

DISTRIBUTION AND HABITAT OF THE CORN CRAKE (*CREX CREX*) AT THE UPPER SOČA BASIN (JULIAN ALPS, SLOVENIA)

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ABSTRACT

During 1993-1995, 30 singing Corn Crane males were recorded at nine sites in the mountains above the Upper Soča river basin. In most cases their habitats were abandoned alpine meadows and pastures at altitudes ranging from 700 to 1440 m, with an inclination of about 25-30 degrees and predominating southern to southwestern exposure. To prevent the area becoming overgrown by shrubs and woods, late mowing or controlled burning are recommended, while grazing should not be practised.

Key words: Corn Crane, alpine meadows, nature conservation, management, burning

INTRODUCTION

The Corn Crane (*Crex crex*) is one of 24 globally endangered bird species in Europe (Collar *et al.*, 1994). As a grassland bird it is threatened particularly by the destruction of its habitat (extensively farmed meadows) and modernization of grassland farming. Populations breeding in upland meadow are in a somewhat better position, for farming modernization is here practised to a much lesser extent than in the lowlands. In the mountains, the opposite phenomenon, *i. e.* abandonment of meadows is more widespread. These birds are losing their habitat as a result of overgrowth. In many places, however, the succession is due to poorer soil and harsher climate so slow that it does not present a critical threat so far. The Corn Crane's mountain populations may thus play a significant role for the species conservation, even though they are generally much smaller than lowland populations. Of particular interest for conservation is the potential mutual connection between the upland and lowland breeding sites. Questions, such as whether the upland populations are independent reproduction units, whether there exists a regular exchange between lowlands and uplands, whether upland populations can even compensate for the losses in low country, are still more or less unsolved.

The Corn Crane breeding grounds in the southeastern Alps (which also enclose the Upper Soča basin) have been discovered in the 1980's (Geister, 1985; Farronato & Fracasso, 1989; Utmar & Parodi, 1989). A number of calling sites at the Upper Soča basin have been surveyed also within the framework of the Slovene Corn Crane census (Trontelj, 1995). Breeding has been confirmed a number of times by the locals (see also Geister, 1985) and a gamekeeper from Kneža. As a supplement to the census, an additional habitat analysis and a survey of the accompanying bird community were carried out in some areas bearing high Corn Crane densities. The aim of this study was a more detailed characterization of the alpine habitat and thus an assessment of potential key factors for habitat choice in mountainous areas.

METHODS

The surveys were carried out in 1993 and 1994 by the national census survey method (Trontelj, 1995). The data concerning the surroundings of Srpénica and Trnovo ob Soči are from 1995 (T. Trilar, *in litt*). Mountainous areas were visited much more frequently in the morning hours than in dusk or at night, since the first visits in the mountains had shown a higher calling activity during the day than at night (see also Discussion).

