INTERNATIONAL SPECIES ACTION PLAN FOR THE EUROPEAN ROLLER CORACIAS GARRULUS GARRULUS

revised version 2020

Prepared by: MME BirdLife Hungary on behalf of the European Commission

Compilers

Orsolya Kiss	University of Szeged
Timothée Schwartz	A Rocha France
Sanja Barisic	Croatian Academy of Sciences and Arts, Institute of Ornithology
Francisco Valera	Institute of Ornithology Casa
Béla Tokody	MME BirdLife Hungary

List of Contributors

Albania	Erald Xeka	erald-20@hotmail.com	University Of Tirana
Austria	Bernard Wieser	bernard.wieser@utanet.at	Lebende Erde im Vulkanland
	Michael Tiffenbach	michitiefenbach@gmail.com	Nature conservation Office- Styria
	Carina Nebel	kerstin.kadletz@students.boku.ac.at	Museum of Natural-History Vienna
Belarus	Maxim Tarantovich	tarantovich@gmail.com	
	Ivan Russkikh	russkikh@bsu.by	
Bulgaria	Petar Iankov	svetoslav.spasov@bspb.org	BirdLife Bulgaria (BSPB)
Croatia	Sanja Barisic	sbarisic@hazu.hr	Institute of Ornithology CASA
	Vesna Tutiš	vtutis@hazu.hr	Institute of Ornithology CASA
Cyprus	Christina Leronymidou	christina.ieronymidou@birdlifecyprus.org.cy	BirdLIfe Cyprus
Czech Republic	Petr Pavelcik	petr.pavelcik@kr-zlinsky.cz	
	Lukas Viktora	viktora@birdlife.cz	Czech Society for Ornithology (CSO)
England	Tom Finch	Tom.Finch@uea.ac.uk	University of East Anglia
	Ian Fisher	ian.fisher@rspb.org.uk	RSPB
	Simon Butler	simon.j.butler@uea.ac.uk	University of East Anglia
	Phil Saunders	philip.saunders@uea.ac.uk	University of East Anglia
France	Timothée Schwartz	timothee.schwartz@arocha.org	A Rocha France
Germany	Dr Tilman C. Schneider	tilman.schneider@cms.int	CMS
Hungary	Göcző Gabriella	goczo.gabriella@mme.hu	MME/BirdLife Hungary
	Golen Gerhárd	golengerhard@gmail.com	University Of Eszterhazy Károly, Eger
	Ludnai Tünde	ludnait@knp.hu	Kiskunsag National Park Directorate
	Vajda Zoltán	vajdaz@knp.hu	Kiskunsag National Park Directorate
	Kiss Tamás	halasimadarasz@gmail.com	MME/BirdLife Hungary
	Balogh Gábor	mosolykomlos@gmail.com	Körös-Maros National Park Directorate
	Széll Antal	szelltoni@freemail.hu	Körös-Maros National Park Directorate
	Csibrány Balázs	csibrany.balazs@mme.hu	MME/BirdLife Hungary
	Hák Flóra	hak.flora@mme.hu	MME/BirdLife Hungary
	Palatitz Péter	palatitz.peter@gmail.com	MME/BirdLife Hungary
	Sümegi Zsófia	roller@mme.hu	MME/BirdLife Hungary
	Hunor-Kálmánczi Anna	kalmanczi.anna@mme.hu	MME/BirdLife Hungary
	Végvári Zsolt	zsolt.vegvari@gmail.com	

			Danube Research Institute
	Bakos Katinka	bakosk@knp.hu	Kiskunsag National Park Directorate
	Sarlós Dávid	sarlos.david@mme.hu	MME/BirdLife Hungary
	Halmos Gergő	halmos.gergo@mme.hu	MME/BirdLife Hungary
	Lendvai Csaba	lendvai.csaba@mme.hu	MME/BirdLife Hungary
	Czirák Zoltán	zoltan.czirak@am.gov.hu	Ministry of Agriculture
	Schmidt András	andras.schmidt@am.gov.hu	Ministry of Agriculture
	Nagy Gergő Gábor	gabor.gergo.nagy@am.gov.hu	Ministry of Agriculture
	Ampovics Zsolt	ampovics.zsolt@mme.hu	MME/BirdLife Hungary
	Gál Zoltán	galzoltan01@gmail.com	MME/BirdLife Hungary
Israel	Eli Haviv,	elih@spni.org.il	Society for the Protection of Nature in Israel (SPNI);
Italy	Angelo Meschini	a.meschini@gmail.com	CORACIAS Gruppo italiano Ghiandaia marina
	Fernando Spina	fernando.spina@isprambiente.it	
Kenya	Alex Ngari	alex.ngari@birdlife.org	BirdLife Africa
Latvia	Edmunds Racinskis	edmunds@ldf.lv	Latvian Ornithological Society
	Ieva Mardega	ieva.mardega@vamoic.gov.lv	State Centre for Defence Military Objects and Procurement
Lithuania	Laimonas Sniauksta	lsniauksta@gmail.com	Vilnius
	Milda Sniaukstiene	miildas@gmail.com	Vilnius
Montenegro	Jelena Popovic	popovic.jelena4@gmail.com	
Poland	Jaroslaw Krogulec	jaroslaw.krogulec@otop.org.pl	Polish Society for the Protection of Birds (OTOP)
	Andrei Górski	andrzej.gorski@uwm.edu.pl	University of Warmia and Mazury in Olsztyn (UWM)
Portugal	Inês Catry	inescatryatgmail.com	Centro de Ecologia Aplicada Prof. Baeta Neves and InBio, Rede
Romania	Nagy Attila	attila.nagy@milvus.ro	Milvus Group
	Bárbos Lőrinc	lorinc.barbos@apmsm.anpm.ro	Milvus Group
	Zeitz Róbert	robert.zeitz@milvus.ro	Milvus Group
	Daróczi Szilárd	szilard.daroczi@milvus.ro	Milvus Group
Serbia	Gergely József	gerjo.madarasz@gmail.com	Riparia Association of Environmentalists
	Ágoston Attila	atiagoston@gmail.com	Riparia Association of Environmentalists
	Szekeres Ottó	otus@riparia.org.rs	Riparia Association of Environmentalists
	Dimitij Radisic	dimitrije.radisic@gmail.com	University Of Novi Sad
Slovakia	Radovan Vaclav	vaclav.radovan@gmail.com	SOS/BirdLife Slovakia
	Gugh Janó	gugh@vtaky.sk	SOS/BirdLife Slovakia
Slovenia	Gregor Domanjko	gregor.domanjko@goricko.info	Goričko Natural Park
South-Africa	Linda van der Heever,	linda.vdheever@birdlife.org.za	BirdLife South Africa;
Spain	Juan Rodríguez-Ruiz	juanrodruiz@eeza.csic.es	
	Francisco Valera	pvalera@eeza.csic.es	
	Anna Folch	afolch@telefonica.net	
	Ferran Gonzalez	fgprat@gmail.com	
Switzerland	Olivier Biber	o.biber@bluewin.ch	African-Eurasian Migratory Landbirds Action Plan (AEMLAP)
Turkey	Ferdi Akarsu	ferdi.akarsu@gmail.com	
Ukraine	Tetiana Kuzmenko	tatiana.kuzmenko@birdlife.org.ua	Birdlife Ukraine
	Hanna Kuzo	hannakuzyo@gmail.com	

Milestones in the Production of the Plan

Development of the Plan
Draft 1.0 sent to all Contributors and published online: June, 2008
Workshop: 22-24 July 2008, Besenyőtelek, Hungary
Draft 2.0 published online: August 2008
First consultation with Member states: 10th October 2008
Draft 3.0 submitted to EC: 30th November 2008
Second consultation with Member States: 05th December 2008

Revision of the Plan
Workshop At the SAP workshop 22-24 January 2017, held in Kecskemét, Hungary
Draft 1.0 sent on 11.05.2020
Draft 2.0 received by 31.05.2020

Draft 3.0: submitted to EU on 23.09.2020

This Species Action Plan should be reviewed and updated every ten years (first review in 2030). An emergency review will be undertaken if there is a sudden major change liable to affect one of the populations or subspecies.

Recommended Citation

Kiss et al (2020) International Species Action Plan for the European Roller *Coracias garrulus* garrulus (…) p. ISSN (…)

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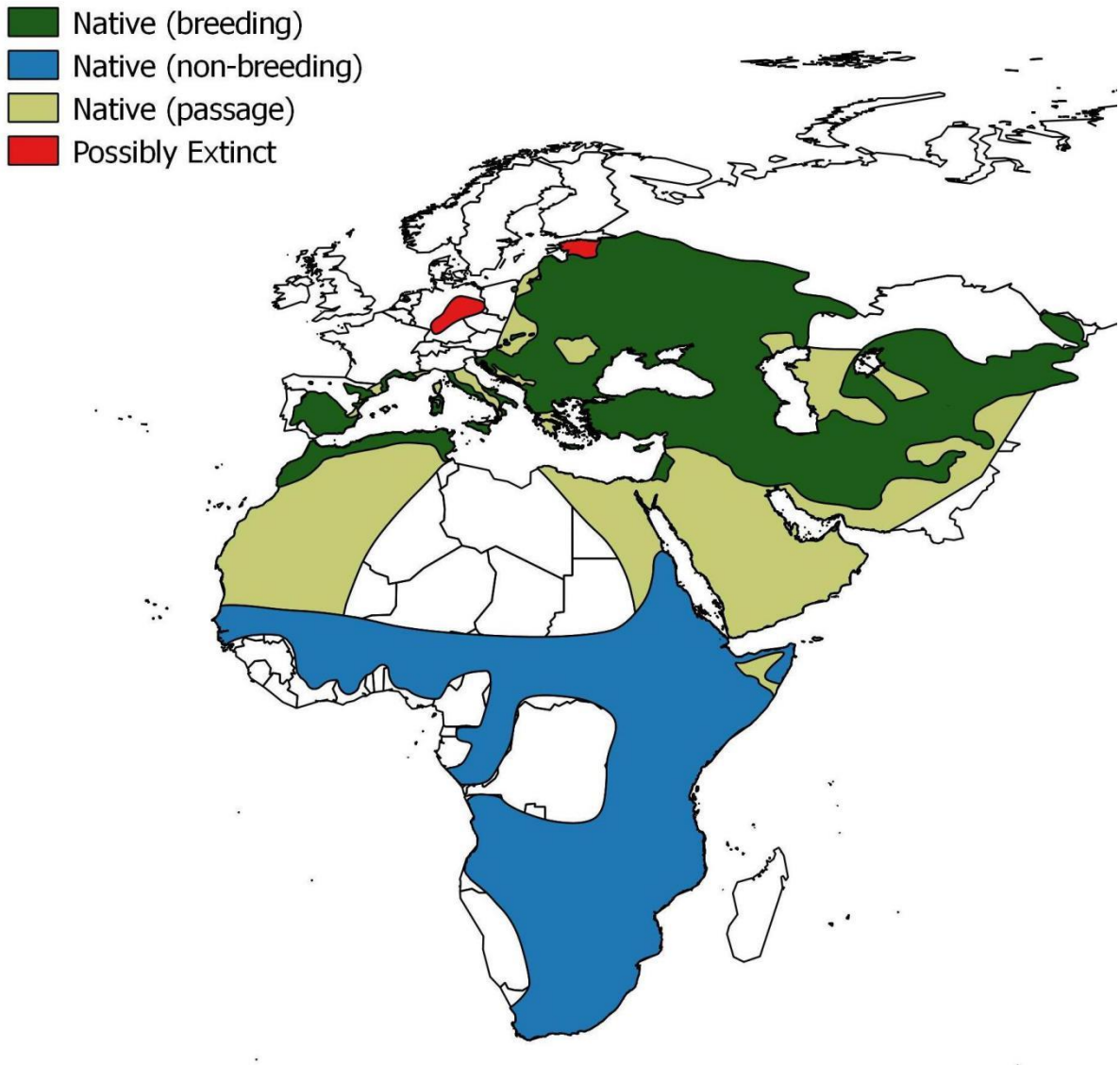
GEOGRAPHICAL SCOPE OF THE ACTION PLAN

This action plan is applicable to the range states of the European Roller *Coracias garrulus* in the European Union (Table 1). However, given the significance of other range states outside the EU but within the geographical borders of Europe, and the conservation problems that affect the European Roller in and beyond that region, the geographical scope of the Action Plan has been extended to include the entire European breeding range of the species (Map 1.).



