# SOME ASPECTS OF THE ECOLOGICAL STRUCTURE OF THE POPULATION OF THE SPECIES *CERVUS ELAPHUS* (LINNAEUS, 1758) IN THE „PLAIUL BAGULUI" RESERVE

## UNELE ASPECTE ALE STRUCTURII ECOLOGICE ALE POPULAȚIEI SPECIEI *CERVUS ELAPHUS* (LINNAEUS, 1758) ÎN REZERVAȚIA „PLAIUL FAGULUI"

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***Sumar.*** *Obiectivul cercetării a fost analiza structurii ecologice a speciei Cevus elaphus în rezervația „Plaiul Fagului" pe parcursul a cca 50 de ani. Evidența speciei C.elaphus a fost efectuată conform metodelor tradiționale – după defecații, la locurile trofice și sărării, numărării duble la liniile parcelare, goana cu numărarea urmelor la linii parcelare. Evaluarea include observații directe în trei etape, fiind identificată mărimea efectivului, structura pe clase de vârstă, sexe și starea de sănătate. Procesul de reaclimatizare a speciei C.elaphus a fost demarat în gospodăria silvo-cinegetică „Redeni" în anii 1975-1977. În total au fost supuși reaclimatizării 76 indivizi. Un factor negativ ce a influențat acest proces reprezintă braconajul. În prezent populația C.elaphus în rezervație este de cca 143 indivizi. S-a înregistrat o creștere în raport cu anul precedent de doar 1,4%. După o ușoară ameliorare a efectivelor, acestea, totuși, sunt de 2-3 ori mai mici în comparație cu cele optimale, reieșind din capacitățile de suport a ecosistemelor silvice.*

***Cuvinte-cheie:*** *Cerbul comun, rezervație, reaclimatizare, braconaj.*

## INTRODUCTION

One of the ungulate species that inhabits the «Plaiul Fagului» reserve is *Cervus elaphus*. *C.elaphus* is a species of large even-toed herbivorous mammal that inhabits large deciduous or mixed forests. This species is widespread in most of Europe, the Caucasus Mountains region, Asia Minor, Iran, parts of West Asia and Central Asia. It has been introduced to some areas, including Australia, the USA, New Zealand, Canada [1, p. 98, 2, p. 170]. Genetic evidence indicates that *C.elaphus* is a group of species, rather than a single species, although exactly how many species the group includes remains uncertain

[3, p. 201]. The ancestor of all deer probably originated in Central Asia. Reintroduction and conservation efforts, such as in the United Kingdom and Portugal, have led to increases in the red deer population, while in other areas, such as North Africa, population decline has continued [4, p. 16].

The «Plaiul Fagului» reserve, located in the center of the republic, in the northwestern part of the Central Codrilor Plateau, represents one of the few corners of nature in the republic, where many species of plants and animals specific to the forest-steppe zone can be found, a good part of which have become rare in recent decades [5, p. 244-265, 6, p. 89-155]. The relief is rugged, narrow peaks with deep valleys, steep slopes, springs with cold and crystalline water. The hydrographic network is formed by tributaries of the Pojarna river, which flows into the Bîc river. There are several water basins in the meadow of the Rădeni river. The «Plaiul Fagului» reserve falls within the deciduous forest zone [7, p. 89]. The zonality by altitude is noticeable. The plateaus and slopes have a zonal vegetation consisting of forests of *Quercus petraea, Quercus robur* and *Fagus sylvatica*. On the territory of the reserve there are 5 ponds arranged in the meadow of the Rădeni stream. Some of them are dry. Agrocenoses occupy very small areas in the central part and larger ones in the neighboring ones. They are intended for additional feeding of wild animals.

*C.elaphus* was completely exterminated in the area between the Prut and Nistru rivers in the 40s of the 19th century [8, p. 162, 9, p. 245]. Since the living conditions are favorable for this species in protected natural areas, with the observance of the necessary conditions, it became possible to restore it and even maintain its optimal population. The purpose of the work was to elucidate the ecological structure of the *C.elaphus* species population in the «Plaiul Fagului» reserve over the course of about 50 years.

## MATERIALS AND METHODS

The *C.elaphus* species was recorded according to traditional methods – after defecation, at feeding and salting sites, double counting at plot lines, chase with counting tracks at plot lines [10, p. 39-43]. The assessment includes direct observations in three stages, identifying the size of the herd, the structure by age classes, sexes and health status. At the first stage, the assessment is carried out by listening during the mating period (bouncing) during the months of September-October. This process will take place before sunrise. At the second stage, the herds are visually recorded during the winter period. Reading tracks on the snow is carried out at the third stage at the end of the winter season. Finally, the arithmetic mean of the herds recorded during the three stages is determined (methods). The photo and video recording method is widely used [10, p. 39-43].

## RESULTS AND DISCUSSIONS

The process of re-acclimatization of the C.elaphus species was started in the forest-hunting farm «Redeni» in 1975-1977 (tab. 1) [11, p. 95, 12, p. 120]. For re-

acclimatization, the nominal European subspecies was introduced from the Voronezh reserve, Russia. In total, 76 individuals, including 49 females, were subjected to re-acclimatization.

