



SOME NOTES ON THE POPULATION OF DWARFED *EMYS ORBICULARIS* FROM PAG (CROATIA)

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Abstract. Basic morphology of 21 specimens of dwarfed *Emys orbicularis* from the Croatian island of Pag was studied. Carapace length of 20 adult specimens reached 89–114 mm. The mean carapace length was 96.6 mm in males (n=6) and 104.1 mm in females (n=14), respectively. The adult specimens showed an obvious sexual dimorphism in shell height and plastron length. Natural history notes for the investigated population as well as an addition (*Natrix natrix*) to the faunal list of Pag are given.

■ Testudines, Emydidae, *Emys orbicularis*, morphology, island of Pag, Croatia.

INTRODUCTION

Within its large range the European pond turtle *Emys orbicularis* L. exhibits considerable variation in size (for detailed review see Fritz 2003). Whereas the maximum carapace length in northern populations can exceed 200 mm, most specimens from the Mediterranean and the Black sea coast do not grow larger than 150 mm. Under suboptimal or pessimal conditions *E. orbicularis* can form local populations of dwarfed individuals. Such populations reaching 100–120 mm of the carapace length are known to occur above all in limestone areas of the Dalmatian coast (including the island of Pag), in Kefallinia and on the Peloponnese (Richter et Mayer 1990; Fritz 1992, 1998, 2001, 2003). Moreover, populations of small sized specimens were reported also from other parts of the range of *E. orbicularis* – e.g. Sicily, north-eastern Bulgaria, southern Central Anatolia (Štěpánek 1934; Fritz 1992, 1995, Fritz et Obst 1995; Taskavak et Reimann 1998).

This short report brings some basic morphological and natural history data on the small population of dwarfed *E. orbicularis* from Pag. Additional data on the herpetofauna of Pag are included.

MATERIAL AND METHODS

The presented data were obtained in northern part of Pag in the period of June 28 to July 12, 2002. Altogether 21 specimens of *Emys orbicularis hellenica* (VALENCIENNES, 1832) were collected in two small, nearly dried-out ponds at the seacoast, south of the village of Novalja. The individual turtles were measured by calliper rule to nearest 0.5 mm immediately after the capture in the field. All specimens were photographed by a digital camera to avoid confusions among the individuals and released on the same place.

The following measurements were taken:

Carapace length (CL): straight distance between the nuchal shield and posterior margin of the supracaudal shields.

Carapace width (CW): straight maximal width of the carapace.

Plastron length (PL): minimum straight median distance between gular and caudal shields (anteriolateral margins of gular shields and posteriolateral margins of caudal shields were abraded in most of the individuals).

Shell height (SH): maximum height of the shell.

Museum abbreviations:

MTD – Staatliches Museum für Tierkunde, Dresden.

ZMB – Zoologisches Museum Berlin.

RESULTS

Size

The examined sample of *E. orbicularis* consisted from unusually small individuals not even exceeding 115 mm. The descriptive statistics of the shell measurements is summarized in the Table 1. Adult males seemed to reach smaller size than females (Fig. 1), nevertheless, both the adult males and the adult females reached the same minimum carapace length

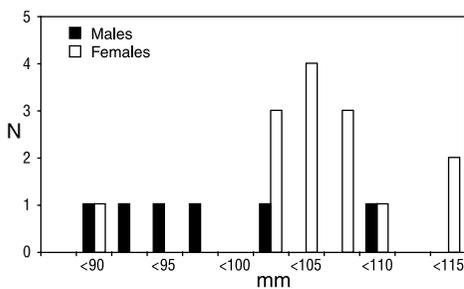


Fig. 1. The frequency distribution of the carapace length in the adult specimens of *E. o. hellenica* from Pag (size classes 2.5 mm).

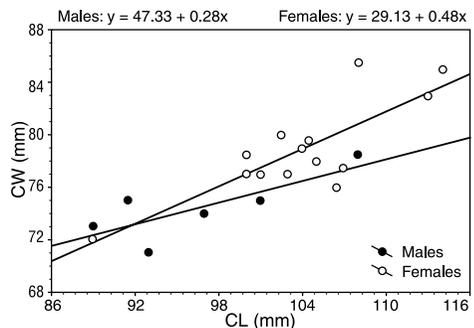


Fig. 2. Sexual dimorphism in the carapace width in the adult specimens of *E. o. hellenica* from Pag.

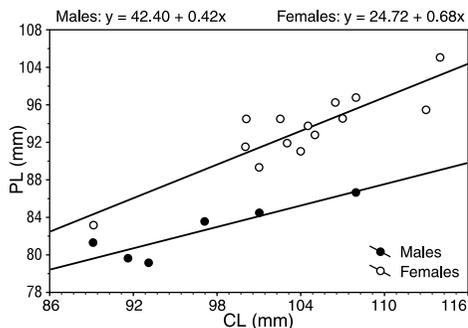


Fig. 3. Sexual dimorphism in the plastron length in the adult specimens of *E. o. hellenica* from Pag.

