

Lisca Nera lizards: history of an extinction through zoology and literature

PIETRO LO CASCIO^{1*}, MARTA BIAGGINI², CLAUDIA CORTI²

¹ *Nesos, Island Research - Via Vittorio Emanuele 24, 98055 Lipari (ME), Italy*

² *Museo di Storia Naturale dell'Università di Firenze, Sezione di Zoologia "La Specola"*

Via Romana 17, 50125 Firenze, Italy

Corresponding author: plocascio@nesos.org

Abstract. The extinction of the population of *Podarcis siculus* from the tiny islet of Lisca Nera (Aeolian Archipelago, NE Sicily, Italy) has been generally placed between 1878 and the 1950s. However, overlooked records and an evaluation of the geographical features of the islet would indicate remarkably narrowing the time frame of the extinction, suggesting some additional hypotheses on its cause.

Keywords. *Podarcis siculus*, extinction, island, Lisca Nera Islet, Aeolian Archipelago.

INTRODUCTION

Extinction is a fairly common risk for island species (Mac Arthur and Wilson, 1967; Schoener and Schoener, 1983; Richman et al., 1988; Smith et al., 1993; Frankham, 1998; MacPhee, 1999; Burkey, 2002; Whittaker and Fernández-Palacios, 2007; Triantis et al., 2010), although those inhabiting the Mediterranean seem to be less frequently affected by this event. Greuter (1991) argued that it rarely occurs in this area for endemic plants, while a comparable assessment is not available for the fauna. Among terrestrial vertebrates, reptiles are probably the most represented and widespread group on the Mediterranean islands (Sindaco and Jeremčenko, 2008), including the smallest and most isolated ones which are frequently inhabited by geckoes and lizards (e.g., species of the genus *Podarcis*) (Poggesi et al., 1996; Corti et al., 2006). As to lizards of the genus *Podarcis* local extinctions are attributed to three general causes, which are frequently interconnected:

- 1) directly induced, i.e. due to anthropogenic disturbance and/or environmental degradation (Corti et al., 1999a, 1999b; Ficetola and Padoa Schioppa, 2008; Zawadzki, 2010; Foufopoulos et al., 2011);
- 2) indirectly induced, as the result of competition (Mertens, 1965; Nevo et al., 1972; Gorman et al., 1975; Capula, 1992; Pérez-Mellado, 2002) or introduction of predators (Mertens, 1957; Kotsakis, 1981);
- 3) apparently natural, as the consequence of particular life-history traits such as low population density and high level of habitat specialization (Foufopoulos

and Ives, 1999), defense relaxation (Pérez-Mellado et al., 1997) or reduction of the viable space (Lanza, 1970).

Focusing on the latter causes, lack of direct evidence does not always allow to understand the extinction pattern. An intriguing example is given by the wall lizard population which occurred on Lisca Nera, a small islet of the Aeolian Archipelago (38°38'15"N - 15°06'45" E Greenwich; NE Sicily, Italy), where lizards were detected for the first time at the end of 19th Century and no more found in the mid 20th. Thus the extinction process has to be occurred within the above mentioned span of time. The circumstances that may have led to the decline of this population were suggested by Lanza and Corti (1996) as likely connected to erosion phenomena underwent by the islet (Lanza and Corti, 1996). The present paper attempts to get more into detail of both, what happened during the above mentioned time frame and the disappearance of the lizards.

