

Sightings and successful reproduction of allochthonous reptiles in Calabria

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Submitted on: 2010, 16th July; revised on: 2010, 8th September; accepted on: 2010, 20th September.

Abstract. This paper reports information about the presence of three allochthonous reptiles species in Calabria: *Testudo marginata*, *Trachemys scripta elegans* and *Chamaeleo chamaeleon*. The first one was found in three sites located in the Catena Costiera Massif and in the Crati Valley (Northern Calabria). The slider turtle was found in seven different sites throughout all the region. It massively colonised the Angitola artificial lake: here, this turtle lives in natural conditions and its reproduction was confirmed by the presence of nests, eggs and hatchlings. *C. chamaeleon* is present in sandy coastal habitats near Palmi and Gioia Tauro (Southern Calabria). From a conservationistic point of view, serious damages to autochthonous species could be caused by the spreading of *T. scripta elegans*: this species has already determined the local extinction of Angitola's *Emys orbicularis* populations.

Keywords. Allochthonous reptiles, Calabria, *Testudo marginata*, *Trachemys scripta elegans*, *Chamaeleo chamaeleon*.

INTRODUCTION

Animals or plants that have been intentionally or accidentally transported by man outside their biogeographic area are considered as introduced, non-native, allochthonous, exotic or alien species. An introduced species turns into an invasive species when, once overcome the acclimation period, it can spread in the new environment and causes ecological and economical injuries (Pimentel et al., 2000). The introduction of a growing number of species outside their native range is one of the main causes of biodiversity loss and species extinction: in fact, exotics may displace and reduce populations of native species (Holland, 1993; Vitousek et al., 1996; Kupferberg, 1997; Wilson, 1997; Hoddle, 2004) and can influence the way by which they use habitat resources (Herlbold and Moyle, 1986; Williamson, 1996).

The principal factors behind species introduction, whether intentional or unintentional, are to be found not only in tourism and international trade, but also in the pet market and into a series of productive activities such as agriculture and breeding for food and industrial purposes (Howarth, 1991; Hill and Greathead, 2000; Henneman and Memmott, 2001; Hoddle, 2004; Gherardi et al., 2008). The ecological implications of these invasions are of primary importance and concern the entire biosphere, from aquatic to land habitats. A first and valuable tool for managing invasive species of conservation importance is the knowledge of their presence and localization in the territory and the confirmation of their successful reproduction in natural conditions. For example, in Italy as far as mammals are concerned, there are 15 non-native species, the majority being rodents, and 110 non-native species of birds (Andreotti et al., 2002). At least, six reptiles and one amphibian have been introduced (Sindaco et al., 2006). Moreover, the outcome of an introduction is usually unpredictable unless demography, resource utilisation and biotic relationships have been carefully investigated (Lodge, 1993; Kareiva, 1996; Shigesada and Kawasaki, 1997; Cadi and Joly, 2004). The aim of this paper is to provide data on the presence of allochthonous reptiles in Calabria, the southernmost region of the Italian peninsula, and to assess their successful reproduction. In fact, observations related to this topic, especially to *Trachemys scripta elegans* reproduction, are scant for southern Italy (Ficetola et al., 2009).

MATERIALS AND METHODS

Data collection included field researches and the collection of information from local peoples, mainly from farmers, shepherds and foresters. Field researches were performed during years from 1998 to 2008, above all in spring and summer when species are more active. A total of 269 sampling sites were investigated along all the region. On average, each site was visited three times (range 1-7). Data collected were registered in the Herpetological Database of the Department of Ecology, University of Calabria (Rossi et al., 1991). Verification of red-eared terrapin reproduction in the Angitola Lake was performed during 2007 and 2008, by visual census. The reproductive success was considered as "confirmed" if nests with eggs and hatchlings were observed. Cartographical analysis was carried out employing the GIS vector cartographic software Map-Info.

RESULTS

Twelve records of allochthonous reptiles were collected, for an amount of three species: *Testudo marginata* Schoepff, 1792, *Trachemys scripta elegans* (Schoepff, 1792) and *Chamaeleo chamaeleon* (Linnaeus, 1758). Their distribution in the study area is showed in Fig. 1.

