

# Golden Jackal (*Canis aureus* L.) in Bulgaria: What is Going on?

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**Abstract:** In order to reveal the well-defined specificity of the number development of golden jackal (*Canis aureus* L.) in Bulgaria, its population dynamics was tracked using the available data from the official results of spring game counts, carried out by the Executive Agency for Forests throughout the country, during the period of 1960-2011. It seems that the largest jackal population (39 343 animals in 2011) in Europe occurs in Bulgaria.

The increased number of golden jackal in Bulgaria requires implementation of adequate measures for its regulation in regions with proven harm on hunting, livestock breeding and human health. Preservation and stable presence of the jackal in Bulgaria could be achieved through declaring it normal game species and treating it as native species of Bulgarian mammals' fauna.

**Key words:** population numbers, game species, golden jackal, *Canis aureus*, Bulgaria

## Introduction

Golden jackal (*Canis aureus* L.) is the most widely distributed jackal species. The species can live under a wide variety of natural conditions and this ecological plasticity allows it to settle large geographic range, covering the territories of East Africa, South-eastern Europe and South Asia to Burma. In Europe, the species distribution is patchy and it is resident in the Balkans (JHALA, MOEHLMAN 2008). In the last decade golden jackal distribution indicates an ongoing expansion in Europe. Increased presence is recorded especially in Hungary, Serbia, Slovakia, Austria and Italy, expanding its European area northwards and westwards (ARNOLD *et al.* 2011).

According to the historical records, the jackal (*C. aureus* L., 1758) is an autochthonous species in Bulgarian mammals' fauna. The fur colour is gray-yellow. It is darker on the back and golden on the sides, neck, legs and both sides of the head. The tail is shaggy, yellow-gray with darker spots and black edge. His exterior somatometric measurements are: total length – up to 80-85 cm; tail length – up to 25-30 cm; withers – up to 45-50 cm. Weight is usually about

12-14 kg and more. Footstep length is about 6 cm and width is about 5 cm. Males are slightly larger than females. After 60-62 days of pregnancy, the female gives birth to 4-6 cubs, which open their eyes after 10-11 days. Under environmental conditions of Bulgaria, the jackals begin to reproduce in February-March.

Until the early 1960s, the jackal has occurred only in the region of Strandzha Mountain, in the Southeast part of the country. After that, its number rapidly increased. The main reasons for its expansion throughout the country were: (1) large amount of available food provided by intensive development of hunting in the country during this period; the offspring of moufflon, fallow-deer and roe-deer, as well as the pheasants and rock partridges, introduced into Southeaster Bulgaria and Thracian Valley, have become main food base for the jackal at this time; (2) in 1962 the jackal has been declared as a protected species. As a result of cumulative impact of these two factors, the jackal has rapidly occupied lowland habitats in the country and has extended its distribution to the west.

While occupying new territories, the jackal avoids large and canopy forests; it adheres mainly to dense parts of small in size forest habitats – young coniferous plants and clearing areas near to settlements and roadside restaurants.

According to the recent contemporary data, obtained from the game count carried out in 2011 in Bulgaria, the increase in total number of jackals becomes more and more sensible in the recent years. The total number of jackals recently reached 39 343 animals, and there were 3268 more jackals in the country than in 2010; that means an increase of 8% of the total population number. In the last decades it was confirmed by data from the number of animals, which have been shot in Bulgaria: in 1983 it was 5538 animals, in 1999 – 7422 (AEFA 1983, 1999) and in 2010 – 26 570 (ABHFU 2010). It seems that the largest jackal population in Europe occurs in Bulgaria (MARKOV 2011).

The increase of golden jackal population number in its European range showed certain specificity: in a small area, when conditions are favourable, it can increase vastly. This is clearly seen on the background of the results obtained by The European Mammal Assessment, which was the first review of the conservation status of all wild mammals in Europe according to IUCN regional Red Listing guidelines. The EMA showed that: (i) only 8% of species populations are increasing; (ii) more than a quarter (27%) of European mammals are declining in population; (iii) a further 32% are stable and because trend information is not available for 33% of species, however, the percentage of species in decline may actually be considerably higher (TEMPLE, TERRY 2007).

As it was found, that the jackal enhancement showed well-defined specificity in Bulgaria; thus, it was necessary to track its population dynamics through the last decades, which was the aim of the present investigation. It would help to analyze the changing status of jackal and the assessments, obtained as a result, would serve as a useful contribution to the scientific basis for setting priorities for management actions in Bulgarian and Europe.

## Material and Methods

There are many approaches to estimate the population dynamics of wild animals (Moss *et al.* 1982), but the correct interpretation of the observed dy-

namics changes requires good knowledge of ecological and biological features of the species, in which population dynamics is investigated at large territory and in different ecological niches. Its hidden way of life and the missing counts for its number for a sufficiently long period in different ecological niches, which it has already occupied and which it continues to occupy in the country, represented an additional restrictive circumstance in generalizing the obtained results for jackal population dynamics during the recent decades in Bulgaria.