Map 1. The geographical distribution of the European Roller (data from NatureServe and IUCN *Coracias garrulus* The IUCN Red List of Threatened Species. Version 2020-1. https://www.iucnredlist.org. Downloaded on 14 April 2020.)

Table 1. European range states of the European Roller and the periods when the species is present (EU member states in bold).

Range states	**Breeding**	**Migration**	**Wintering**
Albania	yes	unknown	no
Armenia	yes	unknown	no
Austria	**yes**	**yes**	**no**
Azerbaijan	yes	yes	no
Belarus	yes	yes	no
Bosnia and Herzegovina	unknown	yes	no
Bulgaria	yes	yes	no
Croatia	yes	yes	no
Cyprus	yes	yes	no
Czech Republic	extinct	no	no
Estonia	extinct	no	no
France	yes	yes	no
Georgia	yes	yes	no
Greece	yes	yes	no
Hungary	yes	yes	no
Italy	yes	yes	no
Latvia	yes	yes	no
Lithuania	yes	yes	no
Macedonia	yes	unknown	no
Montenegro	yes	yes	no
Moldova	yes	yes	no
Poland	yes	yes	no
Portugal	yes	yes	no
Romania	yes	yes	no
Russia (European)	yes	unknown	no
Serbia	yes	yes	no
Slovakia	extinct	yes	no
Slovenia	possibly extinct	yes	no
Spain	yes	yes	no
Turkey	yes	yes	no
Ukraine	yes	yes	no

EXECUTIVE SUMMARY

The European Roller *Coracias garrulus* has an unfavourable conservation status and it is classified as Least Concern in Europe and in the EU (BirdLife International 2020). It is classified as SPEC 2. It has undergone moderately rapid declines across its global range but nowadays European Red List of Birds suggests that the population is declining at a less severe rate (BirdLife International 2015). In 2015, the species was downlisted to globally Least Concern and still with a decreasing population trend (IUCN 2020), however population trends shown in this plan may raise concerns about the improving conservation status of the species.

The European Roller is listed in the following international legislation:

- *EU Birds Directive Annex I*
- *Bern Convention Appendix II*
- *Bonn Convention Appendix I*

It has a large global population; including an estimated number of 40,000-81,000 breeding pairs in Europe (40 % of the global breeding range (IUCN 2020) and 14,000-25,000 breeding pairs in the EU 27). Following a moderate decline during 1970-1990, the species has continued to decline by up to 25% across Europe during 1990-2000 (including in key populations in Turkey, Europe and Russia). Overall European declines between 1980-2012 was 30-60% but between 2001-2012 it was moderate (10-15%) (BirdLife International 2015). Compared to the former version of this plan (Kovács et al. 2008), the population declined by 30% between 2008 and 2016 (from 55,000-117,000 breeding pairs to cc. 40,000-80,000 breeding pairs), although large differences were found in population sizes and trends all over the continent. Conservation actions in several countries have been successful and they have contributed to local recoveries. In contrast, it recently experienced severe declines and local extinctions in northern Europe (in Russia it has disappeared from the northern part of its range and it went extinct in Slovakia, the Czech Republic, Slovenia, Estonia), while in Austria, Belarus, Latvia, Lithuania, and Poland the populations are still small and they are declining critically despite large conservation efforts.

The European Roller is restricted to the Palearctic, breeding from north-west Africa and the Iberian Peninsula eastwards through the Mediterranean to the western Himalayas. It spends the non-breeding season in sub-equatorial Africa. The Sahel region was found as an important stopover site for all the populations in Europe, see Flyway Action Plan for the European Roller (Tokody et al. 2017).

The main causes of its widespread decline are considered the loss of suitable breeding and foraging habitats due to changing agricultural practices and the loss of nesting sites, the use of pesticides and sustained persecution along the migration routes (Tokody et al. 2017).

Critical threats affecting the Roller populations in Europe are the increasing habitat homogeneity, insecticide use, conversion of permanent grasslands to other land use, loss of large trees with natural hollows and cavities in small wood formation and riparian forest, in hedges or solitary trees, as a consequence of intensification of forest management, climate change and extreme weather events, and electrocution. For Central Spain, disappearance of *Picus sharpei,* absence of recovery of anthropic forest (*Ulmus sp and Populus sp.*) and extensive sheet and/or cattle farming are critical, also ploughing of grassland and loss of nesting places due to the production of resin from *Pinus pinaster* forest. Massive solar plants and a very low percentage of the roller population within protected areas or Natura 2000 (only 6,25%) are recent threats in many places in Spain (Bolonio *in prep*.) Most population recoveries of rollers in Europe involve nest-box supplementation (e.g. Rodríguez et al. 2011, Václav et al. 2011, Kiss & Tokody 2017, Monti et al. 2019). Whereas this technique is useful at a short term it also raises some concerns since it can decrease the species' future responsiveness to environmental changes and turn it into a conservation-reliant species (Gameiro et al. 2020).

Goal

Objectives of the plan

Objective 1 Clarify the population status and viability of Roller populations in Europe by 2030.

Objective 2 Stop the decline of the European population by 2030 and promote conditions that will help populations to recover to favourable conservation status and will allow for range expansion in Europe.

Results

Result 1.1 Better planned and implemented Roller conservation measures.

Result 1.2 Increased knowledge on the status, distribution and survival of Roller populations.

Result 1.3 Higher level of awareness of key stakeholders achieved.

Result 2.1 Sufficient area of foraging habitat in terms of size and quality available throughout the distribution range.

Result 2.2 Sufficient number of nest-sites available throughout the breeding range.
Result 2.3 Mortality reduced to a level where it is not a limiting factor of population expansion

Most important actions

- Develop national species action plans (where it is still missing).
- Implement existing management and national species action plans.
- Promote habitat heterogeneity through e.g. agro-environmental schemes. Within EU, design country/regional and species specific CAP packages (including subsidies).
- Promote local best-practice agri-environment schemes and habitat management plans.
- Develop monitoring schemes and implement annual monitoring on Roller populations and breeding success (where it is still missing)
- Fill critical knowledge gaps, develop and implement research plans focusing on Roller mortality, survival rates, factors influencing productivity and factors limiting expansion. Promote research on population trends on excavator species (Bee-eaters, Woodpeckers).
- Design and promote best practice agro-environmental and forest-environmental measures targeting Roller (e.g. to ensure that old cavity trees are not cut by forestry operations).
- Raise awareness about the value and conservation status of the Roller among key stakeholders (nature conservation organisations, landowners, farmers, experts on chemical plant protection, foresters, municipalities, electric utilities, urban and infrastructure development planners, general public).
- Promote legal restrictions to prevent the conversion of permanent grasslands to other land use.
- Protect and restore non-productive features such as tracks, ditches, fallow and beetle banks and non-sprayed patches to increase prey availability.
- Identify and ban insecticides and herbicides with adverse effects on Roller populations and its preys in priority areas. Reduce pesticide use; promote low-chemical-input farming.
- Promote international cooperation for the implementation of the „Flyway Action Plan for the European Roller".

– Legally protect under national and/or international (e.g. Natura 2000) legislation the Roller breeding areas

BIOLOGICAL ASSESSMENT

Description

The European Roller is a Jackdaw-sized bird, called “Blue Crow” in several European languages (Fry & Fry 1999). Unmistakable in Europe: the whole head, neck and underparts are uniformly bright light blue while mantle, scapulars and tertials are rufous-brown. The wing covers are violet and light blue and the primary feathers black.

Taxonomy and biogeographic populations

Phylum: Chordata

Class: Aves

Order: Coraciiformes

Family: Coraciidae

Genus: Coracias

Species: *Coracias garrulus* Linnaeus, 1758

The European Roller (*Coracias garrulus*) is a polytypic species with two subspecies: the nominate *C. g. garrulus* breeds from Morocco, south-west and south-central Europe and Asia Minor east through north-west Iran to south-west Siberia (Russia); *C. g. semenowi*, breeds in Iraq and Iran (except northwest where the nominate race occurs) east to Kashmir and north to Turkmenistan, south Kazakhstan and northwest China (West- Xinjiang) (Fry et al. 2019). The present Action Plan applies to the populations of the nominate subspecies *Coracias garrulus garrulus* within the European Union.

Distribution throughout the annual cycle

The Flyway Action Plan for the European Roller (*Coracias garrulus*) (Tokody et al. 2017) (hereafter FAP) has been accepted by the Convention of Migratory Species (CMS) (UNEP/CMS/COP12/Doc.24.1.9) for improving the conservation status of the species during the non-breeding period. This action plan does not intend to modify the goals accepted by CMS, all goals, threats, and actions listed before are considered to be part of this plan. All populations of the European Roller are long-distance migrants. The European Roller migrates singly or in small parties, birds follow each other in a steady stream. Spring migration takes place between March and June, mainly in April/May, while autumn migration is between August (July in Cyprus and Portugal (Saunders 2016)) and November, mainly in

September/October. According to the results of recent migration studies, the European populations use different migration routes, wintering below the rain forest zone mostly from Angola, Namibia to Tanzania (see FAP). Large numbers of European Rollers are also observed in South Africa, including individuals of both subspecies (i.e. C.g. garrulus and C.g. semenowi, whose populations breed more eastward), but none of the tagged birds from Europe has wintered in that region. Therefore we suggest that individuals of the nominate subspecies observed in South Africa originate from the easternmost part of its breeding range. The species winters primarily in dry wooded savannah and bushy plains (BirdLife International 2008). Rodriguez-Ruiz et al. (2019) found that 9.58% of potential suitable wintering areas overlapped with protected areas and suggested different habitat wintering requirements at population level, and therefore highlight the need for population-specific conservation strategies during the nonbreeding period (Rodríguez-Ruiz et al. 2019). Wintering European rollers seem indeed to show a decreasing spatial range in South-Africa (Les G Underhill, African Bird Atlas Project, 2017), but overall monitoring of the wintering population is not available.