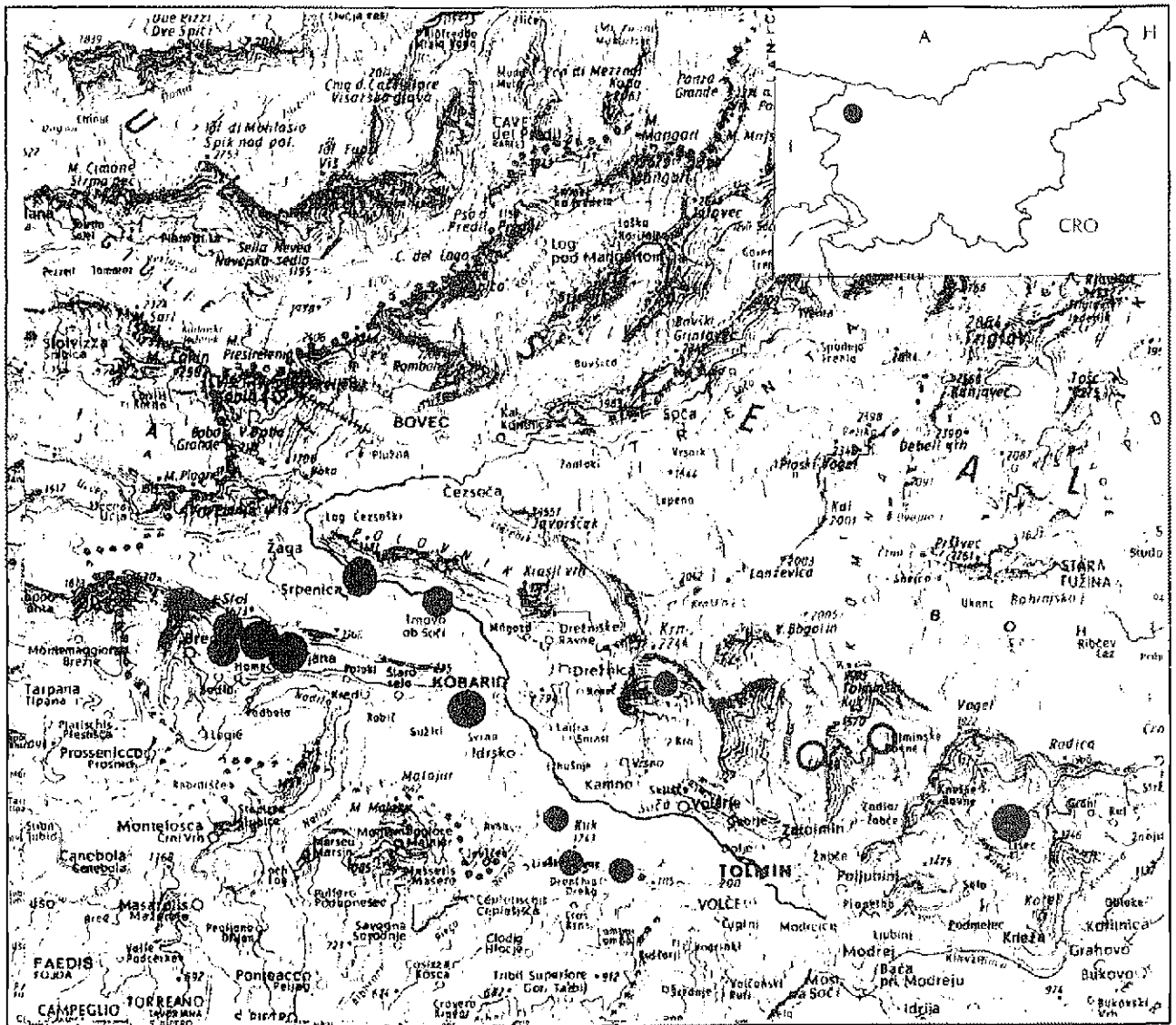


Fig. 1: Distribution of the Corn crake (*Crex crex*) at the upper Soča basin. Dot size app. reflects the number of calling males. Empty circles indicate abandoned sites.
Sl. 1: Razširjenost kosca (*Crex crex*) v zgornjem Posočju. Velikost krogov je prib. sorazmerna številu ugotovljenih koscev. Prazna kroga označujeta opuščeni lokalitetai.

"The Upper Soča basin" is in this paper understood as the range along the Soča river between Most na Soči in the south and Bovec in the north, bordering on the Italian frontier on one side and on Bohinj-Krn high-mountain range on the other. All mountain-dwelling Corn Crakes in Slovenia (with the exception of 2 records from the Snežnik Mountains) were recorded in this area. Habitat measurements were undertaken on June 16th 1994 at Kobariski Stol. Following parameters were measured:

- * max. height of vegetation, measured from the ground;
- * horizontal vegetation density at the layers from 20, 21-40, 41-60, 61-80 and 81-100 cm, estimated by ob-

serving a striped measuring board (divided into 10 cm sections) from a distance of 0.5 m and presented as the percentage of the measuring board covered by vegetation (Flade, 1991);

- * relative humidity of soil (very dry/cracked, dry, damp, wet, flooded);
- * five to ten characteristic plant species representing each site;
- * cover (in percent of the area), type and height of ligneous plants;
- * configuration of the ground, agricultural use and state.

