Acta Universitatis Latviensis, Biology, 2004, Vol. 676, pp. 119–126

Use of biometrical data to study Corncrake *Crex crex* population in Latvia

Oskars Keišs[1,2]*, Jānis Granāts[1], Aivars Mednis[2]

[1]Department of Zoology and Animal Ecology, University of Latvia, Kronvalda Bulv. 4, Rīga LV-1586, Latvia
[2]Laboratory of Ornithology, Institute of Biology, University of Latvia, Miera 3, Salaspils LV-2169, Latvia
*Corresponding author, E-mail: grieze@lanet.lv

Abstract

The Corncrake *Crex crex* population in Latvia was monitored by capturing 509 individuals in the time period between 1995 and 2003. During the breeding season Corncrakes attracted by playback of the territorial call of the male were captured at night, and during the migration birds were captured by cage traps. Only birds, which were identified as males (n = 498) and captured during the breeding season (May - July) were analyzed, except for variation in size by age, when all birds (including those captured on migration) with known age were used. Wing length of Corncrake males in Latvia varied between 130 mm and 152 mm (mean = 142.1; SD = 4.22; n = 455), tarsometatarsus length between 35.6 mm and 50.0 mm (mean = 40.5; SD = 2.94; n = 181), and weight between 134 g and 182 g (mean = 162.8; SD = 11.1; n = 120). Significant differences ($p < 0.01$) in wing length were observed in males from Latvia and other European countries, and comparing other countries with each other, but the expected tendency for northern animals of the species being larger than their con-specifics in the south was not clearly observed. The mean value of the wing maximum length in Corncrakes captured in different habitats, increased as follows: crops < pastures < cultivated meadows < uncultivated meadows < abandoned arable land < abandoned grasslands. The differences were statistically significant ($p < 0.05$), and might reflect the hierarchy of Corncrake males in habitat selection: larger males living in optimal habitats (e.g. abandoned grasslands), smaller – in suboptimal habitats (e.g. crops). Corncrake males captured in different months (May, June, July) had significantly different wing lengths ($p < 0.05$). This might be explained by immigration of birds from other populations later in season (June and July), when massive hay harvest begins to the south from Latvia (e.g. Poland), causing destruction of Corncrake nests and prohibiting successful re-nesting in the affected territories there.

Key words: body weight, *Crex crex*, morphometrical studies, tarsometatarsus length, wing length.

Introduction

Corncrake *Crex crex* is an open landscape species, today almost exclusively living in extensively managed agricultural lands, especially grasslands. Due to a cryptic lifestyle, the biology and ecology of the species have been poorly understood until the 1990s, when scientific research of Corncrake began (e.g. Schäffer 1999). The studies were stimulated by the need for effective conservation measures, since the introduction of intensive methods of agriculture in the 20th century caused dramatic population declines and fragmentation in most of its world range (Green et al. 1997). Species is included in the

IUCN Red List of Threatened Animals (Hilton-Taylor 2000). Corncrake population has declined also in Latvia (von Transehe 1965), but it is still numerous and the population increased in size since the major abandonment of agricultural lands in the 1990s (Keišs, Ķemlers 2000). An increase and recovery of the Corncrake population since 1998 can be observed also in the western Europe (e.g. The Netherlands – Koffijberg, van Dijk 2001). Since the individuals re-colonizing western Europe mostly derive from the East-European populations (Koffijberg, van Dijk 2001), it is important to understand Corncrake population processes at the local (e.g. Latvian) and global scales.

Individuals in a population might differ in various morphological traits. One of the important characteristics of a bird is its body size, which may indicate sex (Stresemann 1934), age (Stewart 1963), geographical origin (Stresemann 1934), and also its hierarchical level and mating success (Ligon 1999). Thus size may characterize a certain group of individuals of a species or population. As it is easy to take different measurements of a captured bird, there is an advantage of using body size in population studies, however overlap in size distributions among different groups may prevent use of size as an indicator of the group (e.g. age class: Jenni, Winkler 1994).

In the present study we use biometrical measurements (size of a bird) to examine the structure of the Corncrake population in Latvia, and provide possible explanations of the observed patterns.

