

HABITAT, VEGETATION AND LAND MANAGEMENT OF CORNCRAKE *Crex crex* BREEDING SITES IN CARNIA (FRIULI-VENEZIA GIULIA, NE ITALY)

Habitat, vegetacija in kmetijska raba na gnezdiščih kosca *Crex crex* v Karnijskih Alpah (Furlanija Julijska krajina, SV Italija)

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During the study, the scope of which was to provide some information on breeding habitat choice of Corncrakes *Crex crex* at one of the most important Italian sites for the species, 21 sites were chosen ranging in altitude from 201–1400 m a.s.l. where the species was present annually from 1991 to 2000. The study was carried out in Carnia (NE Italy). The sites were compared with the same number where the species was not recorded in the same period. In the meadows, some physical factors were measured (slope, aspect, pH, carbonate content, humidity and soil structure), management (number of cuts, timing of first cut, type, frequency and level of fertiliser application, reseeding, grazing animal species present, cutting equipment used, the use of herbicides or pesticides) as well as the type of meadow and complexity of vegetational structure. From the results it was possible to conclude that in Carnia Corncrakes prefer meadows with slight slopes and damp soils with late cuts where spring grazing does not take place. The type of meadow most favoured is that dominated by False Oat-grass *Arrhenatherum elatius* because of its structure (high grass with plenty of space at ground level) that guarantees a great deal of cover and is favourite by good local fertility and a limited number of annual cuts.

Key words: Corncrake, *Crex crex*, habitat choice, vegetation, management, site characteristics, Carnia, Friuli-Venezia Giulia, Italy

Ključne besede: kosci, *Crex crex*, izbor habitata, vegetacija, kmetijska raba, značilnosti zemljišča, Karnijske Alpe, Furlanija Julijska krajina, Italija

1. Introduction

The sites at which a species establishes itself during the breeding season are very important for a species' survival. So it is important to study these for the most threatened species. The Corncrake *Crex crex* is listed as vulnerable in the IUCN Red List of Threatened Animals (BAILLIE & GOOMBRIDGE 2000), and considered as "depleted" in Europe (BIRDLIFE INTERNATIONAL 2004), whilst in Italy the species is considered "endangered" (CALVARIO *et al.* 1999).

The aim of the study is to provide information on breeding habitat choice in one of the most important

areas in Italy for the species. A partial summary of data has already been published (RASSATI & RODARO 2003).

2. Methods

2.1. Study area

The study area was in Carnia, in the central-western part of northern Friuli-Venezia Giulia (Figure 1), dominated by mountains (altitude range: 195–2780 m a.s.l.) and characterised by a broad valley (Val Tagliamento) running west-east occupying the

southern part and joining with secondary valleys (Val Lumiei, Val Degano and Val But), which run largely north-south and occupy the central and northern parts. As in other mountain areas, there are a wide variety of geological substrates, soils, aspects and slopes. The climate overall can be considered temperate but with high rainfall (1400–2400 mm/year).

The grassland plant communities, once widely distributed, have been greatly reduced following the depopulation of the mountain areas and the subsequent abandonment of agricultural activities, particularly grazing and haymaking that has allowed scrub and secondary woodland, particularly of Hazel *Corylus avellana*, Maple *Acer* sp., Ash *Fraxinus* sp. and Pines *Pinus* sp. at low and medium altitudes and Spruce *Picea abies* and Larch *Larix decidua* to grow on medium and higher ground. At present, grassland communities are represented by hay-meadows that are widespread in the valley bottoms, in flat areas and near settlements and open grazing lands at higher altitude where summer grazing is still practiced or has only recently been abandoned.



