

Review

An update of the European breeding population sizes and trends of the Ortolan Bunting (*Emberiza hortulana*)

Frédéric Jiguet*, Raphaël Arlettaz, Hans-Günther Bauer, Viktor Belik, José Luis Copete, Laurent Couzi, Michel Alexandre Czajkowski, Svein Dale, Valery Dombrovski, Jaanus Elts, Yves Ferrand, Régis Hargues, Guy M. Kirwan, Simonas Minkevicius, Markus Piha, Gunnar Selstam, Michał Skierczyński, Jean-Philippe Sibley & Aleksandr Sokolov

*F. Jiguet, Centre d'Ecologie et des Sciences de la Conservation, UMR7204 Sorbonne Universités-MNHN-CNRS-UPMC, CP 135, 43 Rue Buffon, 75005 Paris, France. * Corresponding author's email: fjiguet@mnhn.fr*

R. Arlettaz, Division of Conservation Biology, Institute of Ecology and Evolution, University of Bern, Baltzerstrasse 6, CH-3012 Bern, Switzerland; and Swiss Ornithological Institute, Valais Field Station, Rue du Rhône 11, 1950 Sion, Switzerland

H.-G. Bauer, MPIO, Vogelwarte Radolfzell, Am Obstberg 1, D-78315 Radolfzell, Germany

V. Belik, Southern Federal University, Dept. of Zoology, 344006, Rostov-on-Don, Bolshaja Sadovaja 105, Russia

J.L. Copete, Handbook of the Birds of the World-Alive, Lynx Edicions, Montseny 8, E-08193 Bellaterra, Barcelona, Spain

L. Couzi, Ligue pour la Protection des Oiseaux Aquitaine, 33140, 429 Chemin de Leysotte, 33140 Villenave-d'Ornon, France

M.A. Czajkowski, OMPO, 59 rue Ampère, 75017 Paris, France

S. Dale, Norwegian University of Life Sciences, Dept of Ecology and Natural Resource Management, PO Box 5003, NO-1432 Ås, Norway

V. Dombrovski, National Academy of Sciences, ul. Akademichnaya 27, 220072 Minsk, Belarus

J. Elts, Estonian Ornithological Society, Veski 4, 51005 Tartu, Estonia; Department of Zoology, Institute of Ecology and Earth Sciences, University of Tartu, 46 Vanemuise St., 51014 Tartu, Estonia

Y. Ferrand, ONCFS, CNERA Avifaune migratrice, 39 Bd Albert Einstein, CS 42355, 44 323 Nantes Cedex 3, France

R. Hargues, Fédération Départementale des Chasseurs des Landes, 111 Chemin de l'Herté, 40465 Pontonx-sur-l'Adour, France

G.M. Kirwan, Research Associate, Field Museum of Natural History, 1400 South Lakeshore Drive, Chicago, IL 60605, USA

S. Minkevicius, Pajautos st. 11-40, LT 06203, Vilnius, Lithuania

M. Piha, Finnish Museum of Natural History – Luomus, P.O.Box 17 (Pohjoinen Rautatiekatu 13), FI-00014 University of Helsinki, Finland

G. Selstam, Dept of Molecular Biology, Faculty of Medicine, University of Umeå, Sweden

M. Skierczyński, Department of Behavioural Ecology, Adam Mickiewicz University, Poznan, Poland

J.-P. Sibley, Service du Patrimoine Naturel, Muséum national d'Histoire naturelle, CP41, 36 rue Geoffroy Saint-Hilaire, 75005 Paris, France

A. Sokolov, Belogorie State Nature Reserve, per Monastyrskij dom 3, p Borisovka 309342, Borisovskij r-n, Belgorod Region, Russia

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Following recent updates proposed by BirdLife International and further updates across Europe gathered in the context of a continent-wide study of the migration strategy of the species, we propose here an update of national population sizes and associated recent trends of the Ortolan Bunting (*Emberiza hortulana*). Previous estimates for the period 1999–2002 reported 5,200,000 to 16,000,000 breeding pairs, for an area extending east to European Russia, and south to the Caucasus and Turkey. The countries holding the largest populations were Turkey (3–10 million pairs) and Russia (1.5–5.0 million pairs). The updated results give approximately 3,319,000 to 7,057,000 pairs in Europe (for the period 2012–2014), representing a c. 50% decrease in numbers over the last decade. This decrease is partly due to overestimates proposed in previous reports for the key country, Turkey, which is now considered to support only 500,000 to 1,000,000 pairs. Russia still holds 2.0–4.3 million pairs, although with an estimated decline of c. 15–30% since 2000. Overall, within the 39 European countries assessed here, recent decadal trends (on average 2000–2012) in population size are reported as unknown in 15 countries, increasing in 2 countries (Germany and Serbia), stable or fluctuating in 6 countries, and decreasing in 16 countries including recent extinctions in Belgium, Hungary, Slovakia and the Netherlands. Overall, declining populations are mostly located in northern Europe, and fourteen of the 15 northern European countries with a known national trend have declining breeding populations, suggesting that northern breeders are of particular conservation concern.



