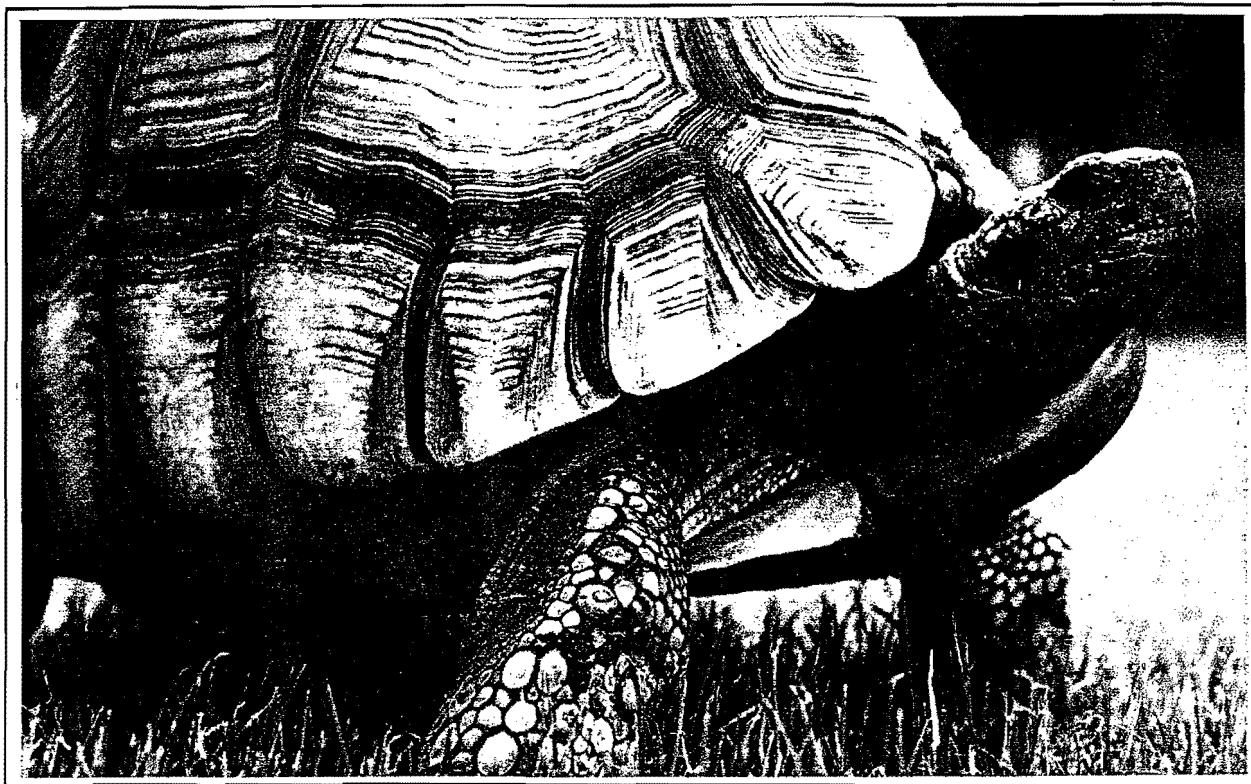


INTERNATIONAL CONGRESS OF CHELONIAN CONSERVATION

FRANCE - GONFARON - Tortoise Village - 6th to 10th of July 1995

Proceedings



Astrochelys yniphora is the rarest tortoise in the world. Reared at Ampijoroa, in Malagasy, and at St Catherine Island (in this photo), its total strength never exceed a few ten individuals in captivity and a few hundred ones in the wild. An excellent conservation programme concerns this animal, leaded by the Jersey Wildlife Conservation Trust and the Wildlife Conservation Society. Nevertheless, at the beginning of may 1996, part of the tortoise populations (adults and juveniles) have been stolen at Ampijoroa, flying specialists into a rage and disappointment. So, this tortoise is a symbol, by its scarceness, by the efforts made to protect it, and by the threats which hang over it, of the difficult conservation of the tortoises in the world.

THE IMPORTANCE OF INTRODUCTIONS IN SPECIES CONSERVATION: THE CASE OF *Testudo hermanni* IN THE EBRO DELTA NATURAL PARK (NE SPAIN)

La importancia de las introducciones para la salvaguardia de las especies: el caso de Testudo hermanni en el Parque Natural del Delta del Ebro (España)

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Abstract

The introduction of the Western Hermann's Tortoise (*Testudo hermanni hermanni*) in the Ebro Delta Natural Park (NE Spain) is reported as a project of conservation. A reproductive population has been created from 44 adults released in 1987/88 and systematically monitored since 1991. The high number of juveniles obtained (222 marked from 1991) represent a stock for reintroducing the species in its natural range in the future.

Resumen

Se informa de la introducción con propósito de conservación de la tortuga mediterránea occidental (*Testudo hermanni hermanni*) en el Delta del Ebro (España). Se ha creado una población reproductora a partir de 44 individuos liberados en 1987/88, los cuales han sido seguidos sistemáticamente desde 1991. El elevado número de juveniles obtenidos (222 marcados desde 1991) representa una reserva demográfica importante con vistas a la reintroducción de la especie dentro de su ámbito natural en el futuro.

