

New data on the herpetofauna of the National Park “Arcipelago di La Maddalena” (NE Sardinia, Italy)

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Abstract. The data available on the herpetofauna of the Archipelago della Maddalena are mainly based on investigations carried out during the 1980's by the Sezione di Zoologia “La Specola” of the Museo di Storia Naturale dell'Università di Firenze. Such records have not been specifically updated successively. Here field data on the composition and distribution of the herpetofauna of the Archipelago are presented, with particular attention to the micro-insular areas for which no bibliographic data were available. Between 2011 and 2012 a total of 51 islands and islets have been visited: new records have been gained for 15 islands and islets already studied in past while on 4 the herpetofauna has been recorded for the first time. The lack of herpetofauna on 9 islets and rocks seemingly never previously studied has been reported too.

Keywords. Herpetofauna, Mediterranean Islands, La Maddalena Archipelago.

INTRODUCTION

The present knowledge on the herpetofauna of the Archipelago della Maddalena is mainly based on the results of investigations carried out during the 1980s by the Museo di Storia Naturale dell'Università degli Studi di Firenze, Sezione di Zoologia “La Specola” under the direction of Benedetto Lanza and in the framework of a national research-project focused on the flora and fauna of the Sardinian satellite islands. After some preliminary contributions (Cesaraccio and Lanza, 1984; Lanza et al., 1984; Borri et al., 1988) and/or some data reported in monographs (Lanza, 1983a; 1983b), the results of this long-term study are summarized in Poggesi et al. (1996) and were presented at the 30th Congress of the *Società Italiana di Biogeografia* (S.I.B.) held in Olbia in May 1994 entirely devoted to the biogeography of the circum-Sardinian islands. Earlier data available in literature are few (Mertens, 1932; Sochurek, 1955; Müller and Schneider, 1969; Schneider, 1971; Bruno, 1976, 1980, 1986; Tiedemann, 1978; Thibault et al., 1987) while later updates are given only for the islands of the “Area Marina Protetta di Tavolara e Pun-

ta Coda Cavallo” (Corti et al., 2006; Corti et al., 2008b; Corti and Spano, 2010), Mal di Ventre Island, (Corti et al., 2008a) and Asinara Island (Corti et al., 2006). Most of the available information is summarized in the recent “Atlante degli Anfibi e Rettili d’Italia/Atlas of Amphibians and Reptiles of Italy” and the “Fauna d’Italia - Reptilia” (Corti et al., 2006; Corti et al., 2010). Later contributions, concerning the status and the distribution of amphibians and reptiles occurring on the Archipelago della Maddalena, do not report new information but only highlight the need that some old records deserve to be reconfirmed (see Bombi and Vignoli, 2004; Bruschi et al., 2006). In the framework of an agreement between the “Parco Nazionale dell’Arcipelago di La Maddalena” and the “Museo di Storia Naturale dell’Università degli Studi di Firenze” field data on the composition and distribution of the herpetofauna of the Archipelago have been gathered during 2011-2012, particularly focusing on the exploration of micro-insular areas for which no data were available.

MATERIALS AND METHODS

Study area

The “*Parco Nazionale dell’Arcipelago di La Maddalena*” includes seven main islands (La Maddalena, Caprera, Spargi, Santo Stefano, Santa Maria, Budelli, and Razzoli) whose areas range from 1.673 km² to 20.116 km², and numerous islets and rocks, some of which extremely small and still without an official toponym (according to the IGM maps 168 I NE, 168 I SE, 169 III NO, 169 IV NO, and 169 III SE) (Figure 1). Furthermore, the National Park includes some other islets off the NE coast of Sardinia (e.g. Bisce, Corcelli, Mortorio, Soffi) not strictly belonging to the Archipelago from a geographical point of view. For details concerning the geology, paleogeography and botany of the study area, see the contributions by Arrigoni and Bocchieri (1996), Bocchieri (1992) and Ulzega (1996).

