

Conservation actions for European pond turtles – a summary of current efforts in distinct European countries

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The “European” pond turtle (*Emys orbicularis*) is a widely distributed species, occurring not only in the European continent, as suggested by its common name. Its range embraces part of the northern African Maghreb region, much of southern and western Europe, Anatolia and vast parts of eastern Europe and adjacent Asia. It is a genetically deeply structured species, and the Sicilian pond turtle was recognized as a distinct species (*E. trinacris*) some years ago. The future will show whether additional genetic lineages currently recognized as subspecies of *E. orbicularis* will be also elevated to species status. In any case, the diversity of genetic and taxonomic structuring corresponds to the diverse habitats in which the turtles occur, ranging from mild Mediterranean climate to severe steppe climate with frosty, long winters. All of this diversity has implications for conservation strategies because the turtles are endangered in much of their range, necessitating individually designed solutions and approaches, depending from the local situation.

Pond turtles are often locally already extinct, and where still occurring, imperilled by habitat alteration mainly, but also by introduced neozoa, such as raccoon and raccoon dog. These species are preying turtles in a previously unknown extent, especially in the northern part of their range, where the turtles are more prone to these predators than elsewhere – not least due to their long generation time and low annual reproduction rate. Another imminent danger may be caused by the naturalized red-eared slider turtle (*Trachemys scripta elegans*) and other slider turtles. These relatives of the “European” species may directly outcompete the native turtle, but they also could introduce alien pathogens and harmful parasites. A further risk for *Emys* could

be even arising from well-meant conservation actions, when locally endangered populations are restocked with genetically incompatible individuals.

Yet, while the endangered and susceptible status of European pond turtles is generally recognized and also reflected by legislation, the knowledge of its status and local threats varies considerably from country to country. Even worse, despite many conservation actions carried out all over the distribution range, many conservationists are not aware of what is going on in other countries, and concerted actions across political borders remain an exception, despite many similar data being currently collected in the different countries. Ideally, similar data collection methods should be applied and the data obtained possibly being interpreted singularly and all together across the distribution range of the species, to highlight ecological and physiological patterns and processes in this species.

This collection of articles on the conservation activities for European pond turtles, published in Herpetology Notes, is intended as a first step to remedy the current situation. We are hopeful that the cork is now out of the bottle and the good genie starts to work!

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Conservation activities for European pond turtles (*Emys orbicularis*) in Hungary

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Keywords. *Emys orbicularis*, Hungary, conservation

Introduction

The European pond turtle is the only native chelonian species occurring within the present borders of Hungary. According to Fritz et al. (2007) Hungarian pond turtles belong to the nominate subspecies *Emys orbicularis orbicularis* (mtDNA haplotype IIa and/or IIc).

Hungarian *E. orbicularis* inhabit stagnant and slowly flowing water bodies. Although there is a single record from 490 m a.s.l. (probably as a result of introduction; Puky et al., 2004), the species is generally found at much lower altitudes (300 m or less). It has so far been documented from 220 out of 1,060 10 × 10 km UTM

squares (Farkas, 2008) and a nation-wide mapping program launched by WWF-Hungary keeps filling the gaps. The strongest populations are believed to inhabit the Great Hungarian Plain (Alföld) but quantitative data are lacking. There is no consensus regarding present status of *E. orbicularis* in Hungary: while some authorities report it in decline even in optimum habitat and certain popular sources claim it to be present in “very small numbers” in the country, others assert it to be in no need of specific conservation action. However, none of these statements is backed by hard evidence (Farkas, 2008).

Intense collecting for food in the 17th century followed by large-scale “reclamation” works initiated 200 years later resulted in steep declines in the numbers of Hungarian pond turtles, but the species was still considered abundant (Méhely, 1918; Dely, 1978). Whereas commercial collecting is no longer an issue, the fragmentation of wetland habitats continues, so the remaining populations tend to concentrate in artificial or semi-natural fish ponds. Unfortunately, the same waterbodies are also increasingly stocked with abandoned pet turtles (mainly *Trachemys scripta scripta* and *T. s. elegans* but other [sub]species have been reported as well) that may on the long run outcompete native *E. orbicularis*. For more detailed overviews in English see Farkas (2000) and Farkas and Gulácsi (2009).

Most research recently or presently conducted on Hungarian pond turtles is conservation-oriented and consists primarily of population surveys and monitoring according to standard procedures outlined in the National Biodiversity Monitoring System (Korsós, 1997; Kiss, 2005). Unfortunately, the Action Plan prepared in 2002 for WWF-Hungary by B. Farkas was ultimately not approved by the Minister of Environment and Water, so conservation activities remain largely uncoordinated and seriously underfunded.

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Conservation projects

Location: Gyálai Holt-Tisza (backwater of Tisza [Theiss] River), Szeged, Csongrád County

Project duration: 2002–present

Funding agency: Kiskunság National Park Directorate

Conservation project responsible: György Györffy

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Local *Emys* conservation problems: This heavily polluted, almost anoxic backwater gives home to a large population of *Emys orbicularis*. A recultivation of the area is in the plans, the effects of which are difficult to foretell.

Conservation project activities and main results: Data on sex ratio, morphological characteristics, age structure, injuries and anomalies, spatial distribution, activity patterns, home site fidelity, physical condition, changes in body mass of adult specimens, reproduction, etc. are also collected. The first results of these investigations were published by Balázs and Györffy (2006) and Györffy (2008).

Location: Peszéradacs meadows, Bács-Kiskun County

Project duration: 2005–2006, 2010

Funding agency: Kiskunság National Park Directorate

Conservation project responsible: Tamás Péchy

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Local *Emys* conservation problems: Lack of information about the distribution and habitat use of the species, considering the seasonal changes of available natural or semi-natural water-bodies.

Conservation project activities and main results: The goal of this study was to monitor population level changes and to determine habitat preference, seasonal movements and potential nesting sites of the local *Emys* population.

Location: Csengersima fish ponds, Császló; Nagyecsed, Szabolcs-Szatmár-Bereg County

Project duration: 2005–present

Funding agencies: Fűvészkeret Társaság Nature Conservation Society; Hortobágy National Park Directorate

Conservation project responsible: Tibor Somlai

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Local *Emys* conservation problems: The natural forestation of these semi-natural ponds and the continuous expansion of human habitations cause range fragmentation. Due to the loss of suitable nesting grounds close to water, female pond turtles are forced to undertake long and risky trips during which they easily get injured or killed. Numerous specimens are also illegally collected in agricultural fields and populated areas on their way to egg-laying sites.

Conservation project activities and main results: The goal of this project is to treat wounded turtles and to repatriate rescued individuals to safe, remote fish ponds, as well as to reconstruct known and potential habitats by clearing the natural forestation of abandoned animal drinking pools and to create proper basking sites in the Nyírség and Bereg regions.

Location: Holt-Marcal (backwater of Marcal River), Győr-Gyirmót, Győr-Moson-Sopron County

Project duration: 2002–2008

Funding agency: Fertő-Hanság National Park Directorate

Conservation project responsible: Gábor Takács (coordinator, National Biodiversity Monitoring), Róbert Dankovics

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Local *Emys* conservation problems: The goal of this project was to monitor population level changes and to establish whether recreational fisheries and introduced red-eared sliders (*Trachemys scripta elegans*) posed a threat to the local *Emys* population.

Conservation project activities and main results: “Sit and wait” monitoring along a 1 km tract of the channel resulted in the observation of 2–31 specimens per occasion. The population appeared to be stable, with no need of specific conservation action; in seven years only two red-eared sliders were seen at a single occasion (in 2003).

Location: Boronka Protected Area, Somogyfajsz, Somogy County

Project duration: 2003–present

Funding agency: private

Conservation project responsible: Tamás Gergely Molnár

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Local *Emys* conservation problems: This semi-natural fish pond system harbors large concentrations of *Emys orbicularis*, but it is unknown whether there is any migration between ponds. Heavy predation by otters (*Lutra lutra*) may also negatively affect the diversity of the individual sub-populations.

Conservation project activities and main results: The genetic distance between the Dávodpuszta and Mike sub-populations is very low and the first results point to considerable inbreeding, probably also as a consequence of predatory pressure. Publications related to this project include Lanszki et al. (2006), Molnár et al. (2006) and Molnár (2008).

Location: Naplás Lake, Budapest

Project duration: 2001–2009

Funding agencies: WWF-Hungary; Szent István University, Gödöllő

Conservation project responsible: Tibor Kovács

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Local *Emys* conservation problems: Originally selected as a model site where comprehensive conservation efforts were to be concentrated, Budapest's largest lake is part of a 150 ha protected, but highly frequented area. In addition to the great numbers of recreational fishermen, non-native turtles dumped into the lake may encumber the survival of *Emys orbicularis*. Basking and egg-laying sites are limited to a shadowy forest and reedbed.

Conservation project activities and main results: Active conservation measures included the setting of a row of buoys in order to keep away anglers from certain parts of the lake, and the mounting of basking platforms. Red-eared sliders caught in the lake were transferred to Budapest Zoo. All specimens captured in turtle traps were individually marked. Data on sex ratio, morphological characteristics, spatial distribution, activity patterns and habitat fidelity were collected. Publications resulting from this project include Kovács et al. (2004), Torvaj (2008) and Lovász (2010).

Location: Péteri Lake System, Pálmonostora, Bács-Kiskun County

Project duration: 2005–present

Funding agency: Kiskunság National Park Directorate

Conservation project responsible: László Molnár

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Local *Emys* conservation problems: With a total surface of approximately 220–240 ha, Péteri Lake System was used for farming fish until 2000. The main issue is the decrease of water level and desiccation. In addition, pond turtle nesting sites are in part located along a major road, which results in high female mortality. Predatory pressure on eggs is also very high.

Conservation project activities and main results: The turtle population of Lake II is monitored. So far more than 1000 specimens caught in traps have been individually marked. Data on sex ratio, spatial distribution, activity patterns, etc. are collected. The first results of the investigations were summarized by Kalmár (2007, 2008), based mainly on the survey of Zs. Kalmár and I. Kiss conducted in 2005–2007. In spite of obvious conservation problems, the local population seems to be stable.

Location: Vörös Swamp, Császártöltés, Bács-Kiskun County

Project duration: 2008–present

Funding agency: Kiskunság National Park Directorate

Conservation project responsible: Péter Agócs

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Local *Emys* conservation problems: There are numerous smaller and larger ponds in this 930 ha area created by past turf mining activities. Pond turtles occur throughout the system but there is no information as to the exact size of the population and its actual distribution. Furthermore, the effects of fish farming on turtles have never been studied.

Conservation project activities and main results: Pond turtles are caught in traps and individually marked. Data on sex ratio, spatial distribution, activity patterns, etc. are collected.

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Conservation activities for European pond turtles (*Emys orbicularis*) in Switzerland

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Keywords. *Emys orbicularis*, Switzerland, conservation

Introduction

During the Holocene expansion, Switzerland was probably recolonized by *Emys orbicularis orbicularis* haplotype IIa north of the Alps and by *E. orbicularis hellenica* haplotype IVa (as defined in Lenk et al., 1999) south of the Alps (Fritz, 2003). Due to the climatic conditions in Switzerland, the suitable habitats to species occurrence are limited to the Swiss Plateau (north of the Alps) and the Ticino region (south of the Alps) at an elevation below 500m. Historically, the species was probably common in numerous aquatic habitats such as lakes, ponds, marshlands and rivers as suggested by subfossil records. However, human activity (e.g. fishing) and the destruction of aquatic habitats and nesting sites have led to the decline of *E. orbicularis* populations in Switzerland.

Native populations may have survived in Switzerland until the 17th or 18th centuries (Fatio, 1872; Fritz, 2003). Observations conducted during the 20th century indicate that the individuals currently living in Switzerland are likely to be escaped or released from captivity and not representing relict populations (Monney and Meyer, 2008). This assumption is corroborated by genetic analyses. Presently, only one breeding population of about 350 allochthonous individuals is reported from the canton of Geneva. This population results from successive introductions of turtles of haploclades II, IV and V during the 1950's. The possibility that autochthonous individuals survived in this location is unlikely (Raemy, 2010). Due to the low number of

individuals and to the occurrence of a single breeding population in Switzerland, *E. orbicularis* is considered as critically endangered (Monney and Meyer, 2005) and as a target species for national conservation programs.

Conservation projects

Location: Swiss Plateau (below 500m of elevation) and Ticino

Project duration: 2010 - present

Fundings: Federal Office for the Environment, Geneva Canton (Direction générale de la nature et du paysage), Communauté d'Intérêts pour les Tortues en Suisse (CITS/SIGS)

Conservation project responsables: Jean-Claude Monney (Karch - Koordinationstelle für Amphibien- und Reptilienschutz in der Schweiz, Neuchâtel), Matthieu Raemy (Universität Basel), Sylvain Ursenbacher (Universität Basel)

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Local *Emys* conservation problems: In Switzerland, due to the high human density on the Swiss Plateau and in the Ticino region, the natural suitable habitats (aquatic ecosystems) and nesting sites of *Emys orbicularis* have seriously been altered and only a few locations may be currently still suitable to the survivorship of this species. Furthermore, available aquatic habitats often lack basking and nesting sites. Therefore, an ecosystems restoration is needed to ensure the presence of suitable habitats for this species. Furthermore, various allochthonous subspecies are currently found in Switzerland, probably due to imported individuals of different subspecies or haploclades that were either released or escaped into the wild.

Conservation project activities and main results: The goals of the *Emys* conservation project in Switzerland are 1) to recreate stable and viable populations in favourable sites 2) to manage and protect favourable sites with regards to the requirements of this species (management and creation of nesting sites) 3) to promote scientific research on the species to improve the chances of successful reintroductions 4) to improve the genetic purity of the species by reintroducing native subspecies (*E. o. orbicularis* IIa north of the Alps and *E. o. hellenica* IVa south of the Alps). Among favourable locations selected by preliminary habitat analyses, the site of Prés Bordon (about 10 km of Geneva) was chosen for the first reintroduction programme in Switzerland. This natural reserve (at an altitude of 480m) comprises three interconnected ponds restored in 2008 with aquatic and riparian vegetation, basking and nesting sites. Presence of surrounding natural forest and wetlands would allow further colonisation in other ponds and wetlands. In 2010, 14 juveniles previously genotyped and belonging to the native subspecies were released in the natural reserve of Prés Bordon. Schools of the surrounding villages, medias and politicians actively

participated to the release in order to increase awareness to the protection of this species and to the preservation of aquatic ecosystems. Juveniles were obtained from the Association Protection et Récupération des Tortues (PRT) and from two private breeders of Swiss *Emys*. All individuals were marked with specific notches in the carapace and equipped with transmitters to evaluate their settlement and survival during one year. Preliminary results suggest that all individuals survived and settled in the site. A monitoring using nets is planned every year to estimate survival and growth rates. Further studies will be conducted to evaluate breeding success and the location of nesting sites..

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Conservation activities for the European pond turtle (*Emys orbicularis*) in Germany

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Keywords. *Emys orbicularis*, Germany, conservation

Introduction

The European pond turtle (*Emys orbicularis*) reaches its north-western range border in north-eastern Germany. According to present investigations the last native populations in Germany are limited to Brandenburg. *E. orbicularis* belongs to the most endangered vertebrate species in Germany. Such species are placed in the Red Data Lists of the German federal states in the categories “extinct”, “endangered by extinction” or “no occurrence”. In the Red Data List of the Federal Republic of Germany, the European pond turtle is found under “endangered by extinction” (Kühnel et al., 2009).

Historically, native pond turtles were distributed in northeastern Germany and in southern and western Germany (in the Rhine valley and near Lake Constance; Kinzelbach, 1988, Schneeweiß and Fritz, 2000). Further historical occurrences cannot be excluded and are often discussed in the literature (Dürigen, 1897, Fritz and Günther, 1996).

Up to the 18th century, the European pond turtle was still so common in some regions of northeastern Germany that large numbers could be captured and sold (Bekmann, 1751, Schneider, 1783, Dürigen, 1897, Schneeweiß, 1997). This was one of the important historical reasons for the extinction of populations. Several colds periods (small ice age) certainly have had a negative natural impact from the 16th to the 19th century. In later times, the draining of marsh forests,

swamps and small ponds led to a drastic reduction of habitats. Numerous nesting sites were destroyed by intensification of agriculture (especially by the change of meadows in arable land) and reforestation in the second half of the 20th century. Currently, traffic on roads and forest ways constitute the main threats, together with the high abundance of predators (especially racoon, racoon dog, wild boar and fox; Schneeweiß and Wolf, 2009).