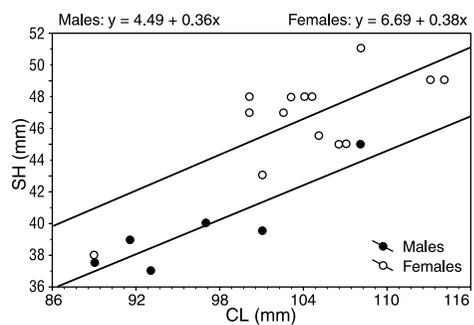


Fig. 4. Sexual dimorphism in the shell height in the adult specimens of *E. o. hellenica* from Pag.

Table 1. Descriptive statistics of the shell measurements of *E. o. hellenica* from Pag (differences between males and females tested by Mann Whitney U test).

Character	Sex	N	Mean, SD, Range	Males vs. females P
Carapace length (mm)	males	6	96.6 ± 7.02, 89.0–108.0	P = 0.053
	females	14	104.1 ± 6.09, 89.0–114.0	
	juvenile	1	43	
Carapace width (mm)	males	6	74.4 ± 2.49, 71.0–78.8	P < 0.05
	females	14	78.9 ± 3.60, 72.0–85.5	
	juvenile	1	37	
Plastron length (mm)	males	6	83.3 ± 3.33, 78.5–88.0	P < 0.01
	females	14	95.6 ± 4.70, 84.0–104.5	
	juvenile	1	34	
Shell height (mm)	males	6	39.7 ± 2.86, 37.0–45.0	P < 0.01
	females	14	46.5 ± 3.19, 38.0–51.0	
	juvenile	1	–	

length (89.0 mm) and the intersexual difference in carapace length was not significant. On the other hand, the adult specimens showed a clear dimorphism at least in the plastron length and shell weight (Fig. 2–4, Tab. 1).

Habitat and natural history notes

The investigated population of *E. orbicularis* inhabited two shallow nearly dried-out brackish ponds situated close each other in an open limestone landscape ca. 25–50 m from the sea coastal line. The bottoms of both ponds were formed by rough limestone gravel covered by a layer of soft mud. The ponds were overgrown by a dense cover of *Juncus* sp. and *Bolboschoenus* sp. and the water was restricted to several small puddles and hollows where the turtles were concentrated (in one case 11 specimens were hidden in ca. 80 by 50 cm large muddy hollow, in another case two individuals were found in a small hollow measuring ca. 30 by 15 cm). In the water puddles a dense population of *Gambusia* sp. and common occurrence of lamellibranches of the genus *Venus* were observed.

The shells and even heads (Figs 5, 7) of all adult turtles were affected by the growth of algae destroying heavily the shell surface. Especially the outer edges of marginal shields were strongly damaged. The abrasions occurring often at the anteriolateral and posteriolateral edges of the plastron (Figs 6, 8) corresponded apparently to the sharp stony character of the bottom basement and to the rocky shores and surroundings of the ponds.

Additional faunistic notes

Altogether 11 other amphibian and reptile species were observed in the northern part of Pag (*Bufo viridis*, *Hyla arborea*, *Rana ridibunda*, *Testudo hermanni*, *Hemidactylus turcicus*, *Podarcis melisellensis*, *P. sicula*, *Pseudopus apodus*, *Coluber gemonensis*, *Malpolon monspessulanus*, *Natrix natrix*). Regarding the fact that Pag is not included into the range of *Natrix natrix* (Kabisch 1999), the observation of two juvenile specimens of this snake in the vicinity of the village of Vidasi complete our knowledge on the distribution of this taxon on the Adriatic coast.

DISCUSSION

The occurrence of the dwarfed *E. orbicularis* in Pag corresponds to the suboptimal conditions under which the turtles live in this island. The small ponds apparently have a temporal character and the observed concentration of the turtles in deeper muddy hollows



Fig. 5. Adult female of *E. o. hellenica* with the shell affected by the growth of algae.



Fig. 6. Ventral view of the same specimen showing the abraded posteriolateral and anteriolateral edges of the plastron.



Fig. 7. Head of the female of *E. o. hellenica* affected by algae.



Fig. 8. Adult male of *E. o. hellenica* having anterior part of the plastron damaged by algae.

indicate that the turtles estivate during the dry and hot summer period in this shelters. Therefore, beside the low food resource in small brackish ponds, their feeding period is restricted to the spring and autumn months only. In addition, the thick growth of algae on the shell has evidently a negative effect on the growth and physical condition of the turtles. An apparently extreme consequence of the algae affection is the case of museum specimen from Pag, ZMB 23765, in which the carapace is shorter than the plastron (Fritz in litt.).

The found carapace length of the adult specimens of the Pag population lies at the lowest limit of the size of mature specimens of *E. orbicularis* and it is comparable both with the size of two available museum specimens (females) from other Pag localities (ZMB 23765 and MTD 39471: CL=104.8 and 104.7; Fritz in litt.) and with the values published for other dwarfed populations of this species; e.g. from the Bay of Kotor (Montenegro), Gytheion (Peloponnese) or Kefallinia (Fritz 2003). Despite the small sample, the results of intersexual comparison of shell measurements correspond fairly well to the data published for *E. o. hellenica* (relatively low difference in carapace length, see Fritz 1992, Fig. 9) or to the general situation reported for the species (shorter plastron in males and higher shell in females, see Fritz 2001).

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