1. Introduction

The intensification of agricultural practices across Europe is considered to be the major recent driver of bird population declines in farmland habitats (Donald *et al.* 2001). Loss of habitat heterogeneity and field margins, conversion of grassland to crops and widespread use of fertilizers, herbicides and pesticides have caused massive declines in food abundance and diversity, including seeds and invertebrates, for breeding birds (Vickery *et al.* 2001). In this context, the Ortolan Bunting (*Emberiza hortulana*) has suffered a major population decline across Europe in recent decades

(Goławski & Dombrowski 2002, Revaz *et al.* 2005, Vepsäläinen *et al.* 2005, Dale 2009, Menz & Arlettaz 2012). As it is a long-distance passerine migrant, population trends might also be influenced by potential pressures or changes in migration stopover and wintering areas (see Selstam *et al.* 2015).

A first step before trying to understand the potential causes of population declines is to quantify the losses. Here we propose an update of estimated national breeding population sizes, based on recent literature and extensive field work conducted in the context of a continent-wide study of the species' migration strategy.

2. Methods

2.1. Previous reference estimates

Baselines for this update are the numbers published by BirdLife International (2004), for the 39 countries listed in Table 1. According to this reference, the European breeding population was estimated to number 5,200,000–16,000,000 breeding pairs, for an area extending east to European Russia, and south to the Caucasus and Turkey. These numbers generally refer to population sizes estimated during the period 1999–2002. Countries holding the largest populations were reported to be Turkey (3–10 million pairs) and Russia (1.5–5.0 million pairs).

2.2. Updated estimates

To propose updated national population sizes for the 39 countries, we used three sources of information. The first one is the official reporting made by EU Member States under Article 12 of the Birds Directive (hereafter Art. 12), available on the website of the European Topic Centre on Biological Diversity (ETC-BD, 2015). The second source comes from ornithological experts participating in a continent-wide research program studying the migration strategy of the species, and their knowledge of national Ortolan Bunting populations, all of whom are co-authors of this paper.

The third one concerned non-EU countries, with recent estimates gathered by BirdLife International (2015) to prepare the recent update of the European Red List of Birds, a project funded by the European Commission. Population changes between the two periods reported in Table 1 were reprinted from BirdLife International 2015, except for Belarus as the updated information here reveals a different trend.

3. Results and discussion

3.1. National population sizes and trends

Table 1 presents an overview of the national population sizes as published by BirdLife International in 2004 (Birds in Europe) and the update by the ex-

perts co-authoring the present paper. We further discuss below the numbers and trends reported in Table 1 for countries for which we propose new data explaining and/or updating the figures published in BirdLife International (2015). Some of these countries have published national Red List status for the species (see IUCN 2012), which is reported here when available.

Belarus

Previous strongholds of the species in the south-east were visited in spring 2014 to locate singing males, and remnant populations were only found in the radio-contaminated exclusion area near Chernobyl. The total population is estimated to number at most between 1,000 and 3,000 males, which represents a decline of c. 34% in 12 years. BirdLife International (2015) reported 2,500 to 4,000 pairs in 2012.

Estonia

Only 200–400 pairs reported in 2014, a 90% decrease since BirdLife International (2004). A prime example of the magnitude of the decline comes from Lahemaa National Park, believed to be one of the strongholds of the species in Estonia, where c. 130 pairs bred at the end of the 1990s, but only 4 singing males were recorded during a thorough inventory in 2014 (data from the Estonian Ornithological Society). Art. 12 reporting mentioned 300–500 pairs in 2008–2012 (Elts *et al.* 2013, BirdLife International 2015).

Finland

There were 9,400 to 25,000 pairs in 2006–2012, a period which does not overlap with the estimates obtained from 1998–2002, thereby representing a decline of c. 60% in c. 10 years. The population estimate in 2014 is, however, updated here to 7,000–19,000 pairs based on the steep and steadily continuing decline of c. 13% per year (Väisänen & Lehikoinen 2013). The rate of decrease is derived from the national line transect and point count data. These monitoring data suggest a national decline of 78% from 2004 to 2014, which is quite similar to the decline observed in adjacent Estonia, but involves here a larger population. Since the start of the national breeding survey, the species has lost 98% of its breeding numbers in 31 years (Väisänen & Lehikoinen 2013). The species is

Table 1. National breeding population sizes of the Oortolan Bunting across Europe. The trend is the recent trend taken from BirdLife International (2015). The countries are categorized into northern and southern Europe.

