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Status of the Corncrake *Crex crex* as an indicator of biodiversity in eastern Hungary

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In eastern Hungary during the summer of 1997, 17 natural grasslands holding Corncrakes were analysed to establish their general biodiversity and to compare them with neighbouring grasslands that lacked calling Corncrakes. The diversity of plants and birds on a small scale was measured through a series of plot and point counts, while the diversity at site level was measured by standardised counts of species richness per site for plants, butterflies and birds. Sites with Corncrakes did hold more plant, butterfly and bird species than the control sites. The small scale of the point and plot counts meant that we could not explain this difference, which may indicate that the effect was mainly caused by a more heterogeneous habitat structure at the Corncrake sites. This is supported by the fact that the number of indicator species of hedgerows, bushes and isolated trees, but not of indicator species of open grasslands, was higher at the sites with Corncrakes. Tree Pipit *Anthus trivialis*, Common Cuckoo *Cuculus canorus* were associated with the Corncrake, (Corn Bunting *Emberiza calandra* tended to be associated with Corncrake) while (Eurasian) Skylark *Alauda arvensis* and Yellow Wagtail *Motacilla flava* tended to be commoner at the control sites. Corncrakes can be considered as a good umbrella species for the biodiversity of wet grassland habitats because the large and heterogeneous habitats suitable for this species also provide suitable niches for most other species of wet grasslands breeding in eastern Hungary.

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1. Introduction

The Corncrake *Crex crex* is a globally threatened bird species living mainly in extensive tall grasslands. It is classified as 'Vulnerable' at both world and European level due to the long-term and very steep population decline of the species across its range. Breeding occurs in 34 countries but has been declining in Europe since the last century, on average since about 1990 by some 20% to 50% (Crockford *et al*. 1996, Tucker & Heath 1994). However, very recent population recoveries throughout Europe demonstrate also the potential for fast population increase under good conditions (Stowe & Green 1997).

In many countries the establishment of conservation programs for the Corncrake is still a difficult task because of its strong dependence on tall grasslands, which are also important in agricultural production (Green *et al.* 1997). This result in a distribution in Europe negatively correlated to the intensity of agricultural production (Green & Rayment 1996). To convince landowners as well as politicians to carry out Corncrake conservation programs, economically acceptable management

Tab. 1. Differences in species numbers of plants, birds and butterflies at plot level (a-diversity) and site level (b-diversity) between grasslands with Corncrakes (+sites) and control sites (-sites). sd = standard deviation. Significant differences are marked in bold letters. One-way ANOVAs.

	Plant species			**Butterfly species**			**Bird species**		
	+sites	-sites	F	+sites	-sites	F	+sites	-sites	F
α-diversity	6.1	6.4	0.1	--			**6.2**	**5.5**	3.4 (*)
sd	2.6	1.9					0.9	1.0	
β-diversity	**65.9**	**54.9**	9.6 **	**11.3**	**7.1**	9.9 **	**17.1**	**13.9**	4.5 *
sd	9.3	10.9		4.7	2.6	3.8	4.1		

(*) p>0.1, * p < 0.05, ** p < 0.01

plans (Schäffer & Weisser 1996) and further political arguments about the importance of Corncrake protection in nature conservation have to be developed.

It has therefore been suggested, as an important aspect in Corncrake conservation research, to analyse the status of the Corncrake as an indicator of biodiversity (Crockford *et al.* 1996). It has long been known that Corncrakes inhabit areas of generally high biodiversity (Flade 1991), but no quantitative data are published that compare the diversity, in the same geographical region, between sites holding Corncrakes and sites where the birds do not occur in grasslands. We therefore analysed biodiversity aspects in a metapopulation of approximately 200 Corncrakes in eastern Hungary. The birds were dispersed in small groups over many isolated sites of natural grasslands situated in the plain of the Upper Tisza, and it was possible to compare diversity between occupied and unoccupied sites. Specifically, we wanted to analyse whether grassland sites occupied by Corncrakes also held a higher diversity of plants, butterflies and birds, if there were differences between measures of diversity at different scales, and if some bird

Tab. 2. Comparison of bird species numbers between sites with Corncrakes (+sites) and control sites (-sites), with species separated into five ecological groups. Significant differences are marked in bold letters. One-way ANOVAs.

