

Nesting preference of European Bee-eater (*Merops apiaster*) in conditions of South Moravia (Czech Republic)

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Abstract: European Bee-eater (*Merops apiaster*) belongs among one of the most endangered birds of the Czech Republic. It is nesting in specific conditions with barren soil. The aim of our study was investigate all nesting colonies in conditions of South Moravia. All visited sites (36), including historical ones without birds (11), were properly described via environmental conditions. The main factor involving nesting is presence of steep slope with barren surface (with different angle of slope). Other factor is heterogeneity of surrounding landscape which fit perfectly with unique habitat of agricultural terraces. This habitat is also inhabited by other interesting bird species including *Saxicola rubetra*, *Sylvia nisoria* and *Lanius excubitor*. Other habitats were sand pits, former quarries and clay pits. All sites in the Czech Republic are artificial and men made only. Based on these results we would like to design conditions, which we can use for creation of other artificial nesting sites within south Moravian countryside.

Key-Words: bare walls, agricultural terraces, nesting

Introduction

European Bee-eater (*Merops apiaster* Linnaeus, 1758) is migratory bird species. It returns during May in the Czech Republic [1, 2]. This species come back to the Czech Republic from its distant wintering areas in tropical and southern Africa. The time of leave to wintering areas is particularly changing in case of young due to smaller physical constitution than adults [3].

The main population decline of European Bee-eater (*Merops apiaster*) was in the years 1970 – 1990. Its general abundance is increasing since the 90s years of last century. The total number didn't reach yet numbers before upper mentioned decline. This species needs bare soil walls for nesting, where it digs long nesting burrows [1, 2] (Fig 1).

First sure nesting was recorded in the Czech Republic in fifties, but several observation were done before this period, but not properly documented. It nests here regularly until now [2]. Nesting sites are sandy or loamy. Nesting was observed also on the ground abroad [1]. European Bee-eater nests often in the vineyard terraces, clay pits and sand pits together with Sand Martin (*Riparia riparia*). All nesting sites European Bee-eater were created by human activity in the Czech Republic [1].

Xerothermic habitats got terraced character at the turn of the 60th to 70th years of the 20th century that could be used as example for the cultivation of the wine. Creating terraces was a big intervention to landscape. These xerothermic places have become important habitats for many species [4, 5, 6], which include the European Bee-eater [1]. European Bee-eater is reliant during nesting on enough suitable slopes for digging burrows. Barren spots created as a result of erosion or human activity cannot stay barren for long time, because succession is always present in the landscape and therefore suitable sites overgrown. In addition the suitability of the material, from which the slope is formed, continuously decreases over time. European Bee-eater is therefore dependent on human activity, with which is associated the creation of appropriate new soil walls. It is also important to keep older slopes, where European Bee-eater nests repeatedly. Also mining activity in sand pits and quarries creates such suitable habitats [1]. It is therefore important to monitor habitat conditions that change over time or habitats directly disappear.

The aim was to find suitable habitats, where European Bee-eater nests, check nesting availability and identify main environmental conditions which it needs for its nesting in southern Moravia. The reason is future possible management of such area

for support nesting this species in the Czech Republic.

Material and Methods

European Bee-eater was observed on agricultural terraces, sand pits, clay pits, quarries and slopes in the landscape of South Moravia. Suitable sites were selected before arriving European Bee-eater, and were inspected repeatable after species arrival. Site selection was carried out on the basis of suitability slopes for nesting and looking for old nesting marks from previous years. Historical nesting sites were also visited (selected based experience of local biologists).

The selected sites were visited during the nesting period. Vocalizations pointed to their presence in case of less number of breeding pairs. The birds were observed and recorded the number of breeding pairs, with a reasonable distance from nesting sites, always from the same observational point.

All monitored sites were located in the South Moravian Region. Particular sites were within following districts: Znojmo (1), Brno-venkov (8), Hodonín (8) and Břeclav (19). The research was conducted from early May to mid-August.

Category nesting sites of European Bee-eater

Vineyard terraces

This habitat presents barren slopes that form the front terraces with adjacent vineyards. There are trees and shrubs growing in surroundings of these slopes.