The presence of *T. marginata* (Fig. 2 A) was confirmed in three sites located in the Catena Costiera Massif and in the Crati Valley with an elevation from 160 to about 800 m a.s.l. All our observations referred to adult specimens observed in the wild. No nests nor newborns were observed.

The slider turtle *T. scripta elegans* (Fig. 2 B) was found in seven different sites with an elevation from 0 to 50 m a. s. l.; the individuals observed near Brancaleone (RC) represent the southernmost record known for the Italian peninsula. Data collected in the field

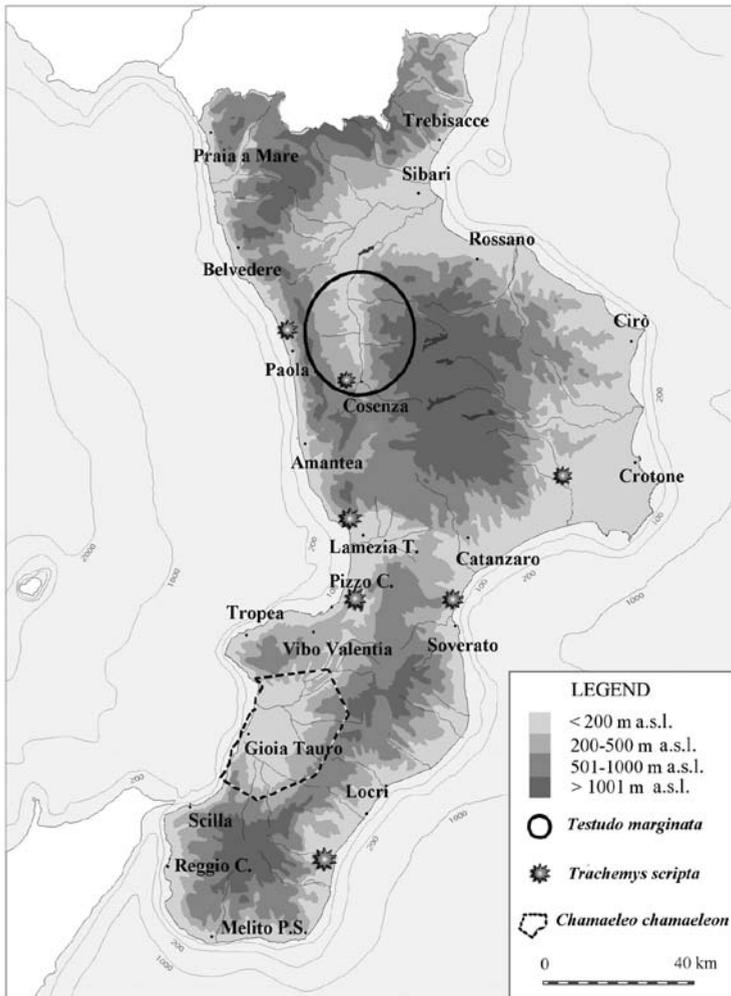


Fig. 1. Distribution map of sightings of allochthonous reptiles in Calabria.

showed that the species has massively colonised the Angitola artificial lake (VV): here, during 2007 and 2008, we observed that this turtle lives in natural conditions and it is well naturalized. In this site, the reproduction of the species was widely confirmed. Eighty nests were discovered during a systematic search around the lake perimeter (Fig. 2 C). Clutch size ranged from one to ten eggs for nests (average 3.73 eggs for nest). Newborns were observed in water.

C. chamaeleon (Fig. 2 D) was found in two sites characterised by coastal scrub habitats or pine forests near Palmi and Gioia Tauro (RC). All our observations referred to mature specimens.

In Table 1 locality, elevation and habitat description for each site of presence of allochthonous reptiles are reported.