Introduction

In most cases, the introduction of a foreign species in an environment produces negative effects on the autochthonous fauna and/or flora. Many examples may be cited around the world. However, under certain circumstances the introduction of a species can contribute to its protection and recovery. This is the case of the Western Hermann's Tortoise (*Testudo hermanni hermanni*) in the Ebro Delta.

The Hermann's Tortoise is an endangered species throughout its distribution range. The only autochthonous populations living in Catalonia (NE Spain) is found in the Massís de l'Albera in the north of Girona province (Félix, 1985). Nevertheless, several citations have been reported along the Catalan coast, indicating that the range of this tortoise has become wider than now in the recent past (Llorente et al., 1995). Specifically, there are some citations that point out the presence of a little-known population in the south of Tarragona province (Cheylan, in press). Moreover, the ancient literature confirms its presence in the south of Catalonia (Baix Ebre and Montsià regions) since at least the sixteenth century (Bertolero & Martínez-Vilalta, 1994). The present introduction project began in 1987 in the Ebro Delta Natural Park. The aim was to create a free population, under controlled conditions, able to produce tortoises for subsequent reintroductions in areas of its original range in south Tarragona.

Origin of the tortoises of the introduced population

The origin of the specimens that constituted to the initial population was heterogeneous. Tortoises were collected in surrounding area of the Ebro Delta (Montsià region) and also came from private donations to the Ebro Delta Natural Park, Barcelona Zoo and the Direcció General de Medi Natural (Generalitat de Catalunya).

Animals were previously kept in captivity in the Canal Vell Biological Station. The tortoises were ascribed to the Western subspecies *Testudo hermanni hermanni* by the analysis of the morphological features and colour pattern. Two isolated populations were established. One was composed of 44 adult specimens released between 1987 and 1988; the sex ratio was female-biased in an attempt to maximize the number of eggs laid and the number hatchlings emerging. The other one was founded with a group of 14 tortoises. Nine were released in 1990 and five in 1993.

Physical Environment

Both populations inhabit islets of the Punta de la Banya Natural Reserve. The space around the islets lacks vegetation and sea cover depends on season and weather. The first population is found in a system of islets usually connected with a total area of 5.8 Ha. The second population occupies only one island of 2.8 Ha.

The islets are sand accumulations with small slope fixed by psammophile and halophile vegetation. A small wood of White Pine (*Pinus halepensis*), which was established in 1940-50, covers part of the islets and also contributes to fixing the sand and retaining humidity. The climate is littoral Mediterranean, with a long dry season in summer (mean annual rainfall=548 mm, mean temperature=16.6°C; see Panareda & Nuet, 1973).

Project monitoring

The first population has been monitored continuously since 1991, a continuous monitoring of was carried out. So, the following data belong to this population. The second population was visited only occasionally, to confirm the breeding of this small colony.

Sampling was performed from the end of winter to the end of autumn, always depending on the weather and transport facilities. The visits made in December under good weather did not revealed any sign of tortoise activity. Sunny days without strong wind were chosen for the sampling, which consisted of a 2.5 km searching transect. When a tortoise was located biometrical data and geographical location, activity and (air, substratum and body) temperatures were recorded.

Results

Population dynamics

41 of the 44 adults initially released were recovered which represent a 93% (Table 1). 37 of them were found alive between 1991 and 1995. The other four tortoises were found dead before the study began. Adults mortality varied between zero and three animals per year. A total of 11 tortoises were found dead. The sex-ratio has remained biased to the females, at 1:1.5 (15 males and 22 females).

From 1991 to 1995, 222 juveniles were marked using two methods (Table 2). 75 tortoises were painted between 1991 and the beginning of 1993. 20 of them were later recaptured and they were re-marked again by notching. Another four were found dead and, finally, the other 51 were lost. This system was abandoned at the beginning of 1993 due to the evident lost of marking. The possibility of recapturing tortoises that had been painted but which no longer retain any sign of the marking is high. 168 juveniles (including the 20 painted animals) were marked by notching. The percentage of recaptures varied between years from 25% in 1995 to 60% 1992.

The population size was estimated to be 86 juveniles in 1994 (95% confidence interval: 75-101), resulting in a density of 15 juveniles/Ha.

The distribution of the size of the juveniles grouped in classes of 10 mm intervals (Figure 2) gives an idea of the population structure. The total number of juveniles found was very variable between years. The number was especially high in 1992. Data for 1995 are obviously only partial. The 90-100 mm and >100 mm classes appeared in all years but their importance increase throughout the sampling period. The rest of classes showed fluctuations between years, probably related with higher mortality of the smaller tortoises (Table 3). So, 86% of the mortality is found in the interval between 30 and 80 mm and only the 9% for the 80-100 mm interval. It seems that the conditions were not favourable for the juvenile population in 1993 (Table 4). Mortality was the highest of the study period and natality (as estimated from the number of 30-40 mm juveniles found) was the lowest. A strong decrease in the annual precipitation (285 mm for 1993; 30 years annual mean 580 mm, data from Ebro Delta observatory) may be partly responsible for this.