Materials and methods

Systematic capture of Corncrakes (*Crex crex*) was initiated in Latvia in 1996, using the method of attracting birds at night by playback of its territorial call, then illuminating with a hand-light and capturing them by hand or spoon-net (the first attracted bird was captured during the day by mist-net in Jelgava in 1995). The majority of birds captured by the attracting method are males, but only those birds which are observed to call during

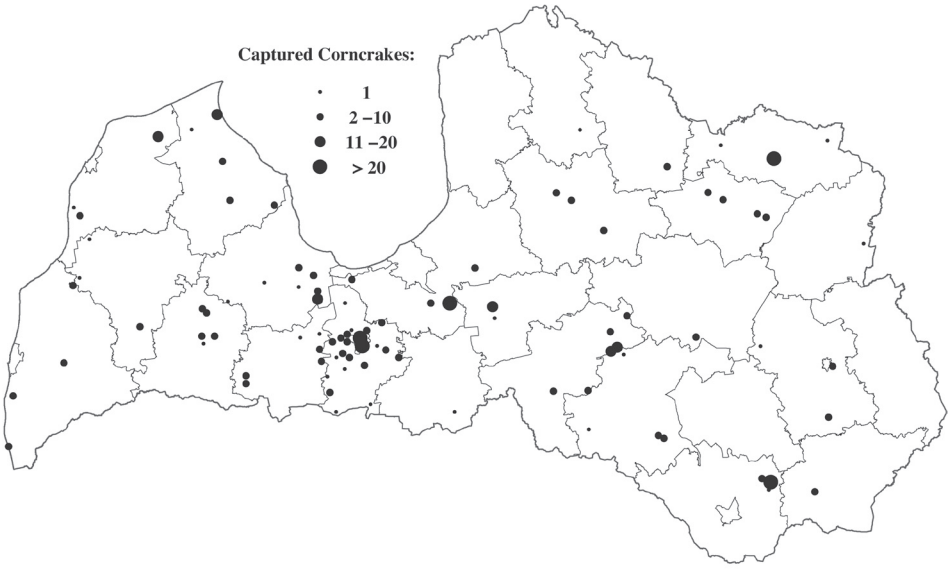

Fig. 1. Captured Corncrakes *C. crex* in Latvia between 1995 and 2003 (n = 509).

the process can be identified as males without doubt (Tyler et al. 1996). During autumn migration at the Pape Ornithological station Corncrakes were captured by cage traps. The authors captured and ringed 44 % of the birds, remaining data were collected by volunteer bird ringers from the Latvian Ringing Centre (Institute of Biology). Bird ringers were instructed how to capture and take measurements of Corncrakes in the seminars organized by the authors and the experts of the Latvian Ringing Centre in 1997, 1998 and 2001. The rings used for marking the Corncrakes were 5.5 mm diameter (LATVIA RIGA P). The geographic location for each capture was recorded (Fig. 1). The maximum wing lengths (length of flattened and straightened wing) of live birds were measured as described by Svensson (1992), using wooden rulers. A wooden rib at the zero mark of the ruler was constructed to facilitate bird wing measurement. All rulers were modified by the same person. The tarsometatarsus length was measured with standard technique as described by Svensson (1992). Birds were weighed in the field using spring balances (300 g spring-balance with 2 g precision: Pesola AG, Switzerland). Age according to iris colouration (Salzer, Schäffer 1997), morphological traits, wear of the primaries, behaviour and habitat category were recorded additionally. We recommended observers to use the following habitat categories: (i) cultivated (grass sown and fertilized) meadows, (ii) uncultivated (natural) meadows, (iii) cultivated (grass sown and fertilized) pastures, (iv) uncultivated (natural) pastures, (v) winter crops (rye, winter wheat), (vi) spring crops (barley, oats and mixed cereals), (vii) other arable land (potatoes, beats etc.), (viii) abandoned grasslands (previously used for moving or grazing), (ix) abandoned arable land (previously used for arable land), (x) abandoned agricultural land (unknown whether it was previously grassland or arable land), (xi) clear cuts in forests and (xii) other habitat. Not all of the habitat categories were represented in our sample (see Results).

Published data on Corncrake measurements (Table 2) were used to investigate the geographical variance in size of Corncrakes. Standard statistical procedures (two tailed *t*-test) were used to test for differences between different groups of birds (Zar 1996).

Results

A total of 509 Corncrakes were captured from 1995 to 2003 (Table 1), two of the birds were recaptured at the ringing site one year after the first capture. We divided the Corncrakes into three age groups – first calendar year (juveniles), second calendar year (one year old birds) and older birds (two years or older).