Country	Birds in Europe (2004)	Year	Update 2014	Year	Trend	Northern/Southern
Albania	1,000–2,000	2002	1,000–2,000	2012	→	S
Andorra	4–10	2001	No new data	–	?	–
Armenia	15,000–30,000	2002	15,000–30,000	2012	?	–
Austria	15–25	2002	4–10	2012		N
Azerbaijan	20,000–100,000	2000	No new data	–	?	–
Belarus	2,500–4,000	2002	1,000–3,000	2014		N
Belgium	0	2000	0	2012	–	–
Bosnia & HG	?	–	1,500–2,000	2012	?	–
Bulgaria	25,000–50,000	2002	34,000–150,000	2012	F	S
Croatia	1,000–5,000	2002	3,500–6,000	2010	?	–
Czech Republic	100–200	2000	80–160	2012		N
Estonia	2,000–4,000	1998	200–400	2014		N
Finland	30,000–50,000	2002	7,000–19,000	2014		N
France	10,000–40,000	2002	5,000–8,000	2012		N
Georgia	present	–	–	–	?	–
Germany	5,600–7,000	1999	10,500–16,000	2009	↑	N
Greece	20,000–50,000	2000	20,000–50,000	2012	→	S
Hungary	10–15	2002	0	2012		S
Italy	4,000–16,000	2003	4,000–16,000	2012	?	–
Kosovo	500–1,000	2003	350–700	2014	?	–
Latvia	500–2,000	2000	144–7744	2004	?	–
Lithuania	200–800	2001	60–100	2012		N
Macedonia	3,000–10,000	2000	3,000–10,000	2012	?	–
Moldova	4,500–5,000	2000	2,000–3,000	2010	F	S
Montenegro	400–800	2003	400–800	2012	?	–
Netherlands	0–5	2000	0	2011		N
Norway	150–155	2002	20	2014		N
Poland	150,000–300,000	2002	197,000–298,000	2012		N
Portugal	500–2,500	2002	1,000–5,000	2012	?	–
Romania	125,000–255,000	2002	225,000–550,000	2013	?	–
Russia	1,500,000–5,000,000	2000	2,000,000–4,300,000	2013		N
Serbia	3,500–4,500	2003	26,000–42,000	2014	↑	S
Slovakia	0–5	1999	0	2012	?	–
Slovenia	200–300	2000	20–34	2012		S
Spain	200,000–225,000	1992	180,500–365,000	2012		S
Sweden	2,000–7,000	2000	2 600–5,000	2012		N
Switzerland	100–150	2002	0–1	2014		N
Turkey	3,000,000–10,000,000	2001	500,000–1,000,000	2014	→	S
Ukraine	58,000–67,000	2000	No new data	–		N
EUROPE	5,184,779–16,219,465	2004	3,318,882–7,056,959	2014	–	–

listed as Endangered on the Finnish national Red List (Rassi *et al.* 2010, Tiainen *et al.* 2016).

France

Recent analyses of the national breeding bird atlas (2009–2012) data provided an estimate of 5,000 to 8,000 pairs, distributed mainly in the south, a c.

68% decline compared to the estimate published in 2002 (10,000–40,000 pairs). Concomitantly, the national breeding bird survey reported a 50% decline for the period 2001–2014 (Jiguët *et al.* 2016). The numbers provided for Art. 12 reporting were overestimated because they were based on an extrapolation of only part of the final semi-quantita-

tive data collected during atlas work (2009–2012), whereas the final estimates of national population sizes were computed in 2014 (Issa & Muller 2015). So, contrary to BirdLife International (2015), the attested recent decrease can be considered as large (> 50%) and not moderate (20–49%), with the result that the species is now listed as Endangered on the French national Red List (IUCN France and MNHN in prep.).

Germany

Recent estimates imply a population increase, but it has been suggested that the previous reported estimates were much too low (Dürr & Ryslavý 2009). The current estimates are based on a much larger sample size and improved knowledge gained during field surveys for the recent breeding bird atlas (Gedeon *et al.* 2014). As to trends, there are also contradictory elements, as the species is still increasing in its current German strongholds (for example in eastern Lower Saxony), also due to conservation efforts, whereas in other areas numbers are decreasing. This might explain the stable trend found by the national breeding bird survey, and the stable long-term trend reported for Germany by BirdLife International (2015). In 2007, the set-aside scheme of the EU was abandoned in Germany; until then the Ortolan Bunting had benefited from improved habitat structure in suitable sandy habitats, but also from the tilling of grasslands in mosaic landscapes and from other conservation actions. In most parts of Germany, the species shows clear declines and even area losses. At the distribution edges, the set-aside scheme has not had the same positive effects on the species, and numbers have been continually declining. Finally, even if a positive population trend in the species' German stronghold is evident, there is a sex bias towards males indicating that reproduction is reduced (Gedeon *et al.* 2014), which is a clear sign of a species with fragmented, "unhealthy" populations (Dale 2001).

Norway

Norwegian counts represent males. The number of males was 152 in 2002 and 20 in 2014, representing a 87% decline. For pairs (so considering females), the trend is a decline of 88% (82 in 2002 to probably 10 females in 2014). BirdLife (2004) reported 150–155 pairs in 2002 but these figures are

in fact related to the number of males. The species is listed as Critically Endangered on the Norwegian national Red List (Kålås *et al.* 2015).

Poland

Despite the previous upper and lower values of the population size estimate being not dissimilar to the current one (see Table 1), the population is known to have declined by 20% during the first decade of the 2000s (Kosicki & Chylarecki 2012), hence the negative trend reported for that country.

