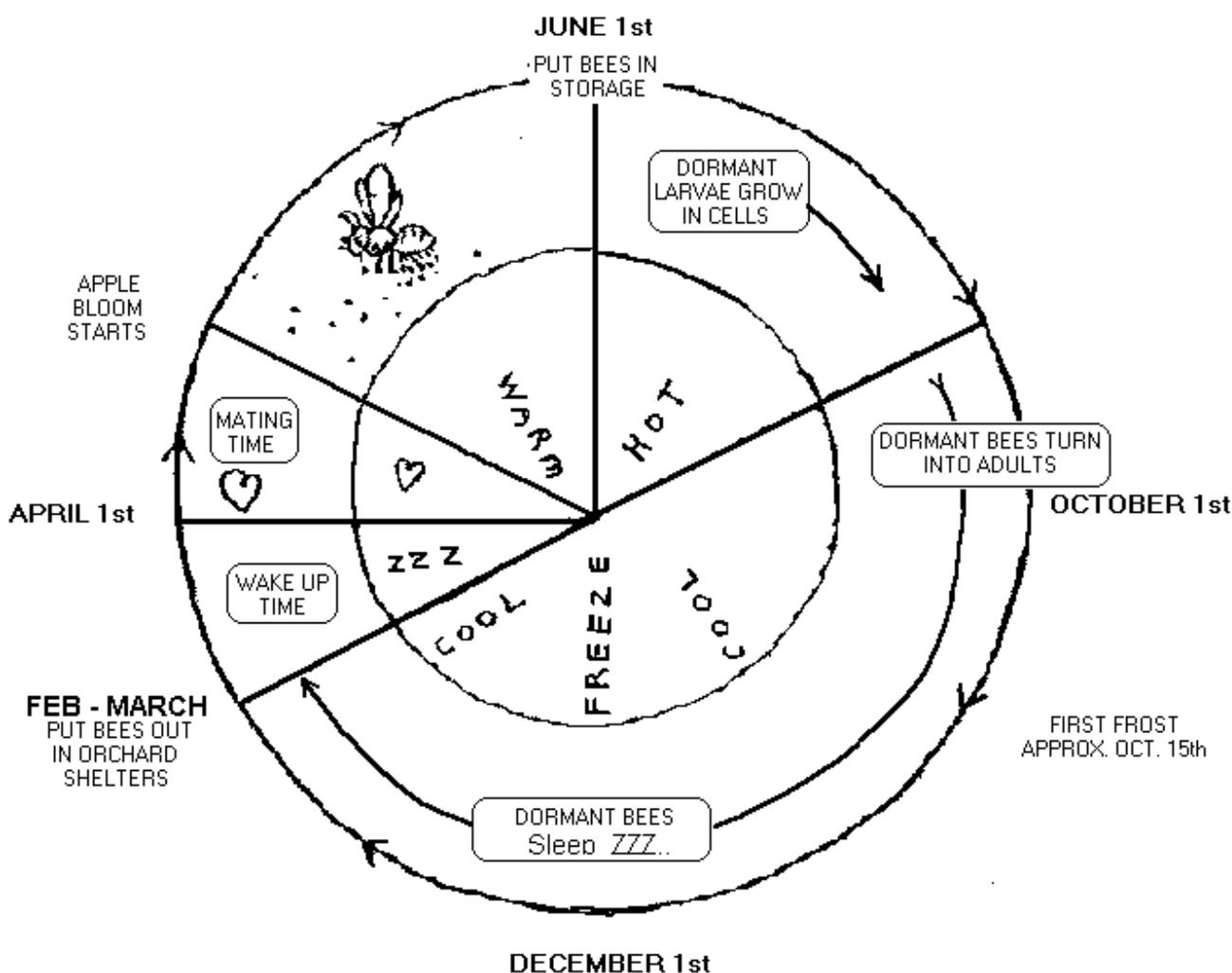
PROTECT THE OPENING FROM BIRDS WITH 1" CHICKEN WIRE

MID SPRING: The bees will need a source of nearby mud. A small creek or muddy birdbath with a ramp for them to crawl in and out is fine. Watch them work. You can get close. They almost never sting, seeming to prefer to get out of harm's way and, being solitary, do not actually have a hive to defend.