Terraces with other crops

This is the bare slopes that form the front terraces with adjacent crops. There are cultivated variety crops (corn, alfalfa, canola, etc.). Bushes grow predominantly around these terraces, but also trees present.

Barren slopes in the landscape

These are the slopes in the landscape that aren't overgrown by vegetation, some are newly created, some overgrown vegetation gradually. These habitats include slopes located in different type of landscape: meadows, field paths or in one case the slope is situated directly over shooting range. There are trees and shrubs.

Sand pits and quarries

Sand pits, clay pits and quarries, which are formed during the extraction bare slopes. It is a mining area where mining takes place and the barren walls of quarries. Bushes grow in the nearby.

Results and Discussion

European Bee-eater nested in 2014 nesting period (13.5.-6.8. 2014) mainly in district of Břeclav (11

sites of evidence nesting), further in district Brno-venkov (4 sites of evidence nesting) and in district Hodonín (3 sites of evidence nesting).

Vineyard terraces

This includes 13 terraces with vineyards. Nesting was observed at the six vineyards, from 2 pairs to 21 pairs per location (Fig. 4). Earlier nesting was found on 3 locations. One site obtained to European Bee-eater regular food hunting ground. No traces of staying European Bee-eater (*Merops apiaster*) were found on 4 locations.

All slopes were barren in spots holes. Slopes orientation was different to cardinal points – north, south, west and east, southwest and southeast (Fig. 3). Burrows were always in angle of 90 degrees to the slope. The nesting (historical and recent) wall, have height from 0.5 m to over 2 m (Fig. 2).

Trees and shrubs around the slope served them as an observation places. Tension pillars in the vineyards were also good such observation post. These places served also to its rest and scaling spots for feeding. The bird firstly checked a pray, before consumption. Birds feed regularly on insects living in vineyards.

Terraces with other crops

This habitat is represented by six terraced sites, on which other crops than vine grew (alfalfa, canola, corn, etc.). Three of these terraces were occupied during the nesting season by European Bee-eater. One terrace wasn't farmed, place overgrown by grass and bushes. On this habitat nested from 6 pairs to 17 pairs (Fig. 4). One terrace, where grew corn, was not occupied. Two European Bee-eaters were observed during the first visit of the site. They started burrowing there. The site was not occupied at the next visit. Traces from previous nesting were found here. Two terraces with barren slopes weren't inhabited.

Angles of slope at places of burrows were always around 90 degrees and orientation to the cardinal points was different – south, southwest, southeast and northwest (Fig. 3). In the place burrows were barren slopes. Nesting spots were between of 1 – 3 m height (Fig. 2).

As an observation spots there were trees and shrubs only. They feed on insects from surroundings fields here.

Barren slopes in the landscape

Altogether 13 different locations were studied; eight sites were used by European Bee-eater. There nested from 1 pair to 26 pairs (Fig. 4). This includes wide variety of habitats. Barren slopes are the most

common element suitable for nesting of European Bee-eater. The bird was not observed at 5 locations; old burrows were found from previous years here. One of these sites was probably visited by European Bee-eater in this breeding season (May to August 2014) too, but it was not inhabited (on the end of June).

Orientation to the cardinal points was different – north, south, west, east, northeast, northwest, southeast and southwest (Fig. 3) and the slope was always around 90 degrees. The slopes with burrows were high from 0.5 to 6 m (Fig. 2).

As an observation sites there were bushes, trees and also dead branches. The species feeds here on insects on all types of habitats– in orchards, fields, gardens, vineyards, etc.

Sand pits and quarries

It includes 4 locations. Large colony of Sand Martin (*Riparia riparia*) nested at one location. European Bee-eater nested at this location also (two pairs nested here) (Fig. 4). The historical nesting was recorded on two such locations.

There were no marks of nesting at two locations. The slope, where it nested was perpendicular. The slopes to the cardinal points were different (Fig. 3). The slope was located in the sand pits with common Sand Martins (*Riparia riparia*) nesting on the southwest. The bare wall had a height of over 2 m (Fig. 2).

Various shrubs around served for observation. The birds were looking for food at surroundings fields.