Russia

BirdLife International (2004) reported 1.5–5.0 million pairs in European Russia as a whole in 2000. In the Rostov region in the late 1990s, the Ortolan Bunting was recorded in 48 of 54 surveyed 50×50 km squares. It was nesting in 25 squares, and probably nesting in another 22 squares. The number of pairs was estimated at 10,000–100,000 for 32 squares, at 1,000–10,000 pairs for 12 squares (Belik 2000). Subsequently, in southern Russia, numbers have decreased in the Stavropol (*vide* Lyubov Malovichko), Rostov and Voronezh regions. Numbers have remained stable in Belogorie reserve in the Belgorod region, but this population is confined to steppe with shrubs and trees that represents less than 1% of the region. In northern Russia, the species colonized the Karelian Isthmus and areas to the southeast (Leningrad, Vologda, Kostroma, Nizhny Novgorod to Perm) during 1930–1950, but started to decline in the early 1980s. It has since almost disappeared as a breeder and migrant in the Karelia and Leningrad regions (*vide* N.V. Lapshin, G.A. Noskov & T.A. Rymkevich). It has become rare or threatened elsewhere, perhaps even in the greater Moscow region where small numbers are sporadic. The Ortolan Bunting is classified in categories 2–4 in the Red List of threatened birds in Eastern Fennoscandia (1998) and in most parts of the northwestern and central Russia: Ryazan (2001), Leningrad, Tula and Tver (2002), Yaroslavl (2004), Vologda and Kaluga (2006), Moscow (2008), Kostroma (2009), Kaliningrad (2010), Vladimir, etc. (*vide* V. V. Romanov).

Overall in southern Russia, from Rostov and Volgograd southwards to Dagestan, the current breeding population is estimated at 1–3 million pairs, representing a decline of 10–20% in the last

ten years. The population in the rest of European Russia was estimated at 1.0–1.3 million pairs in 2012, localized in a southern belt of steppe habitats ranging from Belgorod to Orenburg. In this area, the species is considered in decline too. Therefore, a total of 2.0–4.3 million pairs are estimated to breed in Russia, but largely located in southern districts. Alexander Mischenko, Viktor Belik and other Russian colleagues (BirdLife International 2015) estimate that the number of Ortolan Buntings breeding in European Russia has decreased by 15–30% since 2000.

Serbia, Montenegro and Kosovo

BirdLife International (2004) reported 4,500–6,500 pairs for the former ‘Serbia’, which now comprises three countries, for which separate estimates for 2004 have been calculated (Puzović *et al.* 2003). Using data for the period 1998–2003, the population size could be divided into 500–1,000 pairs in Kosovo, 400–800 pairs in Montenegro and 3,500–4,500 pairs in Serbia. Recent estimates for 2014 amount to 350–700 pairs in Kosovo, 400–800 pairs in Montenegro, and 26,000–42,000 pairs in Serbia. In this context, it is difficult to infer population trends, as former estimates were certainly underestimates, although the Bird Protection and Study Society of Serbia (in litt. to BirdLife International) reported a recent increase in breeding numbers (by c. 10%), probably due to a reduction in agricultural land use and associated pressures.

Spain

The population is now considered to comprise 180,500–365,000 pairs and the species is reported to have colonized many post-fire Mediterranean areas, although overall a slight decrease was reported (–13% for 1998–2012; BirdLife International 2015), even if the population indices reveals strong fluctuations (see http://www.magrama.gob.es/es/biodiversidad/temas/inventarios-nacionales/escribano_hortelano_tcm7-219856.pdf). Trends can vary regionally, and in Catalonia, the SOCC (Seguiment d’Ocells Comuns a Catalunya) reports an overall decrease of –54% from 2002 to 2014 (<http://www.sioc.cat/fitxa.php?sci=0&sp=EMBHOR>).

Sweden

Recent estimates give 2,600–5,000 (probably 4,000) pairs in 2012, i.e. within the range of the previous estimate of 2,000–7,000 pairs (in 2000), although the species is considered to have declined nationally by c. 38% (for results of the Swedish national breeding bird survey see <http://www.fageltaxering.lu.se/node/35785>). The occupied range in Sweden has decreased every year since 2000. The species is listed as Vulnerable on the national Red List (ArtDatabanken 2015).

Switzerland

A lone singing male was detected in spring 2014, and again intermittently in 2015. As the national population was estimated at 100 to 150 pairs in 2002, the species is listed as Critically Endangered on the Swiss national Red List (Keller *et al.* 2010).

Turkey

BirdLife International (2004) reported 3–10 million pairs in Turkey in 2001, which represented c. 60% of the total European population. In an earlier review, Tucker & Heath (1994) reported even wider limits of 1–10 million pairs, based on discussion with observers active in the country in the late 1980s/early 1990s. Kirwan *et al.* (2008) reported that the species is a widespread and common summer visitor, with apparently stable populations, mainly breeding in uplands between 750 m and 2,600 m (exceptionally 3,300 m in the extreme east), more locally at lower altitudes in western and northern coastal regions. The species is completely absent as a breeder from large parts of central and western Turkey, and is local in Thrace (European Turkey). In some suitable areas, its altitudinal range can be much more restricted. For example on Uludağ, in western Turkey, the species is a common breeder between 300 and 1,200 m, but does not occur at higher elevations (Jetz 1995). Unfortunately, both qualitative and quantitative data on the species’ density in Turkey are still extremely scarce, especially at sites within the core range. The largest and most robust dataset (still lacking in density information) that we possess is for south-east Anatolia, an area of 75,358 km², or almost 10% of the Turkish landmass. Here, bird surveys were conducted in 657 squares, or 81.5% of the region, in 2001–2003 (Welch 2004). The survey recorded Ortolan Bunting in 52 of the

