Recent population status and trends of Corncrakes Crex crex in Europe

Kees Koffijberg, Caspar Hallman, Oskars Keišs & Norbert Schäffer

In the mid-1990s, thriving Corncrake populations were discovered in many eastern European countries, leading also to downlisting the species on the global and European Red Lists. The collapse of collective farming systems provided the species with excellent breeding opportunities, and possibly as a result of movements from these eastern populations, also the relict populations in many western European countries are assumed to have benefited from this development. On the far western and southern fringes of the European breeding range, most populations have continued to decrease until recently, often associated with contraction of the national breeding range. However, in Scotland (UK) numbers increased steadily since the beginning of conservation measures in the mid-1990s, up to a plateau level from 2007 onwards.

A review of national breeding bird data shows that between countries distinct patterns exist in trends and annual fluctuations. On one side, Ireland, Scotland and France appear to have small annual changes, probably determined by local breeding conditions. On the other side, many other European countries report highly varying numbers from year to year. Some of them share similar years of peak abundance, e.g. 1998, 2000, 2002, 2003 and 2007, suggesting responses of Corncrakes to synchronous large-scale factors operating at European level. These patterns also suggest that Corncrake abundance in several countries on the European continent depends to a great extent on immigration from the core breeding states in eastern Europe, eventually in combination with fluctuations in productivity. Examples from ringing data, recently added with evidence from satellite-telemetry, show that male Corncrakes may wander considerable distances (up to 1,500 km) over the continent within one breeding season. Such movements partly will be the result of disturbance from mowing, but they may also reflect searches for suitable habitat for second broods. Causes for years with peak abundance are still poorly understood. Ringing data from the British Isles and France show that males in these countries show much smaller within-season movements, indicating a higher degree of natal and breeding philopatry and different dispersal strategies. This also explains why distinct years of peak abundance in neighbouring countries like The Netherlands, Germany and Denmark are not observed at all on the British Isles or in France. Also the lack of expansion in breeding range in UK, despite a population recovery, is likely to be the result of the lack of dispersal. These phenomena also correspond with subtle differences in genetic population structure, differences in morphological characters and perhaps also different migration routes and wintering areas.

Despite the estimated large Corncrake populations occurring in eastern Europe and its secure Red List status, global population assessments and our review of national trends indicate large differences in abundance within the European breeding range, and pronounced annual fluctuations in numbers in many countries, including persistent declines in the west and south. Given the ongoing changes in land-use and the species’ sensitivity to changes in farming practises, it is also not clear if fortunes of Corncrakes, including those in the core breeding range, are secure on the long term. Many of the estimates with 10,000+ Corncrakes come with large uncertainties, and in several of the major countries like Russia a proper monitoring is lacking (but is also challenging), leaving us in the dark when it comes to future prospects of the species. Therefore, we strongly recommend co-ordinated and reinforced survey effort, at least prior to the next overall population assessment.

Key words: Corncrake Crex crex, breeding population, trends, dispersal, migration strategy
1. Introduction

The Corncrake has experienced historical population declines throughout large parts of its breeding range (Green et al. 1997, BirdLife International 2004). Decreases were already reported in the early 20th century and were initiated by increased use of mechanised mowing, allowing a more condensed mowing regime and causing greater losses among clutches and chicks (Koch 1932, Norris 1947, Broyer 1994, Green 2008). Further declines occurred in the past decades due to habitat destruction and ongoing intensification of agricultural practices, for instance abandonment of traditional hay-making, increased use of silage and further advancement in mowing dates (Stowe et al. 1993, Green & Stowe 1993, Sheppard & Green 1994, Broyer 1994, Green 1996, Ottyvall & Pettersson 1998).

In many countries throughout the breeding range, however, numbers of calling males are subject to pronounced annual fluctuations, whilst the increases from the late 1990s and early 2000s partly seem to have turned into a decrease in some countries in recent years (e.g. Bellebaum et al. 2016, Pykal & Flousek 2016).

Apart from these general population assessments, no attempts have been made so far to investigate dynamics in numbers of breeding Corncrakes. In this paper the current population status and trends in numbers are reviewed in more detail for a large number of countries in the species’ breeding range, by making use of population statistics provided by BirdLife International (2004, 2015) and especially by analysing national census data. In focus are population dynamics and patterns in annual fluctuations for the period after 1995. When available, older data were retrieved as well to put recent trends in a broader context. Finally, possible mechanisms behind the observed population trends and their implications for the species’ conservation are discussed.

