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Investigation of the opportunities for introduction of the wild turkey (*Meleagris gallopavo*) in the territory of Bulgaria

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Abstract

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In Biology the introduction is the establishment of outlandish species within the borders outside their natural range (natural habitats) under conditions in which they have not previously developed. The aim was to investigate the possibilities of introduction of wild turkey (*Meleagris gallopavo*) in the territory of Bulgaria and the changes to which they might have led to the morphological features of this species. The study was carried out in the territory of Trankovo village, Stara Zagora region (the pheasantry is a part of Mazalat), the territory of Stara Zagora Zoo and in a licensed game farm Graus.

The used methods are:

• interviews with poultry specialists;

• photographic method – photo-documentation of areas, inhabited by wild turkeys and photo-documentation of morphological features of live wild turkeys;

• biometric morphological method.

In Bulgaria there are real opportunities for introduction of wild turkey due to the presence of objects with parental herds – the pheasantry in the village of Trankovo and the Zoo in Stara Zagora.

The program for the production and displacement of birds bred in farms does not work with wild turkey, although it has been included in the program from 2006.

Hunting farms prefer to buy wild turkeys ready for shooting from the pheasantry in Trankovo rather than rear them in the hunting area. When trying to introduce a group of wild turkeys, it should be composed of young and adult birds as well. The birds that are displaced should be at a distance from the rest that they cannot hear the birds from the parent flock. In order for a higher percentage of birds to survive, strict control must be carried out over the harmful predators – foxes, jackals and martens.

Keywords: wild turkey; introduction; morphology

Introduction

The term introduction in Biology is defined as establishment of outlandish species within the borders outside their natural range (natural habitats) under conditions in which they have not previously developed. Quite often the introduced species significantly change the ecosystem in the affected region and cause a significant decrease in the number of local species, which may even lead to their complete disappearance.

Introduction can be casual, deliberate, ecological and introduction of infectious diseases (Georgieva, 2010).

In Bulgaria, an example of deliberate introduction into the animal world may be the nutria introduced into a free lifestyle in Mandren Lake and the Arkutino Reserve in 1953 (Peshev et al., 2004). As examples of accidental introduction can be mentioned the muskrat, entered in Bulgaria in 1955 and the raccoon dog, appeared in 1968. Having successfully introduced species under the initiative of the hunting holdings in the country can indicate deer in hunting holding "Voden", "Iskar", "Ropotamo", "Kormisosh" and others. In the hunting holding "Voden" has been successfully introduced the wisent, and in the hunting house "Vitinia" has been established a population of Tibetan yak (Executive Environment Agency, 2012).

At the same time can be given unsuccessful experiments for introduction of non-native species in the nature, such as mountain hare and European rabbit that exist only in the northern part of the island of St. Ivan. The experiments for introduction of capercaillie in non-specific for the species habitats are unsuccessful.

It is considered that the turkey (*Meleagris gallopavo*) was domesticated in Mexico during the XVcentury. In Europe, the turkey was introduced for the first time in Spain in 1519 with some American food trophies. Nowadays, turkey breeding is a serious breeding industry in the world. Its wild ancestors now live in Central and North America and are the subject of an attraction hunting tourism (Borislavov, 2012).

Nowadays in Bulgaria has been introduced the American turkey in the program for production and dispersing of birds, bred in farms. The American turkey is intended for breeding in the farm, which belongs to Mazalat game breeding station in Trankovo village (Ataka, 2006).

At Thanksgiving in the United States consume more than 45 million turkeys for which Americans spend an average of $ 5 billion. The Aztecs worshiped the turkey. According to an old Indian legend, a huge turkey flew over the fields of the Indians, brought grain and taught them to grow and harvest (*Mihaylova, 2008*).