Habitat parameters were measured at five calling

sites and at four points in its vicinity - angles of a square with the centre in the calling site and with a 50 m long side. The calling sites were selected along the entire altitudinal range.

The density estimates of the accompanying bird species were obtained by transect counts at altitudes with the highest Corn Crane density. Transect routes

were positioned at constant altitudes (along the contour line). Transect lengths were 0.9-1.5 km, the belt width was 100 m, and no corrections for detectability differences of bird species were made. For comparison, two transect counts in apparently very similar nearby areas void of Corn Crane were carried out.

Site	Number	Year	Altitude (in m)	Slope (in degrees)	Exposure	Description	area (km ²)**
Kobariški Stol	14	1994	815-1280	22-33°	SSW	abandoned meadows/ pastures	2.5
Lisec	4	1994	app. 700	25-30°	S	partially abandoned meadows/pastures	0.5
Kobariško blato	3	1993	240	---	---	lowland meadow corn field	1.0
Srpenica*	3	1995	360	---	---	lowland meadow	0.5
Trnovo ob Soči*	2	1995	320	---	---	lowland meadow	0.5
Livek	1	1994	800	15°	NW	meadow/edge of ski slope	---
Livske Ravne	1	1994	1020	22°	SW	upland meadow, potato, beans	---
Kolovrat	1	1994	1080	27°	SW	densely overgrown meadow/pasture	---
Krn	1	1993	1440	25°	S	sheep pasture, inactive	---

* T. Trilar, *in litt.*

** the estimate of Corn Crane occupied area, ± 0.5 km²

Tab. 1: Sites occupied by Corn Crakes at the upper Soča river.

Tab. 1: Prebivališča kosca v zgornjem Posočju.

RESULTS

During the survey (including the year 1995), 30 calling Corn Crane males were recorded at 9 sites at the Upper Soča basin (Tab. 1, Fig. 1). Apart from these sites, other areas with potentially suitable habitat were visited at least once, but no Corn Crakes had been recorded there. These sites were: Zaprikraj, Planina, Drežnica, Drežniške Ravne, Čadrg, Tolminske Ravne, and the transect Ljubinj - Planina Stador.

The areas where singing males were recorded are of two types:

1. lowland areas: flat hay meadows in the valleys at altitudes ranging from 240 to 360 m;
2. upland areas: alpine grasslands on more or less steep slopes over 700 m a.s.l.

In the further analysis, only upland areas are dealt with.

The upland areas were frequented by Corn Crakes at altitudes ranging from 700 to 1440 m. The central half of the records were made in a relatively narrow belt between 820 and 980 m (median = 880 m). A little less than one fourth (23%) of the records were made above 1000 m. The mean inclination of the slopes on which Corn Crakes were registered, was about 25 degrees; in most cases they were exposed towards south to southwest.

The height of vegetation at the calling sites was 83 ± 25 cm, and 59 ± 11 cm in their vicinity. Vegetation

density decreased rapidly with its height and was in the layer ranging from 41 to 60 cm only 10% of the density in the lowermost layer (Fig. 2). Hence, the vegetation providing cover was effectively much lower (40 cm high at the most) than the total vegetation height.

