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The European Pond Terrapin *Emys orbicularis hellenica* (VALENCIENNES, 1832) in the Aegean: Distribution and threats

(Testudines: Emydidae)

Vorkommen und Gefährdung der Europäischen Sumpfschildkröte, *Emys orbicularis hellenica* (VALENCIENNES, 1832), auf den Inseln der Ägäis

(Testudines: Emydidae)

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KURZFASSUNG

Auf Grundlage von Literaturangaben und eigenen Beobachtungen wird die Verbreitung und Gefährdung der Europäischen Sumpfschildkröte in der Ägäis dargestellt. *Emys orbicularis* (LINNAEUS, 1758) wurde bisher von elf der Inseln angegeben, wobei drei Inselvorkommen unzureichend belegt sind und noch zu bestätigen wären. Die Europäische Sumpfschildkröte wurde in der Ägäis bisher nur auf großen randständigen Inseln nachgewiesen, bei denen in der herpetologischen Artenzusammensetzung auch meist Übereinstimmung mit dem nahen Festland besteht. Es gibt keine gesicherten Nachweise auf den Kykladen, Nördlichen Sporaden, auf Chios, Kythira, Kreta und Karpathos. Die Habitatanforderungen von *Emys orbicularis* in der Ägäis umfassen offensichtlich das Vorhandensein größerer Wasserkörper. In fließenden Gewässern konnte sie dort aber im Gegensatz zum Festland nicht nachgewiesen werden. Alle bisher bekannten Inselpopulationen sind zudem sehr klein, voneinander isoliert und damit durch Außeneinflüsse leicht verletzlich. Ohne den Schutz der küstennahen Inselfeuchtgebiete ist mit dem Erlöschen dieser Populationen zu rechnen. Für die Ägäis-Inseln, die Teil des "Mediterranean Basin biodiversity hotspot" sind, bedarf es deshalb dringend einer gezielten Naturschutzstrategie, um diese hydrophile Art zu erhalten.

ABSTRACT

Based on literature data and personal observations, the authors outline the distribution of the European Pond Terrapin on the Aegean Islands, including the threats to which it is subject. Eleven islands were reported to house *Emys orbicularis* (LINNAEUS, 1758) but confirmation is imperative for three of them. Reliable records of the European Pond Terrapin in the Aegean are available from larger offshore islands only, the herpetofaunas of which resemble the mainland communities. Its presence on the Cyclades, Northern Sporades, Chios, Kythera, Crete and Karphathos is not confirmed. On the Aegean islands, the habitat requirements of *Emys orbicularis* obviously comprise larger water bodies. Different from the mainland situation, it was never observed in the island's flowing waters. The island populations of this species are very small, isolated and thus, highly vulnerable through external effects. The extinction of the populations is to be expected if the islands' coastal wetlands are not saved from destruction. The Aegean Islands which are part of the "Mediterranean Basin biodiversity hotspot" are in urgent need of a protection strategy, to rescue this hydrophilic species.

KEY WORDS

Reptilia: Testudines: Emydidae: *Emys orbicularis hellenica*, Aegean Islands, Greece, Turkey, Mediterranean Basin biodiversity hotspot, zoogeography, distribution, habitat, threats, conservation

INTRODUCTION

Numerous references are available dealing with *Emys orbicularis* LINNAEUS, 1758, however, comparatively little information is provided about this turtle species living on the Aegean Islands, thereby mirroring its rareness there. For example, the chapter about the European Pond Terrapin in "Handbuch der Reptilien und Amphibien Europas" (FRITZ 2001) refers to 480 publications; only 14 of these deal with Greece, seven of the latter covering the Aegean. From 109 papers quoted in the *E. orbicularis* section of the Reptile Database (UETZ 2012), only six explicitly refer to Greece, and one to the area under study here. In another source of information (KRÜGER 2007), the corresponding figures are 556, three and one, respectively.

Based on literature data and personal observations of the authors, the present synopsis provides information on the spatial distribution of the populations of the European Pond Terrapin on the Aegean Islands and the threats the species encounters. The paper follows a publication devoted to equivalent questions in the Western Caspian Turtle *Mauremys rivulata* Valenciennes, 1833 (Broggi 2012). Both turtle species are sympatric in great parts of the Western Caspian Turtle's range area. In the south of the Balkan Peninsula, including the Aegean Islands, *Emys orbicularis* is by far the rarer species (Valakos et al. 2008).