Wild turkey prefers forest areas near a water source. It eats seeds, insects, sometimes frogs or lizards. Its favorite food in Idaho is snails of a different kind. When frightened, the turkey can run extremely quickly or fly over short distances (about 0.5 km). The male courts the female and forms a group of females which lay 8-15 brown speckled eggs in pits in the ground. The chickens hatch for about 28 days. Turkey hunting is popular in many US states, especially in the Midwest and South, Texas and others. Idaho is in the so-called Pacific Northwest and is one of the states where the turkey was not widespread in nature. Like other Western states, US hunting and fishing agencies bring the turkey as a game of hunting. Extremely adaptable, it adapts very well to the Idaho mountain areas and is now one of the most popular hunting birds in the state. For example, in 2005 in Idaho were shot about 5,800 turkeys with an average success rate for different hunting areas around 30%, i.e., only one in three hunters had any success (Hristov, 2007).

Wild turkey (*Meleagris gallopavo*) is a bird of the family Phasianidae, spread in North America, domesticated in the 15th century and transported to Europe in the beginning of 16th century. This is a large bird with a length of 100-120 cm for males and 76-95 cm for females, the size of the tail is smaller than the half of the length of the bird. The males have a weight of about 8 kg and the female 3-3.5 kg. The legs are long in pale violet or light reddish coloration. The color of the plumage is dark with a bronze-greenish glitter of the feathers, which have transverse white lines on the tail and the wings. The head and neck are without ointment and stained in light blue with characteristic warts ("corals"). Above the eyes and the palate, the color is dark blue. Above the base of the beak, the turkey has a growth which, depending on its condition, prolongs and shortens. The female lays up to 15 eggs of pale yellow color with many brownish-red dots that have been mating for 28 days. As soon as they hatch, they are able to follow the mother in food search.

Although they are large birds, the wild turkeys are good flyers; they can fly without rest for almost half a kilometer at a speed of just under 100 km/h, despite their relatively small wings (Grousebg.com).

It is incredible, but the first hunting of wild turkeys in the country is organized in the Pazardzhik hunting-fishermen's association Sokol 1893. The adventure was on the occasion of organized hunting tourism. The exotic wildlife for our country was destined for two American hunters who recently visited their colleagues from Pazardzhik. Philip Ackerman was 72 years old from New York, and his son David was 40 years old. Their countryman David Bodai from Texas brought them to Bulgaria. He was a representative of our hunting tourism companies in the United States. The contact with the association in Pazardzhik has been realized by Stilian Kadrev, the famous creator of films for hunting. The Americans have declared to him a desire to hunt a wild population of a partridges, displaced aviary pheasants, guineafowls and wild turkeys. For the implementation of the action, the management of the association signed a joint project for the displacement of wild turkeys with the company of the National Hunting and Fishing Association "Sokol BRLS" Ltd., which breeds these birds. Three turkeys were expressly

delivered. Interestingly, is that in the 20s of the 20th century, such a population was in Bulgaria in Stara Planina mountain and in Sredna Gora. This is the beginning of the first "Wild Turkey" campaign in Bulgaria. Two of them were placed in the area of Hunting fishermen's association Dobrovnitsa and the third in the hunting fields of Saraia village. The displacement was carried out under the direction of the member of the Board Andon Andonov, the head of the organization Iliya Dolev and his team. Afterwards it was found that they had discovered the most suitable habitats for the turkeys. Birds have been raised in front of hunters using hunting dogs (Grozdev, 2016).

In the Mazalat state hunting farm there is a well-kept pheasary situated within the boundaries of the Stara Zagora State Forestry, which breeds common pheasant, partridge and wild North American turkey (http://dlsmazalat.uidp-sliven.com/).

Aim of the study is to investigate the possibilities of introduction of wild turkey (*Meleagris gallopavo*) in the territory of Bulgaria and the changes to which they might have led to the morphological features of this species.

Tasks of the study are:

• to establish breeding and breeding areas for wild turkey in Bulgaria;

• to analyze the activity and experience in introducing wild turkey;

• to investigate the influence of introduction on the morphology of wild turkey.