2. Data and methods

General population statistics were taken from BirdLife International (2004) and the European Red List of Birds (BirdLife International 2015). These population assessments were based on enquiries among national monitoring agencies and BirdLife partners. For the European Red List in 2015, data from EU-countries were derived from national reports (see http://ec.europa.eu/environment/nature/knowledge/rep_birds/index_en.htm). Data from BirdLife International (2004) mainly referred to the period around 2000 (population status) and 1990-2000 (trends). For the European Red List of Birds population status was mainly assessed in 2008-2012 and population trends reviewed for the period 1980-2012 (long-term trend) and 2000-2012 (short-term trend). In both reviews, data quality was highly variable, both regarding population data and trend information.

In order to allow a closer comparison of national trends between countries, Corncrake census data from 18 countries were analysed (Table 1). Data were collected for the period 1968-2014, with a focus on 1995-2014. Corncrake surveys were either carried out by national census schemes or monitoring of key sites with (nearly) full coverage, monitoring of core breeding regions, monitoring of a network of sample sites from which national trends could be calculated, or national totals derived from a combination of monitoring data and non-systematic data. Hence, data quality differs per country, varying from high-accuracy data with (nearly) full coverage to censuses in key regions or a network of sample sites, thought to be representative for the entire country. Only in the European part of Russia sample plots were likely to cover too few sites to be used as a proxy for national trends (Mischenko & Sukhanova 2006, Mischenko 2016), but these data have been included as well to cover at least part of the large Russian population.

In all countries census data referred to nocturnal counts of calling males, which are commonly used to assess population size and trends in the species (Schäffer 1994). Counting intensity and methods to determine total numbers from the censuses slightly differed between countries. In many national surveys maxima from a series of counts were taken, in other countries multiple visits were used to determine the number of calling males. Since the same routines in a single country have been used from year to year, the data reported here will reflect true annual population changes.

For 12 countries with long and high-quality data series (cf. Table 1) trends in numbers of calling males were calculated, using the TrendSpotter package, with the annual numbers of calling males in each country as response variable. TrendSpotter provides a smoothed trend over time by using a Kalman filter (Soldaat et al. 2014), while accounting for serial autocorrelation. To investigate differences in the amplitude of fluctuations, the standard deviation of the residuals from the trend model were used (log-transformed). Furthermore we calculated correlation coefficients between the annual numbers in countries to seek for common pat-
terns in trends. All these statistics were carried out with the R software package (R Development Core Team 2015).

3. Results

3.1 International population status and trends

Around 2000, the European breeding population of Corncrakes was estimated at 1.3 to 2.0 million calling males, of which 83% occurring in only six countries: Russia (European part), Ukraine, Romania, Belarus, Poland and Latvia. In contrast, 14 out of 38 countries (37%) held 250 or less calling males, most of them situated in Northwest and South Europe. In 2008-2012 similar figures were retrieved: an estimated 1.29 to 2.12 million calling males, of which even 92% in the six countries mentioned before. The successive trend assessments in 2004 and 2015 showed a temporary increase in many (16 out of 38) national Corncrake populations in the 1990s (Fig. 1). After 2000, however, only few countries (3 out of 41) have reported increas-

Table 1: Overview of national data on breeding Corncrakes. Data refers to: (1) national census scheme or monitoring of key sites with (nearly) full coverage; (2) censuses in important regions; (3) network of sample sites allowing national trend calculations; (4) sum of all calling males, from combination of monitoring data and non-systematic data. Period gives first and last year of the data series (number of years available in 1995-2014 given separately). Range in numbers represents the lower and upper population figures for the available data series.

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<tr>
<td>Czech Republic (CZ, 2 regions)</td>
<td>2 1998-2014</td>
<td>14</td>
<td>66 - 146</td>
<td>PYKL &amp; FLOUSEK 2016</td>
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<tr>
<td>Finland (FI)</td>
<td>4 1995-2003</td>
<td>9</td>
<td>461 - 7597</td>
<td>P. PARKKO &amp; M. ASIKAINEN (Birdlife Finland) pers. comm.</td>
</tr>
<tr>
<td>Germany – Nordrhein-Westfalen (NRW)</td>
<td>4 1971-2000</td>
<td>5</td>
<td>5 - 270</td>
<td>MÜLLER &amp; ILLNER 2001</td>
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<tr>
<td>Latvia (LV)</td>
<td>3 1989-2014</td>
<td>20</td>
<td>818 - 1710</td>
<td>KEISS 2004, O. KEISS</td>
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ing numbers, whereas stable or fluctuating numbers prevailed in 39 % of all countries. In all periods, also downward trends still occurred, even becoming dominant after 2000. For the long-term trend assessment 1980-2012 these partly also reflect the ongoing historical declines, which continued into the 1990s, and which have persisted until today in e.g. France (see also Fig. 2). From a comparison of long- and short-term trends it seems that mainly countries in the far western and southern fringes of the breeding range have experienced declines until recently. Besides Ireland and France these are e.g. Italy (see also Pedrini et al. 2016), Slovenia, Croatia, Bosnia-Herzegovina, Bulgaria and Turkey.

