



# All about them Bees

A short presentation on wild-bee diversity, ecology and how to use nesting aids (insect hotels) appropriately

Language: english (with some expressions in german)

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# AUSTRIA: ~ 55.000 Species

> 40.000 species of Insects

~ 350 species of Birds

~ 90 species of Fish

~ 80 species of Mammals

> 10.000 species of Hymenoptera

~ 700 species of Bees



## NATIVE ANIMALS



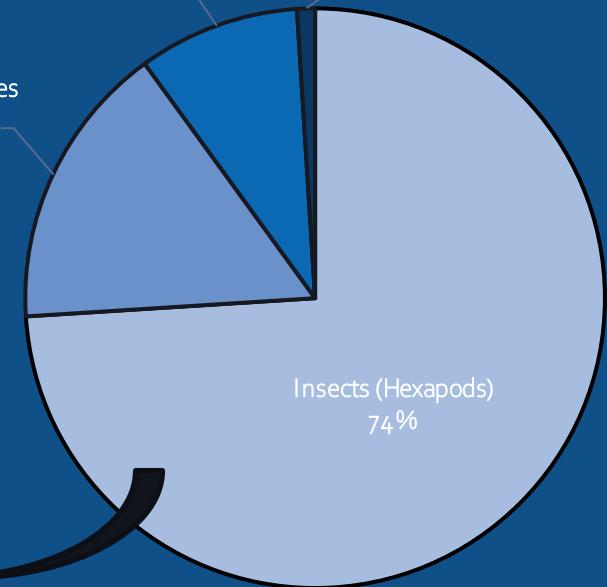
other Arthropods  
(Spiders, Scorpions,  
Centipedes)  
9%