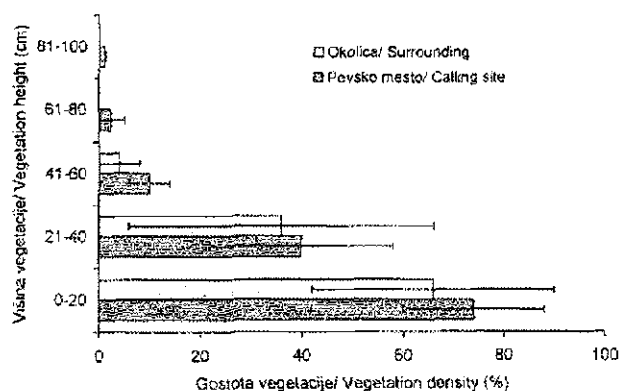


Fig. 2: Vegetation density in 20 cm-layers (mean values and standard errors), estimated from a distance of 0.5 m at the calling site as well as in four points in the surrounding; Kobariški Stol, June 16th, 1994.

Sl. 2: Gostota vegetacije v 20 cm visokih slojih (srednje vrednosti in standardni odkloni) ocenjena na oddaljenosti 0,5 m na mestih, kjer so peli kosci, ter na štirih točkah v bližnji okolici vsakega pevskega mesta; Kobariški Stol, 16.06.1994.

The most numerous and at the same time most characteristic herbs at Corn Crakes' calling sites and in their vicinity were: *Laserpitium siler*, *L. latifolium*, *Thalictrum saxatile*, *Veratrum album*, *Polygonatum odoratum*, *Cynanchum vincetoxicum*, *Arrhenantherum elatius*, *Aconitum napellus*, *Digitalis grandiflora* and *Valeriana officinalis*. It was vaguely estimated that the plant species structure did not differ much at the birds' calling sites and their vicinity. In the immediate vicinity of calling sites, ligneous plants were also found. At the highest singing post (1280 m) there was only an isolated 1.5 tall spruce (*Picea abies*). The vicinity of other singing posts was covered by shrubs (up to 20% of the area). Over half of these were dry bushes destroyed by fire in 1992. Predominating among them were *Corylus avellana*, *Rosa* sp., *Juniperus communis*, *Rubus* sp., *Sorbus aria* and *Fraxinus ornus*. One calling site was situated a little less than hundred metres from the edge of the surrounding forest. The soil was in all places "damp" and humusrich, but never stony. At some calling sites scattered rocks were present (up to 1 m in diameter). In the vicinity of one calling site there were two heaps of stones (with approx. 2 m in diameter).

At Kobarški Stol and Kolovrat (Tab. 2) the densities of the most numerous accompanying bird species were estimated. The slopes of Krn and Krnčica, two very similar adjacent areas void of Corn Crakes, were surveyed for comparison. From the former two they differed in their use as pastures (although there was no livestock there at the time of research) and partially in vegetation, predominated by grasses over other herbs. There was no evident difference in density and height of the vegetation.

Species	areas with Corn Crakes		areas without Corn Crakes	
	Kolovrat	Kobarški Stol	Krnčica	Krn
<i>Anthus spinoletta</i>	5.6	3.3	6.2	3.8
<i>Anthus trivialis</i>	2.2	10.0	1.5	1.1
<i>Saxicola rubetra</i>	6.7	11.5	3.1	4.2
<i>Lanius collurio</i>	1	3.6	2.3	2.1
<i>Emberiza cia</i>	0.6	3.3	--	0.5
<i>Sylvia atricapilla</i>	0.6	1.7	0.8	1.6
<i>Fringilla coelebs</i>	1	0.8	0.8	0.5
<i>Alectoris graeca</i>	0.6	0.9	--	1.6
<i>Alauda arvensis</i>	--	0.8	1.5	1.1
<i>Acanthis cannabina</i>	--	0.8	0.8	1.1
<i>Oenanthe oenanthe</i>	--	--	2.3	1.6
<i>Coturnix coturnix</i>	--	0.8	--	0.5
<i>Monticola saxatilis</i>	--	2.5	--	--
<i>Turdus torquatus</i>	1	--	--	--
<i>Crex crex</i>	0.6	1.7	--	--

Tab. 2: Densities of some bird species in alpine meadow areas with and without Corn Crakes (in territories/10 ha) estimated by transect counts.

