

1-1-1999

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TOK, CEMAL VAROL (1999) "The Taxonomy and Ecology of *Mauremys caspica rivulata* Valenciennes, 1833 (Testudinata: Bataguridae) and *Testudo graeca iberica* Pallas, 1811 (Testudinata: Testudinidae) on Resadiye (Datça) Peninsula," *Turkish Journal of Zoology*. Vol. 23: No. 1, Article 3. Available at: <https://journals.tubitak.gov.tr/zoology/vol23/iss1/3>

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The Taxonomy and Ecology of *Mauremys caspica rivulata* Valenciennes, 1833 (Testudinata: Bataguridae) and *Testudo graeca iberica* Pallas, 1811 (Testudinata: Testudinidae) on Reşadiye (Datça) Peninsula*

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Received: 10.10.1997

Abstract: In this survey, the tortoise and turtle fauna of Reşadiye (Datça) Peninsula, which has not previously been studied in detail, is given. *Mauremys caspica rivulata* and *Testudo graeca iberica* specimens were collected as museum material or released after their measurements were taken, from four and nine localities respectively, establishing the status of the peninsula's testudine fauna. A total of 30 adult and eight juvenile specimens were studied morphologically. Observations on the ecological and biological characteristics of the testudines are also given.

Key Words: *Mauremys caspica rivulata*, *Testudo graeca iberica*, Taxonomy, Ecology.

Reşadiye (Datça) Yarımadası'ndaki *Mauremys caspica rivulata* Valenciennes, 1833 (Testudinata: Bataguridae) ve *Testudo graeca iberica* Pallas, 1811 (Testudinata: Testudinidae)'nin Taksonomisi ve Ekolojisi

Özet: Bu çalışmada şimdiki kadar ayrıntılı olarak çalışılmamış olan Reşadiye (Datça) Yarımadası'nın kaplumbağaları ele alınmıştır. *Mauremys caspica rivulata* örnekleri 4, *Testudo graeca iberica* örnekleri ise 9 lokaliteden toplanmış veya ölçüm alındıktan sonra serbest bırakılmıştır. Morfolojik olarak toplam 30 ergin, 8 juvenil örnek değerlendirilmiştir. Ayrıca türlere ait ekolojik ve biyolojik özellikler verilmiştir.

Anahtar Sözcükler: *Mauremys caspica rivulata*, *Testudo graeca iberica*, Taksonomi, Ekoloji.

Introduction

Reşadiye (Datça) Peninsula was designated a specially protected area in 1990 with its natural resources and untouched wildlife. Furthermore, in order to provide better protection, it was proposed that the area become a national park.

Thus, in this study it was aimed to determine the tortoises and freshwater turtles and their biological and ecological characteristics on Reşadiye Peninsula, the intersection point of the Aegean and Mediterranean regions. Moreover, it was attempted to establish the taxonomic statuses of these species by comparative study of literature data.

Material and Methods

The material used in this study consisted of a total of 38 specimens, 26 of which were deposited in the ZDEU

(Zoology Department, Ege University) collection. *Mauremys caspica* specimens were collected either from the stream or small ponds nearby or at the sides of the stream while basking. *Testudo graeca* specimens were encountered on the land or among the dry herbs, especially in the summer. Some of those specimens were added to our collection and the rest were released after measurements had been taken and carapaces had been marked. Localities in which the specimens were collected or released after measurements are given in Figure 1.

Color and pattern features were determined while specimens were alive. In addition, color slides were used.

Specimens were then anesthetized and killed with ether, and then fixed by injecting 9% formalin in 70% ethanol. Subsequently, they were preserved in 70% ethanol. Parameters such as altitude, air and water temperature, and pH were measured and ecological factors such as vegetation were determined in the field.

* The study is a part of PhD thesis completed in 1993.



Figure 1. Localities in which the specimens were collected or released after measurements: 1. Çubucak, 2. Bördübet, 3. İnbükü, 4. Kovanlık, 5. Kızlan beach, 6. Kızlan, 7. Datça (Iskele mahallesi), 8. Kargı, 9. Yazıköy.

Dissolved oxygen (DO) and salinity were measured in the laboratory. DO measurements were taken by the Winkler method (1) and salinity was determined by the Mhor–Knudsen method (1). A dial caliper with an accuracy of 0.05 mm was used for the measurements of biometrical parameters.