In 1993, the Niederbarnim (today Rhinluch) Station for Nature Conservation started a project for the investigation and protection of the relict populations of the pond turtle in Brandenburg (Schneeweiß, 1995, 1998). This project still runs with different partners and sponsors (Schneeweiß, 2006). Under the direction of the state agency for environment and nature conservation, field studies were carried out also in the federal state of Mecklenburg-Vorpommern (Breu and Korzetz, 2005), but no population could be found there and a reintroduction project was initiated. In recent reintroduction attempts, efforts have been made based on the breeding of genetically suitable *E. orbicularis* in the federal states of Hessen (Schweitzer, 2005) and Rheinland-Pfalz.

Conservation projects

Location: Northeast Germany, Brandenburg and Mecklenburg-Vorpommern

Project duration: 1993 - present

Funding agency: Heinz Sielmann Stiftung, Klara Samariter Stiftung, Naturschutzfonds Brandenburg, HIT Umwelt- und Naturschutz Stiftungs-GmbH, EU-LIFE-Nature (2005-2009), Deutsche Gesellschaft für Herpetologie und Terrarienkunde (DGHT), Ministry of the Environment Brandenburg, private donations.

Conservation project responsible: Dr. Norbert Schneeweiß (Brandenburg), Dr. Kerstin Greulich (Brandenburg), Heike Zbierski (Brandenburg), Hartmut Breu (Mecklenburg-Vorpommern)

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Local *Emys* conservation problems: A problem was and is the low population size (<20 individuals/population), the over-aging of populations (Schneeweiß, 2003, 2004) and their isolation from each other. During recent years the increase of motorized traffic on streets and forest ways has caused increasing losses. Furthermore, turtles walking over land fell victim to heavy agricultural machinery on arable land.

A specific threat for one population was the release of allochthonous *E. orbicularis* (Schneeweiß, 2001). This is also a potential threat for all relict populations and occurs mainly in the vicinity of towns where allochthonous *E. orbicularis* and also other non-native freshwater turtle species are often found. Currently, losses and injuries caused by predators increase in all populations. Wild boar and fox, whose populations have increased significantly during the last 20 years, prey on clutches and hatchlings at the nesting sites. Since end of the 1990s, the immigration of the neozoa racoon and racoon dog has proven particularly problematic (Schneeweiß and Wolf, 2009). Both of these species eat clutches and hatchlings. The racoon in addition predate on subadult and adult turtles in their aquatic habitat.

Conservation project activities and main results: The first and most important task in the 1990s was the successful protection and revitalization of habitats (especially nesting sites; Schneeweiß, 1998). Today, the habitats of the relict populations are protected and in a favourable conservation state. The management of habitats is one of the routine tasks within the scope of the project. An important measure was also closing forest ways for cars.

Already in 1995, a breeding station became an integral component of the project. The supplementation of relict populations started in 1998 and reintroduction at historical sites began in 2005. The first successes of these measures are a rejuvenating of populations and the gradual increase of some populations. In the pond turtle habitats racoon dogs and racoons are now strictly hunted. Nests are protected by wire netting against predators. Within the scope of the monitoring, the pond turtle populations as well as the conditions in their habitats are documented. Associated studies are dedicated to habitat use (radiotracking) (Schneeweiß, 2003, Paul, 2004) and the genetic status of the populations (Lenk

et al., 1999, Fritz et al., 2004, Velo-Antón et al., 2011). Currently the investigation of the influence of predators on the populations is a main focus.

Acknowledgments. These data have been collected thanks to a joined effort of the Conservation Committee of the SEH (Societas Europaea Herpetologica) and organized and edited by Y. Chiari. The authors are thankful to U. Fritz for his valuable comments on this manuscript.

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Historical and current situation of the European pond turtle (*Emys orbicularis*) in the United Kingdom

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Keywords. *Emys orbicularis*, UK, conservation

Introduction

The European Pond Turtle *Emys orbicularis* is presumed not to occur naturally in modern Britain. However, remains of this species have been found in at East Wretham, Norfolk (Eastern England) indicating that, since the last glaciation, the species did occur here. Sommer et al (2007, 2009) reported two specimens of *E. orbicularis* from southern Britain; the first (East Wretham) specimen was subjected to mitochondrial DNA analysis which helped position the British specimens genetically with other subfossils found in northern Europe. The second specimen was found in Three Holes Cave, in Devon, and had been carbon dated (4650 ± 70 years BP) but not subjected to mtDNA analysis. The identification of this specimen is doubted and it is now assumed to be an unidentified fragment of mammal cranial material (C. Gleed-Owen, pers. Comm.). The subfossil remains in Britain are therefore represented by only a single known, confirmed specimen from Norfolk believed to be about 5000-8000 years old, based on pollen spectra from the associated peat it was dug up from (C. Gleed-Owen 2012, Pers comm.). The species had a much wider distribution in Europe in the warmer 'post ice age' period and for a period of about 3,000 years after the end of the Younger Dryas, thermophilic terrestrial fauna could reach Britain before the 'land bridge' between UK and continental Europe was severed by rising sea levels at ca. 8500 bp (Lambeck 1995; Pelletier 1998, but see Jones and Keen, 1993 and Sommer et al., 2007) when further terrestrial immigration would have prevented. Natural colonisation to Britain by *E. orbicularis* seems quite likely (Sommer

et al, 2007). Subsequently there have been records of the species in the wild in UK (and most interestingly in Norfolk) from the 19th Century through to late 20th Century – and while these observations have not been systematically analysed or assessed, these animals have been assumed to have been released or escaped animals of origin from outside the UK. Records of *E. orbicularis* in Britain are few and far between and nothing recently that suggests anything more than occasional small groups or individual animals – and sometimes associated with released American species (notably Red eared terrapins *Trachemys scripta elegans* which is by far the most frequently encountered terrapin species in the UK). There are various reports about *E. orbicularis* breeding in the UK even within the last 20 years (though these have not been verified through this study); reportedly some Norfolk caught animals have previously been taken into captivity. There is no indication that any other species of terrapins are breeding in the wild in UK.

The post Ice Age, but prehistoric, presence of the species, and the observations of *E. orbicularis* since – some from known introductions others of uncertain origin – opens up the question about the relevance to conservation of the species of countries that are outside of the current known range, such as the UK. There is no systematic study of them; they may exist in the wild and may even breed – there is the very slightest possibility (but considered highly unlikely) that they are the remains of a small native population. In the light of threats within the known range elsewhere in Europe, and noting the likely impacts of climate change, even regardless of their 'native' status it may be pertinent to start a debate about whether conservation measures should be considered outside of the presumed current native range of the species and specifically whether there is merit in considering such work in the UK. It is worth noting the issue relating to the Pool Frog (*Pelophylax lessonae*)

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in UK. This species had generally been assumed to be non-native and it was only as they became extinct in 1990s that research was undertaken that indicated that it was in fact a native species; subsequently conservation work, including reintroduction programme, has been initiated.

Additional information has been posted on a RAUK (reptiles & amphibians in the UK) web page at: http://www.herpetofauna.co.uk/forum/european-pond-tortoise-emys-orbicularis_topic314_page1.html and page 2 of this link.

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Conservation activities for the European pond turtle (*Emys orbicularis*) in Serbia

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Keywords. *Emys orbicularis*, Serbia, conservation

Introduction

The European pond turtle inhabits entire Serbia, from the Pannonian lowland (Voivodina) in the north to the Pčinja and Preševo valleys near the border to the Former Yugoslav Republic of Macedonia in the south (Džukić, 1995; Gasc et al., 1997). The maximal vertical distribution is supposed to be 1500m a.s.l. (Crnobrnja-Isailović, unpublished data). According to previous observations, most populations in Serbia are situated at elevations below 1000 m altitude (Džukić, 1991). Populations occur in water bodies of various size, origin, age and vegetational structure (Crnobrnja-Isailović, unpublished data). An inspection of 12 localities in the municipality of the town Niš in southern Serbia suggested that pond turtles prefer slowly running or stagnant shaded waters, and with the presence of both land plants growing along water (up to 10m from the shore) and submersed plants in the pond (Savić, 2010). There is no available data about structure and dynamics of Serbian population.

The European pond turtle is strictly protected by national legislation (Anonymous, 2010). However, at least within the study area of Niš, the capital of Southern Serbia, the pilot study recognised the destruction of habitat due to pollution with waste and chemical products as major threat factor for this species (Savić, 2010). Other general factors of threat include habitat fragmentation and degradation, accidental killing by traffic, persecution by local fishermen, predation of

nests, eggs and hatchlings by domestic animals as a result of antropogenic change of pristine habitats and increased competitive pressure as a result of deliberate release of allochthonous *Trachemys scripta* into habitats of *E. orbicularis*. Also, the observations made during repeated visits to amphibian breeding sites in Serbia suggested a negative impact of the climate change on some aquatic habitats with pond turtles: it seems that the average increase of ambient temperature and lack of rainfall, together with already mentioned antropogenic change, actually accelerate the drainage of certain water bodies during summer months (Crnobrnja-Isailovic, unpublished data).

Conservation projects

Location: Voivodina region

Project duration: 2009- 2010

Funding agency: Secretariat for Environmental Protection and Sustainable Development of Voivodina Province and Netherlands Embassy in Belgrade, Serbia.

Conservation project responsible: Association for protection and development of environment and built heritage "Protego", Matije Korvina 9, 24000 Subotica

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Local *Emys* conservation problems: Autochthonous ecosystems in the Voivodina passed through severe changes in the last 200 years, what significantly influenced on structure and spatial distribution of the wetlands. These changes caused the extinction of *Emys orbicularis* populations in most pristine habitats. Now, this species can be found in both permanent and temporary water bodies, as well as in patchy distributed floodplain forests of the rivers Danube and Tizsa. Most of the pond turtle populations are small and almost non viable. The connection between fragments inhabited by pond turtles is either low or completely destroyed. According to local experts, the future of European

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pond turtles in the Voivodina is not bright. Without an adequate management plan, populations will decline very fast in the near future. The lack of published data on the contemporary distribution of this species in the Voivodina and the absence of information about population dynamics point to need for an urgent action for establishing successful procedure of data collection in the region. This, in turn, will allow a detailed mapping of pond turtle distribution. Furthermore, a number of ponds suitable for the occurrence of this species are located on private lands and are isolated from local populations. Most pond turtle populations exist in habitats with decreasing number of suitable nesting areas, where females have to use suboptimal ones, for example shaded places or arable land far away from the ponds. Far dispersed hibernation sites separate individuals and diminish chances for successful mating in the next spring.

Due to intensive agriculture in the area, the habitats of pond turtle became not just fragmented, but polluted as well. Apart from direct negative effects of pesticide-spray, (killing of pond turtles and diminishing the survival chances of their hatchlings), it also reduces diversity of their food items, e.g. invertebrates, probably producing an even more severe effect. Pesticides can contaminate ponds and thus destroy the ecosystem that both the juvenile and adult turtles depend on. Furthermore, the use of heavy machinery for intensive agriculture has a devastating effect on pond turtles' reproduction, by killing nesting females. Agricultural machines, especially those for cutting weeds in orchards, destroy nests and dig out incubating eggs which, exposed to the direct sunlight, consequently die off. Finally, a high predation rate could be harmful for very small and isolated populations. The loss of nesting sites is another serious threat.

Conservation project activities and main results: The status and perspectives of pond turtles in the Voivodina were discussed at a workshop held in 2008, where the necessity for protection of their populations was emphasized (Cekuš et al., 2008). After that, numerous activities were initiated with the goal of addressing main conservation issues regarding the survival of this species in northern Serbia (Voivodina):

1) raising awareness about the importance of *E. orbicularis* for the well-being of local ecosystems and involvement of local people in active protection of these animals. Leaflets describing biology of European pond turtles and the possible ways of their non-conflict cohabitation with men were prepared and distributed

through an educational campaign by visiting pond owners and by training fishermen through their societies. Leaflets were also presented to fishermen in the field; 2) rescuing turtles from private ponds and transporting them into the Zoo Palić Wildlife Rescue Center, then marking them individually, taking measurements, and releasing rescued individuals into the nature; 3) mapping distribution of pond turtles in northern Serbia in order to recognize the isolated individuals and small local populations that live in suboptimal conditions and evaluate possibilities for their recovering and reproduction; 4) organizing a campaign to promote the conservation of *E. orbicularis* through a press conference held at the Institute for Nature Protection in Novi Sad where promotional material (poster and leaflets) was distributed. Furthermore, the incoming results of monitoring and distributional data collection have been regularly posted on the <http://protego-org.org>.

The main results of this project were: 1) Contacts are established with six registered fishermen's societies and more than 50 pond owners. These actions mainly changed attitudes of citizens toward pond turtles, and furthermore, motivated people to participate in the collection of distributional data and monitoring. Successful contacts have been made with primary and high schools in the area as well. 2) More than twenty pond turtles were rescued during these actions. Their identification files are deposited into the data base managed by the Protego Society for further monitoring. 3) A map of geo-referenced data on the distribution of *E. orbicularis* in the Voivodina is published on the Protego web-site. The map is based on both already published and newly collected (obtained during the conservation project) data. 4) Promotional material for the *E. orbicularis* conservation campaign (including T-shirts, caps, magnets, DVDs, and posters with the specifically created logo) was distributed all around the region. All project activities were recorded with a professional video camera, summarised in a documentary movie and distributed among local TV stations for further awareness rising to pond turtle survival in the Voivodina. 5) Capacity building for pond turtle rescue in the Voivodina was done by networking with 15 ecological NGOs from the same region, which took active participation in the realisation of the project activities. A workshop about establishing standards for marking the pond turtles and defining techniques for collecting their biological data was held. 6) The new rescuing centre for wounded, infected and abandoned European pond turtles was created on

the land borrowed by Protego in the area of Subotica town. The Centre consisted of garden ponds designed for temporary settlement of rescued pond turtles and of laboratory with necessary equipment for their care in closed environments. This centre was registered in the Veterinary Directorate of Ministry of Agriculture, Forestry and Water Management of Republic of Serbia for legal treatment of pond turtles.

Unfortunately, this European pond turtle Rescue Centre did not persist for long, due to both exhausting and complex maintaining procedures and lack of permanent funds. In the meantime, as far as we know, the Palić Zoo in Subotica continued to provide shelter for abandoned individuals of allochthonous pet species *Trachemys scripta*..

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Conservation activities for European pond turtles (*Emys orbicularis*) in Slovenia

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Keywords. *Emys orbicularis*, Slovenia, conservation

Introduction

The first author who mentioned the European pond turtle (*Emys orbicularis*) in Slovenia was Valvasor (1689). He reported its occurrence in Carniola, and mentioned that it was common in the Ljubljana Moor and in the Bela Krajina. Freyer (1842) published a note on the fauna of Carniola, reporting Krupa and Prilozje near Gradec in Bela Krajina as habitat of the pond turtle. According to Sajovic (1910), the turtle must have been frequent in Carniola in Valvasor's times, whereas it became already quite rare in the fourth decade of the nineteenth century. Then, only individual records were made. After 200 years of intensification of agriculture and urbanisation, which resulted in habitat fragmentation and drainage, the turtle became rare. However, these are not the only threats to the survival of this species. There is an oral report on how several truckloads of living turtles were released in Ljubljana Moor in the 1960s, including European pond turtles from the south of former Yugoslavia. Many of them died, as evidenced by heaps

of shells. However, surviving turtles spread throughout the area (Tome, 1996, 2003). We assume that the native local turtles mixed with the allochthonous turtles, but this has never been genetically tested (Vamberger and Kos, 2011). Additionally, the allochthonous slider turtle *Trachemys scripta* (Schoepff, 1792) represents a threat for *Emys orbicularis* since it is present in the same wetlands, rivers and fish ponds in whole Slovenia (Krofel et al., 2009, Vamberger, 2009a, Vamberger et al., 2012) and even reproduces in some parts (Vamberger et al., 2012).

In 1995, a school project named "Looking for the European Pond Turtle" was launched in Bela Krajina. More than 30 new findings were recorded, although previously there were virtually no records for the area (Hudoklin, 1995). Tome (1996) reported on more recent data for the oxbow lakes of the Mura river between Petišovci and Murska šuma, while for the area of the Karst she only mentioned the Doberdob Lake (Italy) and the Osp River Basin. Polak (2002) gave anecdotal data for the occurrence of pond turtles 30-40 years ago for Cerknica Lake, Cerkniščica, Planinsko polje and Pivška kotlina. Grželj and Grželj (2012) confirmed the presence of the pond turtle in Pivška kotlina, but no data are available for the other two localities. In 2008, a healthy population of *Emys orbicularis* has been reported for the Draga pri Igu ponds and few new records for the Ljubljana Moor (Vamberger, 2008, Vamberger and Kos, 2011). New data for single findings of the European pond turtle were reported for the Komarnik pond near Lenart, ponds in the surroundings of Ribnica and Jovsi (Vamberger, 2009a). Larger populations were found in the Sečovelje salt pans (Vamberger, 2009a) and in Metlika (Vamberger, 2009b). According to Fritz (2003), *Emys* should have a major representation in Bela Krajina, in the Sava river basin and in the Istrian coastal region. The latest national species overview (Krofel et al., 2009) presented additional findings also for Gorenjska

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Region, Notranjska Region, Kočevska Region, Goriška Region and Prekmurje Region. The findings are missing from Pohorje, Koroška Region and valley of river Savinja (Krofel *et al.*, 2009). The European pond turtle is expected to occur in most parts of Slovenia, with the exception of mountain areas (Krofel *et al.*, 2009).