LATE SPRING (JUNE): By mid to late June the bees are tired and tattered, and their days are about done. The eggs are laid, with enough pollen and nectar in each cell to see the offspring through until spring's hatching. Now is the time to put them back into storage for the summer, fall and winter. Choose an area with moderate temperatures. For example, if winter storage will be in the garage, but it's too hot there during the summer, use the basement until temperatures cool in the fall. If tubes are left in the orchard during the summer it is likely that leafcutter bees, which do not pollinate, will be filling them up. Worse yet, tiny parasitic wasps will undoubtedly drill into the side of the tubes and eat your bees!

ABSOLUTELY DO NOT LEAVE THE FILLED BEE TUBES OUT PAST JUNE 1st!

This avoids the dreaded parasitic wasps attacking the solitary bees. The parasitic wasp begins flying in June. You can put your bee blocks or tubes in the basement (ideally in a cooler with a small hole). Wasps present among the bees seek the light for mating, fly out and not be able to find the way back into the cooler.

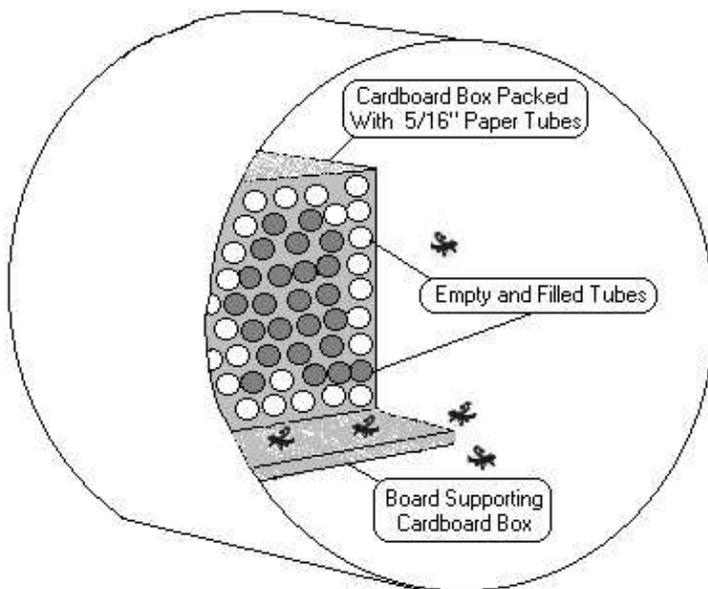


LIFE CYCLE OF A JAPANESE HORNFACED BEE

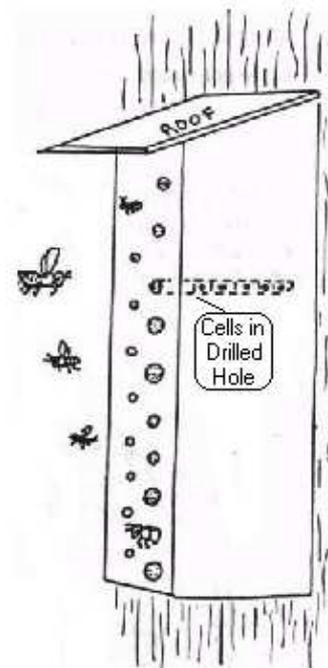
SOLITARY BEE SHELTERS

In 1978 the USDA's Dr. Suzanne Batra established the first viable North American population of Japanese Hornfaced Bees at Beltsville, MD. She somewhat modified the Japanese management techniques in order to reduce costs in time, labor, and materials. Dr. Batra pioneered the use of pre-made cardboard nesting tubes in place of the short bamboo sections the Japanese employ. Due to **the bees short foraging range (only about 100 yards)** she found that it was necessary to disperse several small bee shelters, each containing starter bees and nesting tubes, throughout larger orchards. Based on several years of Backyard Fruit Grower experience we have found that **the following shelters work well:**

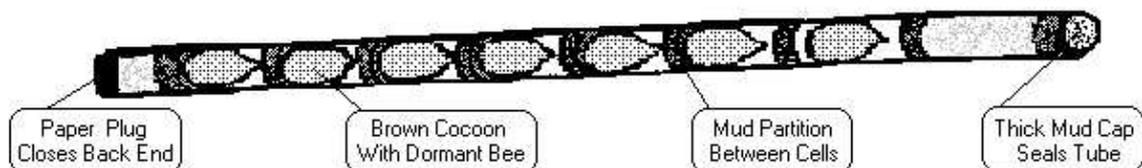
- **A FIVE GALLON PLASTIC BUCKET**, of the drywall compound type, bolted to a southern wall; or I built 'bee stands' from lath board. And rested the 5 gallon bucket on the stand. You want the bees to be elevated off the orchard floor.
- **A DRILLED WOODEN NESTING BLOCK**, (not of treated lumber) with a mini- roof; or
- **A BUNDLE OF SECTIONS OF 4 TO 6 INCH PLASTIC PIPE** (not shown below); each one is cut about twelve inches long. One end is plugged, and they are secured in a rack built near the orchard.



