



Inspiring4Biodiversity

Practical handbook on making nesting aids for wild bees



Erasmus+

Content

Why nesting aids for wild bees

This document has been prepared with the aim to provide those interested in nature with some practical advice on the production of nesting aids for wild (solitary) bee species. Motivation to do so arose from the growing interest of people in transforming and maintaining spots of land in our surroundings in a nature-friendly way and especially by their interest in helping plant pollinators, which includes not only honeybees, but also solitary bees and other groups of animals. Nesting aids for solitary bees are suitable for gardens, parks, schoolyards, green areas in business premises or public urban green spaces. At all these places we can transform the available areas to become more suitable for different species of domestic plants and animals... or for biodiversity that we are losing at a rapid pace in our country, in Europe and worldwide.

In addition to the joy from observing insects or plants around us, the installation of nesting aids for bees is also of practical importance. Many of the species of wild bees make a significant contribution to plant pollination. Several species are active even at relatively low temperatures when the honeybee is not able to perform her job. Other species are good pollinators because they are plant specialists – adapted to pollinate some specific groups of plants. Or some other are just "clumsy" and simply transfer and more pollen than other species. Small kinds of wild bees usually do not fly long distances and we can rely on their services if they live nearby. And we can find more similar reasons why they are good neighbours of gardeners...

It may occur to us that we do not want bees in our vicinity, that it is dangerous due to possible stinging. However, the presence of wild bees is practically risk-free. Most species are relatively small and the sting of many of them does not pierce human skin. More importantly, they are not social insects that defend their nests (which is typical of a honeybee or hornet, for example) – their main life-saving strategy is escape. In the literature, we find statements from experts on these groups of insects that a solitary bee did not bite them even when they significantly restricted them in their movement – the bee tried to escape instead.

The world of wild bees is fascinating because of their diversity. Up to 650 species are recorded in Slovakia. At the same time, individual groups can differ greatly in their way of life. The nesting aids we can offer them do not attract all these species. Anyway, a significant number of wild bees can use them – usually dozens of those living in the area.



Bee houses can become a part of any type of environment, example from London; Photo: 04_by Roger Jones, [CC BY-SA 2.0](#).



Rural garden. Photo: Štefan Jančo

This document focuses on creating a suitable environment for nesting of bee. Wild bee nesting aids belong to the broader and better-known group of aids named insect hotels, which provide living space for several groups of insects (or also other groups of animals) and almost always include elements for bees. The reason for narrowing the focus in this document is mainly because wild bees are among the most endangered groups of animals. In addition, many other inhabitants of insect houses (ladybugs, shelters, etc.) will find suitable spaces for life more easily. Furthermore, presence of some animals can be explicitly undesirable from the point of view of bees – spiders, for example, if in the immediate vicinity, can pose a direct threat to solitary bees. Finally, even this narrowed focus on just wild bees leaves the space wide enough – given the number of species and the options we have in creating their artificial habitats.



How to get a house for wild bees?

If we want a nesting aid for solitary bees, you can make or buy it. Various small-size aids are available on the market on an ever-increasing range of variations. Their design and size are not very limited – the variety of materials used reflects the large number of species that can use them. However, it is also true that nesting aids, both purchased and manufactured, can also have shortcomings – the goal of this document is also to draw attention to some of them.

In the wild, bee larvae live in various cavities in plant materials (hollow stalks, tunnels bored into dead wood by beetles etc.), in cracks in walls, between stones, and other similar places. However, most of our native species' nest in the ground. Some species build chambers out of clay or other materials, and there are also those that use empty snail shells and other unexpected places and materials. Our best choice is to imitate the materials and spaces that bees commonly and naturally use – there are really many possibilities.



Wide range of good-quality houses for bees in Stuttgart, Germany. Photo credit: by Ra Boe, [CC BY-SA 3.0 DE](https://creativecommons.org/licenses/by-sa/3.0/de/),

Materials

Although most of our bee species nest in the ground, the most feasible option is to work with plant materials. In the following section, we provide practical information on working with different types of materials, along with notes on various mistakes that are good to avoid.