THE DISCOVERY OF A LIZARD POPULATION ON LISCA NERA ISLET

In summer 1878, the scientific voyage of the schooner “Olga” reached the Aeolian Archipelago. The zoologist Enrico Hillyer Giglioli joined the cruise with the main purpose to increase the collection of the “Italian Vertebrates” created by himself at the Regio Museo di Fisica e Storia Naturale of Florence (now Section of Zoology “La Specola”, Natural History Museum of the University of Florence: thereafter MZUF) in 1877 (Giglioli, 1877). While exploring the islets located off the eastern coast of Panarea Island (Fig. 1) Giglioli also visited Lisca Nera, the smallest one in the group. On this islet he found a nest of the Storm Petrel, *Hydrobates pelagicus* L., 1758 (the only record for this species gathered during the cruise, published twice in “Ibis” and “Annali di Agricoltura”, see Giglioli, 1881a, 1881b), and collected two sub-adult females of a Wall Lizard, later identified as “*Podarcis muralis*” (Fig. 2). Unfortunately, apart from the basic data reported on the label concerning the origin and collection date of the specimens (September, 2), Giglioli did not add any other information on this population. However, the lizards of Lisca Nera – as well as those inhabiting other islets near Panarea – are mentioned in a letter sent the same year (November, 16) to the journal “Nature” (Giglioli, 1878), where the zoologist fits into a debate on the adaptive value and evolutionary meaning of melanism and color variations observed in several lizard populations inhabiting small Mediterranean island. This debate, inspired by the *Lacerta muralis coerulea* described just few years before for the islet Faraglione di Capri (Eimer, 1875), raised a certain importance in the light of the “phenomena” observed on islands after Darwin’s theory (see Adams, 1878; Wallace, 1878). Giglioli wrote «I have invariably found that our common lizard (*Podarcis muralis*) constantly presents dark varieties on islets adjoining small islands: this is the case on the Scuola, near Pianosa, on the Scoglio di Mezzogiorno, off Palmarola (Ponza), on S. Stefano, off Ventotene, on the Toro, off Vacca (Sardinia), on Lisca nera, Lisca bianca, and

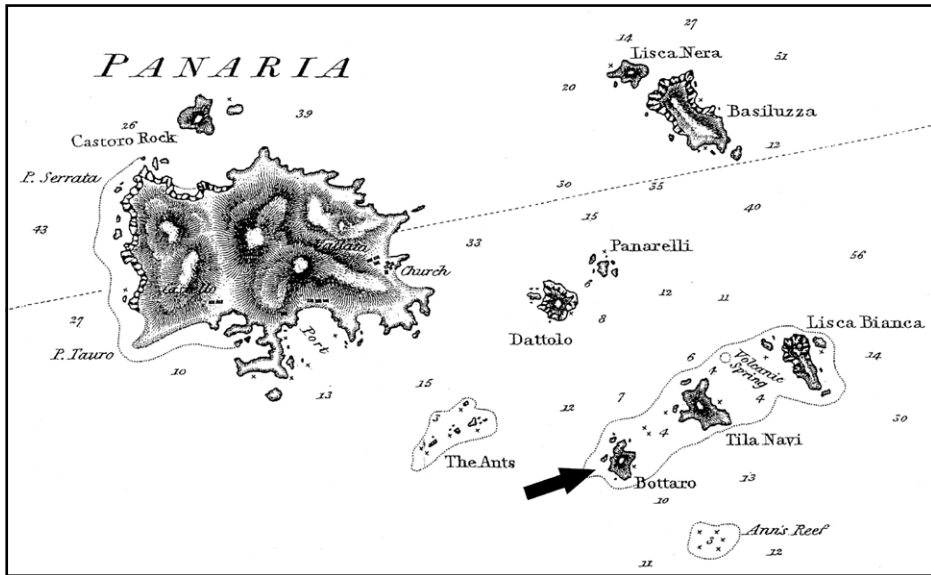


Figure 1. Map of Panarea Island and satellite islets, from W.H. Smyth, “Memoir descriptive of the Resources, Inhabitants and Hydrography of the Sicily ...”, 1824. An arrow indicates the location of Lisca Nera Islet, erroneously named “Bottaro”; the true Bottaro Islet is instead named “Tila Navi”; finally, the one erroneously indicated as “Lisca Nera” corresponds to another islet. Despite the nomenclatural misidentifications of islets, the map shows approximately their extent in the 19th century.

