

Monitoring Programme for Corncrake *Crex crex* in Croatia

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Range

The Corncrake breeds in Europe and central Asia, as far east as western China. Corncrakes formerly bred over much of northern and central Europe between c. 40° and 62°N. Nowadays, distribution is much restricted within the former range, and is fragmented in western and central Europe. Large areas are today abandoned due to habitat degradation and intensified agricultural practice. The estimate of the total European population is 1.3 – 2.0 million singing males (including 1.0 – 1.5 million singing males in European Russia) (BirdLife International 2004).

Distribution in Croatia

Corncrakes are widely but patchily distributed in Croatia. It breeds in the Lowland, Mountain and Mediterranean regions. The breeding population in Lowland Croatia in 2010 was estimated at 250-600 singing males (V. Dumbović Mazal). The most important breeding areas in this region are wet meadows along the River Sava (Turopolje and Donja Posavina areas) and its tributaries Kupa and Una. In Mountain Croatia, the total population was estimated at 240 to 480 singing males (IO CASA). The major habitats are wet meadows in karst poljes (flat-floored closed karst depressions) in Lika and Gorski kotar. In Mediterranean Croatia, small breeding populations occur along the River Cetina, on wet meadows of Paško and Hrvatačko polje (R. Crnković) and in Istria, on karst fields of Čićarija mountain (K. Mikulić, K. Mandić). The most recent Croatian breeding population estimate is 500 – 1,100 singing males.

Habitat

Suitable habitats include moist, unfertilised grassland and regularly cut meadows in areas of low-intensity agriculture where vegetation grows tall in summer. Wetlands and marsh edges may act as important refuges when drier habitats are unsuitable. Ideally 150 ha or more of relatively contiguous suitable habitat should be available to sustain a viable local population. The nest is on the ground in dense vegetation. The diet in the breeding season includes a wide range of invertebrates found on plants, and on and within the soil (beetles, other large insects, earthworms, snails, slugs). Small vertebrates such as fish and amphibians are also taken occasionally.

Habitat types according to the National Habitat Classification: A.4.1.2, C.2.

Phenology and population biology

The Corncrake is a long-distance migrant. It winters mainly in sub-Saharan Africa, in the savannas of south-central and south-east Africa. Most birds arrive on the breeding grounds in May and stay there until August when autumn migration begins. In many areas, there are marked annual fluctuations in the number of singing males. It is sequentially polygynous, with some males moving a considerable distance to new singing areas. There are normally two broods per year. Incubation and care of the chicks are done by the female alone.

Pressures and threats

(according to the reference list of threats and pressures for reporting in Article 12 of the Birds Directive)

The major pressures and threats are connected with Agriculture (A). Since the 1970s, there has been a marked loss or degradation of suitable breeding habitats because of intensification of agriculture (A02.01), grassland removal for arable land (A02.03), intensive grazing (A04.01.), use of biocides, hormones and chemicals (A07), increased use of fertilizers (A08), intensive mowing for silage, and early, fast and synchronous mowing (A03.01). In second half of the 20th century, loss of habitat due to drainage and conversion to arable crop cultivation, as well as improved drainage of fields and control of winter flooding changes (i.e. changes in hydraulic conditions, J02), was severe. This process, with somewhat less intensity, continues to this day.

More recently, the loss of habitat through land abandonment, i.e. lack of mowing (A03.03) or lack of grazing (A04.03.), has become very pronounced in some parts of Croatia. Without regular mowing and grazing, shrubs and trees invade meadows and render them unsuitable as breeding habitat for Corncrakes. In some areas, the vegetation structure has changed to such an extent that Corncrakes no longer breed there.

Early, fast and synchronous mowing (A03.01) increases nest destruction and chick mortality, while poaching (F03.02.03) reduces adult survival.

Conservation measures

Further drainage of wetland areas and humid grassland should be prevented. Re-establishment of destroyed habitats should be carried out wherever possible. Traditional management of grasslands should be supported, both within SPAs and in the wider area. In humid grasslands that are suitable for Corncrakes further intensification should be avoided and Corncrake-friendly farming techniques should be implemented which include: postponing the date of first mowing, using appropriate mowing techniques, staggering the mowing of large fields over a two-week period, leaving uncut areas, providing early cover, removing invading scrub and avoiding excessive grazing (stocking densities should not exceed 0.25 LU per ha).