FIVE GALLON PLASTIC BUCKET BOLTED TO A WALL. THE END IS OPEN TOWARD THE SOUTH



DRILLED NEST BLOCK ON THE SOUTH SIDE OF A BARN



**TYPICAL 5 /16" PAPER TUBE
WITH SEVEN DORMANT LARVAE**

SOURCES

- **JAPANESE HORNFACED BEES (*Osmia cornifrons*)** - Ideally you will find a fellow orchard grower willing to sell or share some of the bounty from his efforts to reproduce these bees. In addition there are several commercial sources for Hornfaced Bees, and their very similar relative the **Orchard Mason Bee (*Osmia lignaria*)**, also called the Blue Orchard Bee. To get an up to date listing it is best to **search the Internet** under the terms: Japanese Hornfaced Bees; *Osmia cornifrons*; Orchard Mason Bees; Blue Orchard Bees; or *Osmia lignaria*.
- **JAPANESE HORNFACED BEES AND ORCHARD MASON BEES CAN COEXIST PERFECTLY WELL TOGETHER. IN PRACTICE THEY WILL FILL TUBES SIDE BY SIDE IN THE SAME NEST BOX.**
- **5/16" CARDBOARD NESTING TUBES (IN BULK)** - For a number of years Backyard Fruit Growers has been ordering 5/16" I.D. x 6" inside length x 0.032" wall thickness tubes, with a curl disc closure and a kraft outer ply, by the thousands from Jonesville Paper Tube, Jonesville MI; Phone 517-849-9963. They have provided a great product and excellent service at a good price. Similar tubes are also available from Custom Paper Tubes, Cleveland OH; Phone 800-766-2527. Custom Paper Tubes also manufactures a cylindrical coated cardboard nesting box containing 55 individual cardboard nesting tubes called The Garden Pollinator®.
- **5/16" CARDBOARD NESTING TUBES (BY THE HUNDREDS)** are available at seasonal meetings of Backyard Fruit Growers based in Lancaster, Pennsylvania. To participate in their local activities, subscribe to the **BACKYARD FRUIT GROWER** newsletter. A newsletter subscription is \$15 for two years. Subscribers gain admission to most BYFG events at no charge. Write to:

**BACKYARD FRUIT GROWER
5276 STEELVILLE ROAD
STEELVILLE PA 19310**

www.byfg.org
byfg@epix.net

- **CREATE YOUR OWN TUBES.** Rather than drilling out blocks you can create nesting tubes from other materials. Bamboo works as it is already hollow, but getting sections the right diameter can be a problem. You can also use Staghorn Sumac branches, as the center of their branches has a large section of soft pith material that is easily drilled. Do not use plastic straws as they do not allow proper air exchange. Paper straws are acceptable, but are more vulnerable to parasite and predator damage.
- **BOOKS:**

THE ORCHARD MASON BEE - By Brian L. Griffin; Knox Cellars Publishing, Bellingham, WA; 1993; ISBN 0-9635841-1-1; 69 pp. This little book is a delightful recounting of the author's experiences in studying and propagating Orchard Mason Bees using wooden nesting blocks. He also touches on how to attract populations of native solitary pollinating bees. The reader will better understand the world of these tiny orchard helpers.

HOW TO MANAGE THE BLUE ORCHARD BEE: AS AN ORCHARD POLLINATOR - by Jordi Bosch, William P. Kemp; Sustainable Agriculture Network (November 2001); ISBN-10: 1888626062; ISBN-13: 978-1888626063; 88 pp. (from review on Amazon.com) This book is directed at the home gardener or orchardist who is interested in learning about managing native

bees on a larger scale, and covers all the aspects of their cultivation, from tube selection to predators. In between it covers multiple other issues, such as how temperature will affect the maturation predictably, and could be used quite effectively as a "how-to" book for an orchard manager. Although brief and a fairly quick read, it is surprisingly comprehensive, with information into web resources as well.

If you're not sure you even want to start rearing native bees, I'd suggest reading Brian Griffin's book on The Orchard Mason Bee (if you can find a copy), which I think is a much better introduction to the topic. But if you've been "bitten by the bug" already, this book is an excellent manual on the management of a small population of bees into a sustainable larger population.