Vertebrates (Fish,  
Reptiles, Birds,  
Mammals)  
1%



other Invertebrates  
(Snails & Slugs)  
16%



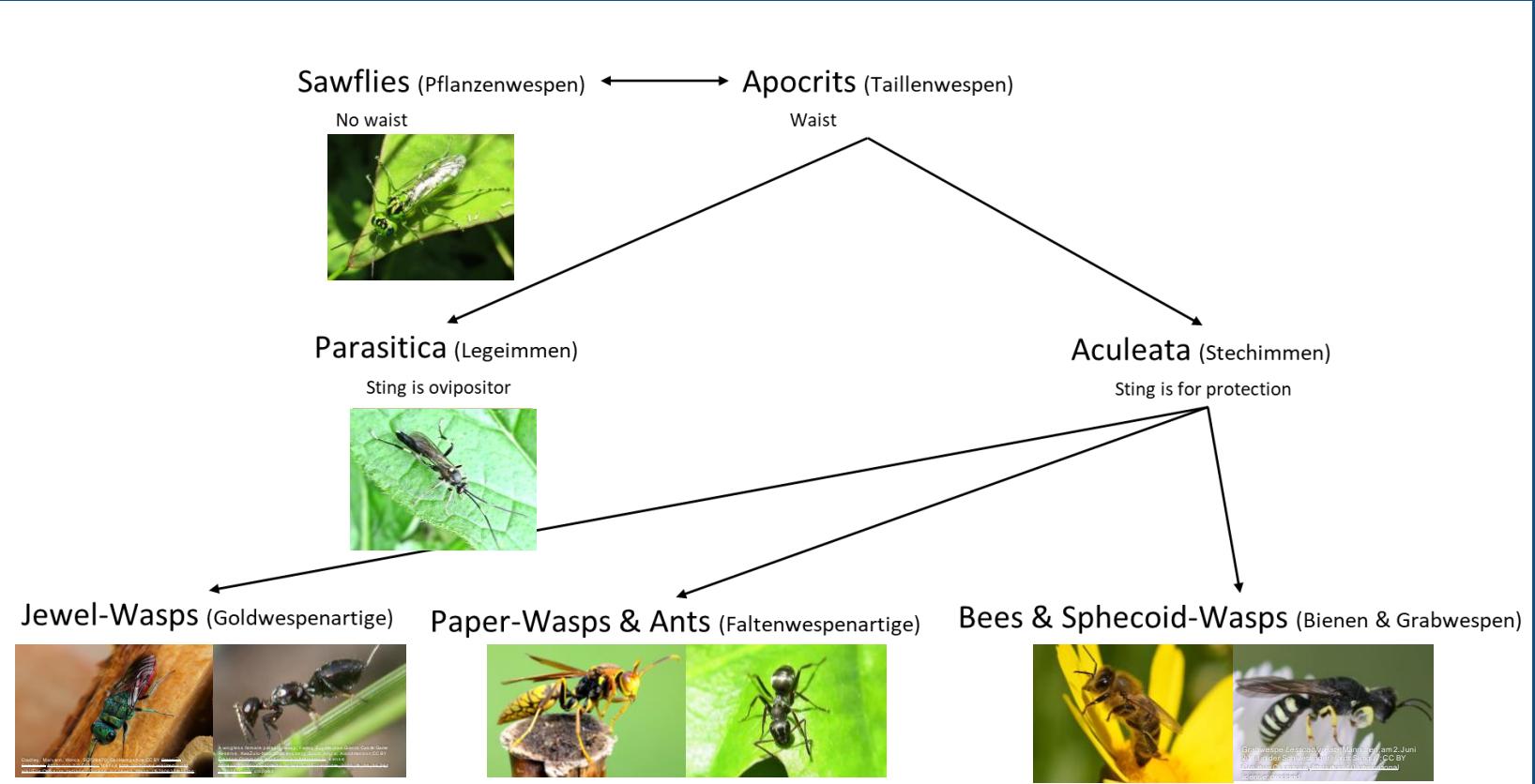
# HYMENOPTERA

Hexapods with 2 pairs of translucent wings



Lifecycle: Egg – Larva –  
Pupa – (Imago) – Adult

Reproduction &  
lifestyle vastly  
different!



# Bees

Pollinators who exclusively consume  
pollen & nectar

Mason Bees (Mauerbienen)



Mining Bees (Sandbienen)



Carpenter Bees (Holzbienen)



Masked Bees (Maskenbienen)



Digger Bees (Pelzbienen)



Leafcutter Bees (Scherenbienen)



Bumblebees (Hummeln)

Honeybees (Honigbienen)



# The Honeybee

One of only two **domesticated** insects in the world

9 species globally (7 SE-Asian, 1 N-African, 1 global)

*Apis mellifera* (Western Honeybee)

Highly social – colonies of 70.000 individuals and more  
Only the queen reproduces, other females are sterile

Life expectancy: ~ 3 months (queen up to 6 years,  
males < 2 months) → Colony spends winter together.

Larvae feed on **honey**

Feed on basically every plant (generalists)



# The Wild Bees

Many specialists – therefore often highly vulnerable

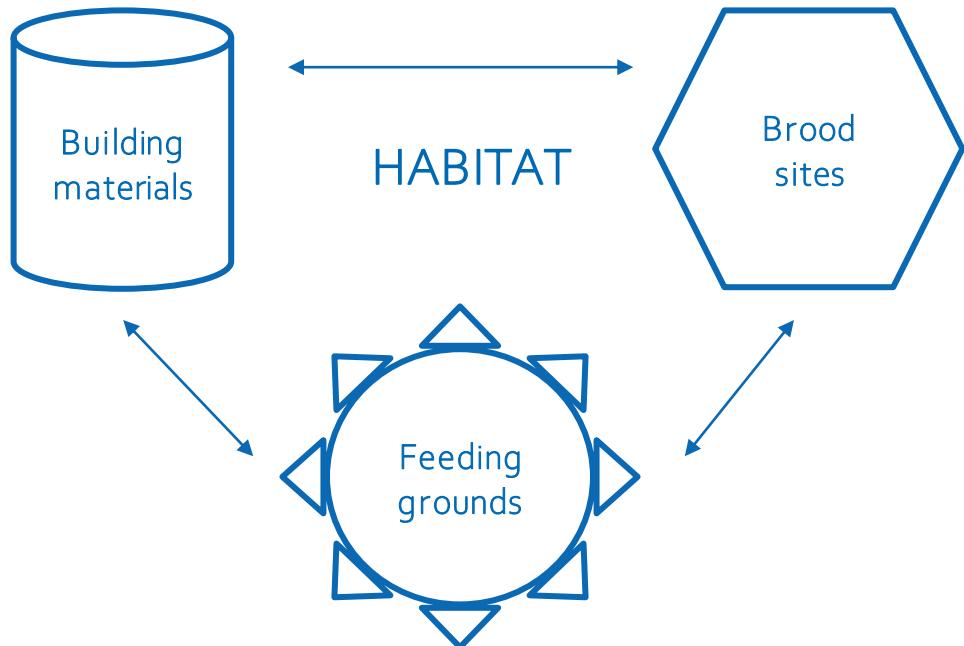
Live mostly solitary → Bumblebees in small colonies of 50 – 500 individuals (queen reproduces, makes *honey*)

Extremely efficient pollinators, many **cuckoo species!**

Life expectancy (3-5 weeks as an adult, ~ 1 year)  
Bumblebee queen up to 4 years

Larvae & pupa spend winter in brood-cells, adults in the ground or in wood. Bumblebees die in autumn, only the fertile queen survives.