The material lists were given as follows: collection code and number, number and sex of specimens, locality, date of collection and name of collector.

The measurements taken from the shells are as follows:

Shell Height (SH): The vertical measurement between the highest point of carapace and the lowest point of plastron.

Straight Carapace Length (SCL): The straight line measurement from the outermost projection of the nuchal plate to the posterior end of supracaudalia.

Straight Carapace Width (SCW): Maximal, straight–line measurement between the lateral margins of the carapace.

Straight Plastron Length (SPL): The straight line measurement from the outermost projection of the gular to the posterior end of the anal.

Straight Plastron Width (SPW): Maximal, straight–line measurement between the lateral margins of the plastron.

Humeral Suture Length (HSL): The straight–line measurement of the contact zone of the two humerals.

Pectoral Suture Length (PSL): The straight–line measurement of the contact zone of the two pectorals.

Abdominal Suture Length (AbSL): The straight–line measurement of the contact zone of the two abdominals.

Femoral Suture Length (FSL): The straight–line measurement of the contact zone of the two femorals.

Anal Suture Length (ASL): The straight–line measurement of the contact zone of the two anals.

The taxonomical status of each species is given under the name of that species.

Results and Discussion

Mauremys caspica rivulata Valenciennes, 1833

Material: ZDEU 18/1990 1 semi-ad. ♀, 1 juv Datça/MUĞLA 25.05.1990 Leg. C.V. Tok, ZDEU 50/1990 1 ♀ Datça/MUĞLA 14.07.1990 Leg. C.V. Tok, ZDEU 57/1990 4 juv. Datça/MUĞLA 14.08.1990 Leg. C.V. Tok, ZDEU 65/1990 4 ♂♂, 3 ♀♀ Kargı-Datça/MUĞLA 16.08.1990 Leg. C.V. Tok, ZDEU 101/1990 1 ♂, 1 ♀, 3 semi-ad. ♂♂, 1 semi-ad ♀, 1 juv. Kargı- Datça/MUĞLA 01.09.1990 Leg. C.V. Tok, ZDEU 73/1991 1 ♀ Çubucak-Marmaris/MUĞLA 17.05.1991 Leg. C.V. Tok.

Pholidosis: 2 supracaudals in all specimens; the width of nuchal plate greater than its length in 19 specimens (86.36%), equal in two specimens, the length greater than its width in one specimen. Always 5 vertebrales, the width of second vertebral plate greater than its length; costals, excluding one specimen, four on both sides; marginals 11 on both sides in 20 specimens (90.91%), in one specimen 12 on the right side, in another specimen the last marginal plate on the right side is united with the right supracaudal. Abdominal suture equal to femoral suture in one specimen, shorter in one specimen, in the remaining specimens, longer than the other sutures. Anal suture always shorter than femoral and pectoral sutures. Plastron is straight in females, whereas it is slightly concave in males. Axillar and inguinal plates distinct. Swimming webs extend between the nails.

Body Measurements and Ratios: The SCL ranges from 115–172 mm with a mean of 144 mm in five male specimens; it varies between 104.15–163.00 mm with a mean of 148.36 mm in six adult females. The SCL of semi-adults ranges between 76.20–99.80 mm and in the juveniles 47.20–68.90 mm, the SCW ranges between 82.00–120.00 mm with a mean of 98.66 mm in five adult males; it ranges between 80.80–117.00 mm with a mean of 106.30 mm in six adult females. This measurement in semi-adults ranges between 56.90–72.50 mm and in juveniles 35.30–52.70 mm. The SPL ranges between 98.80–149.00 mm with a mean of 124.56 mm in five adult males; it ranges between 97.00–162.00 mm with a mean of 141.33 mm in six adult females. This measurement varies in semi-adults from 69.50 mm to 92.70 mm and in juveniles from 35.30 mm to 52.70 mm. The SPW ranges between 67.10–98.00 mm with a mean of 83.02, mm in five adult males, whereas it ranges between 65.00–103.00 mm with a mean of 89.67 mm in six adult females. This measurement varies from 46.10 to 60.80 mm in semi-adults and from 27.50 mm to 41.00 mm in juveniles. The ratio of the SCL to the SCW increases from juveniles to adults. This also occurs in the ratio of SPL ve

SPW. Accordingly, juvenile individuals have less oval, more circular carapaces. The PSL is 1.5 times longer than the HSL in semi-adults and juvenile individuals, whereas it was more than 2 times longer in the adults. Such distinctive characters were not determined in term of sexes and age levels. The values of body ratios are given in Table 1.