The European pond turtle is a protected species in Slovenia, not only by European Union legislation (Habitat Directive and Bern Convention), but also implemented in the national legislation. In the Decree on protected animal species (Uredba o zavarovanih prosto živečih živalskih vrstah, Uradni list RS 46/2004, 109/2004, 84/2005, 115/2007), the species is listed in Annex 1A (autochthonous species protected with the conservation regime for specimens and populations) and Annex 2A (autochthonous species for which measures and guidelines for establishing the favourable conservation state of their habitats are declared).

When Slovenia joined the EU, a baseline study for the Natura 2000 network was prepared (Tome, 2003). In that framework, an overview of the species' status in Slovenia was presented, with proposal for designation of most important areas for Natura 2000.

In Slovenia, two subspecies of *Emys orbicularis* are recognized according to morphological parameters. In the coastal region *Emys orbicularis hellenica* is present, while in the other parts of Slovenia is *Emys orbicularis orbicularis*. It is assumed that the two subspecies mix in Vipavska dolina, where turtles with intermediate morphological characteristics are found, but this has never been confirmed genetically (Vamberger, unpublished data).

In the last five years, the conservation activities in Slovenia mostly focused on surveys to estimate the species' distribution, which is still poorly known for most of the country. The surveys were conducted in the frame of different projects or by regular activities lead by Centre for Cartography of Fauna and Flora or *Societas herpetologica Slovenica*.

Conservation projects

Location: Ljubljana Moor (Ljubljansko barje)

Project: Inventarisation of *Emys orbicularis*, *Triturus carnifex* and *Bombina variegata* in the Ljubljana Moor.

Project duration: 2008-2009

Funding agency: Municipality of Ljubljana

Conservation project responsible: Centre for Cartography of Fauna and Flora

Main contacts: Katja Pobljšaj (Katja.Pobljsaj@ckff.si), Marijan Govedič (Marijan.Govedic@ckff.si),

Melita Vamberger (melita.vamberger@senckenberg.de).

Local *Emys* conservation problems: Before the project started, the status of the species was virtually unknown, all data were anecdotal observations. It was known that specimens were sold in the last century on the Ljubljana market for the food consumption. Due to massive changes in the landscape in the last 20 years (intensive agriculture, urbanisation), there was the need for an overview of the current distribution and habitats of this species. This serves as starting point for further measures.

Conservation project activities and main results: Most of the area is since 2004 "Natura 2000" area and since 2008 declared as Landscape Park Ljubljansko barje. In spite of intensive draining activities, Ljubljansko barje has retained its wetland character. The main natural watercourses of Ljubljansko barje are the Ljubljanica, Iška and Želimejščica rivers with their tributaries. Regular flooding requires high work input for maintenance of highly productive agriculture land, thus preventing parts of the area from being more intensively managed. The present appearance of Ljubljansko barje is a very fragmented mosaic of fields, intensively managed meadows, pastures, late-mown wet meadows, rich fen and transition mire patches, forests, tree plantations and some shrub encroached land, all criss-crossed by an extensive network of drainage ditches. On the other hand, the network of more than 400 km of larger drainage ditches, which keep water level low, represent an important secondary habitat for aquatic animals and plants which had lost their original habitats.

In the project almost 400 km of different sizes of drainage ditches, channels and river Ljubljanica were surveyed. Traps were set on all together 500 sites. As a result, the main areas of distribution of *Emys orbicularis* could be identified. Using capture-recapture, migration distances and habitat connectivity could be determined.

The project resulted in a baseline study, which can be used for preparation of planned management activities for the conservation guidelines for the Landscape Park Ljubljansko barje, which is also a Natura 2000 site with *Emys orbicularis* as qualification species. At the same time, these data are used within the frame of Environment Impact Assessments for different national and local infrastructure projects in the area.

Location: Slovenia

Project: „Reptiles of Slovenia, do we know them?“

Project duration: 1st July 2008 - 1st January 2010 (18

months)

Funding agency: Iceland, Liechtenstein and Norway through the EEA Financial Mechanism and the Norwegian Financial Mechanism

Conservation project responsible: *Societas herpetologica Slovenica*

Main contacts: Melita Vamberger (melita.vamberger@senckenberg.de), Anamarija Žagar (info@herpetolosko-drustvo.si)

Local *Emys* conservation problems: Knowledge on distribution and ecology of reptiles in Slovenia is very poor, especially for *Emys*. There was the need for an overview of the current distribution and habitats of the species.

Aims of the project were:

- informing the public on the importance of reptiles in nature
- to collect data on distribution of reptiles in Slovenia
- to train experts that will be able to carry out research work on reptiles in Slovenia in the future.

Conservation project activities and main results: In the frame of the project, training and surveys for *Emys orbicularis* took place in various localities in Slovenia. We published a poster and a leaflet specially devoted to *Emys*. In all the workshops and public appearances, *Emys* represented an important part of the presentations.

Information on the project were regularly posted on a specific website (<http://sites.google.com/site/plazilcislovenijeihpoznamo/dobrodosli>).

More basic data are required to obtain an idea on the status of the European pond turtle in Slovenia. Until now just few studies on the distribution are done. Nevertheless, there is still ongoing research done by members of the *Societas herpetologica Slovenica* to fill this gap.

Location: Gornji kal (Bela Krajina) and Mura-Petišovci

Project: Life+ Nature “Conservation and management of freshwater wetlands in Slovenia – WETMAN” (Ohranjanje in upravljanje sladkovodnih mokrišč v Sloveniji) (LIFE09 NAT/SI/000374)

Project duration: 2011-2015

Funding agency: EU Life+ Nature program

Conservation project responsible: Institute of the Republic of Slovenia for Nature Conservation;

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Local *Emys* conservation problems: The Centre for Cartography of Fauna and Flora was responsible for

Emys surveys in the areas of Mura-Petišovci and Gornji kal (Bela Krajina). There was no knowledge on the state of the species in the area, as all data were anecdotal observations. As a first step, there was a need to have an overview of the current state of this species in the project areas.

Conservation project activities and main results: More info on the project (<http://www.wetman.si/>).

Mura-Petišovci: Initial survey of *Emys orbicularis* (Vamberger et al., 2011) had been conducted in three oxbow lakes of the Mura River in North-Eastern part of Slovenia from in April and May 2011. The species could be recorded only at two sites (Muriša, Csiko Legelo), in total only seven specimens. Observed turtles were all older, which shows that a successful reproduction of the species in the area is lacking, mostly due to absence of appropriate nesting sites, intensive agricultural usage of surrounding land, lack of riverbanks at the oxbow lakes, the presence of non-native species of turtles, the presence of non-native predatory fish species and intensive recreational activity.

Gornji kal: In the pilot area Gornji kal (Govedič et al., 2011) *Emys* had been confirmed in two ponds during the initial survey conducted in the year 2011: Krivače pond and Gornji kal pond. The initial survey resulted in very low number of identified specimens: two turtles in Krivače pond and three turtles from in Gornji kal pond. No young specimens were found in any of the ponds, indicating that successful reproduction is lacking. The main identified problem are: absence of appropriate riparian shallow water, steep slopes, absence of suitable nesting places, in Gornji kal pond interference due to intensive fly-fishing activities and presence of predator fish species. Initial survey study (Govedič et al., 2011) showed that without active nature conservation measures on long-term *Emys* is locally to extinct.

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Conservation activities for European and Sicilian pond turtles (*Emys orbicularis* and *Emys trinacris*, respectively) in Italy

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Keywords. *Emys orbicularis*, *Emys trinacris*, Italy, conservation

Introduction

Two species of pond turtles belonging to the genus *Emys* are currently recognized in Italy: *E. orbicularis* in mainland Italy and Sardinia, and *E. trinacris* in Sicily (Di Cerbo, 2011; Zuffi et al., 2011). *Emys trinacris* has recently been described on the basis of its genetic

distinctiveness (Fritz et al., 2005) and on the lack of gene flow between *E. trinacris* and *E. orbicularis* (Pedall et al., 2011).

In Italy, pond turtle populations live in water bodies with a wide range of environmental features, including ponds, small lakes, swamps, canals and slow stream water courses. Most populations inhabit lowland areas, but the two species also occur up to 1540 and up to 1400 m of altitude, for *E. orbicularis* in Calabria and *E. trinacris*, respectively. The largest populations occur in protected areas of the Po River Delta, of Tuscany, Latium, Campania and Calabria (Mazzotti and Zuffi, 2006). There is, however, still large uncertainty about the numerical consistence of *Emys* populations in Italy (Zuffi et al., 2011).

In the last century, pond turtles experienced a strong decline in Italy. The main threats to the survivorship of the individuals of these species in nature include the drainage or alteration of water bodies where populations live and the alteration of surrounding terrestrial habitats. Road traffic may also cause heavy mortality at the local scale. Furthermore, in some cases the remaining populations are constituted by a handful of adult individuals that survive in suboptimal habitats. These remaining populations are often isolated: the lack of connection among populations may increase the risk of population extinction, because of demographic or genetic isolation (Zuffi et al., 2011). In the last decades, several species of non-native turtles, such as the North American slider turtle, *Trachemys scripta*, have been massively introduced in Italian wetlands. These alien turtles pose a further threat to the remaining *Emys* populations. For instance, *T. scripta* outcompetes *E. orbicularis* for both food and basking sites, thereby reducing the individual fitness of this latter (Macchi et al., 2008; Zuffi et al., 2011; Ficetola et al., 2012).

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According to the publication of the European Commission (2009) and to the official database of the LIFE program (available on the web <http://ec.europa.eu/environment/life/project/Projects/index.cfm>, April 2011), since 1992 nine Italian Life-Nature projects specifically targeting *Emys orbicularis* or its habitats have been funded. These are, in chronological order: DUNETOSA (LIFE05/NAT/IT/000037), Co.Me. Bis. (LIFE06/NAT/IT/000050), CILENTO IN RETE (LIFE06/NAT/IT/000053), LIFE FRIULI FENS (LIFE06/NAT/IT/000060), DINAMO (LIFE08/NAT/IT/000324), ORISTANESE (LIFE08/NAT/IT/000339), SORBA (LIFE08/NAT/IT/000213), Re.S.C.We (LIFE09/NAT/IT/000608), NATURA 2000 IN THE PO DELTA (LIFE09/NAT/IT/000110). The main beneficiaries of these projects were: managing authorities of protected area (three cases), local authorities (three cases), regional authorities (two cases) and universities (one case). The first Italian LIFE project dealing specifically with *Emys orbicularis* was financed only in 2005, suggesting a recent but, possibly, increasing interest for the species conservation status by Italian ecologists and land managers.

A non-exhaustive list of conservation projects funded exclusively by local authorities can be found below. The majority of these conservation efforts concentrate in Northern Italy, where the species status is probably better studied. We are not aware of projects occurring in the south of Italy and only one in Sicily from where the endemic *Emys trinacris* has recently been described. In addition, the extent of the conservation actions (number or extension of sites and number of populations concerned by the conservation actions) is usually limited, in some cases reduced to a single site or population. In very few cases, the restoration and creation of new habitats suitable for the species have been undertaken. Finally, the complete absence of coordination between these local projects has to be stressed. Very limited exchange of experiences or good practices obtained from these conservation activities is shared, even during national herpetological meetings, and only a few scientific publications arose from these projects. We call for an increase of coordination among the different projects, to optimize the available resources and improve the effectiveness of management actions.

Conservation projects

Location: Lombardia Region – Parco Agricolo Sud Milano (Province of Milano)

Project duration: 2002- present

Funding agency: Parco Agricolo Sud Milano.

Conservation project responsible: Luciana Bottoni, Gentile Francesco Ficetola, Simone Masin, Emilio Padoa-Schioppa (Università degli Studi di Milano Bicocca – DISAT), Fabrizio Scelsi (Parco Agricolo Sud Milano).

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Local *Emys* conservation problems: In the Lombardy Region, *Emys orbicularis* was a relatively common species. However, this species experienced a decline caused by multiple factors, including habitat modification, mostly for agricultural purposes, and collection of individuals. Furthermore, the invasive *Trachemys scripta* and alien predatory fish, together with environmental degradation constitute a threat to the survivorship of *Emys orbicularis* limiting the availability habitats for this species (Fritz and Andreas, 2000; Cadi and Joly, 2003; Ferri and Zuffi, 2004; Ficetola, 2005). At the present, no breeding populations are reported for this species in the Province of Milan.

Conservation project activities and main results: The goals of the *Emys* conservation project in the Province of Milan were: 1) To identify areas with habitat suitable for *Emys orbicularis* and improve habitat suitability; 2) To reintroduce a small population in selected areas; 3) To increase the awareness of the local people to conservation efforts. The chosen area for the reintroduction project is located in the Parco Agricolo Sud Milano, a Regional park extending in the hinterland of the city of Milan. Preliminary habitat analyses identified a wetland system within the Park area with environmental features suitable for *E. orbicularis*. The main features considered where: a) Presence of a network of wetlands surrounded by natural or seminatural terrestrial vegetation; b) Presence of riparian vegetation; and c) Absence of alien turtles (Cadi and Joly, 2003; Ficetola *et al.* 2004). The selected area, which originated from the environmental recovery of a sand quarry, is a groundwater pond network consisting of three main ponds interconnected by small channels and fenced with a 2m fence around the perimeter. At the beginning of the project, the vertebrate community of the area was studied in order to identify and prevent any incoming problem before the release of the first nucleus of *E. orbicularis*. Control interventions on black bass (*Micropterus salmoides*) and carp (*Cyprinus carpio*) population were also performed, together with monitoring of American red

swamp crayfish (*Procambarus clarki*).

At the beginning of the project, 12 juveniles were released in the area during two subsequent years (2004-2005). Juvenile turtles were obtained from a private breeder as hatchlings in September 2003, and from a captive breeding stock coming from the Taro river in Northern Italy. All individuals were individually tagged with a subcutaneous microchip and carapace notching. Turtles were recaptured yearly to assess health status, parasite load and growth patterns; furthermore, microhabitat use and activity patterns were analyzed. Radiography was used to assess the breeding status of females. Since 2009, hatchling monitoring was performed in autumn, by means of pitfall traps. In addition, in the area informative and educational panels were installed, and a pathway was set up for people fruition. The main practical results were: 1) The released individuals reached sexual maturity and reproduce successfully in the area; 2) Educational projects were performed for local people and primary school children.

Location: Piemonte Region - Riserva Naturale Speciale Ghiaccia Grande, Località Cascina Scarella (Pontestura, Province of Alessandria).

Project duration: 2008-2011

Funding agency: Allara S.p.A., di Casale Monferrato (AL)

Conservation project responsible: SEACoop di Torino: Anna Bonardi, Laura Canalis e Stefano Crossetto

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Local *Emys* conservation problems: Within the territory of the Riserva Naturale Speciale Ghiaccia Grande there is a currently ongoing project of environmental recovery. The project includes the mining of cave to remove sand and gravel and replace it with water and plants to recover the natural environment. During the time of the works, a monitoring of the presence and distribution of *Emys orbicularis* has been required to evaluate the impacts of the works on local species. *Emys orbicularis* is considered a target species to monitor during works of environmental recovery of wetland areas. The territory is also inhabited by a large group of *Trachemys scripta*, which directly competes with *Emys* for the resources used.

Conservation project activities and main results: The goal of the monitoring program is to provide information regarding the abundance of *Emys* in the studied territory. Mark and recapture methods are used for this purpose.

During spring and summer, the animals are captured by floating pitfall traps and baited funnel. The latter revealed to be more effecting than floating pitfall traps due to the many available basking sites for this species. Biometric data and marking are performed before releasing the animals. Our results suggest a low number of *Emys* in the surveyed area (11 marked individuals in three years), in comparison with the high occurrence of individuals of *T. scripta*. However, current data do not allow precisely estimating the abundance of *Emys* in the studied territory. Till present, the areas that underwent the above mentioned environmental recovery have been recolonized by *T. scripta* individuals, while a single *Emys* has been observed there in 2011.

Location: Piemonte Region - Parco Regionale delle Lame del Sesia (Province of Novara).