657 squares, widely scattered across the region, or 7.9% of all surveyed localities. However, breeding was not confirmed in any squares and was considered to be probable in just 17 squares, or c. 2.5% of all surveyed areas. Records in many other areas often involved migrants. Nevertheless, the species was observed in c. 50% of the 30 key areas for biodiversity (not only birds) identified during the project. In far eastern Turkey, the range of Ortolan Bunting overlaps with that of Grey-necked Bunting (*Emberiza buchanani*), whose population in Turkey is estimated by BirdLife International (2004) at 6,000–18,000 pairs. In this region, Ortolan is either replaced by Grey-necked, or occurs at lower densities (Kirwan *et al.* 2008). In 1993, GMK surveyed (using 1 km-long line transects) four low-elevation localities with suitable habitat in this region of overlap, recording Grey-necked at all four, but Ortolan at just one, where its numbers were c. 25% lower than Grey-necked. The Ortolan Bunting is generally mapped (in field guides and handbooks) as present at all of these areas in eastern and south-eastern Anatolia, despite being absent locally from many apparently suitable areas. As c. 15–20% of the country constitutes wholly unsuitable habitat for Ortolan Bunting (based on the map in Kirwan *et al.* 2008, all in western, south-western, northern and central Turkey) and Turkey's total land area is 779,452 km², this means that a minimum of 117,000 km² of the country might completely lack the species. In other words, if 10,000,000 pairs breed in Turkey, their density is > 15 pairs per km², or more than 4.5 pairs per km², if the lower limit of the BirdLife estimate was to be applied. Given that surveys (cited above) from parts of Turkey where the species is thought to be generally common demonstrate widespread absence at the local scale, these figures are, at least on the basis of the available evidence, far too optimistic. As the range size of Grey-necked Bunting in Turkey is perhaps just 5–10% of that of Ortolan Bunting and the two species probably occur at generally similar densities (albeit perhaps locally higher in Grey-necked), if the upper limit of the BirdLife estimate for the Grey-necked was correct and was extrapolated to the range of Ortolan Bunting, then the population of Ortolan might be no more than 360,000 pairs. Further anecdotal evidence of the species' true abundance in Turkey comes from Cyprus, where the species does not

breed, but recent estimates (based on data collected between 2003 and 2013) suggest that Ortolan Bunting is only the 45th most abundant passage migrant, with a total of 152 records involving 550 birds (Richardson 2014).

Without robust data, including specific density estimates, from more areas across the species' range in Turkey, however, it is impossible to say more than the BirdLife International (2004) upper limit of population appears likely to be an overestimate by a factor of ten. For now, we suggest that a population of 500,000 to 1,000,000 pairs is a much more reasonable estimate, and even this could be too high. This represents a reduction of 87%, which should be considered as a re-estimation of the population size, not an attested population decrease.

3.2. European population sizes and trends

According to these updates, we can propose a new estimated European population size for the Ortolan Bunting, by summing the most recent national population sizes summarized in Table 1 (taking values published by BirdLife International in 2004 where no updates are available). The result of this exercise is that approximately 3,319,000 to 7,057,000 pairs of Ortolan Bunting are estimated to breed in Europe in the period 2012–2014, compared to 5,185,000 to 16,240,000 reported in 2002 (BirdLife International 2004). As this difference is partly due to earlier overestimates, it is safer to exclude Turkey (unrealistic, inflated estimates in the past) to obtain a more realistic trend estimate between these two dates, and to consider cautiously countries for which we have no estimate for either the early 2000s or the early 2010s (i.e. Andorra, Azerbaijan, Bosnia-Herzegovina, Georgia, Ukraine). For all other countries with recent reliable information, a comparison of the geometric means of the upper and lower values of national population range sizes does not reveal the decline reported by experts, probably because earlier estimates were less precise. The case of Russia illustrates this well: the population size changed from 1.5–5 million to 2–4.3 million pairs, with a trend of geometric means of +7%, while all Russian experts agree upon an overall decline of 15–30% in

numbers, with no region where the species might have increased in numbers in the 2000s, but also regions where the species has almost disappeared.

Overall, within the 39 countries listed in Table 1, the breeding populations of Ortolan Bunting have unknown trends in 15 countries, are increasing in 2 countries (Germany and Serbia), stable or fluctuating numbers in 6 countries, and decreasing in 16 countries, including probable recent extinctions in Hungary, Slovakia and the Netherlands, plus Belgium, where the extinction is confirmed, as well as likely extinction in Switzerland. Nearly 40% of the countries have no monitoring data to permit estimation of a population trend for the species, while most long-lasting or recent declines were detected due to general breeding bird surveys (France, Finland, Sweden) or dedicated monitoring of the species in some strongholds (Russia). This highlights how important good national monitoring data are to monitor the changes of such species across Europe.