When looking at national trends in more detail, they confirm that ongoing declines in the two past decades have occurred in France, from 1995 onwards even with an average rate of 8 % per year (Table 2, Fig. 2). In 2015, the lowest number ever was recorded (200 calling males, E. Beslot pers. comm.). Also Ireland encountered a significant decrease until recently, but numbers have increased significantly from 2005 onwards (notably after 2012), associated with a positive response to conservation action (A. Donaghy pers. comm.). Denmark, Latvia, Norway and UK all show a significant increase in numbers since the start of their monitoring work from the late 1970s and 1980s onwards (usually with highest increase rate from 1995 onwards). In other countries, long-term trends are variable, due to the different years data series were available. When looking at the period after 1995, six out of 12 countries recorded a significant increase, whereas for five countries no sig-

Table 2: Summary of trends in numbers of calling males, computed with TrendSpotter. Long-term trends (with year of start) and short-term trends are shown separately. Given are the annual population change and a classification of the trend according to Soldaat et al. 2007: + increase, = stable, - decrease (all significant, p < 0.05), F fluctuating, i.e. non-significant trend. – Zusammenfassung langfristiger (mit Startjahr) und kurzfristiger Bestandstrends. Dargestellt ist die jährliche Bestandsänderung, mit Einordnung des Trends (signifikante Trends als + Zunahme, = stabil, - Abnahme; nichtsignifikante Trends als F fluktuierend, nach Soldaat et al. 2007).

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<tr>
<td>Denmark</td>
<td>1.10</td>
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<td>Estonia</td>
<td>1.01</td>
<td>=</td>
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<tr>
<td>France</td>
<td>0.94</td>
<td>-</td>
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<td>Germany – Brandenburg</td>
<td>n.a.</td>
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</tr>
<tr>
<td>Germany – Schleswig-Holstein</td>
<td>1.12</td>
<td>+</td>
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<tr>
<td>Hungary</td>
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<td></td>
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<tr>
<td>Ireland</td>
<td>0.93</td>
<td>-</td>
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<tr>
<td>Latvia</td>
<td>1.03</td>
<td>+</td>
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<tr>
<td>The Netherlands</td>
<td>0.98</td>
<td>=</td>
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<tr>
<td>Norway</td>
<td>1.01</td>
<td>=</td>
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<tr>
<td>Switzerland</td>
<td>1.03</td>
<td>=</td>
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<tr>
<td>United Kingdom</td>
<td>1.02</td>
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Fig. 2: Trends in Corncrake numbers for a selection of countries with longer data series. Shown are annual numbers of calling males (dots), the modeled trend (bold line) and the 95% confidence intervals of the trend model (dashed lines). Obvious peak years, with counted numbers lying outside the upper 95% confidence limit of the trend model and appearing in more than one country, are shaded.

Trends der Wachtelkönigbestände in ausgewählten Ländern mit längeren Datenreihen. Dar gestellt sind die jährlichen Bestände rufender Männchen (Punkte), der Bestandstrend nach TrendSpotter (fette Linie) mit 95% Konfidenzintervall (dünne Linie). Einflugjahre mit Beständen größer als die obere 95%-Konfidenzgrenze in mehr als einem Land zeitgleich sind grau hinterlegt.
continental breeding range show considerable annual fluctuation in abundance, for instance The Netherlands, Denmark, parts of Germany and Switzerland. Contrastingly, in France, UK and Ireland, fluctuations are nearly absent (apart from the pronounced decline in UK in 2013 caused by unusually cold spring weather, see Beaumont & England 2016). These differences are also expressed by the residuals from the TrendSpotter trend models (Fig. 3), which differ significantly between Ireland, UK and France and all other countries, situated on the European continent (t = -4.038, df. = 11, p = 0.002). Highest rates of fluctuation were recorded in The Netherlands, Schleswig-Holstein in Germany, Switzerland and Hungary.