Table 1. Values of some morphological characters in the Reşadiye (Datça) peninsula *Mauremys caspica rivulata* specimens.

Parameter	N	Mean±SE	Range
SCL/SCW	22	1.362±0.019	1.212–1.523
SCL/SH	22	2.706±0.044	2.323–3.192
SPL/SPW	22	1.481±0.023	1.277–1.671
PSL/HSL	22	1.927±0.104	1.297–3.143
AbSL/ASL	22	2.046±0.090	1.484–2.929
FSL/ASL	22	1.789±0.083	1.350–2.750

Coloration and Pattern: The basic colour of the dorsum greenish dark brown; the plate margins darker, black in colour. The colour of plastron dark reddish-brown or blackish in five adult specimens. It is blackish in semi-adults and juveniles and a small part of the outer edges of the plates whitish. A brown spot present at mid-plastron of two specimens. The ground colour of soft parts black; on this ground colour longitudinal yellow lines occur on necks and feet.

Biological and Ecological Observations: Most of the specimens were collected from rapid or slow running streams and pools. Specimens bask especially at mid-day near streams or pools on stones, trees (*Ficus carica*) or among the plant groups. They group especially on the branches of fig trees, *Ficus carica*, at the calm part of the stream, 20 m away from the sea. On the other hand, juveniles of this species were observed to feed on bread offered by people although they are known to be carnivores. In the stream near Kargı fresh water algae, *Vaucheria sp.* from Chrysophyta, were observed. On this species a number of gastropods, *Melanopsis preamorsa*, were seen. The other species of animals and plants sharing the same biotope are as follows: amphibians: *Rana ridibunda ridibunda*, *Bufo viridis*; reptiles: *Ophisops elegans macrodactylus*, *Lacerta trilineata diplochondrodes*, *Lacerta oertzeni pelagiana*, *Laudakia stellio*, *Hemidactylus turcicus*, *Testudo graeca ibera*, *Eirenis modestus*; plants: *Juncus heldreichianus*, *Sarcopoterium spinosum*, *Coridothymus capitatus*, *Inula viscosa*, *Eucalyptus sp.* In the Çubucak region, amphibians: *Rana ridibunda*

ridibunda, *Hyla arborea*, *Bufo viridis*; reptiles: *Ophisops elegans macrodactylus*, *Lacerta trilineata diplochondrodes*, *Lacerta oertzeni pelasgiana*, *Laudakia stellio*, *Ablepharus kitaibelii kitaibelii*, *Blanus strauchi strauchi*, *Typhlops vermicularis*; plants: *Rubus* sp., *Myruts communis*, *Juncus acutus*, *Vitex agnus-castus*, *Conyza canadensis*; the in Kovanlık region, amphibians: *Bufo bufo*, *Bufo viridis*, *Rana ridibunda* *ridibunda*, *Hyla arborea*; plants: *Nymphaea alba*, *Inula heterolepis*, *I. viscosa*, *Mentha pulegium*, *Phragmites australis*, *Typha domingensis*, *Agrostis* sp., and *Polypogon* sp. were observed. Ecological parameters of the concerned water bodies are given in Table 2.

Taxonomic Evaluation: Two subspecies were represented in Turkey (5). Of these, the nominate subspecies live in East and southeast Anatolia, whereas *Mauremys caspica rivulata* is distributed in west and southwest Anatolia as well as European Turkey. The characteristics of the examined species of *M. c. rivulata* are in accord with the features given by previous researchers (2, 3, 4, 5, 6).

Testudo graeca iberica Pallas, 1811

Material: ZDEU 19/1990 1 ♂, 1 juv. Datça/MUĞLA 25.05.1990 Leg. C.V. Tok, ZDEU 8/1991 1 juv. Kovanlık–Marmaris/MUĞLA 08.03.1991 leg. C.V. Tok, ZDEU 14/1991 1 ♀ Çubucak–Marmaris/MUĞLA 10.03.1991 Leg. C.V. Tok (the remaining 12 male specimens were measured and released on the peninsula [Fig. 1]).

