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The Balkan Terrapin *Mauremys rivulata* (VALENCIENNES, 1833), in the Aegean islands. Threats, conservation aspects and the situation on the island of Kea (Cyclades) as a case study

(Testudines: Geoemydidae)

Die Ostmediterrane Bachschildkröte, *Mauremys rivulata* (VALENCIENNES, 1833), auf den Inseln der Ägäis. Naturschutzaspekte und die Situation auf der Insel Kea (Kykladen) als Fallbeispiel

(Testudines: Geoemydidae)

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KURZFASSUNG

Auf Basis von Literaturangaben und eigenen Beobachtungen wird die Verbreitung der Ostmediterranen Bachschildkröte im ägäischen Raum dargestellt, wobei historische Aufzeichnungen mit aktuellen Meldungen verglichen werden. Die Bestände dieser Schildkröte, die in Südost-Europa und im westlichen Kleinasien weit verbreitet ist, haben sich in den letzten Jahren lokal auffällig verringert, vor allem auf Grund des Verlustes von Feuchtlebensräumen. *Mauremys rivulata* (VALENCIENNES, 1833) ist eine Reptilienart, die, dem Verteilraster der geologischen Gräben sich entziehend, in der ganzen Ägäis verbreitet ist und bisher von 29 griechischen und zwei türkischen Inseln bekannt wurde. Am Beispiel von Kea (Kykladen) werden ihr Vorkommen, die ökologischen Ansprüche und ihre Gefährdung diskutiert.

Die optimalen Lebensräume der Schildkröte liegen in den Mündungsbereichen der Fließgewässer. Diese sind durch zunehmend intensivierte Nutzungsformen (z.B. Tourismus, Überbauung, Intensivlandwirtschaft) bedroht. Feuchtstrukturen sind gemäß einer Bestandsaufnahme des WWF-Griechenland auf den ägäischen Inseln meist nur kleinflächig ausgebildet. Darum ist ihre Verletzlichkeit durch allfällige Beeinträchtigung oder gar Zerstörung sehr ausgeprägt. Die Ostmediterrane Bachschildkröte besiedelt Mittel- und Oberläufe von Fließgewässern der größeren Inseln. Diese Populationen haben refugialen Charakter und sind in der Regel klein. Im Binnenland der Inseln werden vermehrt Wasser-Retentionsbecken gebaut, die von den Schildkröten allenfalls besiedelt werden können.

Die griechische Inselwelt bedarf dringend einer gezielten Naturschutzstrategie zum Erhalt der herrschenden Naturwerte, insbesondere der letzten Feuchtgebiete. Sie sind für die hygrophile Herpetofauna und die weitere spezialisierte Tier- und Pflanzenwelt – z.B. als Trittsteine für ziehende Arten – von großer Bedeutung.

SUMMARY

The distribution of the Balkan Pond Turtle in the Aegean region is presented by means of the author's observations and information from references, including a comparison of historical records and current data. Within its vast range across southeast Europe and western Asia Minor, a considerable local decline of this turtle's populations, chiefly due to the loss of wetland habitats, was observed over the last decades. *Mauremys rivulata* (VALENCIENNES, 1833), is a species of reptile whose distribution does not correspond to the geological graben system, i.e. it is to be found throughout the Aegean archipelago. To date, the species' occurrence is known from 29 Greek and two Turkish islands. In this paper, the turtle's present situation on Kea (Cyclades) is used as an example to discuss the distribution and ecological requirements of *M. rivulata* and the threats to its survival.

Its preferred habitats are to be found in the estuaries of streams and rivers, which are threatened by increasingly intensified forms of use (e.g. tourism, construction, intensive agriculture). According to an inventory drawn up by WWF Greece, wetland structures on Aegean islands tend to be small in scale. That makes them all the more vulnerable to damage and destruction. Refugial, populations of the Balkan Terrapin are to be found along some of the middle and upper reaches of streams and rivers on the biggest islands, but normally these populations are small. In the interior of the islands, more and more reservoirs are being built, which can be colonized by the Balkan Terrapin.

The Greek islands are in urgent need of a targeted nature protection strategy to ensure preservation of their natural assets, the last remaining wetlands in particular. They are so important to the hygrophilic herpetofauna and other specialized species of the flora and fauna, e.g. as stepping stones for migratory species.

KEY WORDS

Reptilia: Testudines: Geoemydidae; *Mauremys rivulata*, distribution, Aegean Islands, Kea island (Cyclades), Greece, ecology, conservation, threat

INTRODUCTION

The subject of this paper is the fate of the Balkan Terrapin living on the Aegean islands. The author presents key information for better understanding the requirements and peculiarities of this turtle before its distribution and habitats on the island of Kea (Cyclades) will be described and discussed as an example. The chances of survival of the species, a representative inhabitant of wetlands, are analyzed on the basis of the author's observations and with reference to the literature. In addition, some nature protection aspects are addressed.

Classification.- *Mauremys rivulata* (VALENCIENNES, 1833) is one of three West Palaearctic species of the genus *Mauremys*. It is generally considered to form a parapatric pair with *Mauremys caspica* (GMELIN, 1774) living further to the east (DAVID 1994; FRITZ et al. 2007). The Balkan Terrapin is found in an area extending from central Dalmatia to the Near East as far as the Arab Peninsula. Morphologically this turtle represents a plastic species with pronounced sexual dimorphism and heterogeneous morphometry (BEDRIAGA 1882; WISCHUF 1995; TOK 1999; TAŞKAVAK et. al. 1997; AYAZ & BUDAK 2008; AYAZ 2010), coloration included (cf. KAU & THIEME 1985). MERTENS (1946) even described a particular subspecies from Crete based on the aberrant coloration.

Numerous publications are dedicated to the systematics of this turtle species (BEDRIAGA 1881; MERTENS 1946; BUSACK & ERNST 1980; FRITZ & WISCHUF 1997; FRITZ et al. 2007), whereas little information is available about its ecology such as habitat selection (cf. RIFAI 2002; RIFAI & AMR 2004) or threats (e.g. habitat destruction). A compilation of such data is presented in WISCHUF & BUSACK (2001).

Ecology, behavior and protection status.- *Mauremys rivulata* occurs throughout the Aegean. On the mainland, it lives primarily in bogs, ponds, lakes, rivers, estuaries or irrigation channels of the lowlands where it prefers standing or gently flowing waters. In some rare cases, however, *M. rivulata* occupied the upper regions of the stream, whereas the sympatric European Pond Turtle *Emys orbicularis* (LINNAEUS, 1758), was observed in the lower reaches near the coast (RÖDEL 1994). In the Aegean islands, the Balkan Terrapin is mainly found along the lower courses of streams and especially in their estuaries. WERNER (1935: 88) describes the distribution of the species as follows: "The Balkan terrapin is very common on the bigger islands of the Aegean, especially in the marshy estuaries of the mountain streams, which otherwise dry up completely in summer."

In contrast to *E. orbicularis*, *M. rivulata* appears less fastidious in its habitat choice; it also lives in eutrophic waters and tolerates considerable salt concentrations (up to 9.2% for populations in Israel – GASITH & SIDIS 1984). In its southern range area, the Balkan Terrapin can estivate (i. e., have a period of inactivity in summer) when the watercourses dry out (cf. SCHWEIGER 1989). This behavior involves a great degree of ecological adaptability.