**Table 1.** Reacclimatization of the nominal species *C.elaphus* in the «Redeni» forestry-hunting farm

| Data | Number | | Place of introduction | Location of origin |
|---|---|---|---|---|
| | Total | Female | | |
| March 1975 | 15 | 10 | Redenii Vechi Forest, Bahmut station | Voronezh reserv |
| March 1976 | 21 | 15 | | |
| February 1977 | 20 | 11 | | |
| April 1977 | 20 | 13 | | |
| Total | 76 | 49 | | |

In January 1980, the population of the species was 40 individuals [11, p. 95].

Communities belonging to different subspecies on adjacent territories contact each other during the period of sexual activity. There is a process of hybridization of individuals of the nominal species with those belonging to the Ascanian maral. Multi-annual observations have shown an increase in the population of about 5%, which is 3 times lower compared to neighboring countries.

The assessment of the status of deer species, including the *C.elaphus* species, was carried out in the Redeni forest-hunting farm from a helicopter in 1981 [11, p. 95, 12, p. 120]. The data obtained in this way in January and November were supplemented and adjusted with those obtained in the winter and summer periods by other methods. Thus, in January 1981, the presence of 80 deer individuals was established, and in November - 68 individuals. This difference is explained by the fact that in January, individuals group into winter flocks, move deep into the forest and to places where feeders are installed. In November, however, winter groups are not yet fully formed, individuals frequent agricultural crops adjacent to the forest, and their density is lower. Following the acclimatization of the *C.nippon* species, hybrids emerged due to crossing with the *C.elaphus* species, which exceeded the number of each separate species, affecting their genotype.

In the winter-spring period of 1982, following the assessment at the plot lines, 86 *C.elaphus* specimens were recorded, of which 18 were adult males, 34 were adult females, 30 were 1-2 year olds and 4 were of the current year [12, p. 120]. The assessment from the helicopter in December 1981 demonstrated the presence of 68 individuals, of which 67% were adults, 14% were 1-2 year olds and 19% were of the current year. The male:female sex ratio was 1:2. In January, a group of 18 specimens was observed in plots 9,10,18,19,31,32. A group of 12 individuals, consisting of 3 males, 8 females and one individual aged 1.5 years was observed during the winter period in plot 5. During this period the deer fed on the bark of fruit trees in the orchard adjacent

to plots 5 and 6 on a strip of 40-50 m. The formation of winter flocks correlates with the trophic factor. The flocks are composed of 20-30 individuals of a heterogeneous demographic structure in the favorable nutrition sectors. However, they are temporary and break up when the food resources in the given sector are exhausted. In total, 128 individuals were observed in 1982, including 35 males (27.3%), 57 females (44.5%) and 36 (28.1%) juveniles.

At the end of the 80s of the 20th century, the population of the species was about 100 individuals and remained at the same level until the beginning of the 2000s [13, p. 124]. In the years 1991-1994, hybrid specimens and partially *C.nippon* individuals were eliminated. Research conducted in the mid-90s of the 20th century demonstrated that *C.elaphus* more frequently inhabits plots 3-9, and 18, where about 36 individuals were identified, of which 11 males and 25 females. These individuals fed on the remains of oak, ash, hornbeam, poplar, cherry shoots, left after sanitary cuts. In plots 9 and 18 in the spring, 21 individuals were observed, of which 7 males and 14 females. The sex structure is characterized by a male:female ratio of 1:2. Regarding the age structure, we note that in the *C.elaphus* population, 67% are adults, 14% are juveniles and 19% are individuals from the current year. This proportion is an indication of an insignificant natural increase. A local micropopulation with a normal structure has not been formed. In total, about 50 individuals were observed during this period [14, p. 124]. In 2012, following the assessments, the presence of 130 individuals was found. The population in the spring of 2021 was estimated at 140 individuals.

Currently, the *C.elaphus* population in the reserve is about 143 individuals (fig. 1). There was an increase compared to the previous year of only 1.4%. After a slight improvement in the populations, they are, however, 2-3 times smaller compared to the optimal ones, resulting from the support capacities of the forest ecosystems.

The male is usually 1.55 to 2.0 metres long, weighing about 300 kg; the female is 1.40 to 1.8 metres long and often weighs 120 to 170 kg [15, p. 380]. The tail is 12 to 19 cm long, and the height at the shoulder is about 130–150 cm. The horns of males begin to grow in the spring and fall off each year, usually in late winter. They are usually 71 cm long in total and weigh 1 kg, although large ones can grow up to 1.15 metres and weigh 5 kg. The horns can grow at a rate of 2.5 cm per day. The horns are a weapon against rivals in the fight for possession of females. Rivals can assess their chances by looking at the horns, so that individuals with very different strengths rarely fight each other [15, p. 320]. *C.elaphus* individuals stay hidden in hard-to-reach places during the day. At dusk they come out, cautiously, in clearings, clearings or fields. They drink from the spring and bathe, preferring puddles and swamps, especially during the mating season. They graze on the grass in the clearings, feed on tree buds (Populus, Salex, Tilia, etc.), acorns, apples and pears, acorns, leaves, but they also consume agricultural crops, especially grasses.