Classification.- *Emys orbicularis* occurs in a vast range area extending from Northwest Africa across South, Middle and greater parts of East Europe, to the Pontic and Caspian regions as far as the Aral Sea (Fritz 2001). In the past, the European Pond Terrapin was a prime example of a monotypic, widely distributed species. More recent studies (e. g., Fritz 1989, 1992, 1993, 1995) revealed that it represents a species or species complex of great diversity. A second species of *Emys* (*Emys trinacris* Fritz, Fattizzo, Guicking, Tripepi, Pennisi, Lenk, Joger & Wink, 2005), fourteen valid subspecies and some still undescribed taxa are currently distinguished (Fritz 2001; Fritz & Havaš 2007), most of them originating from the southern portion of the range area.

According to Fritz (1992, 2001), the subspecies of the Aegean is *Emys orbicularis hellenica* (Valenciennes, 1832), a small to medium sized, sometimes dwarfish and big-headed form. Maximum length of the carapax rarely exceeds 15 cm, but is frequenly shorter; its color is yellowish to brownish in adults, the throat is monochrome yellow, the iris is white or yellow. Unambiguous *Emys orbicularis hellenica* are found from the Italian Po Plain and Istria Peninsula along the coasts of the east Adriatic and the Ionian Sea (where it occurs on the islands of Corfu, Lefkada, Kefalonia and Zakynthos) over the Peloponnese and Boeotia to Euboea. The Pond Terrapins of northern Greece and probably Thrace are intermediate forms connecting to subspecies of the *orbicularis* group, such as *E. o. colchica* (Fritz, 1994), whereas the specimens of the west Anatolian coasts of the Aegean are tentatively put to *E. o. hellenica* rather than than to the south-central Anatolian *E. o. luteofusca* Fritz, 1989 (Fritz 2001; Franzen et al. 2008).

Ecology, behavior, threats and protection status.- On the southern Balkans, *Emys orbicularis* is frequently associated with *Mauremys rivulata*; this sympatry is however insufficiently studied (Fritz 2001: 466). On the Ionian Island of Corfu, *Emys* can even dominate *M. rivulata* in numbers (Wütschert 1984; but see also Hill 2003, who called it rare on Corfu). On Lefkada the turtle seems to be common (Broggi pers. obs. unpubl.), but rare and apparently severely threatened on Zakynthos (Podloucky & Fritz 1994) and Kefalonia (Wilson 2006a).

Based on the authors' observations, *Emys* is rare throughout the Aegean region, thereby mostly represented by exiguous populations, and of similar timidness as the Western Caspian Turtle, thus, suggesting that both species can be observed at the rate of the actual frequency of their occurrence. The preferred habitats of *E. orbicularis* include still, slow-flowing, densely vegetated waters but also wetland areas, where it lives in water-filled diches, small ponds and lagoons. *Emys* can occur in brackish water, but clearly avoids high salinity and heavily eutrophic water bodies more explicitly than *M. rivulata* does. All specimens observed on the Aegean Islands by the authors were found in backwater estuarine situations disconnected from the sea by costal-sand walls, or roadkills. The wetlands colonized by *Emys* are constantly of bigger size than habitats that would satisfy the demands of *M. rivulata*.

The authors never observed *Emys* along the upper and middle reaches of the Aegean islands' flowing waters. This habitat type is apparently not inhabited by *Emys*, contrary to what is observed in *Mauremys*, to which it represents a refugial area (Broggi 2012). On the mainland of Greece, *Emys* does, however, inhabit flowing waters, where it prefers slow-flowing quiet sections, but also occupies artificial basins and sunken cattle watering tanks, just as *Mauremys* does.