# What do Bees need?





## 1. Feeding grounds

*Wild bees are specialist. Some species only feed on 1-5 different plants!*



Diverse meadows disappear with a rapid pace  
and are not easily restored!



Male red mason bee (*Osmia bicornis*), Sandy, Bedfordshire; Orangeaurochs, CC BY Creative Commons Attribution 2.0 Generic license; [https://commons.wikimedia.org/wiki/File:Male\\_red\\_mason\\_bee\\_\(Osmia\\_bicornis\)\\_Sandy,\\_Bedfordshire\\_\(16949550820\).jpg](https://commons.wikimedia.org/wiki/File:Male_red_mason_bee_(Osmia_bicornis)_Sandy,_Bedfordshire_(16949550820).jpg); cropped



Single shot of the female busy at a tube of a Bee Hotel in my garden near Christchurch Park; Martin Cooper; CC BY Creative Commons Attribution 2.0 Generic license; [https://commons.wikimedia.org/wiki/File:Female\\_blue\\_Mason\\_Bee\\_-\\_Osmia\\_\(Chalcosmia\)\\_caerulescens\\_\(2387864971\).jpg](https://commons.wikimedia.org/wiki/File:Female_blue_Mason_Bee_-_Osmia_(Chalcosmia)_caerulescens_(2387864971).jpg); cropped



Mason Bee - *Osmia* species. Meadowood Farm SRMA, Mason Neck, Virginia; Judy Gallagher, CC BY Creative Commons Attribution 2.0 Generic license; <https://creativecommons.org/licenses/by/2.0/>; [https://commons.wikimedia.org/wiki/File:Mason\\_Bee\\_-\\_Osmia\\_species\\_Meadowood\\_Farm\\_SRMA,\\_Mason\\_Neck,\\_Virginia.jpg](https://commons.wikimedia.org/wiki/File:Mason_Bee_-_Osmia_species_Meadowood_Farm_SRMA,_Mason_Neck,_Virginia.jpg); cropped

## 2. Building materials

*Plant material, resins, sand grains and earth are required, to close the brood cells.*



Sealed with a piece of leaf, Gail Hampshire; CC BY Creative Commons Attribution 2.0 Generic license; [https://commons.wikimedia.org/wiki/File:Mason\\_Bee\\_\(possibly\\_a\\_Megachile\)\\_%2834879174094%29.jpg](https://commons.wikimedia.org/wiki/File:Mason_Bee_(possibly_a_Megachile)_%2834879174094%29.jpg); cropped

Dead plants, sandbanks & natural clay walls disappear with spreading urbanization and land use!



Opened nest of a red mason bee (*Osmia rufa*); tpjunier; CC BY Creative Commons Attribution 2.0 Generic license; [https://commons.wikimedia.org/wiki/File:Osmia\\_rufa\\_nest.jpg](https://commons.wikimedia.org/wiki/File:Osmia_rufa_nest.jpg); cropped



*Osmia bicornis*  
(Red mason bee)



Red mason bee (*Osmia bicornis*) nest cells in a bee hotel, Sandy, Bedfordshire; Orangeauochs; CC BY Creative Commons Attribution 2.0 Generic license; [https://commons.wikimedia.org/wiki/File:Red\\_mason\\_bee\\_\(Osmia\\_bicornis\)\\_nest\\_cells\\_in\\_a\\_bee\\_hotel,\\_Sandy,\\_Bedfordshire\\_\(11370317793\).jpg](https://commons.wikimedia.org/wiki/File:Red_mason_bee_(Osmia_bicornis)_nest_cells_in_a_bee_hotel,_Sandy,_Bedfordshire_(11370317793).jpg); cropped

Eggs and pollen stored within a stalk. One egg after another and compartmented. Hatched bees dig out



