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Research article

Sand Banks in pseudo-steppe areas provide suitable nesting sites: High breeding numbers of the European roller (*Coracias garrulus* L. 1758) in Southwest Turkey

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Abstract: Nest-site selection is one of the important characters especially for under-threaten species. The European Roller (*Coracias garrulus*) is one of the most studied birds after its rapid decline in Europe. Turkey has rich biodiversity in terms of migratory and breeding bird species, but there are very restricted studies about Roller. By observations suitable nesting sites in sand banks in Southwest Turkey, 5 nesting sites of second cavity-nester were found. Long-term observations showed that 22 pairs per year bred as a mean value (3.75 nests/1 km^2) from 2010 to 2018 in the breeding seasons. Using sand banks provided high breeding pairs that there were statistically positive correlations between the length of the nesting site and active nests, and also between cavity numbers and the active nests. The lengthiest (150 m) site with numerous cavities (57), had high active nests (mean value was 11/year). Considering the increase in the populations of the species as a result of the conservation studies carried out using nest boxes in different European countries, Roller populations may begin to decrease due to the habitat loss.

Keywords: Breeding**,** Cavity, *Coracias garrulus*, European Roller, Sand bank.

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Introduction

Most of the species that spread in the Western Palearctic are summer migrants and overwinter in the Southern Sahara and South Africa as the long-distance migratory birds (Bairlein, 1994). In addition to the migration of many species from Turkey on the Eastern European migration routes, many populations of summer migrants breed in Turkey and the European Roller (*Coracias garrulus*) (hereafter, "Roller") is one of these breeding birds of Turkey (Kirwan et al., 2008).

Roller, a medium size and obligatory secondary cavity-nesting bird, is widely distributed across the Palearctic region and breeds in open habitats in warm and lowland areas (Cramp & Simmons, 1988). Roller populations, feeding on large invertebrates (grasshoppers, bush crickets, beetles) as well as small vertebrates (Aviles & Parejo, 2002), have effected and decreased after the large-scale habitat elimination and degradation due to the intensification of agriculture and forestry management in most part of Europe (Donald, Green & Heath, 2001; Donald et al., 2006). Because of the sharp decrease of the populations, the IUCN threaten category of the Roller was changed into VU (vulnerable). The loss of natural cavities is the most important effect of their decline, and the action plan with using of artificial nest-boxes for Roller conservation in the European countries had successful results (Kiss et al., 2017) and the threaten category of the Roller was changed into NT (Near Threatened) and at least LC (Least Concern) progressively after the increasing of the population trends.

There are not many studies on the breeding (Özkan, Karaardıç & Erdoğan, 2012; Karaardıç & Özkan, 2013, 2017) and the migration patterns (Karaardıç et al., 2006a-2006b; Erdoğan et al., 2008; Karaardıç & Erdoğan, 2019)

of the species, although Turkey has rich biodiversity in terms of migratory and breeding bird species. Unfortunately, there are very restricted studies about Roller, which are mostly technical reports given as distribution or existing information's (Kızılkaya, Karaca & Urhan, 2013), even it is one of the important breeding species of Turkish birds depending on its global distribution. In this study, we aimed to compare the breeding pair numbers in south-western Anatolia and its nest site distributions according to the long-term observation data.

Materials and Methods

The fieldwork was carried out regularly from 2010 to 2018 by observations in the breeding season between April and July. During the fieldwork, observations were done by using binoculars according to the transect observation method to find nests 3 times/month each years. All found nests were visited every fieldwork to determine the active nests and breeding pair numbers. Nesting sites are located around Sarayköy (37°54'N, 28°54'S), 25 km distance from Northwest Denizli province in Southwest Turkey (Fig. 1). About 45 km^2 area, sandy soil structure is dominant and has steppe characters. In this area, there are many sand banks in different height (2 m- 5 m) and these sand banks were formed as a result of human activities such as sand quarries. We measured the length and the height of the nesting sites by using standard meter. All nests were found in the cavities in the sand banks (Fig. 2-3).

The mean values of the active nests were calculated and the results summarized in table and figures. Pearson Correlation Analysis was used to understand the relation between Active nests - cavity size and Active nests – Length of the nesting sites.

Results

During the field work from 2010 to 2018 between April and July, 5 different nesting sites (Nesting sites A, B, C, D and E, hereafter "A, B, C, D, E") were found (Fig. 1). A to D were very close to each other, E was far approximately 11 km from the nearest one. The active nests were different both according to the years and nesting sites. A and D had the biggest nesting activity, however the other B, C and E had low intensity all years (Fig. 4-5). On the other hand, the highest nesting activity for all sites was 2014; there is also fluctuation on the number of pairs between years. The number of active nests (pairs) by years was given in the Table 1.