In the European Union, the European Pond Terrapin is protected by the Fauna-

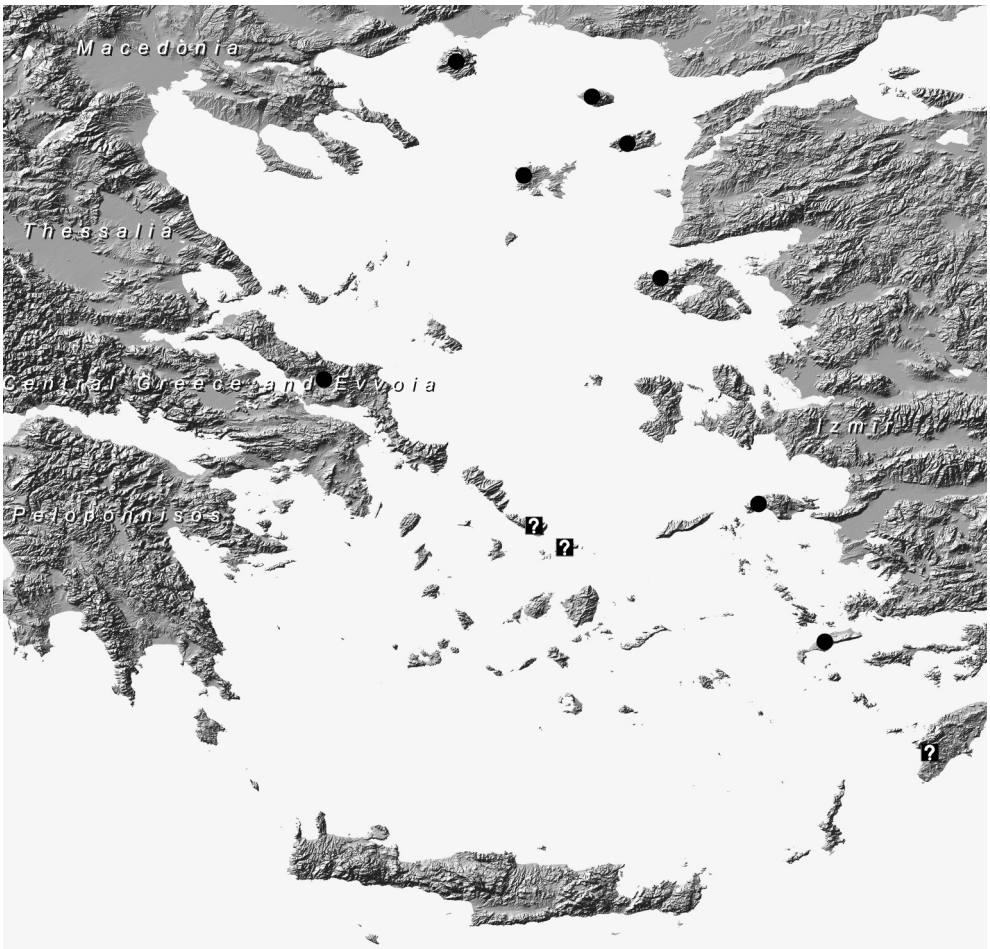

Fig. 1: The distribution (black dots and question marks) of *Emys orbicularis* (LINNAEUS, 1758) on the islands of the Aegean Sea, based on the information given in Table 1. Map source ESRI (Environmental Systems Research Institute) 2006.

Abb. 1: Die Verbreitung von *Emys orbicularis* (LINNAEUS, 1758) auf den Inseln des Ägäischen Meeres (schwarze Punkte und Fragezeichen) auf Grundlage der Angaben in Tabelle 1. Kartengrundlage ESRI (Environmental Systems Research Institute) 2006.

Flora-Habitat Directive, Annexes II und IV, as well as Annex II of the Berne Convention. In the IUCN Red List of Threatened Species, *Emys orbicularis* is categorized "near threatened" (COX et al. 2006), on a local scale it is protected according to Greek regulations (Presidential Decree 67/1981).

The threat status of the Aegean Islands populations of *Emys* was not assessed so far. It is the aim of this paper to characterize the situation of *E. orbicularis* as a representative of the fauna of the "Mediterranean Basin biodiversity hotspot" (COX et al. 2006; http://www.cepf.net/where_we_work/regions/europe_central_asia/mediterranean/Pages/default.aspx). Our knowledge of the turtle's Aegean range area, abundance and main causes of threat are presented in detail and critically reviewed.

DISTRIBUTION RECORDS OF THE EUROPEAN POND TERRAPIN ON THE AEGEAN ISLANDS (FIG. 1)

The herpetological results of the "Expédition scientifique de Morée" (Bibron & Bory de Saint-Vincent 1832) include the earliest reference to the occurrence of *Emys orbicularis* in the Aegean. Its authors reported that this turtle was found at the mouth of the Eurotas River on Tinos Island ("an der Mündung des Eurotas auf Tinos" - Bedriaga 1882). However, this latter author complained about the lack of precision concerning locality data given in the herpetological portion of the published Morée Expedition, in saying that the collections did not come up with accurate locality data "nicht durchweg von richtigen und ausführlichen Fundortsangaben begleitet". Beutler & Frör (1980) supposed confusion with the homonymous river in Lakonia, from where *Emys* is documented. Nonetheless, Tinos is being indicated again and again without reservation as a place of record for *E. orbicularis* (e. g., Valakos et al. 2008), although a river named Eurotas or Evrotas is not known on the island and the presence of this turtle on the island was never confirmed. Fritz (2001) considered the potential extinction of *Emys* on Tinos as a possible consequence of the general ongoing desiccation process that increases the current fresh water deficiency on the Aegean Islands.