Project duration: 2008- 2011

Funding agency: Fondazione Cariplo

Conservation project responsible: Stefano Scali, Silvia Di Martino, Franca Guidali

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Local *Emys* conservation problems: The Parco Regionale delle Lame del Sesia and some research institutes established a comprehensive program with the goals of increasing the public knowledge about the park, to improve its use, its valorization, and the protection of its biodiversity. Within this program, environmental recovery actions of some areas of the park as well as the construction of nature walks are carried out.

Conservation project activities and main results:

One of the environmental recovery action concerns the monitoring of the populations of *Emys orbicularis* inhabiting the park. The specific goals of this action are: 1) to assess the current presence of *Emys orbicularis* in the park, 2) to evaluate the number of individuals inhabiting the park, and 3) if this species is still living in the park, but with a reduced number of reproductive individuals, captive-bred individuals (previously taken from this area and thus genetically compatible) will be reintroduced in recovered natural areas of the park.

Preliminary results indicate the presence of this species in the park, even if with a reduced number of individuals. The occurrence of a small number of individuals of *Trachemys scripta* was confirmed during the monitoring project. The park still includes many natural wetlands, thus since spring 2011, 14 captive-bred individuals, belonging to different age classes to assure a well-structured population, have been released in the

park area. The reintroduced individuals were marked and radio-tracked to monitor their activity. Survivorship of at least some individuals was ascertained even in 2012 and the monitoring project will continue also in 2013 and 2014 thanks to financing from Piemonte Region. The project also contemplates the removal of *Trachemys scripta* from the study area.

Location: Veneto Region - Bosco Nordio (Province of Venezia, municipality of Chioggia)

Project duration: 2002- present

Funding agency: Regione Veneto, Veneto Agricoltura

Conservation project responsible: Donato Ballasina, Jacopo Richard, Federico Vianello

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Local *Emys* conservation problems: The Bosco Nordio has been instituted as a Natural Reserve in 1971. Among the various projects aiming to preserve the preserve the natural habitat and the organisms inhabiting it, a monitoring and reintroduction program of *E. orbicularis* has been started. Until the year 2000, the species could only sporadically be observed in a canal located at the border of the Reserve. The lack of suitable humid habitats within the protected area would in fact impede the spread of the species within the Park, even if the same can be considered relatively abundant in the surrounding territory.

Conservation project activities and main results: Small swamps and humid areas have been built within the Park and a reintroduction program has been started. Consequently to the recovering and building of suitable habitats, the species has now been observed also within the Park. Furthermore, controlled genotyped individuals representing a local (Venetian) population have been reintroduced in a fenced area of the Park. The reproduction of these individuals is currently monitored to assess the success of the action. Moreover, one additional goal of this project is to increase the number of reproductive adults to repopulate suitable areas outside the Park.

Location: Liguria Region - Province of Savona

Project duration: 2000- present

Funding agency: Province of Savona, Liguria Region, Acquario di Genova, ProNatura Genova.

Conservation project responsible: Paolo Genta (Provincia di Savona, Coordination and Administration),

Sebastiano Salvidio and Dario Ottonello (DISTAV Università di Genova, scientific research), Riccardo Jesu, Guido Gnone and Claudia Gili (Acquario di Genova), Stefano Ortale and Luca Lamagni (Pro Natura Genova), Corpo Forestale dello Stato.

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Local *Emys* conservation problems: In Liguria (NW Italy), *Emys orbicularis* was a species commonly found along the West Ligurian coast (Salvidio *et al.*, 2005). However, in the last 20 years, this species was considered extinct in the wild. The causes of its disappearance from Liguria were due to habitat modification (Andreotti, 1994), mostly for agricultural purposes. Furthermore, the presence of invasive species, fishing activities, and the water pollution contributed to the decrease of this species. Recently (Jesu *et al.*, 2000, 2004), a few small and isolated populations were discovered in the Albenga plain (Province of Savona). Due to their geographic isolation from other Italian *Emys* populations and for being the last remnant of once spread distribution area in Liguria, these native populations are recognized deserving priority conservation actions at the Regional level. Therefore, since the year 2000, a restoration program was implemented by different public Authorities (University of Genova, Corpo Forestale dello Stato, Province of Savona), private entities (Acquario di Genova, Fondazione Acquario di Genova), NGOs (WWF Liguria, Pro Natura Genova) and volunteers.

Conservation project activities and main results: The main goals of the *Emys* conservation project in the Province of Savona are to: 1) restore and preserve *Emys* habitats; 2) monitor and protect the remnant populations of *Emys* recently found in the Albenga plain; 3) reinforce these remnant *Emys* populations with captive bred animals; 4) increase the awareness of the local public administrations and the public to the importance of preserving freshwater habitats. The main practical results were (Ottonello and Salvidio, 2007; Ottonello *et al.*, 2010): 1) The institution in 2002 of a new Natura 2000 site (Site of Community Importance „Lerrone-Valloni“) for the conservation of *Emys orbicularis*; 2) the creation of a small breeding center in Leca di Albenga (SV) with 263 newborns since 2000; 3) the creation of a nursery and recovery area for this species in the Acquario di Genova; 4) the creation/restoration of several freshwater habitats inside Natura 2000 already existing sites in the Province of Savona;

5) the official adoption by the Province of Savona of the „Action Plan for *Emys orbicularis*“ (Salvidio et al., 2006); 6) the protection, since 2005, of some nesting sites, done by using metallic net, of this species in the wild thanks to active monitoring of mature females done by radiotracking; 7) the reinforcement, since 2008, of the remnant *Emys* populations in the Albenga plain with 56 captive bred individuals (several of them radiotracked during their first season of activity); 8) the removal of alien terrapin species (*Trachemys scripta*) from the *Emys* sites (Ottonello et al., 2005) and control interventions on black bass (*Micropterus salmoides*) population and others allochthonous fishes; 9) the publication of several scientific reports and popular booklets on freshwater habitats and their fauna, flora and vegetation.

Location: Emilia Romagna Region – Bosco della Mesola, Po Delta River (Province of Ferrara)

Project duration: 2003- present

Funding agency: Parco Regionale del Delta del Po dell’Emilia Romagna; Museo Civico di Storia Naturale, Ferrara

Conservation project responsible: Stefano Mazzotti (Museo di Storia Naturale, Ferrara), Federico Montanari (ARPA, Agenzia regionale ambiente, Regione Emilia Romagna - Struttura Ingegneria Ambientale, Bologna), Corpo Forestale dello Stato-Ufficio territoriale per la Biodiversità, Punta Marina (Ravenna)

Main contacts: Stefano Mazzotti (conszool@comune.fe.it)

Local *Emys* conservation problems: Until some years ago, *Emys orbicularis* was a widespread species in the Emilia Romagna Region. It was commonly found in the Po Valley (especially on the East-side), along the Po river, and in coastal wetlands (Mazzotti, 1995). Although mainly distributed in the lowland zone, the species has also been observed in coastal pine forests and in some areas of the Apennines, up to 681 m. Habitat disturbance and habitat destruction have to be considered the major factors correlated to the decline of the species in the area. In fact, the species is rarely detectable in areas such as agricultural crops. In the Po Valley, the intense human activities, together with the natural geomorphologic characteristics, have determined a poor differentiation of the habitat with a consequent environmental homogeneity. In fact, the natural vegetation covering of the North-Eastern alluvial plain of the Po River has now almost completely been replaced by agricultural fields and only a small portion of it is still covered by

plain forest and woods. Wetland areas have also been drastically reduced and are currently limited to the Po River delta or scattered in small sites.

Conservation project activities and main results: The main goals of *E. orbicularis* conservation project in the Bosco della Mesola are to 1) study the populations structure and density, 2) record the activities of the animals, 3) control the reproductive capacity of mature females. The population structure and density have been studied by applying the linear transect census (LTC) with mark-recapture of the animals. Animal density varies between two and ten animals per hectare depending on the sampling year and the surveyed area (Mazzotti et al., 2007). However, the estimate of the animal density greatly increases when using the Jolly-Seber and Schnabel indices compared to the LTC index. Animal basking activity is strongly correlated to the external environmental temperature, with an optimum at 24°C. To define the periods of eggs deposition, from 2008 to 2010 twenty females were X-rayed 50 times from May to September. The females of the Bosco Mesola reserve have presented an average of 6.5 eggs (range 4-10 eggs) identified by X-rays in the period from May to June. There were no calcified eggs from July to September.

Location: Emilia Romagna Region – Parco fluviale del Secchia (Province of Modena and Reggio Emilia)

Project duration: 2010- present

Funding agency: Regione Emilia-Romagna, Consorzio per la gestione del Parco fluviale del Secchia.

Conservation project responsible: Paolo Filetto, Luigi Sala

Main contacts: Paolo Filetto (paolovincenzo.filetto@gmail.com), Luigi Sala (luigi.sala@nimore.it)

Local *Emys* conservation problems: *Emys orbicularis* was relatively abundant in the provinces of Modena and Reggio Emilia until around 1970. Due to the reduction of the suitable habitats and habitat destruction, this species has been strongly decreasing and it is currently represented in the area by a few isolated populations considered endangered (Sala and Tongiorgi, 1997). In the Emilia-Romagna Region, this species is therefore a priority taxon of interest for conservation (I° Programma per il sistema delle Aree protette e dei siti della rete Natura 2000, Regione Emilia-Romagna).

Conservation project activities and main results: Habitat restoration and construction of suitable habitats for this species have been undertaken. Furthermore, monitoring activity of the known relict populations is

currently ongoing. Future plans include also the re-introduction of individuals genetically recognized as representatives of the area.

Location: Emilia Romagna Region – Parco delle Fonti, Province of Forlì-Cesena, Municipality of Meldola

Project duration: 2010- 2030

Funding agency: Museo Civico di Ecologia di Meldola; Municipality of Meldola and Province of Forlì-Cesena.

Conservation project responsible: Giancarlo Tedaldi

Main contacts: Giancarlo Tedaldi (scardavilla@comune.meldola.fc.it)

Local *Emys* conservation problems: A few isolated and small populations of *Emys orbicularis* inhabit the area. The survivorship of these populations is threatened by ecological competition with invasive species and the destruction of the habitats suitable for the species reproduction and thermoregulation.

Conservation project activities and main results: A captive-breeding reproduction center has been organized and built within the Park area. Two main reproductive groups have been selected and genetic analyses are currently carried out to ascertain the provenience of the individuals selected for the reproduction. Furthermore, behavioral researches are currently undergoing to assess the response of the selected individuals to live in groups in the closures and to receive food.

The center includes not only an area for the reproduction of the species, but also the reconstruction of habitats suitable for the reintroduction of these individuals, and an educational area in order to increase the knowledge on the local flora and fauna. This area is suitable also for visually and mobility impaired people.

Location: Lazio Region – Parco Regionale Marturanum, Province of Viterbo

Project duration: 2011-present

Funding agency: Funding requested to Regione Lazio

Conservation project responsible: Vincenzo Ferri, Luca Luiselli

Main contacts: Vincenzo Ferri, Parco Regionale Marturanum (marturanum@parchilazio.it)

Local *Emys* conservation problems: The Park is inhabited by a recently discovered isolated population of *Emys orbicularis*. Limited suitable habitat and predation of wild boars on the nest of this species make this population especially endangered.

Conservation project activities and main results: Estimates of population size and density are currently ongoing.

Location: Sicilia Region – Integral Natural Reserve “Lago Preola e Gorghetti tondi”, Mazara del Vallo, Province of Trapani

Project duration: 2011- for at least other two years

Funding agency: WWF Italy, WWF Oasi and Arta Sicilia Servizio IV° parchi e riserve

Conservation project responsible: Stefania D’Angelo

Main contacts: Stefania D’Angelo (s.dangelo@wwf.it)

Local *Emys* conservation problems: The local *Emys trinacris* populations are threatened by habitat destruction, reduction of suitable habitats, and pollution. Previous analyses also indicate a low reproduction rate of these populations and individuals size below what it is known for this species.

Conservation project activities and main results: Studies on population density, reproduction, and recruitment for these populations are currently carried out. Detailed biometric analyses are also currently ongoing to further understand the possible causes of the smaller size of the individuals of these populations.

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Conservation activities for European pond turtles (*Emys orbicularis*) in Bulgaria

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Keywords. *Emys orbicularis*, Bulgaria, conservation

Introduction

In Bulgaria, the European pond turtle (*Emys orbicularis*) is distributed along rivers, streams, irrigation canals and in marshes, ponds, dams and fisheries throughout the country up to 1100 m a.s.l. (Beshkov and Nanev, 2002; Petrov, 2007; Stojanov et al., 2011). Several studies on the European pond turtle have used Bulgarian pond turtles since the beginning of the nineties. Information on biometry and systematics (Fritz, 1992; Fritz and Obst, 1995; Lenk et al., 1998), phytogeography (Fritz et al., 2007; Lenk et al., 1999), habitat distribution (Mollov, 2011), helminthology (Kirin, 2001) and paleontology (Schleich and Böhme, 1994) have become available, along with numerous studies reporting new localities of the species in Bulgaria. Most of the literary data on the species distribution is summarized and mapped by Naumov and Stanchev (2010) (Fig. 1). However, only a few studies have focused on the conservation biology of *E. orbicularis* in Bulgaria (e.g., Beshkov, 1998; Tzankov and Stojanov, 2009). Furthermore, there are still data lacking about the species' ecology, population structure, reproductive biology and ethology in the country.

In Bulgaria, *Emys orbicularis* has a high conservation value and is protected by the national legislation by the "Biodiversity Protection Act of Bulgaria" (promulgated in an official gazette No 77 on August 9th, 2002), listed in the annexes II – "Species, for which conservation, preservation areas are established for their habitat protection" and III – "Species protected in the whole

country territory". It is also listed in the annexes II and IV of the Habitat Directive (Council Directive 92/43/EEC, 1992); listed in the annex II (Strictly protected fauna species. Status in force since March 1st, 2002) of the Bern Convention, which came into effect in Bulgaria on May 1st, 1991 (Bern Convention, 1979); listed as NT "Lower Risk/near threatened" category in the IUCN-RedList (IUCN, 2012).

According to Tzankov and Stojanov (2009) the main threats for the species in Bulgaria are: predation on eggs, juveniles and adults, habitat destruction, human consumption, collecting for trade and possible competition with the red-eared terrapin (*Trachemys scripta elegans*), which is still very poorly studied in Bulgaria. According to Beshkov (1998) this species is not as acutely endangered. It has suffered eradication throughout much of its traditional range due to the drainage of marshes, corrections or changes in the river channels and basins, and capture by terrarium enthusiasts. Many turtles are also killed when they are caught by line or captured by the nets of fishermen. However, the European pond turtle has reestablished itself along newly built micro dams, ponds, and fish farms. Special measures for the species' protection will need to be undertaken in the near future.

Conservation projects

Location: Bulgaria (national level).

Project duration: 2011-2013.

Funding agency: Ministry of Environment and Water of Bulgaria.

Conservation project responsible: Consortium „Natura Bulgaria“.

Main contacts: Dobrin Dobrev (dddobrev1@gmail.com)

Local *E. orbicularis* conservation problems: Absence of sufficient data on the distribution, abundance and habitats of *E. orbicularis* in the protected areas.

Conservation project activities and main results:

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*Author order reflects author contribution for the first two authors and then follows alphabetical order

„Mapping and determine the conservation status of habitats and species - Phase I“. A comprehensive project whose herpetological part consists in mapping the distribution and habitats of the target species of amphibians and reptiles (including *E. orbicularis*) in NATURA2000 sites (under the Habitats Directive) in Bulgaria. During the field work (2011-2012) dozens of new localities of *E. orbicularis* have been identified throughout the studied territories.

Location: Bulgaria (national level).

Project duration: 2008-2013.

Funding agency: Bulgarian Herpetological Society.

Conservation project responsible: Bulgarian Herpetological Society.

Main contacts: Borislav Naumov (herpetology_bg@yahoo.com)

Local *E. orbicularis* conservation problems: Absence of sufficient data on the distribution of *E. orbicularis* in Bulgaria.

Conservation project activities and main results: „Atlas of the Distribution of Amphibians and Reptiles in Bulgaria“. Year-long project aimed at exploring and mapping the distribution of all species of amphibians and reptiles in Bulgaria, using the 10 kilometer UTM

grid. In 2013, pending a summary of the data collected and printing a monographic work with high volume.

Location: Osogovo Mts. (SW Bulgaria).

Project duration: 2007-2009.

Funding agency: Frankfurt Zoological Society.

Conservation project responsible: Bulgarian Biodiversity Foundation.

Main contacts: Borislav Naumov (herpetology_bg@yahoo.com).

Local *E. orbicularis* conservation problems: Absence of any data for *E. orbicularis* in the area.