There were inspected a total of 36 sites altogether. European Bee-eater (*Merops apiaster*) nested on 18 of them in nesting period of 2014 (Fig. 4). Altogether 11 historical locations were found (with empty burrows only). Seven possible sites were not occupied. Slope of walls was about 90degrees and orientation to the cardinal points was

different (Fig. 3), mostly southwest. Heights of slopes were from 0.5 to 6 m (Fig. 2), but slopes heights of around 2 m were the most occupied. Various shrubs and trees planted in close proximity to the slopes an important factor.

Other kinds of birds like to use burrows European Bee-eater to its nesting [7, 8]. In our observation, it was mainly Tree Sparrows (*Passer montanus*).

The Czech colonies of European Bee-eater are generally small and the same result has some other authors [9]. Most pairs are nesting together (the richest colony host 27 pairs, the smallest at least 2 pairs).

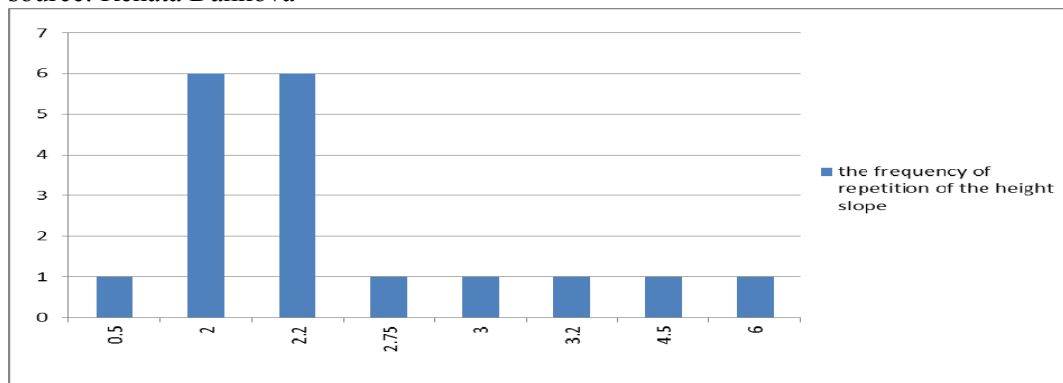
They prefer if they can build burrows by themselves [10]. First at all they search for suitable spot at slopes and later they dig the burrow. During their search they check the substrate first, if it is not suitable, they start burrow new hole. The best substrate in conditions of Moravia is loess [11].

It digs burrow mostly at the end of May [10]. At this year the digging was observed at the first week of June.

Fig. 1 Nesting site (source: Renata Daňková)

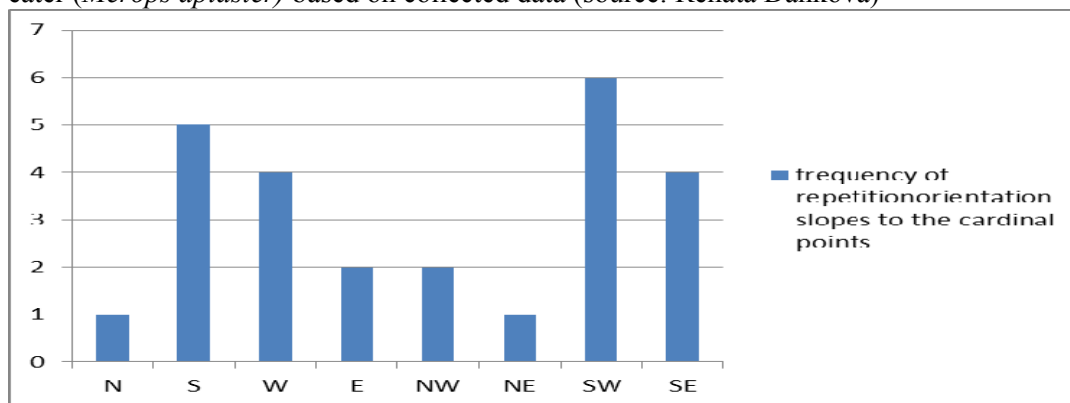


Fig. 2 Frequency of repetition heights of slopes with the presence of European Bee-eater (*Merops apiaster*) – source: Renata Daňková



