

# The bee-eaters and the bees



How can protection  
of the European bee-eater help bees?





Many people consider spring the most beautiful season of the year. After a long winter, the life comes rushing back, bursting with energy. We enjoy the warm touch of sunlight and impatiently expect the first signs of spring. In this time, we like to watch bees, flying from one flower to another, between bushes and trees. Later on, we can observe some long-distance bird travellers returning from their wintering sites. By the end of April, like the wave of a magic wand, their songs revive the silent country –the first European bee-eaters travel their long migratory routes to return to their nesting sites. People who live by a nesting colony, or pass by on their spring wanderings, subconsciously check if the birds have returned. A whistle, heard from high up in the air, impressive acrobatic flies, and colourful feathers the nature has awarded this bird with – it leaves us with the same spring feeling we get when seeing the bees picking pollen from spring flowers.

Bees and bee-eaters have always been sharing homes. Naturally, they developed a well-balanced relationship and are well accustomed to each other.

Photographers and nature enthusiasts enjoy the colourful feathers and pleasant songs heard across the country. However, some beekeepers still get concerned. A questionnaire survey questioned more than 90 beekeepers and showed that only 3% of them consider bee-eaters a real threat to bee colonies, or honey production.



# Are the concerns about the bee-eaters justified?

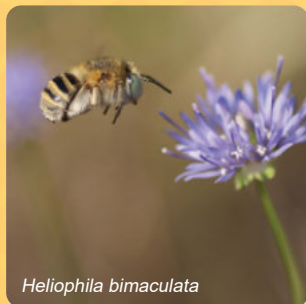
In order to better answer the questions about the relationship between a bee, beekeeper and bee-eater, we asked the experts from The Faculty of Natural Sciences of Comenius University in Bratislava, experts from the Slovak Academy of Sciences, and the beekeepers themselves.

A research conducted in 2015 – 2021 in southern Slovakia aimed to answer the following questions:

- What is the primary food of bee-eaters in Slovakia?
- Do different bee-eater populations prefer different food?
- Does a bee-eater's nesting colony somehow affect honey production in the area?
- Does presence of bee-eaters affect the honey quality?
- Are there any recommendations to follow if bee hives are to be placed nearby a bee-eater's nesting colony?

**A honeybee** (*Apis mellifera*) is a hymenopteran and it belongs to the *Apoidea* group. The group consists mostly of solitary bees. They belong to many different species and amount to 95% of all known bees. There are more than 600 solitary bee species in Slovakia and Czechia alone. Bumblebees, honeybees and tropical stingless bees all belong to *Apidae* family.

**The European bee-eater** (*Merops apiaster*) belongs to *Coraciiformes* family. Birds from this group often feature colourful feathers and nest in tree hollows or holes in the ground. What makes them different from other birds is two toes fused together at their base. In Slovakia, there are two more species of this group – the common kingfisher (*Alcedo atthis*) and the European roller (*Coracias garrulus*).