Habitat requirements

The European Roller breeds throughout temperate, steppic and Mediterranean zones characterized by reliable warm summer weather. It is typically connected to lowlands, at up to 1000 m in C Europe, 1200 m in S Spain, 2300 m in Morocco and 3100 m in Kyrgyzstan. Accordingly, it occurs in the continental interior avoiding oceanic influence. This species breeds in Europe mainly where annual temperature sum exceeds ca. 1400 degree days above 5°C, coldest month mean temperature is above ca.–10°C, and seasonal moisture deficiency is not extreme (Huntley et al. 2007). Rollers prefer heterogenous landspace (Kiss et al. 2016) with mosaics of grasslands, extensive farmlands and various wooded habitats. Breeding habitat types preferred by the Roller are open forests, old parks, riverine forests, orchards, poplar and willow stands and hedges, and riverbanks. It is a secondary cavity nesting species, it needs natural hollows for breeding. Usually, it uses the old holes of Black Woodpeckers (*Dryocopus martius*) and Green Woodpeckers (*Picus viridis*), Iberian Green Woodpecker (*Picus sharpei)* rarely Grey-headed Woodpeckers (*Picus canus*).

Breeding occurs in oaks (*Quercus sp*.), pines (especially *Pinus sylvestris and Pinus pinaster*) in poplars (*Populus alba, Populus x canadiensis, Populus nigra)* and in *Ulmus minor, Prunus*

dulcis or *Olea europaea* in Spain, less frequently in willows (*Salix sp*.) and in natural cavities of Plane trees (*Platanus orientalis*), mainly 4-10 m up (Fry & Fry 1999, Butler 2001, Poole 2007).

Burrows of European bee-eater (*Merops apiaster*) is also typical e.g. in Spain (Casas-Crivillé & Valera 2005, Valera et al. 2019), and rollers may also nest in sand banks, cliff faces (Valera et al. 2019), buildings (Catry et al. 2011) and, increasingly, artificial nest-boxes. Since the 1980s, artificial nest-boxes have been supplemented in many countries and increased the population size significantly (Aleman & Laurens 2013, Avilés et. al., 1999; Kiss et al. 2014a; Kiss et al. 2017, Ruzic et al. 2017, Václav et al. 2011, Finch et al. 2018, Monti et al. 2019). However, the former distribution area has not been recolonized yet and there are still large suitable areas where conservation measures can be effective (Kiss et al. 2020a). Although nest-box provisioning is a very effective method it has to be implemented carefully (Rodriguez et al. 2011), and the diversity of nesting places should be maintained and proper design is essential (Valera et al. 2019), and it should be considered as only a temporaly solution (Gameiro et al. 2020).

Rollers in France exhibit a strong preference for cavities with a south-westerly or north-westerly aspect (Butler 2001). The species has formerly been described as aggressively territorial, solitarily breeding (Samwald & Štumberger 1997), but it occurs in distinct meta-populations and roller pairs are distributed in clusters within these meta-populations. The presence of conspecifics and other species can play a role in breeding habitat selection (Parejo et al. 2004, Václav et al. 2011, Kiss et al. 2017).

The European roller uses various open habitats for foraging. They mostly use mixed farmland especially pasture, meadows and cereals. Rollers hunt from suitable commanding lookout posts on trees, overhead wires, etc. above bare or sparsely vegetated ground or short vegetation providing little cover for prey. They stoop on prey as the birds move only clumsily for brief distances on the ground (Cramp 1998). The species is extremely polyphagous, feeding on a wide variety of invertebrates and occasionally vertebrates or even fruits. They prey upon hard insects, mainly Coleoptera and Orthoptera followed by Araneae and Hymenoptera (Tidmarsh 2004, Avilés & Parejo 2002, Catry et al. 2018), and also other animals than insects which comprise about 3% of prey: scorpions, millipedes, centipedes, spiders, worms, molluscs, frogs, lizards, snakes, small mammals and birds (Fry & Fry 1999). Diet composition shows slight differences according to geographical regions e.g in Hebda et al. (2019). Catry et al. (2018) found Coleoptera consumption higher during the egg laying period when orthopterans were not abundant. The frequency of small mammals, snakes, and

frogs is lower in the nestling diet, however according to their body size they can have also large contribution to the nestling diet (Avilés & Parejo 2002, Kiss 2014a). Different study methods for diet analysis (pellet, nest-box content, video recording, stable isotope analysis) may lead to different conclusions (Catry et al. 2018, Kiss et al. 2014b). Low prey abundance has been suspected to constitute a crucial threat in the northern part of the range (Finch et al. 2018, Hebda et al. 2019).

Survival and productivity

The species has a monogamous mating system, but social polygyny (Catry & Catry, 2016) and extra-pair paternity or extra-pair maternity were also recorded (Sánchez-Tójar et al., 2015). Participation of a helper in nestling rearing is rare (Avilés & Sánchez, 2000, Bohus 2002). Site and hunting area fidelity was observed (Robel & Bude 1982, Hüe & Rivoire 1947). The generation length of the Roller is about 4 years (Bird et al. 2020). The age of first breeding in captive birds is one year but regular occurrence of non-breeders suggests that most birds in the wild do not breed before their second year (Glutz & Bauer 1980). Scarce available data on nest re-occupation suggest relatively low survival rate of juveniles (Rodríguez-Ruiz et al. 2020). Breeding cycle starts usually in April (March in Cyprus (Saunders 2016)) and June and ends in August with the peak period in mid-June/mid-July. The egg-laying period is between May and July (from April in Cyprus), mainly mid-June to mid-July. Incubation usually lasts about 17-19 days (Fry et. al. 2019), but in Spain it was found on average 21 days (Parejo et al. 2015) or even longer (28-29 days) in France (Guillaumot 2016).The fledging period is 25-30 days (Fry et. al. 2019). The 4 (2-8) eggs are incubated by both parents, but mainly by the female, who starts before the clutch has been completed (Cramp 1998, Avilés et al. 1999, Fry & Fry 1999). The mean clutch size were 3.59 in Poland (Sosnowski & Chmielewski 1996), 3.32-4.27 in Hungary (Kiss et al. 2014a), and 5.07 (Spain, Avilés et al. 1999) The reproductive success (fledging/successful nest) in declining Polish (Sosnowski & Chmielewski 1996) and German (Creutz 1979) populations is between 1 – 1.8 and 1.3-3.3 Austria (Sackl et al. 2004), while in increasing populations in south-west Spain and in France is 3.74 (Avilés et al. 1999) and 4.0 -5.4 respectively (Poole 2007). However, Finch et al (2018) did not find significant difference between Latvia and France, but in Latvia 20% of broods produced no fledglings.

In south-west Spain, Rollers nesting in nest-boxes in open pasture field had the highest breeding success, suggesting that this is the most suitable habitat for Rollers in the region. In

Hungary small mosaic grasslands were also found to be suitable habitats for breeding roller pairs (Kiss et al. 2014a). Agricultural practices around nests negatively affected the breeding success resulting in reduced egg productivity and increased chick mortality, with higher losses in irrigated fields (Avilés & Parejo 2004). In the Northern range countries Pine Marten (*Martes martes*) is an important clutch predator.

Rollers host a wide range of ectoparasite and haemoparasites, some of them reaching high prevalence in a well-studied population in south Spain (Václav et al. 2016, Veiga et al. 2018). Some ecological factors influencing the parasitization rate have been investigated (Veiga et al. 2020) and nest-site type (nest-boxes on trees vs nests on cliffs and human constructions) contributed to explain differences in prevalence and abundance of the various ectoparasite species (Veiga et al. in press), what suggests that more research is necessary to ascertain the most appropriate criteria to place nest boxes. There is no information on the effect of parasites on breeding success and demographic parameters.

Population size and trend

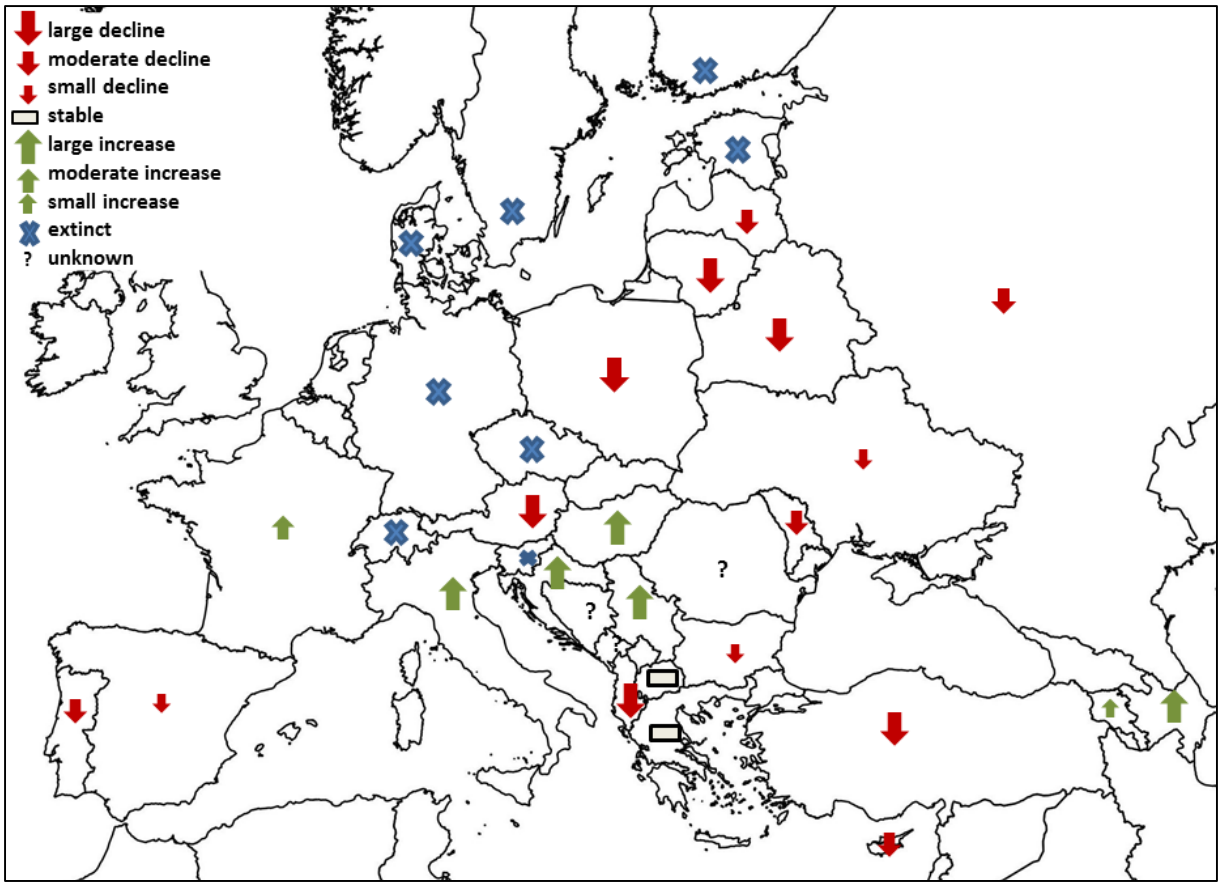
In Europe, Kovács et al. (2008) mentioned an estimated number of 55,000 - 117,000 breeding pairs in Europe (50-74% of the global breeding range), nowadays the breeding population is estimated to 40,057-80,167 breeding pairs and 14093-24550 pairs in EU27 (Table 2). The European population is thought to hold around 40% of the global breeding range, therefore a very approximate estimate of the global population is 200,500-401,000 mature individuals or from other databases 282,000-593,000 individuals (BirdLife International 2020) or 100,000-499,999 (IUCN 2020)

The species has gone extinct in a number of countries in the past century, including Germany, Denmark, Sweden, Switzerland (Snow & Perrins, 1998) and Finland (Avilés et al. 1999), possibly due to habitat loss as a result of agricultural intensification (Snow & Perrins 1998), and in Russia it has now disappeared from the northern part of its range (Cramp 1998) . However, there is no evidence of any declines in Central Asia (R. Ayé *in litt*. 2015 in IUCN 2020). The species in Europe underwent a moderate decline between 1970– 1990. With few exceptions, it continued to decline across most of its European range during 1990–2000 - including key populations in Turkey and Russia (BirdLife International 2004). The overall declines exceeded 30% in three generations (15 years). New data compiled for the 2015 European Red List of Birds suggests that the population is declining at a less severe rate,

decreasing by c. 5-20% over three generations (16.8 years), but the results of the plan show the contrary, the population is still decreasing by a moderate, 29-30% rate over the last 10 years. Many national populations in central and eastern Europe are still declining (BirdLife International 2015) or become extinct (Slovakia) or possibly extinct (Slovenia) and only a few pairs remain in Austria (Nebel et al. 2019). Negative trends are still reported for northern European populations such as Lithuania, Latvia, Poland, and Belarus and in the southern populations such as Portugal. In Spain, significant decline (34%- 80%) was reported from many regions, e.g Tagus Valley, La Mancha, Campo de Montiel, Segovia, and it was claimed for labelling as an Endangered species in a key area (Extremadura) (Bolonio & Valera *in litt*, 2020).