In general, the Balkan Terrapin is a very shy animal. As soon as a human being approaches, the terrapins basking in the sun immediately flee into the water and bury themselves in the mud. During field work, often all that one can hear is the splash as the terrapin hits the water. In a few locations in the eastern Mediterranean, however, *M. rivuata* habituated to humans. LINDNER (1995) mentioned the phenomenon with regard to Crete, where tourists fed the animals from bridges. The author made the same observation in Avlonas on the island of Lemnos in July 1987 (BROGGI unpublished). BUSACK (2009) gave a similar report for Skala Eressos on Lesbos island, and GEMEL et al. (2008) actually mentioned hand feeding there.

Under Greek law (Presidential Decree 67/1981), the Balkan Terrapin is a protected species. In the European Union, it is classified a species of general interest and listed in Annexes II and IV of the Habitat Directive. It is also included in Appendix II of the Bern Convention.

Zoogeography and distribution.- LYMBERAKIS & POULAKAKIS (2010) pointed out that *M. rivulata* is the only species of the Aegean herpetofauna whose distribution does not correspond to the geo-

logical graben system. Phylogeographic studies in relation to its sister species *M. caspica* were presented by FRITZ et al. (2007), investigations upon phylogeography and population genetics of *M. rivulata* by MANTZIOU et al. (2004, 2005) and MANTZIOU (2007). These molecular biological studies demonstrated that today's distribution and population genetics were strongly influenced by climate change in the Pleistocene. In the cold periods, population shifts to refugia in the south and east occurred. Spreading and mixing was facilitated by watercourses present in the area during the Pre-Holocene periods which explains the turtle's Holocene distribution throughout the Aegean. MANTZIOU (2007) found rather homogeneous genetic entities for Cyprus-Jordan, and the Dodecanese, but considerable variation in a zone extending between the Peloponnese, Lesbos and Crete. The peripheral Gavdos population south of Crete e.g., differs significantly from that of the main island. For genetic reasons alone, MANTZIOU (2007) accordingly called for an effort to be made to preserve isolated island populations.

ERHARD (1858) described the Balkan Terrapin as being "rare in the swamps of Naxos and Sifnos" and BEDRIAGA (1882) explicitly mentioned its presence on Milos, Mykonos, Naxos, Syros, Tinos, Sifnos and Serifos. Table 1 compares information on the distribution of the Balkan Terrapin in the Aegean provided by WERNER (1938) and VALAKOS et al. (2008), two works published at an interval of seventy years, as well as other sources. WERNER (1938) did not consider the Dodecanese islands, which at the time were Italian, nor the islands of the Turkish Aegean, whereas the distribution data by VALAKOS et al. (2008: 194), represented in a map, did not cover the Turkish islands.

This present overview of the distribution of *M. rivulata* in the Aegean islands was made in addition to that provided for Asia Minor by FRITZ & FREYTAG (1993) and AYAZ & BUDAK (2008). The progress made in herpetological research in Greece was summarized by PAFILIS (2010). His compilation is all the more useful and valuable as it takes account of the literature published in Greece, which is mainly written in Greek or otherwise difficult to access.

To date, *M. rivulata* has been reported for 29 Greek and two Turkish islands in the Aegean (Fig. 1, Table 1). Its earlier presence on Amorgos (surface area 121 km^2) is uncertain. The report for Symi (58 km^2) is probably incorrect. The species is presumably now extinct on Syros (84 km^2) and Sifnos (74 km^2), and the specimen observed on Tilos (65 km^2) was probably an abandoned pet. *Mauremys rivulata* does not seem to exist on Alonissos, Kythira or in the southern Cyclades, nor on Karpathos and its neighboring islands of Kasos and Saria. Probably due to the lack of perennial freshwater bodies, it is not to be found on Aegean islands smaller than 50 km^2 in size, with the exception of Gavdos (30 km^2), Bozcaada (43 km^2) and Skiathos (47 km^2).

CASE STUDY: THE BALKAN TERRAPIN ON THE ISLAND OF KEA (CYCLADES)

The current situation with regard to the presence of the Balkan Terrapin on Kea can be considered representative of the status of the species in the Aegean as a whole. That also applies to the level of danger with which the species is confronted there.

The island.- Located at a distance of little more than 20 km from the southern tip of central Greece, Kea is the northernmost island of the western Cyclades. It has steeply sloping coasts and is dissected by long and deep valleys, some of which widen out towards the sea. The highest point on the island, at 562 meters above sea-level, is the summit of the mountain Profitis Ilias. With a length of just under 20 km and a width of 10 km at the widest point, Kea covers an area of 132 km^2. Geologically it is composed of mica schists with some inclusions of marble. The vegetation is dominated by the Valonia oak (*Quercus aegilops*), the bark of which was once used for tanning

Table 1: Presence of the Balkan Terrapin *Mauremys rivulata* (Valenciennes, 1833), in the Aegean (island names in alphabetical order).

Tab. 1: Das Vorkommen der Ostmediterranen Bachschildkröte, *Mauremys rivulata* (Valenciennes, 1833) auf den Inseln der Ägäis. Inselnamen in alphabetischer Reihung. Angegeben sind jeweils die Inselfläche, höchste Erhebung, Vorkommensmeldung in Werner (1938) und Valakos et al. (2008) sowie Ergänzungen dazu einschließlich ausgewählter, meist neuerer Literaturangaben.

Island (surface area and highest point taken from Wikipedia ®)	Presence according to Werner (1938)	Presence according to Valakos et al. (2008)	Additions according to supplementary information	Selected supplementary information
Amorgos 121 km², 822 m		X	(X)	Erhard (1858) (probably doubtful, last quoted in 1935, no sighting since, cf. Lotze 1972; Broggi 2007)
Andros 383 km², 997 m	X	X		Beutler & Frör (1980), Broggi (1996), Buttle (1997)
Bozcaada (Tenedos) 43 km², 192 m			X	Tosunoğlu et al. (2009)
Chios (Hios) 843 km², 1257 m	X	X		Cattaneo (2003)
Crete 8261 km², 2456 m	X	X		Sowig (1985), Perez Mellado et al. (1999)
Euboea (Evia) 3660 km², 1257 m	X	X		
Gavdos 30 km², 368 m		X		Valakos (1982)
Gökçeada (Imbros) 279 km², 673 m			X	Baran (1981), Broggi (1999)
Ikaria 255 km², 1037 m		X		Broggi (1994), Clark (1996), Broggi (2001)
Kea (Tzia) 132 km², 568 m		X		Grillitsch & Tiedemann (1984)
Kos 287 km², 846 m		X		Wilson (2006)
Kythnos 99 km², 356 m	X	X		Grillitsch & Tiedemann (1984)
Lemnos 476 km², 430 m		X		Schneider (1986), Cattaneo (2001), Strachnis (2009)
Lesbos (Mytilene) 1636 km², 799 m	X	X		Broggi (1978), Kasapidis et al. (1996), Cattaneo (2003), Gemel et al. (2008)
Milos 160 km², 748 m	X	X		Perez Mellado et al. (1999), Broggi (2000)
Mykonos 86 km², 390 m	X	X		Beutler & Frör (1980) (little more than 100 individuals)
Naxos 389 km², 1000 m	X	X		Buttle (1993)
Paros 165 km², 771 m		X		Gruber & Fuchs (1977)
Rhodos 1401 km², 1295 m		X		Bader et al. (2009)
Samos 478 km², 1434 m	X	X		Ionnides & Dimitropoulos (1994), Clark (2000), Cattaneo (2003)
Samothraki 178 km², 1624 m	X	X		Broggi (1988), Buttle (1989), Clark(1991), Cattaneo (2001), Ochsenhofer (2012)
Serifos 75 km², 585 m	X	X		Cattaneo (1989), Broggi (2011)

Table 1 (continued from opposite page): Presence of the Balkan Terrapin *Mauremys rivulata* (VALENCIENNES, 1833), in the Aegean (island names in alphabetical order).