The trend in breeding numbers is however spatially variable. Some southern countries have stable, fluctuating or increasing populations (Serbia, Greece, Bulgaria and possibly Turkey), almost all western and northern European populations are declining dramatically (Fennoscandia, Poland, Baltic states, France), while eastern populations, including Belarus, Ukraine and the Russian strongholds of the species, have faced important declines during the last decade. If we divide the 39 European countries into two groups according to their latitude (with a split at around 45–46°N; see last column of Table 1 for the classification of each country with a known trend within a group), it appears that the trends in breeding numbers differ between northern and southern countries, with more declines in the north (14 countries with declining populations compared to 1 increasing/stable/fluctuating in the northern group; 3 declining compared to 6 stable/fluctuating/increasing in the southern group; Fisher's exact test, $P = 0.0037$). There are more southern countries with unknown trends, because of missing or incomplete data. However, the quality of the data used to estimate the reported trends (as poor, medium or good) is the same irrespective of the direction of the trend (negative, or not negative e.g. stable, positive or fluctuating; Fisher's exact test, $P = 0.15$).

The reasons for such a strong decline in some northern countries are not clear, but probably involve multiple factors. As reasons for declines in the species, Menz & Arlettaz (2012) mentioned habitat loss, climate change on the breeding grounds, altered population structure and dynamics, hunting on migration, and environmental changes in the wintering areas. Published studies show that factors on the breeding grounds may have had a negative effect on populations, especially the loss of small-scale environmental heterogeneity in farmland landscapes (Vepsäläinen *et al.* 2005, 2007). However, the Ortolan Bunting has also decreased in areas where major changes have not occurred, e.g. in Finland and Sweden. This fact and occasional population crashes (e.g. –20% in 2006–2007 in Finland) makes it plausible that the major drivers of the decline are occurring along the migration flyway(s) or on the wintering grounds, including anthropogenic and climate change-driven habitat deterioration. Northern and southern breeding populations certainly face different changes in their habitats and environmental conditions, as ongoing land use and climatic changes could have different impacts on birds in southern and northern Europe (Barbet-Massin *et al.* 2012, Thuiller *et al.* 2014). Northern and southern populations might also have different migration routes and wintering grounds, and thus face different pressures along their migration flyways, as might do populations using the eastern or the western flyways. Future research that attempts to identify which populations use which flyways, and their respective wintering areas, could shed new light on the varying fates of European breeding populations. Finally, many breeding populations have become small and isolated, often with a biased sex ratio because of a lack of females, so that there are few management options that may help recovery. In Norway, a long-term individual-based monitoring of breeding populations revealed that the decline was caused by a normal behaviour of female dispersal, and not by poor breeding success or low survival (Dale 2009). Natal dispersal is higher in females (Dale 2001), while such a breeding dispersal might be maladaptive in the context of habitat fragmentation and population isolation (no close sites with displaying males), and could amplify the ongoing declines.

3.3. Conclusion

Currently, the Ortolan Bunting is evaluated as Least Concern (with extinction) on the IUCN Red List (BirdLife International 2015), because the species has a large range and a large population size. While a population decline is recognized, this is not considered sufficiently rapid to reach the thresholds for Vulnerable status. The recent information gathered for Article 12 reporting and for this paper suggests strong ongoing declines, at least in northern and eastern countries. Therefore the regional status of the species could be revisited, based on direct observations and an index of abundance appropriate to the taxon (IUCN 2012). In order to complete this exercise and permit the species' global status to be re-evaluated, equivalent population data are also required for the rest of the breeding range in Central Asia and the Middle East. The same is needed also in European countries where the trend is currently reported as unknown, highlighting the importance of operating robust national monitoring schemes to efficiently monitor changes in bird numbers across a species' range. All this calls for urgent research that provides the necessary evidence-base about species decline across Europe so as to prompt proper conservation action.

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Peltosirkun kannankoot ja -muutokset Euroopassa

Peltosirkku on harvinaistunut monin paikoin Euroopassa, minkä vuoksi on tärkeää saada ajan-

tasaista tietoa lajin kannankoosta ja -muutoksista mahdollisimman laajasti lajin esiintymisalueelta. Koostimme tähän artikkeliin päivitettyt arviot peltosirkun kansallisista kannankooista ja -muutoksista. Nämä perustuvat peltosirkun mantereenlaajuisen muuttostrategiatutkimuksen yhteydessä kerättyyn tietoon sekä BirdLife Internationalin julkaisemiin katsauksiin.

