Herpetological notes on *Mauremys*, *Pelophylax* and *Stellagama* from the Cyclades island of Tinos (Greece)

The mountainous island of Tinos (195 km^2) in the northern Cyclades archipelago (Greece) was subject to several herpetological contributions (Bibron & Bory De Saint Vincent 1833; Erber 1867; Bedriaga 1882; Boettger 1888; Bird 1935; Werner 1937, 1938a, 1938b; Buchholz 1963; Clark 1969; Beutler & Gruber 1977; Beutler & Frör 1980; Bohlmann et al. 1981; Cattaneo 1999, 2000; Troidl & Troidl 2006). Nonetheless, there are herpetological reports from the 19th century, which have never been confirmed as to several species allegedly occurring on that island. These include the Slow Worm, Dice Snake, Common Newt, Green Toad, European Tree Frog and Fire-bellied Toad (*Anguis fragilis*, *Tropidonotus hydrus*, *Triton taeniatus*, *Bufo variabilis*, *Hyla arborea* and *Bombinator igneus* in the terminology used in the corresponding paper by Erber 1867), as well as *Emys orbicularis* (Linnaeus, 1758) and *Eryx jaculus* (Linnaeus, 1758) mentioned by Bibron & Bory de Saint-Vincent (1833). Three of these species, the Slow Worm, Common Newt and Fire-bellied Toad are not even known from any other Cyclades island, whereas there is a late report on a burrowing, snake-shaped animal observed on Tinos at dusk, which may have been *E. jaculus* (Beutler & Frör 1980). Heinz Grillitsch (Vienna) offered the following explanation in response to the author's enquiry (e-mail of 14.11.2017). Erber visited the islands of Tinos and Corfu on the same trip. With the exception of *Bombina*, all of Erber's (1867) Tinos species are found on Corfu. Erber may have confused the two islands, although he otherwise provided detailed descriptions of the Island of Tinos.

To approach any of the above questions, the author and his companions Christian Burri, Peter Goop and Günter Stadler visited the Island of Tinos (Fig. 1) from April 2-13, 2018. During that period the weather conditions were not the best for herpetological observations. It was sometimes windy and rather cool, most of the time the maximum did not exceed 16 °C, while the nights remained below 10 °C.

The excursions were centered on the mouths of streams and their water-bearing upper reaches, which in part were difficult to follow or inaccessible. The water was searched for *Mauremys rivulata* (Valenciennes, 1833) and *Pelophylax kurtmuelleri* (Gayda, 1940). Another focus was put on *Stellagama stellio stellio* (Linnaeus, 1758). The map used for the excursion was the GPS-compatible 1: 27 000 map no. 10.20 of Tinos by the mapping and publishing company Anavasi (Athens).

Roughly translated, Beutler & Frör (1980) wrote about Tinos: "It has what is probably the best preserved wetland in the Northern Cyclades, the lagoon of Kolibithra. There is another lagoon near Ormos Panormou. Smaller ponds were found around Tinos Town, Tripotamos, Kardiani and Isternia." Regarding the occurrence of *M. rivulata*, they reported sightings at Ormos Panormou, in ditches between Koni, Kalloni and Kolibithra and in the lagoon at Kolibithra. Bohlmann et al. (1981) saw one specimen near Panormos. The World Wide Fund for Nature – Greece compiled an inventory of the wetlands of the Greek islands in 2004-2013 (WWF Greece 2014) and allowed the author to access the data. This inventory includes four *M. rivulata* habitats on Tinos, namely Panormos, Kolibithra, Agios Ioannis and Livada Bay. Troidl & Troidl (2006) reported hundreds of these turtles at Panormos.

The sites identified by the WWF on Tinos were visited and presented the following situations: The Panormos site (with more than 100 specimens) comprised the last 80 meters of a stream before it reached the sea. The water body bordered the road on the edge of the village at Panormos Bay. The terrapins here seemed to be less shy than usual. In the large brackish water lagoon of Kolibithra (Fig. 2), more than a hundred specimens were observed along the flat reed beds. Also, about 100 specimens were found in the waters of the stream impounded by the barrier beach in Livada Bay. It was not possible to confirm the reports for the degraded wetland near Agios Ioannis. The same applies to the reports by Beutler & Frör (1980) for the "ditches be-