Sampling methods

Field work was mainly carried out in spring and late summer 2011 and 2012, using the Visual Encounter Survey (VES), according to the indications given by Crump and Scott (1994). Sampling methods were based both on linear transects or free search, and were chosen in relation to the characteristics of the examined habitat. Free search resulted particularly suitable especially for tiny islets and rocks where, in most of the cases, the entire islet was investigated with a high level of accuracy. Particular attention was also devoted to the recognition of tracks such as faecal remains deposited in rocky crevices, mostly occupied by species characterized by elusive behaviour [e.g. *Euleptes europaea* (Gené, 1839)] and difficult to be observed during daytime. Several night surveys have been carried out too in order to detect amphibians and/or reptiles whose activity is mainly, or exclusively, nocturnal. A total of 51 islands and islets were explored. All the islands for which additional records are given or for which no data were available in literature are listed in Table 1.

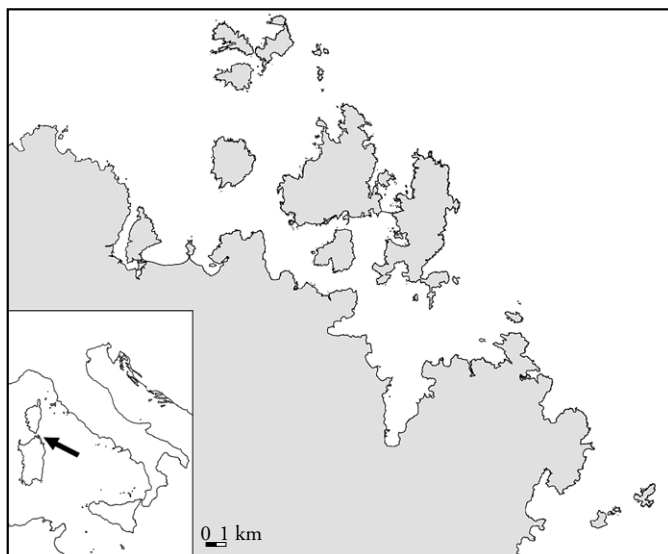


Figure 1. Geographical position and map of La Maddalena Archipelago.

RESULTS

New records

Euleptes europaea (Gené, 1839) was recorded for the first time on the islets Capicciolu, Carpa, Settentrionale dei Paduleddi, Abbatoggia, Isolotto Roma, and Occidentale delle Camere. It occurs also on the Scoglio Occidentale di Cala Lunga, Isolotto N-NO di Barrettini, and Isolotto SO del Porco, islets for which no data were available in literature. Most of these islets harbour very small populations, which are strictly confined to a few places: for example, on Abbatoggia islet *E. europaea* was exclusively found in the rocky outcrops on the western slope used as roosts by the Common Mediterranean Shag, *Phalacrocorax aristotelis desmarestii* (L., 1761), and as breeding sites by the Rock Dove, *Columba livia* Gmelin, 1789. On the Isolotto Roma, this gecko seems to occur exclusively on few square meters on the eastern side, on some rocky layers covered by scarce vegetation. On the contrary, on the Isolotto Carpa the local population is characterized by a discrete density and a fairly balanced demographic structure.

During a night survey carried out in September 2011 (attended by 9 samplers for 145 minutes) 63 individuals were observed across the islet. As expected the European Leaf-Toad Gecko was also recorded on the Isolotto SO del Porco (an islet connected to the Isolotto Porco by a narrow artificial strip of land). The present research has finally allowed us to clarify which of the Scogli dei Monaci, a group of islets located off the Eastern coast of Caprera Island cumulatively quoted in literature (see also Poggesi et al., 1996), is the one reported by Thibault et al. (1987). Presum-

Table 1. Visited islands/islets for which new records are given, or for which there were no data available in literature (*).