In his travelogue, however, Erber (1867) reported, among others, the presence of species of the genera *Lissotriton*, *Bombina* and *Anguis* on Tinos. Curiously, they represent further herpetological taxa that were never again found on this or any other island of the Aegean Sea. Bedriaga (1882) annotated Erhards (1858) "Fauna der Cykladen" in arguing that Erhard's *Emys* records from the islands of Naxos, Amorgos, Andros and Mykonos in reality refer to *Mauremys rivulata* (*Clemmys caspica*, in his words): "Erhard behauptet sie auf den Inseln Naxos, Amorgos, Andros und Mykonos gesehen zu haben, allein ich vermuthe, dass Erhard wohl die *Clemmys caspica* ssp. *orientalis* mit *Emys orbicularis* verwechselt haben wird". In fact, Erhard's records fit in well with the distribution of *Mauremys rivulata* (comp. Broggi 2012), leaving Bedriaga's view uncontradicted and commonly accepted (e. g., Fritz 2001). In his encyclopedic publications of amphibians and reptiles of Greece and the Aegean, Werner (1930, 1938) reports *Emys* from all larger Ionian Islands. However, among all the Islands of the Aegean including the Dodecanese, he mentions only Euboea and Tinos (with question mark; Expédition Morée) to include *Emys*. Due to lack of reliable information in the older literature, the majority of *E. orbicularis* first records on Aegean Islands are of relatively young age.

Emys orbicularis was reported from eleven Aegean islands (Table 1). Besides its occurrence on Tinos, it is the records from Mykonos and Rhodes that urgently require verification. The purported presence of *Emys* on Mykonos (an island next to Tinos) by Bringsøe (1985) was based on a specimen collected by a tourist, whereas evidence of its occurrence on the otherwise well studied island of Rhodes was derived from a single somewhat vague visual encounter (Helmdag 1993). However, nothing speaks against Rhodes, which matches well the general distribution pattern. Also, the axis Euboea-Andros-Tinos-Mykonos constitutes a plausible migration pathway for *Emys* in Pleistozene low water situations. *Bufo bufo*, *Lacerta trilineata citrovittata*, *Natrix natrix*, *Natrix tessellata* and *Vipera ammodytes* are herpetological species which obviously took this route. If *Emys* was found on Andros, the records on Tinos and Mykonos would harmoniously fit into the above migratory scenario. Increasing aridity of the Aegean Islands over the past millenia could explain that *Emys* was present on Tinos at the time of the Morée Expedition but became extinct thereafter. If still possible today, this hypothesis needs to be tested by further investigations.

Disregarding the large mainland-like island of Euboea, the first reconfirmed Aegean island record of *Emys* came from Lesbos (Fig. 2; Broggi 1978), the most recent first record from Thassos Island (Fritz 2001). Another first record refers to the Turkish island of Gökçeada (Imbros) (Fig. 3; Broggi 1999). From a second, smaller,

Turkish island, Bozcaada (Tenedos), *Emys* was not mentioned (TOSUNOĞLU et al. 2009). These two Turkish islands are explicitly covered by this paper, because of their notorious neglect in herpetologigal reviews of the Aegean.

According to what is known, the presence of *Emys* in the Aegean archipelago is restricted to large, peripheral islands, the biota of which have considerable affinity to those of the neighboring mainland (comp. GREUTER 1971). Hence, the east Aegean Islands off the mainland of Asia Minor show close zoogeographic affinities to Anatolia (KASAPIDIS et al. 1996), whereas the Cyclades and Northern Sporades are home to southeast European species. During the last pre-holozene cold period, the permeability of the Aegean archipelago must have been extremely low to the herpetofauna migrating in west-eastern direction. This can be seen from the fact that *M. rivulata* was the only reptile species which successfully transcended the marked barrier of the Mid-Aegean Trench (LYMBERAKIS & POULAKAKIS 2010). These authors interpret this as a strong indicator for the efficiency of marine barriers to terrestrial species, a restriction which, curiously, applies to *Emys orbicularis* as well.