Description of national legislative protection

The Corncrake is strictly protected in Croatia under the Nature Protection Act (NN 70/05, NN 139/08, NN 57/11).

Annexes of the Birds Directive

Annex I

Croatian Red List

2010 Vulnerable

MONITORING PROGRAMME

The basis of the monitoring programme is regular counting of singing male Corncrakes at the same survey plots. Counting should be done according to the standard methods of the International Corncrake Monitoring Scheme. Survey plots can be of different sizes, but preferably as large as can be completely surveyed during one night.

Field mapping

Objectives

To update and improve the accuracy of the population estimate and range map in Croatia, made in 2010. These were based on existing data, collected mainly through surveys carried out in some of the key Corncrake areas in Croatia. However, it is suspected that the actual range is much wider and that it breeds all over the Alpine region and a much wider area of central and western Lowland Croatia.

Fieldwork instructions

Counting should be done following the standard methods of the International Corncrake Monitoring Scheme (see monitoring on plots, below).

Sampling design

Additional data on the distribution and number of Corncrakes should be collected by visiting randomly chosen 10 x 10 km grid squares containing suitable habitats. Grid squares containing parts of SPAs where transects have already been established should be excluded from the sampling procedure.

It is recommended that a total of 74 grid squares are randomly selected: 14 in the Mountain and 60 in the Lowland regions (Appendix 1). The occurrence of potential Corncrake habitats within each of the selected squares should be determined (based on vegetation maps and DOF) and counting sites/transects (which can be covered in one night) established. Before the first count, each site/transect should be visited during the day to adjust the route if necessary – it should pass within 500 m of any potential Corncrake habitat (meadows, very extensively pastures, nettle beds etc.).

It is recommended that each of selected sites/transects is surveyed once in four-years. All selected sites/transects can be surveyed in the same year, or progressively during first four years of the six-year reporting period (18 to 19 sites/transects per year). All sites where Corncrakes are found should be included in the national survey, which should be carried out in the fifth year of the six-year reporting period.

To survey the 74 sites/transects (each should be visited twice during the breeding season), about 350 person-days are needed (74 sites x 2 surveys x 2 fieldworkers = 296 + 20% allowance for repetition of visits because of bad weather).

Data forms

The same as for monitoring on plots.

Monitoring on plots

Objectives

To monitor the status of Corncrakes in Croatia through regular counting of singing males at the same survey sites/transects, following the methods of the International Corncrake Monitoring Scheme.

Fieldwork instructions

The team for each site should comprise 2 surveyors, of which at least one must be familiar with Corncrake vocalization and monitoring protocols. They should have good hearing abilities and sufficient sense of direction to determine the direction of calling Corncrakes from a compass.

Detailed instructions

Survey sites/transects should be surveyed with the following frequencies:

- 8 existing transects/plots in SPAs should be surveyed annually;
- the other 18 existing transects in SPAs should be surveyed during 3 consecutive years (in the second half of the 6-year reporting period);
- another 35 randomly selected transects should be surveyed once (in addition to the first survey carried out during field mapping) during the national count in the fifth year of the 6-year reporting period.

Note: the national count involves simultaneous counting on all selected sites/transects, once, in the fifth year of the 6-year reporting period.

Each survey site/transect should be surveyed twice during the breeding season in the counting year, at least 10 days apart. Preferably, first count should be done between 25 May and 5 June and the second between 20 and 30 June.

Counting should be done during the night, preferably between 23.00 and 02.00, but between 22.00 and 03.00 is acceptable if the routes are long. Every predetermined route should be counted during one night.

Adverse weather conditions (strong wind, rain, snow, strong fog, etc.) can influence Corncrake activity and the ability of surveyors to detect them. Accordingly, counting should be done only during favourable weather conditions: wind velocity Beaufort scale 3 or below, and no precipitation. If low pressure accompanied by a cold front is forecast it is the best to postpone the survey and conduct it when the pressure starts to rise again. If weather conditions deteriorate over the course of an evening, surveyors must use their judgement whether the route should be completed, or do it again on another evening. Data on weather conditions should be recorded at the beginning and end of each survey, and preferably at every counting point, so that weather variables can be used as covariates to reduce variance in count indices.

Field procedure

Counting could be done along transects (if routes go through areas without drivable roads) or along point-transects.

