

PRELIMINARY DATA ON THE ISOLATED *TESTUDO GRAECA* POPULATION FROM THE “CETATEA HISTRIA” MUSEUM COMPLEX, THE DANUBE DELTA BIOSPHERE RESERVE (ROMANIA)

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Abstract. The land of the “Cetatea Histria” Museum Complex, the Danube Delta Biosphere Reserve, holds a large population of *Testudo graeca*, relatively well isolated due to the existing fence around the land of museum and the lack of suitable habitat in the vicinity. The relative high density of individuals in this area, 1.68 individuals / ha, and low recapture rates, 9.25%, suggests a large population size. The presence of juveniles and the lack of individuals with tick infestation or traces of human violence on carapace or plastron indicate a viable population which occupies an area with limited human activity.

Résumé. Le périmètre du Complexe Muséal «Cetatea Histria», Réserve de la biosphère du Delta du Danube, est habité par une importante population de *Testudo graeca* relativement bien isolée en raison de la barrière existante et le manque d'habitat convenable à proximité. La forte densité relative des individus dans ce domaine et la recapture faible suggèrent une grande population. La présence de nombreux juvéniles et aucune infestation de tiques observées ou de violence humaine sur la carapace ou le plastron, montrent une reproduction de la population qui occupe une superficie où l'activité humaine est limitée.

Key words: *Testudo graeca*, population structure, Romania, Danube Delta.

INTRODUCTION

Spur-thighed Tortoise (*Testudo graeca* Linnaeus, 1758) is an attractive species for ecological studies because of its status of priority species for conservation (92/43/EEC), long life, high catchability and the opportunity for permanent individual marking due to structure of carapace. Land tortoises are also important flagship species for conservation since they attract public attention (Walpole & Leader-Williams, 2002).

The distribution of *T. graeca* in Dobrogea is uneven, with larger populations in the north, Măcin Mountains (Cogălniceanu et al., 2007) and in southern forested areas (Cogălniceanu et al., 2008). Between those areas only small isolated populations survive (Covaciu-Marcov et al., 2006). One of these is located on the northern tip of Saele Sand Bank (Băcescu, 1966), in the enclosed area of “Cetatea Histria” Museum Complex. This population is relatively well separated from other populations, because of habitat discontinuity, water bodies or fenced areas. The current population of the species occupies an area characterized by low human impact, abundant vegetation and complex landscape with large number of pits and hillocks from past archeological sites. The study of this population is a part of long term monitoring focused on the evaluation of the population's structure, distribution, health and human impact.

The present work describes the preliminary results of the monitoring carried out in 2010.

MATERIAL AND METHODS

This preliminary study was done from May, 2010 to October, 2010, in the enclosed area of the “Cetatea Histria” Museum Complex (Fig. 1). The study area has a surface of 32 ha and a perimeter of 2.3 km with limited archeological activity. The perimeter of the area is fenced, which keeps it safe from potential predators, domestic animals or tourists, and at the same time limiting dispersal of tortoises.



Fig. 1 - Location of “Cetatea Histria” Museum Complex (Dobrudja = Dobrogea).

Air temperature was also recorded (Lascar EL-USB-2 temperature data loggers). For juveniles and subadult animals age estimation (Germano & Bury, 1998) was done by counting the number of rings on at least three carapace scutes (Bertolero et al., 2005).

The study area was covered by 24 transects with an average length of 400 m and a combined length of 10 km. They were repeated ten times, between 9:00 and 14:00 hrs. (Hill et al., 2007). The distance between two adjacent transects was 20 m, because of abundant vegetation which prevents optimum observation of tortoises (Mazerolle et al., 2007). The location of the tortoises along transects was recorded with a handheld GPS Garmin eTrex. Individuals were sexed, measured with a caliper (40 cm size, 0.01 mm precision) for straight carapace length, curved carapace length and height, weighed with a portable electronic balance (Momert portable electronic balance, maxim weight 3kg, with 1g precision) and temporary marked with a marker (Stubbs et al., 1984). Each tortoise was photographed from both dorsal (carapace) and ventral (plastron) side for later in detail measurements.

RESULTS

During the study period 54 individuals of *T. graeca*, 27 females, 21 males and six juveniles, were registered. The sex ratio was 0.77, males by females, and juvenile age was between three and seven years. No tortoise under three years of age was captured, probably due to small size, camouflage colors, dense vegetation and less active behavior. The average sighting rate per day of the study was four

tortoises, with a minimum of three and a maximum of 16 tortoises. The recapture rate was extremely low, 9.25%, with only five tortoises recaptured (three females, one male and a single juvenile). Tortoises were located mainly within the border area of the land, on sun exposed area of hillocks, with the central part having a very low animal density. In relation to the study area the numbers of captured tortoises was 1.68 individuals/ ha, lower than those obtain by Kaddour et al., (2006) in the Central Jbilets in Morocco.

The weight and straight carapace length of captured individuals of *T. graeca* are presented in table 1.

Table 1

Weight and straight carapace length of captured *T. graeca*.