Juvenile birds captured at Pape were significantly smaller in size ($p = 0.05$) to

Table 1. Number of Corncrakes *C. crex* captured and measured in Latvia between 1995 and 2003 by months

	Males	Other (sex undetermined)		Total
	May - July	May - July	August - September	
Captured, of them:	498	6	5	509
– ringed	496	6	5	507
– wing length measured	455	6	5	466
– tarsometatarsus length measured	181	1	3	185
– weighted	120	2	1	123

Table 2. Biometrical measurements [range; mean; standard deviation (SD); sample size (n)] of Corncrake *C. crex* males in Europe

Country or region	Wing length (mm)				Weight (g)				Tarsometatarsus length (mm)				Source
	Range	Mean	SD	n	Range	Mean	SD	n	Range	Mean	SD	n	
Bavaria					139 - 190	164.0	12.1	25					Schäffer 1999
Belarus					145 - 180	163.6	9.7	9					Schäffer 1999
Estonia					155 - 170	162.0	5.6	6					Schäffer 1999
Latvia	130 - 152	142.1	4.2	455	134 - 182	162.8	11.1	120	35.6 - 50.0	40.5	2.9	181	this study
Nordrhein-Westfalen	132 - 148	140.4	3.7	49	138 - 176	161.9	8.8	40					Prünte 1972
Poland	136 - 154	143.4	3.3	258	133 - 190	161.7	10.8	272					Schäffer 1999
Scotland	141 - 158	149.9	3.6	60									Tyler et al. 1996
The Netherlands	139 - 150	144.0	4.2	15	135 - 202	169.0	18.7	28	37.0 - 43.0	40.0	1.8	36	L.M.J. van den Bergh (after Cramp, Simmons 1980)

compare with birds of the other two age categories. Significant differences between other age categories were not found.

Geographical differences in size

Wing length of Corncrake males captured in Latvia and males from other countries (Table 2) significantly differed ($p < 0.008$), except for The Netherlands ($p = 0.08$). Also, pair-wise comparisons of all but one pair of countries (Poland and The Netherlands) were highly significant ($p < 0.005$). Tarsometatarsus length was measured only in The Netherlands, where it was slightly shorter than in Latvia, but the difference was not statistically significant ($p = 0.3$). Corncrake males weighed (Table 2) during the breeding season (May - July) did not differ significantly between several European countries excepting that Dutch birds were significantly heavier than birds from Poland ($p < 0.002$), Latvia ($p < 0.03$) and Nordrhein-Westfalen ($p < 0.04$).

Size differences among habitats

Only the wing length was compared between birds captured in different habitats, due to small sample size of other measurements,. To enlarge the sample size, we combined cultivated and uncultivated pastures into the category "pastures" and winter and spring crops into the category "crops". The mean value of the wing maximum length increased as follows: crops < pastures < cultivated meadows < uncultivated meadows < abandoned arable land < abandoned grasslands (Fig. 2). Wings of Corncrake males captured in crops (140.3; SD = 4.8; n = 15) and pastures (140.6; SD = 3.0; n = 16) had a similar length ($p = 0.84$), and males in cultivated meadows (141.2; SD = 4.1; n = 80) were non significantly ($p = 0.5$) larger comparing with those in crops and pastures. Corncrake males inhabiting uncultivated meadows (142.4; SD = 4.3; n = 163) had larger wings in comparison with inhabitants of crops ($p = 0.08$), pastures ($p = 0.11$) and, significantly, cultivated meadows ($p < 0.05$). Birds in abandoned grasslands (143.3; SD = 4.2; n = 35) were significantly larger than birds captured in crops ($p < 0.04$), pastures ($p < 0.04$) and cultivated

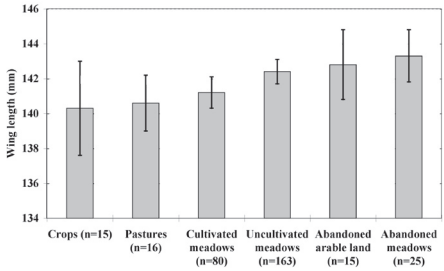

Fig. 2. Wing length of male Corncrakes *C. crex* captured in different habitat categories in Latvia between 1995 and 2003.

meadows ($p < 0.02$). This is also true for birds in abandoned arable land (142.8; SD = 3.7; n = 15) but the differences were not significant. Inhabitants of abandoned arable lands and grasslands had similar size ($p = 0.72$).

Size differences during the season

Different individuals captured at different times of the breeding season showed differences in size (Fig. 3). Males captured early in the season in May were larger than those caught later in June and July. This pattern was observed for all size measurements – tarsometatarsus length, wing length and weight, and the differences in the latter two were statistically significant between May and June, May and July ($p < 0.003$). June and July sizes were significantly ($p < 0.04$) different only in wing length: males, captured in July had longer wings.

