

Grade 3 Spring Garden Lesson

Bee Life Cycle and Comparing the Honey Bee (social) to the Mason Bee (solitary)- Information provided by the website buzzaboutbees.net, Wikipedia, Arizona EDU,

Bee Basics

Bees are insects (invertebrates, have 6 jointed legs, 3 body parts, two antennae, and compound eyes). There are 20,000 known species of bees, though many are undescribed and the actual number is probably higher. They are found on every continent except Antarctica, in every habitat on the planet that contains insect-pollinated flowering plants. Bees are adapted for feeding on nectar and pollen, the former primarily as an energy source and the latter primarily for protein and other nutrients fed mostly to the larvae. Bees have a long proboscis (a complex "tongue") that enables them to obtain the nectar from flowers.

Not all bees are **social bees** that live in large families like bumble bees and honey bees. Most species are less well-known bees called **solitary bees**, for example mason bees, leafcutter bees, alkali bees, or sweat bees. In fact of all the bee species, over 80% are solitary bees. Female solitary bees build their own nests and provide food for only their offspring, while female social bees lay eggs in cells created by and fed by a colony of worker bees. All bees collect pollen and nectar, but many of the solitary species are essential because they pollinate plants ignored by honey bees.



Bumble Bee



Mason Bee



Honey Bee



Leaf Cutter Bee



Green Sweat Bee



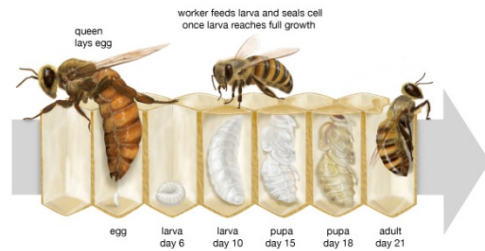
Alkali Bee

Bees are very important to us and not just because some make honey. They are most important because they pollinate flowers. Because bees visit many flowers every day collecting nectar and pollen, they accidentally transport pollen from one flower to the next. When that pollen travels to the pistil of the flower, and meets the flower egg, a seed and fruit will start to form. Without help from bees and other pollinators, this would not happen and we would not have most fruits and vegetables. The number of Honey Bees is decreasing and scientists don't entirely know why. That's why it's important to support the solitary bee populations, which are native pollinators in our area.

Social Bees vs. Solitary Bees

All bees go through the same stages of development (Egg → Larvae → Pupa → Adult). Bee life cycles vary, depending on the species of the bee and whether it is a social or solitary bee.

Life cycle of honeybees



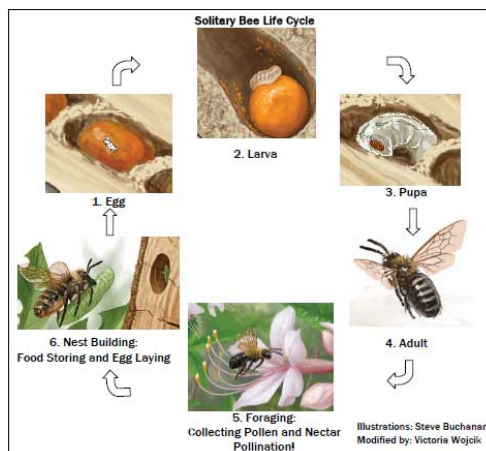
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The life span of **honey bees (a social bee)** varies, depending on the role of an individual bee within the colony. Honey bees live in sophisticated, well organized societies of 50,000 to 60,000 bees, performing different roles in order to help ensure the smooth running success of the colony.

In summary:

- **Queen** - female bee lays fertilized eggs for the entire colony – she's much bigger than the other bees and could live for 3 to 4 years,
- **Drones** - male bees that mate with the queen bee - may live for just a few weeks or up to 4 months. Upon mating with the queen, drones die immediately.
- **Workers** – female bees incapable of laying fertilized eggs, gather honey and pollen, tend to the larvae and defend the hive if needed; may live for 6 or 7 weeks.

Mason (Solitary Bees)



- 1 egg is laid on a pollen ball and sealed in a cell with mud
- After 3 days a larva hatches from the egg and eats the pollen ball
- The larva grows and becomes a pupa. While a pupa, the body cells rearrange and mature to form an adult bee.
- The pupa hatches and chews its way out of the cell
- Adult bee emerges and starts the cycle again

Adult **Mason Bees (a solitary bee)** emerge in spring after a period of development and hibernation in a cell and live for 6-7 months. Males appear first, waiting eagerly for sight of the females with which they will mate. After mating has taken place, the males will soon die. The female will seek a suitable location for her nest, like a long hole in wood or a hollow stem of a plant. She then constructs the nest, providing pollen and nectar in each cell for a single egg. Eggs destined to become females are laid toward the back of the nest, whilst males are laid toward the front. They will usually make between 4 and 6 cells. Four or five similar nests may be completed in a season. There will be one generation per year. The larvae develop and pupate, emerging as adults the following spring.

Similarities and Differences:

A female solitary bee doesn't tend to its larvae like female honey bees do. Once solitary bee eggs are contained in their cell with a pollen ball, they are on their own. However, she must build and provision her nest completely on her own, without any help from other bees. Because they don't have a large nest with a lot of offspring to defend, solitary bees tend to be less defensive than social bees. Social bees defend their nests when it is threatened, while solitary bees simply move to a new location if their nest is threatened.