POLLINATION WITH MASON BEES: A GARDENER AND NATURALIST'S GUIDE TO MANAGING MASON BEES FOR FRUIT PRODUCTION - by Margriet Dogterom; Beediverse Publishing; 1st ed edition (March 15, 2002); ISBN-10: 0968935702; ISBN-13: 978-0968935705; 80 pp. This book takes a different approach with the bees using reusable nesting blocks. The author's approach is labor intensive. If you definitely want to have mason bees, but are having trouble with parasites, this may offer a solution to your problem.

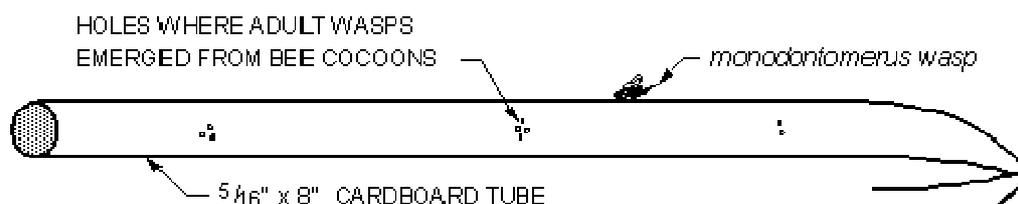
MORE ON HOW TO CONTROL PARASITIC WASPS (*Monodontomerus obscurus*)

Dr. Batra

This tiny, gnat sized, black wasp parasitizes several kinds of solitary bees in North America and Europe, including leafcutter bees and mason bees. In Maryland, these wasps start to attack Hornfaced bees in mid-to-late May. Thus, it is important to protect your bees from wasp attacks toward the end of the bees' seasonal period of adult activity. This can easily be done by removing the bees from the field and promptly putting them into storage, or by securely screening your bee shelters at that time with a fine-meshed metal, fiberglass, or nylon screen that the tiny wasps cannot squeeze through. Each female wasp can lay about ten eggs in each Hornfaced bee as it develops in its brood cell. The wasp eggs produce mostly female wasps. Thus, the potential for multiplication of wasps and destruction of bees is great. These wasps have two generations per year, which makes it possible to control them when they attack Hornfaced bees. The first generation of wasps appears in late May and the second generation appears in July. I control wasps in Beltsville by the following simple method:

Remove bees from the field to the storage shed, barn, etc., in late May. The bees (developing brood in tubes) are put in large cardboard boxes (or garbage cans, if mice are a problem) with only a slit left open for wasps to emerge through (the July brood). When in storage containers, tubes should be laid horizontally, as they were in the field. The boxes with bee tubes are then put on shelves in a dark storage shed that has only one window (facing south). Ordinary fly paper is hung inside the window to trap wasps, which come to the light from the window in July. Most wasps do not find their way back to the bee tubes in the dark boxes. They get stuck on the fly paper or die of starvation. By this simple, easy method, I have been able to maintain Hornfaced bees for 15 years with less than 1 percent parasitization.

FIGURE 6. Signs of parasitic wasps.



Solitary Pollinating Bee Sources

	Beediverse	Pollinator Paradise	Knox Cellars	Mason Bee Homes
URL	www.beediverse.com	www.pollinatorparadise.com	www.knoxcellars.com	www.masonbeehomes.com
Contact	Margriet Dogterom, Ph.D	Karen Strickler, Ph.D.	Lisa Novich	Gordon Cyr
Email	bees@beediverse.com	karens@pollinatorparadise.com	Lisa@knoxcellars.com	gord@masonbeehomes.com
street	641 Clairmont St	31140 Circle Dr	25724 NE 10th St	2460 Oakes Rd
Town; St/Prov./Country	Coquitlam, BC V3J3T5 Canada	Parma, ID 83660 USA	Sammamish, WA 98074 USA	Black Creek, BC V9J1J1 Canada
Phone	604-936-3913	208-722-7808	206-849-5065	
Nest device	Tray , wood laminates, routed & bound	Binderboard , wood laminates, routed & bolted	Tube & liner, paper	Bee Block, polypropylene
DVD	<u>All About Mason Bees</u>	http://www.sare.org/publications/bob.htm (Free PDF download)		
Book	<u>Pollination with Mason Bees</u>	<u>How to Manage the BOB</u> , Bosch & Kemp	<u>The Orchard Mason Bee</u>	