Aiemman, vuosien 1999–2002, arvion mukaan peltosirkun kannan esitettiin olleen 5,2–16 miljoonaa paria Euroopan, Euroopan puoleisen Venäjän, Kaukasian ja Turkin kattamalla alueella. Suurimpien populaatioiden esitettiin tuolloin olevan Turkissa (3–10 miljoonaa paria) ja Venäjällä (1,5–5,0 miljoonaa paria). Nyt päivitettyjen tulosten mukaan alueen kokonaisparimäärä arvioitiin vuosina 2012–2014 vuosikymmenen takaiseen parimääräarvioon verrattuna n. 50 % pienemmäksi (3,3–7,1 miljoonaa paria). Väheneminen johtuu osittain aiemmasta Turkin populaatiokoon yliarviosta, sillä nykyinen arvio Turkin populaatiokoolle on vain 0,5–1,0 miljoonaa paria. Venäjän Euroopan puoleisen osan kannan arvioidaan olevan yhä suuri käsittäen 2,0–4,3 miljoonaa paria, vaikka kanta on siellä vähentynyt 15–30 % vuodesta 2000.

Viimeisen n. kymmenen vuoden (keskimäärin vuodesta 2000 vuoteen 2012) kannanmuutos 39 maassa osoitti, että peltosirkun kanta väheni 16 maassa sisältäen neljä maata, joista laji on äskettäin kuollut sukupuuttoon (Belgia, Unkari, Slovakia ja Alankomaat). Laji runsastui kahdessa maassa (Saksa ja Serbia), kuudessa maassa kannankehitys oli vakaa tai vaihteleva ilman selvää pitkäaikaisuudesta, ja 15 maan osalta kannanmuutosta ei oltu arvioitu. Peltosirkun suojelutilanne on erityisen huolestuttava Pohjois-Euroopassa, missä 15 arvioidusta maasta 14:ssä pesimäkannat ovat vähentyneet.

References

- ArtDatabanken 2015: Rödlistade arter i Sverige 2015. — ArtDatabanken SLU, Uppsala. Accessed at <http://www.artdatabanken.se/media/2013/hela-boken.pdf>, page 83.
- Barbet-Massin, M., Thuiller, W. & Jiguet, F. 2012: The fate of European breeding birds under climate, land-use and dispersal scenarios. — *Global Change Biology* 18: 881–890.