Solid wood (logs, wooden blocks, branches, etc.)

Wood is one of the most used materials to make bee nesting aids. We can drill holes in the wood with a diameter of 3 – 9 mm and a depth of at least 8 cm. It is important that the surface of the holes is smooth after drilling, as sharp edges and chips can damage the wings of bees. For this reason, the most suitable material is dry and hard wood, where achieving a good result is most likely. Spruce and other soft woods are not recommended by some authors. They argue by very likely presence of small chips dangerous for bee wings as well as low resistance of the material to decomposition. The resin present in this type of wood that can fill the drilled holes can also be a problem.

When using wood, we often find holes drilled transversely into sawn blocks – which is considered aesthetic among other things. But the logs often crack if they are not sufficiently dried, which is the weak spot of this option. Cracks pose a danger for the development of bees in the chambers because water can seep into the cavities with larvae and their development is thus endangered by fungi and bacteria. However, if we drill holes in logs placed vertically, the problem of wood cracking is largely avoided. For this purpose, we can use not only logs, but also thicker branches.

Practical tip is to store some wooden material in advance (1 – 2 years) so that the wood is sufficiently dry. After cutting off the cracked ends, the wood retains its shape without a significant change in volume and formation of new cracks.

Suitable are also wooden blocks, for example of old oak or other hardwood. In this case, damage on the surface of the wood is not an obstacle, oak wood is very durable and can serve the bees for many more years if placed in a suitable location.



Two different ways of drilling holes in wooden blocks.
Photo credit. Left: Štefan Jančo. Right: by Magne Flåten, [CC BY-SA 4.0](https://creativecommons.org/licenses/by-sa/4.0/).



Summary:

Suitable

- ✓ dry hardwood – logs, branches, blocks etc.
- ✓ holes with diameter 3 – 9 mm
- ✓ cavities at least 6 cm deep

Unsuitable

- softwood
- wood with cracks intersecting the holes.

Hollow plant stems

Hard bamboo stalks (*Bambusa sp.*) available in shops with gardening or building materials are probably most often used material in bee nesting aids. However, nature around us is a good source of suitable herbal material as well. We can use various dry and undamaged stems, which we can most easily collect in the autumn or winter. Among the specific plants suitable for harvesting are for example: the black elder, thistle, mullein, knotweed, carrot family (various larger species), reed, goldenrod and others. The giant goldenrod (*Solidago gigantea*), Canadian goldenrod (*Solidago canadensis*) and knotweed (*Fallopia sp.*) are problematic plants because they are non-native and very invasive species. However, their stems will serve in making wild bee nesting aids well. Inside of the stems of many plant species is filled with soft tissue. However, it is relatively easy to remove this part from the stems and thus create a space with a cavity.



Mason bee *Osmia rufa* using hollow plant stems for nesting.

Foto: *Osmia rufa* 8, Saxifraga-Pieter van Breugel

Summary

Suitable

- ✓ dry stalks with diameter 3 – 9 mm
- ✓ variety of plant species

Unsuitable

- cracked or otherwise damaged stalks.

Bricks, stones and clay

Bricks are another popular material in the construction of bee nesting aids. From a large amount, we can use old and new bricks, bricks with cavities directly from production or full bricks with drilled cavities. It is suitable if the cavities are of rounded shape, but bricks with square holes are used successfully as well. As a ready-made product, various nesting aids produced of burnt clay are beginning to appear on the market in some European countries.

Instead of bricks, we can also drill holes into natural soft stones, such as sandstone or tuff.

Out of available materials, soft sand lime bricks and other similar materials are not recommended – these, if exposed to external environment, disintegrate relatively quickly.



Cavities in burnt clay and in a tuff stone.

Photo credit. Left: by Ra Boe, [CC BY-SA 3.0 DE](#),. Right: Štefan Jančo

Summary

Suitable

- ✓ burnt bricks with round openings with diameter up to 10 mm (original or drilled cavities)
- ✓ soft natural stones with drilled holes with diameter up to 10 mm.