Pholidosis: Supracaudal unpaired. The posterior edge of this plate is slightly folded ventrally in the adult males. Nuchal unpaired and its length is greater than its width. 5 vertebrae, four pairs of costals; the widths of costals and vertebrae greater than their lengths. 11 pairs of marginals and free edges of these scutes on the femur side are folded towards the dorsum in the males. Mid-plastron in concave in males, straight in one female. Humeral suture was damaged in one specimen from

Kovanlık. Excluding this specimen, humeral suture is longer than pectoral suture and abdominal suture is the longest suture in all specimens. Usually one prefrontal but in one specimen from the vicinity of İnbükü it is paired. The number of large scales on the anterior part of the forelimb is 4 in 8 (57.14%) specimens and 5 in 6 (42.86%) specimens (only adult specimens were taken into consideration).

Body measurements and ratios: The SCL of 12 adult males ranges between 182–250 mm with a mean of 216 mm, in one female it was 220 mm. The SCW of the males ranged between 125–178 mm with a mean of 153.23 mm, whereas it was 157 mm in the female. The SPL ranged from 156 to 240 mm with a mean of 198.77 mm in the males and 210 mm in the female. The SPW ranged from 117 to 164 mm with a mean of 139.92 mm in the males, whereas it was 152 mm in the female. The ratio of the SCL to the SCW ranged from 1.257 to 1.481. The ratio of the straight carapace length to the shell height ranged from 1.811–2.316. The values of body ratios are given in Table 3 (only adults were taken into consideration).

Coloration and Pattern: The ground colour of the carapace yellowish or brownish yellow with dark brown or black spots variable in size and in shape which are especially found densely on the vertebral region. The ground colour of the plastron dirty yellow with dark brown or black spots. These spots cover a large part of keratin plates in the 9 (64.29%) specimens–suture regions yellowish in these specimens. In the remaining 5 (35.71%) specimens sutures blackish and a large part of plates yellowish. The carapace lighter and palstron darker in the two young individuals.

Biological and Ecological observations: Specimens were encountered around the water accumulations or within the herb groups, relaxing during the mid-day in summer. They were seen strolling around in the morning and in the evening. The air temperature ranged from 19

Locality	Altitude (m)	Temperature (C)	Ph	% Salinity	ppm Oxygen (mg/l)
Datça	0	water: 10 air: 18	7.8	0.700	9
Kargı	0	water: 22 air: 25.5	7.8	1.100	8.6
Kovanlık	0	water: 15.5 air: 19	8.1	0.800	6
Çubucak	0	water: 12 air: 17	8.5	0.400	11

Table 2. Some ecological parameters in the Reşadiye (Datça) Peninsula biotopes.

to 34 °C during the observation of the specimens. In the same biotope, plants such as *Pinus brutia*, *Pistacia lentiscus*, *Coridothymus capitatus*, *Sarcopoterium spinosum* and *Quercus coccifera* were observed.

Table 3. Values of some morphological characters in the Reşadiye (Datça) Peninsula *Testudo graeca iberica* specimens.

Parameter	N	Mean±SE	Range
SCL/SCW	14	1.414±0.017	1.257–1.481
SCL/SH	14	2.074±0.042	1.811–2.316
SPL/SPW	14	1.421±0.017	1.256–1.480
PSL/HSL	13	2.146±0.165	1.500–3.181
AbSL/ASL	13	2.887±0.127	2.129–3.529
FSL/ASL	13	1.133±0.076	0.704–1.688

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Taxonomic Evaluation: This species is found every region of Turkey excluding the Eastern Black Sea region. The most widespread subspecies, *Testudo graeca iberica*, occurs in a large part of Anatolia as well as European Turkey, whereas *T. g. terrestris* is distributed in the vicinity of Hatay and Şanlıurfa (5). The specimens examined in this study show similarity to the features of *T. g. iberica* given by previous researchers (2, 3, 4, 5, 6, 7, 8, 9) in terms of coloration and pattern and body measurements and ratios. However, according to Boulenger (2), the anal suture is equal to or longer than the abdominal suture. In our material the abdominal suture was 3 times longer than the anal suture. Furthermore, the ratio of the humeral suture to the pectoral suture was 2.42, while it was given as 3.89 in Çevik (6).