

Status and mortality factors of the Great Bustard (*Otis tarda*) in Croatia during the 20th century

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ABSTRACT—In the 20th century the Great Bustard (*Otis tarda*) was a passage migrant and winter visitor in Croatia. Birds observed in Croatia belong to the Central European population for which the harsh winters were identified as the most important cause for adult bird mortality. We investigate the mortality factors of adult birds in Croatia. Data on the occurrence of the Great Bustard in Croatia were collected from the literature and from feedback of a questionnaire distributed among hunters in 2004. During the 20th century, 35 records of at least 60 birds were reported. Occurrences were more frequent at the beginning of the century, but they turned scarcer and more irregular in later years. Birds were observed between October and April. During winter, Great Bustards were more frequently recorded in Southern Croatia, while records from Northern Croatia dominated during autumn and spring. From the total number of records, 57% referred to birds being shot. Shooting occurred between December and March mostly in Southern Croatia. The Great Bustard is strictly protected by law in Croatia since 1967, with one recorded case of birds being illegally shot since the hunting ban has been imposed.

Key words: *Otis tarda*, adult mortality, illegal hunting, Croatia.

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Introduction

The Great Bustard (*Otis tarda*) used to be a breeding species in Croatia until the end of 19th century. The only proof for its breeding is one chick from Slavonia (unfortunately without a date) kept in the ornithological collection of the Croatian Natural History Museum (Rössler, 1902; Grbac & Kralj, 2008). The breeding population soon disappeared, and by the 20th century the species became an irregular visitor in Croatia. There are no recoveries of ringed birds to confirm the origin of birds being found in Croatia. Also, when looking at recovery data of the nearest population in Hungary, in spite a total of 545 birds had been ringed in Hungary between 1951 and 2006, only one foreign recovery (in Albania) has been known until now (Faragó, 2009). However, according to the movements of the central European birds (Streich *et al.*, 2006) it is reasonable to conclude that Great Bustards being observed in Croatia belong to the Central European population and originate from Hungarian, Austrian and probably Serbian (at least the observations in eastern Croatia) breeding populations. From these three populations, the Hungarian is the most numerous, but it faced a strong decline during the 20th century.

The Central European population is only a facultative migrant in response to extreme weather conditions. The mortality during migration is very high and after those winters when migration occurred, Hungarian Great Bustard populations suffered extreme declines (Faragó, 1993). Harsh winters were identified as the most important reason for adult bird



Figure 1. Localities of records of the Great Bustard in Croatia during the 20th century
1. ábra. A tüzok 20. századi előfordulási helyei Horvátországban

mortality, either due to the starvation or mortality factors related to migration, such as illegal shooting, collision with power lines and predation (Faragó, 2005).

In this study we investigate the mortality factors of adult birds in Croatia during the 20th century, based on literature data. The aim of our study is to identify the main mortality factors and their effect at spatial and temporal scales.

Materials and methods

Data about the occurrence of the Great Bustard in Croatia were taken from the annual reports of the Croatian Ornithological Centre (Rössler, 1902–1918), various ornithological and hunting literature (Maštrović, 1931; Krpan, 1960; Tutman, 1980; Delić & Grlica 2003), museum collections (Piasevoli & Pallaoro, 1991; Sušić *et al.*, 1988; Grbac & Kralj, 2008), as well as from the feedback of the questionnaire distributed together with the national hunter's magazine "Lovački vjesnik" in 2004. The hunting bag statistics listed bustards until 1930, but annual totals were given for bustards and herons together (Signjar, 1925) therefore those data were inadequate for analysis.

For every recorded data, apart from the number of reported birds, locality, date (where available) and the type of recovery was noted (bird being observed, shot or found dead or

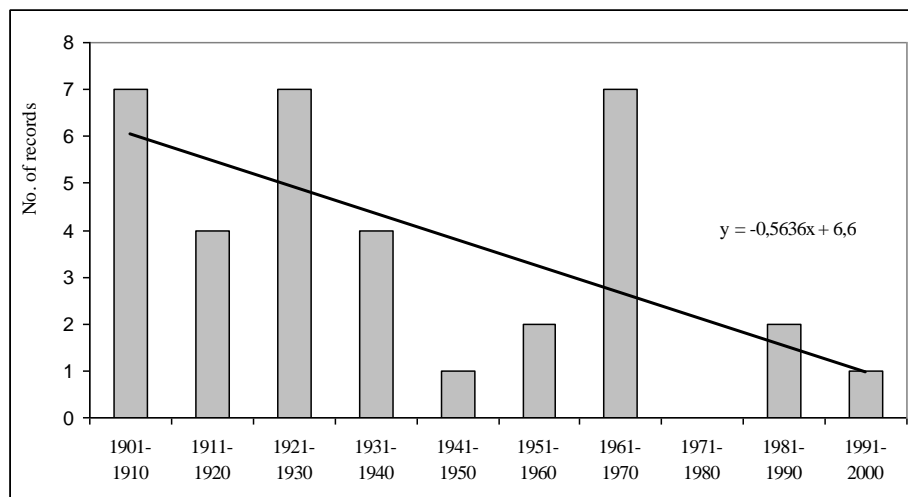


Figure 2. Number of records of the Great Bustard in Croatia in different decades of the 20th century (n = 35)