	Weight (g)						Straight carapace length (cm)					
	min	Max	Average	SD	SE	CI	min	Max	Average	SD	SE	CI
Females	359	2883	1525.48	±481.16	92.60	1.00	10.1	21.8	15.90	±2.66	0.51	1.00
Males	1516	1965	1718.28	±230.92	50.39	98.76	14.5	19	16.76	±1.26	0.27	0.54
Juveniles	26	291	136.5	±118.95	48.56	95.17	4.7	8	6.81	±1.97	0.61	1.20

SD = Standard Deviation; SE = Standard Error, CI= Confidence Interval

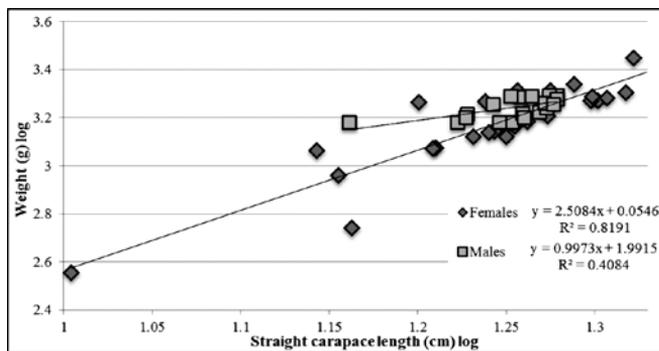


Fig. 2 - Correlation between weight and straight carapace length of captured *Testudo graeca* for n=27 for females and n=21 for males.

There is a statistically significant correlation between weight and straight carapace length (Fig. 2), with female weight increasing faster than in males, what was in concordance with studies performed on *T. graeca* in other parts of species area (Türkzoan et al., 2003).

Only one tortoise showed injuries attributed to human activity; all tortoises had no tick infestation.

DISCUSSIONS

The data collected in this study follows the pattern observed in other studies on *T. graeca* regarding population size, structure and body parameters (Kaddour et al., 2006). Captured adults represent 88.88% of all captures and juveniles only 11.11%. This population structure resembles the population structure from a study in Măcin Mountains National Park, situated at over 100 km north of Cetatea Histria. In the Măcin Mountains study (Cogălniceanu et al., 2007) the juveniles represented 6.7% of the 310 tortoises captured. The population's structure dominated by adults may indicate a low reproductive rate. This may not be accurate because the proportion of juveniles in a population is difficult to estimate due to their behavior which makes them difficult to observe and to capture (Kaddour et al., 2006). Also the tortoise density is higher in Cetatea Histria, 1.68/ha, comparing it to 0.27/ha in Măcin Mountains, which has a surface of 1132 ha. The suitable habitat of Cetatea Histria which attracted tortoises from the nearby overgrazed and humid habitats is the most probable the explanation for the higher density of tortoises in Cetatea Histria area (Preda et al., 2009). This concentration effect and the number of captures and recaptures tend to indicate a large tortoise population. The low detectability and recapture rate is due to the abundant vegetation and high temperatures in the spring and summer of 2010. The low tortoise density in the central area might be explained by the landscape characteristics with abundant vegetation and less hillocks or sun exposed areas (Ioannidis & Bousbouras, 1997).

The Cetatea Histria captured tortoises are smaller both in size and weight comparing with those from Măcin Mountains. The smaller body signification can't be explained in this preliminary study due to limited data, but it can be related to the age of the captured tortoises, food source availability or environmental factors. In both areas, the female tortoises have increased body size parameters comparing to males and females increase their weight faster with the increasing of the straight carapace length. This sexual size dimorphism is most likely due to sexual selection and fecundity selection (Carretero et al., 2005). Adult sex-ratio (males: females) is of 0.77:1 in Cetatea Histria, with fewer males in contrast with Măcin Mountains where sex-ratio is of 1:0.57 (Cogălniceanu et al., 2007). This difference is probably caused by the local habitat characteristics and by the behavior of these tortoises, males being prone to a more active life, which affects catchability.

This preliminary result shows that *T. graeca* maintains a viable population in the study area, with its population structure extending from juveniles, with lower weight and straight carapace length to older individuals with weight over 2800 g in females and straight carapace length over 20 cm. Animals also lack ticks and the carapace is free from man-made scars as frequently is the case in other populations.

Conclusion

This preliminary study showed that the *T. graeca* from the enclosed area of “Cetatea Histria” Museum Complex might be isolated from other similar tortoise populations due to fenced perimeter of Complex and unsuitable nearby habitats (swamps and salty areas). Inside the studied perimeter there is a healthy population which tends to aggregate in well exposed to sunlight spots.

The low recapture rate suggests a larger population. The fact that this population is free of tick infestation and almost absent man-made scars on carapace shows it resides in an area without intense human activity.

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DATE PRELIMINARE PRIVIND O POPULAȚIE IZOLATĂ DE *TESTUDO GRAECA* DIN COMPLEXUL MUZEAL “CETATEA HISTRIA”, REZERVAȚIA BIOSFEREI DELTA DUNĂRII (ROMÂNIA)

REZUMAT

Țestoasa de uscat dobrogeană *Testudo graeca* are în interiorul Complexului Muzeal “Cetatea Histria” o populație care poate fi considerată izolată de populațiile din imediata apropiere datorită împrejuririi cu gard a Complexului și a lipsei de habitat specific în proximitate. Acest studiu preliminar a arătat existența unei densități a indivizilor acestei specii destul de ridicate pentru suprafața studiată, 1,68 indivizi/ ha, dar și a unui succes scăzut al recapturării, 9,25%, fapt ce sugerează o populație mult mai numeroasă. Capturarea și recapturarea de indivizi juvenili arată o populație viabilă, iar lipsa infestării cu căpușe precum și lipsa urmelor de violență umană asupra carapacei arată că această populație ocupă un teritoriu cu activitate umană limitată.

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