Unsuitable

- soft sand lime bricks

Clay

By using clay, we can attract other species of bees. It is a bit more difficult to work with clay than with previously mentioned materials, because when drying, it tends to crack and disintegrate. To create a clay element for a bee nesting aid, we can press wet clay into a form and repair the surface in a repeated process, which is quite tiring. We can improve this procedure by adding chopped straw (its fibers will ensure the "bonding" of the clay), or a little cement, which we add to the whole clay or just the top layer to ensure stability of the final object.



*Nesting cavities in compressed clay (top) Photo credit: Štefan Jančo; and the grey-backed mining bee *Andrena vaga* (bottom), Photo credit: Saxifraga-Pieter van Breugel*

Clay elements can be part of houses together with other materials, or they can stand alone, or they can be planted in the ground, which creates a kind of transition conditions for bees between the use of clay and building houses in the ground – a small reminder, most species of wild bees nest in the ground.

We can also modify a small piece of land by thinning the vegetation and compressing the surface layer of the earth so that it is easily accessible to bees.

Other special materials

Insect houses can be made more interesting also with other materials that some species of bees can use. We can, for example, use gills (bumps on plants whose



growth is caused by other organisms, such as larvae of other insects), empty snail shells or cones. Yes, some species also nest in cones, although the probability of presence of these specialised bee species in your bee hotel is not very high. Particularly suitable in this respect are the gills used by several species of bees, including some relatively common ones.

Glass and plastics tubes are often mentioned as unsuitable materials. The walls of pipes made of these materials are airtight which makes the environment unfavourable for development of bee larvae that are endangered by moulds and bacteria.

Overall design, placement, and maintenance of a bee house

When designing the nesting aid, its size, shape and elements of the individual "departments", options are open, and we can unleash our imagination. Result sometimes include very interesting creations that attract not only bees but also human attention and become a noteworthy part of the space.

The size of the house and the number of individual elements

Despite this openness of options, it is advisable to consider several recommendations, or to avoid some mistakes. Some authors state that an insect house (especially a nesting aid designed primarily for bees) should not be too large and if, it should not consist large areas attracting bees of the same kind. The reason for such a recommendation is to decrease danger posed to inhabitants the bees by parasites (including mites) and various predatory species that bees hunt can multiply in their vicinity. So-called nest parasitism (kleptoparasitism) is another threat to bee larvae – another type of specialised bee, wasp or another kind of insects captures the nest and uses stored supplies, kills the larva etc. To some extent, these are natural situations, but the precautionary principle is in place – too much of the same can lead to unwanted damage.



A relatively common type of cuckoo wasp - the ruby-tailed wasp (*Chrysis ignita*). Photo credit. left: *Chrysis ignita* 1, female, Saxifraga-Pieter van Breugel. Photo right: *Chrysis ignita* 7, Saxifraga-Ab H Baas

Location of the nesting aid

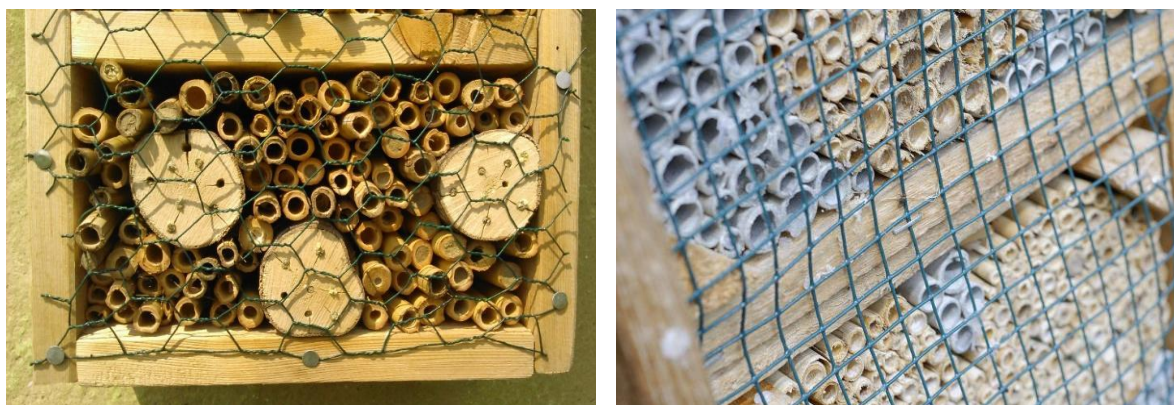
The nesting aid, depending on its size and design, can be hung on a tree, wall, fence, or we can build it as a separate object. Places that are too shaded are suitable, bees could completely avoid them. Bees generally like warmth and nesting aids should therefore be exposed to sunlight for at least part of the day. Orientation to the east is extra suitable – the bee dwelling is warmed by the morning sun and at the same time it is not extremely overheated over the day in the summer. However, some thermophilic species also occupy habitats that are south-facing and exposed to full sunlight.