Tab. 2: Gostote nekaterih vrst ptic na travnatih gorskih pobočjih z in brez koscev (v teritorijih/ 10 ha), ocenjene s transektnimi popisi.

DISCUSSION

Geographical and ecological analysis

The alpine grasslands on the mountains above the Upper Soča valley are the only known regular and confirmed Corn Crane's upland breeding sites in Slovenia. Due to the relatively low level of fieldwork input, new discoveries seem quite possible. However, discoveries of concentrations such as at Kobarški Stol seem unlikely, for the geographical and ecological conditions elsewhere in the Slovene Alps are not in favour of this species. The analysis of some geographical factors (Tab. 1) seemingly speaks in favour of a narrow habitat choice determined by an altitude from some 800 to 1000 meters, south to southwestern exposure of the slopes and inclination of about 25 degrees. On the other hand, the altitude coincides with the belt of predominantly abandoned mountain pastures. The exposure of the slopes is dictated by direction of mountain chains. On sunward slopes there predominated haymaking and grazing, while on shady slopes forests were prevalent. As there are almost no other extensive enough upland meadows in the Slovene Alps, it cannot be said for certain that the Corn Crakes selectively choose grassy slopes at certain altitude with certain exposure and inclination. Equally likely seems the presumption that they simply take what is available to them. In that case key factors should be looked for at a microgeographical and physiognomical scale.

Most Corn Crakes (63%) inhabit areas which have not been farmed for a number of decades. Characteristic of these habitats are high herbs which in succession super-



Fig. 3: The extensive southern slope of Kobarški Stol is Corn Crane's most important alpine breeding site in Slovenia; June 17th 1993. (Photo: P. Trontelj).

Sl. 3: Obsežno južno pobočje Kobarškega Stola je najpomembnejše gorsko gnezdišče kosca v Sloveniji; 17. 06. 1993. (foto P. Trontelj).

seede grasses. Shrubs and trees in early succession stages are covering up to 20% of the area. Corn Crakes also inhabit farmed meadows and margins of pastures, as long as the vegetation there is high and dense enough. There were no records from pastures in use. Height and density of vegetation are concordant with the findings of other authors on lowland meadows (Schäffer, 1993; Flade, 1991).

The bird communities accompanying Corn Crakes in their upland habitat include grassland and alpine species as well as species favouring shrub and rocky habitats. The community of these birds, e.g. Corn Crane, Rock Partridge, Rock Thrush and Whinchat, seems somewhat unusual but may occur throughout the mountains of southeastern Europe. Whinchat is typically accompanying Corn Crane also in its lowland breeding grounds. In the Alps, Whinchats were present at all sites frequented by Corn Crakes; a reciprocal relationship, however, was not noted. No Corn Crakes were noted in areas inhabited by Wheatears, which also holds for smaller patches within the areas.

Open questions

1. Connection and comparison with breeding sites in NE Italy

The mountain-dwelling Corn Crakes in Slovenia probably belong to a subpopulation of the much larger Italian population inhabiting the Alps and the pre-Alpine country to the west (Farronato, 1994). For an assessment of the key factors for habitat selection, the conditions in Italy should be also compared.

2. Vertical migration

Recent investigations on radio-tagged Corn Crakes in Bulgaria have indicated vertical migration from valleys to higher lying mountain areas (Schäffer, *in litt.*). This shift is due to improved conditions (melting of snow, growth of vegetation) in the uplands in late spring. In the Upper Soča valley calling sites were also found at low altitude flatlands. From the nearest upland habitats they are four kilometers away. The question is, however, what is the role of these habitats early in the season, when the conditions higher on the mountains are still unfavourable. Do they serve as starting points for the birds to inhabit their upland breeding grounds? Parallel monitoring of the Corn Crane's in the valleys and higher up in the mountains could provide some answers to these questions.