Mason Bee Females Laying and Storing Eggs; Tim Sheeeman-Chase; CC BY Creative Commons Attribution 2.0 Generic license; [https://commons.wikimedia.org/wiki/File:Mason\\_Bee\\_Females\\_Laying\\_and\\_Storing\\_Eggs.jpg](https://commons.wikimedia.org/wiki/File:Mason_Bee_Females_Laying_and_Storing_Eggs.jpg); cropped



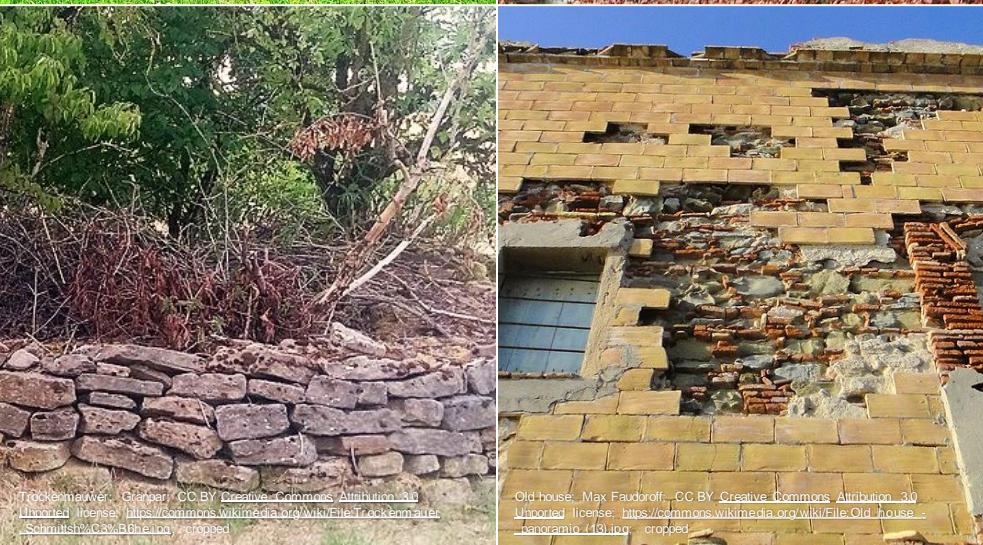
Can be very specific!

The poppy mason bee uses exclusively poppy leafs to build its brood cells!

*Hoplitis papaveris*  
(Poppy mason bee)



Once a proud tree, Stiller Beobachter, CC BY Creative Commons Attribution 2.0 Generic license, [https://commons.wikimedia.org/wiki/File:Once\\_a\\_proud\\_tree\\_\(Flickr\)\\_-\\_Stiller\\_Beobachter.jpg](https://commons.wikimedia.org/wiki/File:Once_a_proud_tree_(Flickr)_-_Stiller_Beobachter.jpg), cropped



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## 3. Brood sites

*Structures to lay eggs, form brood cells and spend the winter in while protected from freezing temperatures and predation.*

- Dead wood & plants
- Bare and loose ground
- Sand and clay walls
- Stone piles and murals
- Holey walls

Most of these structures are now deemed “undesired” and “ugly” in modern, “tended” urban areas.

# Take a look around!



Tawny mining Bee Nest, Gai Hampshire; CC BY Creative Commons Attribution 2.0 Generic license; [https://commons.wikimedia.org/w/index.php?title=Tawny\\_mining\\_Bee\\_Nest&oldid=60925211](https://commons.wikimedia.org/w/index.php?title=Tawny_mining_Bee_Nest&oldid=60925211); cropped



Cradley, Malvern, Worcestershire SG7 247, Gai Hampshire; CC BY Creative Commons Attribution 2.0 Generic license; [https://commons.wikimedia.org/w/index.php?title=Bombus\\_terrestris\\_Cradley,\\_Worcestershire,\\_UK&oldid=60925211](https://commons.wikimedia.org/w/index.php?title=Bombus_terrestris_Cradley,_Worcestershire,_UK&oldid=60925211); cropped



SZ37853 Studland Bay, Dorset, UK Gai Hampshire; CC BY Creative Commons Attribution 2.0 Generic license; [https://commons.wikimedia.org/w/index.php?title=Andrena\\_ligulata,\\_Small\\_Sand\\_Mason\\_Bee\\_\(37853\).jpg&oldid=37853](https://commons.wikimedia.org/w/index.php?title=Andrena_ligulata,_Small_Sand_Mason_Bee_(37853).jpg&oldid=37853); cropped