In the first case, surveyors should walk slowly along the route and stop each time a Corncrake is heard. The surveyor should record this position with a GPS, and find the direction of the bird with a compass; then walk about 100 m further to reach a position from which triangulation of the bird's location should be possible (reading the GPS and compass direction again), and the data recorded. In addition, the bird's position should if possible be recorded on a map. Thereafter, the surveyor should continue to walk until a new bird is heard. If several birds are heard from the same position, every bird should be noted with a number in superscript (i.e. CREX¹, CREX², etc.). The direction (azimuth bearing) of each bird should be determined by compass and position calculated by triangulation.

For a point-transect, the surveyor usually drives between predetermined survey points. When the surveyor reaches the predetermined position, they should stop the car, turn off the engine, get out of the car and listen for the calling males. If a bird is heard, its position and subsequent changes in position should be noted. If there is more than one bird vocalizing, the surveyor should determine the direction (azimuth bearing) and estimate the distance; every bird heard should be marked with a number in superscript (i.e. CREX¹, CREX², etc.; see Appendix 2). The distance to bird is hard to estimate correctly because the strength of the call depends on the direction the bird is facing. It is easy to get an impression of two birds (near and far) when a bird turns about; or if it is calling near objects that reflect sounds (buildings or rocks), echoes can easily give the illusion of two birds in different directions. With care, this problem can be solved because there are always differences in the rate of calling between two real birds, but echoes of the same bird always go at the same rate. However, triangulation should be applied whenever possible by recording the positions of every male calling from at least two standing positions (distance between standing points should be at least 100 m) located by GPS. The azimuth direction from each standing position and name (or coordinates) of the standing position should be recorded.

During listening, surveyors should move their head, and occasionally whole body, in order to record Corncrakes' position as accurately as possible. During a count, surveyors should be silent and all necessary movements should be done without making a noise. To avoid bias of the survey results, play back of Corncrake calls should not be undertaken.

All routes should be checked during daytime, before or immediately after counting in order to record the habitat conditions – percentage of mowed area, percentage of too wet or too dry areas, etc. For this purpose, the surveyor should follow the procedure described in habitat mapping below, using habitat field forms and a printed 1:5,000 DOF map.

Equipment

- Data forms
- Compass
- Map (1:25,000) with drawn points
- GPS unit with entered coordinates of counting points
- Head lamp for every team member
- Thermometer
- Pencil
- Personal field equipment - warm clothes and shoes
- Vehicle

Sampling design

Survey sites/transects should be selected so that they are representative of the region in order to make valid statistical inferences about the Corncrake population in the region. Ideally, random sampling or random stratified sampling should be applied. In order to incorporate already established plots/transects (about 22) and also to ensure that SPAs where the Corncrake is a target species are covered by monitoring, a semi-random sampling approach is proposed.

New sites/transects in non-SPA areas should be selected by random stratified sampling (during field mapping), while already established (and previously surveyed sites/transect within SPAs) should be retained. In SPA Lička krška polja additional transects should be established (for example in Ličko and Vrhovinsko polje). Transects should be also established in SPA Pokupski bazen.

It is expected that new sites/transects, selected by random stratified sampling, will constitute at least half of the total number of sites/transects needed for monitoring. The final selection of transects will be possible after the above described research is carried out during first four years of the reporting period.

Habitat mapping

A detailed description of the habitat in the survey areas should be made at the beginning (in the first monitoring year) and then at regular intervals (but at least once in a six-year reporting period). For habitat mapping all available GIS layers should be used, esp. DOF imagery. Information gathered from those layers should be combined with information gathered in the field. Pictures documenting different habitat types and structures (particularly if some abandoned parts under vegetation succession are present in the area) should be taken. A habitat map of the survey area should be produced using the categories given in the following table (these categories should be regarded as preliminary and to be further developed by the Working Group):

Habitat type	Specify
Meadows	wet/dry; intensive/non-intensive
Pastures	wet/dry; intensive/non-intensive
Crops	type - maize, wheat, etc
Other arable land	type – vegetable, etc.; intensive/non-intensive
Fallow land	type - grassland, pasture, other
Abandoned land	degree of succession: I. few scattered low shrubs present II. ≤50% of the area covered by shrubs III. > 50 of the area covered by shrubs mostly < 2m high IV. shrub-land, tall shrubs mostly > 2m high
Other	forest, water, etc.