Bottaro, off Panaria (Lipari), on Filfla, off Malta, and on Linosa, near Lampedusa. The extreme cases are those of the Faraglione off Capri and Filfla, where a nearly intense black is obtained; next comes Toro, and next Linosa; only the latter case might be explained by the ‘struggle for existence’ theory, for the lava rocks of Linosa are black; but such is certainly not the case with the other islets, and, *pace* Dr. Eimer, the Faraglione is gray, while Filfla – on which I spent a pleasant day in Oc-

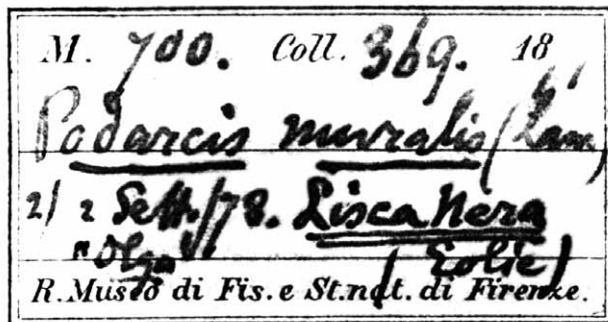


Figure 2. The old label of the two lizard specimens from Lisca Nera Islet (courtesy of MZUF).

tober last – is painfully white in the glaring Maltese sun, so that its black lizards are most conspicuous» (Giglioli, 1878: 97).

The preservation in alcohol tends to affect the chromatic characteristics of preserved specimens, gradually losing the original colors, therefore it is not possible to establish precisely how “black” the lizards of Lisca Nera were (Fig. 3). Later on Taddei (1949) studied and correctly identified these specimens as *Podarcis siculus* (Rafinesque-Schmaltz, 1810) (sub *Lacerta sicula*), referring them simply to the nominal subspecies waiting for further material, while he described those from the nearby islands of Panarea, Basiluzzo and Stromboli as *Lacerta sicula strombolensis*. Anyway, he did not comment on their coloration. Twenty years later, Lanza (1973: 775) briefly came back to this subject giving no new morphological or meristic details but reporting that in the MZUF collection’s catalogue he found a note by Giglioli concerning the «color rosso mattone cupo ventralmente, soprattutto sotto la coda» [ventrally dark brick-red color, especially under the tail] observed on the Lisca Nera specimens. Individuals from the neighboring islets of Lisca Bianca and Bottaro, described as *Podarcis siculus liscabiancae* and *P. s. trischittai* respectively by Mertens (1952, sub *Lacerta*), are frequently hyperchromatic, showing ventrally a blue coloration pattern present also on the throat, but characterized by a moderate degree of melanism; the same was observed for the population inhabiting Dattilo Islet (Lo Cascio and Corti, 2006; P. Lo Cascio, unpubl. data). The occurrence of a reddish coloration could therefore represent a distinctive trait of the Lisca Nera population, although not necessarily reflecting taxonomic implications.

THE DISCOVERY OF LIZARDS’ EXTINCTION

In the 1950s, Robert Mertens undertook an extensive study of the herpetofauna of the Aeolian Islands, with the significant help of the Italian zoologist Antonino Trischitta, a local teacher who facilitated his field work. The results are published in two important contributions in which Mertens describes several new micro-insular subspecies (Mertens, 1952; 1955). The detailed work carried out by Trischitta was remarkable: he collected a great amount of specimens on all main islands and on many islets of the Archipelago. He also surveyed Lisca Nera but no lizards were there found. In 1955, Mertens wrote: «teilte mir aber Dr. Trischitta a 28. Juni 1951 mit, daß auf dieser Insel von 3 Sammlern in 3 Stunden keine einzige Echse gesehen worden ist. ‘In diesem Falle wäre das absolute Fehlen einer Herpetofauna darauf zurückzuführen, daß während eines Sturmes die Wellen die an sich niedrige Insel überschwemmt und jedes Tier getötet haben’, schrieb Dr. Trischitta» [Dr. Trischitta, however, informed me that June 28th, 1951 the island was explored for three hours long by three collectors but any lizard was found. ‘In this case, the complete lack of herpetofauna is due to the fact that during a storm, the waves covered the island and swept away all the occurring animals’, wrote Dr. Trischitta] (Mertens, 1955: 37). It is not clear if Trischitta was a direct witness of this storm or if this information was merely obtained by local people or simply was for him the