Figure 1. Location of the study area in Southwest Turkey and the different nesting sites of the Roller in the study area (Google earth)

Figure 2. The lengthiest nesting site (A) has many cavities in the sand bank. The small cavities (not useful for Roller) were excluded from evaluation. In this site, different species (Little Owl, European Bee-eater, House sparrow) had also breeding activity.

Figure 3. An Adult Roller carrying food into the active nest.

Table 1. The number of pairs (=active nests) according to the years (2010-2018).

Nesting Sites	2010	2011	2012	2013	2014	2015	2016	2017	2018
A	12	9	10	10	16	12	12	10	8
B	1	-	1	-	-	1	-	1	-
C	1	2	-	2	2	1	2	1	-
D	8	8	9	10	12	10	10	8	7
E	1	-	1	1	-	1	1	-	-
Total	**23**	**19**	**21**	**23**	**30**	**25**	**25**	**20**	**15**

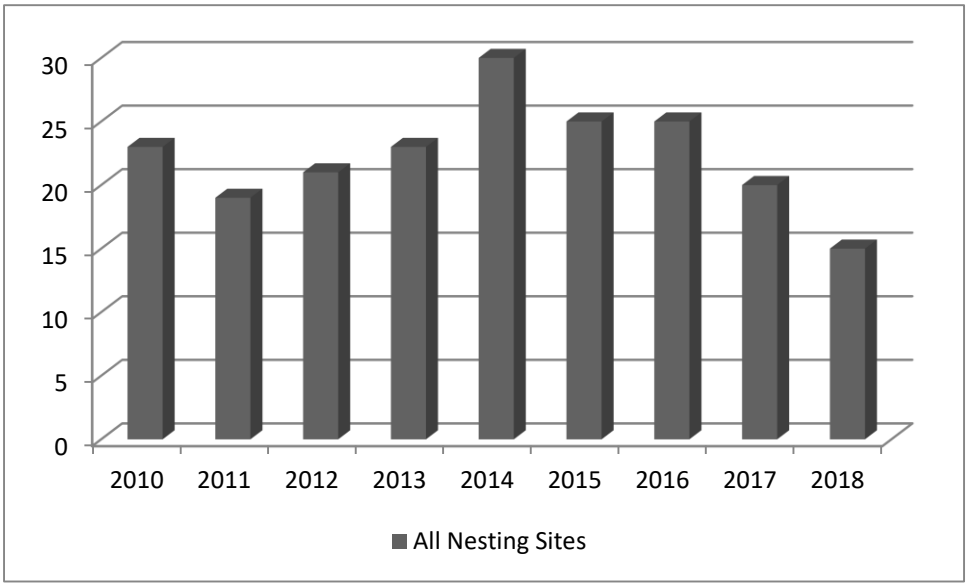

Figure 4. Distribution of active nests (total numbers per year) in all nesting sites by different years.

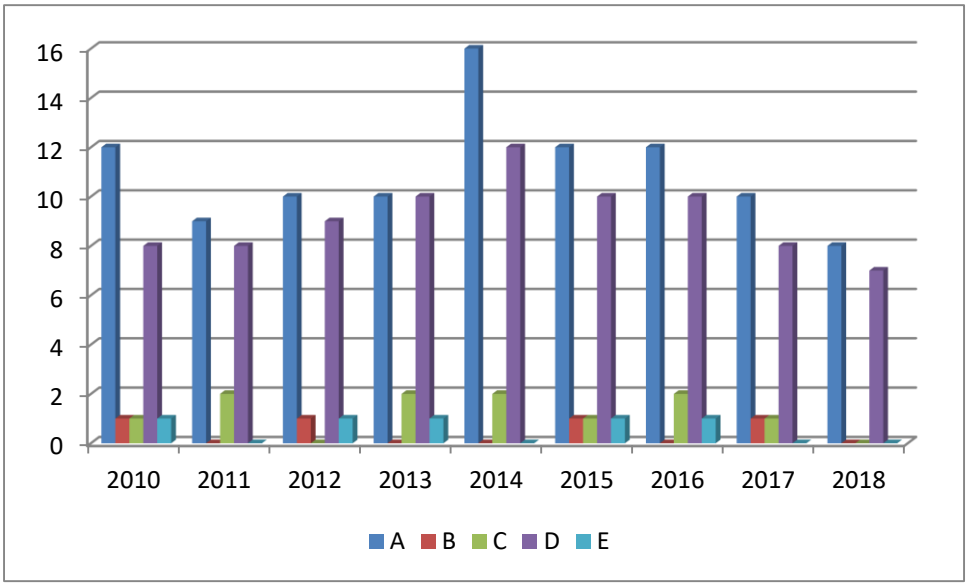

Figure 5. Distribution and comparison of active nests (=pairs) in all nesting sites by different years.