Figure 1: Study area of the Corncrake *Crex crex* habitat choice in NE Italy

Slika 1: Območje raziskave izbora habitata kosca *Crex crex* v SV Italiji

2.2. Data collection

In an initial phase, based on data collected between 1991 and 2000 by one of the authors (G. RASSATI), between 201 metres and 1100 m a.s.l. two areas where the species was present annually and two areas where the species was never recorded were identified. Single

areas with birds present every year between 1991 and 2000 and areas with birds never recorded were identified for the altitudinal range of 1101 through to 1400 m a.s.l. These subdivisions were made following the percentage presence of Corncrakes at different altitudes in Carnia (RASSATI & TOUT 2002). The areas not holding Corncrakes were identified from those adjacent to areas holding calling birds (RASSATI & TOUT 2002) and apparently similar to the human eye. In this way the 42 (21+21) sites examined were believed to be a representative cross sample of the grassland in the study area.

A long time period (10 years) was chosen to identify and distinguish between the 'best' (and 'worst') areas where the Corncrake was present (or absent) since the species can be present at a site for a year or two with many individuals but rare or even absent before and after this (RASSATI & TOUT 2002). The average number (calculated from 10 years: 1991–2000) of Corncrakes for the sites with annual presence is 1.82, while the average number (calculated from 10 years: 1991–2000) of Corncrakes for the whole Carnia is 85.

Following this, standardised data was entered on printed forms covering physical aspects (altitude, slope, aspect, pH, carbonate content, soil classification, soil moisture) and management (number of cuts, timing of the first cut, type of fertiliser application, frequency of fertiliser application, level of fertiliser applied, reseeding, grazing animal used, grazing pressure if any, use of herbicides and pesticides in the fields). The timing of the first cut was classified as 'normal', 'slightly late' or 'late', reflecting the qualitative characteristics of the meadow and its altitude. To each meadow, a probable level of fertilizer application was assigned according to the floristic and physical characteristics observed. Samples of soil were collected so that their characteristics could be examined. The reaction of the first 10 cm of soil using the colorimetric method was measured, as well as carbonate content (SANESI 1977), the structure following the indications of McRAE (1991) and soil humidity, estimated by touch was assessed several times during the course of the season. Any use of herbicides and pesticides in the fields was also assessed, as well as the frequency of fertiliser application by interviewing the farmers.

Shortly before first cut, an overview of the vegetation was made by censusing the most representative species on the basis of their presence and their abundance. To establish the sites to be surveyed, the points where calling males were censused during the study period (1991–2000) (RASSATI & TOUT 2002, RASSATI unpubl.), were georeferenced. In this way, clusters of singing males were identified and the sampling carried

Table 1: Site characteristics of the two groups of sites in Carnia studied (21 each); Corncrakes *Crex crex* were either present or absent. Averages of slope, soil pH and carbonate content are given with one standard deviation.

Tabela 1: Značilnosti lokacije za dva tipa lokacij v Karnijskih Alpah, s kosci *Crex crex* in brez (21 enih in drugih). Naklon, vsebnost karbonatov in pH prsti so podani z eno standardno deviacijo.

Group / Skupina	1	2
Presence of Corncrakes / Prisotnost koscev	present / prisotni	absent / odsotni
Average slope / Povprečen naklon (%)	6.28 ± 6.7	16.28 ± 23.7
minimum slope / minimalni naklon (%)	0	0
maximum slope / maksimalni naklon (%)	20	100
Main aspect / Prevladujoča ekspozicija	SW / SE	SW / SE
Average pH / Povprečni pH	5.96 ± 0.63	5.98 ± 0.57
min.	4.5	5
max.	6.5	6.5
Average carbonate content / Povprečna vsebnost karbonatov	2.24 ± 1.70	1.99 ± 1.84
min.	0	0
max.	4	4
Main soil classification / Glavni tip prsti	L–S	L–S
L–S	11	10
S–L	7	7
L–C	2	2
S	1	0
L	0	2
Main soil moisture classification / Glavni tip vlažnosti prsti	D	RD–D
RD	2	8
D	16	11
DW	3	2

Remarks / Opombe:

Carbonate content / Vsebnost karbonatov:

0 = non-calcareous / ni (< 0.5–1%)

1 = very low carbonate content / zelo nizka (0.5–1%)

2 = low carbonate content / nizka (1–5%)

3 = calcareous / karbonatna (5–10%)

4 = very calcareous / zelo karbonatna (> 10%)

Soil classification / Tip prsti:

S = sand / pesek

L = loam / ilovica

C = clay / glina

Soil moisture / vlažnost prsti:

RD = rather dry / pretežno suho

D = damp / vlažno

DW = damp with waterlogging / vlažno, prepojeno z vodo

out from the central point of the cluster with the most contacts and identifying a sufficient homogenous square of c. 100 m² (10 x 10 m) considered sufficiently large to establish the nature of the plant communities present (WESTHOFF & VAN DER MAAREL 1978). In the sites where the Corncrake was not found the survey was made from the central point of the site under examination. On the basis of the data collected, the plant communities were assigned to those proposed in the most up-to-date studies (ROUMET *et al.* 1999, SCOTTON *et al.* 2000, SCOTTON & RODARO 2001).

The vegetational structure's complexity – that is to say in terms of the stratification of the above ground

plant biomass and the effect of this on visibility was estimated by eye and classified as “low”, “medium” or “high”. “Low” was deemed to be the height of the vegetation reduced almost to ground level with ground cover almost complete and a high level of visibility of the ground from above (the animal being easily visible in the meadow). “High” was represented by tall vegetation with limited cover present at ground level and little visibility of the ground from above (the animal being hidden in the meadow). The value “medium” indicates a state of affairs intermediate between the two indicated above.

3. Results

3.1. Site characteristics

The results of the site characteristics assessment are presented in Table 1. The sites at which the species was found were flat (9 sites out of 21) or gently sloping, ranging from 0 to 20% with an average slope of 6.28% and main aspect lying between south-west and south-east. Where, on the other hand, the species was not found, the slopes were steeper varying between 0% and 100%, with an average slope of 16.28% and main

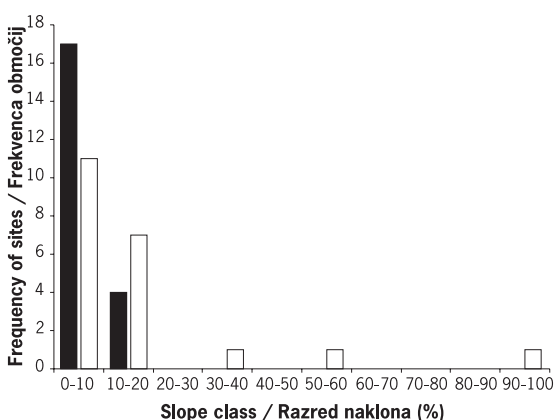


Figure 2: Slope (%) of the two groups of sites in Carnia studied (21 each); Corncrakes *Crex crex* were either present (black) or absent (white)

Slika 2: Naklon (%) za dva tipa območij v Karnijskih Alpah, s kosci *Crex crex* (črni stolpci) in brez (beli stolpci; 21 enih in drugih)

aspect lying between south-west and south-east. In addition, only 2 out of 21 of the sites could be termed 'flat' (Figure 2). The pH in the first 10 cm ranged from 4.5 to 6.5 in all the sites examined. Carbonate levels ranged from very low carbonate content through to calcareous, whilst the soil types ranged from sandy loam to loamy sand. The sites holding Corncrakes tended overall to be more humid compared to those where the species was absent (Figure 3).

3.2. Management characteristics

The results of the management characteristics assessment are presented in Table 2. On average, the fields are cut twice a year. The timing of the first cut at the sites where Corncrake is present is slightly later than those sites in which the species is absent. Fertiliser applications take place, on average, once a year using organic material (manure and slurry); the

level of fertiliser application overall appears to be medium. None of the fields used by the birds appear ever to have been re-seeded and even in the control group (Corncrakes absent) the practice appears rare. Autumn grazing is rarely practised and where it occurs the principle grazing animals used are cattle. To complete the study, other factors were assessed, such as the equipment employed to do the cut and any use of herbicides and pesticides in the fields. As far as the first element is concerned, cuts are made using rotary cutters where the lay of the land allows, whereas in steeper areas, the cuts are made with slower machines, such as Allen Scythes (motor scythes with horizontal knife) or even hand-held scythes. Finally, no use of herbicides or pesticides was noted.