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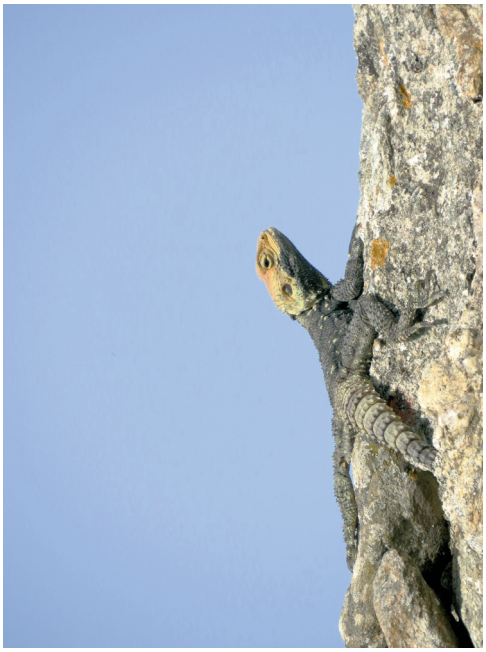

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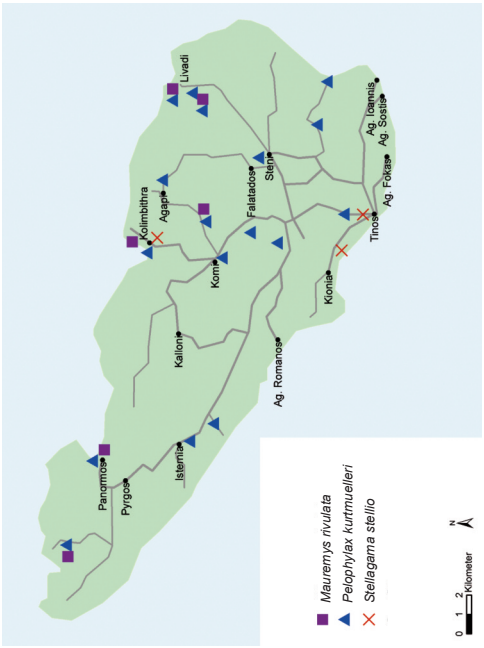
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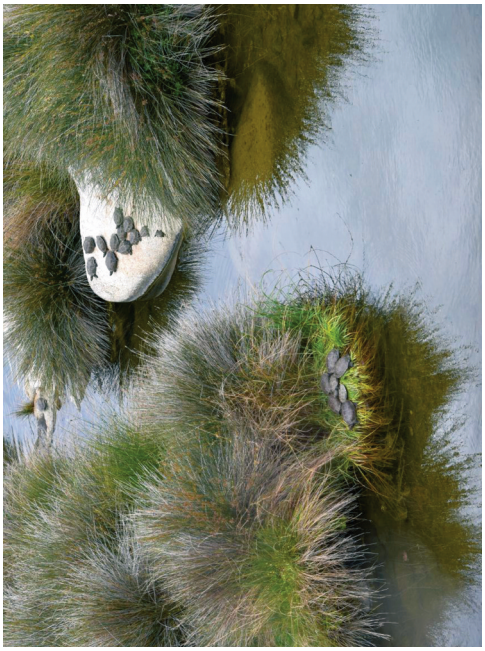

tween Koni, Kalloni and Kolibithra", where no open water was found. The wetland areas east of Tinos Town no longer existed either.

On April 6, 2018, a sizeable population was detected along the stream that runs from Falatados to Livada Bay. Following the stream starting at the hamlet of Plati, several groups of terrapins were seen basking (Fig. 3). It was the largest population the author ever observed along a watercourse in the Aegean.

In addition to these observations, two more sightings were made in streams on Tinos: On April 9, 2018, in a tributary stream above Agapi, at about 80 m above sea level, two adult *Mauremys* specimens were found in a small backwater covered with duckweed (37° 36.145" N, 25° 10.046" E). This is the location of a former water mill, which suggests that flowing water is available there frequently. On April 4, 2018, Günter Stadler came across a single subadult specimen in the impounded water of a stream near Machera, along the road from Marlas to Koumelas (37° 39.987" N, 25° 00.799" E). The stream has weirs to hold back the water, and below the observation point the stream had dried up. This location appeared to be very isolated, not connected to any other water-bearing site in the same hydrological system.

The three sites described in the stream mouth areas with barrier beach or lagoon formations are thus still home to large *Mauremys* populations. The Livada Valley with its stream below Falatados is part of the Natura 2000 area GR 4220031, that also includes the lagoon of Kolibithra.