Variable	Nr. of species (means)	R^2	n	F
Indicators of grassland	+sites: 4.5 –sites: 4.5	0.001	34	0.02
Indicators of bushes, hedgerows and old isolated trees	+sites: **4.8** –sites: **2.9**	0.15	34	5.58 *
Other possibly breeding species	+sites: 2.4 –sites: 2.0	0.01	34	0.39
Raptors	+sites: **2.1** –sites: **1.4**	0.10	34	3.49 (*)
Visitors	+sites: 3.5 –sites: 3.2	0.01	34	0.33

** = p<0.01, (*) = p<0.1

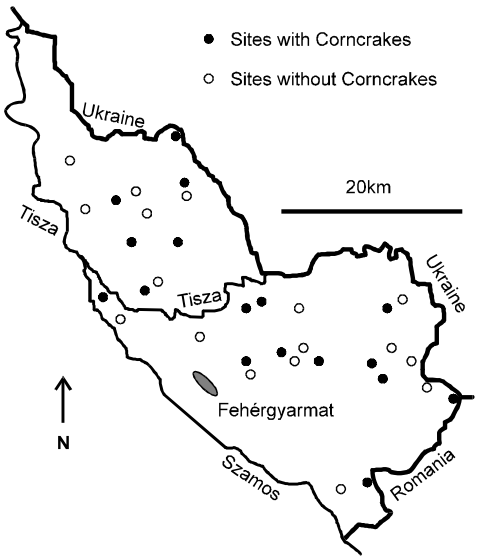

Fig 1. The location of the 34 study sites in the Szatmár-Bereg region of eastern Hungary (48°00'N, 22°30E).

species or groups of species were associated with Corncrakes.

2. Methods

The study area was the Szatmár-Bereg lowland (Important Bird Area HU35, category A1, Nagy 1998) in easternmost Hungary in a triangle bounded by the rivers Tisza and Szamos and the border with the Ukraine and Romania (48°00'N, 22°40'E), an area of approximately 1170 km^2. A general survey of the Corncrake was carried out in this region between 15 May and 12 June 1997, covering 137 km^2 of natural grassland.

Based on this survey, we selected 17 clearly delineated grassland sites each holding at least two singing males so that a diversity analysis could be carried out. Additionally, for each site holding Corncrakes, we wanted to analyse (as a control) a clearly delineated natural grassland lacking calling males. To ensure a similar geographical distribution of the two site groups, for each Corncrake site we selected the closest properly surveyed site that lacked calling males. Because of the number of unoccupied sites in the north was limited, the separations between the pairs of site types are greater there. In the end, we had a total of 34 grassland sites in which we could compare the diversity of those that held Corncrakes with those that were unoccupied (Fig. 1). A second survey was made between 26 June 1997 and 6 July 1997 to establish presence of the birds. An important outcome of the second survey was that it confirmed the status of the study sites for the diversity analysis. At all occupied sites, Corncrakes were heard again, while none could be found at any of the control sites.

We used the MapInfo v4.0 GIS software for measuring the size of the potential breeding habitats, by identifying the border of the habitats on the digitised and geocoded 1:25 000 map and calculated the area of the identified polygons. There was no difference found in the extent of the area of occupied and control sites but the grasslands differed mainly thus: occupied sites had taller but less dense vegetation and comprised a higher degree of additional habitat structures, such as like bushes and old riverbeds (Wettstein, *et al.* 2001).

To measure the diversity of plants in the grasslands on a small scale (α-diversity), we determined five points along a 500 m transect. The transects at Corncrake sites were placed through the centre of the area of highest density of calling males, because many of the occupied sites also contained large areas lacking Corncrakes . We had to be sure to sample habitats that

Corncrakes had preferred. At the control sites, transects were placed randomly. At the determined points, we placed a 33×33 cm frame in the vegetation and counted the number of plant species growing within the frame.

To measure diversity of birds on a small scale, a one-minute point count was carried out at every point selected for the plant analysis. Only birds within the borders of the grassland site were counted. For plants and birds, we calculated the average of these five counts respectively