3.3. Vegetational characteristics

The results of the vegetational characteristics assessment are presented in Table 3. Five types of vegetation were identified:

- 1) Upright Brome *Bromus erectus* dominated,
- 2) False Oat-grass *Arrhenatherum elatius* dominated – sparse,
- 3) False Oat-grass dominated – typical,
- 4) False Oat-grass with umbellifers,
- 5) Yellow Oat-grass *Trisetum flavescens* dominated.

Corncrakes were found at the sites dominated by False Oat-grass (containing mostly *Arrhenatherum elatius*, particularly in those classified as 'typical' together with

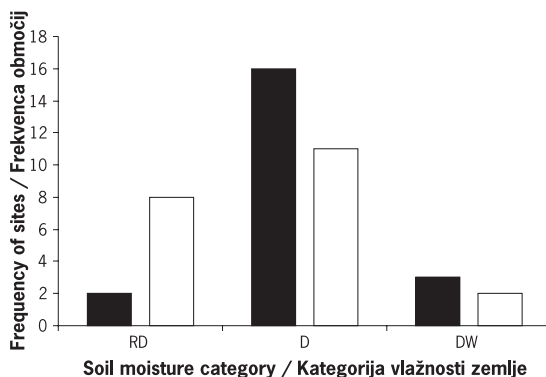


Figure 3: Soil moisture of the two groups of sites in Carnia studied (21 each); Corncrakes *Crex crex* were either present (black) or absent (white). RD = rather dry, D = damp, DW = damp with waterlogging

Slika 3: Vlažnost prsti za dva tipa območij v Karnijskih Alpah, s kosci *Crex crex* (črni stolpci) in brez (beli stolpci; 21 enih in drugih). RD = pretežno suho, D = vlažno, DW = vlažno, prepojeno z vodo

Table 2: Management characteristics of the two groups of sites in Carnia studied (21 each); Corncrakes *Crex crex* were either present or absent**Tabela 2:** Značilnosti kmetijske rabe za dva tipa lokacij v Karnijskih Alpah, s kosci *Crex crex* in brez (21 enih in drugih)

Group / Skupina	1	2
Presence of Corncrakes / Prisotnost koscev	present / prisotni	absent / odsotni
Average number of cuts / Povprečno število košenj	2	2
min.	0	0
max.	3	3
Timing of first cut / Čas prve košnje	sl. late – late/ rahlo kasnejši – pozen	sl. late (late)/ rahlo kasnejši (pozen)
normal / običajen	3	6
slightly late / rahlo kasnejši	5	4
late / pozen	13	11
Fertilisation regime / Režim gnojenja	manure	manure – slurry/ gnoj – gnojnica
manure / gnoj	10	5
slurry / gnojnica	4	4
manure and slurry / gnoj in gnojnica	3	8
no fertiliser / brez gnojila	4	4
Frequency of fertiliser application / Pogostost gnojenja	annual / letno	annual / letno
no fertiliser / ni gnojenja	4	4
annual fertiliser application / letno	16	17
biennial fertiliser application / na dve leti	1	0
Prevalent level of fertiliser applied / Intenzivnost gnojenja	medium / srednja	medium / srednja
low / nizka	3	5
medium / srednja	13	11
high / visoka	5	5
Reseeding / Vnovično sejanje	no / ne	rare / redko
no / ne	21	18
yes / da	0	3
Most frequent grazing animal used / Pretežni tip živine	cattle / govedo	cattle / govedo
cattle / govedo	3	4
sheep and goats / ovce in koze	0	2
horses / konji	0	0
horses and cattle / konji in govedo	1	1
sheep and cattle / ovce in govedo	1	1
sheep and horses / ovce in konji	0	0
ungrazed meadows / ni paše	16	13
Use of herbicides or pesticides / Uporaba herbicidov in pesticidov	no / ne	no / ne

Cocksfoot *Dactylis glomerata*, Meadow Fescue *Festuca pratensis* and White Bedstraw *Galium album*, whilst in those with umbellifers the latter largely consisted of Cow Parsley *Anthriscus sylvestris* and Hogweed *Heracleum sphondylium*) as well as in the *Trisetum flavescens* meadows, whilst it was absent from the sparse fields of *Bromus erectus*. The complexity of the vegetation structure shows a slight difference between the two groups of sites: that in which Corncrakes are found was shown to be slightly more complex.