Tab. 1 (Fortsetzung der gegenüberliegenden Seite): Das Vorkommen der Ostmediterranen Bachschildkröte, *Mauremys rivulata* (VALENCIENNES, 1833) auf den Inseln der Ägäis. Inselnamen in alphabetischer Reihung. Angegeben sind jeweils die Inselfläche, höchste Erhebung, Vorkommensmeldung in WERNER (1938) und VALAKOS et al. (2008) sowie Ergänzungen dazu einschließlich ausgewählter, meist neuerer Literaturangaben.

Island (surface area and highest point taken from Wikipedia ®)	Presence according to WERNER (1938)	Presence according to VALAKOS et al. (2008)	Additions according to supplementary information	Selected supplementary information
Sifnos 74 km², 682 m	X	X		WETTSTEIN (1953); FRÖR collected two specimens in Kamares Bay in 1977 (FRITZ & WISCHUF 1997); no sightings in GRILLITSCH & TIEDEMANN (1984), nor in BROGGI (2000)
Skiathos 47 km², 433 m		X		CATTANEO (1997)
Skopelos 96 km², 567 m			X	CATTANEO (1998)
Skyros 208 km², 792 m	X	X		CATTANEO (1998), BROGGI (2006b)
Symi 58 km², 617 m			(X)	DIMAKI (2002) (probably incorrect, cf. BROGGI 2002, WILSON & GRILLITSCH 2009)
Syros (Syra) 84 km², 442 m	X	X		BEDRIAGA (1882) (no sighting since, cf. BEUTLER & FRÖR 1980)
Thassos 380 km², 1108 m		X		CLARK (1999), CATTANEO (2001)
Tilos 65 km², 612 m		X	(X)	BROGGI (2006a) (probably an abandoned pet)
Tinos 195 km², 727 m	X	X		BEUTLER & FRÖR (1980)

leather. The trees give the island its green aspect (KOCYAN & JOSHI 1992). According to MALAKATES (1928), the island has about 230 springs. The main springs are marked on the new ANAVASI 1:25,000 topographic map of Kea (map sheet No. 10.41), which makes it invaluable for herpetological fieldwork. Another typical feature of the landscape are the terraced hillsides, often at a considerable distance from the nearest town or village. They are no longer in use, and the phrygana is being permitted to spread. Only in a few, mostly inaccessible valleys vegetables are still grown in small boxed beds in the vicinity of a stream. The climate is typically Mediterranean; relatively mild winters with abundant precipitation are followed by long, hot and dry summers. The northerly winds buffet the island with full force, and storms are a common occurrence, especially in winter. During this period, the rainfall can be so strong that the streams swell and become torrents. The winter of 2010/2011 was apparently extremely wet on Kea. A 36-hour downpour in March 2011 caused considerable erosion damage and probably harm to the populations of *M. rivulata.*

Our group of experienced fieldworkers was on the island from 9 to 19 April 2011. The weather was cool with rain at times and not very conducive to herpetological research. For herpetological information on Kea see GRILLITSCH & TIEDEMANN (1984) and CATTANEO (1990).

Distribution of the Balkan Terrapin.- GRILLITSCH & TIEDEMANN (1984) were the first to record the presence of *M.rivulata* on Kea. They did so on 23 April 1980 in the estuary of the river near

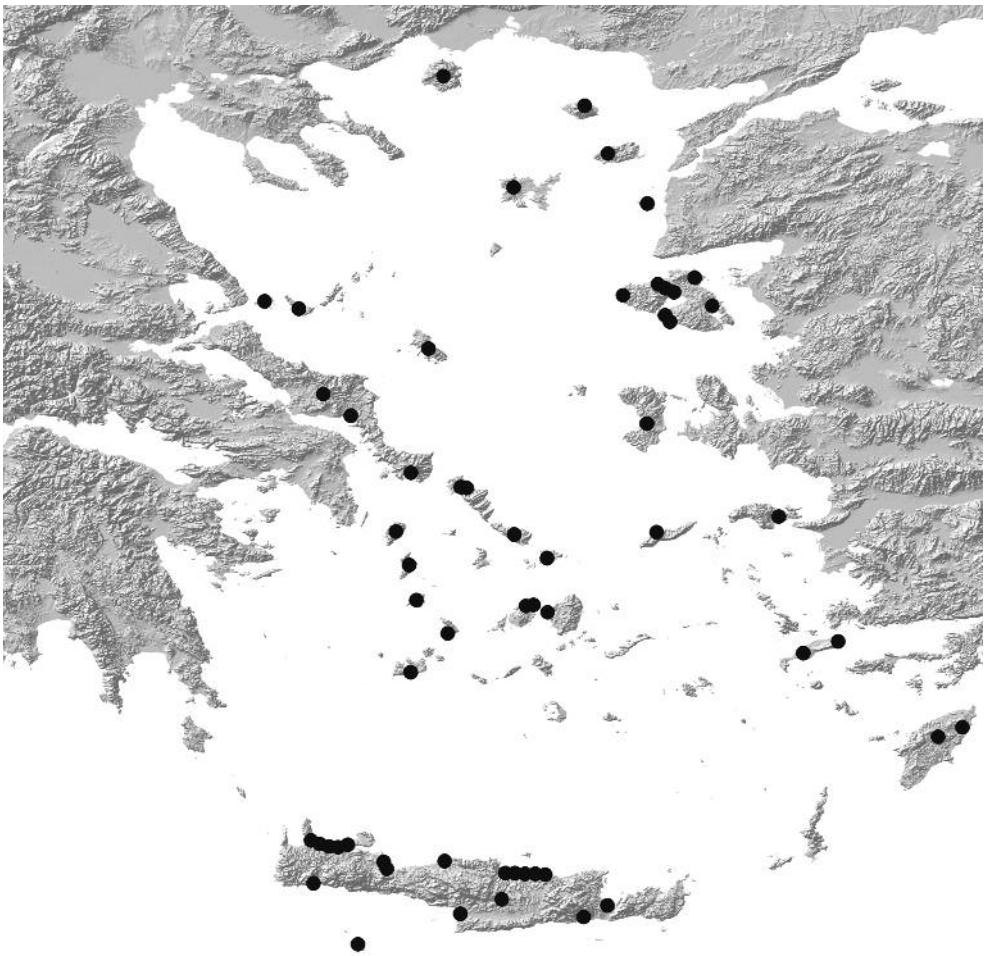

Fig. 1: Distribution of *Mauremys rivulata* (Valenciennes, 1833) in the Aegean based on Valakos et al. (2008), modified. Map source: ESRI (Environmental Systems Research Institute) 2006.