*Heliophila bimaculata*



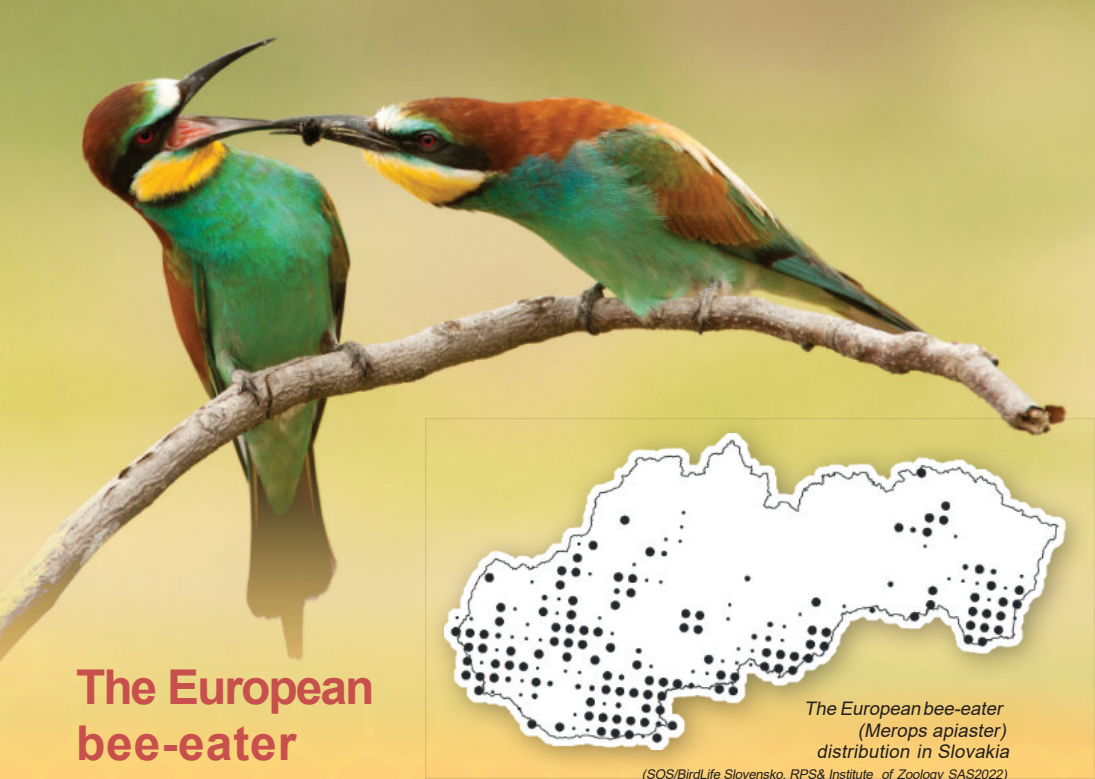
*Anthophora plumipes*



*Tetraloniella salicariae*

*Solitary bee species – important and efficient pollinators of many plants*





## The European bee-eater

*The European bee-eater  
(Merops apiaster)  
distribution in Slovakia*

(SOS/BirdLife Slovensko, RPS& Institute of Zoology SAS2022)

The European bee-eater is one of the most colourful birds nesting in our country. Typically, they feature shades of turquoise on the belly, tail and parts of wings. The throat is intense yellow with black borderline that stretches from the beak across the striking red eyes. Back and part of head vary from brownish to golden.

The bee-eater is a strictly migratory bird. They return to Slovakia between mid-April and mid-May. After nesting (end of August to end of September), the birds return to their wintering sites. They spend the winters south from Sahara, in African savannahs.

Their colours, typical body shape and pleasant unmistakable voice make them a noticeable and interesting species.

The bee-eaters nest in warmer areas in southern Slovakia and their numbers are stable. Total amount of the European bee-eaters in Slovakia is estimated to 700 – 1,300 nesting couples.

### Nesting

The European bee-eaters nest in colonies, rarely alone. Typically, nesting colonies were built in vertical sandy, loessial or loamy walls or river banks. However, the birds can dig the nesting holes in the gravel-sandy grounds, too. If the conditions are suitable for digging a hole, they are able to nest in horizontal terrain, as well. In such case, the height of nearby vegetation is a limiting factor – the birds need to see their surroundings; therefore, they prefer pastures with extensive grazing, located on sandy and loessial dunes. The bee-eaters have adjusted to human activities. They often nest in quarries, grooves along the roads, vineyards or excavation sites.



*Two nesting habitats of the bee-eaters: a nesting wall (left), and holes in the ground, in a shallow groove, and a nesting hole on a pasture, in the front (left)*

The nest consists of a long corridor with a nesting chamber at the very end. The female lays 4 –6 eggs and sits on them from the very beginning. Therefore, the young ones hatch one-by-one, after about 20 –22 incubation days. The parents feed the youngs for 30 –33 days.