Conservation project activities and main results: „Balkan Green Belt - Osogovo“. Field studies were conducted on the fauna diversity in Bulgarian part of Osogovo Mts. (Kyustendil District). A series of new for the area species were recorded, as well as many new localities of the known species. *Emys orbicularis* is found in several places in the lower parts of the mountain. Four different sites in the territory of Osogovo Mts. are identified as Herpetological Important Areas. These are areas with high diversity of amphibians and reptiles, and with presence of species of high conservation value, including *E. orbicularis*.

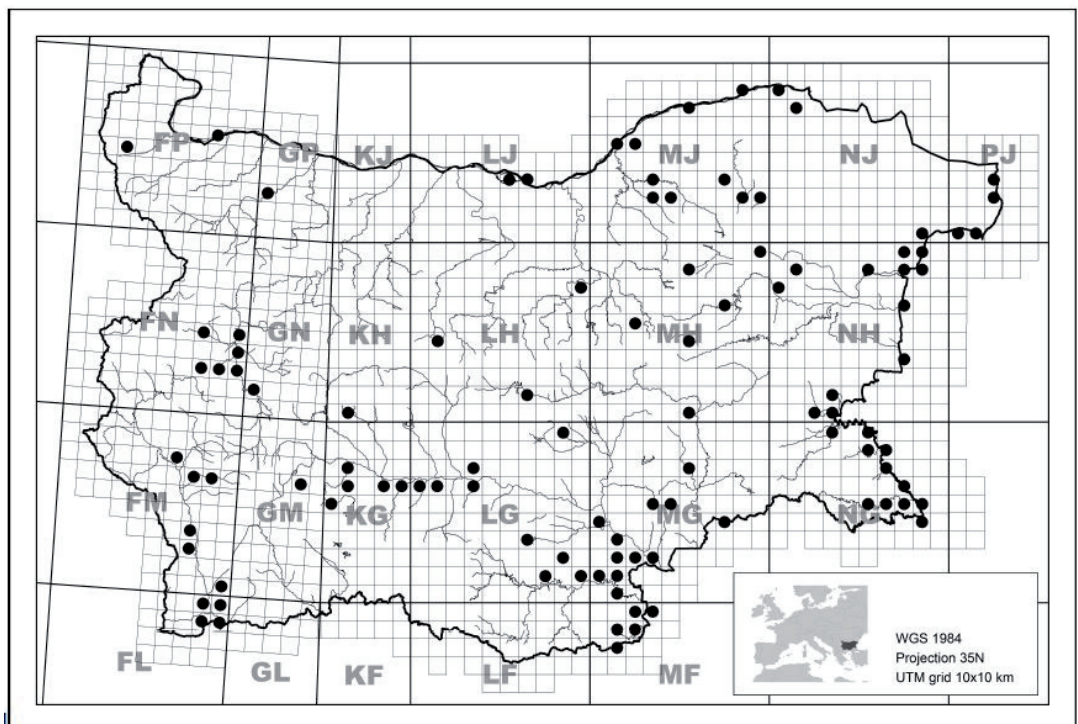


Figure 1. Distribution of *Emys orbicularis* in Bulgaria by UTM grid according to Naumov and Stanchev (2010) with some additions (includes data coming from more recent publications).

Location: Besaparski Heights (S Bulgaria) and Ponor Mt. (NW Bulgaria).

Project duration: 2009-2010.

Funding agency: UNDP-GEF.

Conservation project responsible: Bulgarian Society for the Protection of Birds.

Main contacts: Gergi Popgeorgiev (georgi.popgeorgiev@gmail.com)

Local *E. orbicularis* conservation problems: Absence of sufficient data on the distribution, abundance and habitats of *E. orbicularis* in these areas.

Conservation project activities and main results: „Conservation of globally important biodiversity in high nature value semi-natural grasslands through support for the traditional local economy“. Field studies were conducted on the fauna diversity in Besaparski Hills (Pazardzhik District) and Ponor Mt. (part of the Western Stara Planina Mts.). Partly, this herpetological research includes study of the distribution and abundance of species and determination of Herpetological Important Areas. Some preliminary results for the herpetofauna (including *E. orbicularis*) are reported by Popgeorgiev et al. (2010).

Location: Districts of Pazardzhik and Plovdiv (S Bulgaria).

Project duration: 2009-2012

Funding agency: Bulgarian Science Fund, Ministry of Education, Youth and Science of Bulgaria.

Conservation project responsible: Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences.

Main contacts: Georgi Popgeorgiev (georgi.popgeorgiev@gmail.com), Ivelin Mollov (mollov_i@yahoo.com).

Local *E. orbicularis* conservation problems: Mortality caused by the automobile traffic on “Trakia” highway and a secondary road in the section between the towns of Pazardzhik and Plovdiv.

Conservation project activities and main results: „Impact of “Trakiya” Highway Traffic in the Section between the Town of Pazardzhik and the Town of Plovdiv on the Biodiversity“. The aim of the study is to explore the effects of “Trakiya” highway traffic and one control road section (between the towns of Belovo and Plovdiv) on birds, amphibians, reptiles (including *E. orbicularis*), small mammals and adjacent water bodies in the region. The results of the project will contribute to more effective preliminary planning of road infrastructure in Bulgaria and its consequent management, especially

during the next years when the responsible institutions plan to rehabilitate and broaden the road network. The results of the study could be used for the preparation of Environmental Impact Assessments and ecological assessments of investment offers for rehabilitation or construction of new road sections. Some preliminary results are published by Kambourova-Ivanova et al. (2012).

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Conservation activities for European pond turtles (*Emys orbicularis*) in France

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Keywords. *Emys orbicularis*, France, conservation

Introduction

The European pond turtle *Emys orbicularis* is found in five areas of France: the Centre and Limousin regions (mainly Brenne), the southern half of the Atlantic coast including the Garonne watershed, the Mediterranean region, the foothills of the Alps (Savoie and Isère departments) and Corsica. Two subspecies occur in the country, *E. orbicularis galloitalica* in the Var department and in Corsica and *E. o. orbicularis* in the rest of the distribution area (Vacher and Geniez, 2010).

In France, European pond turtle populations occupy different kinds of habitats according to the regions. Turtles are found in lakes, rivers, alluvial habitats,

permanent or temporary ponds, canals, and even peat bogs in the Isère department.

The current distribution of the species in France seems to be quite similar to the situation at the beginning of the 20th century. Before the 19th century, the species was more widespread, but it declined in the course of the 19th century, mainly during the second half. Nowadays, the main threats to the European pond turtle in France are the destruction of suitable habitats (especially the nesting sites), fragmentation of habitats through canalization of rivers and roads, and removal of individuals from their natural habitats. The introduction of North-American terrapins such as *Trachemys scripta elegans* might also cause problems to *Emys orbicularis* populations, in terms of spreading of pathogens or ecological competition, but further studies are needed in order to assess such impacts. Yet, some studies show that there is a negative effect of the presence of *T. scripta elegans* in some sites where both species occur (Cadi and Joly, 2003)

According to the publication of the European Commission (2009) and the official database of the LIFE program (available on the web <http://ec.europa.eu/environment/life/index.htm>, September 2012), there was since 1992 only one Life-Nature project with *Emys orbicularis* or its habitats as target in France. This project is Lake of Bourget (LIFE99 NAT/F/006321). The main beneficiary of this project was the Conservatoire Rhône-Alpes des Espaces Naturels, which is a NGO that works on conservation and management of natural habitats. The project ran from 1999 to 2003. During this project, a reintroduction of *Emys orbicularis* has been conducted in the Lake of Bourget. Since then, the reintroduced population is monitored to control the success. A book about the conservation of *Emys orbicularis* was published after the end of the LIFE project (Cadi and Faverot, 2004).

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Also, the French Herpetological Society (SHF) has a group of experts on the conservation of the European pond turtle that publishes a yearly bulletin entitled „La Lettre du Groupe Cistude“. This newsletter provides information and updates on different conservation projects carried out in France in order to share information around in the network of people working on the conservation of the species.

National action plan

Since 2010, the French ministry of ecology and sustainable development launched a national action plan for the species that runs from 2011 to 2015. In the scope of this action plan, several conservation actions are listed and grouped in three main categories: study and research, conservation and public awareness. The national action plan can be found under the following link: http://www.developpement-durable.gouv.fr/IMG/pdf/PNA_Cistude.fr. The SHF takes part in the plan as the provider of a dedicated website for the action plan (http://lashf.fr/cistude_europe.php) and also helping with the development of other communication tools (newsletter, internet group list, etc.).

In the scope of the National action plan, inter-regional actions are implemented:

- Collaboration between the biological station “La Tour du Valat” in Provence and the University of Burgundy (Bourgogne, France) on a study concerning the dispersal of juvenile *E. orbicularis*.
- Collaboration between the NGO Nature Midi-Pyrénées and the Nature reserve of Chérine for a study about mycosis in this species.
- Sampling of endoparasites in populations of Burgundy, Centre and Midi-Pyrénées for a study carried out by Olivier Verneaux (University of Perpignan, France).
- Collaboration between the NGO Cistude Nature (Aquitaine region) and the NGO Conservatoire des espaces naturels de Savoie for the filming of a documentary on the European pond turtle

A yearly meeting of the permanent committee of the action plan aims at reviewing the actions that need to be implemented and to share different tasks at the national level between collaborators. Out of eleven regions where the species occurs, four have formally written a regional declaration of the National action plan (Auvergne, Bourgogne, Centre, and Rhône-Alpes), three have established a working document to list the priorities that need to be implemented in the region (Provence-Alpes-Côte d’Azur, Languedoc-Roussillon, and Midi-

Pyrénées) and four do not wish to implement the national action plan, as the regional partners do not consider the species as a priority in terms of conservation on their territory (Limousin, Poitou-Charentes, Aquitaine, and Corsica).

The main conservation actions in the regions are developed below.

Languedoc-Roussillon

Location: Nature reserves (natural reserves) of L’Estagnol and Bagnas (Herault department)

Project duration: 2007 - present

Conservation project responsible: Thomas Gendre (Conservatoire Espaces Naturels-Languedoc-Roussillon)

Main contacts: Thomas Gendre (cen-lr@wanadoo.fr)

Conservation project activities and main results: This project focuses on the reintroduction of European pond turtles in two nature reserves in Herault. The animals come from nearby natural populations located in the Gard department.

Centre

Location: Brenne (Indre department)

Project duration: 2007-2011

Conservation project responsible: Zoey Owen-Jones (Nature reserve of Chérine)

Main contacts: Zoey Owen-Jones (owen-jones.zoey@neuf.fr)

Local Emys conservation problems: Intensive fish farming modified the living conditions within lakes, associated with a management of land for hunting practices that favours meadow overgrowth. These factors are not in favour of the conservation of the species in the region.

Conservation project activities and main results: This project aims at characterizing and monitoring the population in Brenne. It yielded interesting results on dispersal skills of the species through a large capture-mark-recapture (CMR) study carried out simultaneously on 25 lakes (Réserve naturelle de Chérine, 2011).

Auvergne

Location: Allier department

Project duration: 2000 - present

Conservation project responsible: Office national de la chasse et de la faune sauvage 03 (Game and Wildlife department)

Main contact: Jean-Luc Marandon (sd03.b2@oncfs.gouv.fr)

Local *Emys* conservation problems: destruction and alteration of habitats and unsuitable agricultural practices (Veron, 2011).

Conservation project activities and main results: The project focuses on building a map of presence of the species in order to initiate a survey and to begin a monitoring of populations.

Bourgogne

Location: all populations in the region.

Project duration: 2010 - present

Conservation project responsible: Society of Natural History of Autun

Main contacts: Lerat Damien (shna.damien@orange.fr)

Local *Emys* conservation problems: Destruction and alteration of habitats and unsuitable agricultural practices, plus populations are highly fragmented.

Conservation project activities and main results: After a survey of sites where the species occurs, populations are monitored using a CMR method in order to estimate their viability on the long term. Also, a telemetry study is carried out in order to get information on the use of space in an agricultural landscape (Société d'Histoire Naturelle d'Autun & Conservatoire des Sites Naturels Bourguignons, 2011).

Midi-Pyrénées

Location: Gers department

Project duration: 2009-2011

Conservation project responsible: Nature Midi-Pyrénées

Main contacts: Laurent Barthe (l.barthe@naturemp.org)

Local *Emys* conservation problems: destruction and alteration of habitats (mainly ponds) and unsuitable agricultural practices, plus population fragmentation.

Conservation project activities and main results: After a survey of sites where the species occurs, populations are monitored out using a CMR method in order to estimate their viability on the long term. Also, a telemetry study is carried out in order to get information about the spatial requirements of the species in an agricultural landscape (CPIE Pays Gersois, 2012).

Rhône-Alpes

Location: Isère department

Project duration: 1999 - present

Conservation project responsible: Association Nature Nord-Isère LO PARVI

Main contacts: Raphaël Quesada (direction@loparvi.fr)

Local *Emys* conservation problems: destruction and alteration of habitats, both aquatic and terrestrial, unsuitable agricultural practices (intensive maize growing), and fragmentation by urbanization and transport infrastructures.

Conservation project activities and main results: After a survey of the sites where the species occurs, some populations were monitored using a CMR method from 2001 up to today, in order to estimate their long term viability. At the same time, a monitoring of all Espaces Naturels Sensibles (sensitive natural sites) of the Conseil général d'Isère (Isère local government) is carried out, with a CMR campaign every five years.

Rhône-Alpes

Location: Ardèche department

Project duration: 2010- 2011

Conservation project responsible: Syndicat Mixte Ardèche Claire

Main contacts: Aurélie Caillebotte (natura2000@ardecheclaire.fr)

Local *Emys* conservation problems: presence of possibly introduced populations

Conservation project activities and main results: A new population has been discovered through a CMR study near the river Ardèche. Genetic studies indicated a strong genetic isolation of this population (Astruc and Cheylan, 2011).

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Conservation activities for European pond turtles (*Emys orbicularis*) in Turkey

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Keywords. *Emys orbicularis*, Turkey, conservation

Introduction

Emys orbicularis is distributed almost throughout Turkey (Baran and Atatür, 1998; Fritz, 2001) and it is especially quite abundant in Central Anatolia (Ayaz et al., 2007a, 2008). Currently, two described and one additional putative subspecies of European pond turtles are recognized for Turkey: *E. o. eiselti*, endemic to the east of Amanus Mountains of south-eastern Turkey, a “putative subspecies” along the central Mediterranean coast of Turkey, and *E. o. orbicularis*, in the rest of the country (Fritz et al., 2009).

For the last 20 years, the number of studies on the systematics (e.g. Ayaz et al., 2004; Ayaz and Budak, 2006; Ayaz et al., 2007b), ecology (e.g. Auer and Taşkavak, 2004; Ayaz et al., 2007a, 2007c) and biology (e.g. Çiçek and Ayaz, 2011) of *E. orbicularis* in Turkey has been gradually increasing; however, it is still inadequate. Although the species is under legal protection in Turkey, the related laws have not been implemented yet in an effective manner for the effective conservation of the species. On the other hand, the laws have been implemented so effectively in the recent years that even scientists working with this species need to secure prior official approval to conduct their studies. The preparation for the first conservation action plan to and to create awareness was launched in 2011 and is still continuing.

Conservation projects

Location: Mediterranean Region of Turkey

Project duration: 2011-2014

Funding agency: TÜBİTAK (The Scientific and Technological Research Council of Turkey) and EBİLTEM (The Research and Application Center of Science and Technology, Ege University)

Person responsible for the conservation project: Dinçer Ayaz

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Local *Emys* conservation problems: Although not distributed in dense populations, *E. orbicularis* inhabits suitable habitats almost throughout the Mediterranean Region of Turkey. Nevertheless, in the field studies performed over the last 15 years, it has been seen that the populations have decreased seriously (Ayaz, 2005; Fritz et al., 2009). Tourism and, depending on this, urbanizations are increasingly continuing day-by-day in the Mediterranean Region, particularly in its central and western sections, and the habitats of the species are being destroyed. In addition, road construction, desiccation of wetlands (e.g. Lake Amik), and the construction of new dams, fishing, invasive species and water pollution pose a serious danger (Atatür, 1995; Ayaz, 2005). Due to these negative effects, the two subspecies inhabiting the Mediterranean Region are seriously endangered. We conducted extensive field studies in the Mediterranean Region of Turkey between 1998 and 2010. Our findings confirm that conservation and management studies should be urgently conducted for *Emys orbicularis eiselti* and the putative subspecies from the Mediterranean Coast. For this purpose, we launched a project on the

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population status and conservation of *Emys orbicularis* in the Mediterranean Region of Turkey (including *E. o. ssp.*, and *E. o. eiselti*) in early May 2011. Both are critically endangered and deserve highest conservation priority. To increase public and political awareness, we further recommend the inclusion of *E. o. eiselti* and the putative subspecies from the central Mediterranean coast of Turkey in the IUCN Red List of Threatened Animals.

