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RECORDS OF THE EUROPEAN ROLLER *Coracias garrulus* OUTSIDE KNOWN BREEDING AREAS IN COASTAL CROATIA: INDICATIONS OF BREEDING RANGE EXPANSION?

Nalazi zlatovrane Coracias garrulus izvan poznatih područja gniježđenja u priobalnoj Hrvatskoj: indikacije za širenje areala gniježđenja?

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ABSTRACT

Observations of the European Roller *Coracias garrulus* collected during 2024 outside known breeding areas in coastal Croatia are summarized. For each observation, the breeding probability was assessed, based on the presence of an individual or a pair, bird behaviour, breeding and migration phenology, and the availability of suitable nesting (poplar trees with cavities) and foraging habitats (agricultural land). Seven observations were recorded between 30 April and 25 June 2024, with low to high breeding probability. The potential expansion of the European Roller breeding area in Croatia creates a need for systematic surveys of this species outside known breeding areas, which could be supported by the evaluation of data from citizen science databases.

The European Roller *Coracias garrulus* (hereafter “Roller”) is a critically endangered breeding species in Croatia (TUTIŠ *et al.* 2013) that has shown a remarkable recovery since the discovery of its breeding population in 2010 in the Ravni kotari area in coastal Croatia (BARIŠIĆ *et al.* 2019). The Roller, a secondary-cavity nesting bird, has benefited from extensive provision of nest boxes in the Ravni kotari area, with the breeding population increasing from 5 pairs in 2010 (TUTIŠ *et al.* 2013) to 64–78 pairs in 2019 (BARIŠIĆ *et al.* 2019). In addition to nest boxes, poplar trees have been identified as the most important natural nesting sites for Rollers, as they provide suitable cavities for breeding (BARIŠIĆ *et al.* 2019).

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Since 2015, 4-5 breeding pairs have been recorded in the Mirna valley on the Istrian Peninsula (L. Meštrović, pers. comm.). In addition, in 2018, Rollers have been recorded in the southernmost part of Croatia, in Konavosko polje near Dubrovnik where 7-8 birds have been recorded displaying courtship behaviour and visiting nesting holes (D. Dender, pers. comm.). However, breeding in this area has not yet been confirmed (BARIŠIĆ *et al.* 2019).

We consider Ravni kotari and the Mirna Valley as known breeding areas for Rollers in Croatia, while Konavosko Polje is regarded as a possible breeding area. New observations from 2024 outside these known breeding areas (Ravni kotari, Mirna Valley) are presented here.

Between 30 April and 25 June 2024, we recorded a total of seven observations of European Rollers outside their known breeding areas (Table 1, Fig. 1). All observations were occasional observations and occurred within the assumed breeding season of the Roller in Croatia (MONTI *et al.* 2024a), although migrating birds can still be encountered as late as the end of May (MONTI *et al.* 2024a). We assessed the breeding probability of these observations (Table 1) by considering factors such as whether a single bird or a pair was recorded, as well as any observed courtship or territorial behaviour (such as rolling). Further, we considered the breeding/migration phenology of the Roller in Croatia, the availability of suitable nesting trees, and the share of adequate foraging habitats within a 1.15 km radius of the observation point (according to MONTI *et al.* 2024a). Farmlands (arable land, pastures, meadows and orchards) were considered suitable foraging habitats (CRAMP 1998).

Our observations indicate several new sites in Croatia with low to high breeding probability for the Roller (Table 1). Low breeding probability was assigned to sites where only a single bird was present, and the surrounding area had less than 70% of farmlands. Moderate breeding probability was assigned to sites where a single adult was recorded and the surrounding area had more than 70% of farmlands. High breeding probability was assigned to sites where two birds were recorded within an area with more than 70% of farmlands (Table 1). In addition, a site was classified as having a high breeding probability if previous records indicated breeding activity of Rollers.

The site on Pag island is less than 15 km away from known breeding sites in the Ravni kotari area, whereas Sinsko polje and Imotsko polje are located approximately 100 km and 150 km away, respectively. The records from Cres and Prevlaka are assessed as having a low breeding probability since much of the surrounding habitat is covered by forests and shrubland.

Furthermore, Konavosko polje was assigned as having a high breeding probability, as Rollers have been recorded there since 2018 (D. Dender, pers. comm.), despite our observations being limited to single individuals. The nearest known breeding area is located near Zeta north of Lake Skadar in Montenegro, approximately 75 km away (B. Zeković, pers. comm.).

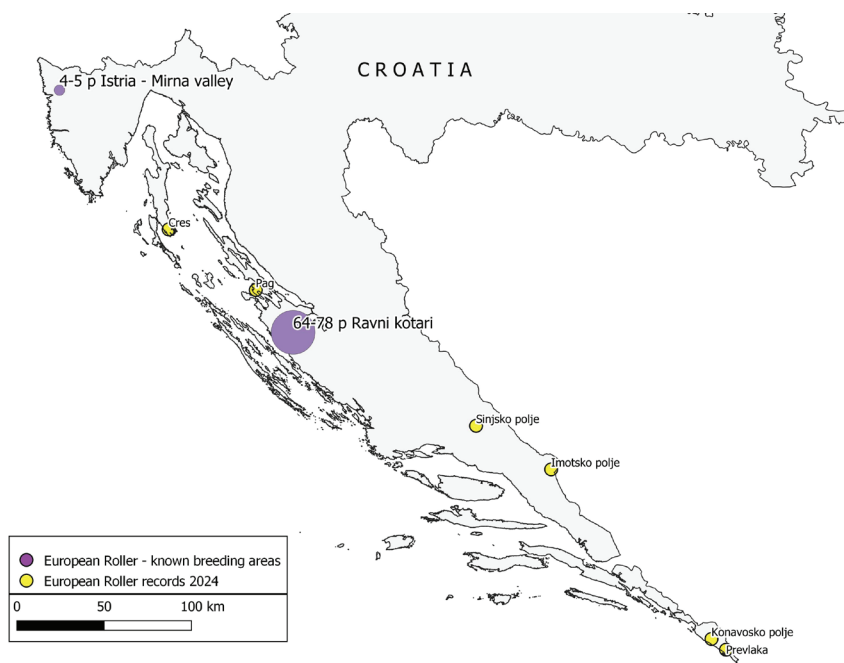


Figure 1. Records of the European Rollers in coastal Croatia from 2024 (yellow circle); known breeding areas are indicated (violet circles), along with the estimated population size in pairs (p)