The distribution pattern favors the view that *Emys* colonized the peripheral Aegean islands from the adjacent mainland each, rather than by island hopping across the archipelago as must have been done by other species (e.g., *Pelophylax* spp., *Mauremys rivalata*, *Hemidactylus turcicus*, *Mediodactylus kotschyi*, *Podarcis erhardii*, *Lacerta trilineata*, *Ablepharus kitaibelii*, *Eryx jaculus turcicus*, *Hierophis caspius*, *Zamenis situla*, *Elaphe sauromates*, *Telescopus fallax*, *Vipera ammodytes*). In this respect, the south Aegean island chain was not an option for spreading, which is in agreement with the absence of *Emys* from the big Island of Crete, but also from Karpathos linking Crete to Rhodes and Kythira linking Crete to the Peloponnese. In a greater comparison with *M. rivulata*, only the larger islands and their bigger water bodies seem to satisfy the habitat requirements of *Emys*.

In the relevant paragraph of their herpetology of the Croatian Island of Mljet, JELIĆ et al. (2012) reported a colonization event by drift. Driven by sea currents, numerous individuals of *E. orbicularis* floated from the mouth of the river Neretva to the island of Korčula, over a distance of 65 km. Out of 21 turtles found on the island, 14 had survived this voyage. They will, however, not be able to reproduce on Korčula due to the absence of appropriate habitats. This observation supports the hypothesis that current or wind driven drift contributed to the terrapin colonization of the Aegean archipelago.

Also, deliberate release by man was revealed a possible mechanism of dispersion for *Emys orbicularis*, e.g., in the case of Corsica und Sardinia (PEDALL et al. 2011). Moreover, one can surmise that the number of released pet turtles clearly increased over the last decades. This is why it became more and more difficult to distinguish autochthonous Aegean Island tortoises from escaped introduced individuals (BUSKIRK et al. 2012: 138). Citizens of the major cities Athens and Thessaloniki in particular take their pet tortoises from the mainland to their second homes on the islands, where they frequently escape from captivity. Similarly, this may apply to *Emys*.

When assessing these southern *Emys orbicularis* populations, it is important to bear in mind that in all places where *Emys* was found, *Mauremys* was detected as well. Hence, it is essential to watch *Mauremys* populations closely, as *Emys*, which in general is clearly underrepresented in mixed populations, could be easily overlooked. Thus, e.g., STRACHINIS (2009) found only a single specimen of *E. orbicularis*, but about 40 *M. rivulata* on the Island of Lemnos. PEREZ MELLADO et al. (1999) managed to observe, among numerous *Mauremys*, just a single *Emys* which represented the second record of the species on Lesbos. The same, WILSON (2006b) found only two individuals of *E. orbicularis*, but at least some *M. rivulata* populations on Kos. *Emys* and *Mauremys* were jointly observed by the latter as was the case on Rhodes reported by HELMDAG (1993). MEYER & FRITZ (1996) classified the European Pond Terrapin extremely rare on Samos, whereas they observed *M. rivulata* in great numbers. Those individuals of *Emys* which represented first records

Table 1: Occurrence of the European Pond Terrapin *Emys orbicularis hellenica* (Valenciennes, 1832), on the Aegean Islands. Island descriptions include surface area and maximum elevation [m a.s.l.]; source: < http://en.wikipedia.org/wiki/List_of_islands_of_Greece >. The unconfirmed record localities Mykonos, Rhodes and Tinos are identified by a question mark. Islands in alphabetical order. DOR – dead on the road; MTKD – Museum für Tierkunde, Dresden; NMW – Naturhistorisches Museum Wien.

Tab. 1: Vorkommen der Europäischen Sumpfschildkröte *Emys orbicularis hellenica* (Valenciennes, 1832) auf den Inseln der Ägäis. Die Angaben zur Insel umfassen Name, Fläche und höchste Erhebung [m. ü. M.]; Quelle: < http://de.wikipedia.org/wiki/Liste_griechischer_Inseln >. Die unsicheren Angaben Mykonos, Rhodos und Tinos sind mit Fragezeichen versehen. Inseln in alphabetischer Reihenfolge. DOR – Straßentotes Exemplar, MTKD – Museum für Tierkunde, Dresden; NMW – Naturhistorisches Museum Wien.

