

The Balkan Terrapin *Mauremys rivulata* (Valenciennes in Bory de Saint-Vincent, 1833) (Testudines Geoemydidae) in the Aegean island of Chalki: native or introduced?

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ABSTRACT

The presence of the Balkan Terrapin *Mauremys rivulata* (Valenciennes in Bory de Saint-Vincent, 1833) (Testudines Geoemydidae) for the Aegean island of Chalki (Dodecanese, Greece), is here recorded for the first time. *Mauremys rivulata* is common in continental Greece and quite widespread in many Aegean islands, however, its presence in Chalki, extremely dry island and poor of water resources, leads to important thoughts and questions.

KEY WORDS

Balkan Terrapin; Chalki; Dodecanese; *Mauremys rivulata*; Rhodes Archipelago.

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INTRODUCTION

Mauremys rivulata (Valenciennes in Bory de Saint-Vincent, 1833) (Testudines Geoemydidae) is a medium-sized freshwater turtle. Shell size reaches a straight carapace length of up to 244 mm in females, and up to 187 mm in the slightly smaller males (Rifai & Amr, 2004; Mantziou, 2006). Males usually have a longer post-anal tail length, and the base of the tail is wider than that of females. Males have a generally flatter appearance than females and their plastron is slightly concave (Wischuf & Busack, 2001; Rifai & Amr, 2004). The carapace of adults is usually uniformly brown, or olive green to green, with faint or no pattern. The plastron of adults rarely has light shapes; however, with age the plastron lightens up and appears more yellowish overall. The bridge is generally uniformly dark to black, sometimes light yellow spots can be seen on its margins (Wischuf & Busack, 2001; Mantziou & Rifai, 2014). *Mauremys rivulata* occurs in a variety

of natural and man-made habitats from streams to seasonal ponds, lakes, brackish coastal lagoons and drainage ditches, irrigation canals, dams and reservoirs. Also is highly tolerant of a wide range of water conditions; it is found in acid, alkaline, and several polluted and brackish water bodies (Gasith & Sidis, 1983; Sidis & Gasith, 1985) and it has a great tolerance to seawater, wide sea straits and sea bays (Mantziou & Rifai, 2014). This species ranges from coastal Croatia, Bosnia-Herzegovina, Montenegro and Albania, through most of Greece (including many Aegean and Ionian islands), southeastern Macedonia and southern Bulgaria, to the Marmara Sea region, and widely through the Mediterranean regions and river basins of Turkey to western Syria, Lebanon, northwestern Jordan and northern and central Israel (Van Dijk et al., 2004).

This taxon is widely treated as a subspecies of *Mauremys caspica*, but has most recently been considered a full species. In the taxonomic study of the genus *Mauremys* Gray, 1869, Fritz & Wischuf

(1997) recognized that there is a clear geographical partition between *M. caspica caspica* and *M. caspica rivulata*; morphometric features could not separate the two subspecies, but they suggested species status on the basis of the geographic separation and the color pattern of the carapace and plastron. The elevation of *M. rivulata* to species level was later confirmed by molecular data, using both mitochondrial DNA and nuclear markers (Mantziou et al., 2004; Barth et al., 2004; Mantziou, 2006; Fritz et al., 2008).

MATERIAL AND METHODS

Study area

Chalki is a small island belonging to the Dodecanese Archipelago (SE Aegean), located south-west of Rhodes Island. Its coordinates are: 36°13'44.49"N; 27°34'18.74"E. Administratively Chalki is part of Rhodes Regional Unit. It's located west of Rhodes (Monolithos Cape), from which is only five nautical miles, south-east of Tilos (10 nautical miles), and north of Karpathos. Has a length of 10 km, a width of 4 km and an area of 28.125 km². The wider and more important bays are Imborios and Pondamos (Iliadis, 1950). Chalki is a mountainous and rocky island and the highest peak is represented by Maistros Mount (593 m a.s.l.). The entire island, except for the eastern part, is surrounded by very steep cliffs with scarce accessibility. These vertical cliffs allowed the presence of a rare and highly specialized chasmophytic flora. Several species are endemic with a distribution area limited to the island and to the SE Aegean, including W Turkey (Cattaneo & Grano, 2014; Cattaneo & Grano, 2015). Recently it has been discovered a new species for science, that seems to be restricted to Chalki and the nearby island of Tilos: *Seseli halkensis* Cattaneo, Tan et Biel (Cattaneo et al., 2016). The island is essentially dry, and lacks of superficial hydrography, however, the numerous wells on the island are still rich in water. In ancient times Chorio (the current Palio Chorio) was the capital, village by now abandoned. Currently the population, which amounts about three hundred inhabitants, is concentrated exclusively in Imborios, which appears to be the only village on the island. Together with the small surrounding islands, Chalki