Materials and Methods

Materials

The study was carried out on the territory of Trankovo village, Stara Zagora region (the pheasantry is a part of Mazalat), the territory of Stara Zagora Zoo and in a licensed game farm Graus for the period from 20/09 /2016 to 25/03/2017. Twenty-five live wild turkeys from the Zoo in Stara Zagora were used.

Methods

Interviews with hunters are showing experience in hunting wild birds and interviews with poultry specialists.

Photographic method – photo documentation of areas, inhabited by wild turkeys; photo documentation of morphological features of live wild turkeys in the Zoo in Stara Zagora; photo documentation of the pheasantry in the village of Trankovo.

Biometric morphological method is a study of some morphological characteristics of wild turkeys from the Zoo in Stara Zagora.

Results and Discussion

The pheasantry in the village of Trankovo (Fig. 1) is a separate production unit of the structure of the state hunting farm Mazalat. It is situated on an area of 17 decares, in a wood of oak, which is part of a 3800 decares mixed broad-leaved massif, managed by state hunting farm Mazalat, Stara Zagora. It is located 25 km from Stara Zagora and 2 km from Trankovo village.

According to information of long-time employees in the pheasantry, the first wild turkeys were hatched from 50 eggs imported from Canada in 2005. For a few years, only reproduction was carried out without the displacement of birds in hunting farms. Now in the pheasantry are bred 250 adult wild turkeys which represent the parent flock.

Fig. 1. The pheasantry in the village of Trankovo

Fig. 2. Facilities for breeding of wild turkeys

The flock consisted of 30 male and 220 female turkeys. The gender ratio was 7.33. Birds were grown underfloor on natural soil in a facility surrounded by a metal mesh and a roof of a net (Fig. 2). The area of the facility was 5 decars. Its height was 2 m, so that the workers who served the birds to move freely.

In the facility there are overexposed shed constructions (Fig. 3) which serve as shelters for birds in unfavorable climatic conditions and for food supply in rainy weather. For resting and sleeping of the birds, a lot of perches of wooden branches with thickness from 2 cm to 3 cm were installed in the facility. That kept the instinct of the birds to stay high in the branches of the trees in order to their protection from predators (McRoberts, et al., 2014).

Drinkers for turkeys are with spouts and provide sufficient drinking front. In the facility are built nests of hay in which the female turkeys lay their eggs. The nests are built on the ground under the shed construction. The laying of the eggs and eggs' collection begin around mid-March and continue until the end of May. For this period, each female turkey lays 12-15 eggs for one ovum cycle. For the aforementioned period, each turkey has two ovum cycles with a 25-30 day period from the end of the first to the beginning of the second ovum cycle. The collected eggs are stored in a room at a temperature of 12-18°C, in egg cartons with their air chambers up. Before being loaded into an automated incubator Victoria, the eggs are tempered to 20-25°C for 20 hours to avoid thermal shock of the embryos when the eggs are placed in the incubator at a temperature of 37.6-37.8°C. The duration of egg hatching is 28 days. After staying in the incubator for 12-24 hours for drying, the newly-hatched wild turkey poults are moved indoors. They have tunnel heating, while maintaining the temperature scheme for home-breeding turkeys up to 45 days of age. Food and water are available without restraint. Drinking water is provided with medicinal products under a scheme for rearing of domestic turkey poults. After 45 days of age, the wild turkeys are removed for cultivation under natural conditions in the facilities enclosed by a grid. In 2016, 1000 turkey poults were hatched in the pheasantry.

Fig. 3. Shed constructions in the facility

It is noted that the plumage in last year turkeys is streaked with many white feathers (Fig. 4), which is not typical for the coloring of the birds.

Fig. 4. Non-typical plumage in the turkeys

This morphological change is a consequence of the stress of the birds in the violation of various technological parameters and traumatic factors. When we shared this with the staff in the pheasantry, it was found that for a certain period, the premises for young birds were actually overcrowded (more birds per unit area), which is a violation of the technological parameter – stocking density. The birds are bred in accordance with a government order for the needs of the hunting farms and associations in the country. They order to shoot as many birds as they need. This coincides with that described by Grozdev (2016).