| | Name |
|----|---|
| 1 | *Scoglio Orientale di Cala Lunga |
| 2 | *Scoglio Occidentale di Cala Lunga |
| 3 | Isolotto Capicciolu |
| 4 | Isola La Presa |
| 5 | *Isolotto Presotto (o Scoglio di fuori) |
| 6 | Isolotto Carpa |
| 7 | Isolotto Settentrionale dei Paduleddi |
| 8 | *Scoglio 1 a Sud di Paduleddi Settentrionale |
| 9 | *Scoglio 2 a Sud di Paduleddi Settentrionale |
| 10 | *Isolotto a N-NO di Barrettini |
| 11 | Isolotto dei Colombi |
| 12 | Isolotto Abbatoggia |
| 13 | Isolotto Roma |
| 14 | Isola Giardinelli |
| 15 | *Isolotto Settentrionale della baia SO di Giardinelli |
| 16 | *Isolotto Meridionale della baia SO di Giardinelli |
| 17 | Isola Caprera |
| 18 | *Isolotto a Nord di Punta Stagnali |
| 19 | *Isolotto di fronte a Stagnali |
| 20 | Isolotto Porco |
| 21 | *Isolotto a SO del Porco |
| 22 | Isolotto Pecora |
| 23 | *Isolotto a Est di Pecora |
| 24 | *Isolotto di fronte a Cala Spalmatore di Mortorio |
| 25 | Isola Occidentale delle Camere |

ably a very small population inhabits just the main islet, where very scattered vegetation occurs just on the top. The remaining islets are entirely lacking plants, thus being inadequate to support non flying terrestrial vertebrates.

Regarding *Tarentola mauritanica* (Linnaeus, 1758), remains of two not recently laid eggs (quite surely to be referred to this species) were found on the Isolotto dei Colombi. This could suggest a possible, at least temporary, colonization.

Podarcis siculus (Rafinesque-Schmaltz, 1810) was recorded for the first time on the islands Giardinelli and Caprera. It was previously known only for La Maddale-

na to which both islands are artificially connected. The colonization of these islands could be therefore undoubtedly eased by this condition. However the sampled areas seem not to have undergone strong landscape changes which generally appear to be related to the expansion of the Italian Wall Lizard. It is noteworthy that during a prolonged survey carried out on two thirds of Giardinelli island no one individual of the congeneric *P. tiliguerta* was found, although the latter species was previously reported as the only *Podarcis* lizard present on this island (Cesaraccio and Lanza, 1984).

Podarcis tiliguerta (Gmelin, 1789) was recorded on the Isolotto Roma and Isolotto di fronte a Stagnali. On the latter, a very small islet located about 30 m far from the coast in the small bay of Stagnali (Caprera Island), just one individual was found during a night survey carried out in May 2012. Further investigations are therefore needed to confirm the occurrence of a presumably small-sized population.

Chalcides ocellatus (Forsskål, 1775) was recorded for the first time for the Isolotto Porco and the Isolotto Pecora.

Hierophis viridiflavus (Lacépède, 1789) was found on the islets: Isolotto Capicciolu, Isolotto Pecora, Isola La Presa, and Isolotto Settentrionale dei Paduleddi. Concerning the latter, it is worth to observe that the species was already known for the nearest Isolotto Meridionale dei Paduleddi (Borri et al., 1988). Both islets, as well as La Presa, are located close to Santa Maria Island, where the species is relatively common. Thus, it cannot be excluded that occasionally some individuals swim from one to the other island.

Species previously recorded but not reconfirmed

Podarcis tiliguerta (Gmelin, 1789). Despite careful surveys it was not possible to reconfirm the occurrence of this lizard on the Isolotto Settentrionale dei Paduleddi, as reported by Cesaraccio and Lanza (1984). The lack of occurrence deserves further surveys, considering that the geographical and biological characteristics of the site are very similar to those of the nearby Isolotto Meridionale dei Paduleddi, where a population of the Tyrrhenian Wall Lizard occurs in discrete density.

Chalcides ocellatus (Forsskål, 1775), although being a relatively elusive species, seems no longer to be present on the islets Meridionale and Settentrionale degli Italiani, (whole area of approximately 10,000 m²). On the first islet the species was observed in the late 80s by the local naturalist Giovanni Cesaraccio, while on the second it was observed in 1990 by the herpetologists of the Zoological Museum "La Specola".