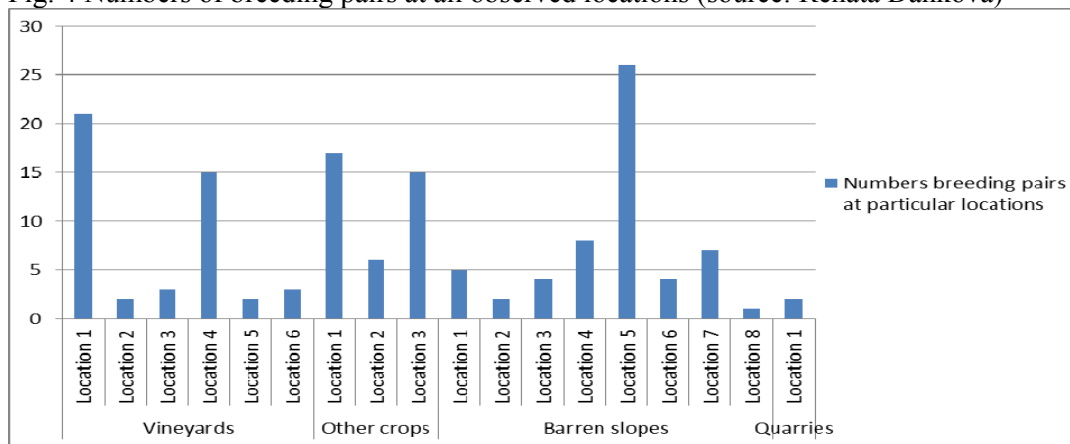
Legend: x-axis – the total height of slopes is quoted in meters, y-axis – frequency of repetition of the same height of slope

Fig. 3 Frequency of repetition orientation slopes to the cardinal points with the presence of European Bee-eater (*Merops apiaster*) based on collected data (source: Renata Daňková)



Legend: x-axis – individual cardinal points: N – north, S – south, W – west, E – east, NW – northwest, NE – northeast, SW – southwest, SE – southeast, y-axis – frequency of repetition of individual orientation to the cardinal points

Fig. 4 Numbers of breeding pairs at all observed locations (source: Renata Daňková)



Legend: x-axis – the individual locations occupied by European Bee-eaters (*Merops apiaster*) with their inclusion in the relevant category y-axis – the number of breeding pairs

Conclusion

Barren slopes of agricultural terraces, sand and clay pits, quarries and barren slopes in the landscape are very important for European Bee-eater at present time. They look for manmade habitats in the countryside which are the only suitable habitats of this species in conditions of Czech Republic. They nest close to human settlements and also other human activities don't disturb them to much (one place is at active sport shooting range). It's important to notice that they are strongly connected to human activities in landscape and that they cannot survive in modern countryside without these activities.

The birds choose slopes that are nearly perpendicular. If the slope isn't perpendicular, the holes are located on the most perpendicular parts of the slope.

Ravine routes with vertical slopes, which were in the vineyards, proved to be also very suitable for nesting. Even though the walls are low, it is like to use them on both sides.

The space between individual burrows can be very small (13 cm). Birds can use effectively the space of the slope because the suitable habitats are rare and scarce.

The interesting fact is that burrows are reachable for other animals including predators, but predation was not recorded.

European Bee-eater prefers for its nesting various high of slopes. However, most of the burrows are always at the highest slope, the number of nests decrease with decreasing height of the slope (Fig. 1).

The most important is of maintaining at least part of the barren slopes in which it can dig its burrows. It is not problematic for the bird, if slopes are therefore slightly covered by low and sparse vegetation, but the species usually prefers slopes without vegetation.

The preliminary results shows that the species is not affected by orientation of the slope, and that

more important is the height of the slope and its cover.

Furthermore, shrubs and trees have to be present in the vicinity of nesting sites. These are used as observation spots, but also for resting and food adjustment. Vineyard tension pillars are also used for the same reason in the vineyards.

European Bee-eater needs a lot of insects during the nesting, because the birds nest in colonies and the surroundings has to offer sufficient food supply for higher numbers of specimens locally. They feed primarily butterflies, beetles and different kind of bees. The food supply has to be supported by nature management activities, because is crucial.

Burrows constructed by European Bee-eater are also important for other bird species such as Tree Sparrow (*Passer montanus*) and Black Redstart (*Phoenicurus ochruros*).

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