Some of the observed fluctuations come with pronounced peak years, observed in one or more countries simultaneously (Fig. 2). Synchronized peak abundance (including countries from Table 1 for which no formal trend analysis was carried out), was especially recorded in 1998 (The Netherlands, Schleswig-Holstein, Niedersachsen and Nordrhein-Westfalen/Germany), 2000 (Belgium, The Netherlands, Switzerland, Denmark), 2002 (The Netherlands, Schleswig-Holstein and Brandenburg/Germany, Switzerland, Denmark, Norway, Sweden, Latvia), 2003 (The Netherlands, Schleswig-Holstein, Switzerland, Denmark, Norway) and 2007 (The Netherlands, Schleswig-Holstein and Brandenburg in Germany, Denmark, Latvia). Similarities in annual abundance are also expressed by sig-

### Table 3: Correlation of annual Corncrake abundance between countries (see Table 1 for abbreviations), for the period 1995-2014. Significant correlation coefficients (p < 0.05) shaded and printed in bold. – Korrelationen zwischen Wachtelkönigbeständen in den unterschiedlichen Ländern von 1995 bis 2014 (s. Tabelle 1 für Länderkürzel). Signifikante Korrelationskoeffizienten sind grau hinterlegt und fett gedruckt.

|    | GB  | IE  | FR  | BE  | NL  | CH  | SH  | BRB | NRW | DK  | NO  | FI  | SE  | CZ  | LV  | RUS | HU  | EE  |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| GB | 1.00| -0.04| -0.63| -0.06| -0.40| -0.17| -0.50| -0.22| -0.34| 0.00| 0.37| 0.10| 0.56| -0.68| 0.36| 0.20| -0.56| -0.05|
| IE | 1.00| 0.31| -0.39| -0.36| 0.17| -0.21| 0.05| -0.61| -0.29| -0.11| -0.34| -0.53| -0.26| 0.27| -0.42| 0.32| 0.20|     |
| FR | 1.00| 0.18| 0.38| -0.41| 0.46| 0.24| -1.00| -0.21| -0.43| -0.80| -0.61| 0.06| -0.40| -0.55| 0.54| -0.36|     |
| BE | 1.00| 0.56| 0.24| 0.34| 0.13|     | 0.24| 0.01| -0.64| 0.11| 0.20| -0.28| -0.17| -0.26| -0.07|     |     |
| NL | 1.00| 0.35| 0.86| 0.35| 0.88|     | 0.57| 0.27| 0.10| 0.22| 0.50| -0.37| 0.16| 0.17| 0.15|     |     |
| CH |     | 1.00| 0.20| 0.32| 0.30| 0.51| 0.40| 0.40| 0.09| 0.35| 0.03| 0.32| -0.01| 0.53|     |     |     |
| D.SH|     |     | 1.00| 0.35| 0.91| 0.37| 0.13| 0.01| 0.10| 0.33| -0.19| 0.22| 0.43| 0.14|     |     |     |
| D.BRB|     |     |     | 1.00| -0.06| 0.38| 0.35| 0.42| 0.51| 0.34| 0.19| -0.15| -0.46| 0.14|     |     |     |
| D.NRW|     |     |     |     | 1.00| 0.59| 0.60| 0.39| 0.83| -0.67| -0.30| 0.40| 0.37| 0.52|     |     |     |
| DK |     |     |     |     |     | 1.00| 0.68| 0.39| 0.43| 0.58| -0.02| 0.00| -0.20| 0.44|     |     |     |
| NO |     |     |     |     |     |     |     |     |     |     | 1.00| 0.46| 0.52| 0.36| 0.17| -0.10| 0.53| 0.23|
| FI |     |     |     |     |     |     |     |     |     |     |     | 1.00| 0.59| 0.74| 0.14| 0.35| -0.72| 0.85|
| SE |     |     |     |     |     |     |     |     |     |     |     |     | 1.00| 0.00| -0.06| 0.32| -0.85| 0.13|
| CZ |     |     |     |     |     |     |     |     |     |     |     |     |     | 1.00| -0.41| -0.14| 0.08| 0.45|
| LV |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 1.00| 0.16| -0.08| 0.47|
| RUS|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 1.00| 0.10| 0.39|
| HU |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 1.00|     |
| EE |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 1.00|