The most applicable approach complying with these restrictive circumstances is to analyze the temporal variation of the population dynamics of jackals using the available data from the official results of spring game counts, carried out over the country during the period 1960-2010. The data originate from the particular natural regions with specific ecological niches, for the period 2002-2010, according to National jackal population monitoring schemes, initiated by Executive Agency for Forests (EAF) of Ministry of Agriculture and Food (ABHFU 1960-2010). It must be taken into account that this analysis was carried out without specific detailed assessment of many factors, such as general state of environment (natural succession), anthropogenic effects, predator effects, and illegal hunting, which also affect the wild animal population in different combinations and in different way. The absence of scientific data prevented us from estimating these factors and the obtained results have to be interpreted only as expression of certain trends in population numbers enhancement of the jackal, without detailed discussion on the specific influence of particular ecological factors.

Population development of jackals over two consecutive years was measured as the rate of increase, or  $R = \ln(N_t/N_0)/t$ , where  $N_t$  is the population count at time  $t$ , and  $N_0$  is the initial population size (Dixon 1987).

## Results and Discussion

According to records of EAF (ABHFU 1988-2011), the increase of the jackal population number all over the country even more intense in the last decade (Fig. 1a).

The population development of jackals during the last 13 years was measured as the intrinsic rate of increase, based on the changes in species numbers

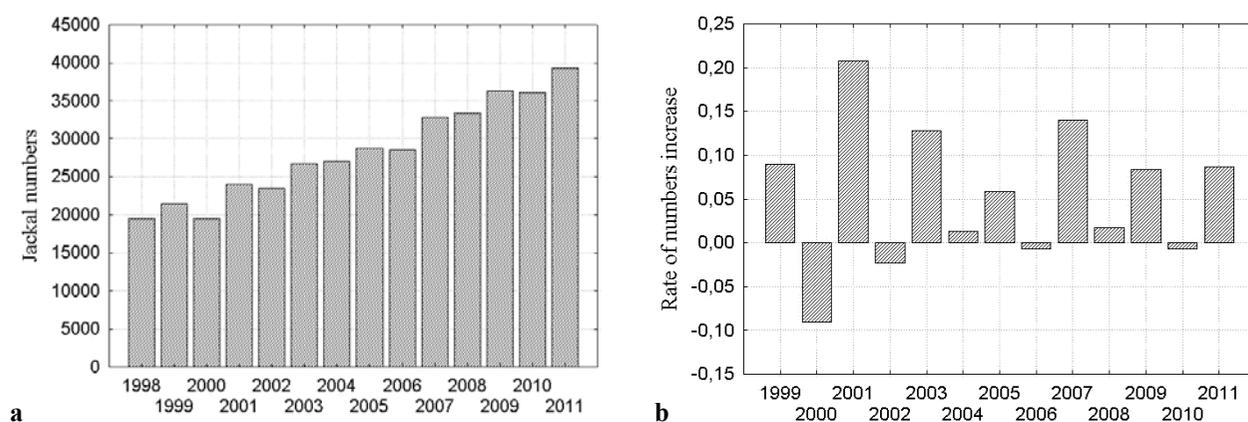
in two consecutive years during this period (Fig. 1b). The analysis of population development status showed positive values in nine consecutive intervals with a pronounced maximum in 2001 and minimum in 2000; even in the intervals with insignificant negative value the absolute numbers of jackal population in the country remained high (Fig 1a).

According to the current regulations, the jackal could be shot yearly in order to control its number, but the payment of bonuses for killed animal has stopped after 2009. This is probably one of the subjective reasons that the number of jackals remained relatively high over the country after 2009. The jackals have extended its distribution range in the country and have found suitable habitats in the mountainous и semi-mountainous part of hunting regions (Fig. 2).

The absolute number of the jackals in Bulgaria in 2009-2011 (Fig. 3a) determined by the rate of population development (Fig. 3b) in the Submitted hunting economic areas (SHEA), managed by the game association, where the jackal was supposed to develop under weaker anthropogenic pressure and different ecological conditions showed that: (i) in the regions with favourable conditions for jackal development both in North-eastern Bulgaria (Veliko Turnovo, Lovech and Sliven) and in South-eastern Bulgaria (Burgas and Stara Zagora) the population development of the species is similar and its number is the highest; (ii) despite of the worse conditions for intensive increase of population numbers in the mountainous regions (Blagoevgrad, Smolyan and Kyustendil), the population similarity of the increased number of the jackal was also high; (iii) in 2011 the rate of population development was nega-

tive only in 15 administrative management structures Regional Directorate of Forestry, where the assessment of jackal number is carried out, but even with negative rate of increase, the absolute number of the species still remains high.