Abb. 1: Verbreitung von *Mauremys rivulata* (Valenciennes, 1833) in der Ägäis, verändert nach Valakos et al. (2008). Kartengrundlage: ESRI (Environmental Systems Research Institute) 2006.

Pisses, where they found a dense population in an area of the beach surrounded by reeds and rushes, with the adults living in a main pool and the juveniles in smaller pools. They also found *M. rivulata* in four places in the dense undergrowth on the upper and middle reaches of the valley of the Mylo - potamos (mill stream). Those sites are located at an elevation of about 200 meters above sea level and more than three km from the mouth of the river. With foresight the abovementioned authors wrote, that "it is to be expected that such water-rich valleys will in future serve as refuges for threatened coastal populations".

On our visit to the mouth of the brook Aghion Anarghiron near Pisses on 11 April 2011, we found that the area had been completely transformed for tourism purposes. The terrain had been levelled to form a bay

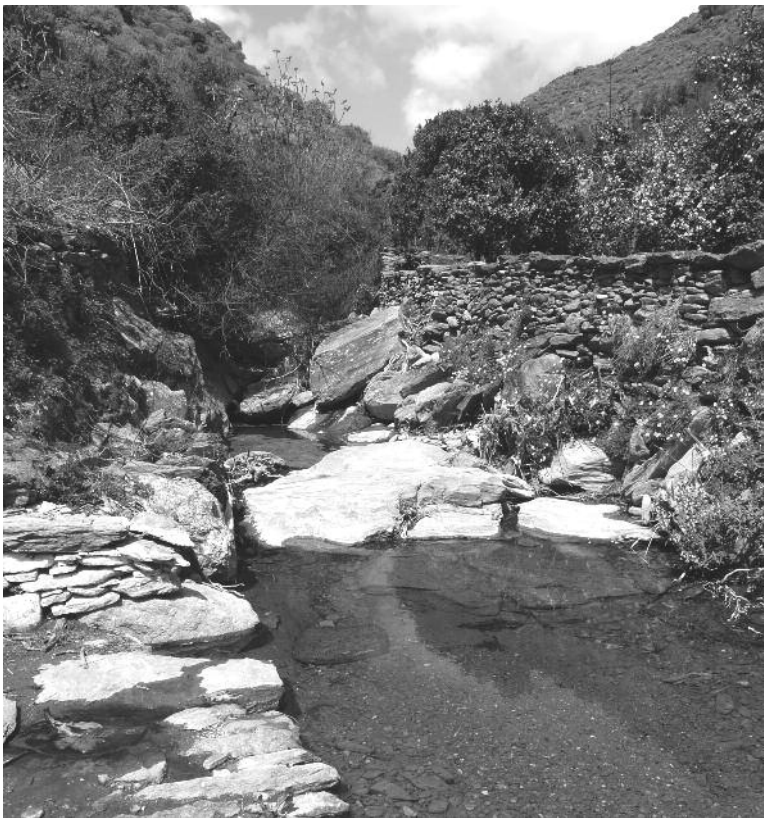

Fig. 2 (above): The present aspect of the beach near Pisses (Kea Island 2011).

Abb. 2 (oben): Gegenwärtige Strandsituation bei Pisses (Insel Kea 2011).

Fig. 3 (left): Vathiapotamos Brook on the island of Kea as a refuge for *Mauremys rivulata* along its middle reaches.

Abb. 3 (links): Vathiapotamos Bach auf der Insel Kea, ein refugialer Lebensraum für *Mauremys rivulata* im Mittellaufbereich.

for swimming; there was no backwater left and hence no more habitats for Balkan Terrapins (Fig. 2).

In April 2011 the Mylopotamos formed a continuous, 700 meter long watercourse on its upper reaches from Flea almost to the church of Aghia Marina. Along its course stand the ruins of four water mills, which is indicative of a long period of flow in the stream. Even today water is extracted from the stream over the full feasible length to irrigate local vegetable beds. Nonetheless, enough pools of water still persisted in April and offered a suitable habitat for Balkan Terrapins. We did not observe any ourselves, but our host Costas Maroulis of Red Tractor Farm at the port of Korissia, who also works as a nature guide on the island, confirmed their presence there. A few years ago, he returned a number of Balkan Terrapins to their area of settlement after heavy rain had washed them downstream as far as the coast.

Costas Maroulis also provided us with information about a population in the southwest of the island, in the Vathipotamus Brook (Fig. 3), which flows into the sea near the ancient Ionian city of Karthea. Over a length of 500 meters, the stream bed received enough water from two springs at Klodhouka and Pighi Vathipotamou to provide a suitable habitat for terrapins. We limited our investigations there to sighting records as the stream bed was largely inaccessible. Here, too, some vegetable gardens were still in use along the stream, and they were irrigated with water taken from its springs.

From the botanist Rena Karakatsani, who lives in Ioulis (Chora) we received information on the presence of turtles in the stream that flows into the Aghiou Filipou Bay on the same side of the island. There is a spring near the village of Vrises, which is also used to water remote vegetable gardens. Here we found Balkan Terrapins on a wet, 800 meter long stretch of the middle reaches of the stream. It can therefore be said that there are at least three populations on the island of Kea living in water-rich valleys at a distance from the coast.

GENERAL ASSESSMENT OF THE BALKAN TERRAPIN'S CHANCES OF SURVIVAL ON AEGEAN ISLANDS

Pronounced threat to optimum habitats in the estuaries of streams and rivers.- The estuaries of streams and rivers and beach lagoons are the preferred habitats of the Balkan Terrapin. There they benefit especially from the barrier beach effect. The mouth of the streams is blocked with sand deposited by the coastal currents, thus interrupting the surface water link between the streams and the sea in the absence of adequate freshwater pressure (Fig 4). On sandy beaches especially, the retention effect on the streams causes lagoons to form. These wetland structures are of special biological interest. They also have a stepping stone function for migratory bird species (Zacharias et al. 2007). Werner (1935) described this situation aptly as follows: "On Sifnos and Samothraki they live in a pool formed at the end of a stream that fails to reach the sea but rather builds up and spreads out on the sandy shore (similar to Lemnos)." In the Aegean, significant populations of *M. rivulata* are therefore to be found along the intact lower courses and in the estuaries of streams and rivers.

Catsadorakis & Paragamian (2007) provided a wetland inventory for the Greek Aegean. In total, they listed 352 wetland structures on 51 islands, not including Crete. 257 of them were natural sites, and 65 artificial. The wetlands listed for the Aegean islands had a total surface area of about 40 km^2, including 30 km^2 on the islands of Lesbos, Lemnos and Euboea (Evia). The Prefecture of Lesbos alone contains 84 wetland structures on two islands, followed by Rhodes and Lemnos with 18 each and Andros with 14. Along with the wetlands of the Turkish island of Gökçeada (Imbros), this delineates the main habitats of the Balkan Terrapin in the Aegean.

No overall study is available that analyzes the magnitude of decline of *M. rivula-*

Fig. 4: Barrier beach in the northwest of the island of Ikaria. The mouth of the streams is blocked with sand deposited by the coastal currents, thus interrupting the surface water link between the streams and the sea in the absence of adequate freshwater pressure. The retention effect on the streams creates lagoon structures, which are of special biological interest.