Name of the island, its surface area and maximum elevation Name der Insel, ihre Fläche und höchste Erhebung	Mentioned in map and/or text by Valakos et al. (2008) Erwähnt in Karte und/oder Text in Valakos et al. (2008)	Observations (* - first record) [Original text / translation] Beobachtungen (* - Erstmeldung) [Textoriginal / Übersetzung]
Euboea / Euböa (3660 km^2, 1257 m)	X	- Cyrén (1935*) [auf dem Rückweg von einem Ausflug nach Steni, ein Exemplar neben mehreren *Clemmys*. Das Exemplar war stark deformiert und ging in Stockholm ein / on the way back from a trip to Steni, one individual among numerous *Clemmys*. The specimen was strongly malformed and died in Stockholm]; - Fritz (2001) [Marmari MTKD 14347, Agia Anna (Fritz unpubl.)]
Gökçeada (Imbros) (279 km^2, 673 m)	-	- Broggi (1999*) [Mündungsbereich eines Baches bei Aydıncık am 29.4. sowie in einem Resttümpel 2 km entfernt am 5.5.1998 an der Ostküste / mouth of a stream near Aydıncık, April 24, and in a residual pool, 2 km away, on May 5, 1998, at the east coast]
Kos (287 km^2, 846 m)	X	- Fritz (1989*, 1993) [*E. orbicularis* cf. *hellenica* - NMW 28291, between Kos and Cape Psalidi]; - Wilson (2006b) including a voucher photograph showing *Emys* and *Mauremys* / mit einem Photobeleg, der *Emys* und *Mauremys* zeigt [I am the first person to find two species on this island: the European Pond Terrapin (*Emys orbicularis*).... / Ich war der erste, der zwei Arten auf der Insel fand: die Europäische Sumpfschildkröte (*Emys orbicularis*)....]; - Bader et al. (2009) [NMW 28291 - between Kos and Psalidi, 1 adult specimen, DOR, 13.IV.1984, leg. Grillitsch; 2 specimens June, 2006, fide Wilson in litt. 2008 / NMW 28291 - zwischen Kos und Psalidi, 1 adultes Exemplar, DOR, 13.IV.1984, leg. Grillitsch; 2 Exemplare Juni 2006 fide Wilson in litt. 2008]
Lesbos (Mytilene, Mitilini) (1636 km^2, 799 m)	X	- Broggi (1978*) [1 adultes Exemplar, DOR bei Ntipi am Nordende der Gerasbucht. Später erwies sich in diesem Gebiet etwa jede fünfte Schildkröte als *Emys*; weitere Jungtiere in einem Sumpf südlich des Hauptortes Mytilene / 1 adult specimen, roadkill, near Ntipi at the northern end of Geras bay. Later, every fifth turtle in the area turned out to be *Emys*; further juveniles in a swamp south of the town of Mytilene]; - Perez Mellado et al. (1999) [1 specimen observed near Moni Myrtiotissas-Filia (second record for Levos Island) / 1 Exemplar beim Kloster Myrtiotissas-Filia (zweiter Nachweis von Lesbos)]

Table 1 (continued from opposite page): Occurrence of the European Pond Terrapin *Emys orbicularis hellenica* (VALENCIENNES, 1832), on the Aegean Islands.

Tab. 1 (Fortsetzung der gegenüberliegenden Seite): Vorkommen der Europäischen Sumpfschildkröte *Emys orbicularis hellenica* (VALENCIENNES, 1832) auf den Inseln der Ägäis.