It is not clear to us how the "Bird Farmed Production and Displacement Program"is being implemented in respect of American turkey (Ataka, 2006). In none hunting farm or hunting area has ever been reported a tentative to introduce naturally bred turkeys into their hunting grounds.

Experts, working in the pheasant farm in Trankovo reported us that they tried in 2015 to displace in the natural area 50 young wild turkeys. They introduced the birds in a forest environment near the pheasantry. The turkeys lived alone without being cared for by humans for about 60 days. Unfortunately, they have probably heard the sounds of the turkeys on the farm and have moved in that direction and as a result have gone to the pheasant area alone.

We consider that this is a good attempt to introduce a wild turkey, if some mistakes are skipped by the experts in the pheasantry. We definitely assume that when trying to introduce a group of wild turkeys, it must be composed not only of young individuals but also of adults. This coincides with the attitude of Eaton (1992) that each gender has an independent hierarchy, the female hierarchy is stable and the male is constantly changing. The presence of adult female turkeys would help the group to be not separated, due to the instinct of the young turkeys to follow the adults in the flock. Imitating the adult behavior, young birds would find food and water more easily, and would easily escape the predators.

Another problem we consider to be an error in this experiment for introduction is that the birds that are being displaced must be at such a distance that they cannot hear birds from the pheasantry. The strong herb instinct has stimulated them to move towards the sounds of the turkeys in the farm, which coincides with Melina and Bryner (2015), according to whom the turkeys show a strong relationship with other members of the flock, sometimes moving in a group of 200 or more turkeys. Since 2010 four wild turkeys have been grown in the Zoo in Stara Zagora. They were bought by the pheasantry in the village of Trankovo to enrich the exposition in the Zoo. Now, their number is about 40 birds and this is the result of good breeding of the birds. Over 20 wild turkeys are delivered to other zoos for species enrichment. Here the birds are grown in aviaries (Fig. 5) and are free (Fig. 6).

Aviary breeding has advantages over controlled breeding. Each bird can be observed regarding its health status, nutritional and gender behavior and, if necessary, an action can be undertaken. In the period of egg laying in the aviary shelters are formed and in them nests of hay and leaf mass are made. The female turkeys lay their eggs and self-nest. After hatching the little birds stay with the female in the aviary. Food and water are available at will. Unlike the peasantry in Trunkovo, no drugs are added to the water and there have never been any problems. In addition to the fodder, cottage cheese, yogurt and boiled eggs are given. There is not additional artificial heating. Small turkeys are covered by the female when it gets cold. Their rearing is almost in natural conditions, except the aviary enclosure that protects them from predators – martens, common ferrets, wild cats and wandering domestic cats. After 45 days of age, wild turkeys are taken outside the aviary in the zoo's natural environment (Fig. 6). For gradual adaptation to the new environment, food and water are placed in certain places. Initially, the turkey poults move around the aviary, but after about a week exploring the territory they move around the entire zoo. Zoo experts report that critical, in terms of protection from predators – foxes and jackals, are the first 2-3 nights in their free rearing. For this period, the pussies are accustomed to climb on the branches of the trees for the night, and this is their behavior when protected from predators in the natural environment.

Bred in this way, wild turkeys are almost ready for independent life in a natural environment. In the breeding season the female birds form nests usually in thick bushes, such as in the zoo – bushy tuuna, mahogany, rosehip and wild blackberries. Of seven self-nested wild turkeys in the zoo in 2014, unfortunately, four of them became victims of foxes and jackals in their nests.