3. Circadian calling pattern

During the first visits of Kobariški Stol (e.g. on June 17th 1993), Corn Crakes were intensively calling in the

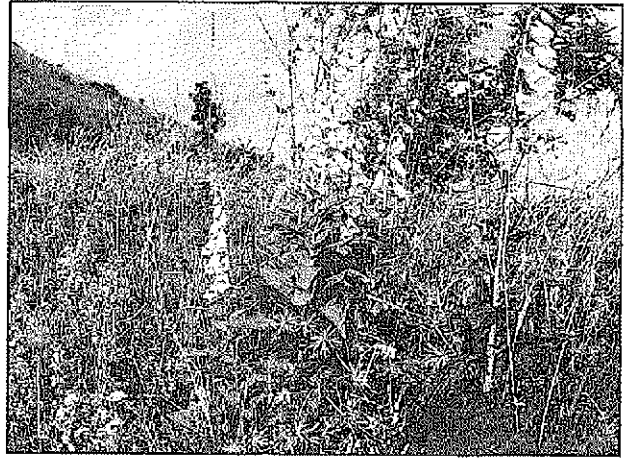


Fig. 4: A close view of the Corn Crane's alpine habitat on Kobariški Stol; June 17th 1993 (Photo: P. Trontelj)
Sl. 4: Pogled od blizu v košček življenjski prostor na gorskih travnikih Kobariškega Stola; 17.06.1993. (foto P. Trontelj).

afternoon as well as in morning hours. In the evening and night time their activity was considerably reduced. At Mt. Krn, on June 16th and 17th 1993 a solitary Corn Crane was periodically calling through the entire day, and showed no increase in calling activity at night. Such circadian calling pattern deviates from the pattern known from low country: continuous calling at night and only occasional calls at daytime. A possible explanation was presented by Schäffer (1995) who determined that paired males cease singing at night and begin to call at daytime. As far as the Upper Soča basin is concerned, this would mean that most recorded Corn Crakes were paired males. In view of the relatively high number of breeding records in the mountains, such assumption is not utterly unfounded. An answer could be found by regular monitoring of the circadian calling activity throughout the breeding season.

4. Breeding success

Factors reducing breeding success in the lowlands (early mowing, mechanical mowing, floods) are largely absent in the mountains. Moreover, the climate at the alpine grasslands above the Upper Soča valley is in spite of the high altitude relatively mild. Hence, a high breeding success with two clutches can theoretically be expected. Ideally, a single female could produce more offspring in the mountains than a whole group of females in a lowland meadow with an unfavourable mowing regime. Females breeding in the mountains may thus play in the reproduction of larger population a much greater role than is their actual proportion. A possible approach for elucidating this question would be radio tagging of females (for establishing the number of

offspring and clutches) as well as banding of the pulli and netting in lowland breeding sites (to establish their dispersal).

Conservation

Since the Corn Crake is considered a globally threatened species, any newly discovered Corn Crake breeding site automatically raises the question of its conservation and protection. In those alpine breeding sites that support considerable numbers of Corn Crakes (Kobariški Stol, Lisec), it would be sufficient to freeze the state as existing at the moment. In the long run, however, this would be possible only by preserving the ecosystem at its early stage of succession. Potential mechanisms are three: grazing, mowing and burning. Grazing of cattle as well as sheep and goats is unsuitable, for the results of the research have shown that Corn Crakes do not inhabit active pastures. Summer mowing is an ideal way of habitat management but is, as far as steep mountain meadows are concerned, at many places unsuitable.

These areas are inaccessible by ordinary agricultural mechanization, while scything in such vast areas cannot be even thought of today. Controlled burning as an alternative method for the maintenance of open habitats has become an important tool in conservation management (Gimingham, 1994; Blab, 1993; Calder *et al.*, 1992; Waldrop *et al.*, 1992). When carried out carefully (at the end of reproduction and vegetation period, in restricted areas, and not every year) it does not seriously affect plant and animal populations in open habitats.