Discussion

The introductions carried out under controlled conditions and in certain circumstances can contribute to the survival and recovery of species that are threatened in their original distribution ranges. The ecosystem chosen will be suitable if no new negative factors similar to those found in the original environment appear. It is thus important to determine which factors affect survival.

In the case of the Western Hermann's Tortoise, these negative pressures are the loss of natural habitat (forest fires, desertization, urbanization and changes in traditional land use), collection and high predation levels of eggs and hatchlings (Honegger, 1981; Félix, 1985; Stubbs & Swingland, 1985; Cheylan, in press). In the Ebro Delta Natural Park these factors are reduced by the legal protection of this area. So, neither activities promoting habitat alterations nor the collection of tortoises are carried out. Furthermore, the physical isolation has prevented islets from colonization of many predators like the badger (*Meles meles*), the fox (*Vulpes vulpes*) and the wild boar (*Sus scrofa*). The only possible predators present are the rat (*Rattus rattus*), which reaches low densities and the Montpellier's Snake (*Malpolon monspessulanus*), which has not being reported to consume tortoises. The low predation pressure, allowing the survival of many juveniles has produced a fast increase in the population size until reaching higher densities than those reported in the literature (see Cheylan, in press). This population represents a possible demographic stock for the colonization of new areas and their reintroduction in the original range in the future.

References

- BERTOLERO, A. & MARTINEZ-VILALTA, A. (1994): Presencia histórica de *Testudo hermanni* en las comarcas del Baix Ebre y Montsià (Sur de Cataluña). *Bol. Asoc. Herptol. Esp.* 5:2-3.
- CHEYLAN, M. (in press). *Handbuch der Reptilien und Amphibien Europas*. Band 3/II.
- FELIX, J. (1985). Grave peligro de extinción de la tortuga mediterránea en la península Ibérica. *Quercus* 17:10-12.
- HONEGGER, R. E. (1981): *Threatened Amphibians and Reptiles in Europe*. Ed European Committee for the Conservation of Nature and Natural Resources Council of Europe.
- LLORENTE, G. A.; MONTORI, A.; SANTOS, X. & CARRETERO, M. A. (1995): *Atlas dels amfibis i rèptils de Catalunya i Andorra*. Ed. El Brau, Figueres.
- MONTORI, A.; LLORENTE, G. A. & FELIX, J. (1993): Status and Management of *Testudo hermanni hermanni* populations from NE Iberian Peninsula. In: *Seminar on Recovery Plans for Species of Amphibians and Reptiles*. Report T-PVS(93)34. Council of Europe. El Hierro (Canary Islands, Spain). 71-83. 99pp.
- PANAREDA, J. M. & NUET, J. (1973): El clima i les aigües dels Països Catalans. pp. 69-102, in: *Geografia física dels Països Catalans*. Ed. Ketres, Barcelona.
- STUBBS, D. & SWINGLAND, I. R. (1985): The ecology of a Mediterranean tortoise (*Testudo hermanni*): declining population. *Can. J. Zool.* 63: 169-180.

Legends to figures:

Figure 1: Past and present distribution ranges of *Testudo hermanni hermanni* in Catalonia (NE Spain) taken from MONTORI *et al.* (1993).

Figure 2: Variation of the size classes distribution in *Testudo hermanni hermanni* throughout the five years of sampling.

Table 1: Number of adults observed since the introduction.

	1987-90	1991	1992	1993	1994	1995
alive males	?	8	11	11	11	8
alive females	?	15	18	16	16	12
dead males	?	0	0	0	1	1
dead females	?	0	2	0	1	2
dead unknown	4	0	0	0	0	0
TOTAL	44	21	31	27	29	23
TOTAL DEAD 87-95	11					

Table 2: Number of juveniles marked in the study.

marking method	1991	1992	1993	1994	1995	total
painted (P)	30	42	3	0	0	75
notched (N)	8	54	33	39	14	148
P controls	0	7	9	8	7	
N controls	0	6	17	26	33	
TOTAL	38	109	62	73	54	

Table 3: Number of juveniles by size class and juvenile mortality throughout the five years of sampling.

Carapace length (mm)	1991	1992	1993	1994	1995
30-40		4		6	
40-50		5	4	2	
50-60	1	3	2		
60-70	1	2	7	2	4
70-80		1	4	2	
80-90			2		
90-100			1	1	1
unknown	1			1	1
TOTAL DEAD	3	15	20	14	6
TOTAL CAPTURED	38	109	62	73	54

Table 4: Estimations of juvenile mortality and natality throughout the five years of sampling.

	1991	1992	1993	1994
Mortality rate	0.07	0.12	0.24	0.16
Natality rate	-	0.13	0.07	0.11