Fig. 3: Amount of fluctuation in annual numbers of Corncrakes per country in 1995-2014, expressed by the standard deviation of the residuals from the TrendSpotter trend models (see Fig. 2). Countries are ranked according to longitude, see Table 1 for country abbreviations. – Stärke der Fluktuationen von Wachtelkönigbeständen pro Land 1995–2014, dargestellt als die Standardabweichung der Residuen des Trendmodells (Abb. 2). Länder geordnet nach Längengrad, Kürzel für Länder. s. Tab. 1.
significant positive correlations of numbers in a cluster of countries represented by Belgium, The Netherlands, Schleswig-Holstein and Nordrhein-Westfalen in Germany, Switzerland and Denmark (Table 3). Furthermore, annual abundance in the eastern part of the Baltic, incl. Finland, is positively correlated. Numbers in Ireland, UK and France are negatively correlated (significant for UK and France).

4. Discussion

4.1 Current status of the European breeding population

Following historical declines in large parts of the breeding range, Corncrakes have shown population recoveries in many countries from the 1990s onwards. The series of peak years between 1998 and 2003 seem to be part of a general population high, in line with the assumed increase of the overall breeding population in the 1990s (BirdLife International 2004, 2015). During these years Corncrakes were more abundant in many countries, both in the western part of the continental range (e.g. The Netherlands, Germany, Denmark, Norway) and in countries which constitute the core breeding areas in eastern Europe (e.g. Baltic States, Poland, Czech Republic, Slovakia, Slovenia, Romania and Moldova; BirdLife International 2004, Pykal & Flousek 2016). However, especially on the far western and southern fringes of the European breeding range, declines continued until recently. A notable exception in this context is the situation in Scotland, where a population recovery appeared from the mid 1990s onwards, in response to concerted conservation action (O’Brien et al. 2006). Very recently, and after a significant contraction of the national breeding range, similar observations have been made in Ireland (A. Donaghy pers. comm.).

The general increase in Corncrake numbers in the late 1990s has been commonly attributed to optimal breeding opportunities and high reproduction rates in eastern Europe. Corncrakes are assumed to have benefited from the collapse of collective farming systems and abandonment of large agricultural areas in the late 1980s and early 1990s (Schäffer & Green 2001, Keišės 2003, 2005, Mischenko 2016). Since annual survival is low (0.20–0.30, Green 1999, Green 2004), Corncrake populations are highly sensitive to changes in reproduction rates (Green et al. 1997). Hence, favourable breeding conditions and increased productivity in eastern Europe are thought to have boosted the total breeding population, resulting in high abundance in e.g. the Baltic States and Russia, where total population size in the 1990s was estimated well above 1 million calling males (BirdLife International 2004).

It is likely that this development has also contributed to the observed population increase in many countries in the northwestern part of the European continent, where small populations in the mid 1990s were often close to extinction and numbers started to recover in the late 1990s. This hypothesis is supported by findings from Wettstein et al. (2003a, 2003b), who found a moderate to high gene flow from northeast to southwest throughout the European continent. In some parts of Northwest Europe, increases have continued until recently (e.g. Norway), but in others numbers tended to go down after 2005 (e.g. The Netherlands, Schleswig-Holstein in Germany, see also Bellebaum et al. 2016, Pykal & Flousek 2016).

4.2 Is there evidence for different breeding populations in Corncrakes in Europe?

On the British Isles and in France, any impact from the agricultural changes in eastern Europe and subsequent population response by Corncrakes is very unlikely, as numbers of calling males did not show similar trends and patterns in abundance, in comparison to those observed in neighbouring countries on the European continent (Fig. 2, Table 3). At least in Ireland and Scotland, annual abundance mainly seems to depend on local breeding conditions, in combination with conservation effort (O’Brien et al. 2006, Beaumont & England 2016). Moreover, Corncrakes from Ireland, Britain and France show different dispersal behaviour, compared to birds in other countries. Ringing data from The Netherlands, Germany and the Czech Republic indicate that male Corncrakes may wander distances up to 1,500 km within one breeding season (see Tab. 4 in section 4.3). Extensive ringing effort on the British Isles revealed longest movements of adult males detected within one breeding season of 45 km and 18 km respectively (R. E. Green pers. comm.), despite widespread recapture effort, which could have detected movements of hundreds of kilometres (Green 1999). Furthermore, long-distance natal and breeding dispersal between years is also unusual in Britain and Ireland (Green 1999). This limited dispersal also explains the phenomenon that, despite a recovery in numbers, Corncrake distribution in UK is still confined to the westernmost part of Scotland, where the species persisted during the long period of declines across the rest of UK. In France, long-distance movements within a breeding season were not observed as well (F. Noël pers. comm.). In addition, Wettstein (2003b) hypothesised a higher degree of philopatry among French birds than birds elsewhere on the European continent (data for British Isles were not included), according to analyses with trace elements and stable isotope ratios.