Conservation project activities and main results:

The main goals of the *Emys* conservation project in the Mediterranean Region of Turkey are to: (1) fully determine the distribution of the species in the Mediterranean Region; (2) estimate the population sizes; (3) collect information on the reproductive ecology which is poorly known in our country; (4) determine habitat preferences by radiotracking; and (5) determine the factors that threaten the populations. (6) All data obtained [also by making use of the literature information] will be used for analyses of population viability and scenarios for the future of the population will be formed. Another goal is to draw up the conservation action plan required for the continuity of populations by considering this information. (7) The drafts of the action plan required for the conservation of populations will be drawn up in the final year of the project. A workshop will be held with the local governments and the nongovernmental organizations and the opinions and recommendations on the drafts will be evaluated. In this way, a valid action plan shall be established, also with the participation of the local governments and the nongovernmental organizations. Furthermore, via public awareness campaigns, including meetings, local people will be informed about the action plan. Scout groups, teachers, various nongovernmental organization and association members and fishermen will be considered the primary target for training activities. Finally (8), several scientific reports and popular booklets about freshwater habitats and their fauna are planned to be published within that frame.

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Conservation activities for the European pond turtle (*Emys orbicularis*) in Slovakia

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Keywords. *Emys orbicularis*, Slovakia, conservation

Introduction

In the past, the European pond turtle (*Emys orbicularis*) occurred in Slovakia in more localities, in the Záhorská (Štěpánek, 1947) and Východoslovenská lowland (Štollmann, 1957). Recently, only one reproducing population is known in Slovakia (Novotný et al., 2004). This population lives in a pond of the Tajba National Pond Reserve close to the town of Streda nad Bodrogom (48°23' N, 21°47' E). However, there are some unconfirmed records for further smaller populations or the occurrence of individual turtles. Using the capture-recapture method, the total number of adult turtles in the Tajba Reserve was estimated to 171 individuals in 2010. Unfortunately, currently there are no ongoing conservation activities on the European pond turtle in Slovakia.

Conservation projects

Southeast Slovakia

Location: Tajba National Pond Reserve

Project duration: 2001-2006

Funding agency: State Nature Conservancy of the Slovak Republic, Banská Bystrica

Conservation project responsible: Adriana Burešová, Stanislav Danko, Milan Novotný, Peter Havaš, Fridrich Szalay

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Local *Emys* conservation problems: The main problem with the conservation of *Emys orbicularis* in Slovakia is the insufficient protection of this animal in its habitat. In Tajba National Pond Reserve, the only protected part is the water body and 100 m of buffering area around the pond, even if it has been described that turtles lay eggs at an average distance of 348,7 m from the water body (Bona et al., 2012a). This means that the nesting areas are located on unprotected agricultural privately owned land. Furthermore, the frequent changes in the water level in the pond (due to climatic conditions) lead to an overgrowth of dense vegetation (*Typha latifolia*, *Phragmites communis*, *Salix cinerea*) in the pond during low water stands (Španíková, 1985). The overgrowth of dense vegetation results in shadow for basking sites, which are often located near the shores of the pond. The second problem with overgrowth is that after the water level rises, vegetation dies and accumulates at the bottom of the pond. That could secondarily lead to a reduction of the height of the water column. Finally, the poor communication between the State Nature Conservancy of the Slovak Republic and scientists to assess the most appropriate conservation measures for *Emys orbicularis* causes further problems, as well as the little number of people working on the conservation of this species.

Conservation project activities and main results: The main objectives of the conservation program on *Emys orbicularis* in Slovakia were:

- (1) Providing the legislative protection of habitats with *Emys orbicularis*,
- (2) providing protection of nests and hatchlings, by preventing the destruction of habitats with *Emys orbicularis* and the identification of suitable sites for reintroduction or introduction,
- (3) carrying out ecological monitoring of *Emys orbicularis*,
- (4) establishing a record of all pond turtles found in the wild by photographing the plastron and carapace, or by taking biometric measurements, and blood sampling for genetic analysis, and
- (5) carrying out education and cooperation programs with the public.

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The main results were:

(1) Production of data and scientific works about seasonal activity (Novotný *et al.*, 2004), overwintering (Novotný *et al.*, 2008) and nest site fidelity (Bona *et al.*, 2012a); (2) headstarting of several turtles at the beginning of the program (1999) and the recent (2010) observation of the first headstarted adult females in nesting areas (Bona *et al.*, 2012b); (3) since 1999, protection of nests (90 nests until 2009;); (4) the organization of the 3rd International Symposium on *Emys orbicularis* and the edition of the respective proceedings volume (*Biologia - Section Zoology*, 59, SUPPL. 14); and (5) public awareness activities, for example the edition of post stamp with *Emys orbicularis*, lectures for the general public especially for young people in the town Streda nad Bodrogom and for students of University of P.J.Šafárik in Košice and print of awareness raising leaflets..

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Conservation activities for European pond turtles (*Emys orbicularis*) in Romania

Tibor Sos^{1,2}

Keywords. *Emys orbicularis*, Romania, conservation

Introduction

In all European countries, including Romania, the habitats of *Emys orbicularis* have become smaller and more fragmented due to intensive agriculture and industrial activities (Fritz, 2001; Cordero Rivera and Fernández, 2004; Sos, 2009, 2011). One direct consequence of the loss of suitable habitats has been the reduction of the population sizes of this species. To reverse this tendency, the single nationwide conservation effort dealing with the species in post-communist Romania was integrated via the Habitats Directive of the European Union into the designation of new Natura 2000 sites for priority species (Ioja et al., 2011). The recently designated Sites of Community Importance (SCI) in 2007 and later in 2011 (see law reference, below) partly managed to protect the Romanian distribution of the species. In the absence of a national population survey, the extent to which protected areas cover this distribution can only be estimated. Of 383 sites designated as SCIs, the species is listed in just 86 (22%), from an overall 4,152,152 ha the designation of 1,571,134 ha (38%) was based also on the presence of *Emys orbicularis* (see law reference, below). These data allow only relative comparison, since, as a rule, the important wetlands are of limited occurrence in the designated sites. The exceptions to this are represented by the wetlands as the Danube Delta, exclusively designated for their humid environment. In case of several designated sites, where *E. orbicularis* occurs, it is not listed. Designation is not yet complete, since in 2012 another bio-geographical seminar is planned with the aim of extending and filling gaps in the existing Natura 2000 network. In parallel, since the designated sites and their species need their management plans, the inventory of priority species

has already started for compiling their distribution and abundance in these areas.

Conservation projects

Name of the Project: Conservation of European Pond Turtle in Transylvania, Romania: Guideline for monitoring and management of small European Pond Turtle populations and their habitats.

Location: Intra-Carpathian Transylvania

Project duration: 2009–2010

Funding agency: Netherlands Embassy in Bucharest through the MATRA/KNIP programme.

Conservation project responsible: Green Echoes Association, Cluj-Napoca, in collaboration with “Milvus Group”, Association for Bird and Nature Protection, Amphibian and Reptile Protection Working Group, Târgu Mureş.

Main contacts: Tibor Sos (tibor.sos@gmail.com)

Local *Emys orbicularis* conservation problems: The threats to the species that have been identified in Romania were: habitat deterioration and destruction as a result of water management activities, such as damming, regulation and drainage, the expansion of industrial, residential and tourist infrastructure, the industrial, agricultural and domestic pollution of water, collection for the pet trade, and injury or death caused by fishermen, road accidents, reed burning, etc. (Sos, 2009). The known Romanian intra-Carpathian, likewise the national, distribution of *E. orbicularis* is still based only on scanty data (Sos, 2011). These derive mostly from the sighting of several specimens within the same populations – thus the first conclusion is that these are small and endangered populations. Safeguarding existing small and isolated populations could provide source populations for later repopulation of areas from which the species has disappeared (Moll and Moll, 2004). In 2009, following up this idea and with the need to designate new Natura 2000 sites in the intra-Carpathian area, also at a national level, we began an inventory of the species

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distribution. Focusing on recently reconfirmed small populations of *E. orbicularis* on the Middle Olt River, we established a pilot study for the development of a monitoring protocol for these small populations and for writing a primary management plan for their habitats (Sos, 2011). Evaluation of the current status of these small populations was considered a priority activity in safeguarding their future through concrete protection activities.

Conservation project activities and main results:

The main goals and achievements of the *E. orbicularis* conservation project in the Middle Olt section were (1) the elaboration of monitoring and management guidelines in Romania for the species, based on international and national best practice or data (Sos, 2011); (2) insuring favourable status of populations at local and national level, including their habitats in the Natura 2000 network, completed partially as only parts of the proposed areas were included; and (3) continuing the inventory of *E. orbicularis* populations in the intra-Carpathian region of Transylvania and also on a national scale. In 2009, following up this idea and with the need to designate new Natura 2000 sites in the intra-Carpathian area, also at a national level, we began an inventory of the species distribution (Figure 1).

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have been collected thanks to the joint efforts of the Conservation Committee of the SEH (Societas Europaea Herpetologica), especially C. Ayres, and organized and edited by Y. Chiari. U. Fritz provided useful comments on this manuscript.

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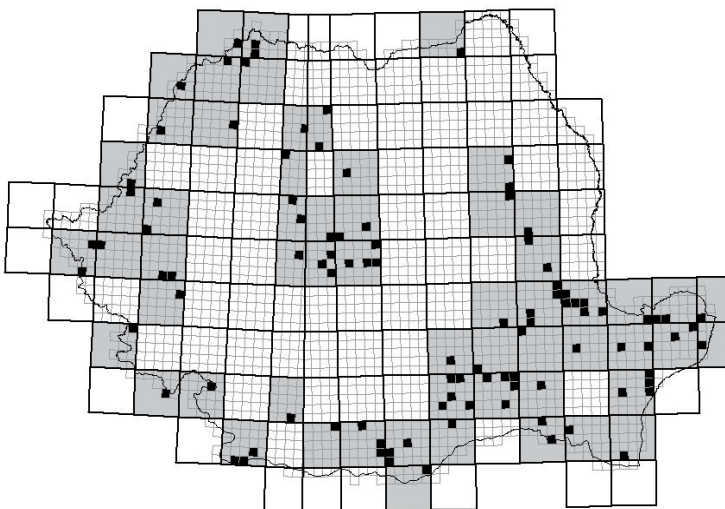


Figure 1. Distribution map of *Emys orbicularis* in Romania with preliminary records from the “Milvus Group”- Bird and Nature Protection Association database (black and grey square: data available from 10 km x 10 km and 50 km x 50 km UTM square respectively)

Conservation activities for European pond turtles (*Emys orbicularis*) in Croatia

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Keywords. *Emys orbicularis*, Croatia, conservation

Introduction

The European pond turtle is wide-spread in all biogeographical regions of Croatia (Figure 1.), that is, in the Mediterranean, Alpine, Pannonian and Continental Regions. In the Red Book of amphibians and reptiles of Croatia, it is listed in the NT category, inhabiting rivers, lakes and ponds on the mainland (Janev-Hutinec et al., 2006), as well as ponds on some of the Adriatic islands: Krk, Cres, Plavnik, Rab, Pag, Kornat (Hirtz, 1930; Fritz, 1992) and Mljet (Kolombatović, 1904; Jelić et al., 2012). However, there were no recent records on Kornat, Rab and Plavnik. The Alpine Biogeographical Region (called Lika and Gorski kotar) does not provide many suitable habitats. According to Fritz (1992, 2001) and Fritz and Obst (1995) this area is the border between the subspecies *E. o. orbicularis* and *E. o. hellenica*.

Recent publications on the pond turtle are mainly inventory reports (Jelić and Karaica, 2012; Jelić et al., 2012; Koren et al., 2011; Pawlowski and Krämer, 2009; Tóth et al., 2006; Lončar, 2005; Sehnal et al., 1999). Therefore, more accurate information on the distribution of the species and specific population needs are required. Moravec (2003) reports on dwarfism in the Pag island population.

Legislation in Croatia classifies the pond turtle as a strictly protected species (Pravilnik o proglašavanju divljih svojti zaštićenim i strogo zaštićenim (Official gazette 99/09)). The national budget funds eight national park areas covering about 1% of the national territory, three of which have the pond turtle on their

inventory lists (NP Krka, NP Plitvice, NP Mljet). One of the remaining national parks, NP Kornati, considers the Tarac pond population of this park to be possibly extinct and no *Emys orbicularis* oriented research has ever taken place there. Nature parks are also funded by the national budget, but they have a lower rank of habitat protection than national parks. Seven out of 11 nature parks have records of pond turtle there: PP Žumberak - Samoborsko gorje, PP Vransko jezero, PP Telašćica, PP Papuk, PP Lonjsko polje, PP Kopački rit, PP Biokovo. No population assessments for *E. orbicularis* have been performed for these protected areas. Lonjsko polje and Kopački rit are amongst the more important continental areas for *E. orbicularis* and Vransko jezero is an important Mediterranean habitat. Among the locally funded areas, the Regional Park of the rivers Mura and Drava in NW Croatia is one of the more important areas for *E. orbicularis*.

The main problems for the populations are habitat loss, introduced species and pet trade. The loss of habitat is a result of meliorations affecting ponds, marshes and streams; canalizations of rivers and streams as well as the use of springs for drinking water (urbanization) and agriculture (Šalamon, 2007; 2008). The latter is the main problem in the karstic Mediterranean areas (Šalamon and Šilić, 2008), especially on the islands during the dry season. Urbanization is also affecting the continental habitats, while natural succession of ponds affects island and mainland Mediterranean habitats (Strišković et al., 2009). Isolated *Emys* sites in Zagreb, Sisak and Kutina area were influenced by the iron and oil industry. Occasional road-kill problems indicating habitat fragmentation are being recorded in the National herpetofauna database (Jelić et al., 2009). Introduced species threatening aquatic turtles in Croatia are the red-eared sliders (*Trachemys scripta elegans*), which were banned for import in 2007. Although all the habitats affected by this invasive species are not yet accounted for, lake and river populations are recorded

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in the continental and Mediterranean areas near urban excursion sites. Some of them are hosting slider populations with high densities and are being monitored (Maksimir park, Zagreb). Yellow-bellied sliders (*T. s. scripta*) are still frequent in pet trade. Southern Dalmatian populations (Mljet, river Konavočica, Stonsko polje) of *E. orbicularis* are affected by another alien species. The small Indian mongoose (*Herpestes auropunctatus*) was introduced to Mljet on August 26th 1910, when 11 specimens of this species, imported from India, were released at the location of Vilina vodica (Mader, 2010). Since then, the mongooses dispersed across the whole island and made a serious impact on its sensitive ecosystem (Barun *et al.*, 2010). Mongooses were spotted in the coastal Dalmatian areas as well (Šalamon, 2007; 2008).

There is legalized pet trade of this protected species in Croatia. During the attempt of registration of reptile pets and breeding pet reptiles by the Ministry of

environmental and nature protection, certain number of owners and breeders of *Emys orbicularis* were provided with permits for keeping and/or breeding. Chip tags for *Emys* offspring are used when they are at least 10 cm of straight carapace length and the insertion of the chips is not supervised by the licensing authority. This practice presents a problem of an unknown extent because it leaves an open door for restocking from the wild. Some of the *Emys* pet individuals were not registered. Although keeping *Emys orbicularis* from the wild population as a pet and without a permit is illegal in Croatia, there is, at this time, no possibility to know where these animals are or if the individuals are from the Croatian wild populations. Therefore, there are no offence penalties in practice and the educational activities of the Ministry have limited result. Additionally, there are possible introductions of home-bred animals into wild population habitats. Different forum activity shows that some of *Emys* „owners“

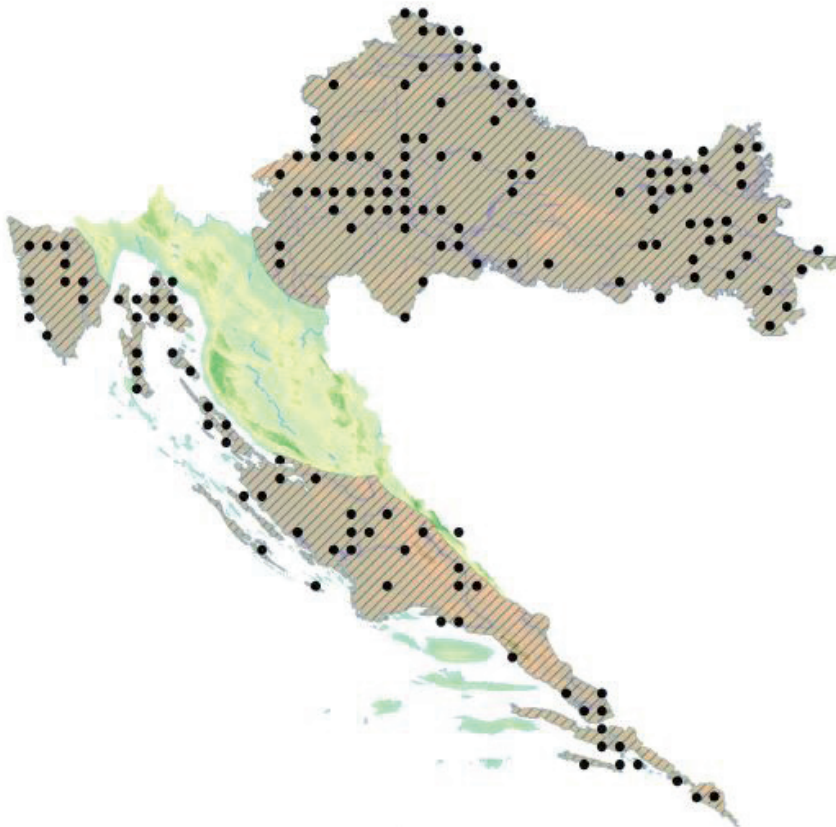


Figure 1. Distribution map of *Emys orbicularis* in Croatia with records from the National herpetofauna database. Courtesy of Dušan Jelić and Croatian herpetological society -Hyla.

are getting organized in the (re)introduction attempts because they consider the engagement to be helpful for this endangered species. Although these activists are mostly informed (via public forums) of the problems for native *Emys* populations that could occur, and the fact that unauthorized introductions are illegal, there is no evidence that the education works.