The fire which raged in 1992 on the entire southern slope of Kobariški Stol can serve as a model case. The herb vegetation has been soon (mostly in the following year) completely renewed while shrubs and trees mostly died away. Corn Crakes inhabited this area prior and after the fire. Their abundance prior to it (Geister, 1985) is indeed not known, but in 1994 it nearly reached saturation. The established density (10 calling males/km²) was among the highest in Slovenia (Trontelj, 1995). The species richness and abundance of other birds additionally speak in favour of a positive ecological effect of the fire.

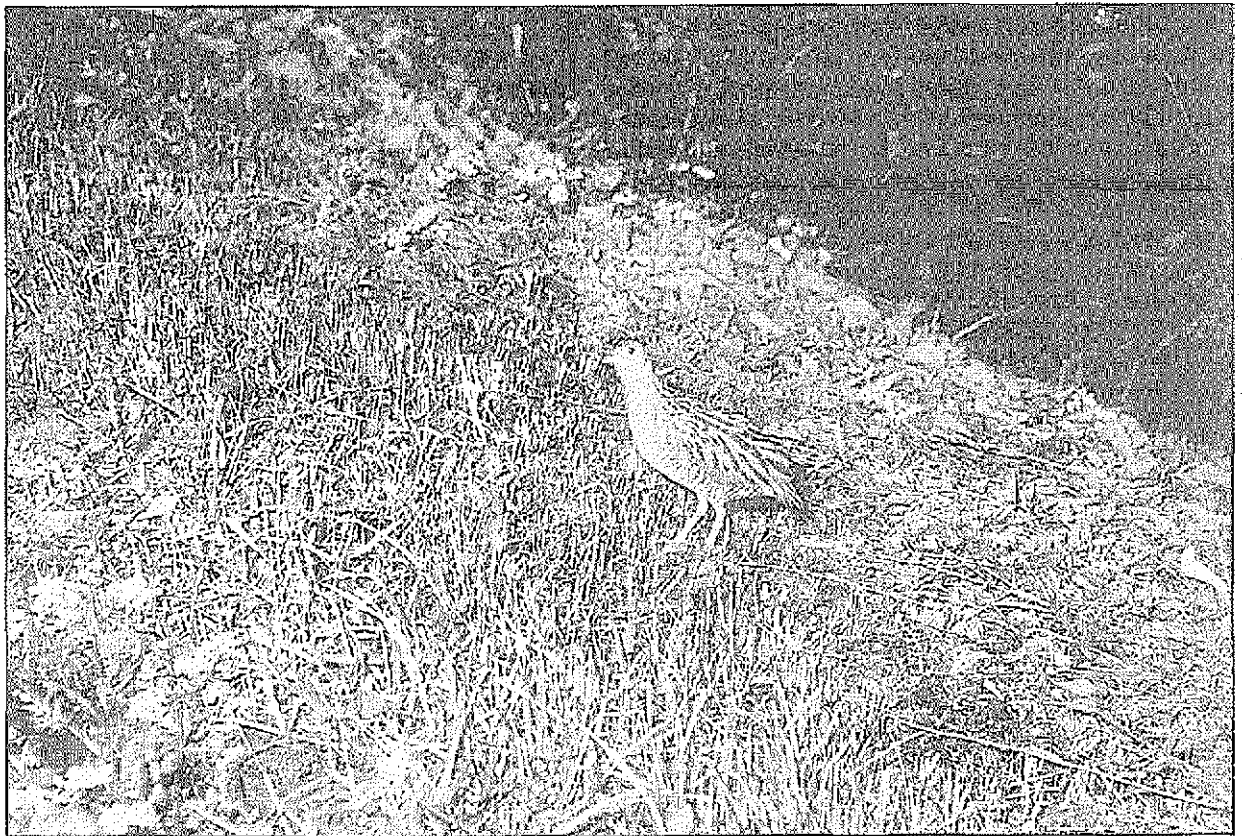


Fig. 5: Corn Crakes only exceptionally leave the cover of dense meadow vegetation. This bird was taken unawares by mowing (Photo: N. Schäffer).