Further differences also exist with respect to (timing of) migration and perhaps also wintering strategies. Ringing data give evidence that birds from the British Isles move through France and the extreme eastern part of Spain to their wintering sites in Africa (Wernham et al. 2002), whereas birds from more eastern populations on the European continent seem to move...
through the Middle-East (PETTerson 1992, PEŠKE & VlČEK 2015). Recent studies with geo-locators have confirmed the movements from UK-ringed birds, and have also revealed a double migration with birds first moving south to wintering sites in West-Africa and, later in the winter east-south-east to the Congo Basin (GREEN 2013). A recovery from a Dutch-ringed bird during spring migration in Syria (vAN den BERGH 1991, WaltHer 2008) and movements of satellite-tagged birds from Czech Republic (PEŠKE & VlČEK 2015) in spring and autumn indicate an eastern migration route of birds breeding in those countries.

Different migration strategies are also reflected in arrival patterns in spring. Arrival of males in Britain and Ireland takes place around 20th April, in Northwest France even in March and first half of April (KOFFIJBERG unpublished). In other countries on the European continent, however, males usually arrive in the first week of May or the very last days of April, thus one to two weeks later than on the British Isles. The small variation in arrivals over a vast range of countries, including Russia, Estonia, Latvia, Sweden, Poland, Hungary, Slovakia, Czech Republic, Germany, Denmark and The Netherlands suggests a highly synchronized wave of arrivals taking place in early May, probably entering Europe through the Middle-East. Increased use of geo-locators or GPS loggers could probably help to get more insight in the migration patterns across the breeding range, but will involve considerable effort, given the low annual survival and differences in breeding philopatry.

Furthermore, Corncrakes in France, Ireland and Scotland are on average heavier and larger in structural size than birds from other countries (KEISS et al. 2004, SchAFFER & KOFFIJBERG 2004, FourCADE et al. 2016). All these differences between Britain and Ireland and France on one side, and other European countries on the other side, fit fairly well in the observed subtle differences in genetic structures across Europe (WettSTEIN 2003a, b, FourCADE et al. 2016). FourCADE et al. (2016) were able to distinguished genetic clusters for Scotland, western France/Italy and populations on the German/Polish border and further east (i.e. east of 12° E).

4.3 Are Corncrakes moving vagabonds across continental Europe?

The ups and downs in annual numbers of calling males in many countries on the European continent suggest a high amount of immigrants arriving in these countries in varying numbers from year to year, perhaps in combination with (local) fluctuations in annual productivity. In case of immigration, it is likely that such birds originate from the large core populations in the eastern part of the breeding range. There is evidence from ringing, that male Corncrakes frequently move considerable distances on the European continent within one breeding season in various directions (Table 4). Recent data from satellite-tracked males in Czech Republic confirm these movements (PEŠKE & VlČEK 2015). Such behaviour is probably more common throughout continental Europe, but poorly known since intensive ringing is only carried out in a few regions and recapture probability is low. The many records from the Czech Republic are the result of a co-ordinated national ring-

Table 4: Examples of long-distance movements (>100km) of male Corncrakes within the same breeding season (May-August). – Beispiele von Wanderungen von Wachtelkönig-Männchen über Distanzen von 100 km oder mehr innerhalb einer Brutsaison (Mai bis August).