Mining Bee - Andrena species, Meadowood SRMA, Mason Neck, Virginia; Judy Gallagher; CC BY Creative Commons Attribution 2.0 Generic license; [https://commons.wikimedia.org/w/index.php?title=Mining\\_Bee\\_-\\_Andrena\\_species,\\_Meadowood,\\_SRMA,\\_Mason\\_Neck,\\_Virginia,\\_March\\_11,\\_2022\\_\(62234627983\).jpg&oldid=62234627983](https://commons.wikimedia.org/w/index.php?title=Mining_Bee_-_Andrena_species,_Meadowood,_SRMA,_Mason_Neck,_Virginia,_March_11,_2022_(62234627983).jpg&oldid=62234627983); cropped

*Andrena* sp.  
(Mason bee)



Tree trunk in a vacant lot east of the big church. I like the contrast with the tree that's still alive behind it.  
Attribution: Disk CC BY Creative Commons Attribution 2.0 Generic license, cropped

# Many Structures = Biodiversity Hotspots!

*Crossocerus sp.*  
(square-headed wasp)



Cradley, Malvern, Worcs, SO7347; Gail Hampshire; CC BY Creative Commons Attribution 2.0 Generic license; [https://commons.wikimedia.org/wiki/File:Crabronidae\\_Crossocerus\\_species\\_-\\_Flickr\\_-\\_gailhampshire.jpg](https://commons.wikimedia.org/wiki/File:Crabronidae_Crossocerus_species_-_Flickr_-_gailhampshire.jpg); cropped

*Crysis bicolor*  
(Emerald wasp)



Cradley, Malvern, Worcs, SO729470 Gail Hampshire; CC BY Creative Commons Attribution 2.0 Generic license; [https://commons.wikimedia.org/wiki/File:Cinara\\_radaris\\_Cuckoo\\_fly\\_Jewell\\_Wasp\\_\(35790632441\).jpg](https://commons.wikimedia.org/wiki/File:Cinara_radaris_Cuckoo_fly_Jewell_Wasp_(35790632441).jpg)

*Lucanus cervus*  
(Stag beetle)



Las Desninas / France / 2008/16; CC BY Creative Commons Attribution 2.0 Generic license; [https://commons.wikimedia.org/wiki/File:Lucanus\\_cervus\\_\(3924923656\).jpg](https://commons.wikimedia.org/wiki/File:Lucanus_cervus_(3924923656).jpg)

*Xylocopa violacea*  
(Blue carpenter bee)





# BIG vs small scale



**Less structure** - less everything



20180520\_0132; Fake Shemp; CC BY Creative Commons Attribution 2.0 Generic license;  
[https://commons.wikimedia.org/wiki/File:Meadow\\_\(28514673288\).jpg](https://commons.wikimedia.org/wiki/File:Meadow_(28514673288).jpg)



North Common Meadow, Petersham, Massachusetts; John Phelan; CC BY Creative Commons Attribution 3.0 Unported license;  
[https://commons.wikimedia.org/wiki/File:North\\_Common\\_Meadow,\\_Petersham,\\_MA.jpg](https://commons.wikimedia.org/wiki/File:North_Common_Meadow,_Petersham,_MA.jpg); cropped

The importance of classic, extensive agriculture: **It keeps and promotes structure, thereby diversity!**



Claude Monet house and garden in Giverny: Michael Osmenda: CC BY Creative Commons Attribution 2.0 Generic license: [https://commons.wikimedia.org/wiki/File:Claude\\_Monet\\_house\\_and\\_garden\\_in\\_Giverny\\_\(8741496041\).jpg](https://commons.wikimedia.org/wiki/File:Claude_Monet_house_and_garden_in_Giverny_(8741496041).jpg); cropped



# Structure is diversity!



## Where do we go from here?

What do people do, who live here, and claim that they care for the environment?



Berrington Hall: PJ Marriott: CC BY Creative Commons Attribution 3.0 Unported license: [https://commons.wikimedia.org/wiki/File:Berrington\\_Hall\\_-\\_panoramio\\_\(PJMarriott\).jpg](https://commons.wikimedia.org/wiki/File:Berrington_Hall_-_panoramio_(PJMarriott).jpg); cropped



# Nesting aids (Insect Hotels)

Bringing structure to a place where it has been lost...