Name of the island, its surface area and maximum elevation Name der Insel, ihre Fläche und höchste Erhebung	Mentioned in map and/or text by VALAKOS et al. (2008) Erwähnt in Karte und/oder Text in VALAKOS et al. (2008)	Observations (* - first record) [Original text / translation] Beobachtungen (* - Erstmeldung) [Textoriginal / Übersetzung]
Limnos (Lemnos) (476 km^2, 430 m)	X	- SCHNEIDER (1986*) [Lediglich zwei Exemplare konnten in einem größeren Restwasserbereich in Strandnähe bei Nevgatis beobachtet werden / Only 2 specimens were observed in a larger residual waterbody near the beach at Nevgatis]; - STRACHINIS (2009) [June 8 2009: First day I went for walk in my village at a little bridge with some water and observed the first reptiles, tens of Balkan Terrapins (*Mauremys rivulata*),….and one single specimen of the very rare on the island European Pond Terrapin (*Emys orbicularis*) / 8. Juni 2009: Am erten Tag bei einem Spaziergang in meinem Dorf an einer kleinen Brücke über eine kleine Wasserstelle beobachtete ich die ersten Reptilien; dutzende Ostmediterrane Bachschildkröten (*Mauremys rivulata*),…..und ein einzelnes Exemplar der auf Inseln sehr seltenen Europäischen Sumpfschildkröte (*Emys orbicularis*)]
Mykonos (86 km^2, 390 m)	-	- ? BRINGSØE (1985*) [Moreover, I have observed [sic!] one specimen collected on Mykonos by a Swedish tourist, this is a first record for the Cyclades / Weiters beobachtete [sic!] ich ein Exemplar, das von einem schwedischen Touristen auf Mykonos gesammelt worden war; das ist der Erstnachweis für die Kykladen]
Rhodes / Rhodos (1401 km^2, 1295 m)	X	- ? HELMDAG (1993*) Arguable sighting / Unsicherer Sichtnachweis [Zwischen Dimilla und Salakos, in einer größeren Gruppe von *Mauremys* / Between Dimilla and Salakos, within a larger group of *Mauremys*]
Samos (478 km^2, 1434 m)	X	- BUTTLE (1995*) Without comment / Ohne Kommentar; - MEYER & FRITZ (1996) Photo documentation of a *hellenica* specimen on the reed coverd bank of a reservoir near the mouth of the stream Tourkomylona near the villages Mesokambos and Mykali where *Mauremys* was common, 12 April, 1996 / Fotodokumentation eines *hellenica* Exemplares am verschilften Ufer eines Bewässerungsteiches nahe der Tourkomylona-Mündung zwischen den Ortschaften Mesokambos und Mykali, wo ansonsten *Mauremys* zahlreich war, 12. April 1996.
Samothrake (178 km^2, 1626 m)	X	- BROGGI (1988*, 1994) [Östlich des Fonias-Baches, hangwärts der Küstenstraße, 26.5.1987, zwei adulte Exemplare beobachtet. (Habitatfoto: Abb. 4) / East of the stream Fonias, mountainwards of the coastal road, May 26, 1987, two adult specimens observed (for habitat see Fig. 4)]
Thassos (380 km^2, 1108 m)	X	- FRITZ (2001)* [MTKD 39627] - FOWLES (2012) Observation by an informant (Yann HORSTINK) in July 2007 / Beobachtung durch eine Gewährsperson (Yann HORSTINK) vom Juli 2007
Tinos (195 km^2, 727 m)	X	- ? BIBRON & BORY DE SAINT-VINCENT (1832) [At the mouth of the river Eurotas on Tinos Island / An der Mündung des Eurotas auf Tinos]

Fig. 2: The first documented proof for the presence of *Emys orbicularis* (Linnaeus, 1758) on an Aegean island was this photograph of a roadkill specimen found in the nortern end of Geras Bay near the village of Ntipi on the Island of Lesbos in 1978. (Photo: Mario F. Broggi)

Abb. 2: Der erste belegte Nachweis von *Emys orbicularis* (Linnaeus, 1758) für eine Ägäisinsel war das Foto eines überfahrenenen Exemplares vom Nordende der Gerasbucht bei Ntipi auf der Insel Lesbos im Jahre 1978. (Photo: Mario F. Broggi)

Fig. 3: *Emys orbicularis hellenica* (Valenciennes, 1832) in the estuary of a stream near Aydıncık on the island Gökçeada on May 5, 1998. (Photo: Mario F. Broggi)

Abb. 3: *Emys orbicularis hellenica* (Valenciennes, 1832) im Mündungsbereich eines Baches bei Aydıncık auf der Insel Gökçeada am 5. 5. 1998. (Photo: Mario F. Broggi)

Fig. 4: Habitat requirements of *Emys orbicularis hellenica* (VALENCIENNES, 1832) comprise larger, well vegetated water bodies as were found in the vicinity of the Fonias stream on Samothrake in 1987. (Photo: Mario F. BROGGI)

Abb. 4: *Emys orbicularis hellenica* (VALENCIENNES, 1832) ist vor allem auf größere, mit Vegetation ausgestattete Wasserflächen angewiesen, wie sie im Nahbereich des Fonias-Baches auf Samothrake im Jahr 1987 auftraten. (Photo: Mario F. BROGGI)

for Lesbos, Samothrake and Gökçeada (BROGGI 1978, 1988, 1999) were all found among prevalent co-occurring *M. rivulata*. However, the first record of Lesbos and the earliest voucher of Kos (NMW 28291) are based on roadkill specimens. Records from Thassos include a voucher [MTKD 39627 - FRITZ 2001) and a sighting from the vicinity of Prinos in July, 2007, when a single individual of *Emys* among about 20 *M. rivulata* was observed by Yann HORSTINK in a system of ditches vegetated by reed (FOWLES 2012). On the other hand, due to the rareness of *Emys*, one can frequently observe that field herpetological reports covering the Aegean do not mention new records of this turtle species from islands, where it was already detected (e. g., BADER et al. 2009 for Rhodes; CATTANEO 2001, 2003 for Thassos, Samothrake, Lemnos, Lesbos and Samos; KASAPIDIS et al. 1996 for Lesbos).