Discussion

The small sample size (n = 30) of old birds (at least 2 years old) might explain why significant differences between yearlings and older birds were not found. Salzer and Schäffer (1997) suggest to use colour of the iris to determine age of Corncrake, but artificial light conditions at night inconvenience its use and might be potential source of error.

The results showed significant geographical differences in wing length of Corncrakes. It is not known, whether these differences are determined by a specific factor. Expected tendency for northern animals of the species being larger than their con-specifics in the south (Stresemann 1934; Stevens 1989) was not clearly observed. All birds used to test for geographical differences were captured during the breeding season. Moult can be excluded as a possible cause of errors, since complete moult in Corncrake occurs after the breeding season in August (Cramp, Simmons 1980). It is possible, however, that using our capture method, aggressive males were selectively caught. These males are expected to be larger than the rest of population; i. e. the population was not sampled randomly. We also lack data on Corncrake measurements in other countries with large populations (e.g. Lithuania, Belarus, Ukraine). Comparing the size measurements of birds captured in May – "true" Latvian population, the pattern might be more pronounced – Latvian birds has longer tarsometatarsus and they are heavier (Fig. 4).

We assume that Corncrakes with longer wings are higher in hierarchy and therefore

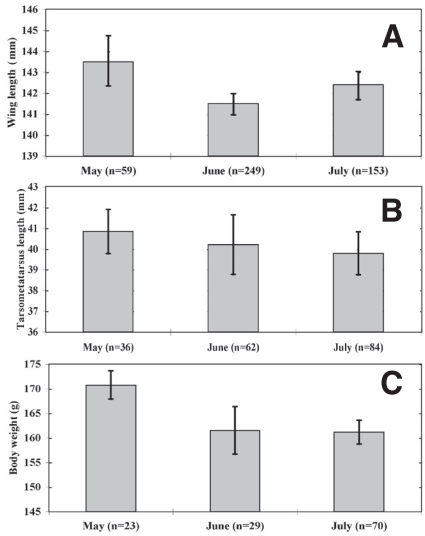

Fig. 3. Morphometrical data of male Corncrakes *C. crex* captured at different time of season in Latvia between 1995 and 2003: A, maximal wing length; B, tarsometatarsus length; C, body weight.

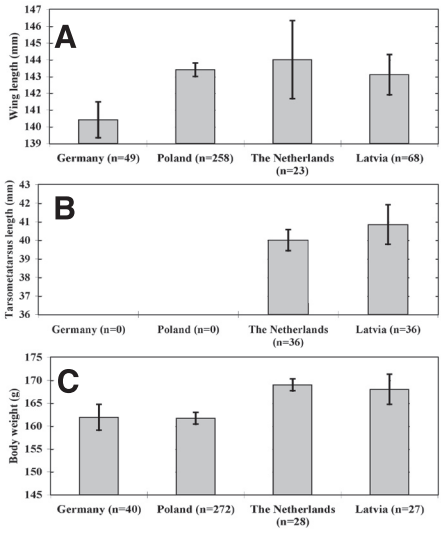

Fig. 4. Morphometrical data of male Corncrakes *C. crex* captured in Latvia in May and in Germany, Poland and The Netherlands: A, maximal wing length; B, tarsometatarsus length; C, body weight.

occupy better habitats. Our observed gradient of wing length in different habitats perfectly coincides with the preferred habitat gradient of Corncrakes in Latvia estimated by the density of calling males (Keišs 1997). Corncrakes avoid crops and pastures (we also found the shortest wings of males captured in these habitats), cultivated meadows are a neutral habitat (wing length have a medium value between crops/pastures and uncultivated meadows/abandoned lands), and uncultivated meadows and abandoned lands (the longest wings) are preferred by Corncrake males (Keišs 1997). Nevertheless a behavioral study of Corncrake males is required to confirm this observation.

Changes in size of Corncrakes during the season might have several explanations. It is clear that early in the season in May captured birds were larger. Assuming that also Corncrakes are lager in northern populations, these might have been birds from the “true” Latvian population, which later in the season mix with short-winged birds displaced by grass mowing in south. Recovery of a Corncrake ringed in May 23, 1972 in The Netherlands and found in Latvia in August 1, 1972, supports this hypothesis (Latvian Ringing Center, unpublished data). Also ringing results of Brüger and Pykal (2000) in the Czech Republic showed one Corncrake male calling in the same breeding season at two places 600 km apart. Another explanation is that the large birds were dominant males, arriving and starting to call early. They also might have been individuals still on migration to North, but this explanation is unlikely, since Corncrakes first start to call only a few days after arrival at their breeding grounds (Beme et al. 1987). According to Tyler et al. (1996), males are silent when accompanied by female, which be the case of "true" Latvian males in June, when immigrants are the most active at calling and therefore are captured. The calling activity (and capture rate) of local males increases again in July before the second brood.