is included in the Natura 2000 network (GR 4210026) for the presence of particular bird species and for a peculiar chasmophytic flora related to elective habitats represented by crevices in the limestone rocks of these islands (Cattaneo & Grano, 2014; Cattaneo & Grano, 2015).

Methods

The island of Chalki has been studied by the authors in four different times, during August 2014, April 2015, August 2016 and August 2017. The first investigations were also extended to the neighboring island of Alimia (Grano et al., 2015). During the fourth investigation of the island, on August 17th in the bay of Dhio Ghiali, a recently died specimen of *M. rivulata* was found (Fig. 1). The Dhio Ghiali's bay, accessible only by sea, has been formed by the estuary of an ancient far-reaching river currently dry. Inside this bay, close to the beach, there is a well used for watering the goats, but actually dry; the dead specimen was found in close proximity of this well (Fig. 2). The well was built from stones and has a degrading part to allow the animals to drink directly. Such a structure could have allowed the specimens of *M. rivulata* to get in or out. The shell, which was in excellent condition with the plaques well attached to the carapace, has the following features: CL (greatest carapace straight length) 18.00 cm; CCL (greatest curvilinear carapace length) 20.80 cm; CH (carapace height) 6.90 cm; PL (greatest plastron length) 17.30 cm; CW1 (medial carapace width) 12.50 cm; CW2 (greatest carapace width) 12.90 cm; W (weight) 244 g. The shape and size are compatible with a female specimen. Fieldwork and lab measurements were conducted in accordance with the Greek National Legislation (Presidential Decree 67/81).

RESULTS AND CONCLUSIONS

The first data about the herpetofauna of Chalki were provided by Boettger (1888) and Werner (1935), afterwards summarized in the checklists on the Greek herpetofauna realized by Chondropoulos (1986, 1989). Later the island was once again investigated by Buttle (1995) and by Cattaneo (2009). Only five species were known for the island: *Hemidactylus turcicus* (Linnaeus, 1758), *Cyrtopodion*



Figure 1. The died *Mauremys rivulata* (Chalki island, Dodecanese Archipelago, SE Aegean).



Figure 2. The well in Dchio Ghiali's bay (Chalki island, Dodecanese Archipelago, SE Aegean).

kotschyi (Steindachner, 1870), *Stellagama stellio daani* (Beutler et Frör, 1980), *Ablepharus kitaibelii* (Bibron et Bory, 1833), *Dolichophis jugularis zinneri* Cattaneo, 2012. Boettger (1888), on report by Oertzen, had made a reference for the island of Chalki to the existence of *Montivipera xanthina* (Gray, 1849), but the presence of this viper has never been validated by any authors (Dimaki, 2002). In 2015, the authors confirmed the presence of another snake: *Zamenis situla* (Linnaeus, 1758) (Grano & Cattaneo, 2015). The discovery of this snake, species related to adequately damp environments, highlighted the presence of some humid areas on the island. This latest discovery shows that there is still to be investigated on the island. It is to be considered that Chalki is very hard to investigate since the presence of only one viable road, the absence of trails, and transport services, moreover, many areas (including Dchio Ghiali) can be reached only by sea. The presence of *M. rivulata* on Chalki, although anomalous, is compatible with its features as: the Balkan terrapin is still widely distributed in the Aegean (Bader et al., 2009); on most medium-sized island, only small population of this species are to be found (Broggi, 2012); this species is able to colonize artificial reservoirs created in the island (Broggi, 2012); the preferred habitats of this species are the estuaries of streams and river (Broggi, 2012).

It is also reasonable to think that this unique specimen of Balkan terrapin has been subjected to passive transport, but the area in question is not fre-

quented by man (only by a few tourists with boats during the summer). Or it might have come from the sea already dead, but its perfect conditions (it seemed dead from short time) and the absence of incrustations are not compatible with a prolonged permanence in the sea.

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