Rollers started to arrive to the nesting sites in the late April. Arrival of all pairs completed in the Mid-May. The surface of all sites shows the nesting capacity of Roller in the area. The length of A was 150 m and the cavity number on the A was 57, the highest value of the active nests were 16 in 2014 (mean=11 nests). The length, cavity size and the mean value of active nests according to the sites were given in Table 2.

Discussion

This is the first study providing the nesting area choice and the abundance of breeding pairs of the European Roller based on the long-term observations in Turkey. Unfortunately there were very restricted studies in Turkey, although Roller is widely distributed medium size bird species in the western Palearctic and based on its sharp decline in the 1980s so many studies performed to understand breeding and conservation of this species (Aviles & Parejo, 2002; Kiss et al., 2017). There is not enough knowledge about the breeding pair numbers and distribution of the breeding pairs in Turkey, but the threaten status of the Roller, even there was a big development to conservation of this species in European countries, is similarly LC. Our data shows that the Roller could have more breeding pairs than expected.

Table 2. The length (in meter), Cavity numbers and the mean value of active nests (=pairs) according to the sites.

Nesting Site	Length (m)	Cavity Size	Active Nest (Mean value)
A	150	57	11
B	30	4	0.4
C	25	3	1.2
D	75	45	9.1
E	7	2	0.6

Rollers are secondary cavity-nesters and using abandoned woodpecker cavities in trees, fissured rocks or sandy banks for nesting (Cramp & Simmons, 1988). In the study area, all pairs used cavities in the sand banks. There were statistically positive correlations between the length of the nesting site and active nests, and also between cavity numbers and the active nests (Table 3). A was the lengthiest (150 m) site and had most cavities (57), as a mean value of active nests was 11/year. It is not clear to say, but if the suitable lands could enlarge, this may effect to increase the breeding populations of the Roller. In this study, we observed that a few species (European Bee-eater – *Merops apiaster*, Little Owl – *Athene noctua*, Common Kestrel – *Falco tinnnunculus*, House Sparrow – *Passer domesticus*) bred at the same sites. Especially at the lengthiest, both sites A and D, all these species bred together, even a few meters between some nests. Probably due to studies of burrows in tree cavities mostly in forest areas, there is no knowledge that contains many nests close to each other (Avilez, Sanchez & Parejo, 2000; Catry et al., 2011; Barisic et al., 2018). We did not control the nests to understand the breeding biology (laying date, egg size, hatchling and fledgling numbers) of the Roller, but this huge breeding numbers in a season may be extremely high. If E removed to evaluate the nest frequency, value showed the importance of the area (3.75 nests/1 km^2) in the highest year (2014). Due to the soil structure of the study area, sand quarries operate in the region. In this process, almost all of the nesting sites are sand banks that emerged as a result of these activities. At first glance, this situation seemed to have created suitable areas for Roller and similar species, but in recent years, it has been observed that the numbers of the active nests have gradually decreased in all sites (Fig. 4 and 5). Considering the increase in the populations of the species as a result of the conservation studies carried out using nest boxes in different European countries (Finch et al., 2019; Rodriguez-Ruiz et al., 2020), it is necessary to determine the nesting sites especially in open areas such as sand banks.

Table 3. Correlation between Cavity-size/Active nest and Cavity-size/Length of the nesting sites

	N	Mean	St. Dev.	Correlation	P
Cavity Size	45	22.2	1.072	0.961**	< 0.01
Active Nest	45	4.47	0.331		
Length (m)	45	57.40	4.629	0.894**	< 0.01
Active Nest	45	4.47	0.335		

Ethical Approval

The authors declare that no need to ethical approval.

Conflicts of Interest

The authors declare that they have no conflict of interest.

Funding Statement

The authors don't declare any found.

References

Avilez, J. M., Sanchez, J. M. & Parejo, D. (2000). Nest-site selection and breeding success in the Roller (*Coracias garrulus*) in the Southwest of the Iberian peninsula. *Journal of Ornithology*, 141, 345-350.