Protection and maintenance of nesting aids

The nesting aid should be covered with a durable roof, which protects the rest from water. With durable roof, the whole building and its individual elements can last for many years. The bees are generally able to adjust and clean the dwelling so that their larvae develop in a suitable environment.

Some authors are more careful and point out unsuitable components, which bees will use anyway. Fewer durable materials (some types of stems) or due to weather some materials decompose faster, and the damaged parts should be replaced. However, some authors strongly recommend more frequent replacement of all parts, which prevents bees from parasites, fungi and bacteria. Wood, stems, etc. can be stored at another suitable place in the exterior to end their career ensuring that if bees or other insects are present, they will have a chance to develop into adulthood and leave the place. Vacant areas in nesting aids can be filled with new suitable components.

Some parts of the nesting aid, especially those with fine or unstable components, can be protected with fine mesh. The bees fly easily through the holes and the mesh protects the nesting aid from animals that can damage them. For example, different species of birds can try to catch bee larvae, also damaging the elements of the bee dwelling in the process – the mesh will largely prevent this.



Different types of metal nets for protection of fillings of the nesting aids. Photo left: Štefan Jančo. Photo right: 06_by Ra Boe, [CC BY-SA 3.0 DE](#),



Surroundings of the nesting aid

If the nesting aid is in a colourful garden with plenty of flower species, including native ones, and various chemicals (eg. pesticides) are not used, the bees are very likely in a good environment. We can help them significantly in other ways as well. For example, we can set aside a certain part of the lawn for a zone that we mow only once or twice a year. Some other parts with a short lawn can be supplemented with suitable flowering herb, such as the creeping clover (*Trifolium repens*), daisy (*Bellis perennis*), selfheal (*Prunella vulgaris*), birdsfoot trefoil (*Lotus corniculatus*), mother-of-thyme (*Thymus serpyllum*) and other species. All these native plant species of smaller height are excellent choice for areas of lawn that are mowed often but are flowery at the same time. Elsewhere, we can establish new flower beds composed mainly of native (domestic) plant species. Nowadays there are suitable mixtures of seeds composed of species native to our Central European region, or we can collect the seeds of domestic plants in the meadow ourselves. Various flowery areas usually become an interesting and aesthetic addition to the garden.



Flower bed made of mostly wildflowers and a flowery green roof - elements that improve the living conditions of bees, including wild bees, around us. Photo left: by Karen Mardahl, [CC BY-SA 2.0](#), Photo right: Štefan Jančo



A few tips out of the good-quality sources of information on wild bees:

Books:

- Domečky pro včely a užitečný hmyz, Petr Bogush, Grada, 2019
- Blanokřídlí České republiky I., Jan Macek a kol., Academia, 2010
- Solitary Bees, Ted Benton, Pelagic Publishing, 2017
- Pollinators and Pollination, Jeff Ollerton, Pelagic Publishing, 2021

Websites:

- <http://www.atlashymenoptera.net>
- <https://www.buzzaboutbees.net/>
- <https://www.bwars.com>
- <https://ec.europa.eu/environment/nature/conservation/species/redlist/bees/introduction.htm>
- The Solitary Bees, Team Candiru, 17 min,
<https://www.youtube.com/watch?v=hGhyZRY2KFc>



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Editor:

Ekopolis Foundation (Slovakia)

www.ekopolis.sk

Štefan Jančo, janco@ekopolis.sk

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