However, some populations such as Croatia (Barišić et al. 2018), France, Hungary, Serbia, and Italy started to increase because of the nest-box provisioning or the improving climatic conditions (Kiss et al. 2020b).

Scarce information is available on the effect of climate change on the European Roller. Catry et al. (2015) found relatively high thermal tolerance in roller nestlings but the predicted increases in the frequency of extreme temperatures can accentuate lethal and sublethal fitness costs for the species. Moreover, both thermal tolerance and the effect of climate change may depend on the type of cavity used by the birds. Amat-Valero et al. (2014) found important differences in microclimatic variables among different nest types that could affect rollers and their parasites. The disappearance of *Picus sharpei* from many areas in Central Spain may be related to climate change, and the old nests of this species are the main nesting substrate of the roller, thus the future of rollers in this area is linked to the future of *Picus sharpei* (Bolonio *in prep*.). The future changes in climate can result in significant changes of the species distribution area (Huntley et al. 2007, Kiss et al. 2020b). According to the modelled climate changes wide suitable areas under current climatic conditions are predicted to become unsuitable in the future significantly impacting large populations such as those from Romania, Spain, Bulgaria, and Hungary. Expansion further north is also predicted, but considering the above mentioned trends in the northern population their ability to colonize new areas is highly questionable. Model predictions have identified the French and Italian as key populations for Roller conservation under future climatic conditions (Kiss et al. 2020b). The roller has recently colonized areas of the Iberian system (in Teruel) above 1.000 meters. These areas were only used until recently as post-breeding feeding areas (Bolonio *in prep*.)



Map 2. Population trends for the 2008 – 2019 period

Table 2. Population size and trend by country

Country	Min population size (2008)	Max population size (2008)	Trend (2008)	Min population size (2016-2019)	Max population size (2016-2019)	Trend (2008-2019)
Albania	10	50	decline	1	3	large decline
Armenia	300	650	stable	400	700	small increase
Austria	**10**	**18**	**stable**	**2**	**2**	**large decline**
Azerbaijan	1000	5000	stable	2000	10000	large increase
Belarus	20	50	large decline	10	20	large decline
Bosnia and Herzegovina	0	0	extinct	0	2	unknown
Bulgaria	**2500**	**5500**	**small increase**	**2500**	**4000**	**small decline**
Croatia	**0**	**5**		**15**	**20**	**large increase**
Cyprus	**2000**	**4000**	**small increase**	**1000**	**3000**	**moderate decline**
Czech Republic	**0**	**0**	**extinct**	**0**	**0**	**extinct**
Denmark	**0**	**0**	**extinct**	**0**	**0**	**extinct**
Estonia	**1**	**5**	**moderate decline**	**0**	**0**	**extinct**
Finland	**0**	**0**	**extinct**	**0**	**0**	**extinct**
France	**800**	**1000**	**moderate increase**	**1143**	**1499**	**moderate increase**
Germany	**0**	**0**	**extinct**	**0**	**0**	**extinct**
Greece	**200**	**300**	**small decline**	**300**	**500**	**stable**
Hungary	**1000**	**1000**	**stable**	**1800**	**2000**	**large increase**
Italy	**300**	**400**	**stable**	**1000**	**1000**	**large increase**
Kosovo				3	7	unknown
Latvia	**20**	**30**	**large decline**	**15**	**20**	**moderate decline**
Lithuania	**35**	**50**	**large decline**	**10**	**15**	**large decline**
Macedonia	300	1000	moderate decline	400	400	stable

Country	Min population size (2008)	Max population size (2008)	Trend (2008)	Min population size (2016-2019	Max population size (2016-2019)	Trend (2008-2019)
Moldova	50	80	large decline	30	60	moderate decline
Montenegro				15	25	
Poland	**60**	**80**	**moderate decline**	**16**	**20**	
Portugal	**80**	**150**	**moderate decline**	**64**	**100**	
Serbia	70	120	small increase	230	270	large increase
Romania	**4600**	**6500**	**small decline?**	**4600**	**6500**	**unknown**
Russian Federation (European)	6000	20000	moderate decline	7000	10000	moderate decline
Slovakia	**1**	**20**	**large decline**	**0**	**0**	**extinct**
Slovenia	**0**	**0**	**possibly extinct**	**0**	**4**	**possibly extinct**
Spain	**2000**	**6000**		**2000**	**6000**	**reported decline**
Sweden	**0**	**0**	**extinct**	**0**	**0**	**extinct**
Turkey	30000	60000	moderate decline	11500	29000	large decline
Ukraine	4000	5000	large decline	4000	5000	reported decline
Total number of breeding pairs	**55357**	**117008**		**40103**	**80225**	
Decrease (%)				**27,6**	**31,5**	**moderate decline**

THREATS

General overview of threats

The loss of suitable foraging habitat due to changing agricultural practices, loss of nest sites, and use of pesticides are considered to be the main causes of recent widespread decline (BirdLife International 2004). Available information about mortality factors such as electrocution does not allow precise modelling of their overall effects on Roller populations.

List of critical threats

The Roller populations in Europe use various breeding and foraging habitats, and also show different regional population trends. To capture these differences, threats were firstly analysed according to regions (South-western Europe (Spain, Portugal, France), Southern Europe, Albania, Italy, Bulgaria, Croatia, Cyprus, Montenegro, Romania-northern part), Central-Eastern Europe (Hungary, Serbia, Romania-southern part, Slovenia), Northern Europe (Belarus, Poland, Latvia, Lithuania; Ukraine) then the results were summarized.

Threat analysis

Impact analysis were used to prioritizing the potential threat according to the followings.
IMPACT/PRIORITY = SCOPE + SEVERITY + TIMING

Table 3. Threat analysis

scores	Scope (% of the population/range/habitat affected)	Severity (how affected is that part of the population)	Timing (when is the threat occurring)
3	Entire population/range/habitat> 90%	Rapid deterioration (crash)	Now
2	Most of the population/range/habitat 50-90%	Moderate deterioration (persistent)	Likely in the short-term (<4 years)
1	Some of the population/range/habitat 10-50%	Slow deterioration (reducing over time)	Likely in the long-term (> 4 years)

8 -9 indicate “Top priority”, 6-7 “High priority” and 3-4-5 “Low priority”

Table 4. List of threats according to impact/priority scores and geographical regions

Threat	Description	North	Central-Eastern Europe	South	South-West	Total
Loss of large trees	The Roller requires large trees, often partially dead. The number of old trees, treelines and small patches is decreasing because of the homogenisation of agricultural landscape and also due to illegal tree logging.	9	9	9	9	36
Increasing habitat homogeneity	The intensification of agriculture is resulting in the creation of large fields and the reduction of the extent of field margins, hedgerows, tracks, ditches and fallow land that represent important habitat for the species' prey and offer nesting opportunity for the Roller.	9	9	9	8	35
Insecticide use (knowledge gap around effects)	The European Roller is highly exposed to the secondary poisoning due to its predominantly insectivorous habit. European agriculture sector use a wide selection of different pesticides whose effects are unknown yet. Poisoning may happen when chemicals are accumulated in the food-chain.	9	9	9	8	35
Conversion of permanent grasslands	The transformation of pastures in other cultures or land uses (e.g. olive groves or in herbaceous monocultures,solar power plants, substitution of extensive sheep farming for semi-intensive cow farming) reduce habitat and food availability.	9	9	8	8	34
Land abandonment/ Reduced management	Roller requires grazed grasslands as tall and dense grass cover reduces its hunting success.	8	8	7.5	6.5	30
Climate change and extreme weather events	The frequency of extreme weather events is increasing due to the climate change. During the breeding season the extreme weather conditions such as high temperature or solid raining, even storms could cause high mortality and decreased reproductive success. The change of the current climatic conditions in the breeding and non-breeding areas, could result in changes of vegetation composition and structure accompanied by the decreased or less available food. It may even cause the disappearance of the excavator species e.g. P. sharpei.	7	7	5	8	27

Threat	Description	North	Central-Eastern Europe	South	South-West	Total
Decreased food availability	The availability of potential prey population could be decreased by unsuitable land management such as overgrazing or land abandonment and also by increased use of agricultural chemicals	9	9		6,5	24,5
Urbanization	The increase of urban areas may result in the decrease of natural or seminatural areas serving as potential feeding or breeding site for rollers.	5	5	7	7	24
Roadkill	Roller's hunting takes places on medium-voltage wires which are often along the roads. Both adult and young birds can fall victim to car-hits.	5	5	6	7	23
Logging of suitable trees	Forest industry nowadays prefers short rotation growing, clearcut harvesting and replanting. European roller prefers old trees with cavities which offer them suitable breeding places. Forestry doesn't serve for cavity-breeder species due to the profit-focused economy.	7	7		9	23
Electrocution	Roller is a well-known species for its perch-hunting behaviour. They used to use trees for hunting but nowadays wires and middle-voltage pylons offer suitable perching sites, which is a strong driver of mortality.	5	5	6	7	23
Intensification of forest management	The intensification of forest practices is promoting the removal of dead/decaying trees (considered a potential source of pathogens and pests) and the replacement with fast growing trees that are not suitable for the species. Extractive procedures of resin in Pinus pinaster in Spain.	5	5	5	7	22

Threat	Description	North	Central-Eastern Europe	South	South-West	Total
Clearing of riverbank forest / riverside forest	The gallery forests usually consist of softwood species e.g. willow and poplar species. These tree species frequently have natural cavities and/or woodpecker hollows providing suitable nest-site for rollers. The clearing of riverbank forest potentially decreases the availability of nest-sites.	4	4	6	7.5	21,5
Natural predation	Prevention of natural predation can be necessary in case of decreasing, small populations.	5	5	5	6	21
Intensification of grassland management	Land-use intensification weakens biodiversity which leads to lack of food-supply.	7	7	6		20
Afforestation of pastures/fallow	The Roller's most important foraging habitats are pastures and fallows. Spontaneous or direct human afforestation lead to loss of habitat.	3	3	6	7	19
Invasive species (hornets)	The potential breeding cavities are suitable for different invasive insects, such as hornet species selecting them resulting in competition.	5	5	7 (France)		17
Disturbance (local)	Disturbance at Roller's nests is an increasing problem because the growing number of amateur nature photographers. This species is a very colourful and highly decorative bird which makes it a popular topic for photographers.	5	5	5		15