All records are reported in Poggesi et al. (1996), although never reconfirmed due to the lack of monitoring activity. Both islets are inhabited by large populations of the Yellow-legged Gull, *Larus michahellis* Naumann, 1840, and rats, *Rattus rat-*

tus L., 1758, probably determining a high degree of disturbance. These islets harbour other two reptile species, *Euleptes europaea* and *Podarcis tiliguerta*, which seem to be characterized by very low population density. In particular, the Tyrrhenian Wall Lizard showed a remarkable fearful attitude. These aspects seem to reflect an unfavourable environmental context, which likely could be the cause of the local possible extinction of the Ocellated Skink.

Islets without herpetofauna

Our study was extended to some islets and rocks for which bibliographic information was lacking. In Poggesi et al. (1996) no herpetological species are reported for the Isolotto Barrettinelli di Fuori and the Isolotto Maggiore dei Barrettinelli.

The same has been observed by us also for the following 9 islets: Scoglio Orientale di Cala Lunga, Isolotto Presotto, Scoglio 1 a Sud dell'Isolotto dei Paduleddi Settentrionale, Scoglio 2 a Sud dell'Isolotto dei Paduleddi Settentrionale, Isolotto Settentrionale della baia SO di Giardinelli, Isolotto Meridionale della baia SO di Giardinelli, Isolotto a Nord di Punta Stagnali, Isolotto a Est di Pecora, Isolotto di fronte a Cala Spalmatore di Mortorio. Common traits among these islets and rocks are the scarce elevation, the small surface (ranging from some tens to few hundreds of square meters), and the very low floristic richness. An extreme example is given by the Isolotto Presotto, characterized exclusively by bare rocks. Although the lack of sightings does not always mean that islets are devoid of fauna, the limited spatial extent of the sites and the high accuracy of the surveys make the lack of herpetofauna particularly plausible.

The only exception concerns the small Isolotto Settentrionale della baia SO di Giardinelli and the Isolotto Meridionale della baia SO di Giardinelli (very close to Giardinelli Island). Despite their narrow surface, the vegetation cover includes even some vascular plants, and its location would ensure adequate protection from adverse marine conditions, these islets seem not to be adequate to support the presence of any herpetological species, even those adapted to micro insular habitats as *Euleptes europaea*. These variables, usually suitable at least for the occurrence of reptiles adapted to micro-insular environments such as *Euleptes europaea*, in this case seem not to be adequate to support the presence of any species.

DISCUSSION

The results summarized and discussed in the present paper, although certainly not exhaustive, provide updated distribution lists and information essential for proper management and conservation activities.

New distribution data are reported for six species (*Euleptes europaea*, *Tarentola mauritanica*, *Podarcis siculus*, *P. tiliguerta*, *Chalcides ocellatus*, *Hierophis viridiflavus*). New records were obtained for fifteen islands and islets, of these four were surveyed for the first time; while on other nine, never previously studied, no herpetological species were found. Our results show that the most widely distribut-

ed species is the European Leaf-Toad gecko (*Euleptes europaea*), followed by the Tyrrhenian wall lizard (*Podarcis tiliguerta*). Thanks to its peculiar ecology, *Euleptes europaea* affirms its remarkable capacity to be able to live on micro-insular habitats characterized by extremely small surface and scarce vegetation (Salvidio et al., 2010). The lack of observations concerning *Podarcis tiliguerta* on the Isolotto Settentrionale dei Paduleddi and *Chalcides ocellatus* on the two islets Isolotto Meridionale and Settentrionale degli Italiani suggest their possible local extinction, although the possible causes are unclear. On the contrary, the apparent absence of *P. tiliguerta* on Giardinelli Islet (at least in the surveyed portion of the island), where the species was the only *Podarcis* reported by Cesaraccio and Lanza (1984) and Poggesi et al. (1996), requires further investigation. Could its disappearance, or at least its drastic reduction, be due to competitive exclusion with the congeneric *P. siculus* seemingly at present widespread on the island?

Micro-insular populations are particularly vulnerable and exposed to abrupt environmental changes which can rapidly lead to their extinction. In the light of the rapid changes observed in the herpetological composition of some of the studied islands, monitoring activity is strongly recommended.

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