**Not an essential element!**



# Nesting aids

the good

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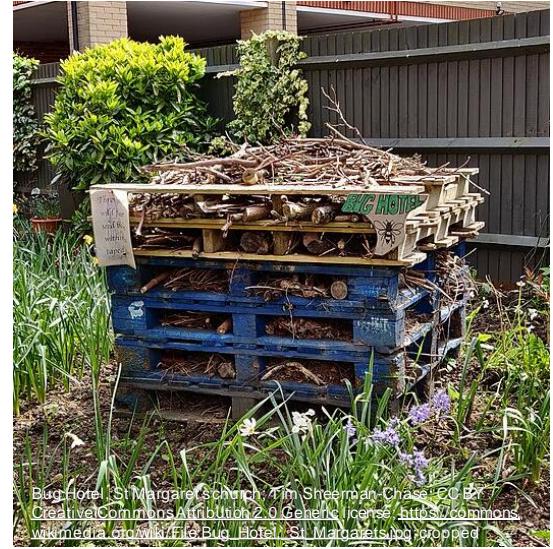
the bad

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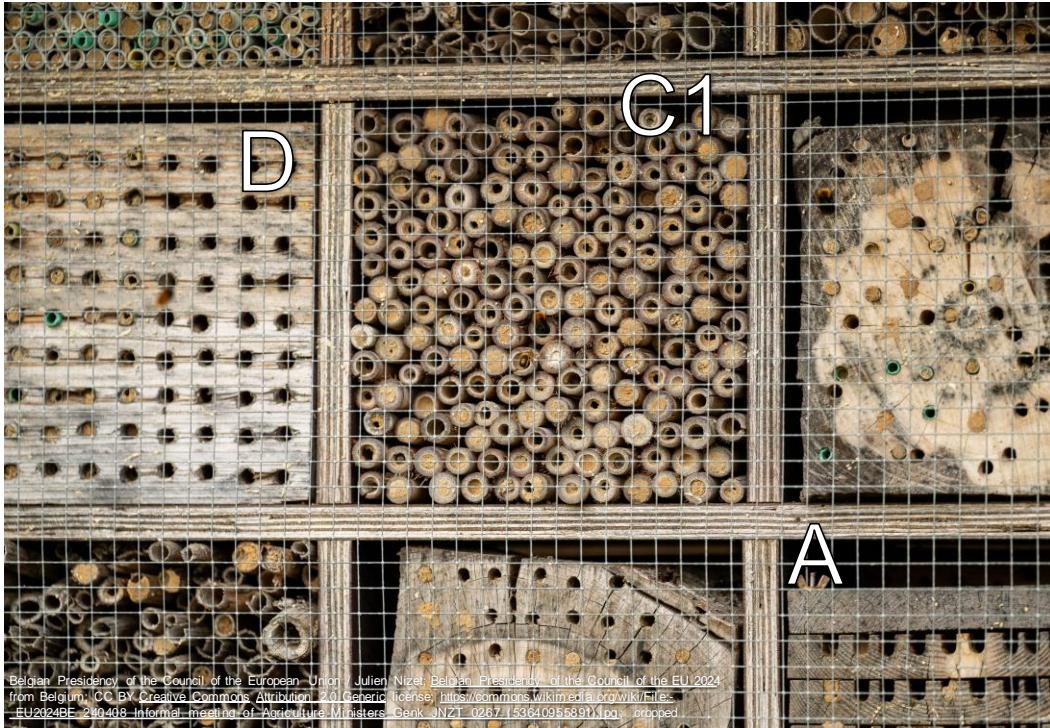
& the ugly

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Bug Hotel St Margarets church, Tim Sheerman-Chase CC BY Creative Commons Attribution 2.0 Generic license. [https://commons.wikimedia.org/w/index.php?title=Bug\\_Hotel\\_St\\_Margarets&oldid=580000](https://commons.wikimedia.org/w/index.php?title=Bug_Hotel_St_Margarets&oldid=580000)

# What makes a good nesting aid (for bees)?



(A) protection from rain & predators (B) inclusion of myelinated stalks (C1 & C2) clean stalks and drill holes of various sizes (D) large pieces of wood, drilled from the side (E) inclusion of sand & clay