Threat	Description	North	Central-Eastern Europe	South	South-West	Total
Loss of old buildings	European rollers' typical breeding places include the abandoned, old farmhouses, mostly in the Mediterranean region of Europe. These facilities are collapsing or getting refurbished for touristic or recreation purposes, which terminates them as Roller breeding places.	0	0	6	9	15
Native soft wood replaced with hard wood or introduced trees	Forest industry focuses on those tree-species which provide profit for them. Hard-wood or introduced tree species do not provide European roller with suitable breeding places.	7	7			14
Human dependence (nest box provision, false abundance)	Conservation of the European roller is based on setting up artificial nestboxes for them throughout Europe. The effectiveness of this method is well-proved but it leads to a high dependence of human activity due to the high number of birds that breed in nestboxes instead of natural breeding places. Nest-box erection without food-ability analysis may happen to lead to higher mortality due to a lack of proper volume and quality of food-supply.	?	7?		7	14
Renewable energy	Advances in technology offer renewable resources but some methods may have an effect on the European roller. Wind farms have negative impact on breeding and migrating birds with evidenced collisions. Solar farms can decrase feeding places for them.			6,5	7	13,5

Threat	Description	North	Central-Eastern Europe	South	South-West	Total
Nest site competition	The secondary cavity-breeder species have limited possibilities to breed which lead to competition between similar sized birds such as Jackdaws, Lesser Kestrel and Little Owl	3		5	3	11
Natural predation	Natural predation by different animals as martens or snakes. European roller doesn't have a second breeding period so predation leads to loss of clutch.	5	5			10
Illegal killing, trapping, trade	Rollers suffer legal or illegal shooting through their migration pathway from the Mediterranean region to the wintering places. European roller is an attractive bird which makes this bird species very desired for private collectors.	5	5			10
Loss of sand cliffs	Disturbance and/or destruction may cause the loss of this nesting site.				7	7
Loss of excavating species	The European roller is a secondary cavity nesting species therefore it highly relies on the excavator species such as European Bee-eater and large woodpecker species.				7	7
Parasites	Lack of knowledge about the effect of internal or external parasites on rollers.				4	4

POLICIES AND LEGISLATION RELEVANT FOR MANAGEMENT

International policies, legislation

Bern Convention - Convention on the Conservation of European Wildlife and Natural Habitats

Category: Appendix II
Aim: To maintain populations of wild flora and fauna with particular emphasis on endangered and vulnerable species, including migratory species.
Appendix II: lists strictly protected fauna species.

EU Birds Directive – Council Directive on the conservation of wild birds (79/409/EEC)

Category: Annex I
Aim: to protect wild birds and their habitats, e.g. through the designation of Special Protection Areas (SPAs).
Annex I: The directive requires that species listed in Annex I 'shall be subject of special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution ' and that 'Member States shall classify in particular the most suitable territories in number and size as special protection areas for the conservation of these species, taking into account their protection requirements in the geographical sea and land area where this Directive applies '.

Bonn Convention - Convention on the Conservation of Migratory Species of Wild Animals

Category: Appendix I
Aim: To conserve terrestrial, marine and avian migratory species throughout their range.
Appendix I comprises migratory species that have been assessed as being in danger of extinction throughout all or a significant portion of their range. The Conference of the Parties has further interpreted the term "endangered" as meaning "facing a very high risk of extinction in the wild in the near future" (Res. 11.33 paragraph 1). Res. 11.33 also defines a general correspondence between the term 'endangered' as defined within CMS and the IUCN Red List Criteria (Version 3.1).

Parties that are a Range State to a migratory species listed in Appendix I shall endeavour to strictly protect them by: prohibiting the taking of such species, with very restricted scope for exceptions; conserving and where appropriate restoring their habitats; preventing, removing or mitigating obstacles to their migration and controlling other factors that might endanger them.

Table 5. International legislation

Global status	European status	SPEC category	LIFE Priority birds	EU Birds Directive Annex	Bern Convention Appendix	Bonn Convention Appendix
LC	Declining	2	Yes	I	II	III

National policies, legislation

The European Roller is a protected species throughout most of its distribution range (Annex 3) provides an overview of the protection status in Europe). The species is listed in Annex I of the Birds Directive and is protected in all EU countries. The inclusion of the species' breeding territories in protected areas varies considerably between countries. Where the species has small populations and is concentrated, it has been well covered by SPAs. Over 50% of the national populations are in SPAs in Hungary, Lithuania, Portugal and Latvia. Only a quarter of the Polish population is captured by the SPA network and the percentage is only 10% in Spain. IBAs cover over half of the Serbian population, but most of them are not legally protected.

Recent conservation activities

Since the former version of this plan, all countries with existing roller population have installed and maintained artificial nest-boxes for the species (Table 11). In many countries international grants were gained for conservation and research of the European Roller such as Rufford grant in Belarus and Serbia, and EU's LIFE+ Nature Grant in Cyprus, France, Spain, Hungary, Romania and Slovakia. (http: // ec. europa.eu/environmant/life/project/Projects. Altogether 10 projects.

Species action plans have been developed in Austria, Belarus, Croatia, Hungary and Latvia.

Most range countries have monitoring programmes in place at different scales (national, regional, local) (Table 12).

Framework for actions

Goal

To restore the European population of the Roller to a favourable conservation status.
The target for favourable conservation status of the Roller in the EU is to:
- maintain a population larger than 15,000 breeding pairs;
- restore the area of the distribution to 1990 levels (cf. EBCC Atlas of European Breeding Birds, Hagemejer & Blair, 1997);
In the short term, halt the decline of the species. In the long term - maintain overall stable population trend for at least 3 generations (15 years).

Objectives of the plan

Objective 1 Clarify the population status and viability of Roller populations in Europe by 2030.
Objective 2 Stop the decline of the European population by 2030 and promote conditions that will help populations to recover to favourable conservation status and will allow for range expansion in Europe.

Results

Result 1.1 Better planned and implemented Roller conservation measures.
Result 1.2 Increased knowledge on the status, distribution and survival of Roller populations.
Result 1.3 Higher level of awareness of key stakeholders achieved.
Result 2.1 Sufficient foraging habitat is available throughout the distribution range in terms of size and quality.
Result 2.2 Sufficient number of nest-sites is available throughout the breeding distribution.
Result 2.3 reduced mortality to a level where it is not a limiting factor of population expansion

Table 6. Actions corresponding to the results and the main objectives.

Objective 1. Clarify the population status and viability of Roller populations in Europe by 2030.				
Results	**Actions**	**Overall priority level**	**Time scale**	**Responsible organization**
1.1 Better planned and implemented Roller conservation measures	1.1.1. Implement existing management and national species action plans	Critical	Short	Ministries of Environment, National nature conservation authorities and NGOs.
	1.1.2. Catalogue/mark important structures	High	Medium	Ministries of Environment, National nature conservation authorities, and NGOs.
	1.1.3.Promote certification schemes for products from well-managed sites	High	Medium	Ministries of Environment, National nature conservation authorities.
	1.1.4. Promote landscape level Roller measurements, compile concept of Roller friendly landscape and include into ecological network.	Critical	Short	Ministries of Environment, National nature conservation authorities.
	1.1.5. Prepare (local) best-practice agri-environmental schemes	Critical	Medium	Ministries of Environment, National nature conservation authorities.

	1.1.6. Prepare (local) best-practice habitat management plans	High	Medium	Ministries of Environment, National nature conservation authorities.
	1.1.7. Develop national species action plans (where it is missing)	Critical	Medium	Ministries of Environment, National nature conservation authorities and NGOs.
	1.1.8. Legally protect under national and/or international (e.g. Natura 2000) legislation the Roller breeding areas	Critical	Medium	Ministries of Environment, National nature conservation authorities and NGOs.
1.2 Increased knowledge on the status, distribution, survival and effective conservation measures for Roller populations.	1.2.1. Promote research to understand optimal Roller habitat (for each country). Design and promote best practice agro-environmental measures targeting Roller.	High	Medium	Ministries of Environment, National nature conservation authorities.
	1.2.2. Promote research to understand the effect of climate change on European Rollers	High	Long	Universities, Researchers, Scientific Institutes and NGO's
	1.2.3. Analyse Roller carcasses to investigate secondary poisoning and reveal sub-lethal effects, direct/indirect effects of existing and new pesticides on Roller and their prey. Identify poisoning chemicals and promote their restriction/banning in Roller priority areas.	Medium	Medium	Universities, Researchers, Scientific Institutes and NGO's
	1.2.4. Promote research on population trends of excavating species (Bee-eaters, Woodpeckers)	Critical	Long	Universities, Researchers, Scientific Institutes and NGO's

	1.2.5. Promote research on temporal and spatial dynamics of key prey species in different habitats	Medium	Long	Universities, Researchers, Scientific Institutes and NGO's
	1.2.6. Test effectiveness of 'substrate' supplementation (manure, sawdust, wood piles, grazing livestock)	Medium	Long	Universities, Researchers, Scientific Institutes and NGO's
	1.2.7. Research to establish dominance hierarchy in nest-site competition. Develop best practice guide for nest box placement, design and maintenance to reduce nest site competition with other species and natural predation.	Low	Long	Universities, Researchers, Scientific Institutes and NGO's
	1.2.8. Study lethal and sub-lethal effects, parasite loads in different nest types & habitats	Low	Long	Universities, Researchers, Scientific Institutes and NGO's
	1.2.9. Develop monitoring schemes and implement annual monitoring on Roller populations and breeding success.	Critical	Short	Ministries of Environment, National nature conservation authorities and NGOs.
	1.2.10. Fill critical knowledge gaps, develop and implement research plans focusing on Roller mortality, survival rates, factors influencing productivity and factors limiting expansion.	High	Medium	Universities, Researchers, Scientific Institutes and NGO's
	1.2.11. Design and promote best practice forestry measures targeting Roller.	Critical	Medium	Ministries of Environment, National nature conservation authorities and NGOs.

1.3 Higher level of awareness of key stakeholders achieved.	1.3.1. Promote knowledge exchange across all levels as part of any major project	High	Long	Universities, Researchers, Scientific Institutes and NGO's
	1.3.2. Raise the awareness about the value and conservation status of the Roller among key stakeholders (nature conservation organisations, landowners, farmers, experts on chemical plant protection, foresters, municipalities, electric utilities, urban and infrastructure development planners, general public).	High	Medium	Ministries of Environment, National nature conservation authorities and NGOs.
	1.3.4. Promote ecotourism. Provide infrastructure for low disturbance photography (e.g. hides) where practical.	Low	Long	Ministries of Environment, National nature conservation authorities and NGOs.
	1.3.5. Market mechanism for the Roller friendly products. Promote certification schemes	Medium	Long	Ministries of Environment, National nature conservation authorities and NGOs.
	1.3.6. Raise awareness about impact of disturbance – administration, local community, photographers; produce best practice guidelines & code of conduct for photographers	Medium	Long	Ministries of Environment, National nature conservation authorities and NGOs.
	1.3.7. Design, implement, advise farmers on availability of funding incentives (AES; Natura 2000) to protect	High	Medium	Ministries of Environment, National nature conservation authorities and NGOs.