4. Discussion

The results obtained allow the identification of certain physical, management and vegetational aspects of sites where Corncrakes were recorded annually when compared with the sites where the species was never recorded. We refer to the comparisons obtained with descriptive statistics presented in Tables 1, 2 & 3.

Table 3: Vegetational characteristics of the two groups of sites in Carnia studied (21 each); Corncrakes *Crex crex* were either present or absent

Tabela 3: Značilnosti vegetacije za dva tipa lokacij v Karnijskih Alpah, s kosci *Crex crex* in brez (21 enih in drugih)

Group / Skupina	1	2
Presence of Corncrakes / Prisotnost koscev	present / prisotni	absent / odsotni
Types of vegetation / Tipi vegetacije	3 (4)	3-4
<i>Bromus erectus</i> dominated / dominira	0	1
<i>Arrhenatherum elatius</i> dominated – sparse / ponekod dominira	3	5
<i>Arrhenatherum elatius</i> dominated – typical / večinoma dominira	9	7
<i>Arrhenatherum elatius</i> with Umbellifers	7	7
<i>Trisetum flavescens</i> dominated / dominira	2	1
Complexity of vegetational structure / Kompleksnost vegetacijske strukture	high / visoka	high (medium)/visoka (srednja)
low / nizka	3	4
medium / srednja	3	5
high / visoka	15	12

The difference between grasslands occurring on the two groups of sites are not very evident for various parameters, as already noted, but the sites without Corncrakes chosen tended to be in marginal areas but close to the main sites holding birds with a view to establishing the parameters used by the birds in choosing breeding sites. As far as site characteristics are concerned, the species appears to be influenced in its choice of reproductive habitat principally by slope and humidity that, at the sites that consistently held birds, were respectively lower and higher than in those without. Slope was the parameter that showed the greatest difference. To further confirm this, in sites with variable slope the singing males tend to position themselves in the flatter areas and these are also chosen for nesting (RASSATI *unpubl.*). It was also noted that where Corncrakes do occupy slopes they tend to choose those where flat areas tend to alternate with (usually small) steeply sloping areas where hand- or Allen scythes (motor scythes with horizontal knife) are used and rotary cutters cannot be employed. In many cases, these sites remain uncut or are cut only occasionally allowing adults and young to find refuge during mowing operations, given the lower speed of the tools employed (RASSATI *unpubl.*). CADBURY (1980), GREEN (1995), NIEMANN (1995), SCHÄFFER & WEISSER (1996), GREEN *et al.* (1997A), TYLER *et al.* (1998) all indicated that slower mowing gave greater chances of a successful outcome of breeding and the presence of unmowed or mowed in different times areas close by was generally considered important for the survival of broods and adults (GREEN & STOWE 1993, SCHÄFFER & MÜNCH 1993, NIEMANN 1995,

BROYER 1996, SCHÄFFER & WEISSER 1996, GREEN *et al.* 1997A, GREEN *et al.* 1997B, BROYER & RENAUD 1998, TYLER *et al.* 1998, BROYER 2003, RASSATI 2004). The new element met with in Carnia is represented by the fact that the use in different times (or non-use) of sites seems dependent upon the lay of the land and not a choice in favour of "Corncrake-friendly mowing".

Slope and humidity are also connected inasmuch as where the slope is greater, waterlogging is usually less. In addition, where humidity is linked to a favourable type of soil (deep and moisture-retaining) it favours the development of the sort of vegetation (False Oat-grass or False Oat-grass with umbellifers), which seem best suited to the species' requirements. Humidity has been found to be important in other studies on the choice of breeding habitat (CADBURY 1980, BROYER 1987, GREEN *et al.* 1997A, GREEN *et al.* 1997B, TRONTELJ 1997, BROYER & RENAUD 1998).