There are no nationwide projects focusing on the European pond turtle in Croatia. However, a significant amount of basic data on this species is collected in numerous local faunistic inventory projects. Also, data is collected as added value from nationwide projects such as the database of reptiles and amphibians of Croatia (State institute for nature protection, Croatian herpetology society and Rivers of Croatia).

Conservation projects

Sovsko Lake

Location: Sovsko jezero (lake), protected area of Požega-Slavonija County

Project duration: 2009-2010

Funding agency: Public institute for the management of protected areas of Požega-Slavonija County

Conservation project responsible: Croatian herpetological society- HYLA

Main contacts: Mila Lončar (snakepit.zg@gmail.com), Dragica Šalamon (salamon.d@gmail.com)

Local *Emys* conservation problems: This lake is an excursion site and the basic population data were gathered as a starting point for further monitoring of population trend and surveyed for *Trachemys* presence.

Conservation project activities and main results: To estimate the population size and status: no *Trachemys* individuals were recorded and Sovsko Lake population appeared healthy.

Maksimir Park

Location: Lake system in the Maksimir Park, Zagreb

Project duration: 2006-2008 and 2010- present

Funding agency: Public institution for the management of Maksimir Park

Conservation project responsible: Croatian herpetological society – HYLA and Public institute for management of Maksimir Park

Main contacts: Mila Lončar (snakepit.zg@gmail.com), Dragica Šalamon (salamon.d@gmail.com), Biljana Janev Hutinec (bjanev.hutinec@gmail.com)

Local *Emys* conservation problems: The lake system is an excursion site with a large *Trachemys* population. Assessment of the presence and survival of *Emys*

orbicularis was necessary as well as to investigate reproduction of *Trachemys* and if there was a change in population size in *Emys orbicularis* and *Trachemys*.

Conservation project activities and main results:

to estimate the population size and status of *Trachemys* and *Emys* species in all 5 Maksimir lakes

- to target the lakes and areas utilized by *Emys* and *Trachemys*

- to target *Trachemys* reproductive behaviour

- to target *Trachemys* nesting sites

- to record *Trachemys* hatching success

-to suggest possible management actions for *Trachemys*

Lake system in the Maksimir Park consists of five lakes named using the ordinal numbers. There was a small *E. orbicularis* population indentified on the Third Lake, estimated to 12 animals. The population of the Fifth Lake was estimated to 18-20 animals. In both investigated lakes, *Trachemys* turtles were by far predominant. Since *Trachemys* hatchlings were found, it was important to find more evidence on *Trachemys* reproduction in the follow-up and to organize *Trachemys* management program. Therefore, as a follow-up for the previous Maksimir Park turtle project (2006 – 2008), monitoring on the Third and Fifth Lake continued. The number of *Emys orbicularis* in the Third Lake decreased, while the number on the Fifth Lake increased to the maximally 25 observed individuals. The change on the Fifth Lake could be due to restoration of the adjacent Fourth Lake in 2008, which now hosts part of the *Trachemys* population from the Fifth Lake. Other lakes were also included in the *Trachemys* assessment program. *Trachemys* nesting behaviour was recorded near the Third Lake, and nesting sites were mapped on the meadows next to the Third Lake. The research is still in progress.

Acknowledgments. These data have been collected thanks to a joint effort of the Conservation Committee of the SEH (Societas Europaea Herpetologica), especially of Cesar Ayres. Collected data were organized and edited by Y. Chiari. Uwe Fritz provided useful comments on this manuscript.

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Conservation activities for the European pond turtle (*Emys orbicularis*) in Portugal

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Keywords. *Emys orbicularis*, Portugal, conservation

Introduction

In Portugal, the European pond turtle (*Emys orbicularis*) is classified as Endangered (EN) (Cabral et al., 2005) and it is suspected to have suffered a continued decline during the last 100 years, not only in terms of population size, but also in its distribution area (Segurado and Araújo, 2008; Araújo et al., 1997). Furthermore, the populations of this freshwater turtle are still dwindling in much of their distribution range and there is an urgent need for the implementation of conservation actions (Segurado, 2000). Its distribution presents a high degree of fragmentation, especially in the Centre and North of Portugal, being more easily observed in well preserved wetlands south of river Tagus (Araújo et al., 1997; Segurado, 2000; Ferrand et al., 2001). Their populations are often small and relatively isolated from each other, a common pattern throughout all the Iberian Peninsula and in other European countries (Araújo et al., 1997; Segurado, 2000).

The main threats for this species are the destruction, alteration and pollution of wetlands, the illegal capture and the introduction of exotic invasive turtles, namely *Trachemys scripta* (Cabral et al., 2005). Due to the late sexual maturity of females, low fertility rates and high juvenile mortality, which implies a very low population growth rate and a reduced resilience in face of negative impacts (Keller, 1997; Araújo et al., 1997; Segurado, 2000; Cadi and Joly, 2004; Perez-Santigosa et al., 2011), *E. orbicularis* is particularly vulnerable to habitat destruction and exotic species competition.

Conservation projects

LIFE *Trachemys* Conservation Project

Location: Algarve Region – Parque Natural da Ria Formosa (Almancil, Loulé)

Project duration: 2011-2013

Funding agency: European Commission, LIFE + Project

Conservation project responsables: José Teixeira (Research Center in Biodiversity and Genetic Resources, CIBIO – University of Porto, Portugal), Fábía Azevedo (RIAS / Aldeia), Ana Alves (PBG - Gaia Biological Park).

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Local *Emys* conservation problems: The study area consists of 4 coastal lagoons in the Ria Formosa Natural Park (Almancil, Loulé) considered of great value to freshwater biodiversity, particularly for *Emys orbicularis*. This area is one of the few in Portugal with confirmed simultaneous presence of the two native species *Emys orbicularis* and *Mauremys leprosa* together with the invasive turtle *Trachemys scripta*. The impact of *Trachemys scripta* on native species is well documented (Cadi and Joly, 2003; Cadi and Joly, 2004). Therefore, since 2011 the LIFE *Trachemys* conservation project has been implemented in order to preserve the existing populations of endangered freshwater *Emys orbicularis* and to develop and test the effectiveness of different control methods for exotic freshwater turtles. This Iberian LIFE project is being implemented in Portugal by different research groups (CIBIO – Research Centre in Biodiversity and Genetic Resources – University of Porto), NGOs (Recuperation and Research Center of Wildlife – RIAS / Aldeia) and private entities (Gaia Biological Park - PBG).

Conservation activities and main results: The main

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*Author order reflects author contribution

conservation goals of this project are:

1) the development of a strategy and techniques to control and eradicate *Trachemys scripta* from *Emys orbicularis* habitats in Algarve Region; 2) the monitoring of the main remaining populations of *Emys orbicularis* in the region; 3) the reinforcement of *Emys orbicularis* populations through captive breeding programs; 4) to increase public awareness of the importance of the species and its freshwater habitats conservation, and also of the problems caused by the introduction of exotic invasive species in order to prevent this negative practice.

The main results so far include:

1) The removal of more than 200 alien freshwater turtles (mainly *Trachemys scripta elegans*) from four *Emys orbicularis* sites. The animals were captured with a mix of classic funnel traps, different floating traps designed for this project and by the use of trained dogs. The animals were delivered to Zoological Parks (KrazyWorld Zoo and Gaia Biological Park) where they are exhibited in adapted facilities for educational purposes;

2) Location and protection of several nesting sites of *Emys orbicularis* in the wild;

3) Monitoring of the two autochthonous species (*Emys orbicularis* and *Mauremys leprosa*) in the region through mark-recapture techniques;

4) Captive breeding program of *E. orbicularis* through the use of pregnant females captured in the wild, which are released at the same site after egg deposition. For this purpose special outdoor captive breeding facilities and indoor thermal controlled egg incubation were created in Olhão (RIAS) and Vila Nova de Gaia (PBG). More than 50 juveniles were born during the first year of the project, representing about 1/3 of the actual local population size;

5) Numerous environmental education actions directed at local schools and the general public to inform the population about the freshwater turtle's biology, conservation problems and to avoid the introduction of exotic turtles in the wild. We have also produced different communication materials, including information panels, leaflets, stickers, pins and a website.

6) A microsatellite genetic tool that allows the geographical identification of the specimens delivered to Official Reception Centres and their release in the wild into their origin region.

7) Creation of an alert network for the detection of exotic freshwater turtle's species presence throughout the country;

8) The publication of several scientific reports and

congress presentations.

The developed capture methods showed promising results, but the present situation of invasive freshwater turtle populations in the region is already alarming and once again highlights the urgent need for an early detection alert and eradication procedure. After establishment, the invasive species tends to dominate the wetlands in a very fast process, making their eradication extremely difficult. The population monitoring, environmental education actions and captive breeding programs also showed good results and constitute key conservation procedures that would be very important to replicate in other areas of the country. Presently there is a huge lack of information about *E. orbicularis* population status across the country, together with exotic species distribution, reproduction sites and population size, which should be remedied urgently.

Besides this project, the conservation efforts targeted at *Emys orbicularis* in Portugal are still very scarce, with the exception of a few punctual actions to preserve especially important habitats for the species, namely one microreserve definition for a costal lagoon in Southwestern Portugal (Almogrove, Odemira) by the NGO Quercus. The implementation of two more microreserves for *E. orbicularis* is presently under study by CIBIO in the Terva Valley Archaeological Park (Bobadela, Boticas), where one of the largest populations north of Douro river still prevails, and in the International Tagus Natural Park (Malpica do Tejo, Castelo Branco). This protection scheme is particularly directed to the conservation of small size habitats. A broad network of small protected wetlands has several advantages for species that depend of localized habitats, as they: i) are probably more effective than the generally adopted "large site" strategy; ii) have simpler procedures than traditional large protected areas; and iii) allow the commitment and whenever possible the financial reward to the land owners for their role in biodiversity conservation. As so, the population monitoring and identification of particular important areas for the species and the consequent definition of an extended microreserve network assume to be promising tools for the conservation of this endangered species.

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Conservation projects for *Emys orbicularis* in Spain

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Keywords. *Emys orbicularis*, Spain, conservation projects

Introduction

The European pond turtle (*Emys orbicularis*) is globally listed as Least Concern (LC) in the IUCN Red List (IUCN, 2012), although this classification should be reconsidered. In Spain, *E. orbicularis* is included in the List of Species under special protection, but not in the Spanish Red List of Endangered Species. It has

been proposed that populations from the northwest and from the Levant should be considered endangered (EN) (Keller and Andreu, 2002). Recent studies suggest that this category should be applied nationally due to the decrease of the area occupied by the species in recent years (Ayres, 2009).

The main threats to the Iberian populations of *E. orbicularis* are the destruction and fragmentation of the species habitat by extensive and intensive farming, infrastructure construction, and urbanization (Cordero Rivera and Ayres Fernandez, 2004; Sancho, 1998). Other negative factors are the introduction of exotic species (Cadi and Joly, 2004), like fishes (pike, blackbass) (Lacomba and Sancho, 2000) and invertebrates (Marco and Andreu, 2005).

Also, an illegal trade for terrarium keepers exists and to a lesser extent turtles are yet caught for consumption. Populations occupying seasonal wetlands have suffered most from the effects of the droughts in the Iberian Peninsula in recent years. In those areas where water is extracted for agricultural use, this is a big problem threatening the survival of *E. orbicularis*.

For the conservation of the species in the Iberian Peninsula it is essential to preserve its habitat, especially in the areas where there is a non-sustainable use of water resources. It is also necessary to prevent the introduction of exotic fish that prey on hatchlings (Lacomba and Sancho, 2004).

In recent years there have been several LIFE projects in which *E. orbicularis* has been included as a species to be protected (Barriocanal et al., 2005, Life *Emys*Ter, 2008). Some regional governments have included the species in the regional Red List and have developed management plans (i.e. Valencia) (Sancho, 1998), whereas other governments have not approved the regional catalogue or have not developed plans of management and recovery (Cordero Rivera and Ayres Fernandez, 2004).

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Conservation projects

Location: Madrid

Project duration: 2003-2013

Funding agency: FIDA, Fundación para la Investigación y el Desarrollo Ambiental, y Consejería de Medio Ambiente de la Comunidad de Madrid.

Conservation project responsible: Alberto Alvarez. AHE.

Main contacts: Alberto Alvarez (alberto.alvarez@herpetologica.org), Enrique Ayllon.

Local *Emys* conservation problems: The European pond turtle is listed as Endangered in the regional Red List (Alvarez and Esteban, 2005). The main problem for the species in this region seems to be habitat alteration, specially caused by desiccation of wetlands due to overexploitation of aquifers. Another important threat is the presence of alien species that can compete with *E. orbicularis*, as *Trachemys scripta* and the presence of racoons that can predate on nests or juveniles. Furthermore, competitive interactions with populations of *Mauremys leprosa* has been reported and while this does not represent a threat in itself to the survival of natural populations of *Emys orbicularis*, it could contribute to weaken populations of the pond turtle if already endangered and depauperated (Segurado *et al.*, 2012). Further research addressing the interaction between these two species will provide additional information on how their occurrence in syntopy can differently affect species survival in case of habitat destruction and competition for limited resources. Furthermore, the lack of connectivity among populations of pond turtle represents a limitation to the gene flow between populations. Finally, there is a risk of capture of animals as pets in the populations more close to urban areas.

Conservation project activities and main results:

- Studies were carried out to assess the distribution and identification of unknown populations.
- Population census.
- Radiotracking of individuals in order to detect problems during breeding season, hibernation and aestivation (2005-2007).
- Captive breeding program (2007-2012).
- Creation of new ponds in order to correct the lack of connectivity between populations.
- Release of head-started individuals: 2010 – 2012.
- Eradication of alien turtles.
- Genetic analysis of the population in order to detect individuals released from captivity.

Location: Laguna del Campillo (Sureste Regional Park), Madrid.

Project duration: 2009-2012

Funding agency: Comunidad de Madrid

Conservation project responsible: Sureste Regional Park-AHE

Main contacts: Enrique Ayllon Lopez (AHE, enrique.ayllon@herpetologica.org)

Local *Emys* conservation problems: There is only one locality for the species in the Sureste Regional Park. The lagoon is an old gravel pit with bad water quality due to low rate of water renewal. There are many alien species (crayfishes, fishes, turtles, racoons) in the park. The presence of alien fishes causes an influx of fishermen and visitors. The *E. orbicularis* population is small, with a low number of juveniles detected during the study. These data suggest a lack of successful reproduction in this population.

Conservation project activities and main results:

Since the year 2008 there has been a periodic monitoring program for the herpetofauna. The pond turtle population has been studied using a capture-mark-recapture (CMR) scheme. Some females were radiotracked to detect egg-laying areas and nest predation. A small captive breeding and head-starting program has been started during 2012. There is a specific program for the eradication of alien turtles, using floating traps.

Location: “Evaluación de las poblaciones de galápagos europeo, *Emys orbicularis*, (Linnaeus, 1758) en la provincia de Toledo”. Castilla-La Mancha region, Toledo province, Central Spain.

