

# An assessment of the current and historical distribution of the Corncrake *Crex crex* in the Western Italian Alps

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**Abstract** - Agricultural intensification and mechanization are major threats to farmland birds in Europe. The Corncrake *Crex crex* was a common and widespread species in rural landscapes in Italy, but its numbers strongly declined in most of its former range in the last half of the 20<sup>th</sup> century. Although it is a well-studied species in the Eastern Italian Alps, where most of the Italian population now occurs, there is no published information from the Western part of the range. This study aimed to describe the distribution of the Corncrake in the regions of Piedmont and Aosta Valley, taking into account both historical and recent records. Additionally, we assessed the habitat in which apparently breeding individuals were found. Overall, 78 occurrences of this species were recorded in the study region. Migrating individuals occurred at lower elevations, whilst possible breeding records were located at higher elevations in meadow-pastures and secondary grasslands. Two main current hotspots were identified in the Chisone Valley and in the valleys in the province of Cuneo, which represent the core areas for the species in Piedmont and Aosta Valley. The observation trend shows a possible recovery of the population at the regional scale, although a large-scale dedicated survey is needed to estimate population size. In 2020, the highest number of singing males in one site (5) was recorded with individuals observed above 1800 m. Conservation measures at a regional scale addressing grassland management (including mowing and grazing) might benefit the species and promote a wider recolonization of the area.

**Keywords:** farmlands bird, *Crex crex*, historical distribution, habitat management

## INTRODUCTION

The Corncrake *Crex crex* is a species of the family Rallidae (Gruiformes) which is declining in Europe because of agricultural intensification, in particular changes in grassland management (Keišs 2003, BirdLife International 2004, Moga et al. 2010). It is a high priority species for conservation (BirdLife International 2020). The Corncrake was a common species,

with a wide breeding range at the continental scale and occurring in agricultural landscapes characterized by low-intensity management (Cramp & Simmons 1980). Population declines were first noticed in western and central Europe in the late 19<sup>th</sup> century and especially since the 1950s (Tucker & Heath 1994). This decline has been attributed to the rapid intensification and mechanization of agriculture in the last

century (Green et al. 1997a). However, in some European Countries, a local increase has been reported recently, albeit with marked fluctuations (Wotton et al. 2015, Koffijberg et al. 2016, Keller et al. 2020).

In Italy as in most of Europe, the population has declined severely (BirdLife International 2004, Nardelli et al. 2015, Pedrini et al. 2016) and the breeding range is now limited to a few restricted areas in the Alps, with an estimated population size of 160-200 singing males. Indeed, the Italian Corncrake population has undergone a decline of an estimated 45-61% in the period 2000-2012 (BirdLife International 2017). In the Alps, the species has disappeared at low elevations due to the rapid urbanization and agricultural intensification of valley floors, and is currently concentrated at higher elevations, mostly in agroecosystems dominated by hay meadows. Even though the majority of the Italian population can be found in the Central and Eastern Alps, with the province of Trento accounting for half of the national population (Pedrini et al. 2012), historical sites are present in the Western Alps, and males are sometimes recorded in this geographical area, but much less commonly than further east. The current distribution, population trend and habitat preferences have not been investigated in the Western Alps yet, whilst the species has been studied in detail in the Central and Eastern parts of the mountain range (Brambilla & Pedrini 2011, Florit & Rassati 2012, Pedrini et al. 2012, Brambilla & Pedrini 2013).

In Piedmont (NW Italy), the species was described as commonly breeding during the 19th century (Salvadori 1872, Corti 1961), although there are contradictory reports (Giglioli 1889), and few successful nesting attempts were documented (Bazzetta 1894). Similarly, a wide distribution can be hypothesized in the past for the Aosta Valley (Peola 1905), according to the extent of suitable wet meadows, especially in the surroundings of St. Christophe and to the west of Aosta (Bocca & Maffei 1997). Nevertheless, recent work has highlighted a general lack of information on the current distribution and population size in Piedmont and in the Aosta Valley. Pavia & Boano (2009)

and Caula & Beraudo (2014) suggested that a few pairs might still breed occasionally. An apparent increase in records and potential breeding activity in 2019 and 2020 (R. Alba personal observation) suggested a potential recolonization of the Western Alps.