Avilez, J. M. & Parejo, D. (2002). Diet and prey type selection by Rollers *Coracias garrulus* during the breeding season in southwest of the Iberian peninsula. *Alauda*, 70, 227-230.

Bairlein, F. (1994). Manual of Field Methods. European-African Songbird Migration Network, Wilhelmshaven, Germany.

Barisic, S., Tutis, T., Cikovic, D. & Kralj, J. (2018). European Roller Coracias garrulus in Croatia: historical review, current status and future perspective. *Larus*, 53, 19-31.

Catry, I., Silva, J. P., Cardoso, A., Martins, A., Delgado, A., Sanches, A. R., … & Ferro, T. (2011). Distribution and population trends of the European Roller in pseudo-steppe areas of Portugal: results from a census in sixteen SPAs and IBAs. *Airo*, 21, 3-14.

Cramp, S. & Simmons, K. E. L. (1988). (Eds.) The Birds of the Western Palearctic, Vol V. Oxford University Press, Oxford.

Donald, P. F., Green, R. E. & Heath, M. F. (2001). Agricultural intensification and the collapse of Europe's farmland bird populations. Proceedings of the Royal Society London B, 268.

Donald, P. F., Sanderson, F. J., Burfield, I. J. & van Bommel, F. P. J. (2006). Further evidence of continent-wide impacts of agricultural intensification on European farmland birds. 1990-2000. *Agriculture, Ecosystems and Environment*, 116, 189-196.

Erdoğan, A., Karaardıç, H., Sert, H., Özkan, L., Vohwinkel, R. & Prünte, W. 2008. Manavgat/Titreyengöl Kuş Halkalama Çalışması. *Tabiat ve İnsan*, Eylül, 23-33.

Finch, T., Branston, C., Clewlow, H., Dunning, J., Franco, A. M. A., Racinskis, E., … & Butler, S. J. (2019). Context-dependent conservation of the cavity-nesting European Roller. *Ibis*, 161, 573-589.

Karaardıç, H., Erdoğan, A., Vohwinkel, R. & Prünte, W., (2006a). The relationship between biometry and migration time among nine species of warblers in southern Turkey. *Journal of Ornithology*, 147 (5): 191.

Karaardıç, H., Yavus, M., Erdoğan, A., Pruente, W. & Vohwinkel, R. (2006b). Results of bird banding in spring at Titreyengöl, Manavgat, Turkey since 2002. *Journal of Ornithology, 147(5),* 192.

Karaardıç, H. & Özkan, L. (2017). Breeding and migratory distribution of Collared pratincole (*Glareola pratincola*) at Boğazkent, southern Turkey. *Acta Biologica Turcica*, 30 (3), 74-78.

Karaardıç, H. & Özkan, L. (2013). Breeding ecology of Greater short-toed lark (*Calandrella brachydactyla*) at Boğazkent, Antalya, Turkey. *Zoology in the Middle East, 59(1)*, 6-9.

Karaardıç, H. & Erdoğan, A. (2019). Spring migration phenology of wheatear species in southern Turkey. *Acta Biologica Turcica, 32(2)*, 65-69.

Kızılkaya, E., Karaca, M. & Urhan, R. (2013). Investigations on Ornithofauna of Sarayköy District (Denizli, Turkey). *Journal of Selçuk University*, ICOEST Conference (Special Issue-2), 395-404.

Kirwan,G., Demirci, B., Welch, H., Boyla, K., Özen, M., Castell, P. & Marlow, T. (2008). The Birds of Turkey. The Distribution, Taxonomy and Breeding of Turkish Birds. A & C Black Publishers, London. 512 pp.

Kiss, O., Tokody, B., Ludnai, T. & Moskat, C. (2017). The effectiveness of nest-box supplementation for the conservation of European Rollers (*Coracias garrulus*). *Acta Zoologica Academiae Scientiarum Hungaricae*, 63, 123-135.

Rodriguez-Ruiz, J., Exposito-Granados, M., Aviles, J. M. & Parejo, D. (2020). Apparent survival, growth rate and dispersal in a declining European Roller population. *Journal of Ornithology,* 161, 103-113.

Özkan, L., Karaardıç, H. & Erdoğan, E. (2012). Breeding Biology of Spur-Winged Lapwing (*Vanellus spinosus* L.) at Boğazkent, Antalya/Turkey 2009-2011. *Fresenius Environmental Bulletin*, 21, 3440-3442.