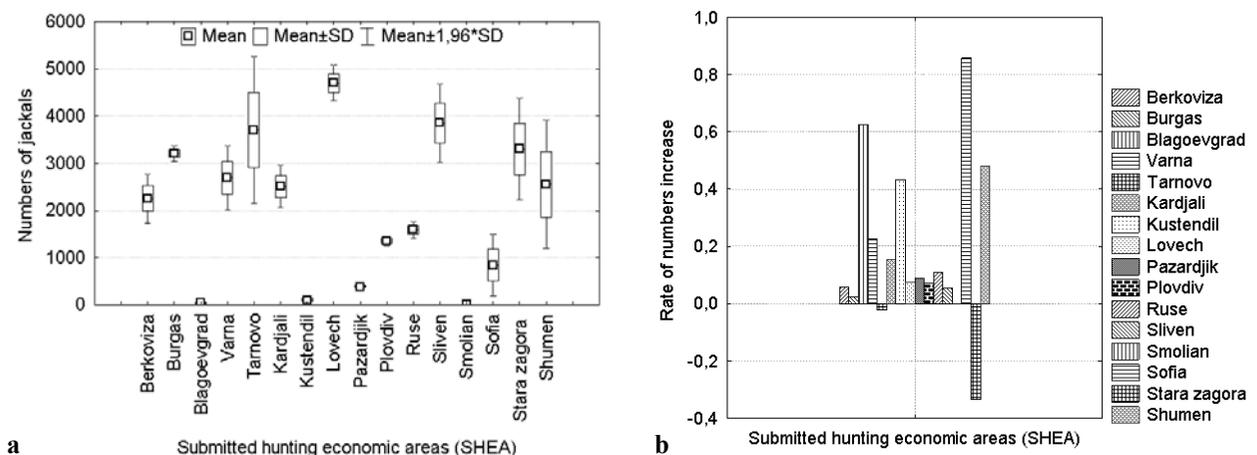
The jackals do damages to hunting not only because of its increased number, but also because of its ability to chase in groups. This way jackals could easily catch cubs of artiodactyls. The high number of jackals in the newly occupied habitats could represent one of the factors limiting the number of game animals and harming domestic ones. High predation upon ungulates (especially fawns) and livestock was reported from semi-mountainous regions of the country (STENIN *et al.* 1983, GENOV, VASSILEV 1991). This view is maintained by many hunting experts (STENIN 2007), finding a direct relation between decreased game number and increased number of jackals in the hunting regions of the country. At the same time, with few exceptions, there is still no comprehensive quantitative information on diet composition of the jackals in lowland agricultural environment in Bulgaria in relation to food availability in different seasons. To obtain this information, which could help assessing jackal impact on wild and domestic animals in different landscapes, specialized investigations on its diet composition and food availability, especially on the abundance of small mammals, are necessary in agricultural regions, where a different set of factors are likely to operate. First results obtained in this direction demand it too (MARKOV, LANSZKI 2012), indicating that during late summer and early autumn, a period when small mammals' density is high in lowland agricultural regions, the food of jackal typi-



**Fig. 1.** Jackal numbers according to estimate surveys in Bulgaria (a) and Rate of numbers increase in Bulgaria in two consecutive years (b) in 1998-2011



**Fig. 2.** Number of jackals in 2010 in the areas of the 15 administrative management structures “Regional Directorate of Forestry (RDG) in Bulgaria. It is graphically shown by displaying the city in which is the administration of the management structures. 1- RDG Kustendil; 2- RDG Blagoevgrad; 3- RDG Sofia; 4-RDG-Berkoviza; 5- RDG Lovech; 6- RDG Pazardjik; 7- RDG Plovdiv; 8-RDG Tarnovo; 9-RDG Sara zagora; 10-RDG Kardjali; 11-RDG Ruse; 12-RDG Shumen; 13- RDG Varna; 14- RDG Sliven; RDG Burgas.



**Fig. 3.** Absolute numbers of jackals (a) and Rate of numbers increase (b) during the period 2009-2011 in the Submitted hunting economic areas (SHEA), managed by the game association of the 15 administrative management structures “Regional Directorate of Forestry (RDG) in Bulgaria

cally consisted of small-sized and wild-living prey species, among which rodents have been found to represent the primary food.

The full assessment of the importance of jack-

al’s increased number should take into account also its impact on human health, wild and domestic animals and should consider the role in distribution of many infectious pathogens, such as: rabies (*Rabies*,

*Lyssa*), brucellosis (*Brucellosis*), leptospirosis (*Leptospirosis canum*), ringworm (*Herpes tonsurans canum*), tuberculosis (*Tuberculosis*), ehrlichiosis (*Ehrlichiosis*), yersiniosis (*Yersiniosis*), pseudotuberculosis (*Pseudotuberculosis*), tetanus (*Tetanus*), lime disease (*Lyme borreliosis*), desert disease (*Coccidioidomycosis*), sporothriosis.

As the jackal number in Bulgaria retains its trend to increase, adequate measures for its regu-

lation are needed in regions with proven harm of jackal on game and domestic animals and human health. The control of predators' number is partially connected with the obligatory planned shootings in all hunting regions. Preservation and stable presence of the jackal in Bulgaria could be achieved through declaring it normal game species and treating it as native species of Bulgarian mammals' fauna.

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