Immediately before (or after) every survey, the area should be checked by day and all important alterations in the habitat since the previous visit recorded.

Data forms

See Appendix 2.

Interpretation of the results

Information required:

- estimated number of singing males
- maps showing location of all singing males
- possible explanation of changes in numbers from previous year and notes about threat/pressures detected during fieldwork.

The data from each survey should be used to make a map showing all locations of singing birds at the end of the field season. Birds present at locations less than 200 m apart on different visits are best treated as being the same individual; conversely, birds more than 200 m apart are treated as separate individuals (unless a known movement took place, for example because a site was mowed or flooded). It is important to apply these rules, or any other set considered more appropriate, consistently from year to year.

Evaluation of the conservation status components

Population size

Population units are singing males.

As a result of this monitoring programme, the Corncrake population will be sampled to get an index of abundance (population index) – i.e. the number of singing males/surveyed sites (transects). Changes in the population index over an extended period of time will provide a trend in population size. The population size calculated on the basis of the population index obtained from sampled plots can be extrapolated to estimate the whole population size in Croatia.

Breeding distribution map and range size

Additional research (using a simple presence-absence approach), carried out at localities not covered by existing survey sites/transects would permit more precise determination of the Corncrake range size and boundaries in Croatia. Such research should be carried out periodically (at least every ten years) in suitable habitats outside the boundaries of the known range in order to determine if the range is expanding. If population indices gained through national monitoring indicate negative or positive population trends, additional sampling, using the same standard methodology, would facilitate revision of the breeding range.

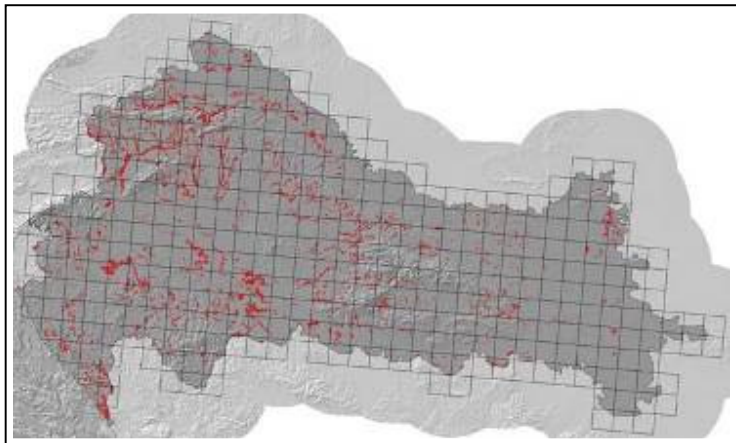
Main pressures and threats

The underlying reasons for population trend changes would not be revealed by the monitoring programme alone. However, regular collection of data on habitat conditions at counting points or along routes can aid the interpretation of observed changes. Further research, concentrated in areas (transects/plots) with pronounced changes in Corncrake numbers, should be carried out in order to determine which factors have affected the population density.

Selection of sample areas for Corncrake *Crex crex* monitoring programme

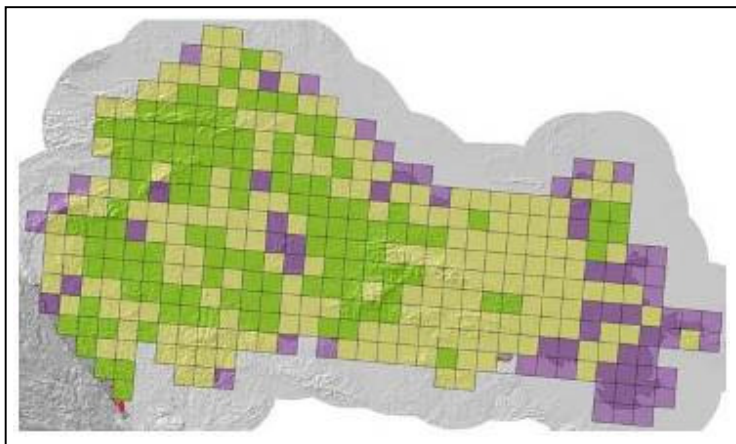
LOWLAND CROATIA

Baseline



GRID = 10 x 10 km squares N= 377
 RED = grasslands according to Corine Land Cover Map (codes 231 and 321)

First step



All grid squares in Lowland Croatia were classified in three groups:

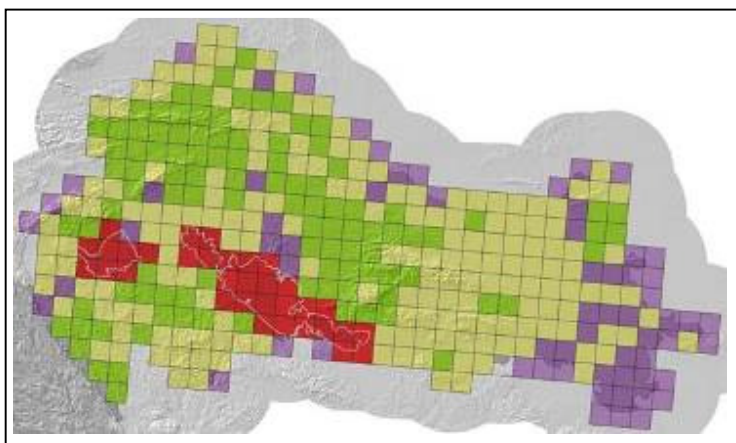
VIOLET = grid squares with grasslands = 0% (N = 64)

YELLOW = grid squares with grasslands < 5% (N = 187)

GREEN = grid squares with grasslands > 5% (N = 126)

Violet squares were excluded from random sampling!

Second step



Grid squares that cover SPAs were also excluded (some of them are already have exiting plots)

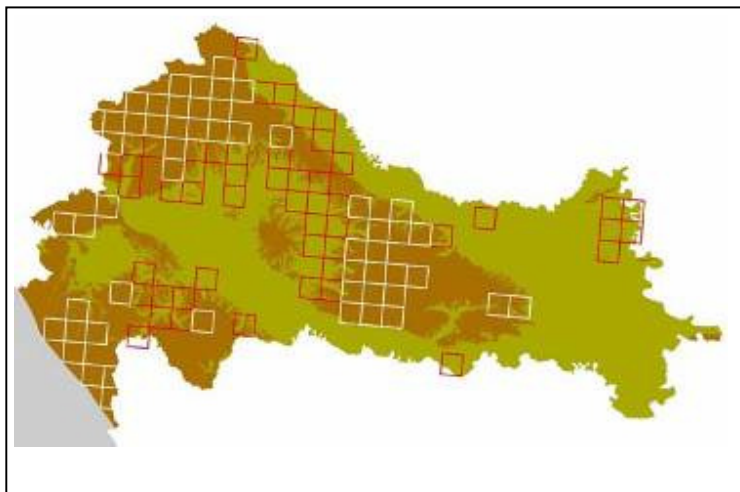
RED = grid squares "occupied" by SPA
 N = 33

After First and Second step 280 grid squares left for random sampling:

YELLOW = grid squares with grasslands < 5%
 N= 175

GREEN = grid squares with grasslands > 5%
 N = 105

Third step



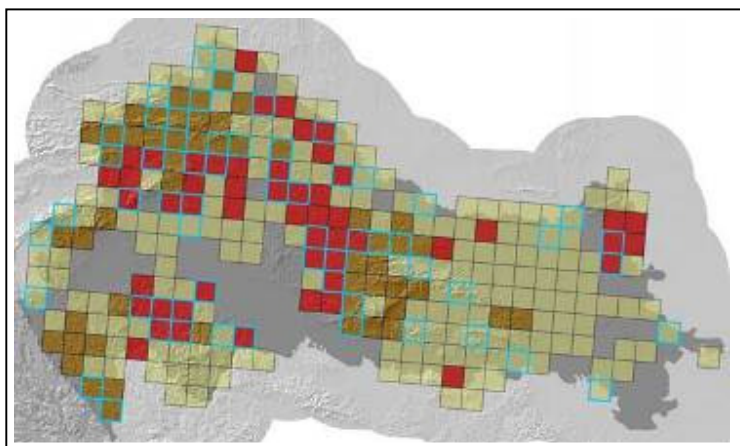
Within existing CLC cover only one category of grassland is recognized. However, for the Corncrake the most important habitats are wet grasslands in river basins. Therefore, Lowland Croatia was divided in two parts:

OLIVE GREEN – areas below 150 m (mostly river basins, assumed to have a higher proportion of wet grasslands)
BROWN – areas above 150 m