The numbers of nesting bee-eaters in Slovakia are limited by various factors and cannot grow uncontrollably. The main limiting factor is the nesting opportunities. These are quite limited in Slovakia. Second limiting factor is food availability. Young birds hatch one-by-one, and if the food is scarce at the time, only the oldest ones survive. Third, the bee-eaters (just like all other birds) are threatened by predators, parasites and bacteria or viruses.

## The diet

The bee-eater is a skilled predator of flying insects. It catches the prey in the air, or attacks from a perch. Its name suggests a strict specialization in bee-hunting. However, the literature shows that the bee-eater hunts the insects available nearby the nest, most often hymenopterans, beetles, butterflies, dragonflies, stink bugs, grasshoppers, bush crickets, flies and earwigs.

Feeding habits and preference were subject of various expert studies. Some focused on the impact of bee-eater feeding habits on bee families, and their possible protection. For example, Ali and Taha (2012) suggest that bee-eaters could only cause damage to beekeepers if they caught the Queen bee during the mating, or if they catch high numbers of bees.



*Recommended protective measures for areas with abundant bee-eaters (western Spain, photo: Moreno-Opo et al. 2018). The authors recommended such protective measures to be implemented in areas with both abundant bee hives and high numbers of bee-eaters. At the same time, they emphasised the need of placing water sources for bees under protective nets.*

Interesting information came from Spain, where 76% of European bee-eaters nest (less than 1% of the population nests in Slovakia), and their important spring and autumn migratory routes pass. An extensive research (Moreno-Opo et al. 2018) in western Spain did not reveal any negative impact on bee hives caused by the bee-eaters. The same research tested possible protection of bees from the bee-eaters by use of nets, or a predatory bird model. These protective measures served well during the nesting season, but mostly during migrations, when massive flocks consisting of thousands of birds fly over the country.



*A bee-eater spitting out undigested parts of insects in a form of a pellet*

## What do bee-eaters eat in Slovakia and how it can be determined?

Similarly to owls and predatory birds, the bee-eaters spit out undigested parts of their food in a form of pellets. These are a great source of information when determining the composition of their diet. Pellets contain undigested parts of insects: heads, wings, elytrons, and others. Through analysis, we can determine bee-eaters' food preference quite precisely. The experts can identify the proportion of different insect species in the bird's diet. In many cases, the insect can be identified down to exact species.

During the first two years, a detailed diet composition research was carried out in south-western Slovakia, in Podunajsko region, mostly in Dolné Pohronie Special Protection Area. Based on collected data, the experts were able to objectively assess feeding habits of bee-eaters in Slovakia. Moreover, the experts introduced bee hives close to the bee-eaters colony. Therefore, they could observe possible changes in bee-eaters' diet and the impact of bee-eaters on honeybees and honey production.



*A bee-eater's pellet*



*Pellet material preparation and sorting for further analysis*



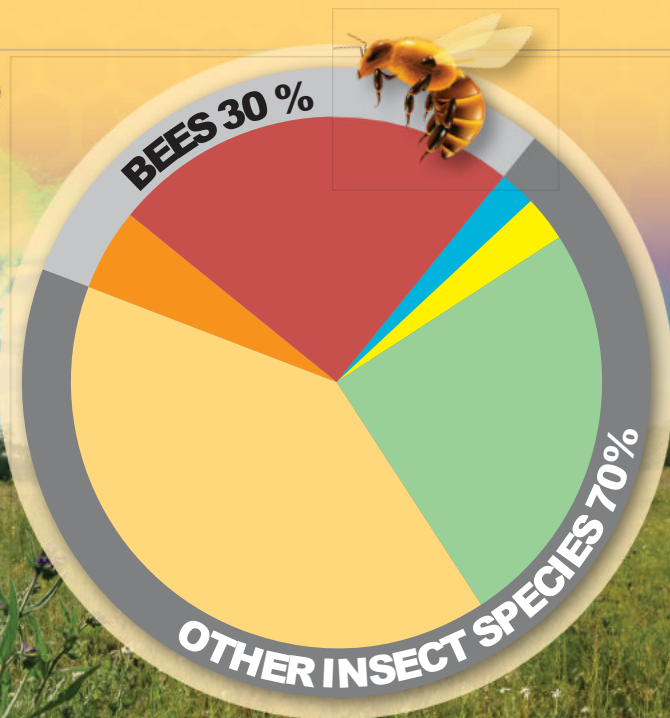
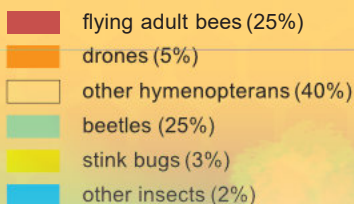
# Bee-eaters diet composition in south-western Slovakia