Abb. 4: Strandwallbildung im Nordwesten der Insel Ikaria. Die Mündungsbereiche der Fließgewässer werden durch die Küstenströmung mit Sand verlegt, wodurch die oberflächliche Verbindung zum Meer bei mangelndem Süßwasserdruck unterbunden wird. Dadurch stauen sich die Buchten lagunenartig ein. Die so entstandenen Feuchtgebietstrukturen sind von hohem biologischen Interesse, ihr Naturwert besonders erhaltenswert.

Fig. 5: The only wetland complex on the island of Skyros (approx. 70 ha) is located in the northwestern half of Kalamitsa Bay. It is compromised by building and highway construction.

Abb. 5: Der einzige, ca. 70 ha große Feuchtgebietskomplex der Insel Skyros liegt in der nordwestlichen Hälfte der Kalamitsa-Bucht. Das Feuchtgebiet ist durch Häuser- und Straßenbau beeinträchtigt.

Fig. 6: Cattle watering facilities near Tuzla on the island of Gökçeada serve as *Mauremys rivulata* biotopes.

Abb. 6: Viehtränken bei Tuzla auf der Insel Gökçeada werden von *Mauremys rivulata* als Lebensraum genutzt.

ta on the Aegean islands. Walters (1998) gave examples for the coast at Nidri, the island of Lefkas and the southwest of Turkey. The biggest aggregation of individuals observed by the author was on Lesbos in April 1978, when hundreds of Balkan Terrapins were seen in brackish water in the Gulf of Hiera (Broggi 1978). The sighting of 200-300 Balkan Terrapins at the mouth of the Mirsonas on Ikaria in 1986 was not repeated during a second field trip in 2000, when only about fifty specimens were found (Broggi 2001). The population on the lower reaches of the Charakas on the same island, on the other hand, was unchanged at about a hundred individuals.

Although there is no specific data available to prove that the total Aegean population of *M. rivulata* has declined, a qualitative assessment may be permitted on the basis of observations made by the author over the last 35 years. Growing land use, conflicts with tourism and intensive agriculture have developed at the mouths of streams and rivers. Sandy beaches are needed to attract tourists. To create them, the accessible estuaries are being modified accordingly, with impacts on the local hydrology that deprive the Balkan Terrapin of its habitats. The flat ground around the estuaries is also advantageous for intensive forms of agriculture. The terrain is levelled accordingly. In addition, water is extracted directly from the streams and rivers, or groundwater pumps are used, causing groundwater levels to sink, which in turn impacts surface waters. During their work on their wetland inventory, Catsadorakis & Pargamian (2007) noted that at least 25 wetland systems had been destroyed over the last decades. In view of the fact that half of the 352 sites listed covered less than one hectare, the damage done to those habitats may well be irreversible and the fate of their Balkan Terrapin populations sealed. Of all the wetland structures listed, only two sites

were given adequate legal protection. The situation is similar on the island of Crete, which was not included in the inventory. There, about 60% of the wetland structures were destroyed in the last thirty years and many others seriously compromised (NATURAL HISTORY MUSEUM OF CRETE & UNIVERSITY OF CRETE 2005). The ongoing destruction of these isolated wetland structures is doubtless causing great damage in terms of biodiversity.

As a result, many *Mauremys* populations on the islands have shrunk and can be expected to die out, as addressed by BEUTLER & FRÖR (1980) for Mykonos, BROGGI (2000) for Milos, where the shallow lake at Provatas has disappeared (cf. SCHWEIGER 2009), or BROGGI (2006b) for Skyros, where the last major wetland structure was significantly compromised (Fig. 5). In consequence of the loss of their habitats, the populations on Syros and Sifnos (Kamares Bay) have presumably disappeared.

Refugial populations in the middle and upper courses of streams and rivers on major islands.- Whereas the lower courses of the streams and rivers are easier and more frequently accessed and thus at greater risk, that does not apply to the same degree to the middle and upper courses. No systematic herpetological fieldwork in search of *Mauremys* populations seems to have been undertaken on those middle and upper courses to date. That might explain why so few sightings have been reported for inland locations on Aegean islands as e. g. in WERNER (1935) for Kythnos, WETTSTEIN (1953) for Naxos, and GRUBER & FUCHS (1977) for Paros.

Despite the fact that *M. rivulata* inhabits a wide range of different wetland habitats and prefers muddy freshwater systems with intensive algal and water plant vegetation near the coast (cf. WISCHUF & BUSACK 2001), it seems that the Balkan Terrapin has penetrated the middle and upper courses of streams and rivers more frequently than previously assumed. The author first found Balkan Terrapins in a mountain stream in the Lepetimnos Massif on Lesbos (BROGGI 1978). On Andros, Balkan Terrapins were found five km from the estuary (BROGGI 1996). The climbing skills of these animals are amazing; in the north of Gökçeada, Balkan Terrapins colonized a sump between two waterfalls, a location that seemed almost inaccessible (BROGGI 1999). They also cover impressive distances outside of their established habitats in order to find suitable locations for settlement (e.g. on Ikaria, BROGGI 2001). The populations observed on inland courses of flowing streams, however, are much smaller than those living on the coasts (cf. CLARK 1996 for Ikaria). Concerning the future of the species, however, the importance of these refugial populations increases as compared with the coastal populations, which are more and more coming under threat. For Andros, Chios, Gökçeada, Ikaria, Naxos, Serifos and Kea, the existence of these refugial populations can be confirmed from the author's own observations.

Settlement of newly created reservoirs.- Reservoirs have been built in the interior of several islands for water storage purposes, and were colonized by Balkan Terrapins, e.g. Ikaria (BROGGI 2001), Gökçeada (BROGGI 1999) and Serifos (BROGGI 2011). This role of the reservoirs is reflected in the 65 artificial wetland structures on Aegean islands listed by CATSADORAKIS & PARAGAMIAN (2007). Water supply structures in agricultural areas such as cattle watering facilities (e.g. on Ikaria and Gökçeada, Fig. 6) and water channels for irrigation (e.g. on Andros) can also assume this function.

Potential threat from climate change.- Over the last two decades, the author noted an increasing tendency towards surface waters to dry up. On the islands of Lipsi in 2007, Ithaki in 2008 and Alonissos in 2009, for example, no more running water was seen in April already. Analysis of the meteorological data for the eastern Mediterranean confirmed that summer precipitation levels have lowered (SARRIS et al. 2007). Dendrochronological investigations presented in the same work confirmed this trend for the second half of the last century. On the other hand, winter precipitation can be expected to surpass the average as a result of increasing probability of heavy rainfall events. An increase in such weather phenomena would endanger the semi-aquatic herpetofauna of the smaller islands by depriving their habitats of

water in summer and exposing their populations to fatal injury caused by heavy rainfall in winter (cf. the above example of Kea).

Nature protection aspects.- AYAZ (2010) lists the threats for *M. rivulata* in Turkey. Main reasons of habitat destruction were man-made alterations such as drying up and filling of water bodies (sometimes motivated by mosquito prevention) and water pollution by agricultural biocids. In some regions the turtles were systematically fished and hunted to be killed, mainly by local farmers and fishers. Accessory threats include collecting of juveniles for the pet trade and decimation by traffic (dead on road), concerning mainly females during migration to the egg-laying sites and migrating hatchlings and juveniles.