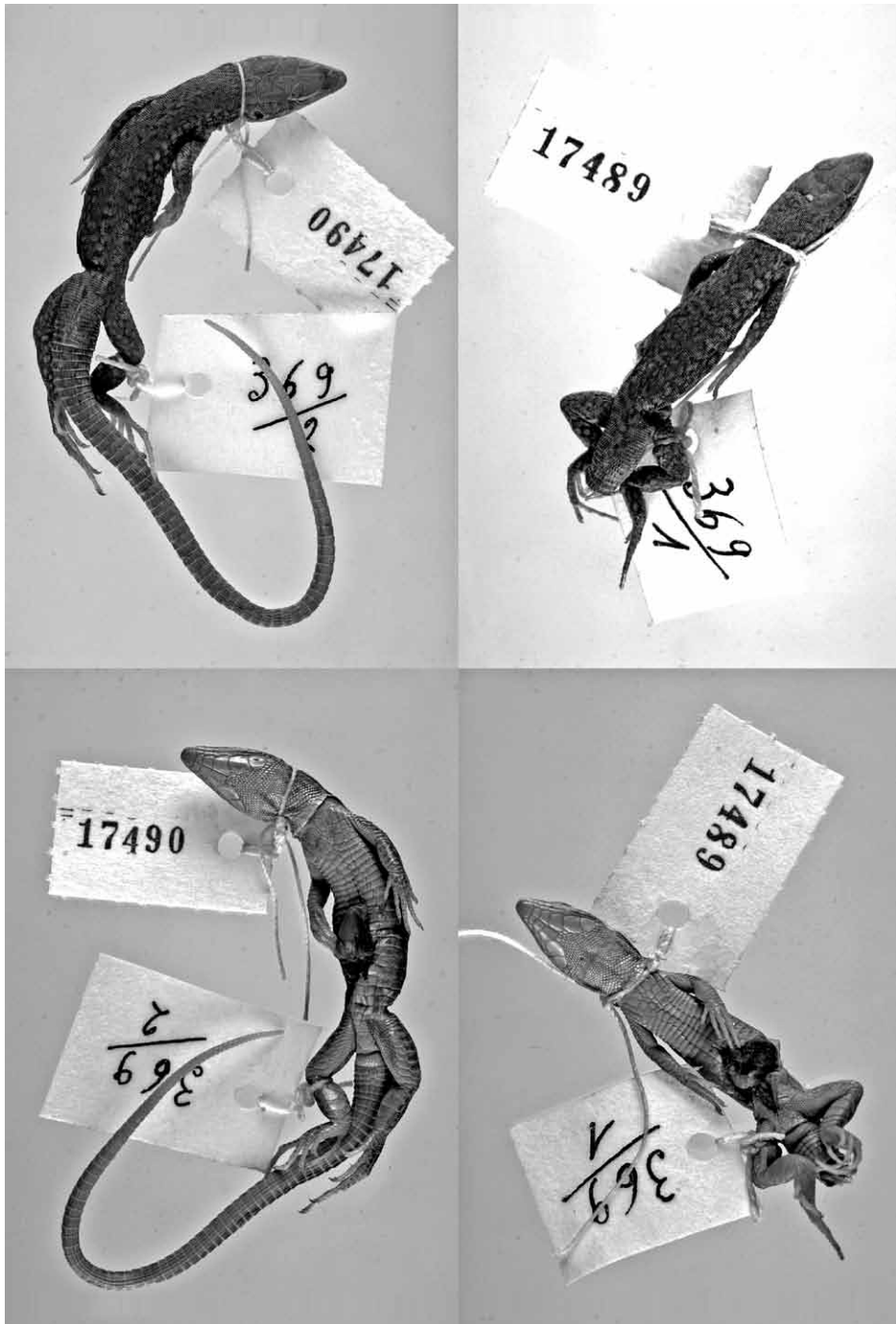


Figure 3. The sub-adult female specimens collected by E.H. Giglioli in 1878 (MZUF coll. n. 17489 and 17490) (courtesy of MZUF; photo: S. Bambi).