Objective 2. Stop the decline of the European population by 2030 and promote conditions which will help populations and range expansion in Europe				
2.1 Sufficient foraging habitat is available throughout the distribution range in terms of size and quality.	2.1.1. Promote wildlife friendly farming	High	Short	Ministries of Environment, National nature conservation authorities and NGOs.
	2.1.2. Eradicate subsidies for intensive farming	High	Long	Ministries of Environment, National nature conservation authorities and NGOs.
	2.1.3. Promote habitat heterogeneity through e.g. agroenvironmental schemes. Within EU, Design country/regional and species specific CAP packages (including subsidies).	High	Long	Ministries of Environment, National nature conservation authorities
	2.1.4. Enforce current laws to preserve rollers' habitats and promote legal restrictions to prevent the conversion of permanent grasslands to other land use.	High	Medium	Ministries of Environment, National nature conservation authorities
	2.1.5. Restore converted grasslands and non-productive features.	High	Medium	Ministries of Environment, National nature conservation authorities
	1.1.6. Research to understand optimal Roller habitat (for each country). Compile concept of Roller friendly landscape.	High	Medium	Universities, Researchers, Scientific Institutes and NGO's

	2.1.7. Promote precision farming	High	Medium	Ministries of Environment, National nature conservation authorities and NGOs.
	2.1.8. Support organic farming using Roller as flagship species.	Medium	Long	Ministries of Environment, National nature conservation authorities and NGOs.
	2.1.9. Identify and ban insecticides and herbicides with adverse effects on Roller populations in priority areas. Reduce pesticide use, promote low-chemical in put farming.	Medium	Long	Ministries of Environment, National nature conservation authorities
	2.1.10. Ensure that Roller breeding areas are taken into account during urban development planning.	Medium	Long	Ministries of Environment, National nature conservation authorities
	2.1.11. Maintain habitat diversity. Protect non-productive features such as tracks, ditches, fallow and beetle banks and non-sprayed patches to increase prey availability.	Medium	Long	Ministries of Environment, National nature conservation authorities
	2.1.12. Leave clear-cuts near Roller territories unplanted to naturally regenerate (to maintain open areas for foraging)	Medium	Long	Ministries of Environment, National nature conservation authorities
	2.1.13.In protected forests, encourage maintenance of open areas near Roller territories, through controlled burning or cutting	Medium	Long	Ministries of Environment, National nature conservation authorities

	2.1.14. Provide natural and artificial perches for hunting in areas where they are missing.	Medium	Long	Ministries of Environment, National nature conservation authorities
	2.1.15. Promoting optimal level of grazing ensuring high food abundance for Rollers. Prevent overgrazing and land abandonment.	Medium	Medium	Ministries of Environment, National nature conservation authorities
	2.1.16. Prevent afforestation of permanent grasslands.	High	Medium	Ministries of Environment, National nature conservation authorities
2.2. Sufficient number of nest-sites is available throughout the breeding distribution.	2.2.1. Preserve nest-site diversity and promote natural nest site availability for Rollers	High	Medium	Universities, Researchers, Scientific Institutes and NGO's
	2.2.2. Test insulation properties of natural tree cavities, and consider maintaining / creating them	Low	Long	Universities, Researchers, Scientific Institutes and NGO's
	2.2.3. Develop project or incentives to plant trees for long term sustainability/replacement of Roller nest-sites	Medium	Long	Ministries of Environment, National nature conservation authorities and NGOs.
	2.2.4. Preserve suitable/used ruins and abandoned buildings and manage for Rollers (and other species) through agreement/contract between NGOs and land owners (stakeholders)	Low	Long	Ministries of Environment, National nature conservation authorities and NGOs.

	2.2.5. Establish funding through AES for providing and maintaining nest-sites	Medium		Ministries of Environment, National nature conservation authorities and NGOs.
	2.2.6. Create best practice guideline for sensitive restoration of old buildings	Medium	Medium	Ministries of Environment, Nationalnature conservation authorities.
	2.2.7. Design management actions to promote/protect excavator species	Medium	Medium	NGO,s
	2.2.8. Protect natural nest holes, ensure that old cavity trees are not cut by forestry operations.	High	Medium	Ministries of Environment, National nature conservation authorities
	2.2.9. Organise roller conservation groups to support long-term maintenance of existing nest box schemes – repair & replace for sustainable provision	High	Short	NGO's
	2.2.10. Design, install nest boxes with greatest longevity and which are most ¨future-proof¨ e.g. to reduce over-heating. Develop best practice guidelines about design and installation	High	Short	NGO's

	2.2.11. Ensure clear recognition that nest boxes are temporary solution and discuss policy and management recommendations accordingly.	High	Medium	Ministries of Environment, National nature conservation authorities
	2.2.12. Promote diversity of nest site options so as not to ¨fix¨ specialisation on nest boxes	Medium	Medium	Universities, Researchers, Scientific Institutes and NGO's
	2.2.13. Build inventory and protection strategy for existing sand cliff breeding sites	Medium	Medium	Ministries of Environment, National nature conservation authorities
	2.2.14.Develop guidelines to restore sand cliffs	Medium	Medium	Ministries of Environment, National nature conservation authorities
	2.2.15. Promote planting of native soft woods and the elimination of introduced tree species in Roller distribution areas through forestry planning and site management plans.	High	Medium	Ministries of Environment, National nature conservation authorities
	2.2.16. Design nest boxes and surrounds to prevent access (manipulation of natural sites if possible)	Medium	Medium	Ministries of Environment, National nature conservation authorities and NGOs.
	2.2.17. Provide piles of dead wood and sawdust in (forest) Roller territories and encourage foresters to leave deadwood standing to ensure feeding sites for excavator species	Medium	Medium	NGO's

2.3. Reduced mortality to a level where it is not a limiting factor of population expansion.	2.3.1. Law enforcement and policies to prevent illegal killing (outside of EU)	High	Medium	Ministries of Environment, National nature conservation authorities and NGOs.
	2.3.2. Reveal indirect effects of wind, solar, other energy production systems – installations to be subject of thorough and correct EIA	High	Short	Universities, Researchers, Scientific Institutes and power-supply companies
	2.3.3. Control predators if invasive, alien species	Medium	Medium	Ministries of Environment, National nature conservation authorities
	2.3.4. Produce best-practice guide for predator-safe nest-boxes (e.g. Austrian metal plate design, correct hole size, plastic around tree trunk)	Medium	Medium	Ministries of Environment, National nature conservation authorities
	2.3.5. Nest box construction/design to reduce risk of over-heating	Medium	Medium	Universities, Researchers, Scientific Institutes and NGO's
	2.3.6. Equip wires, powerlines with existing devices to avoid collisions (direct impact)	Medium	Long	Ministries of Environment, National nature conservation authorities and power-supply companies
	2.3.7. Promote bird friendly electric pylon design. Replace, modify or retrofit power lines to prevent Roller electrocution.	Medium	Long	Ministries of Environment, National nature conservation authorities and power-supply companies

	2.3.8. Promote bird friendly wind turbines (direct impact)	Medium	Long	Ministries of Environment, National nature conservation authorities, NGO'sand power-supply companies
	2.3.9. Create sensitivity maps for electrocution	High	Medium	Ministries of Environment, National nature conservation authorities and power-supply companies
	2.3.10. Introduce temporary speed limit restrictions where it is necessary.	Low	Long	Ministries of Environment, National nature conservation authorities
	2.3.11. Introduce ¨guarding regime¨ to reduce disturbance during key breeding period.	Low	Long	Ministries of Environment, National nature conservation authorities
	2.3.12. Use supplementary feeding during spells of bad weather	Low	Long	NGO's

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ANNEX 1. MOST IMPORTANT SITES FOR THE EUROPEAN ROLLER.

Table 7. Most important sites for the Roller in the European Union and their SPA status

Country	IBA Code	Site name	Area (km2)	SPA Code	Name of SPA	Area (km2)
Austria	AT043	Südoststeirisches Hügelland	108.64	AT2230000	Teile des südoststeirischen Hügellandes inklusive Höll und Grabenlandbäche	156.67
Bulgaria	BG009	Zlatiata	434.93	BG0002009	Zlatiata	434.95
	BG062	Ludogorie	913.86	BG0002062	Ludogorie	913.88
	BG074	Nikopolsko plato	222.60	BG0002074	Nikopolsko Plateau	222.62
	BG096	Obnova	54.22	BG0002096	Obnova	54.24
France	FR224	Gorges du Gardon	195.84	FR9110081	Gorges du Gardon	70.11
				FR9112031	Camp des Garigues	20.85
	FR225	Hautes garrigues du Montpellierais	907.06	FR9112004	Hautes garrigues du ontpellierais	455.35
				FR9112011	Gorges de la vis et cirque de Navacelles	202.75
				FR9112012	Gorges de Rieutord, Fage et Cagnasse	122.81
	FR229	Etangs de Vendres, Pissevache et Lespignan	48.66	FR9110080	Montagne de la Clape	90.14
				FR9110108	Basse plaine de l'Aude	48.39
	FR234	Petite Camargue fluvio- lacustre	193.84	FR9112001	Camargue gardoise fluvio-lacustre	57.12
				FR9112013	Petite camargue laguno-marine	156.46
				FR9112017	Etang de mauguio	74.06
				FR9310019	Camargue	1,137.57
	FR239	Camargue	762.58	FR9310019	Camargue	1,137.57
	FR240	Crau	441.57	FR9310064	Crau	392.27
				FR9312001	Marais entre Crau et	72.10

					Grand Rhône	
				FR9312013	Les Alpilles	269.34
	FR245	Marais entre Crau et Grand Rhône: Meyranne, Chanoine, Plan de Bourg et Salins du Caban				
			56.58	FR9310064	Crau	392.27
				FR9312001	Marais entre Crau et Grand Rhône	72.10
		Plateau de l'Arbois, garrigues de Lancon et chaîne des Côtes	347.23	FR9310069	Garrigues de Lançon et Chaînes alentour	273.95
	FR250					
				FR9312009	Plateau de l'Arbois	42.99
	FR251	Plaine des Maures	75.91	FR9310110	Plaine des Maures	45.22
Hungary	HU021	Jászkarajenő környéki puszták	80.67	HUDI10004	Jászkarajenõi puszták	105.38
	HU026	Alsó-Tisza-völgy	294.84	HUKN10007	Alsó-Tisza-völgy	357.32
	HU036	Hevesi-sík	639.66	HUBN10004	Hevesi-sík	774.79
				HUHN10002	Hortobágy	1,207.98
	HU037	Borsodi-Mezőség	390.18	HUBN10002	Borsodi-sík	370.45
	(blank)	Kolon-tó	345.03	HUKN10002	Kolon-tó	357.53
	(blank)	Balástya–Szatymaz környéki homokvidék		HUKN10008	Balástya–Szatymaz környéki homokvidék	617,18
	(blank)	Abonyi-kaszálóerdő		HUDI10001	Abonyi-kaszálóerdő	418.95
	(blank)	Bihar		HUHN10003	Bihar	71 610.23
	(blank)	Csongrád-bokrosi Sóstó		HUKN30001	Csongrád-bokrosi Sóstó	714.15
	(blank)	Felső-kiskunsági szikes puszták és turjánvidék		HUKN10001	Felső-kiskunsági szikes puszták és turjánvidék	15 776.02
	(blank)	Gátéri Fehér-tó		HUKN30002	Gátéri Fehér-tó	852.78
	HU32	Hortobágy		HUHN10002	Hortobágy	136 300
	(blank)	Jászság		HUHN10005	Jászság	20 131.13
	(blank)	Kesznyéten		HUBN10005	Kesznyéten	6 352.96
	(blank)	Kiskunsági szikes tavak		HUKN10002	Kiskunsági szikes tavak és az őrjegi turjánvidék	35 722.19