In this paper, we assess the past and current distribution of the Corncrake in North-Western Italy (Piedmont and Aosta Valley) based on both historical and recent records, and we describe the broad-scale habitat use in terms of elevation, topography and (for more recent records) land use. Our aim is to put recent records into a historical context, with the aim of informing future conservation actions for this species in Western Italian Alps. Possible management strategies to increase the occurrence of the Corncrake in the area are also proposed.

## **MATERIALS AND METHODS**

In order to define the Corncrake distribution in North-Western Italy, we reviewed records collected between 1900 and 2020 from different sources: regional and local ornithological reports and atlases, citizen-science databases (Aves Piemonte, ornitho.it, iNaturalist.org, eBird.org, observation.org, xencanto.org) and direct observations carried out by the authors or personally communicated to them by other ornithologists. Observers were directly contacted whenever possible if further information on their observations was needed. Record locations were approximated as accurately as possible based on the information given, often at municipality level. For a sample of records, GPS coordinates were available or exact location could be identified for accurately described records. The number of individuals for each site was recorded, together with the date and the type of observation (i.e. singing, found dead, shot or ringed).

Observations were classified into two phenological categories based on the date of observation: individuals recorded from 25 May to 15 July were considered as potentially breeding (henceforth “breeding”), whilst records in other periods of the year were referred as migrants. We decided to adopt this range of

time for the breeding records since altitudinal shifts are known for the species from the second half of July onwards, mainly due to mowing practices in the breeding habitats at lower elevations (Pedrini et al. 2012).

We estimated the minimum number of individuals for each breeding population, represented by the highest number of singing individuals recorded in an observation. For more accurate recent records for which coordinates were available (after 1979), the main habitat at each locality was obtained from a land-use map for Piedmont (Piano Forestale Territoriale, <http://www.sistemapiemonte.it/cms/privati/territorio/servizi/526-sistema-informativo-forestale-regionale>) and from orthophotos for Aosta Valley. Elevation was retrieved from Google Earth (earth.google.com). For historical and recent occurrences where coordinates were not available, land use and elevation were not estimated.

A species distribution map was produced and a descriptive analysis was carried out with the aim of showing the temporal pattern of the species occurrences during the years 2000-2020 and the broad-scale habitat use during the breeding period according to land use and elevation.

## RESULTS

Overall, 78 records were collected between 1906 to 2020 (Tab. 1). Of these, eight records reported individuals found dead, including three records of shot specimens. All dead individuals were found during the period of autumn migration of the species. There were two records of ringed individuals, one from the ringing station of Isolino (Verbania, 45°56'N 08°30'E) and one from the ringing station of Casalbeltrame (Novara, 45°26'N 08°28'E) in northern Piedmont. Overall, we collected 42 records of individuals observed during the migration period, whilst 35 were considered as possibly breeding, although there was no evidence for definite nesting attempts for any record. One record was excluded from the analysis due to lack of information on date.