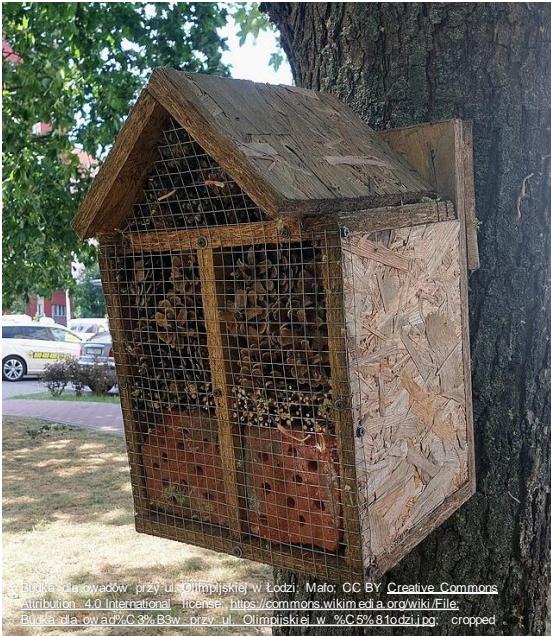
# What makes a nesting aid useless?



(A) Bricks with giant holes/spaces (B) thin, big (unclean) straws (C1 & C2) completely useless filler

(D) wood drilled from the wrong side (E) **depth of <15cm** (F) inclusion of pinecones and straw

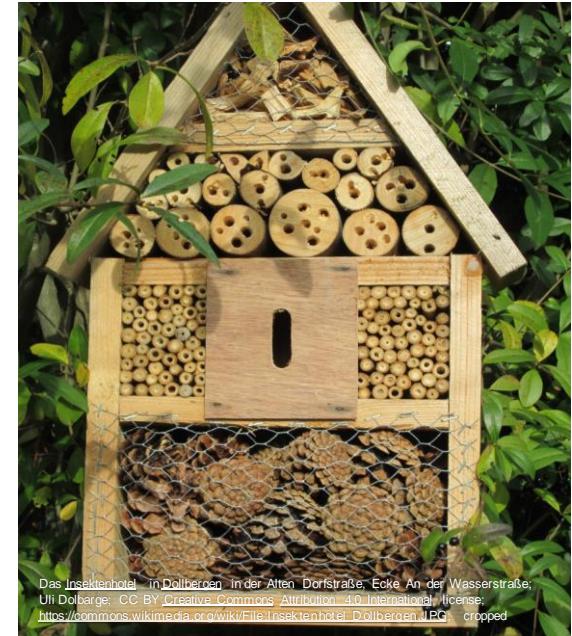
# AWFUL Nesting aids



Balka dla rozwadów przy ul. Olimpijskiej w Łodzi; Mata; CC BY Creative Commons Attribution 4.0 International license; [https://commons.wikimedia.org/wiki/File:Balka\\_dla\\_gwad%C3%93w\\_przy\\_ul.\\_Olimpijskiej\\_w\\_%C5%81odzi.jpg](https://commons.wikimedia.org/wiki/File:Balka_dla_gwad%C3%93w_przy_ul._Olimpijskiej_w_%C5%81odzi.jpg); cropped



Hôtel à insectes à Belfort; Thomas Bresson; CC BY Creative Commons Attribution 4.0 International license; [https://commons.wikimedia.org/w/index.php?title=File:38-35\\_hotel-a-insectes.jpg](https://commons.wikimedia.org/w/index.php?title=File:38-35_hotel-a-insectes.jpg)



Das Insektenhotel in Döllbergen in der Alten Dorfstraße, Ecke An der Wasserstraße; Uli Döhrge; CC BY Creative Commons Attribution 4.0 International license; [https://commons.wikimedia.org/wiki/File:Insektenhotel\\_Döllbergen.JPG](https://commons.wikimedia.org/wiki/File:Insektenhotel_Döllbergen.JPG); cropped

Poor nesting aids can both attract and promote parasites and neozoic species like asian ladybugs (*Harmonia axyridis*).

# GOOD Nesting aids



# Other viable options





# General rules

- Protection from wind, rain & predators (birds, ants)
- Straws and stalks of different sizes (>15cm long)
- Wood & bricks with holes of different sizes (>5 cm deep)

## Ideal:

- Vertical myelinated stalks
- Inclusion of sand and/or clay
- Flower strips & open ground nearby
- Dead wood nearby