Project duration: April 2009-April 2010

Funding agency: Servicio de Medio Ambiente de la Diputación Provincial de Toledo

Conservation project responsible: Pedro Luis Hernández Sastre (AHE)

Main contacts: Pedro Luis Hernández Sastre (patiportico@hotmail.com)

Local *Emys* conservation problems: The lack of knowledge on the current status of the species in this area was the main motivation for this study. In the studied area there are many alien species, specially fishes and crayfishes, causing great pressure by fishermen. Desiccation of water points due to overexploitation is a big threat to isolated populations.

Conservation project activities and main results:

The study had two main objectives: 1) update the distribution of *Emys orbicularis* in the province of Toledo, 2) population estimates. To achieve these goals,

we assembled all literature references for the presence of *E. orbicularis* in the region. Once identified, the zones most likely harbouring populations were visited to determine the presence / absence of the species. A total of 75 locations were visited along different types of aquatic environments: streams, rivers, reservoirs, pools and ponds. The species was found in only one location. In addition, the small number of individuals detected in this location prevented the realization of any population estimates.

Location: Monumento Natural Lagunas de Cañada del Hoyo, Cuenca.

Project duration: 2009-present.

Funding agency: JCCCLM.

Conservation project responsible: Enrique Ayllon (AHE).

Main contacts: Enrique Ayllon (tesoreria@herpetologica.org), Pedro Hernandez Sastre (patiportico@hotmail.com), Cesar Ayres (cesar@herpetologica.org).

Local *Emys* conservation problems: The lagoons are located inside a Natural Monument area, with a high number of visitors. This is probably the entry route of the alien turtle species (*Trachemys scripta* and *Graptemys* sp.) that have been detected in the lagoons. The presence of alien fishes, *Micropterus salmoides* and *Gambusia* sp., has been also detected in most of the lagoons and there is also a big population of signal crayfish in the surrounding rivers. Previous to the beginning of this study there was a lack of knowledge about the origin and current status of this population. Rubio and Palacios (1998), claimed that some individuals were traslocated from southern populations, but there are some old references (Torner de la Fuente, 1920) that reported the turtles as quite common in the area. The population size is small and the data suggests that there is no reproductive success in some of the lagoons

Conservation project activities and main results: Since 2009 the population has been monitored using a capture-mark-recapture (CMR) scheme (Ayllon et al., 2010). After 2010 the turtles were also marked using numbered plastic tags to allow visual censuses by workers of the environmental agency, in order to detect movements between lagoons. Adult turtles were radio tracked to detect hibernation and also nesting areas. During 2013 alternative nesting areas and additional basking spots will be created.

Location: Lago Somido (Las Médulas Natural Monument), León.

Project duration: 2008-2011

Funding agency: Comunidad Autónoma de Castilla y León

Conservation project responsible: Las Médulas Natural Monument

Main contacts: David Miguélez Carbajo (biodavid@hotmail.com)

Local *Emys* conservation problems: In Las Médulas Natural Monument area there are a high number of alien species (crayfishes, fishes) that caused important degradation of the ponds, destroying the macrophyte community. A potential risk of colonization of alien species (fishes, turtles) from closest wetlands exists (Alarcos-Izquierdo et al., 2010). The presence of alien crayfishes causes pressure from visitors and illegal fishing. The population size is small. The ponds have bad water quality due to low rate of water renewal. The banks of the ponds are stomped by cattle. Ponds are used as a place of water recharge for helicopters of the regional fire department.

Future proposals and conservation project activities:

- Prospecting programs to quantify the population size.
- Genetic studies to determine the origin of the population.
- Monitoring of the population inhabiting Las Médulas Natural Monument, using a CMR scheme.
- Studies to evaluate connectivity with other populations are necessary to maintain gene flow.
- Control (or eradication) of alien species.
- It will be important to involve the local people in the planning and protection of the area.

Location: Bolue Wetland (Getxo, Bizkaia province)

Duration: 2003- present

Funding agency: Getxo City Council

Project responsible: Xabi Buenetxea.

Main contacts: Xabi Buenetxea (boluEmys@hotmail.com), Leire Paz (l.pazleiza@gmail.com)

Local *Emys* conservation problems: Lack of knowledge and awareness about the status of the turtle populations until the start of this project. High number of alien species (crayfishes, fishes, turtles). Lack of successful reproduction.

Conservation activities and main results:

- Monitoring of the population through a CMR scheme.

- Radio tracking of some individuals to describe phenology and land use of the area.

- Faecal analysis of diet.

- Captive breeding and reinforcement of the population by reintroduction of individuals received in the public wildlife rescue centre.

- Removal of exotic terrapins to decrease pressure on native turtles.

Location: province of Bizkaia

Duration: 2006- present

Funding agency: Diputación Foral de Bizkaia

Main contacts: Xabi Buenetxea (boluEmys@hotmail.com), Leire Paz (l.pazleiza@gmail.com)

Local Emys conservation problems: Lack of knowledge and awareness about the status of the turtle populations until the start of this project. High number of alien species (crayfishes, fishes, turtles), pressure from poachers, small population size, and lack of successful reproduction.

Conservation activities and main results: Search of unknown wild populations and monitoring of the captured individuals. Radio tracking of some individuals to describe phenology and land use of the area. Removal of exotic terrapins.

Location: province of Araba

Duration: 2001-now

Funding agency: Diputación Foral de Araba

Main contacts: Xabi Buenetxea (boluEmys@hotmail.com), Leire Paz (l.pazleiza@gmail.com)

Local Emys conservation problems: Lack of knowledge and awareness about the status of the turtle populations until the start of this project. High number of alien species (crayfishes, fishes, turtles). Pressure from poachers. Small population size. Lack of successful reproduction.

Conservation activities and main results: Search of unknown wild populations and monitoring of the captured individuals. Radiotracking of some individuals to describe phenology and land use of the area. Removal of exotic terrapins.

Location: Gandaras de Budiño e Ribeiras do Louro wetland (Natura 2000)

Project duration: 2010

Funding agency: Delegación Provincial da D.X. de Conservación da Natureza

Conservation project responsible: Adolfo Cordero Rivera (Universidade de Vigo)

Main contacts: Adolfo Cordero Rivera (adolfo.cordero@uvigo.es), Cesar Ayres (cesar@herpetologica.org).

Local Emys conservation problems: Habitat fragmentation and alteration is the main problem in the area, due to industrial pressure. Desiccation of wetlands due to changes in land use has been also a common practice in the area. There are many alien species (red swamp crayfish, American mink, blackbass, *Trachemys sp.*) that can compete with pond turtles. A lack of connectivity between ponds has been detected. There are reports of individuals being captured as pets. High levels of pollution have been detected, especially Lindane spills. The population size is small and the sex ratio skewed to the males.

Conservation project activities and main results: During 2010 three Urgent Priority Actions from the Regional Action Plan were developed: 1) Creation of alternative nesting areas. 2) Radiotracking of females to find and protect nesting and hibernating areas. 3) Testing methods to eradicate alien fish species.

Location: Aragón

Project duration: 2011-2014

Funding agency: Gobierno de Aragón

Conservation project responsible: Joaquín Guerrero

Main contacts: Joaquín Guerrero (jguerrero@aragon.es), Aitor Valdeón (Emys@galapagosdenavarra.com).

Local Emys conservation problems: There are many problems in most of the populations, but they are very heterogeneous. The most important are habitat destruction or habitat quality loss, presence of multiple alien species (turtles, crayfishes, fishes), pressure from visitors, in particular fishermen, population isolation.

Conservation project activities and main results: *Emys orbicularis* populations in Ebro Basin are studied by Aitor Valdeón during his doctoral thesis (2011-2015). In Aragon nowadays it requires a lot of efforts to detect all *Emys orbicularis* populations, locating new unknown sites and updating old information about this species. Conservation activities consist in monitoring using a CMR scheme and in removing alien turtles. Since 2004, 170 alien turtles (mostly *Trachemys scripta*) have been removed from the “Reserva Natural Dirigida de los Sotos y Galachos del Ebro”, from which more than 50 were captured during the last two years. In this reserve live ca. 100 *Emys orbicularis* and 100 *Mauremys leprosa*.

Location: Gállego River (Zaragoza province)

Project duration: 2010

Funding agency: Departamento de Medio Ambiente del Gobierno de Aragón

Conservation project responsible: Luis Lorente

Main contacts: Luis Lorente (lor036@orange.es)

Local *Emys* conservation problems: Water pollution was very serious in the Gállego River because of spills of Lindane. Other main threats are habitat alteration, presence of alien species like crayfishes and fishes, and the poor knowledge about this population.

Conservation project activities and main results: Gállego River was monitorized using a CMR scheme. More than 100 *E. orbicularis* were captured and marked, adding new data to the knowledge of the species.

Location: Navarra

Project duration: 2006-2012

Funding Agencies: Gobierno de Navarra and Gestión Ambiental de Navarra, S.A.

Conservation Project responsible: Jokin Larumbe

Main contacts: Aitor Valdeón (*Emys@galapagosdenavarra.com*)

Local *Emys* conservation problems: In Navarra, *Emys orbicularis* populations are being studied since 2005, locating some really endangered populations: There are many problems in most of the populations, but they are very heterogeneous. The most important are habitat destruction or quality loss, presence of multiple alien species (turtles, crayfishes, and fishes), pressure from visitors (especially fishermen), and population isolation.

Conservation project activities and main results: Monitoring using a CMR scheme and proposal of conservation measures. Some ponds have being restored and a small captive breeding and head-starting program has started in a critical population.

Location: Canal de Navarra irrigable area (Navarra)

Project duration: 2010-2011

Funding Agencies: Aguacanal and UTE Riegos del Canal

Conservation Project responsible: Aitor Valdeón

Main contacts: Aitor Valdeón (*Emys@galapagosdenavarra.com*) and Virginia Rada (*vradaojer@gmail.com*)

Local *Emys* conservation problems: Habitat transformation and direct mortality due to heavy machinery used during the transformation work.

Conservation project activities and main results:

Turtles were trapped before and during the working project, maintaining them in captivity to avoid their death. After the works finished, 41 *Emys orbicularis* and one individual of *Mauremys leprosa* were reintroduced in the closest suitable area.

Location: Sierra de Grazalema and Los Alcornocales Natural Parks (south of Spain, Málaga province)

Project duration: 2010-2013

Funding agency: University of Málaga

Conservation project responsible: Raimundo Real (University of Málaga)

Main contacts: Jesús Duarte (*jddbiogea@gmail.com*), David Romero (*davidrp@uma.es*), Miguel A. Farfán (*mafarfanaguilar@hotmail.com*)

Local *Emys* conservation problems: Small and isolated populations. Lack of demographic data and unknown distribution range inside the species' favourable area. Likely low reproductive success. Potential presence of alien species.

Conservation project activities and main results:

- Monitoring known populations using CMR techniques.
- Search of the species in favourable zones near to the already known areas.
- Habitat and community characterization of the known areas.
- Developing low range favourability distribution models for the rivers and wet areas in the two nature parks and neighbouring areas.
- Evaluating population densities of *M. leprosa* in sympatric areas.

Location: Segura River Basin (Albacete and Murcia provinces)

Project duration: 2010.

Funding agency: VolCam, Caja Mediterraneo (CAM).

Conservation project responsible: Marcos Ferrandez (ANSE).

Main contacts: Marcos Ferrandez (*fsmarcos69@gmail.com*), Jorge Sanchez (*araar@asociacionanse.org*).

Local conservation problems: Lack of knowledge of the current status of the populations inhabiting the Segura River Basin. Drainage of water points represents an important threat for turtles. The presence of invasive alien species (fishes, crayfishes, chelonians) has been reported in many areas of the basin.

Conservation project activities and main results:

The main objective of the project was the evaluation of the viability of the historical records for the species in the Segura Basin. A volunteer based program to detect and eradicate exotic turtles was developed. Also an awareness campaign for fishermen and farmers was designed and developed.

Location: Region of Valencia (East Spain)

Project duration: 2011-2013

Funding agency: Generalitat Valenciana/European Commission (co-financing with LIFE+ Programme)

Conservation project responsible: Regional Ministry of Environment

Main contacts: Ignacio Lacomba (lacomba_ign@gva.es), Vicente Sancho (sancho_vicalc@gva.es)

Local *Emys* conservation problems: High number of alien species (mainly *Trachemys scripta*). Nest predation by foxes. Pressure from visitors and fishermen. Small population size and isolated populations due to habitat fragmentation

Conservation project activities and main results:

- Design and implementation of specific regulations in order to avoid trade and release of exotic invasive turtles.

- Raising an official campaign for the control and elimination of exotic invasive freshwater turtle's trade (more than 13,000 exotic turtles captured in the wild during the years 2011 and 2012).

- Create a protocol and a network for the early detection of the presence of exotic freshwater turtles in natural wetlands.

- Design of a complete methodology and specific new techniques and tools to be implemented in order to detect, catch and eradicate exotic freshwater turtles from the wild (mainly wetlands).

- Dog training and use of ground penetrating radar in order to detect nesting sites.

- Breed in captivity and reinforcement or reintroduction of populations of indigenous endangered freshwater turtles (in the framework of the official Action Plan for the Conservation of indigenous freshwater turtles).

- Design and implementation of a specific awareness campaign (including web, media, signals, etc.) in order to involve society in the project (control of exotic turtle expansion) and results dissemination and replication.

- To produce a handbook of methods and techniques for the control and eradication of exotic invasive turtles in wetlands in order to disseminate and replicate the goals of the project.

Location: Zones Humides de la Selva (Girona, Catalonia)

Project duration: 1986 – present

Funding agency: Unknown, currently without official funds

Conservation project responsible: *Emys* Foundation (NGO) and Generalitat de Catalunya (Country Government)

Main contacts: *Emys* Foundation – Marc Franch (apoarmatu@gmail.com)

Local *Emys* conservation problems: The problems affecting *E. orbicularis* are basically the excessive pressure in habitats: destruction of aquatic habitats and high fragmentation of the area and an increased presence of invasive exotic species (American mink, turtles, crabs, fish).

Conservation project activities and main results: Projects that have been made, and are being made in this area, mainly focus on the recovery of habitats and removal of exotic specimens as well as the *Emys* populations monitoring (mainly capture - marking-recapture studies). To develop projects for the conservation, research and management, we are currently working with the Land Stewardship as a set of tools to protect habitats and species by involving citizens, business owners and government.

Location: Parc Natural del Delta de l'Ebre (Natura 2000).

Project duration: since 1994 to present

Funding agency: Government of Catalonia, Diputació de Tarragona and recently European Union (LIFE 09 NAT/ES/000520).

Conservation project responsible: Antoni Curcó Masip (Parc Natural del delta de l'Ebre) and Albert Bertolero (IRTA Ecosistemes Aquàtics).

Main contacts: Antoni Curcó Masip (acurcom@gencat.cat); Laura Fortuño (canalvell.dmah@gencat.cat); Albert Bertolero (albert.bertolero@irta.cat, albertb@tinet.org).

Local *Emys* conservation problems: At present only very small natural populations remain in the Ebro Delta. The main problems are the water contamination, the interaction with lagoon fisheries, the concrete channels and the capture as a pet.

Conservation project activities and main results: A small breeding program started in 1994 in the Biological Station (Parc Natural del Delta de l'Ebre). In 2006 the program was re-launched, and since 2009 more than 250 hatchlings are produced each year. Currently two

reintroduction actions are carried out in two areas of the Natural Park. The first started in the Illa de Buda in 2006, where more than 200 individuals have been released until present. Monitoring of this reintroduction has confirmed the successful reproduction of the European terrapin in the wild, with the annual survival of the released individuals being estimated in more than 85% (Bertolero, 2011). The second reintroduction project started in 2011 in the Alfacada lagoon (action included in a Life project to improve the ecological status of the Alfacada and Tancada lagoons), where 54 individuals have been released (most of them equipped with radiotransmitters).

Other actions carried out have been the monitoring and the protection of the remnant populations (Bertolero 1999, 2000) and annual reports of the monitoring and reintroduction programs (Bertolero 2001 to 2011).

Location: Natural Park of s'Albufera de Mallorca (Mallorca, Balearic Islands)

Project duration: 2006-2010

Funding agency: Obra Social „Sa Nostra“ Caixa de Balears, Consell Insular de Mallorca, Associació per a l'Estudi de la Natura & Geochelone sulcata s.l.u.

Conservation project responsible: Herpetological Study and Conservation Centre (Associació per a l'Estudi de la Natura)

Main contacts: Samuel Pinya Fernández (sampinya22@gmail.com)

Local *Emys* conservation problems: The main problem in the natural park is the increasing populations of *Trachemys scripta* and other alien turtles, as well as the modifications of aquatic habitat caused by invasive exotic species (common carp, red swamp crayfish)

Conservation project activities and main results: Main activities are focused on the study of demographical parameters by monitoring *Emys orbicularis* population using capture-marking-capture techniques. Complementary efforts focus on the removal of specimens of alien turtle species.

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