Social Bee – Honey Bee	Solitary Bee – Mason, Leaf cutter, Sweat Bees
One queen – one hive. Worker bees defend the hive, the queen and the young	Every female is the queen; no hive
Hive communicates and every bee has a specific task:	No communications since no one works for the female. She does all chores herself.
More aggressive and protective of the hive	Gentle
More potent sting with stronger reaction	Rarely stings unless being squished, then the sting is like a mosquito bite
Make honey	None available for harvest
Effective pollinator. One bee gathers pollen and another gathers nectar	Efficient pollinator. Pollen and nectar are gathered in the same visit
Pollen becomes sticky and is combed into pollen sacs for carrying to the hive	Dry pollen clings to hairy body and drops off to pollinate almost every flower visited

Honey Bee Facts:

Only the female bees are pollinators and have the structure on their legs called a pollen basket that no other insect has. The basket is constructed of a row of stiff hairs that form a hollow space on the outside of the bee's legs. The bee combs grains of pollen into each of the baskets every time she visits a flower. During a collection trip a honey bee visits 50-100 flowers.

To produce one ounce of honey, bees travel an average of 1600 round trips of up to 6 miles per trip. Bees travel a distance equal to 4 times around the earth in order to produce 2 pounds of honey.

A worker bee will produce only 1/12 of a teaspoon of honey in her lifetime. It takes 35 pounds of honey to provide enough energy for a small colony of bees to survive the winter. In one day, 60,000 bees can produce 2 pounds of honey.

Mason bee facts:

A female solitary bee visits 15–20 flower to complete just one cell in a nest. Pollination occurs as the female bumps into the flower's anthers and stigma during these visits.

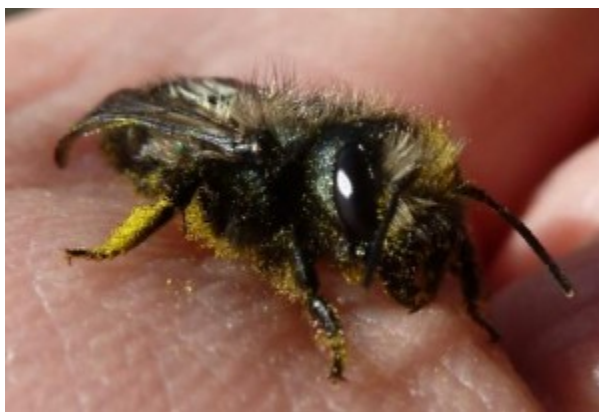
One Mason Bee can do the pollination work of 100 Honey Bees because they are less precise when they visit flowers and "belly flop" onto flowers. Honey bees are gentler in their landing and brush pollen off of their belly into their pollen baskets to bring back to the hive.

Discussion:

- What are the advantages of being a solitary bee? What are the advantages of being social bee?
- Why would honey bees rather live in a colony?
- Why are bees important to us?
- Are there ideas about how to help solve the problem of decreased bee populations?
- How can we support the solitary bees in our garden? What do they need to live? (habitat)

Mason Bee Houses

We need to help solitary bees to thrive. Provide the bee with shelter and food and mud. Providing 1cm holes, either by drilling and lining a wood block or bundling plant stems or cardboard tubes, the mason bee can create its nest inside the hole. Lining the holes with paper allows removal of the cocoons to overwinter in a box in a refrigerator protected from mites, birds and hornets.



Lesson: Bees

Objective – to understand the difference between solitary and social bees and to support mason bees with shelter by helping to build a mason bee home. Consider this as a solution to the problem of declining pollinator populations.

Preparation:

Gather life cycle of bee sheet

Get the Mason bee house

Print and laminate color copy of the bee information sheets and the large bee lifecycle sheet

Action:

1. Ask students if there are more than one type of bee? How many do they think there are in the world? *There are nearly 20,000 known types of bees.* Do all bees live together in a colony or a society? *No – some are individual or solitary bees. In fact 80% of bee types are solitary kinds of bees. But there are higher numbers of social bees.*
2. Describe the main difference between social and solitary bees. Refer to handout above.
3. Ask students if they know the lifecycle stages of a bee? See if they remember the life cycle stages of a butterfly (from 2nd grade). Draw this on a white board. Compare the two life cycles. (Both are complete insect life cycles because they go through metamorphosis including a pupae stage between larvae and adult).
4. Which bee do you think creates more baby bees – one colony of social bees or many solitary bees? *(there are many more bees created in a year in a colony of social bees, but one solitary bee can produce around 30-40 new bees)*
5. Describe how honey bees are careful to brush pollen onto their baskets and some pollen falls off, but mason bees are sloppy and they get covered in pollen and when they visit the next flower, pollen falls all over. Expressing this visually has an impact. *Solitary bees are better pollinators because they are messier. One mason bee pollinates as many flowers as 100 honey bees.*
6. What do animals need to survive? *Food, water, shelter, air.*
7. How can we help solitary bees thrive? *Provide flowers for food and shelter to lay their eggs.*
8. Will this help our garden? *Yes mason bees are excellent pollinators which mean we'll have more fruit in our garden.*
9. Show students the mason bee shelter. Have students roll a tube of paper to fit inside the hole. This helps remove the cocoons in fall to protect them from mites and wasps. Tell students the mason bee house will be placed in a special place that is warmed by the morning sun.