The obtained results support observations made in previous studies on Corncrake habitat selection in Latvia. The data suggest that seasonal variation in size can be explained by movements of Corncrake males during the breeding season, but behavioral study and simultaneous ringing efforts in European countries during the breeding season are needed for conformation.

Acknowledgements

During the period 1995–2001, the study was supported by the authors and volunteer bird ringers, who together conducted the fieldwork: Valdis Ādamsons, Aivis Berents, Dmitrijs Boiko, Reinis Brusbārdis, Guna Duba, Edgars Dzenis, Aldis Freibergs, Viesturs Freimanis, Oļegs Gafijčuks, Gaidis Grandāns, Didzis Grundulis, Imants Jakovļevs, Aigars Kalvāns, Viesturs Ķļaviņš, Indulis Krodznieks, Jānis Ķuze, Artūrs Laubergs, Rolands Lebuss, Edgars Lediņš, Arnis Pāvelsons, Gatis Reiters, Kārlis Sams, Andris Stīpnieks, Jānis Suveizda, Modris Trompets, Ilze Vilks and Viesturs Vintulis. In the period of 2002 - 2003 the study was supported by the Science Council of Latvia as a PhD grant (Nr. 678). Norbert Schäffer are acknowledged for demonstration of the catching method and presenting cassette recorder "Philips" to the authors in 1996. We are grateful to Alberts Keišs for modification of rulers for wing measurements. Baiba Strazdiņa prepared the map. Antra Stīpniece, Jānis Priednieks, Jānis Vīksne and an anonymous referee are acknowledged for valuable comments on the draft of the manuscript. Guntis Brūmelis improved the English of the manuscript.

References

Beme R.L., Grachev N.P., Isakov J.A., Koshelev A.I., Kurochkin E.N., Potapov R.L., Rustamov A.K., Flint V.E. 1987. *Birds of the USSR. Galliformes. Gruiformes*. Leningrad, Nauka. 528 p. (in Russian)

Brüger P., Pykal J., 2000. Report on activities of the Corncrake Research Group in the period 1998 - 1999. *Zprávy ČSO* 50: 13–16. (in Czech)

Cramp S., Simmons K. E. L. 1980. *The Birds of the Western Palearctic*. Vol. 2. Oxford University Press, Oxford. 695 p.

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

Hilton-Taylor C. 2000. *IUCN Red List of Threatened Species*. IUCN/SSC, Gland, Switzerland and Cambridge. 61 p.

Jenni L., Winkler R. 1994. *Moult and Ageing of European Passerines*. Academic Press, London. 225 p.

Keišs O. 1997. Results of a randomised Corncrake *Crex crex* survey in Latvia 1996: population estimate and habitat selection. *Die Vogelwelt* 118: 231–235.

Keišs O., Ķemlers A. 2000. Increase in numbers of Corncrake (*Crex crex*) in Latvia in late 1990-ies – result of conservation efforts or accidental circumstances? *Putni dabā* 10.3: 22–30. (in Latvian)

Koffijberg K., van Dijk A. J. 2001. Influx van Kwartelkoningen *Crex crex* in Nederland. *Limosa* 74: 147–159.

Ligon J.D. 1999. *The Evolution of Avian Breeding Systems*. Oxford University Press, Oxford. 504 p.

Prünte W. 1972. Wachtelkönig: biometrische Ergebnisse und oekologische Randbemerkungen. *Anthus* 9: 73–76.

Salzer U., Schäffer N. 1997. Altersbestimmung von Wachtelkönigen *Crex crex*. *Die Wogelwelt* 118: 135–139.

Schäffer N. 1999. Habitatwahl und Partnerschaftssystem von Tüpfelralle *Porzana porzana* und Wachtelkönig *Crex crex*. *Ökologie der Vögel* 21: 1–267.