<table>
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<tr>
<th>Ringed – Beringt</th>
<th>Recovered or recaptured – Wiederfund oder Wiederfang</th>
<th>Source – Quelle</th>
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<tr>
<td>23rd May 1972, Tiel, Gelderland, The Netherlands</td>
<td>1st August 1972, Gulbene, Latvia, 1,489 km ENE</td>
<td>van den BERGH 1991</td>
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<tr>
<td>14th May 1996 Hradiste-Doupov, Czech Republic</td>
<td>31st May 1999, Polka, Czech Republic, 145 km SE</td>
<td>CEPÁK et al. 2008</td>
</tr>
<tr>
<td>14th June 2000, Horovice-Nerezin, Czech Republic</td>
<td>3rd July 2000, Koprivna, Czech Republic, 221 km E</td>
<td>CEPÁK et al. 2008</td>
</tr>
<tr>
<td>8th June 2007, Budenin, Czech Republic</td>
<td>18th July 2007, Mohra, Thüringen, Germany, 342 km NW</td>
<td>CEPÁK et al. 2008, BAIrLEIN et al. 2014</td>
</tr>
<tr>
<td>28th May 2012, Schwedt/Oder, Germany</td>
<td>16th June 2012, Valtířov-Vranov, Pilsen region, W Bohemia, Czech Republic, 391 km S</td>
<td>Jiří VlČEK pers. comm.</td>
</tr>
<tr>
<td>20th May 2013, Předboř, district Jihlava, W Moravia, Czech Rep.</td>
<td>13th June 2013, Heroltice, N Moravia, Czech Republic, 102 km NE</td>
<td>CEPÁK &amp; KlvaŇA 2014</td>
</tr>
</tbody>
</table>
ing programme that has been carried out since 1994 (BÜRGER et al. 1997, CEPÁK et al. 2008).

Factors triggering long distance movements of males within one breeding season are still poorly understood. Besides, it is not known if females behave in a similar way, as mainly males are ringed, because they are more easily trapped by tape-lure. Movements of some males were obviously associated with disturbance by mowing, e.g. birds that went from The Netherlands to Latvia and from Germany to Czech Republic. This also fits in the findings of HOFFMANN (1997), who studied displacements of 100 radio-tracked males in Poland, after they had been disturbed by mowing. Of this sample, an estimated 60% moved to areas outside a 100 km radius around the study site, suggesting that mowing might initiate considerable long-distance movements in Corncrakes. However, most of the Czech-ringed birds moved without obvious reason (J. PYKAL pers. comm.). Data from radio-tracked males in the Lower Oder valley in Germany and the floodplain meadows of the Rhine in The Netherlands also demonstrated that during the breeding season males frequently left the area, partly but not exclusively because of mowing (BELLEBAUM et al. in prep.). Since Corncrakes usually produce two clutches in a breeding season (GREEN et al. 1997), such within-season movements may reflect searches for suitable breeding sites for a second brood, or a replacement clutch after the first brood has been disturbed. Several authors have pointed at shifts in distribution of breeding sites due to changes in vegetation structure throughout the breeding season (FLADE 1991, SCHÄFFER 1999, GREEN 1996). In a similar context, Corncrakes are known to move from lowland to mountainous areas during the breeding season, anticipating on a later start of the vegetation season on higher altitudes in spring (DELOV & IANKOV 1997).

Another aspect that is not very well understood yet is the mechanism behind years with peak abundance, in some countries appearing at the same time, implying common factors to operate. KOFIJBERG & VAN DIJK (2001) hypothesized that the influx in 1998 was triggered by heavy rainfall in Northwest Russia, leading to unfavourable breeding conditions at many breeding sites (as was confirmed by reports from local birdwatchers). MISCHENKO & SUKHANOVA (2006) explained low numbers in their Russian study plots in 2002 (also coinciding with peak-occurrence in some West-European countries) by extraordinary dry conditions in most river valleys. Other authors have mentioned weather conditions, notably precipitation, as well to be a driver of local numbers and distribution (e.g. NIEDERSACHSEN, Germany, FLADE 1991, SCHÖDER et al. 2007; HUNGARY, BOLDOGH et al. 2007). An explorative analysis of weather data provided by KLEIN TANK et al. (2002), however, was not able to detect any consistent and significant relationships with precipitation or temperatures in May–June, along a gradient of countries from Russia to The Netherlands (KOFIJBERG & NIEHUIS unpublished). This does not imply that large-scale weather patterns do not matter, but it is more likely that Corncrake abundance depends on many more (and partly inter-related) local and regional factors, like e.g. habitat quality (vegetation structure), food availability, annual variation in mowing dates and fluctuations in productivity. This makes it very difficult to unravel causes for years with peak abundance.