We maintain that this way of farming is very suitable for adaptation of birds to the natural environment and such birds can be successfully introduced. However, in order to have a higher survival rate for the birds, there should be more strict control, accomplished by the hunting associations over the predators – foxes, jackals and common ferrets. The reason for this is the fact that for only one month in the Zoo in Stara Zagora were

Fig. 5. Breeding of the turkeys in aviaries

Fig. 6. Free rearing of turkeys

trapped four jackals, two foxes and three wandering domestic cats (Fig. 7).

Experts from Zoo in Stara Zagora have also experimented with hatching of wild turkeys in the spacious enclosure for herbivores, which is about 5 decares. Besides herbivores, about 15 adult wild turkeys are reared there (Fig.8). In the breeding period, the turkeys have constructed nests at the base of piles of fallen trees and successfully hatched turkeys. This way of

Fig. 7. Trap for harmful predators

reproduction is very close to that in the environment. Zoo specialists, however, report a high mortality rate for new hatched birds caused by diurnal raptors – mainly magpies because the enclosure is not covered.

It is clear to us that the lack of dense forest greenery and the opened space, such as the enclosure for herbivores in the zoo, does not provide adequate hiding places for newly hatched birds from the forays of the diurnal raptors.

The sexual dimorphism in wild turkeys is clearly expressed in favor of males (Fig. 9). In our morphological studies on the birds (Fig. 10) we found that the length of the body from the tip of the beak to the end of the tail in the male birds is 100 to 125 cm and for the females from 60 to 95 cm. The body weight of the male turkeys ranges from 7.5 to 11 kg, and in the females from 3.5 kg to 6 kg, which coincides with the data from Grousebg.com.

The color of the plumage is soot-black with a greenish bronze hue in sunlight. At the end of the feathers of the tail are observed distinct transverse white streaks, which coincide with the spreading of the tail. The wings' feathers are streaked with transverse white lines evenly situated along the feather.

The head and base of the neck are devoid of feathers; the skin is wrinkled and colored in red except the periorbital space which is colored in blue. A single skin fold, beginning from the middle of the mandibular space and reaching the level of 2nd/3rd cervical vertebra, is observed in turkeys (Fig. 9). On the ventral surface of the border between the plumose part of the neck and that with feathers, the skin forms large bumps called "corals", more pronounced in male birds (Fig. 9). At the border between the caudal end of the upper part of the beak and the interorbital space there is a skin appendage with a conical shapes which is 1.5-2 cm long (Fig. 9). It is more developed in the male birds. Another characteristic of the male birds is the presence of specific strand located ventral at the border between the neck and the thorax. It occurs after six months of age and its length may reach 10 cm (Fig. 9).

In the sexual arousal and the performance of the ritual sex dance in courtship of the females, the turkeys swell their chest, the tail rises as a fan, and the wings are brought to the ground

Fig. 8. Wild turkeys in the open area for herbivores in the Zoo in Stara Zagora

Fig. 9. Male and female turkeys

Fig. 10. Part of the morphological studies with female wild turkey

Fig. 11. Sexual arousal in male turkey

with spread wing feathers. During this condition, the color of the skin of the head changes from red to blue, and the coral and conical appendage over the beak change the size 2-3 times (Fig. 11). This is most likely due to the delayed venous outflow of vessels in the head area, because of the apnea in which the turkeys get into their sexual arousal.

Conclusions

In Bulgaria there are real opportunities for introduction of wild turkey due to the presence of objects with parental herds – the pheasantry in the village of Trankovo and the Zoo Park Stara Zagora.

The program for the production and displacement of birds bred in farms does not work with wild turkey, although it has been included in the program from 2006.

Hunting farms prefer to buy wild turkeys ready for shooting from the pheasantry in Trankovo rather than rear them in hunting fields, which is more complex and related to potential future losses from predators.

When trying to introduce a group of wild turkeys, it should be composed of young and adult birds as well.

The birds that are displaced should be at a distance from the rest that they cannot hear the birds from the parent flock. In order for a higher percentage of birds to survive, strict control must be carried out over the harmful predators – foxes, jackals and martens.

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