Grid squares with total grassland cover > 5% were then classified in two groups:

WHITE = squares with grasslands > 5 % in areas above 150 m (N = 52)
RED = squares with grasslands > 5 % in areas below 150 m (N = 53)

Fourth step



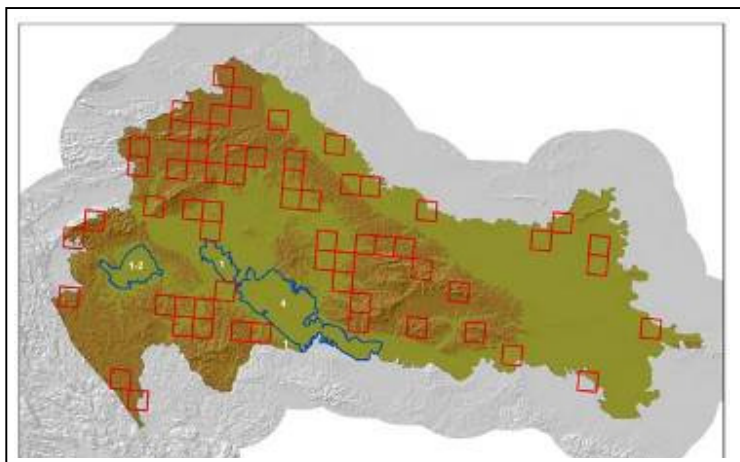
Random sampling of classified grid squares was done. The categories were sampled in different proportions reflecting their suitability for Corncrakes:

YELLOW = squares with grasslands < 5% (N = 175) @ 10% = 17 squares

BROWN = squares with grasslands > 5 % above 150 m (N = 52) @ 30% = 16 squares

RED = squares with grasslands > 5 % below 150 m (N = 53) @ 50% = 27 squares

SAMPLING AREA IN LOWLAND CROATIA



Non – SPA areas

60 transects/plots should be established in the randomly selected 10 x 10 km grid squares (red squares) – one transect per grid-square. These transects should be surveyed once in the first four years; depending on the survey results, some of them (up to 24) should be incorporated in the national monitoring programme (in the fifth year)
+ 1 already established transect (Una)

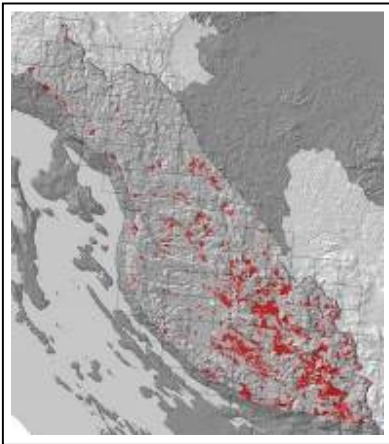
SPA areas

SPA Pokupski bazen: 1-2 transects (to be established)
SPA Donja Posavina: 4 transects (3 already established, 1 more to be established)
SPA Turopolje: 1 transect (already established)

For the establishment of survey plots and transects in the selected 10 x 10 grid squares, all available GIS layers should be consulted (vegetation maps, topographic maps, aerial photographs etc.) to determine where habitats that could be suitable for the Corncrake occur. In those areas, a transect route or a plot, that can be covered in one night, should be identified. If this is not possible (because of unfavorable distribution of adequate habitats inside the selected square, minefields, etc.), a replacement square should be chosen from the neighbouring squares. Replacement squares should have the same characteristics (same habitat type prevailing): the order of choice for a replacement should be a square situated to the north, then east, south and west. If all neighbouring squares are found to be unsuitable, random sampling of a new square from the sampling pool should be done.

MOUNTAIN CROATIA

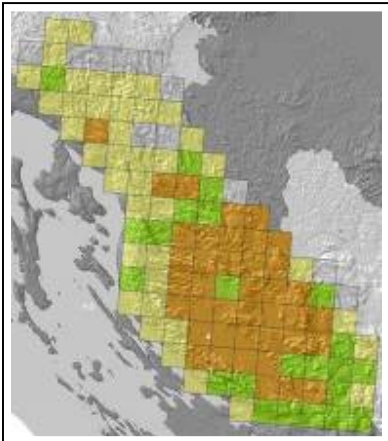
Step 1



10 x 10 km grid squares in mountain region, N = 114

RED = grasslands according to Corine Land Cover Map (code 231 and 321)