Stevens G.C. 1989. The latitudinal gradient in geographical range: how so many species coexist in the tropics. *Amer. Naturalist* 133: 240–256.
Stewart I.F. 1963. Variation of wing length with age. *Bird Study* 10: 1–9.
Stresemann E. 1934. *Handbuch der Zoologie: eine Naturgeschichte der Stämme des Tierreichens. Siebenter Band, 2. Hälfte. Sauropsida: Aves*. Walter de Gruyter, Berlin und Leipzig. 900 S.
Svensson L. 1992. *Identification Guide to European Passerines*. Fourth, revised and enlarged edition. Lars Svensson, Stockholm. 368 p.
von Transehe N. 1965. Die Schnarrwachtel *Crex crex* [*C. pratensis*]. In N. von Transehe. *Die Vögelwelt Lettlands*. Verlag Harro von Hirschheydt, Hannover-Döhren. S. 158–159.
Tyler G.A., Green R.E., Stowe T.J., Newton A.V. 1996. Sex differences in the behaviour and measurements of Corncrakes *Crex crex* in Scotland. *Ringing & Migration* 17: 15–19.
Zar J.H. 1996. *Biostatistical Analysis*. Prentice Hall, Upper Saddle River, New Jersey. 918 p.

Biometrisko mērījumu izmantošana, pētot griezes *Crex crex* populāciju Latvijā

Oskars Keišs[1,2]*, Jānis Granāts[1], Aivars Mednis[2]

[1]Zooloģijas un dzīvnieku ekoloģijas katedra, Latvijas Universitātes Bioloģijas fakultāte, Kronvalda bulv. 4, LV-1586 Rīga, Latvija
[2]Ornitoloģijas laboratorija, LU Bioloģijas institūts, Miera 3, LV-2169 Salaspils, Latvija
*Korespondējošais autors, E-pasts: grieze@lanet.lv

Kopsavilkums

No 1995. līdz 2003. gadam Latvijā tika noķertas un apgredzenotas 509 griezes *Crex crex*. Ligzdošanas laikā griezes tika ķertas naktī, pievilinot tās ar tēviņa balss ierakstu, bet migrāciju laikā – ar ķeramkastēm. Biometrisko mērījumu analīzē izmantoti dati tikai par putniem (n=498), kuri noķerti ligzdošanas sezonas laikā (maijā - jūlijā) un kuru dzimums (tēviņš) tika nešaubīgi noteikts, izņēmums ir lieluma variāciju analīze pēc vecuma, kurā izmantoti visi putni ar zināmu vecumu (t.sk. migrāciju laikā noķertie). Latvijas griežu tēviņu spārna garums variēja no 130 līdz 152 mm (vidējais=142,1; SD=4,22; n=455), stulma garums 35,6–50,0 mm (atbilstoši: 40,5; 2,94; 181), svars 134–182 g (atbilstoši: 162,8; 11,1; 120). Salīdzinot spārna garumu, Latvijas griežu tēviņi būtiski ($p<0.01$) atšķīrās no citās Eiropas valstīs ligzdošanas laikā mērītajiem griežu tēviņiem. Savstarpēji atšķīrās arī šo valstu (Polijas, Skotijas, Vācijas) tēviņu mērījumu rezultāti, taču sagaidāmā tendence, ka ziemeļu populāciju īpatņi ir lielāki, netika skaidri konstatēta. Dažādus biotopus pēc noķerto griežu vidējā spārna garuma no īsākā uz garāko varēja sakārtot šādā secībā: 1) labība; 2) ganības; 3) kultivētas pļavas; 4) nekultivētas pļavas; 5) aramzeme atmatā; 6) pļavas atmatā. Atšķirības bija statistiski būtiskas ($p<0.05$) un, iespējams, atspoguļo to, ka hierarhijā augstāk stāvoši (lielāki) tēviņi ieņem teritorijas optimālos biotopos (piemēram, atmatās), bet zemāk stāvoši – suboptimālos biotopos (piemēram, labībā un ganībās). Sezonas gaitā (maijā, jūnijā, jūlijā) noķerto tēviņu spārna garums būtiski atšķīrās ($p<0.05$). Iespējams, to var izskaidrot ar griežu imigrāciju no citām populācijām jūnijā un jūlijā, kad lielās platībās sākas siena pļauja uz dienvidiem no Latvijas un iznīcina iesāktās griežu ligzdas, kā arī padara neiespējamu atkārtotu ligzdošanu šajās teritorijās. Par griežu pārvietošanos ligzdošanas laikā lielā attālumā (>600 km) liecina divu gredzenoto griežu atradumi (gredzenotas un atrastas vienā un tajā pašā ligzdošanas sezonā).