The example of the populations of *Mauremys rivulata* in the Aegean shows that habitat loss seems to be the main risk to turtle populations, since remaining wetland structures, especially on the medium-sized islands, exist only as isolated sites. These wetland relicts are generally endangered. In the course of a WWF campaign, a total of 814 wetland structures (584 natural and 230 artificial systems) have been identified to date on 75 Greek islands in the Aegean, the Ionian Sea and on Crete. Another fifty wetland sites not yet listed are thought to exist on the smaller islands. The project runs to the end of 2012 (communication received from project leader Thanos GIANNAKAKIS of WWF Greece on 22 September 2011). In March 2011 the Greek Parliament enacted legislation for the protection of biodiversity, which includes the precise definition of a wetland based on the Ramsar criteria. On the basis of the new regulations, a presidential decree has been drawn up for 350 natural wetlands located on islands with an area of less than 8 hectares, which is expected to be issued in the next few months.

CONCLUSIONS

The main findings of this paper can be summarized as follows:

* The Balkan Terrapin is still widely distributed in the Aegean. It is present on most of the larger islands.

* The biggest populations of *M. rivulata* are or were to be found on the lower reaches and in the estuaries of streams and rivers, mirroring the turtles' habitat preferences.

* Coastal wetland structures, are often endangered by construction works, tourism and intensive agriculture (cultivation, irrigation).

* Refugial populations of the Balkan Terrapin established themselves on the middle and upper courses of streams on the bigger islands, but none of them have the potential size of the populations in coastal locations.

* On most medium-sized islands, only small populations of the Balkan Terrapin are to be found. Their isolated locations can be seen as relicts and as such are acutely endangered.

* *Mauremys rivulata* is able to colonize artificial reservoirs created in the interior of the islands.

* The Greek islands require a targeted nature protection strategy to ensure preservation of the last wetland structures, which, amongst other things, are so important to the hygrophilic herpetofauna. The work of WWF Greece appears suited to contribute to this goal.

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REFERENCES

Ayaz, D. (2010): Übersicht über *Mauremys rivulata* in der Türkei.- Marginata, Münster; 7 (2) [26]: 16-25.

Ayaz, D. & Budak, A. (2008): Distribution and morphology of *Mauremys rivulata* (Valenciennes, 1833) (Reptilia: Testuidines: Geoemydidae) in the Lake District and Mediterranean Region of Turkey.- Turkish Journal of Zoology, Ankara; 32 (2008): 137-145.

Bader, T. & Riegler, C. & Grillitsch, H. (2009): The herpetofauna of the Island of Rhodes (Dodecanese, Greece).- Herpetozoa, Wien; 21 (3/4): 147-169.

Baran, İ. (1981): Kuzey Ege Denizi, Marmara Denizi ve Karadeniz'deki adalarımızın herpetofaunasının taksonomik ve ekolojik araştırılması [Taxonomic and ecological investigations of the herpetofauna of Turkish islands. Part I: The populations of the northern Aegean, the Marmara Sea and the Black Sea].- Doğa Bilim Dergisi / TÜBİTAK, Ankara; 5: 155-162.

Bedriaga, J. v. (1882): Die Amphibien und Reptilien Griechenlands.- Bulletin de la Société Impériale des Naturalistes de Moscou, Moskva; 56 (3): 278-346.

Beutler, A. & Frör, E. (1980): Die Amphibien und Reptilien der Nordkykladen.- Mitteilungen der Zoologischen Gesellschaft Braunau, Braunau; 3 (10/12): 255-290.

Bird, C. G. (1935): The reptiles and amphibians of the Cyclades.- Annals and Magazine of Natural History, Zoology, Botany and Geology, London; (Ser. 10) 16: 274-284.

Broggi, M. F. (1978): Herpetologische Beobachtungen auf der Insel Lesbos (Griechenland).- Salamandra, Frankfurt a. M.; 14 (4): 161-171.

Broggi, M. F. (1988): Herpetologische Beobachtungen auf Samothraki (Griechenland).- Berichte der Botanisch-Zoologischen Gesellschaft Liechtenstein-Sargans-Werdenberg, Vaduz; 17: 93-99.

Broggi, M. F. (1994): Feldherpetologische Beobachtungen und Bemerkungen zu schützenswerten Biotopen auf griechischen Inseln (Amphibia, Reptilia, Griechenland).- Herpetozoa, Wien; 7 (1/2): 29-34.

Broggi, M. F. (1996): Die Feuchtgebiete der Insel Andros mit ihren Amphibien und hydrophilen Reptilien (Amphibia, Reptilia, Kykladen, Griechenland).- Herpetozoa, Wien; 8 (3/4): 135-144.

Broggi, M. F. (1999): Notizen zur Herpeto - fauna der Ägäisinsel Gökçeada.- Herpetozoa, Wien; 12 (1/2); 73-78.

Broggi, M. F. (2000): Herpetological notes on the islands of Milos and Sifnos (Cyclades, Greece).- Herpetozoa, Wien; 13 (1/2): 89-93.

Broggi, M. F. (2001): Bemerkungen zur Herpetofauna der Ägäisinsel Ikaria (Griechenland).- Herpetozoa, Wien; 14 (1/2): 9-14.

Broggi, M. F. (2002): Herpetological notes on the Dodecanese Islands of Symi and Sesklia (Greece). Herpetozoa, Wien; 15 (3/4): 186-187.

Broggi, M. F. (2006a): Isolation und Land - nutzungswandel und ihre Einflüsse auf die Herpetofauna – dargestellt am Beispiel der Insel Tilos (Dodekanes, Griechenland).- Herpetozoa, Wien; 19 (1/2): 13-16.

Broggi, M. F. (2006b): Feuchtgebiete auf Skyros (Nördliche Sporaden - Griechenland) – ihre Beschreibung und einige ornithologische und herpetologische Inselbeobachtungen.- Berichte der Botanisch-Zoologischen Gesellschaft Liechtenstein-Sargans-Werdenberg, Vaduz; 31: 1-6.

Broggi, M. F. (2007): Herpetological notes on the island of Amorgos (Cyclades, Greece).- Herpetozoa, Wien; 20 (1/2): 94-96.

Broggi, M. F. (2011): The semi-aquatic herpetofauna of Serifos (Cyclades, Greece) including conservation aspects (Amphibia, Reptilia).- Herpetozoa, Wien; 24 (1/2): 13-22.

Busack, S. D (2009): *Mauremys rivulata* (Balkan Terrapin) - tourist habituation and diet.- Herpetological Review, New York; 40 (2): 216.

Busack, S. D. & Ernst, C. H. (1980): Variations in the Mediterranean populations of *Mauremys* Gray, 1869.- Annals of the Carnegie Museum of Natural History, Pittsburgh; 49: 251-264.

Buttle, D. (1989): Notes on reptiles and amphibians of N. E. Greece and the island of Samothraki.- Bulletin / British Herpetological Society, London; 29: 49-53.

Buttle, D. (1993): Notes on the herpetofauna of some of the Cyclades Islands, Greece.- Bulletin / British Herpetological Society, London; 46: 5-14.

Buttle, D. (1997): Observations on reptiles and amphibians of Andros (Cyclades, Greece).- Bulletin / British Herpetological Society, London; 60: 5-12.