Out of all pellets collected on two locations, 70% of material consisted of other insects, rather than bees. It was mostly ants, wasps, beetles and stink bugs. Flying adult female bees and drones represented about 30% of the bee-eaters diet.

Food array can significantly differ based on a location, or per year. An agricultural landscape with large monocultures, intense farming, scarcethickets, drained wetlands and intense use of pesticides and chemical spraying is –from an insect biodiversity perspective –a deserted place. For bee-eaters, this is not a place to be.

Fortunately, the opposites can still be found – places favourable to bees, bee-eaters, and beekeepers at the same time. These can be, for example, extensively grazed meadows in south and western Slovakia, often located on sandy dunes.

***Bee-eaters diet composition based on data from a location with diverse food sources and higher numbers of bee hives***  
(data from 2017 and 2018)



# Grazing is a blessing – for both bees and bee-eaters

Greater the insect selection by the nesting site, more varied the bee-eaters diet. The same goes for southern Slovakia. Young birds were fed more beetles, stink bugs and flies on extensively grazed locations, even though the bee hives were just 200m away from the nesting colony. Young birds that lived nearby a location with no grazing would ended up with less varied diet and provably more bees on the plate.

The ecologists agree that extensive grazing significantly contributes to increased diversity of insects. Due to grazing, more microhabitats suitable for insects are created on location – e.g. beaten paths, exposed soil patches, ungrazed edges. At the same time, extensive grazing in southern Slovakia promotes blooming of native plant species, including those that require drier stands, e.g. sandy dunes in wider areas along the rivers. Due to intensive farming and disappearance of grazing, many such locations vanished.

Various experts from different fields agree grazing in such areas is of great benefit. The sandy dune, where the research was carried out, is a perfect example. This dune is a result of fine river sand accumulation. Once the cows and horses returned to the pastures, many rare insects species found their way back, along with some invertebrates that had not been seen in Slovakia for decades.

Many native plant species now bloom in the area, providing food to wide variety of pollinators. Various solitary bee species and different sand wasp species need the exposed soil to dig their nests. The bee-eaters also take advantage of exposed soil and zones with low vegetation – here, they dig their nesting holes.

Properly managed grazing and farmers, who appreciate the beauty and diversity of nature and farm accordingly, can, within a few years, restore the picturesque countryside with all its diversity and wilderness. Grazing benefits everything – native plants, animals, and people, including the beekeepers.



*Dasygaster alterator*

*Solitary bee species – important and efficient pollinators of many plants*

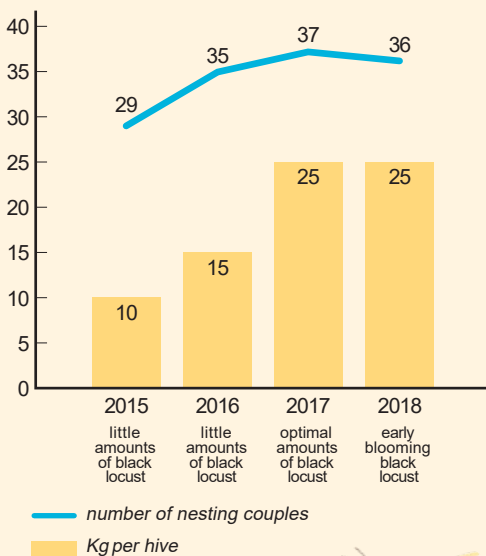


*Extensive grazing on a sandy dune*





*Comparison of the numbers of nesting bee-eaters with honey production on the location*