	(blank)	Cserebökényi-puszták		HUKM10005	Cserebökényi-puszták	280,74
	(blank)	Kígyósi-puszta		HUKM10001	Kígyósi-puszta	8 771.93
	(blank)	Hódmezővásárhely környéki és csanádi-háti puszták		HUKM10004	Hódmezővásárhely környéki és csanádi-háti puszták	21832.54
Italy	IT117	Litorale Romano	338.30	IT6030026	Lago di Traiano	0.62
				IT6030084	Castel Porziano (Tenuta presidenziale)	60.38
	IT125	Fiume Biferno	448.42	IT7228230	Lago di Guadalfiera - Foce del Fiume Biferno	287.44
	IT126	Monti della Daunia	746.10	IT7222108	Calanchi Succida - Tappino	2.28
				IT7222124	Vallone S. Maria	19.74
				IT7222248	Lago di Occhito	24.57
				IT7222253	Bosco Ficarola	7.17
				IT7222265	Torrente Tona	3.94
				IT7222267	Località Fantina - Fiume Fortore	3.65
	IT149	Marchesato e Fiume Neto	702.06	IT9320302	Marchesato e Fiume Neto	702.15
		Gargano Promontory and Capitanata Wetlands				
	IT203		312.73	IT9110037	Laghi di Lesina e Varano	152.09
				IT9110038	Paludi presso il Golfo di Manfredonia	144.43
				IT9110039	Promontorio del Gargano	700.57
			2,059.08	IT9110037	Laghi di Lesina e Varano	152.09
				IT9110038	Paludi presso il Golfo di Manfredonia	144.43
				IT9110039	Promontorio del Gargano	700.57
	(blank)	Lago di Bracciano e Monti della Tolfa	906.11	IT6030005	Comprensorio Tolfetano-Cerite-Manziate	698.36
				IT6030085	Comprensorio Bracciano-Martignano	195.45

Lithuania	LT032	Aukstaitijos nacionalinis parkas	368.27	LTIGNB003	Vakarine Aukstaitijos nacionalinio parko dalis	350.06
				LTSVEB002	Labanoro giria	532.03
	LT034	Dzukijos miskai	585.39	LTVAR0009	Cepkeliu pelke	127.56
				LTVARB002	Cepkeliu pelke	112.25
				LTVARB005	Dainavos giria	558.67
				LTVARB007	Grybaulios zuvininkystes tvenkiniai	7.43
Poland	PL038	Puszcza Napiwodzko-Ramucka	1,064.34	PLB280007	Puszcza Napiwodzko-Ramucka	1,167.30
	PL053	Dolina Omulwi	345.38	PLB140005	Doliny Omulwi i P³odownicy	344.14
				PLB140014	DOLINA DOLNEJ NARWI	259.23
				PLB280007	Puszcza Napiwodzko-Ramucka	1,167.30
	PL057	Dolina Dolnego Bugu	698.20	PLB140001	Dolina Dolnego Bugu	743.21
				PLB140002	Dolina Liwca	274.40
				PLB140007	Puszcza Bia³a	838.37
Portugal	PT008	Serra da Malcata	163.43	PTZPE0007	Serra da Malcata	163.56
		Serra de Penha Garcia e Campina de Toulões			Canchos de Ramiro y Ladronera	
	PT012		156.79	ES0000434		230.83
				ES4320001	Canchos de Ramiro	69.23
	PT029	Castro Verde	835.72	PTZPE0046	Castro Verde	790.59
				PTZPE0047	Vale do Guadiana	765.72
	PT051	Serra do Caldeirão	711.62	PTCON0037	Monchique	760.01
				PTCON0057	Caldeirão	472.83
Slovenia		Doli Slovenskih goric	49.57	SI5000004	Slovenske gorice - doli	49.45
Spain	ES142	Secanos de Lérida	937.53	ES0000321	Anglesola-Vilagrassa	8.56
				ES0000322	Granyena	66.46
				ES5130014	Aiguabarreig Segre-Noguera Pallaresa	101.13
				ES5130016	Valls del Sió-Llobregós	266.30
				ES5130021	Secans de la Noguera	89.58
				ES5130025	Bellmunt-Almenara	34.64
				ES5130032	Vessants de la Noguera Ribagorçana	65.22

			ES5130036	Plans de Sió	52.90
			ES5130037	Secans de Belianes-Preixana	19.24
	Cogul-Alfés	186.27	ES0000021	Secans de Mas de Melons-Alfés	64.22
			ES5130038	Secans del Segrià i Utxesa	37.90
ES144	Monte El Valle y Sierras de Altaona y Escalona	236.26	ES0000269	Monte el valle y Sierras de Altahona y Escalona	148.23
ES168	Saladares del Guadalentín	64.41	ES0000268	Saladares del Guadalentin	30.12
ES175	Sierra de Pela-Embalse de Orellana-Zorita	1,434.65	ES0000068	Embalse de Orellana y Sierra de Pela	425.97
ES284			ES0000333	Llanos de Zorita y Embalse de Sierra Brava	187.76
			ES0000367	La Serena y sierras periféricas	1,534.65
			ES0000400	Arrozales de Palazuelo y Guadalperales	131.24
			ES0000401	Colonias de Cernicalo Primilla de Acedera	0.00
				Vegas del Ruecas, Cubilar y Moheda alta	
			ES0000408		142.07
	Llanos entre Cáceres y Trujillo-Aldea del Cano	1,062.29	ES0000071	Llanos de Cáceres y Sierra de Fuentes	695.84
ES295			ES0000356	Riberos del Almonte	82.72
			ES0000416	Embalse de Aldea del Cano	1.09
			ES0000422	Colonias de Cernicalo Primilla de la ciudad monumental de Caceres	0.16
			ES0000425	Magasca	108.41

TOTAL			**20,926.82**			**28,167.74**

Table 8. Most important sites for the Roller in non-EU countries and their protection status

Country	International and national name	Area (ha)	Population		Year	Season	Accuracy	Protected areas name	% area protected
			Min	Max					
Serbia	Gornje Podunavlje (eng. Gornje Podunavlje) IBA: / RS001 and North West Backa (Severozapadna Bačka)	22.617 ha + 15000ha	10	15	2019	B	Good	Gornje Podunavlje Special Nature Reserve	0,2
	Subotička jezera i pustare (eng. Subotica Lakes and Sands) IBA:/ RS002	25923 ha	70	80	2019	B	Good	Subotica Sands Landscape of Outstanding Values; Ludaš Lake Special Nature Reserve; Seleveljske Pustare Special Nature Reserve, Kamaraš Nature Park	50%
	Pašnjaci velike droplje (eng. Great Bustard Pastures) Size of the IBA. /RS011, and North Banat (Severni Banat)	20522 ha + 20000ha	40	50	2019	B	Good	Great Bustard Pastures	50%
	Slano Kopovo (eng. Slano Kopovo) IBA: /RS012	9344 ha	13	15	2019	B	Good	Slano Kopovo Special Nature Reserve	30%

	Middle Banat Okanj and Rusanda) IBA: RS038 Carska Bara) IBA: RS013 Tamiš Floodplain	65,000 ha	60	70	2019	B	good	Carska Bara Special nature Reserve, Rusanda Nature Park	30%
	South Banat 8. Vršačke planine (eng. Vršac Mountains). IBA: RS015 9. Deliblatska Peščara (eng. Deliblato Sands) IBA: RS016	80.000 ha	12	15	2019	B	good	Deliblatska Peščara Special Nature, Vršački Breg Landscape of Outstanding Values	0,3
	Middle Bačka Jegrička (eng. Jegrička) IBA: / RS004	30.000ha	15	20	2019	B	good	Jegrička Nature Park	0,1
	Vajdaság teljes területe beleértve a föntieket is	216400 km2	280	310	2019	B	good		
	Negotinska Krajina	30.000ha	15	20	2019	B	Medium		
	Timok Valey	5.000ha	3	5	2019		Medium		
	Barajevo	10	4	5	2019	B	Medium		
Turkey	Akdağ- Denizli	126,946	4	?	1995- 2005	B	Good (O)	No protection status	74,624 ha protected
	Allahuekber dağları	295,968	5	?	1995- 2005	B	Good (O)	National Park	No protected area

	Amanos dağları	372,779	Present	?	1995-2005	B	Poor	Nature Protection Site, Wildlife Protection Area	
	Armutlu Yarımadası	80,038	Present	?	1995-2005	B	Poor	No protection status	30,128 ha protected
	Batı Menteşe Dağları	142,222	Present	?	1995-2005	B	Poor	Archaeological and Natural SİT	No protected area
	Beydağları	191,178	Present	?	1995-2005	B	Poor	Natural SİT	823 ha protected
	Boz dağlar	236,126	Present	?	1995-2005	B	Poor	Natural SİT	35,615 ha protected
	Bozova	164,743	Present	?	1995-2005	B	Poor	No protection status	5,819 ha protected
	Çaldıran ovası	38,556	Present	?	1995-2005	B	Poor	No protection status	No protected area
	Çanakkale boğazı	110,294	Present	?	1995-2005	B	Poor	National Park	No protected area
	Çankırı Jipsli Tepeler	125,052	Present	?	1995-2005	B	Poor	No protection status	23686 ha protected

	Çoruh vadisi	63,765	10	?	1995-2005	B, M	Good (O)	Wildlife Protection Area	No protected area
	Datça ve Bozburun Yarımadaları	247,684	Present	?	1995-2005	B	Poor	National Park, Specially Protected Area, Wildlife Protection Area, Natural and archaeological SİT	12834 ha protected
	Dicle vadisi	135,548	Present	?	1995-2005	B, M	Poor	Archaeological SİT	200.181 ha protected
	Dönemeç Deltası	9,224	2	?	1995-2005	B	Poor	No protection status	No protected area
	Ekşisu Sazlığı	2,372	3	5	1995-2005	B	Good (O)	Archaeological SİT	No protected area
	Ermenek vadisi	139,820	Present	?	1995-2005	B	Poor	Wildlife Protection Area	

	Foça yarımadası	25,411	Present	?	1995-2005	B	Poor	Specially Protected Area, Natural and Archaeological SİT	No protected area
	Gediz Deltası	26,165	Present	?	1995-2005	M	Poor	Ramsar Site, Natural and Archaeological SİT	2,656 ha protected
	Geyik dağları	251,601	Present	?	1995-2005	B	Poor	Wildlife Protection Area	?
	Göksu Deltası	21,752	Present	?	1995-2005	B, M	Poor	Specially Protected Area, Natural SİT, Ramsar Site	7,614 ha protected
	Göreme tepeleri	6,871	Present	?	1995-2005	B	Poor	National Park	?
	Güllük Deltası	24,280	15	20	1995-2005	B, M	Poor	Specially Protected Area	6,422 ha protected
	Güney Van Gölü Kıyıları ve Alacabük Dağı	44,850	4	?	1995-2005	B	Poor	Archaeological SİT	?
	Hafik Zara Tepeleri	103,032	Present	?	1995-2005	B	Poor	No protection status	?