- Belik, V.P. 2000: Birds of the steppe part of the Don river basin: Formation of birds fauna, its anthropogenic transformation and some conservation problems. — Rostov-on-Don: Publishing house of the Rostov State Pedagogical University. (In Russian)
- BirdLife International 2004: Birds in Europe: population estimates, trends and conservation status. — BirdLife Conservation Series N° 12. BirdLife International, Cambridge, UK.
- BirdLife International 2015: Species factsheet: *Emberiza hortulana*. — Downloaded from <http://www.birdlife.org> on 25/11/2015.
- Dale, S. 2001: Female-biased dispersal, low female recruitment, unpaired males, and the extinction of small and isolated bird populations. — *Oikos* 92: 344–356.
- Dale, S. 2009: Diagnosing causes of population decline of ortolan buntings in Norway: importance of dispersal and local patch dynamics. — In *Ökologie und Schutz des Ortolans (Emberiza hortulana) in Europa – IV. Internationales Ortolan-Symposium* (ed. Bernardy, P.): 29–33. *Naturschutz und Landschaftspflege in Niedersachsen* 45.
- Donald, P.F., Green, R.E. & Heath, M.F. 2001: Agricultural intensification and the collapse of Europe's farmland bird populations. — *Proceedings of the Royal Society B* 268: 25–29.
- Dürr, T. & Ryslavý, T. 2009: Zur Bestandssituation des Ortolans in Brandenburg. — In *Ökologie und Schutz des Ortolans in Europa – IV. Internationales Ortolan-Symposium* (ed. Bernardy, P.): 13. *Naturschutz und Landschaftspflege in Niedersachsen* 45.
- Elts, J., Leito, A., Leivits, A., Luigujõe, L., Mägi, E., Nellis, R., Nellis, R., Ots, M. & Pehlak, H. 2013: Status and numbers of Estonian birds, 2008–2012. — *Hirundo* 26: 80–112. (In Estonian with English summary)
- European Topic Centre on Biological Diversity (ETC-BD) 2015: — Downloaded from <http://bd.eionet.europa.eu/article12/summary?period=1&subject=A379> on 27/01/2015.
- Gedeon, K., Grüneberg, C., Mitschke, A., Sudfeldt, C., Eikhorst, W., Fischer, S., Flade, M., Frick, S., Geiersberger, I., Koop, B., Kramer, M., Krüger, T., Roth, N., Ryslavý, T., Stübing, S., Sudmann, S.R., Steffens, R., Vökler, F. & Witt, K. 2014: Atlas Deutscher Brutvogelarten. Atlas of German Breeding Birds. — Stiftung Vogelmonitoring Deutschland und Dachverband Deutscher Avifaunisten, Münster, Germany.
- Goławski, A. & Dombrowski, A. 2002: Habitat use of yellowhammers *Emberiza citrinella*, ortolan buntings *E. hortulana*, and corn buntings *Miliaria calandra* in farmland of east-central Poland. — *Ornis Fennica* 79: 164–172.
- Issa, N. & Muller, Y. (coord.) 2015: Atlas des Oiseaux de France. — Delachaux & Niestlé, Paris, France.
- IUCN 2012: IUCN Red List Categories and Criteria: Version 3.1. Second edition. — Gland, Switzerland and Cambridge, UK: IUCN.
- Jetz, W. 1995: Birds of Turkey 11: Uludağ. — Kasperek Verlag, Heidelberg.
- Jiguet, F., Gonzalez, D., Andrade, C. & Fontaine, B. 2016: STOC et SHOC, les programmes de suivi des oiseaux communs au Muséum par les ornithologues : quelles nouvelles ? — *Ornithos* (in press)
- Kålås, J.A., Dale, S., Gjershaug, J.O., Husby, M., Lislvand, T., Strann, K.-B. & Strøm, H. 2015: Fugler (Aves). Norsk rødliste for arter 2015. — Artsdatabanken, Norge.
- Keller, V., Gerber, A., Schmid, H., Volet, B. & Zbinden, N. 2010: Liste rouge oiseaux nicheurs. Espèces menacées en Suisse, état 2010. Office fédéral de l'environnement, Berne, et Station ornithologique suisse, Sempach. — *L'environnement pratique* n° 1019.
- Kirwan, G.M., Boyla, K., Castell, P., Demirci, B., Özen, M., Welch, H. & Marlow, T. 2008: The birds of Turkey: the distribution, taxonomy and breeding of Turkish birds. — Christopher Helm, London.
- Kosicki, J.Z. & Chylracki, P. 2012: Habitat selection of the Ortolan Bunting *Emberiza hortulana* in Poland: predictions from large-scale habitat elements. — *Ecological Research* 27: 347–350.
- Menz, M.H.M. & Arlettaz, R. 2012: The precipitous decline of the ortolan bunting *Emberiza hortulana*: time to build on scientific evidence to inform conservation management. — *Oryx* 46: 122–129.
- Puzović, S., Simić, D., Saveljić, D., Gergelj, J., Tucakov, M., Stojnić, N., Hulo, I., Ham, I., Vizi, O., Šćiban, M., Ružić, M., Vučanović, M. & Jovanović, T. 2003: Birds of Serbia and Montenegro – breeding population estimates and trends: 1990–2002. — *Ciconia* 12: 35–120.
- Rassi, P., Hyvärinen, E., Juslén, A. & Mannerkoski, I. (coord.) 2010: Suomen lajien uhanalaisuus — The Red List of Finnish Species, page 329. Accessed at: http://www.ym.fi/fi-FI/Ajankohtaista/Julkaisut/Erillisjulkaisut/Suomen_lajien_uhanalaisuus_Punainen_kirj%284709%29
- Revaz, E., Posse, B., Gerber, A., Sierro, A. & Arlettaz, R. 2005: Quel avenir pour le Bruant ortolan *Emberiza hortulana* en Suisse? — *Nos Oiseaux* 52: 67–82.
- Richardson, C. 2014: The status, frequency and abundance of passerine passage migrants and seasonal visitors in Cyprus 2003–2013. — *Sandgrouse* 36: 197–236.
- Selstam, G., Sondell, J. & Olsson, P. 2015: Wintering area and migration routes for Ortolan Buntings *Emberiza hortulana* from Sweden determined with light-geologgers. — *Ornis Svecica* 25: 3–14.
- Thuiller, W., Pironon, S., Psomas, A., Barbet-Massin, M., Jiguet, F., Lavergne, S., Pearman, P.B., Renaud, J., Zupan, L. & Zimmermann, N.E. 2014: The European functional tree of bird life in face of global change. — *Nature Communications* 5: 3118, DOI: 10.1038/ncomms4118
- Tiainen, J., Mikkola-Roos, M., Below, A., Jukarainen, A., Lehikoinen, A., Lehtiniemi, T., Pessa, J., Rajasärkkä, A., Rintala, J., Sirkiä, P. & Valkama, J. 2016: Suomen

- lintujen uhanalaisuus 2015 – The 2015 Red List of Finnish Bird Species. — Ympäristöministeriö & Suomen ympäristökeskus. 49 pages.
- Tucker, G.M. & Heath, M.F. 1994: Birds in Europe: their conservation status. — BirdLife International, Cambridge, UK.
- Väisänen, R.A. & Lehtikoinen, A. 2013: Suomen maalinuston pesimäkannan vaihtelut vuosina 1975–2012. — Linnut vuosikirja 2013: 62–81.
- Vepsäläinen, V., Pakkala, T., Piha, M. & Tiainen, J. 2005: Population crash of the ortolan bunting *Emberiza hortulana* in agricultural landscapes of southern Finland. — *Annales Zoologici Fennici* 42: 91–107.
- Vepsäläinen, V., Pakkala, T., Piha, M. & Tiainen, J. 2007: The importance of breeding groups for territory occupancy in a declining population of a farmland passerine bird. — *Annales Zoologici Fennici* 44: 8–19.
- Vickery, J.A., Tallowin, J.R., Feber, R.E., Asteraki, E.J., Atkinson, P.W., Fuller, R.J. & Brown, V.K. 2001: The management of lowland neutral grassland in Britain: effects of agricultural practices on birds and their food resources. — *Journal of Applied Ecology* 38: 647–664.
- Welch, H.J. (ed.) 2004: GAP Biodiversity Research Project 2001–2003 final report. — Doğal Hayatı Koruma Derneği, Istanbul.