Black locust blossoms nectar production as assessed by a bee-keeper



## Honey production

Besides the bird diet composition, the research examined the honey production in hives located nearby the bee-eaters nesting colony.

In 2015 – 2018, the honey production of 10 strong bee families located about 200m away from the bee-eaters nesting colony was observed.

As a consequence of restoration measures, the numbers of bee-eater couples in the nesting colony progressively increased (1 to 6 new couples year-on-year). Despite that, honey production did not drop. Trend was rather opposite, and according to the beekeeper, the production depended mostly on black locust blossoms nectar available in the spring, not on the presence of nesting bee-eaters.

## Golden honey “by the bee-eater”

What matters for a beekeeper is the amount of honey, as well as its quality. Besides the physiochemical parameters, the honey has certain biological characteristics. They are related to nectar quality in the area. Clearly, a blooming meadow with plenty of native plants, including medicinal herbs, offers wider possibilities and higher nectar quality, than a oilseed rape field.



*Honey collected from bee hives located nearby the bee-eaters nest*

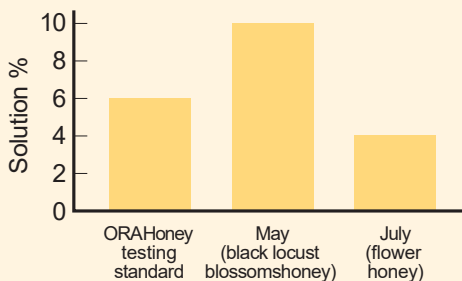
# Antibacterial activities of honey

Antibacterial potency is one of the valued properties of honey. It is the ability of its natural components to fight bacteria.

During four consequent seasons (2018 – 2021), honey quality, including its antibacterial potency, was measured. Tests were ran in the Laboratory of Apidology and Aitherapy, in the Institute of Molecular Biology SAS, Bratislava, Slovakia.

The tested honey samples showed excellent inhibitive characteristics against *Staphylococcus aureus*. Antibacterial activity in multifloral honey (from native plants of grazed meadows) was inhibiting the bacterial growth even better than ORA Manuka Honey, known for its exceptional antibacterial activity and used for medical purposes.

## Analysis of antibacterial potency of tested honey samples



Solution % stands for the amount of honey in the sample needed to suppress the reproduction of *Staphylococcus aureus*. Shorter the chart column, more efficient the honey – less honey needed to suppress the bacteria reproduction.



Analysis of antibacterial activity of spring (black locust blossoms) and summer (flower) honey shows that natural and native plants provide honey with much higher proportion of antibacterial substances. Flower honey collected from the grazed location had even higher antibacterial activity than both ORA Manuka Honey – the standard used for medical purposes, and a honey from a randomly chosen area of Podunajsko region with no bee-eaters nesting sites. Obviously, the quality of honey is affected mostly by quality of melliferous plants in the area.

## Quick good news for the beekeepers

- Adult bee-eaters, as well as their youngs, feed mostly on insects other than honeybees (70%).
- Bee-eaters that nest by pastures and wetlands can access rich food pallet.
- Insect predators to bees, such as wasps and hornets, are a part of the bee-eaters diet.
- Bee-eaters prefer to hunt the slowest or sick individuals, which – in case of honeybees – mean flying adults at the end of their life cycle. The oldest flying adults are replaced quickly. By catching the sick individuals, the bee-eaters help maintaining the overall health of bee populations.
- Measures taken in order to improve feeding and nesting opportunities for bee-eaters are beneficial to honeybees – they result in higher biodiversity and better food quality.
- Extensive grazing nearby bee-eaters nesting sites promotes blooming of many native plant species and thus provides the beekeepers with honey of exceptionally high quality, with high contents of natural antibacterial substances.