# Supplementary material

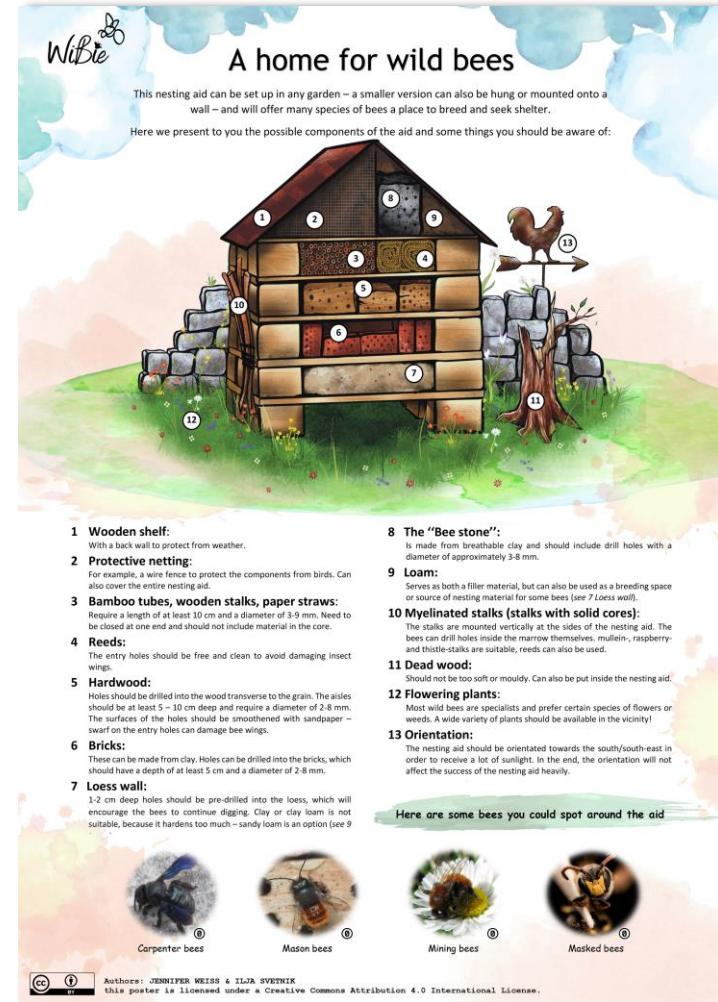
Find our instruction/componetens poster for building a proper nesting-aid for wild bees!

(available in German and English!)

<https://zenodo.org/records/12543703>



You can also visit <https://wibie.at/>  
or contact the author [ilja.svetnik@gmx.at](mailto:ilja.svetnik@gmx.at)  
for further information or requests!



The poster features a colorful illustration of a multi-story nesting aid designed for wild bees. The structure is built on a grassy hillside with a wire fence at the base. Numbered callouts point to various parts of the aid:

- 1 Wooden shelf:** With a hawthorn wall to protect from weather.
- 2 Protective netting:** For example, a wire fence to protect the components from birds. Can also cover the entire nesting aid.
- 3 Bamboo tubes, wooden stalks, paper straws:** Require a length of at least 10 cm and a diameter of 3.9 mm. Need to be closed at one end and should not include material in the core.
- 4 Reeds:** The entry holes should be free and clean to avoid damaging insect wings.
- 5 Hardwood:** Holes should be drilled into the wood transverse to the grain. The aisles should be at least 5–10 cm deep and require a diameter of 2.8 mm. The surfaces of the holes should be smoothed with sandpaper – swarf on the entry holes can damage bee wings.
- 6 Bricks:** These can be made from clay. Holes can be drilled into the bricks, which should have a depth of at least 5 cm and a diameter of 2.8 mm.
- 7 Loess wall:** 1-2 cm deep holes should be pre-drilled into the loess, which will encourage the bees to continue digging. Clay or clay loam is not suitable, because it hardens too much – sandy loam is an option (see 9).
- 8 The “Bee stone”:** Is made from breathable clay and should include drill holes with a diameter of approximately 3-8 mm.
- 9 Myelinated stalks (stalks with solid cores):** The stalks are mounted vertically at the sides of the nesting aid. The bees can drill holes inside the marrow themselves. mullein-, raspberry- and thistle-stalks are suitable, reeds can also be used.
- 10 Dead wood:** Should not be too soft or mouldy. Can also be put inside the nesting aid.
- 12 Flowering plants:** Most wild bees are specialists and prefer certain species of flowers or weeds. A wide variety of plants should be available in the vicinity!
- 13 Orientation:** The nesting aid should be oriented towards the south/south-east in order to receive a lot of sunlight. In the end, the orientation will not affect the success of the nesting aid heavily.

**Here are some bees you could spot around the aid**

Illustrations of four bee species are shown:

- Carpenter bees
- Mason bees
- Mining bees
- Masked bees

Authors: JENNIFER WEISS & ILJA SVETNIK  
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