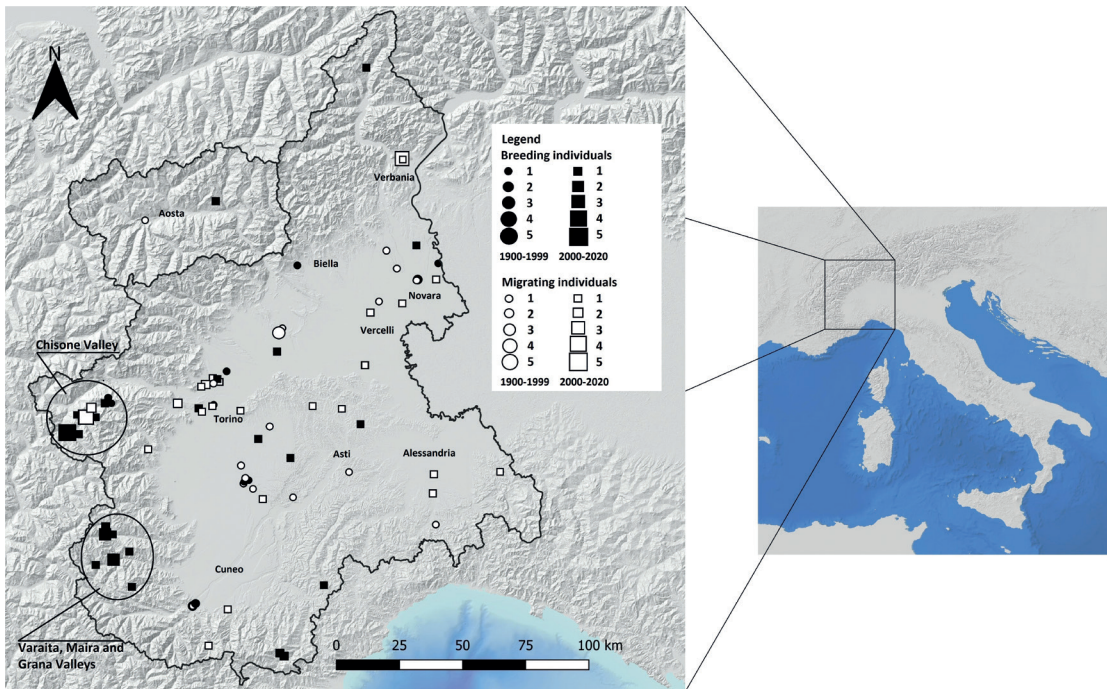
Potentially breeding records were concentrated

in two areas, the Chisone Valley, between Pragelato and Cesana Torinese (Province of Torino), and a more southerly area between the Varaita, Maira, and Grana Valleys (Province of Cuneo). These two populations accounted for the highest number of individuals recorded for one location (3 to 5 singing males), although other possibly breeding individuals were reported in other Alpine valleys (Fig. 1). Torino (30) and Cuneo (22) provinces accounted for the highest number of records. Other records were scattered throughout Piedmont at lower elevations in the provinces of Novara (8), Alessandria (5), Asti (4), Vercelli (3), Verbania (3) and Biella (1). Only two records were from Aosta Valley; one individual during the migration period at Villeneuve (45°42'N 7°12'E) in 1970 (Bocca & Maffei 1997) and one singing male recorded near Verrayes (45°46'N 7°32'E) at Lozon Lake (46°77'N 7°33'E; L. Forneris, xenocanto.org) where it was present for at least two weeks in July 2020.

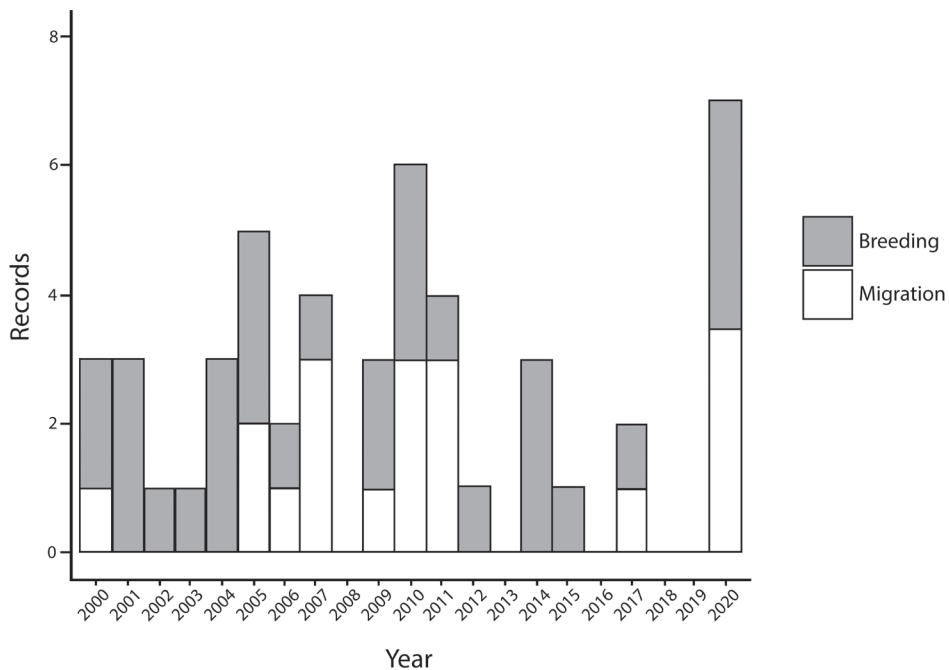
The number of records for the species over the last two decades (2000-2020) was 49, with 66 individuals observed. Due to the uneven effort in observations, the trend in records fluctuated in this period (Fig. 2), although there was a notable peak in observations in 2020 (7 records, 11 individuals) from locations where the species was also recorded in the past (Tab. 1). In the same year, the highest number of breeding individuals ever observed at the regional scale was recorded in the surroundings of Cesana (Torino, 44°57'N 6°47'E), with  $\geq 5$  singing males in an area of 450 x 350 m (R. Alba & F. Cravero, personal observations), resulting in a relatively high-density of territories.