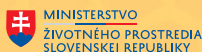
## Project LIFE: Restoration of nesting and feeding habitats of Sand Martin, Kingfisher and European Bee-eater in Danube-Morava region

EULIFE Programme under European Commission is there to improve the status of endangered species and habitats. LIFE Projects implement restoration measures in Natura 2000 locations.

The BeeSandFish project aimed to protect and restore nesting sites and hunting habitats of three interesting bird species – the sand martin (*Riparia riparia*), the common kingfisher (*Alcedo atthis*) and the European bee-eater (*Merops apiaster*). All three species share a specific way of nesting in steep river banks or walls, or – as in the case of the bee-eater – in the ground on sandy dunes.

The measures of the Project LIFE are examples of typical restoration measures that benefit the target species, as well as many other native plants and animals, including humans.

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### Použitá literatúra:

- Ali M. A., Taha E. A. (2012). Bee-eating birds (Coraciiformes: Meropidae) reduce virgin honey bee queen survival during mating flights and foraging activity of honey bees (*Apis mellifera* L.). International Journal of Scientific & Engineering Research 3(6): 1-8.
- Černecký, J., Lešo, P., Ridzoň, J., Krištín, A., Karaska, D., Darolová, A., Fulín, M., Chavko, J., Bohuš, M., Krajniak, D., Ďuricová, V., Lešová, A., Čuláková, J., Saxa, A., Durkošová, J., Andráš, P. 2020. Stav ochrany vtáctva na Slovensku v rokoch 2013–2018. Banská Bystrica: ŠOP SR, 105 pp.
- Goffová, K., Schlimbachová, E., Matisková, D., Krčmárik, S., Bohuš, M. a Majtán, J. 2021. Včelárík zlatý – priateľ či nepriateľ včiel? E-Newsletter Ústavu včelárstva: IV(4) 2-5.
- Hudec, K. a Štastný, K. (2005). *Merops apiaster* – Vlha pestrá. In: Ptáci – Aves. Fauna ČR, díl 2/II. Academia, Praha.
- Karaska, D., Trnka, A., Krištín, A. a Ridzoň, J. (2015). Chránené vtáčie územia Slovenska. ŠOPSR, Banská Bystrica, 380 pp.
- Krčmárik, S. 2019. Chrobáky Scarabaeidae v potrave kolónie včelárika zlatého (*Merops apiaster*) hniezdiacej na horizontálnych plochách pieskovej duny pri Virte (Podunajská pahorkatina). Diplomová práca, 66 pp.
- Matisková, D. 2020. Blanokridlovce (Hymenoptera) v potrave včelárika zlatého (*Merops apiaster*) na Podunajsku. Diplomová práca. Bratislava, 71 pp.
- Moreno-Opo R., Núñez J. C., Pina M. 2018. European bee-eaters (*Merops apiaster*) and apiculture: understanding their interactions and the usefulness of nonlethal techniques to prevent damage at apiaries. European Journal of Wildlife Research 64(5): 1-11.
- SOS/BirdLife Slovensko, RPS & UZSAV 2022: Včelárík zlatý. Dokázané a pravdepodobné hniezdenie v rokoch 2014-2022. <http://aves.vtaky.sk/sk/view10>





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**Regional Association for Nature Conservation and Sustainable Development (BROZ)** is a civic organization focused on field nature conservation and sustainable development. Its main goal is nature conservation and restoration in Podunajsko region, Malé Karpaty, Biele Karpaty, Záhorie, and many more Slovak regions, where they aim to restore rare habitats by bringing back the traditional management techniques.

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