2. ábra. A túzok előfordulási adatainak eloszlása Horvátországban a 20. század egyes évtizedeiben (n = 35)

dying). Observation sites were divided to Northern (Lowland) Croatia and Southern (Mountain and Coastal) Croatia. A single record from the Croatian Mountain was merged with those of Coastal Croatia for topographical reasons. Northern Croatia consists predominantly of lowlands, so there are no greater natural barriers between Great Bustard breeding areas and Northern Croatia. To reach Southern Croatia, birds must overfly mountains (up to 2000 m height) and eventually the sea.

Results and discussion

During the 20th century, 35 records of at least 60 birds were reported (*Figure 1*). Birds were noted at many localities in continental Croatia (from Valpovo on the east to Brežice and Kostajnica on the west) and along the Croatian coastline (from Zadar to Cavtat), including the island of Hvar. Records were more frequent at the beginning of the century, when Great Bustards were observed almost annually (*Figure 2*). During much of the century the species was present irregularly; its occurrence was mostly related to harsh winters. Years with the harsh winter weather initiating Great Bustard migration were: 1929, 1940, 1947, 1985 and 1987 (*Faragó, 2005*). Out of these years, birds were recorded in Croatia in 1929, 1940 and 1985. Records were also more frequent in the early 1960s. The last year with several observations was 1964 when Great Bustards were reported from Ogulin, Dubrovnik and the island of Hvar.

The relatively small number of observations does not enable us to run a very detailed statistical analysis. However, we consider that even that small number can give us an indication on the main mortality factors and their effect at spatial and temporal scales.

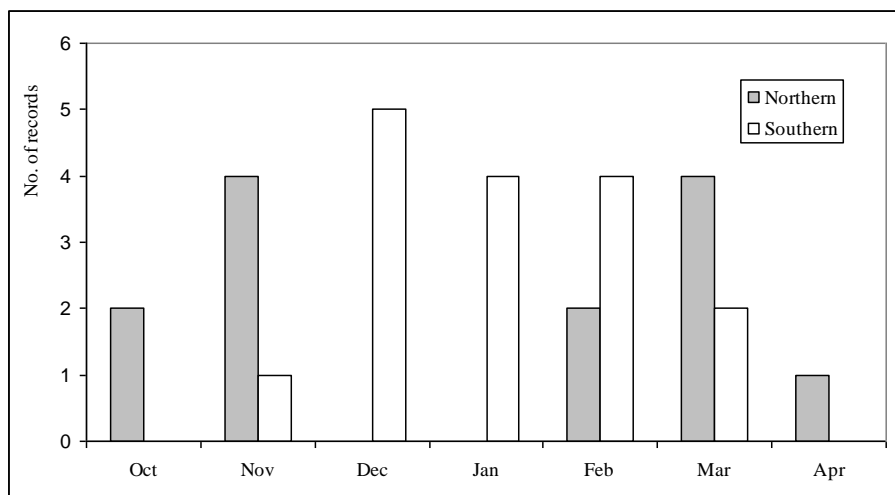


Figure 3. Monthly distribution of records of the Great Bustard in Northern and Southern Croatia (n=29)

3. ábra. A túzok előfordulási adatainak havi eloszlása Horvátországban (n=29) (szürke oszlopok: észak; üres oszlopok: dél)