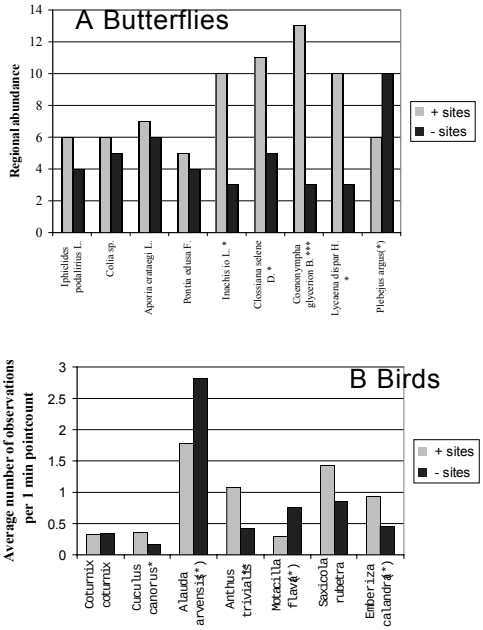

Fig 2. Comparison between sites with Corncrakes (+sites) and sites without Corncrakes (-sites) for: a. The regional abundance of the butterfly species that have been observed at 10 to 20 sites during all visits (Chi-square tests); b. The average number of observed bird individuals during the five one-minute point counts for all the observed indicator species of grasslands and for Cuckoo (One-way ANOVAs).
*** = $p<0.001$, ** = $p<0.01$, * = $p<0.05$, (*) = $p<0.1$

to compare the small-scale diversity between Corncrake sites and control sites. The density of butterflies was very low at most sites, so that no measure of diversity was established from the point counts. At the selected plots, mostly the very common species *Pieris sp*., *Maniola jurtina* and *Coenonympha pamphilus* were observed, other species were only very rarely seen.

To obtain a measure of plant diversity at site level (β-diversity), the number of plant species that could be identified during a half an hour walk at constant speed was noted. The walk followed a course chosen to cover all the important grassland types present at the site proportionally to their area. The diversity of birds and butterflies at site level was measured as the number of species that could be found within the grassland during the site visit (approximately 3 hours per site). On any one day, one site of a pair would be investigated after 0800 and one in the afternoon before 1700 with occupied and control sites distributed equally at both times. The bird species list for each site was then divided into the functional groups 'Indicators of grassland', 'Indicators of bushes, hedgerows and old isolated trees', 'Raptors', 'Other species possibly breeding at the site' and 'Visitors' depending upon the breeding biology of the observed species.

3. Results

3.1. Plants

Grasslands holding Corncrakes had very variable plant diversity at plot level. Corncrakes occupied not only grassland

with the lowest species diversity dominated mainly by *Alupecurus pratensis* (averaging only 2.6 plant species per 33×33 cm square) but also the most diverse alluvial meadow (11.4 plant species per 33×33 cm square). Species numbers at the control site plots were less variable, averaging 6.4 species per plot, very similar to the Corncrake site values. In the half-hour transect counts, however, which represent the large-scale diversity of the sites, the Corncrake sites held on average ten more species than the control sites (Tab. 1).

3.2. Butterflies

Species richness of butterflies at site level ranged from 3 to 19 species in Corncrake sites, averaging 11.3 species per site. In the control sites however, fewer species (ranging from 3 to 15) were found, an average of 7.1 species per site (Tab. 1). *Inachis io, Clossiana selene, Coenonympha glycerion* and *Lycaena dispar* occurred significantly more frequently at the occupied sites than at the control sites (Fig. 2a).

3.3. Birds

The bird point counts at the Corncrake sites produced an average 6.2 species per one-minute point count. In the control sites, the average tended to be lower at with 5.5 species per site. For each site as a whole, Corncrake sites had 17.1 species, averaging 20.5% more species than the control sites (Tab. 1). Analysis of the ecology of the observed bird species revealed that the higher diversity attained on the occupied sites was due mainly to the 'indicators of bushes, hedgerows and isolated trees' (14 species in total). On average, occupied sites held two more indicator species than did the control sites (Tab. 2). Furthermore, Corncrake sites were likely to hold one more raptor species than control sites (10 raptor species in total). However, we could not detect any difference between site types in the number of grassland indicator species (a total of 6 species). In addition, other species as possible breeders or visitors were found in similar numbers at both site types.

The comparison of the abundance of single species at the point counts shows differing results for different species (Fig. 2b). Quail *Coturnix coturnix* was observed in similar numbers at the two site types. Typical short-grass habitat species like Skylark or Yellow Wagtail were commoner in the control sites. The Cuckoo, the Tree Pipit and the Corn Bunting, however, were more often observed at sites with Corncrakes. We had classified both the Tree Pipit and the Corn Bunting as grassland birds, but both like bushes and isolated trees in their habitat, which is consistent with the result from the previous paragraph. Interesting patterns were further observed for the River Warbler *Locustella fluviatilis* and the Grasshopper Warbler *L. naevia*, which were both observed only at Corncrake site point counts (four occasions each). All other species did not show clear numerical differences between the two types of grassland or were observed on too few occasions to draw meaningful conclusions.