4.4 Implications for conservation and management

Today, the Corncrake is globally listed as a species of ‘Least Concern’ in the IUCN Red List (IUCN/BIRD-LIFE INTERNATIONAL 2011) and in Europe its status is regarded as secure (BIRD-LIFE INTERNATIONAL 2015). However, we observe large differences in abundance and annual fluctuations in numbers within the European breeding range. Corncrakes breeding on the western and southern fringes of the breeding range still show overall ongoing declines, in France also in conjunction with a significant range contraction (HENNIQUE et al. 2014). In Ireland, breeding sites in the south-western part of the country were abandoned recently, and birds now mainly concentrate in Donegal, where numbers recently increased as a result of conservation measures. Corncrakes in Scotland have recovered in response to conservation measures as well, but they have not yet re-occupied former parts of their breeding range within the UK, and their limited dispersal behaviour implicates that such an expansion may be very unlikely in future. In this context, also range expansions in Ireland and France do not seem very likely. Besides, the ongoing declines in France have not stopped yet.

For other western European countries, there is evidence that they at least partly depend on immigration from the large core populations in Eastern Europe. This also makes recolonisation of new breeding sites possible, on the provision that appropriate conservation action is undertaken. Site-specific data from The Netherlands show, that breeding sites established during the peak years around 2000, and having late-mowing regimes, have been occupied ever since (KOFIJBERG & SCHOPPERS 2009). The same also applies to the Norwegian breeding population, which was able to keep the level of the peak years around 2000 (HÉGGØY & ØIEN 2013). However, numbers of calling males in many countries in continental Western Europe have tended to decline again, after the population high around 2000 (albeit coming with large annual variation). Also evidence that lower numbers recorded recently are linked to lower abundance in the core breeding populations in Eastern Europe is absent, as high-quality monitoring data is scarce among the countries with highest numbers. At least in the Baltic States, increases were still reported for the period 1995–2014 (Table 3).
5. Zusammenfassung


Affen sind auf vielen nicht beglaubigten Daten und angeschlossenen Beständen, die in den letzten Jahren aufgezeichnet wurden, mechanische und Erntezeiten aufgezeichnet werden. Diese unterschiedlichen Trendmuster lassen vermuten, dass die Bestände in vielen anderen westeuropäischen Ländern im hohen Maß von Immigration aus den viel größeren osteuropäischen Brutpopulationen abhängig sind.

Auffällige Bestandsschwankungen in kalten Frühlingsbeobachtungen werden jedoch auch oftmals aus Osteuropa beobachtet. Diese unterschiedlichen Trendmuster lassen vermuten, dass die Bestände in vielen anderen westeuropäischen Ländern im hohen Maß von Immigration aus den viel größeren osteuropäischen Brutpopulationen abhängig sind.

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die Vögel sich auch in ihren Zugmustern, Zugwegen, Mor-
phologie und ihrer genetischen Struktur unterscheiden. Im
Vergleich zu den Britischen Inseln und Frankreich bedeutet
dies auch, dass es bei Wachtelkönigen in z.B. Deutschland
durchaus ein Wiederansiedlungspotenzial gibt, wenn geeig-
nete Schutzmaßnahmen getroffen werden.

Ob die Wachtelkönigbestände in Europa langfristig gesi-
chert sind, ist unklar. Die Art bleibt sehr abhängig von Ent-
wicklungen in der Agrarlandschaft und geeigneten Schutz-
maßnahmen, vor allem in Osteuropa auch von großräumigen
Änderungen in der Landnutzung. Ein Problem ist zudem,
dass von den großen Beständen in Osteuropa kaum zuver-
lässige Zahlen über deren Größe und Trend vorliegen, und
wir nur dort über gute Populationsdaten verfügen, wo die
Populationen recht klein sind und nur einen geringen Anteil
der Gesamtpopulation darstellen. Das macht Aussagen über
der Erhaltungsstatus sowohl aus kurz- als auch langfristig
problematisch.

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Kees Koffijberg, Sovon Vogelonderzoek Nederland, P.O. Box 6521, NL-6503 GA Nijmegen, The Netherlands; E-Mail: kees.koffijberg@sovon.nl

Caspar Hallmann, Sovon Vogelonderzoek Nederland & Experimental Plant Ecology Group, Radboud Universiteit Nijmegen, Institute for Water and Wetland Research, P.O. Box 9010 (mail box 31), NL-6500 GL Nijmegen, The Netherlands; E-Mail: C.Hallmann@science.ru.nl

Oskars Keišs, Laboratory of Ornithology, Institute of Biology, University of Latvia, LV-2169 Salaspils, Latvia; E-Mail: grieze@lanet.lv

Norbert Schäfer, Landesbund für Vogelschutz in Bayern e. V., LBV e. V. Landesgeschäftsstelle, Eisvogelweg 1, D-91161 Hilpoltstein; E-Mail: n-schaeffer@lbv.de