In conclusion, while there are still vital populations of *M. rivulata* on Tinos, habitats suitable for *E. orbicularis* were not found. This species is not likely to occur on that island since it avoids inhabiting streams and brackish water present in some of the lower courses of the streams, which are separated from the sea by the barrier beach effect. Also, the occurrence of *B. variabilis* can be considered improbable as its tadpoles would have been numerous in the water bodies at the time of visit but were not seen.

The lower courses of the abovementioned island streams, which still contained water in April thanks to the impounding effect of the barrier beachs, and the long stretches of their headwaters, are now endangered sites. The construction of reservoirs deprives the lowest stream stretches of water, as could be seen in the stream discharging east of Tinos Town. All the mountain streams that bore water were used for irrigation. Wherever possible, siphon intakes with hoses were installed for diversion of water, in some cases the water was pumped and often transported over long distances to open or covered cisterns. Open cisterns can be home to water frogs, depending on the construction.

In the Cyclades, the Roughtail Rock Agama, *Stellagama stellio* (Linnaeus, 1758), is found in the Mykonos archipelago (islands of Mykonos, Delos, Rhineia and Tinos) and more southwards, in the Naxos-Paros-Antiparos-Despotico island complex (Valakos et al. 2008). The latest land bridge connecting the Cyclades islands to the mainland disappeared more than 200,000 years ago, whereas the islands themselves formed a continuous land mass until 21,500 years ago (Brammah et al. 2010). For this reason there are close relationships in terms of their shared herpetofaunas. *Stellagama* has been known to occur in the Cyclades since long (Pitton de Tournefort 1717: 373) but only Beutler & Frör (1980) made the first reference to this agama on Tinos

Figs. 1-4: Opposite page. Photographs nos. 1, 2 and 4 by the author.

Fig. 1: Observed locations of *Mauremys rivulata* (Valenciennes, 1833), *Pelophylax kurtmuelleri* (Gayda, 1940) and *Stellagama stellio stellio* (Linnaeus, 1758), on the Island of Tinos, Cyclades islands (Greece).

Fig. 2: The lagoon of Kolibithra, the largest wetland in the northern Cyclades islands (Greece).

Fig. 3: Groups of *Mauremys rivulata* (Valenciennes, 1833), in a brook in the Livada Valley, Island of Tinos, Cyclades islands (Greece). Photograph by Peter Goop.

Fig. 4: *Stellagama stellio stellio* (Linnaeus, 1758), on a stone wall near the water retention basin of Tinos Town, Island of Tinos, Cyclades islands (Greece).

(Arnadhas near Dio Chorio) at the top of the slope above the town of Tinos. In the reference work by VALAKOS et al. (2008) *Stellagama* it is not listed for Tinos and TROIDL & TROIDL (2006) reported record locations above Tinos Town and west of the excavations at Kionia. The agama may therefore have been introduced to Tinos in the 1970s, probably from the Island of Delos.

On the present trip, *S. stellio* was found near Kionia, and large numbers of specimens above Tinos Town (Fig. 4) as far as the water retention basin one kilometer in northeastern direction but nowhere else with one exception: a single specimen was observed by Peter Goop in the north of the island near the Kolibithra lagoon, about ten kilometers away and separated by a mountain from the sightings near Tinos. Thus, it remained unclear whether this specimen belongs to an isolated maybe separately introduced population or undetected linking populations in between.

In fact the situation is even more complicated (*cf.* BRAMMAH et al. 2010). The agamas of the Mykonos archipelago belong to the subspecies *stellio* (LINNAEUS, 1758), which is genetically and morphologically distinct from *Stellagama stellio daani* BEUTLER & FRÖR, 1980, on Naxos and Paros. The nearest continental subspecific relatives of the agamas of the Mykonos archipelago live in South-east Anatolia, of the Naxos-Paros populations in the Aegean and western Turkey. One explanation for this disjunctive distribution pattern could be that the Naxos-Paros populations existed prior to the isolation of the islands from the mainland, whereas the populations on the Mykonos archipelago were introduced much later. It seems that *S. stellio* can easily be translocated, e.g., *S. s. daani* to Corfu and Paxi in the Ionian Island region and *S. s. stellio* to Thessaloniki and, as recently discovered, to eastern Crete (SPANELI & LYMBERAKIS 2014). It is no wonder that in the age of globalization, such events will become more common.

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AUTHOR: Mario F. BROGGI < mario.broggi@adon.li > – St. Mamertenweg 35, 9495 Triesen, Fürstentum Liechtenstein.

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