Step 2



The grid squares in Mountain Croatia were classified in three groups:

EMPTY SQUARES = grid squares with grasslands = 0%, N = 11

YELLOW = grid squares with grasslands < 5%, N = 51

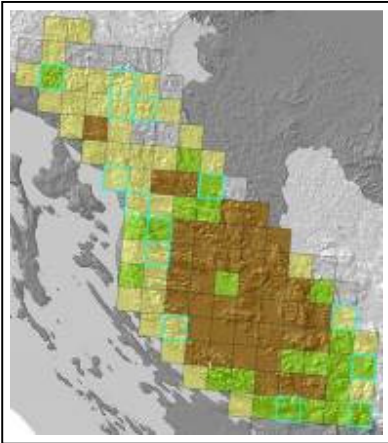
GREEN = grid squares with grasslands > 5%, N = 15

Empty squares were excluded from random sampling!

And, grid squares that already contains transects were excluded, N = 40

Total grid squares available for random sampling = 63

Step 3



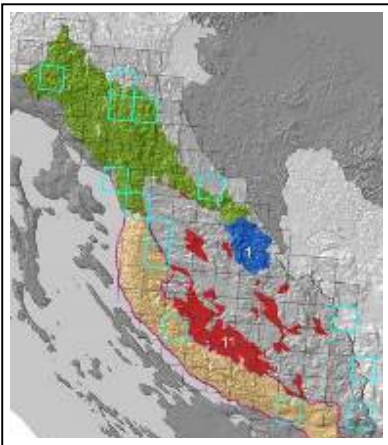
Random sampling of classified grid squares was done. The categories were sampled in different proportions reflecting their suitability for Corncrakes:

YELLOW = grid squares with grasslands < 5%, N = 40 @ 20% = 8 squares

GREEN = grid squares with grasslands > 5%, N = 123 @ 30% = 6 squares

Selected squares shown with turquoise borders

SAMPLING AREA IN MOUNTAIN CROATIA



14 randomly selected transects/plots (squares with turquoise borders)

+

13 non-random transects/plots in SPAs:

SPA Gorski kotar i sjverna Lika

Lič -TES*

SPA NP Plitviča jezera

Homoljačko i Brezovačko polje -TES

SPA Lička krška polja (11 transects)

Crnač - TES

Stajničko

Lapačko - TES

Gacko - TES

Krbavsko -TES

Ličko polje (2)

Vrhovinsko polje

Lipovo polje

Gračačko polje

Bjelopolje ili Krbavica ili Podlapača

*TES = transect already established

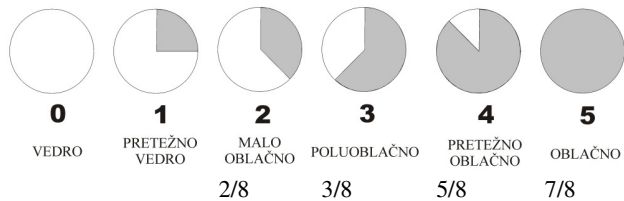
MONITORING – Corncrake

station	t (°C)	wind (Beaufort)	cloud cover	fog	precipitation	moonlight	noise	Comment
1	16	0	1	no	-	-	Q	
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
etc.								

Wind Seed (Beaufort Scales)

	for ce	name	km/h	Appearance of wind effect	
OK	0	Calm	0-1	Smoke rises vertically	NOISE Q quiet SN some noise, but not distracting SG significant noise that may have reduced owl detectability CN constant noise (ie. heavy traffic, compressor station, roaring creek)
OK	1	Light air	1-5	Wind direction shown by smoke drift	
OK	2	Light breeze	6-11	Wind felt on face, leaves rustle	
	3	Gentle breeze	12-19	Leaves, small twigs in constant motion; wind extends light flag.	
	4	Moderate breeze	20-29	Raises dust and loose paper, small branches move	
	5	Fresh breeze	30-39	Small trees in leaf sway	
	6	Strong Breeze	40-50	Larger tree branches moving, whistling in wires, umbrella difficult to control	

Cloud Cover



Fog

N none
 P patchy
 C continuous

MONITORING Corncrake

1. Topographic map 1: 25.000/ DOF map
2. Data Forms
3. GPS with stored survey points positions
4. Headlamp
5. Pen/Pencil
6. Watch
7. Thermometer
8. Warm clothes