Considering the general environmental conditions, records occurred in a wide range of elevation and habitats, from agricultural landscapes in the lowlands to Alpine pastures at middle-high elevation. However, there was a significant difference in elevation between records of migrating individuals (mean = 383 m, 95% CI = 262-505 m) and breeding records (mean = 975 m, 95% CI = 751-1200 m).

Habitat use during the breeding season was inves-



**Figure 1.** Occurrences (N = 77) of the Corncrake in Piedmont and Aosta Valley (45°04'N 7°42'E). Circles represents records between 1900 and 1999, squares are records from 2000 to 2020. In black are shown potential breeding individuals and white are migrants. The size of the point is relative to the number of individuals recorded at each site. Points are not always shown in the precise location in order to avoid overlapping records. Names of province capitals are reported.



**Figure 2.** Occurrences of Corncrake in Piedmont and Aosta Valley during the period 2000-2020 (N = 49). In grey the number of potential breeding records, whilst the records during migration are represented in white.

tigated for 27 records where an accurate location could be assigned (35% of the total). Corncrakes occurred in a variety of habitats at different elevations during the reproductive season (range 225-1850 m), including meadow-pastures (N = 10, mean elevation = 1302 m, 95% CI = 912-1693 m), grasslands (N = 8, mean = 1699 m, 95% CI = 1563-1835 m), low elevation annual crops (N = 6, mean = 364 m, 95% CI = 203-524 m) and others (3). The locality with the highest number of individuals is also at the highest elevation ever recorded for Corncrake in the Western Italian Alps (1850 m in Cesana (Torino), see Tab. 1). It is also worth underlining that in 2020, all four records were above 1500 m and three out of them were located above 1800 m.

## DISCUSSION

In this study, we have shown that, historically, the Corncrake occurred throughout the regions of Piedmont and Aosta Valley, and that the species is likely still regular, though scarce, over most of the area, with individuals occurring mostly in the lowlands during migration and on meadow-pastures and secondary grasslands at middle-high elevation during the breeding period. These results are in line with other studies in the Alps (Brambilla & Pedrini 2011, Pedrini et al. 2016) where open habitats provide the most suitable conditions for the Corncrake to breed (Green et al. 1997b, Bricchetti & Fracasso 2004). Furthermore, it is interesting to note that more recent records have been at exceptionally high elevations, with individuals observed above 1800 m.

The trend of observations during the last 20 years has been stable overall, with peaks recorded during 2005, 2010 and 2020, with the highest number of occurrences and singing males ever observed at the regional scale during the latter year. This might reflect fluctuations in the population trend at a regional scale, which are well known for the species in other regions and countries (Cramp 1985, Rassati & Tout 2002), although it is necessary to consider also the uneven effort in observation over the period considered that prevented any quantitative assess-

ment of population trends. The species is undoubtedly rarer nowadays compared to the past, when the Corncrake was a common breeder and migrant in North-Western Italy (Salvadori 1872, Giglioli 1907, Moltoni 1943). For instance, there is a noteworthy report of 311 Corncrakes killed by a hunter near Trino Vercellese (45°12'N 8°18'E) during his entire hunting career (Arrigoni 1914), although lack of details precludes this anecdotal record from consideration in this study.