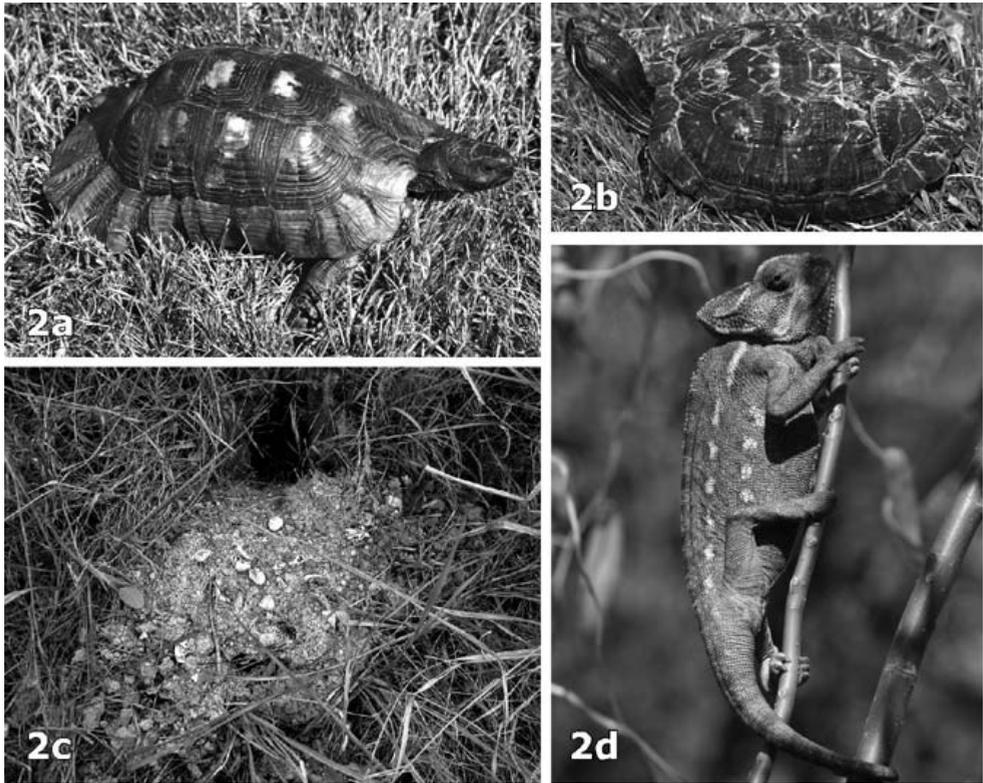


Fig. 2. Allochthonous reptiles of Calabria: *Testudo marginata* (A), *Trachemys scripta elegans* adult (B) and nest (C), *Chamaeleo chamaeleon* (D).

Table 1. Features of the finding sites where allochthonous reptiles were found

Species	Finding site	Habitat	Elevation	Year
<i>C. chamaeleon</i>	Palmi	Coastal pine forest	5 m a.s.l.	1994
<i>C. chamaeleon</i>	Gioia Tauro	Coastal scrub	10 m a.s.l.	2000
<i>C. chamaeleon</i>	Palmi	Coastal pine forest	5 m a.s.l.	2002
<i>C. chamaeleon</i>	Palmi	Coastal pine forest	5 m a.s.l.	2007
<i>T. marginata</i>	S. Vincenzo Lacosta	Uncultivated area	800 m a.s.l.	1997
<i>T. marginata</i>	Rose	Scrub	800 m a.s.l.	1999
<i>T. marginata</i>	Tarsia	Uncultivated area	160 m a.s.l.	2007
<i>T. scripta</i>	Angitola	Lake	70 m a.s.l.	2007
<i>T. scripta</i>	Paola	Stream	10 m a.s.l.	1999
<i>T. scripta</i>	Nasari	Pond	50 m a.s.l.	2001
<i>T. scripta</i>	Crotone	Pond	27 m a.s.l.	2003
<i>T. scripta</i>	Brancaleone	Pond	50 m a.s.l.	2005
<i>T. scripta</i>	Lamezia Terme	Pond	100 m a.s.l.	2005
<i>T. scripta</i>	Castiglione Cosentino	Pond	250 m a.s.l.	2007

DISCUSSION

Our research showed the presence of three species of allochthonous reptiles in Calabria. *T. marginata* and *C. chamaeleon* showed a localized distribution: our sightings have been made in widely different habitat types, often near human settlements, suggesting recent introduction. *T. marginata* is a non-native species for Italy, although its introduction to Sardinia and Etruria dates back to ancient time (Sindaco et al., 2006). Data presented in this paper add to few undated records for peninsular Italy: Tuscany (Sindaco et al., 2006) and Latium (Carpaneto, 2000). It is interesting to observe that Calabrian population is located at an altitudinal range higher than the optimal one (0-400 m a.s.l.) showed by the Sardinian records. The presence of the Mediterranean chameleon in Calabria represents a new datum: the species, in fact, has been reported for Sicily (Gasc et al., 1997) and for Apulia (Basso and Calasso, 1991; Fattizzo, 1996; Fattizzo and Marzano, 2002), where since 1980 observations lasted about ten years could indeed imply a small reproductive population, especially considering the limited longevity of the species. Calabrian records cover years from 1994 to 2007: so, the naturalization and successful reproduction of the species could be possible.