Sl. 5: Kosec le izjemoma zapusti kritje visokega travniškega rastlinja. Ptico na sliki je presenetila kosnja (foto N. Schäffer).

The main Corn Crane's upland nest sites lie outside the borders of Triglav National Park and should be therefore given an appropriate conservation status (e.g. nature monument), which will promote the implementation of management schemes and prevent possible negative human impact. The problem of disturbance is particularly pressing on the slope of Kobariški Stol which is accessible to motorized tourists. Cross country racing, hang gliding and paragliding are not compatible with the aims of nature conservation.

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RAZŠIRJENOST IN ŽIVLJENJSKI PROSTOR KOSCA (*Crex crex*) V ZGORNJEM POSOČJU (JULIJSKE ALPE, SLOVENIJA)

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POVZETEK

Kosec je globalno ogrožena vrsta ptice, ki poleg nižinskih travnikov naseljuje tudi travnata pobočja gora v višjih legah. Dejavniki ogrožanja (uničevanje življenjskega prostora in intenzivno kmetijstvo) so v gorskih gnezdiščih neprimerno manj opazni kot v nižinah. Zato je na dlani vprašanje pomena gorskih gnezdišč za ohranitev koševih populacij v Evropi. Gnezdišča v zgornjem Posočju, obravnavana v tem prispevku, so verjetno del večje populacije s težiščem v zahodno ležečih italijanskih Alpah in predalpah. V letih 1993-95 je bilo v zgornjem Posočju ugotovljenih devet lokalitet s skupaj 30 pojočimi samci. Tri lokalitete ležijo na dnu dolin in so primerljive z drugimi nižinskimi prebivališči. Pri drugih gre za večidel opuščene gorske travnike ali pašnike na nadm. višini med 700 in 1440 m, s srednjim naklonom 25-30 stopinj in prevladujočo južno do jugozahodno izpostavljenostjo. Srednja maksimalna višina vegetacije na mestih oglašanja samcev je bila pribl. 80 cm. Najizrazitejše zelne rastline so bile: *Laserpitium siler*, *L. latifolium*, *Thalictrum saxatile*, *Veratrum album*, *Polygonatum odoratum*, *Cynanchum vincetoxicum*, *Arrhenantherum elatius*, *Aconitum napellus*, *Digitalis grandiflora*, *Valeriana officinalis*. Okolico večine pevskih mest je poraščalo tudi grmovje, ki je zavzemalo do 20% površine. Značilne spremljajoče vrste ptic so bile npr. repaljščica, vriskarica in drevesna cipa, pa tudi kotorna, slegur in skalni strnad. Območja kosca in kupčarja, čeprav na pogled podobna, so se izključevala. Nekatera tačas odprta vprašanja se nanašajo na ključne dejavnike za izbiro habitata v gorah, morebitno vertikalno migracijo med dolinami in gorskimi gnezdišči, vzorec cirkadiane razporeditve petja ter gnezditveni uspeh in obstoj drugega legla. Glavni naravovarstveni problem je zaraščanje opuščanih travniških površin. Kot možni rešitvi se ponujata pozna košnja ter kontrolirano požiganje. Slednje je marsikje že uveljavljeno orodje naravovarstvenega managementa in ima modelno oporo v nedavnem velikem travniškem požaru na Kobariškem Stolu. Pašniška raba je neprimerna, saj kosci pašnikov ne naseljujejo.

Ključne besede: kosec, gorski travniki, varstvo narave, management, požiganje

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