Estimating population size, trends and habitat use for the Western Italian Alps is not a simple task. In Piedmont and Aosta Valley, the historical distribution is generally unknown, reliable breeding records are scarce, and distribution maps from different authors are contradictory (Giglioli 1889, Corti 1961, Mingozzi et al. 1988). Furthermore, it is difficult to distinguish between real population size fluctuations and variations in observer effort over time. In the last decades, along with a worldwide increase in the number of birdwatchers (Carver 2013, Kronenberg 2016), submitted observations in opportunistic citizen-science programs have impressively increased (Sullivan et al. 2014, Soroye et al. 2018), allowing birdwatchers to submit records for species and areas based on personal decisions. It is thus necessary to control for observer effort for casual observations in the field in order to have reliable data on population estimates. However, even though successful reproduction has not been confirmed yet, it can be assumed that the current population is very small, especially if compared to the data of the Central and Eastern part of the Alps, where most of the Italian Corncrake population occurs (Pedrini et al. 2012).

The presence of Corncrakes in most years of this century, and an apparent recent upturn in breeding records, show that there is great potential for the species to establish a permanent and growing population in the Western Alps. In order for this to happen, it is essential to implement conservation policies, especially in low-intensity agricultural systems that have a potential role for the conservation of many threatened farmland species (Assandri et al.



**Table 1.** Occurrences (N = 78) of Corncrake in Piedmont and Aosta Valley with details on the date, number of observed individuals with relative status (dead, shot, ringed), phenological period (breeding, migration), location and references.

Date	Individuals (Status)	Phenology	Location	References
15/10/1906	1 (Dead)	Migration	Druento (TO)	Aves.piemonte, Banca Dati GPSO, accessed on 02.09.2020
27/04/1927	1	Migration	Corneliano d'Alba (CN)	Caula & Beraudo (2014)
06/1929	1	Breeding	Chieri (TO)	Aimassi & Levi (1991)
15/07/1933	2 (Shot)	Breeding	Borgo San Dalmazzo (CN)	Caula & Beraudo (2014)
07/09/1949	1 (Shot)	Migration	Pra (TO)	De Beaux 1951, G. Boano, pers. notes
02/09/1969	1	Migration	Carmagnola (TO)	G. Boano, pers. obs.
25/04/1970	1	Migration	Villeneuve (AO)	Bocca & Maffei (1997)
30/06/1972	2	Breeding	Caltignaga (NO)	Bordignon (2004)
1974	1	NA	Ceresole d'Alba (CN)	Caula & Beraudo (2014)
12/10/1974	1	Migration	Caramagna (CN)	Caula & Beraudo (2014)
02/06/1979	1	Breeding	Caramagna (CN)	G. Boano, M. Ferro, pers. obs.
06/1980	1	Breeding	Caramagna (CN)	G. Boano, pers. notes
08/08/1981	1	Migration	Candia (TO)	GPSO (1982)
19/09/1982	1	Migration	Tagliolo Monferrato (AL)	GPSO (1984)
20/09/1983	1 (Dead)	Migration	Sommariva Bosco (CN)	GPSO (1984)
22/09/1983	3	Migration	Caluso (TO)	GPSO (1985)
01/05/1984	1	Migration	Caramagna (CN)	Caula & Beraudo (2014)
20/06/1988	1	Breeding	Usseaux (TO)	GPSO (1990)
02/07/1989	1	Breeding	Usseaux (TO)	GPSO (1990)
21/05/1993	1	Migration	Borgo San Dalmazzo (CN)	Caula & Beraudo (2014)
03/1994	1	Migration	Montegrosso d'Asti (AT)	Aves.piemonte, Banca Dati GPSO, accessed on 02.09.2020
28/06/1994	1	Breeding	Bellinzago Novarese (NO)	Casale et al. (2017)
05/06/1995	1	Breeding	Caselle (TO)	GPSO (1996)
25/09/1996	1	Migration	Ghemme (NO)	Bordignon (2004)
14/05/1998	1	Migration	Rivoli (TO)	Aimassi & Reteuna (2007)
21/09/1998	1	Migration	Briona (NO)	Bordignon (2004)
21/06/1999	1	Breeding	Graglia (BI)	GPSO (2002)
19/09/1999	2	Migration	Albano Verellese (VC)	GPSO (2002)
29/09/1999	1	Migration	Caltignaga (NO)	Bordignon (2004)
08/06/2000	1	Breeding	Bellino (CN)	Caula & Beraudo (2014)