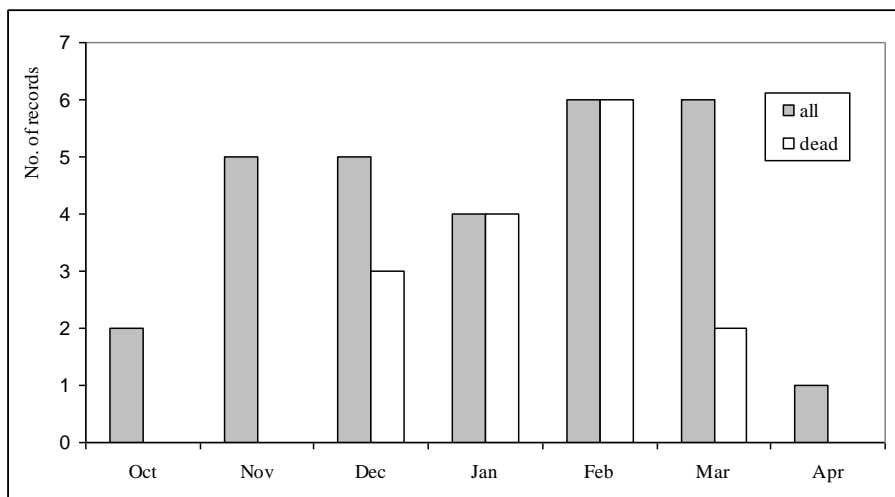


Figure 4. Monthly distribution of records of the Great Bustard being shot or found dead (n=15) compared to the total number of records (n=29)

4. ábra. A Horvátországban lelőtt vagy elpusztultan talált túzokok (üres oszlopok; n=15) előfordulási adatainak havi eloszlása az összes adathoz viszonyítva (szürke oszlopok; n=29)

Great Bustards used to be passage migrants or winter visitors in Croatia, recorded between October and April, with a majority of reports in February and March. During the winter months (December to February) they were more frequently recorded in coastal Croatia (with 54% of all records), while in autumn and spring records from the northern part of the country dominated (Figure 3). Records from Northern Croatia mostly originated from the period 1901–1929, while data from Southern Croatia referred to the period from the 1920s to 1960s. A possible explanation for the observed spatial shift is that before the decline of the Central European Great Bustard population Northern Croatia was part of their regular range during the non-breeding season. After the population decline, birds were recorded in Croatia only during those winters, when they were leaving the Carpathian basin to migrate to areas with a milder climate in Dalmatia. Further proof that the Great Bustard was a regular bird until the 1920s is the fact that it was repeatedly listed in annual reports of the Croatian Ornithological Centre (Rössler, 1902–1918), giving data about the first and the last occurrence of numerous bird species. In later years, it was mostly listed in hunting or ornithological journals as a rare or unusual sighting or catch.

Some 57% of all records (comprising about half of recorded birds) referred to birds being shot, all of them between December and March, with a peak in February (Figure 4). Almost all birds were shot in winter, in Southern Croatia, between the 1920s and 1960s. The ratio of records of birds being shot in winter months (from December to February) is 87%. It is very likely that shooting also occurred before that period in Northern Croatia, but data were not adequately addressed in hunting statistics (Signjar, 1925). Starvation was identified as a mortality factor in only one occasion near Bjelovar (Northern Croatia, on 1st March 1940). The high ratio of shot birds in winter is in line with the high mortality recorded in years with winter migration (Faragó, 1993; 2005).

In the early 20th century the Great Bustard was hunted in Croatia. The species has been protected strictly by law in Croatia since 1967, when the Great Bustard already became a rare visitor. No exemption for shooting was granted after that time. After the legal protection of the Great Bustards, only three records referring to 18 birds were reported. In one occasion a flock of 5 birds was shot in 1980s, indicating that illegal killing still occurred. However, monitoring of illegal killing was not possible.

Only a few records are known from the beginning of the 21st century, all of them from Northern Croatia: Belje, Baranja (T. Mikuska, pers. com.) and three records near Lipovljani, Posavina during the winter and spring of 2005 (T. Kolarić, in litt.). All records relate to observations of live birds, which give us hope that illegal killing in Croatia will not cause the threat for this scarce visitor any more.

KIVONAT—A huszadik században a tűzok (*Otis tarda*) átvonuló és téli vendég volt Horvátországban. A Horvátországban megfigyelt madarak a közép-európai állományhoz tartoznak, melynél a kemény teleket jelölik meg a felnőtt madarak legfőbb pusztulási okának. A dolgozatban megvizsgáltuk a mortalitási okokat a horvátországi felnőtt madarak esetében. A horvátországi tűzok-előfordulási adatokat a szakirodalomból, illetve egy 2004-ben vadászok között köröztetett kérdőív felmérési eredményeiből gyűjtöttük. A huszadik századból 60 egyedre vonatkozó 35 adatot sikerült összegyűjteni. A faj előfordulása gyakoribb volt a század elején, de később ritkábbá és szabálytalanabbá vált az egyes adatok eloszlása. A megfigyelések október és április közé estek. Télen a tűzokot gyakrabban észlelték Dél-Horvátországban, míg Észak-Horvátországra az őszi és tavaszi adatok voltak jellemzők.

ek. Az összes adat 57%-a lelőtt madárra vonatkozott. A lelövések december és március között, többnyire Dél-Horvátországban történtek. A tüzök 1967 óta a törvény által fokozottan védett Horvátországban, egy esetben fordult elő a faj illegális vadászata a lelövési tilalom bevezetése óta.

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