The availble information on the distribution pattern of *Emys* in the Aegean suggests to carefully look for this species on the offshore islands of Chios (Hios), Ikaria, Kythira, Andros and the Northern Sporades. On these islands, which indeed offer suitable habitats, *Emys* is not yet detected and may well have been overlooked.

CAUSES OF THREAT AND THE SITUATION OF THE POPULATIONS OF *EMYS* ON AEGEAN ISLANDS

The threat status of the populations of *Emys* on the Aegean Islands has never been assessed. Concrete information regarding population size is not available; all that is known originates from museum specimens and the above anecdotal reports of the species' occurrence. In the past decades, however, there was a constant decline in number and size of the islands' larger wetland habitats which are essential for the survival of *Emys* (CATSADORAKIS & PARAGAMIAN 2007). Due to these massive changes in the choro-

logical conditions, the status of its populations on the Aegean islands has to be classified "Threatened". The sporadic records in the literature and the authors' personal observations categorize the European Pond Terrapin of the Aegean Islands as an extremely rare animal. In addition, all potentially existing populations are highly isolated, which causes strongly delimited gene exchange.

In a modified environment, habitat specialists obviously suffer from higher extinction rates than ubiquists. In the case of *Emys* and the Aegean Islands, potential habitats are scattered and small (on little islands in particular), both in number and size. As a consequence, *Emys orbicularis* holds a leading position regarding the probability of extinction among the reptiles of the Aegean Islands (Foufopoulos & Ives 1999; Foufopoulos et al. 2011).

The existence of *Emys* populations is vitally bound to the presence of freshwater wetland habitats. Especially in the last decades, their number is in dramatic decline, both due to local technical interventions to the water regime (e.g., drainage, increased abstraction of surface water for irrigation and drinking water) and climate change. Moreover, the habitats of the Pond Terrapin are compromized by their destruction in the process of developing beach tourism, but sometimes also by extension of agricultural activities into the beach area (Morand 2001). Thus, the sandy soils in the environs of the beaches, which are essential prerequisites for the Pond Terrapin's egg deposition, become less and less available. Further important causes of threat comprise increasing frequency and magnitude of bush and forest fires, and the road traffic. Finally, the European Pond Terrapin is in a top consumer position within the food web, and thus is increasingly exposed to potentially toxic chemical substances applied in agriculture, industry, craft and household. In addition, the following predators must be expected to occur on the islands: various big sized bird species, mustelids (marten, badger), canids (fox, golden jackal, domestic dog), and domestic cats. The brown rat (*Rattus norvegicus*) in particular is dangerous to estivating and hibernating specimens of *Emys*, its eggs and juveniles, just as the freshwater crab, *Potamon*. Escaped or released North American Red-eared Sliders *Trachemys scripta elegans* (Wied, 1838), which are ubiquitous pets, spread inexorably into many parts of the world, southern Europe included (e.g., Wilson 2006b - "Near a fresh water pond I found Balkan Terrapin (*Mauremys rivulata*) and some red-eared sliders (*Trachemys scripta*) which it would seem is now found on most Greek island, but does not seem particularly threatening to native terrapins, at least not here"). This Slider population on the Island of Kos was observed already 15 years ago (Bringsøe 2001 - B. Lindhe pers. comm. 1997). Almost nothing is known about interspecific competition between *Trachemys* and autochthonous turtle species (Bringsøe 2001).

CONCLUSIONS

The key results of this paper are summarized as follows:

1. The European Pond Terrapin is present on some of the larger Aegean islands off the mainland of Boeotia, Thrace and Asia Minor; reliable records from the Cyclades, Northern Sporades and the islands of the south Aegean island arc are missing.

2. As inhabitants of primarily limnic wetland structures, the island populations of *Emys* are subject to massive restrictions of their range area proper in that their habitats are shrinking due to a plethora of reasons but also exposed to various other adverse effects.

3. The existing island populations of *Emys* are, without exception, very small and isolated from each other. However, one can not exclude the possibility that there remain unnoticed, sparse *Emys* populations occurring in hidden syntopy with *M. rivulata*.

4. The available information clearly points to the fact that most Aegean island populations of *Emys orbicularis* are acutely threatened with extinction. *Emys orbicularis* as a species must be expected to disappear from the islands if its habitats are not immediately preserved and protected.

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