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17/06/2000	1	Breeding	Acceglio (CN)	Caula & Beraudo (2014)
20/09/2000	1 (Dead)	Migration	Bra (CN)	GPSO (2003)
19/05/2001	1	Migration	Casasco (AL)	GPSO (2003)
19/05/2001	1	Migration	Piovà Massaia (AT)	GPSO (2003)
16/08/2001	2	Migration	Avigliana (TO)	GPSO (2003)
16/09/2002	1 (Dead)	Migration	Torino (TO)	D. Lo Bue, pers. obs.
02/06/2003	3	Breeding	Bellino (CN)	Aves.piemonte, Banca Dati GPSO, accessed on 02.09.2020
31/07/2004	4	Migration	Pragelato (TO)	GPSO (2006)
13/10/2004	1	Migration	Bosco Marengo (AL)	GPSO (2006)
03/11/2004	1	Migration	Villarbasse (TO)	GPSO (2006)
28/05/2005	1	Breeding	Ormea (CN)	Caula & Beraudo (2014)
10/06/2005	1	Breeding	Villarbasse (TO)	GPSO (2007)
27/06/2005	1	Breeding	Pragelato (TO)	Aves.piemonte, Banca Dati GPSO, accessed on 02.09.2020
22/07/2005	1	Migration	Trino (VC)	GPSO (2007)
21/10/2005	1	Migration	Cameri (NO)	GPSO (2007)
14/05/2006	2	Migration	San Gillio (TO)	GPSO (2008)
07/07/2006	1	Breeding	Usseaux (TO)	GPSO (2008)
17/05/2007	4 (1 ringed)	Migration	Fondotoce (VB)	GPSO (2009)
03/07/2007	1	Breeding	Cesana (TO)	Aves.piemonte, Banca Dati GPSO, accessed on 02.09.2020
23/07/2007	2	Migration	Pragelato (TO)	GPSO (2009)
25/08/2007	1	Migration	Quinto vercellese (VC)	GPSO (2009)
28/05/2009	1	Breeding	Cellarengo (AT)	GPSO (2010)
04/07/2009	1	Breeding	Druento (TO)	GPSO (2010)
24/10/2009	1 (Ringed)	Migration	Casalbeltrame (NO)	GPSO (2010)
25/04/2010	1	Migration	Rivoli (TO)	GPSO (2011)
10/05/2010	1	Migration	Fondotoce (VB)	GPSO (2011)
22/06/2010	1	Breeding	Santena (TO)	GPSO (2011)
01/07/2010	1	Breeding	Camerana (CN)	Caula & Beraudo (2014)
11/07/2010	1	Breeding	Castelmagno (CN)	Caula & Beraudo (2014)
16/10/2010	1 (Shot)	Migration	Predosa (AL)	GPSO (2011)
07/05/2011	1	Migration	Druento (TO)	Marotto (2012)