Catsadorakis, G. & Paragamian, K. (2007): Inventory of the wetlands of the Aegean Islands. Identity, ecological status and threats. Athens (World Wide Fund for Nature – WWF Greece), pp. 392. [in Greek with English abstract].

Cattaneo, A. (1989): Note erpetologiche sulle isole greche die Serifos, Sifnos e Milos (Cicladi occidentali).- Atti della Società Italiana di Scienze Naturali e del Museo Civico di Storia Naturale in Milano, Milano; 130: 57-76.

Cattaneo, A. (1990): I serpenti delle isole greche di Kythnos e Kea (Cicladi occidentali).- Atti della Società Italiana di Scienze Naturali e del Museo Civico di Storia Naturale in Milano, Milano; 131: 209-219.

Cattaneo, A. (1997): L'erpetofauna dell'isola greca di Skiathos (Sporadi settentrionali).- Atti della Società Italiana di Scienze Naturali e del Museo Civico di Storia Naturale in Milano, Milano; 136: 145-156.

Cattaneo, A. (1998): Gli anfibi e i rettili delle isole greche di Skyros, Skopelos e Alonissos (Sporadi settentrionali).- Atti della Società Italiana di Scienze Naturali e del Museo Civico di Storia Naturale in Milano, Milano; 139: 127-149.

Cattaneo, A. (2001): L'erpetofauna delle isole egee di Thassos, Samothraki e Lemnos.- Bollettino del Museo Civico di Storia Naturale di Venezia, Venezia; 52: 155-181.

Cattaneo, A. (2003): Note erpetologiche sulle isole egee di Lesvos, Chios e Samos.- Bollettino del Museo Civico di Storia Naturale di Venezia, Venezia; 54: 95-116.

Clark, R. (1991): A report on herpetological investigations on the island of Samothraki, North Aegean Sea – Greece.- British Herpetological Society Bulletin, London; 38: 3-7.

Clark, R. (1996): Some notes on the reptile fauna of Fournoi, Ikaria and Schinoussa, Aegean Sea,

Greece.- British Herpetological Society Bulletin, London; 56: 33-39.

Clark, R. (1999): Herpetofauna of Thassos, North Aegean Sea, Greece.- British Herpetological Society Bulletin, London; 66: 14-18.

Clark, R. (2000): The herpetology of Samos Island, eastern Aegean Sea, Greece.- Herptile, Journal of the International Herpetological Society, Walsall; 25 (4): 172-175.

David, P. (1994): Liste des reptiles actuels du monde. I. Chelonii.- Dumérilia, Paris; 1: 7-127.

Dimaki, M. (2002): Herpetofauna of Rhodes and the rest of the Dodecanese; pp. 63-68. In: Masetti, M. (Ed): Island of deer. City of Rhodes (Environment Organization).

Erhard (1858): Fauna der Cykladen – 1.Teil Wirbeltiere. Leipzig (Voigt & Günther), pp. 117.

Fritz, U. & Ayaz, D. & Buschbom, J. & Kami, H. G. & Mazanaeva, L. F. & Aloufi, A. A. & Auer, M. & Rifai, L. & Silic, T. & Hundsdörfer, A. K. (2007): Go east: phylogeographies of *Mauremys caspica* and *M. rivulata* – discordance of morphology, mitochondrial and nuclear genomic markers and rare hybridization.- Journal of Evolutionary Biology, Oxford [Blackwell electronic resource] doi.10.1111/ j.1420-9101.2007. 01485.x.

Fritz, U. & Freytag, O. (1993): The distribution of *Mauremys* in Asia Minor, and first record of *M. caspica caspica* (Gmelin, 1774) for the internally drained central basin of Anatolia (Testudines: Cryptodira: Bataguridae).- Herpetozoa, Wien; 6 (3/4): 97-104.

Fritz, U. & Wischuf, T. (1997): Zur Systematik westasiatisch-südosteuropäischer Bachschildkröten (Gattung *Mauremys*) (Reptilia: Testudines: Bataguridae).- Zoologische Abhandlungen / Staatliches Museum für Tierkunde, Dresden; 49 (13): 223-260.

Gasith, A. & Sidis, I. (1984): Polluted water bodies, the main habitat of the Caspian terrapin (*Mauremys caspica rivulata*) in Israel.- Copeia, Washington; 1984 (1): 216-219.

Gemel, R. & Leubolt, M. & Wohlmuth, J. (2008): Bemerkenswertes Verhalten der Ostmediterranen Bachschildkröte auf Lesvos (Mytilini), Griechenland. Aspekte zur Biologie von *Mauremys rivulata* (Valenciennes, 1833).- ÖGH-Aktuell, Wien; 20 (Februar 2008): 7-10.

Grillitsch, H. & Tiedemann, F. (1984): Zur Herpetofauna der griechischen Inseln Kea, Spano - poula, Kithnos, Sifnos, Kitriani (Cycladen), Alonissos und Piperi (Nördliche Sporaden).- Annalen des Natur - historischen Museums, Wien; (B) 86: 7-28.

Gruber, U. & Fuchs, D. (1977): Die Herpeto - fauna des Paros-Archipels (Zentral-Ägäis).- Salamandra, Frankfurt a. M.; 13 (2): 60-77.

Ionnides, Y. & Dimaki, M. & Dimitropoulos, A. (1994): The herpetofauna of Samos (Eastern Aegean, Greece).- Annales Musei Goulandris, Kifissia; 9: 445-456.

Kasapidis, P. & Provatidon, S. & Maragou, P. & Valakos, E. D. (1996): Neue Daten über die Herpetofauna von Lesbos (Ägäische Inseln, Griechen - land) und einige biogeographische Bemerkungen über die Inseln des nordöstlichen ägäischen Archipels.- Salamandra, Rheinbach; 32 (3): 171-180.

Kau, H. P. & Thieme, U. (1985): Die Farbe der Iris bei den drei Unterarten der Kaspischen Sumpfschildkröte *Mauremys caspica* (Gmelin, 1774) (Testudi - nes: Emydidae).- Salamandra, Bonn; 21 (2/3): 123-136.

Kocyan, A. & Joshi, J. (1992): Die Orchideen von Kea.- Mitteilungsblatt / Arbeitskreis Heimische Orchideen Baden-Württemberg, Stuttgart; 24 (3): 457-486.

Lindner, J. (1995): Zum Vorkommen der Kaspischen Wasserschildkröte auf Kreta.- Die Aquarien und Terrarien Zeitschrift (DATZ), Essen; 48 (12): 777-778.

Lotze, H. U. (1972): Bemerkungen zur Herpetofauna der Insel Amorgos.- Salamandra, Frankfurt a. M.; 6 (3/4): 119-127.

Lymberakis, P. & Poulakakis, N. (2010): Three continents claiming an archipelago: The evolution of the Aegean's herpetofaunal diversity.- Diversity, Basel; 2010 (2): 233-255 [electronic resource doi:10.3390/ d2020233].

Malakates, S. (1928): Die Flora von Kea. pp. 193-200. In: Fedde, F. (Ed.): Repertorium specierum novarum regni vegetabilis.- Centralblatt für Sammlung und Veröffentlichung von Einzeldiagnosen neuer Pflanzen, Berlin-Dahlem; Fasciculus XXIV (1927/ 1928) [Editor's edition].

Mantziou, G. (2007): Phylogeography and population genetics of *Mauremys rivulata* (Chelonia: Geoemydidae). Ph D thesis, University of Crete, Faculty of Sciences and Engineering, Department of Biology.