4. Discussion

The use of simple and fast field-methods makes a comparison to other studies difficult. Therefore, we cannot compare the

biodiversity found in the Corncrake habitats of eastern Hungary to other similar habitats elsewhere. Our results reflect the features of a habitat choice within a region. Because the Corncrake preferred very diversely structured grasslands, it was also associated with a high general biodiversity. In the study region such diversity includes, in particular, thorn bushes on pastures, willow bushes, former riverbeds, hedgerows along ditches or paths and isolated old trees, which are highly important for other wildlife. These features mostly derive from extensive land-use over a long period, but in at least four sites, the observed diverse landscape structure is the direct consequence of cessation of land-use since the late 1980s. The fact that no difference was found between each site type for the number of generalist species probably breeding in them indicates that both kinds of grassland have similar basic ecological conditions, but differ in special features that affect the specialist species, such as site management or vegetation structure.

The region has large unprotected valuable areas, a circumstance that demands timely conservation action in devising and applying suitable methods of selecting key additions to enlarge the protected areas. Without doubt, Corncrake distribution is a good indicator of valuable wet grassland habitats. Its need for large heterogeneous grasslands and the indication of high β-diversity make it a good umbrella species for the grasslands of fluvial plains.

So far, no management conflicts with other threatened species have arisen from Corncrake-friendly management. The two species that were found to be commoner in sites without Corncrakes are both very common and prefer short-grass steppe-like habitats. This is a reminder that for dry habitats, completely different aspects have to be considered. It is also important to remember that such things as small patches of rich or diverse habitat untypical of the surrounding area may easily overlooked in this single-species approach, yet these patches may be very valuable for plant or insect populations (Simberloff 1998).

Further studies are needed to determine direct interrelationships between the occurrence of Corncrakes and additional landscape structures in grasslands (*e.g.* recognition of suitable habitat types during return migration and shelter or rest areas). However, if the Corncrake is to be regarded as an umbrella species for general conservation of biodiversity, these elements need special consideration. If the conservation approach also embraces the maintenance of the heterogeneous landscape structure associated with Corncrake areas, it will support a wide range of biodiversity at the same time. Isolated single-species management focused solely increasing Corncrake populations would not justify its status as an indicator species of biodiversity, because in very poor species habitats, management efforts may also boost population numbers (Simberloff 1987). To save the Corncrake and the high general biodiversity of wet grasslands, agricultural policy should encourage a variety of low intensity land-use practices, thus safeguarding the traditional flood plain landscape structure; with special soil relief and other structuring elements.

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References

Crockford, N. J., Green, R. E., Rocamora, G., Schäffer, N., Stowe, T. J. & G. Williams. 1996. Corncrake. pp. 205-243. In: Herida, B., Rose, L. & M. Painter. (Eds). Globally Threatened Birds in Europe: Action Plans. – Council of Europe, Strasbourg, France.

Flade, M. 1991. Die Habitate des Wachtelkönigs während der Brutsaison in drei europäischen Stromtälern (Aller, Save, Biebrza). – Vogelwelt 112: 16-40.

Green, R. E. & M. D. Rayment. 1996. The decline of the Corncrake *Crex crex* in Europe in relation to the intensity of agriculture. – Bird Cons. Int. 6: 201-212.

Green, R. E., Rocamora, G. & N. Schäffer. 1997. Populations, ecology and threats to the Corncrake *Crex crex* in Europe. – Vogelwelt 118: 117-134.

Nagy, S. 1998. Fontos madárélőhelyek Magyarországon. – Magyar Madártani és Természetvédelmi Egyesület, Budapest, Hungary.

Schäffer, N. & W. W. Weisser. 1996. Modell für den Schutz des Wachtelkönigs. – J. für Orn. 137: 53-75.

Simberloff, D. 1987. The spotted owl fracas: mixing academic, applied, and political ecology. – Ecology 68: 766-772.

Simberloff, D. 1998. Flagships, umbrellas, and keystones: is single species management passé in the landscape era? – Biol. Cons. 83: 247-258.

Stowe, T. J. & R. E. Green. 1997. Response of Corncrake *Crex crex* populations in Britain to conservation action. – Vogelwelt 118: 161-168.

Tucker, G. M. & M. F. Heath. 1994. Birds in Europe: their Conservation Status. – BirdLife International, Cambridge, U.K.

Wettstein, W., Szép, T. & M. Kéry. 2001. Habitat selection of Corncrakes *Crex crex* in Szatmár-Bereg (Hungary) and implications for further monitoring. – Ornis Hung. 11: 9-18.