24/05/2011	1	Migration	San Gillio (TO)	Marotto (2012)
26/05/2011	1	Breeding	Ormea (CN)	GPSO (2012)
24/07/2011	1	Migration	Limone Piemonte (CN)	Aves.piemonte, Banca Dati GPSO, accessed on 02.09.2020
07/06/2012	1	Breeding	Grana (AT)	GPSO (2013)
05/07/2014	1	Breeding	Baceno (VB)	GPSO (2017)
06/07/2014	3	Breeding	Prazzo (CN)	GPSO (2017)
11/07/2014	1	Breeding	Bellino (CN)	GPSO (2017)
01/06/2015	1	Breeding	Suno (NO)	Casale et al. (2017)
25/06/2017	1	Breeding	Montanaro (TO)	Marotto (2018)
22/09/2017	1 (Dead)	Migration	San Germano Chisone (TO)	D. Seglie in <a href="http://www.inaturalist.org">www.inaturalist.org</a> , accessed on 02.09.2020
04/05/2020	1	Migration	Alfiano Natta (AL)	D. Rubolini in <a href="http://www.ornitho.it">www.ornitho.it</a> , accessed on 02.09.2020
12/05/2020	1	Migration	Peveragno (CN)	L. Giraud, pers. obs.
25/05/2020	1	Breeding	Druento (TO)	A. Bergamo in <a href="http://www.inaturalist.org">www.inaturalist.org</a> , accessed on 02.09.2020
20/06/2020	5	Breeding	Cesana (TO)	F. Cravero, pers. obs.
30/06/2020	1	Breeding	Pragelato (TO)	C. Mermillon in <a href="http://www.inaturalist.org">www.inaturalist.org</a> , accessed on 02.09.2020
04/07/2020	1	Breeding	Stroppio (CN)	G. Soldato, pers. obs.
06/07/2020	1	Breeding	Verrayes (AO)	L. Forneris in <a href="http://www.xenocanto.org">www.xenocanto.org</a> , accessed on 02.09.2020

2019a). As proposed by Brambilla & Pedrini (2013), a potential conservation tool might be the Rural Development Programmes (RDPS), where different prescriptions could address more Corncrake-friendly grassland management (different periods of mowing with lower-intensity strategies) and thus promote a recolonization of the area by the species. In particular, the core areas of the Chisone Valley and the Varaita, Maira, and Grana Valleys in the province of Cuneo should be priorities for any such conservation action.

In terms of practical applications, proper grassland management is required both at middle and high elevations. Mowing represents a major threat to the species during the breeding period; adults, chicks and nest survival depend on methods and the extent of this practice (Green et al. 1997a). During the early

phase of the breeding season, hay harvesting should be managed in the meadows at a lower elevation (< 1000 m), which are of primary importance for the species. In particular, hay-making should be delayed in order to maximise the chances of successful nesting. Delayed cutting should also be applied at higher elevations (> 1000 m) during the late breeding season, where it should be postponed until at least after the 25 July (Berg & Gustafson 2007). Conservation measures of this kind are expected to exert large positive effects not only on the Corncrake, but also on several other grassland avian species that are largely declining in Europe (Broyer et al. 2014, Fourcade et al. 2017, Assandri et al. 2019b).

In 2020, a local conservation action was implemented in one of the core areas near Cesana (Torino), where five males were recorded singing in June



and July, within the Natura 2000 protected area “ZPS IT1110026 Champlas - Colle Sestriere”. After a previous agreement with farmers, a grassland area of 500 x 500 m where individuals were observed singing during diurnal and nocturnal monitoring sessions was fenced off. In this way, the Corncrakes were protected for the whole breeding season and the area was neither grazed nor mown. However, proof of successful nesting was impossible to obtain, although the continued presence of birds suggested it was likely, showing the potential of correctly applied management. In general, the Corncrake is nowadays undoubtedly scarce in Piedmont and Aosta Valley. Accurate research is needed to confirm the successful breeding of the species at the regional scale in order to evaluate its conservation status and to protect potentially breeding areas.

The conservation status of the Corncrake in Italy is currently assessed as ‘Unfavourable – Bad’ (Gustin et al. 2016, 2019) and the species is likely to undergo a further marked reduction at national scale if conservation strategies are not implemented to counteract population decline. It is necessary to promote a standardized survey protocol in suitable areas to assess the magnitude of the population at the regional scale and thus intervene with proper management strategies in the habitats where the species breeds. Although the species is rare and occurs irregularly in a few alpine valleys in Lombardy during the breeding period (Brambilla et al. 2019), the promotion of a population nucleus in addition to that in the Central-Eastern Alps would undoubtedly benefit the species. Indeed, through a program of monitoring and management at a regional scale would likely further enhance the prospects of a more widespread recolonization of the species. The Corncrake currently has a tenuous foothold in the Western Alps – the opportunity this provides to help this threatened species should not be missed.

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