	Hodulbaba dağı	79,589	Present	?	1995-2005	B	Poor	Wildlife Protection Area	No protected area
	Iğdır ovası	65,173	Present	?	1995-2005	B, M	Poor	No protection status	51,244 ha protected
	Karakaya barajı	9,351	Present	?	1995-2005	B	Poor	No protection status	362 ha protected
	Kaz Dağları	160,161	Present	?	1995-2005	B	Poor	National Park, Nature Protection Site	No protected area
	Kazan tepeleri	43,943	Present	?	1995-2005	B	Poor	No protection status	21,178 ha protected
	Kastabala Vadisi	9,145	10	?	1995-2005	B	Poor	No protection status	No protected area
	ızılırmak Deltası	31,327	40	50	1995-2005	B, M	Good (O	Ramsar Site, Wildlife Protection Site, Natural SİT	1,466 ha protected
	Kirmir Vadisi	37,142	5	1995-2005	B, M	Poor	Archaeological and Natural SİT	Category III: Natural Monument	
	Manyas Gölü	21,821	10	12	1995-2005	B	Good (O)	National Park, Ramsar Site, Natural SİT	?

	Mardin Dağları	287,162	Present	1995-2005	B	Poor	No protection status	?	
	Marmara adaları	102,875	Present	1995-2005	B	Poor	Natural SİT	Category III: Natural Monument	
	Hasan Dağı	199,181	Present	1995-2005	B	Poor	Specially Protected Area	Category V: Protected Landscape/Seascape	
	Mersin tepeleri	46,185	Present	1995-2005	B	Poor	No protection status	?	
	Munzur Dağları	585,044	Present	1995-2005	B	Poor	National Park & Wildlife Protection Area	Category II: National Park & Category IV: Habitat / Species Management Area	
	Nallıhan Tepeleri	82,667	4	1995-2005	B	Good (O)	No protection status	?	
	Nemrut Dağı	108,331	Present	1995-2005	B	Poor	National Park, Archaeological SİT	Category III: Natural Monument	

	Olur-oltu Bozkırları	104,907	Present	1995-2005	B	Poor	No protection status	?	
	Sarıyar Barajı	31,754	Present	1995-2005	B	Poor	Wildlife Protection Area	Category IV: Habitat / Species Management Area	
	Saros körfezi	41,735	Present	?	1995-2005	B	Poor	Natural SİT	
	Tanin Tanin Dağları	183,854	Present	?	1995-2005	B	Poor	No protection status	No protected area
	Tendürek Dağı	90,680	Present	?	1995-2005	B	Poor	No protection status	No protected area
	Tohma vadisi	79,704	Present	?	1995-2005	B	Poor	Natural SİT	No protected area
	Uluabat Gölü	24,623	Present	?	1995-2005	B	Poor	Ramsar Site	No protected area
	Van ovası	102,960	Present	?	1995-2005	B	Poor	No protection status	19,900 ha protected
	Yılanlıkale tepesi	9642	Present	?	1995-2005	B	Poor	No protection status	No protected area

ANNEX 2. NATIONAL LEGAL STATUS

Table 9. Overview of goals and actions from the last ISAP (2008) that are now considered complete or improved

Country	Goals with achievements since 2008
Albania	-
Austria	Development of national SAP Protection of priority areas (NAT2000) Site Management Plans Monitoring schemes Filling knowledge gaps Best practice Agro-Environmental measures Awareness raising
Belarus	Development national SAP. Protection priority areas Site management plans for Roller priority areas or include Roller conservation measures in existing ones Monitoring schemes Filling critical knowledge gaps Best practice forestry measures Develop best practice guide for nest box placement Raise the awareness about the value and conservation status of the Roller Ensure that state, regional and local nature conservation agencies are aware of Roller priority areas Ensure that old cavity trees are not cut by forestry operations. Install nest boxes including in areas with healthy populations but with likely shortage of nest sites.

Bosnia and Herzegovina	-
Bulgaria	Legally protect under national and/or international (e.g. Natura 2000) legislation the priority areas; Define priority areas for Roller conservation; Promote habitat heterogeneity through e.g. agro environmental schemes; (partly); Promote legal restrictions to prevent the conversion of permanent grasslands to other land use; (partly); Promote grazing livestock practices and hay mowing on meadows and grasslands by increasing the economic viability of livestock farming in high priority Roller areas through agro-environmental schemes or other rural development measures; (in some IBAs). Ensure that cross-compliance requirements are strictly adhered to; especially avoid afforestation of pastures and other permanent grasslands; (partly) Ensure that old cavity trees are not cut by forestry operations; (at initial stage) Conserve riverbank trees and riparian forests as protected habitat types and features of the landscape; (at initial stage) Install nest boxes including in areas with healthy populations but with likely shortage of nest sites. (at initial stage)

Croatia	Develop national species action plans – announced Legally protect under national and/or international (e.g. Natura 2000) legislation the priority areas – completed. Monitoring schemes and implement annual monitoring on Roller populations and breeding success – partly achieved. Define priority areas for Roller conservation – partly achieved. Ensure that state, regional and local nature conservation agencies are aware of Roller priority areas – partly achieved. Protect and restore non-productive features to increase prey availability – partly achieved. Mapping of hedges and suitable trees is achieved in the part of the breeding area. Install nest boxes including in areas with healthy populations but with likely shortage of nest sites – partly achieved. Prosision of alternative nest sites (nest boxes) near old buildings
Cyprus	Monitoring schemes and implement annual monitoring on Roller populations and breeding success
France	Increase of monoculture Cultivation of fallow land Increased availability of perches for hunting
Hungary	Develop national species action plans Install nest boxes including in areas with healthy populations but with likely shortage of nest sites. Monitoring schemes. Awareness raising Protect and restore non-productive features to increase prey availability Mapping of suitable trees is achieved in the part of the breeding area

Italy	Clarification the population status and viability of Roller populations The decline of Italian population is stopped Better planned and implemented Roller conservation measures. Increased knowledge on the status, distribution and survival of Roller populations. Higher level of awareness of key stakeholders achieved. Sufficient foraging habitat is available throughout the distribution range in terms of size and quality. Sufficient number of nest-sites is available throughout the breeding distribution. Reduced mortality to a level where it is not a limiting factor of population expansion.
Latvia	n.a.
Lithuania	n.a.
Montenegro	-
Poland	Problem of shortage of breeding sites where addressed and solved by mass introduction of nest boxes

Portugal	Site management plans for Roller priority areas or include Roller conservation measures in existing ones; Monitoring schemes and implement annual monitoring on Roller populations and breeding success Fill critical knowledge gaps, develop and implement research plans focusing on Roller mortality, survival rates, factors influencing productivity and factors limiting expansion Design and promote best practice agro-environmental measures targeting Roller Develop best practice guide for nest box placement, design and maintenance to reduce nest site competition with other species and natural predation. Raise the awareness about the value and conservation status of the Roller among key stakeholders Provide alternative nest sites (nest boxes) near old buildings with nests to avoid nest-site destruction. Promote international cooperation for the study of Roller movements and the threats along flyways.
Romania	Management Plans in place in many SPA's relevant for Roller since 2015 Several new SPA's designated from 2008
Serbia	Install nest boxes including in areas with healthy populations but with likely shortage of nest sites. Monitoring schemes. Awareness raising
Slovenia	
Spain	
Turkey	n.a.
Ukraine	Install nest boxes including in areas with healthy populations but with likely shortage of nest sites.

TABLE 10. Overview of the coverage of the species in networks of sites with legal protection status.

	Percentage of national population included in IBAs	**Percentage of population included in SPAs**	**Percentage of population included in areas protected under national law**
Austria	100	100	1000
Bulgaria	20	12	<25-30%
Croatia		95%	95%
Cyprus	37%	70%	
France	50-60	30-50	5-10
Hungary	65-70	70-75	50-90
Italy			<20%
Latvia	40-80%	30-65%	30-65%
Lithuania	More than half	More than half	More than half
Montenegro			More than half
Poland	0	%	0
Portugal	More than half	50% (57-89%)	More than half
Romania			20%
Serbia	More than half	n.a.	25%
Spain	<10%	<10%	<10%
Ukraine			n.a
Turkey	Unknown	n.a.	<10%

ANNEX 3. KNOWLEDGE GAPS AND MONITORING

Table 11. Knowledge gaps regarding Roller conservation

Methods	**Importance**	**Likely cost**
Methods		
Population-size estimation methods	H	L
Monitoring methods for estimating trends	C	L
Survival, mortality and health status		
Health status, parasitism (induced by climate change?)	L	H
Poisoning effects on adults and breeding success	H	H
Survival rates	H	H
Habitat use and selection		
Habitat (breeding and foraging) selection and preference (optimal foraging sites)	C	H
Bio-indicator potential	M	H
Social behaviour and density dependent breeding habitat selection, congregation of breeding sites	H	H
Impact of threats		
Impact of climate change on populations	H	M
Monitoring of electrocution on power lines	M	M
Secondary poisoning	H	H
Impact of public policies (esp CAP) on Roller status	C	H
Migration and wintering grounds (see FAP)		
Migration pattern, time and routes	H	H
Wintering grounds of Western and Eastern	H	H

subpopulations		
Factors (e.g. pesticide use) affecting the survival during migration and wintering	H	H
Population ecology		
Genetic structure and fragmentation (gene flow between subpopulations)	H	H
Dispersal mechanism of species	H	H
Population Viability Analyses	M	C
Identification and assessment of conservation measures		
Design and evaluation of agri-environmental measures	C	H
Effects of nest box distribution pattern and design	M	L
Status of Roller populations		
Population size	H	H
Trend	H	L
Distribution	L	L

Table 12. Ongoing monitoring schemes for the species

Country	Is there a national survey / monitoring programme?
Austria	Yes, annual nest-box monitoring progammes.
Belarus	Yes, monitoring known nesting sites and urvey potential habitat of species
Bosnia and Herzegovina	Roller breeding was not confirmed yet.
Bulgaria	Partially, standard CBM scheme methods and checking known nest locations during the monitoring of some IBAs.
Croatia	Yes, monitoring of known nesting sites and suveys in potentional nesting habitats.
Cyprus	Yes, species-specific monitoring program, CBM scheme methods and nest-box monitoring
France	National census protocol was developed in 2015, and nest-box monitoring program.
Hungary	Yes, annual nest-box monitoring. No species specific: CBM scheme methods and Breeding Bird Atlas scheme
Italy	Monitoring of population distribution and local nest-box monitoring programmes.
Latvia	Yes, annual nest-box monitoring progamme.
Lithuania	Regular monitoring of the breeding population and monitoring in the former breeding sites.
Montenegro	Monitoring programmes at the Ulcinj Salina (IBA), where 80% of population is nesting.
Poland	Yes, annual monitoring.

Portugal	Yes, annual monitoring.
Romania	No specific and countrywide monitoring scheme is in place regarding the Roller breeding population. Population monitoring only in Western Romania.
Serbia	Yes, annual nest-box monitoring progamme.
Spain	Annual monitorig programmes are done in Almería, Catalonia, Hoya de Guadix-Baza, Guadix (Granada), Extremadura, and Murcia.
Ukraine	Local nest-box monitoring programmes in Rivnenskiy Nature Reserve
Turkey	No.