Slika 1. Opažanja zlatovrane u priobalnoj Hrvatskoj iz 2024. (žuti krug); poznata područja gniježđenja su označena (ljubičasti krug), zajedno s procijenjenim brojem parova (p)

Table 1. Observations of the European Roller outside known breeding areas in coastal Croatia
Tablica 1. Opažanja zlatovrane izvan poznatih područja gniježđenja u priobalnoj Hrvatskoj

| No | Site | Date | Observation | Share (%) of farmland* | Breeding probability |
|----|---------------------------|-----------|---|------------------------|----------------------|
| 1 | Imotsko polje | 30.4.2024 | single adult bird displaying, visited Lombardy poplar <i>Populus nigra 'italica'</i> with potential nesting cavities; surrounding area provides suitable foraging habitats; site revisited on 30 May 2024, but Roller presence not reconfirmed. | 97 % | moderate |
| 2 | Pag island – Povljana | 21.5.2024 | single adult bird displaying; poplar trees present; surrounding area provides suitable foraging habitats; breeding population nearby (Ravni kotari). | 85 % | moderate |
| 3 | Sinjsko polje | 2.6.2024 | one pair observed on poplar trees with potential nesting cavities; surrounding area provides suitable foraging habitats. | 95 % | high |
| 4 | Konavosko polje | 9.6.2024 | single adult bird observed on poplar trees with potential nesting cavities; surrounding area provides suitable foraging habitats. | 73 % | high |
| 5 | Konavosko polje | 10.6.2024 | single adult bird observed on poplar trees with potential nesting cavities; surrounding area provides suitable foraging habitats. | 76 % | high |
| 6 | Prevlaka | 10.6.2024 | single adult bird; surrounding area provides suitable foraging habitats. | 8 % | low |
| 7 | Cres island – Punta Križa | 25.6.2024 | single adult bird; trees with potential nesting cavities present (Holm oaks <i>Quercus ilex</i>); surrounding area mainly forested | 9 % | low |

* share of farmland (%) within the radius of 1.15 km around probable nesting sites (No 1 - 5) or the location of the record (No 6 and 7)

The Roller is a long-distance migrant that winters in sub-Saharan Africa (MONTI *et al.* 2024b, CRAMP 1998). It exhibits a tendency for natal philopatry, as Rollers often breed near their natal areas (VÁCLAV *et al.* 2011). However, MONTI *et al.* (2024a) demonstrated a high degree of mobility in Rollers since two out of 21 tracked Rollers exhibited unusual long-distance movements during the breeding season following nesting failure. One failed breeder from Italy crossed the Adriatic Sea five times, prospecting large areas in Italy and along the Croatian coast in July and August before departing for autumn migration. These findings highlight that non-breeding adult birds may be present in suitable habitats throughout the entire breeding season, underscoring the need for careful evaluation of Rollers records.

Assuming a positive density-dependent dispersal scenario for the Roller, emigration from high-density breeding areas with positive population growth, such as the Ravni Kotari region (BARIŠIĆ *et al.* 2019) and parts of Italy (MESCHINI *et al.* 2024), has likely occurred in recent years. Combined with their capacity for extensive prospecting movements, this could have contributed to the colonisation of new breeding areas along the Croatian coast and its hinterland. However, the lack of suitable nesting holes (e.g. nest boxes, tree cavities) may limit the dispersal of Rollers (FINCH *et al.* 2019).

The new records suggest a potential breeding range expansion of Rollers in Croatia, with potentially breeding adult individuals found in suitable habitats in scattered locations along the coast and hinterland. These findings underline the need for systematic surveys of the Roller, which could be facilitated by evaluating data from citizen science databases.

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SAŽETAK

Opisani su slučajni nalazi zlatovrane *Coracias garrulus* prikupljenih tijekom 2024. godine izvan poznatih područja gniježđenja u obalnoj Hrvatskoj. Nalazi zlatovrane evaluirani su s obzirom na vjerojatnosti gniježđenja uzimajući u obzir prisutnost jedinke ili para, ponašanje ptica, fenologiju gniježđenja i selidbe te dostupnost prikladnog staništa za gniježđenje (stabla topola s dupljama) i staništa za hranjenje (poljoprivredna zemljišta). Zabilježeno je sedam opažanja između 30. travnja i 25. lipnja 2024. Opažanja ukazuju na to da u Hrvatskoj postoje lokaliteti na obali (otok Pag, Konavosko polje) te zaleđu (Imotsko i Sinjsko polje) s niskom do visokom vjerojatnošću gniježđenja ove vrste. Potencijalnim širenjem područja gniježđenja zlatovrane u Hrvatskoj stvara se potreba za sustavnim istraživanjima ove vrste izvan poznatih područja gniježđenja, a koje bi moglo biti potpomognuto evaluacijom podataka iz baza podataka građanske znanosti.