Mantziou, G. & Antoniou, A. & Poulakakis, N. & Goulielmos, G. & Tsigenopoulos, C. S. & Pinou, T. & Mylonas, M. (2005): Isolation and characterization of six polymorphic microsatellite markers in the freshwater turtle *Mauremys rivulata* (Testudines, Geoemydidae).- Molecular Ecology Notes, Oxford [Blackwell]; 5 (4): 727-729.

Mantziou, G. & Poulakakis, N. & Lymberakis, P. & Valakos, E. M. & Mylonas, M. (2004): The inter- and transspecific status of Aegean *Mauremys rivulata* (Chelonia, Bataguridae) as inferred by mitochondrial DNA sequences.- Herpetological Journal, London; 14: 35-45.

Mertens, R. (1946): Über einige mediterrane Schildkröten-Rassen.– Senckenbergiana Biologica, Stuttgart; 27 (4/6): 11-118.

Natural History Museum of Crete & University of Crete (2005): Mediterranean reservoirs and wetlands: a demonstration of multiple-objective management in the island of Crete. Project Life00 ENV/GR/000685. WWW documents available e.g., at http://www.nhmc.uoc.gr/Wetlands/files/laymans.pdf.

Ochsenhofer, G. (2012 in press): Botanisch-ökologische Exkursion nach Samothraki.- ÖGH-Aktuell, Wien; 28.

Pafilis, P. (2010): A brief history of Greek herpetology.- Bonn Zoological Bulletin, Bonn; 57 (2): 329-346.

Perez Mellado, V. & Valakos, E. D. & Gil, M. J. & Guerrera, F. & Welch, J. & Navarra, P. & Maragou, P. (1999): Herpetological notes from mainland and insular Greece.- British Herpetological Society Bulletin, London; 67: 33-39.

Rifai, L. B. (2002): Ecology and biology of the Caspian Terrapin, *Mauremys rivulata*, in Jordan.- Jordan University of Science and Technology. Master's Thesis, xii+162 pp.

Rifai, L. B. & Amr, Z. (2004): Morphometrics and biology of the Striped-Necked Terrapin, *Mauremys rivulata* (Valenciennes, 1833), in Jordan (Reptilia; Testudines: Geoemydidae).- Zoologische Abhand-

lungen / Staatliche Naturhistorische Sammlungen, Museum für Tierkunde, Dresden; 54: 177-197.

Rödel, M.-O. (1994): Beiträge zur Kenntnis der Verbreitung, Habitatwahl und Biologie griechischer Amphibien und Reptilien: Daten aus 7 Exkursionen von 1987 bis 1991.- Faunistische Abhandlungen / Staatliches Museum für Tierkunde, Dresden; 19: 227-246.

Sarris, D. & Christodoulakis, D. & Körner, C. (2007): Impact of recent climatic change on growth of low elevation eastern Mediterranean forest trees.- Global Change Biology, Oxford [Wiley-Blackwell]; 13 (6): 1187-1200.

Schneider, B. (1986): Zur Herpetofauna der Insel Limnos (Hellespontische Inseln, Nordägäis, Griechenland). Salamandra, Bonn; 22 (4): 276-280.

Schweiger, M. (1989): Über die Auswirkungen der Hitzewelle 1988 auf einige Schildkrötenpopulationen in Griechenland.- Herpetofauna, Weinstadt; 58: 24-26.

Schweiger, M. (2009): Die Amphibien (Lurche) und Reptilien (Kriechtiere) der Insel Milos. WWW document < www.milos-greece.com/herpetofauna-2.html > (last accessed: October 2011).

Sowig, P. (1985): Beiträge zur Kenntnis der Verbreitung und Ökologie der Amphibien und Reptilien Kretas.- Salamandra, Bonn; 21 (4): 252-262.

Strachnis, I. (2009): Field report – Lemnos, Greece – June & August 2009. WWW document < www.euroherp.com/Field/greece9.html > (last accessed: October 2011).

Taşkavak, E. & Reimann, M. & Atatür, M. K. (1997): A morphological comparison of two marginal populations of *Mauremys caspica rivulata* in Anatolia.- DGHT Jahrestagung, Dormagen: 10-14. September 1997 (Programmheft).

Tok, C. V. (1999): The taxonomy and ecology of *Mauremys caspica rivulata* Valenciennes, 1833 (Testudinata: Bataguridae) and *Testudo graeca ibera* Pallas, 1811 (Testudinata: Testudinidae) on Refladiye (Datça) peninsula.- Turkish Journal of Zoology, Ankara; 23 (1): 17-21.

Tosunoğlu, M. & Gül, Ç. & Uysal, İ. (2009): The herpetofauna of Tenedos (Bozcaada, Turkey).- Herpetozoa, Wien; 22 (1/2): 75-78.

Valakos, E. (1982): New locality records of three Greek reptiles.- ÖGH-Nachrichten, Wien; (12/13): 70-71.

Valakos, E. & Pafilis, P. & Sotiropoulos,K. & Lymberakis, P. & Maragou, P. & Foufopoulos, J. (2008). The amphibians and reptiles of Greece. Frankfurt a. M. (Edition Chimaira), pp. 463.

Walters, G. (1998): Coastal development in the Mediterranean and the stripe-necked terrapin (*Mauremys caspica*).- British Herpetological Society Bulletin, London; 62: 23-26.

Werner, F. (1935): Reptilien der Aegäischen Inseln.- Sitzungsberichte der kaiserlichen Akademie der Wissenschaften, Wien; (mathematisch-naturwissenschaftliche Klasse, Abt. 1) 144: 81-117.

Werner, F. (1938): Die Amphibien und Reptilien Griechenlands.- Zoologica, Stuttgart [Schweizerbart'sche Verlagsbuchhandlung]; 35 (94): 1-116.

Wettstein, O. (1953): Herpetologia aegaea.- Sitzungsberichte der Akademie der Wissenschaften, Wien; (mathematisch-naturwissenschaftliche Klasse, Abt. 1) 162: 651-833.

Wilson, M. (2006): Field Report Kos Greece, 8-22 June 2006. WWW document < www.euroherp.com/Field/Kos1.php > (last accessed: October 2011).

Wilson, M. J. & Grillitsch, H. (2009): The herpetofauna of Simi (Dodecanese, Greece).- Herpetozoa, Wien; 22 (3/4): 99-113.

Wischuf, T. (1995): Geographische Variabilität der Bachschildkröte *Mauremys caspica* (Gmelin, 1774) in Südosteuropa und Westasien. Ph.D. thesis, University of Hohenheim (Stuttgart), pp. 86.

Wischuf, T. & Busack, S. D. (2001): *Mauremys rivulata* (Valenciennes in Bory de Saint-Vincent et al., 1833) - Ostmediterrane Bachschildkröte; pp. 89-110. In: Fritz, U. (Ed.): Handbuch der Reptilien und Amphibien Europas. Schildkröten (Testudines) I. Wiebelsheim (Aula Verlag).

Zacharias, I. & Dimitriou, E. & Dekker, A. & Dorsman, E. (2007): Overview of temporary ponds in the Mediterranean region: threats, management and conservation issues.- Journal of Environmental Biology, Lucknow; 28 (1):1-9.

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