Among allochthonous reptiles species founded in Calabria, the most problematic one is the red-eared slider turtle (*T. scripta elegans*), introduced in the 1980s (Tripepi and Aceto, 2000). Widespread as a pet, it was frequently abandoned in natural habitats and in urban areas. Our research showed that this turtle has a widespread distribution in the study area, as also observed in other regions of Italy: Piedmont (Andreone and Sindaco, 1999), Lombardy (Ferri and Di Cerbo, 1995; Bernini et al., 2004), Trentino Alto Adige (Caldonazzi et al., 2002), Veneto (Fracasso et al., 2000), Friuli Venezia Giulia (Lapini et al., 1999), Liguria (Doria and Salvidio, 1994), Tuscany (Scoccianti and Cigna, 1999), Emilia-Romagna (Lanza and Corti, 1993), Latium (Marangoni, 2000), Molise (Lanza and Corti, 1993), Apulia (Scillitani et al., 1996) and Sicily (Turrisi and Vaccaro, 1998). However, in some regions the presence of the species has occurred only in single localities or refers only to single individuals. Not much is known about reproduction of *T. scripta* in natural habitats in Italy. It seems that the species is certainly able to reproduce, not in the wild but only in urban or suburban pools, as in Friuli Venezia-Giulia (Lapini et al., 1999) and Latium (Marangoni, 2000). Ferri and Di Cerbo (1998) reported for Piedmont and Lombardy only egg-depositions, but not hatchlings. Ficetola et al. (2003) reported the case of the reproduction of this species for the Po Delta. This paper presents the first confirmed reproductive site in the wild for *T. scripta* in Southern Italy: its reproductive success was also confirmed in Europe only for France (Cadi et al., 2004) and Spain (De Roa and Roig, 1997; Martinez-Silvestre, 1997; Bertolero and Canicio, 2000; Capalleras and Carretero, 2000). The high number of nests founded around the Angitola Lake disproves the hypothesis outlined by Luiselli et al. (1997) that suggested that the danger of naturalization of the species is less serious than is thought. It is believed that this species can compete with *Emys orbicularis*, the only native European pond turtle inhabiting Calabria, currently in sharp decline due to alterations to water surfaces (Cadi and Joly, 2003, 2004). It is due to the fact that the Chelonian communities in North-American freshwaters differ from the European ones: in fact, whereas most European freshwater habitats are commonly occupied by only one species, North-American habitats support

up to six species (Gibbons, 1990). In such assemblages, species exhibit high competitive abilities that ought to favour their establishment in European waters, at the expense of the niche breadth of species such as *Emys orbicularis*. In particular, the expected advantage of allochthonous species relies on lower age at maturity, higher fecundity and larger adult body size (Rollinat, 1934; Cagle, 1946; Lebboroni and Chelazzi, 1991; Arvy and Servan, 1998; Cadi and Joly, 2003, 2004). On the basis of these assumptions, and due to the fact that there are no sightings of individuals of *E. orbicularis* from the Angitola Lake since 1992 (Tripepi and Aceto, 2000; G. Paolillo pers. comm.), it is possible to affirm that the presence of *T. scripta* in the study area could affect the fitness and survivorship rate of *E. orbicularis*.

On the basis of the collected data, from a conservationistic point of view, we can affirm that:

- *T. marginata* and *C. chamaeleon* are alien, but not invasive species according to the IUCN (2000) classification, and should thus be subjected to biodiversity conservation measures;

- *T. scripta* potentially threatens natural populations of *E. orbicularis* and it can be considered as a serious invasive alien species and several European countries have stopped the importation of the red-eared slider from North-America.

Our results demonstrate a need for:

- estimating the size of *T. scripta* populations in Calabria;
- evaluating their reproductive success;
- planning the removing of the exotic turtles from natural habitats, where possible.

Such actions are urgent and remain a challenge for the managements of natural environments.

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