As far as agricultural management and vegetational characteristics is concerned, one parameter that certainly affects the presence of Corncrakes is the timing of the first cut, which, if it occurs early and intensively, certainly compromises the chances of birds choosing a site and breeding successfully (CADBURY 1980, BROYER 1987 & 1994, GREEN & STOWE 1993, GREEN 1995, NIEMANN 1995, GREEN *et al.* 1997A, GREEN *et al.* 1997B, BROYER & RENAUD 1998, RASSATI 2001 & 2004). Early or frequent cutting was not recorded in the meadows studied. Overall in the sites where the animals were located the date of the first cut was slightly later than in those meadows in which animals were not recorded. As far as fertiliser application is concerned, the amount of nitrogen distributed during the process

seems important regardless of its source (organic or inorganic) as it tends to influence the species present in the meadow and therefore the type of vegetational community found there. On average, the level of fertiliser applied was slightly higher in the meadows where birds were recorded. Grazing does not take place during the breeding season of Corncrakes and this is a positive element in that intensive grazing can cause the death of individuals or the abandonment of a site (STOWE & HUDSON 1991, TRONTEJ 1997). It has been shown on more than one occasion in montane areas of the region when the passage of large herds of sheep has caused the (at least temporary) abandonment of important Corncrake breeding sites as well as those of Rock Partridge *Alectoris graeca* and Black Grouse *Tetrao tetrix* (RASSATI *unpubl.*). Only a single example is known, late on in the breeding season, of a calling male at a site a few days before a flock of sheep had arrived (RASSATI *unpubl.*).

The reason that Corncrakes prefer meadows of False Oat-grass (especially the 'typical' variety and those containing umbellifers) as well as those of Yellow Oat-grass when compared to those of Upright Brome can be put down to their structure. The former are usually tall but with a low density of vegetation at ground level that permits free movement. These are characteristic of good local fertility but nevertheless with just a small number of annual cuts (RASSATI & RODARO 2003). In the meadows of False Oat-grass, in addition, the ground is hardly visible from above.

The fields dominated by Upright Brome, on the other hand, although extensively managed and therefore less disturbed, do not offer good habitat because they are usually low, denser at soil level and, therefore, with a structure not much liked by the Corncrakes.

To add weight to the above, the height of the vegetation is a parameter held to be important by other authors together with an overall favourable structure (CADBURY 1980, BROYER 1987, SCHÄFFER & MÜNCH 1993, NIEMANN 1995, GREEN *et al.* 1997A, GREEN *et al.* 1997B, TRONTEJ 1997).

To end with, it is hoped that the information obtained in this study might be used to direct appropriate safeguard measures for the species at a regional level that foresee the modification of management of areas suitable for Corncrakes and compensatory measures should these changes lead to lower or inexistent revenues as a result of these changes, already recommended in RASSATI & TOUT (2002) and in RASSATI (2004) but currently still lacking in Friuli-Venezia Giulia.

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5. Povzetek

Raziskava primerja območja, stalno naseljena s kosci v obdobju 10 let (1991–2000), z območji brez koscev v Karnijskih Alpah, SV Italija. V primerjavi je bilo zajetih 21 območij s kosci in 21 območij brez njih, območja pa so bila v razponu nadmorske višine 201–1400 m. Avtorja sta primerjala naslednje spremenljivke: naklon, ekspozicija, pH prsti, vsebnost karbonatov v prsti, vlažnost in strukturo prsti, število košenj, čas prve košnje, način gnojenja, vrsto živali na paši in še nekatere druge spremenljivke. Primerjala sta tudi vegetacijo. Iz rezultatov sta zaključila, da imajo kosci v Karnijskih Alpah raje travnike z manjšim naklonom in vlažno zemljo, raje pa imajo tudi kasnejšo košnjo in območja brez pomladanske paše. Najraje imajo travnike z dominantno travo visoko pahovko *Arrhenatherum elatius*, ker ima primerno strukturo; zaradi višine pticam zagotavlja primerno skrivališče, a tudi dovolj prostora za premikanje po tleh.

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