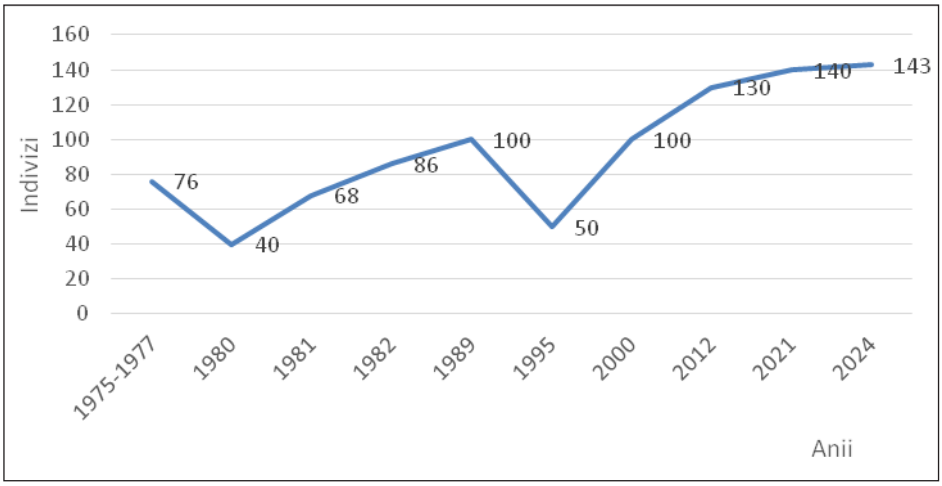



**Figure 1.** Multiannual dynamics of the C.elaphus species populations in the «Plaiul Fagului» reservation

While the herd grazes, one or two animals are alert to danger and give alarm signals if a predator approaches. From the salt pans, set up by hunters, they supplement their nutrients. In winter, they gnaw on tree bark and moss, choosing the sunniest places in the forest as their dwelling during this season.

Males live alone or in families, in dens, and females in small family groups. Males tend to gather in groups after losing their horns. Before calving, females are easily separated from other individuals, but later they form groups again. When cornered, they defend themselves with quick blows of their forelimbs, and their extremely sharp fangs are an effective weapon. In this way, females can defend their young well.

Reproduction occurs from early September to the second decade of October.

Mating is preceded by a distinctive male roar during the rut, which is an adaptation to forested environments, unlike male American wapiti make a horn-like sound during the rut, as an adaptation to open environments. Hunters call this period “booming”. The male roars to keep his harem of females together, these being attracted to those males that roar most often and have the loudest sound. The deer thus gathers around him between 5 and 15 females, which he guards jealously, at the cost of furious fights against all rivals, which can sometimes have a lethal outcome [15, p. 341].

Only mature deer have harems (groups of females), and reproductive success peaks at around eight years of age. Deer aged two to four years rarely have harems and spend most of the rut on the outskirts of larger harems, as do deer over 11 years of age. Deer with a harem feed infrequently and lose up to 20% of their body weight. Males who enter rut in poor condition are less likely to reach the conception period. Once the rut period has passed, males reform their herds, resuming their normal lives, while females, also gathered in separate herds with younger males, set off in search of safe places to spend

the first days of gestation. Gestation lasts 34 weeks, and usually only one calf is born at each birth, rarely two. The chick has a spotted back to better camouflage itself in the bushes, where it remains perfectly still and cannot be spotted by any predator because it does not emit any scent. The chick remains hidden in the dense bushes, where the female only accompanies it to feed, for a few weeks, after which it is able to follow the group with other females with chicks.

One of the factors of anthropogenic origin, which limits the number of *C.elaphus* species, is poaching, the share of which is 81.1% of the total number of factors [16, p.169]. It began to influence from the very beginning of the reacclimatization process, disrupting the process of forming a stable population. Poaching is carried out using motor transport, especially in the autumn and winter. Another factor of anthropogenic origin is poisoning with mineral fertilizers and pesticides.

In order to increase the annual growth of the *C.elaphus* species, maintain the sex and age structure at the optimal level, and obtain healthy offspring, the population of even-toed ungulates in the reserve should be maintained at the optimal level, according to the hunting management, sick, old individuals, etc. should be eliminated from the population, the areas of clearings, feeding fields, waterers and stalls should be increased, and prophylaxis against diseases and parasites should be carried out on a permanent basis.

In the case of exceeding an optimal population, when damage is caused to forestry and agriculture, the economic value of the *C.elaphus* species can be considerable, provided that it is managed properly.

## CONCLUSIONS

An increase in the population of the *C.elaphus* species of about 5% was determined in the «Plaiul Fagului» reserve, which is 3 times lower compared to neighboring countries.

In the *C.elaphus* population, 67% are adult individuals, 14% are young and 19% are individuals from the current year, which is an indication of an insignificant natural increase and the fact that a local micropopulation with a normal structure has not been formed.

It has been established that one of the factors of anthropogenic origin, which limits the population of the *C.elaphus* species, is poaching. It began to influence from the very beginning of the reacclimatization process, disrupting the process of forming a stable population.

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