most plausible cause. In any case, seen that the interest of Mertens was basically focused on taxonomy, he saw no need to give further comments on the disappearance of this lizard population. Some decades later Lanza and Corti (1996) explained the extinction as the possible result of natural erosion processes which seemingly occurred on the isles as already observed for other Tyrrhenian islets: «It is therefore a process of extinction that can be considered quite natural and unavoidable whenever erosion reduces the rock to conditions inconsistent with the minimum living needs of a given species».

A WRITER SEARCHING FOR LIZARDS

In spring 1891, the Archipelago was visited by Norman Douglas (Fig. 4), a famous writer who traveled and lived long time in Italy. Douglas was also an amateur herpetologist, as he tells in many of his books. During his journey, he collected specimens then sent, perhaps sold, to many specialists, as e.g. George Albert Boulenger. Many of these are at present preserved at the Natural History Museum of London. He visited the islands in order to investigate their herpetofauna: «I was there for the first time in March-April 1891, collecting beasts (a note of what

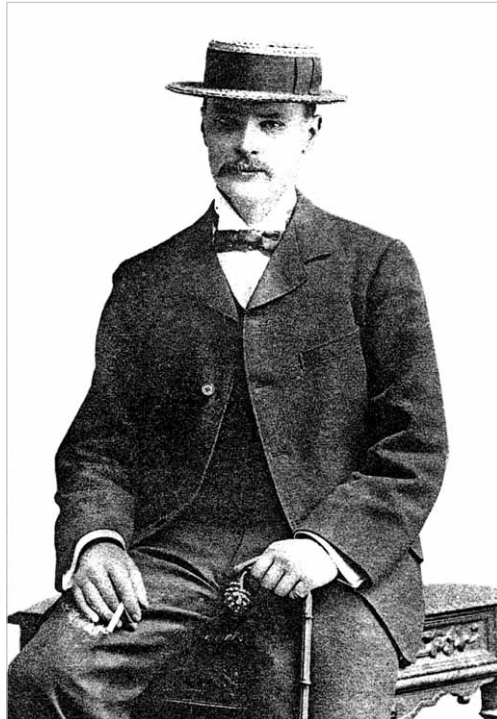


Figure 4. Norman Douglas around 1891.

was then observed will be found in my ‘Three of Them’, page 217), and climbing about rocks like Bottaro and Lisca Nera at some little risk, in the hope of discovering new varieties of lizards» (Douglas, 1933: 118). Referring to the lizards of the latter islet, in “Three of Them”, an anthology where he dwells in describing his scientific observations and findings, the author writes as follows: «I could not detect it on Lisca Nera» (Douglas, 1930). Only 13 years have passed since Giglioli’s journey, and it is almost clear that in the meantime no other zoologists visited the islet. It is objectively difficult to believe that an accurate observer as Douglas could have failed to detect the presence of lizards on such a small surface covered by scattered vegetation, particularly in the period of the lizard’s maximum activity. His skill is confirmed by the fact that he found species more elusive than lizards, such as the gecko recorded as “*Hemidactylus verruculatus*” on the nearby Dattilo Islet (Douglas, 1930), even much less accessible than Lisca Nera. Hence, it is reasonable to presume that at the time he visited the islet the lizards were already disappeared.

A TOO FAST DECLINE?

This extinction may sound strange, because lizards of the genus *Podarcis* are known to live on micro-insular habitats characterized by harsh conditions and chronic poorness of resources. For instance, *P. tiliguerta* (Gmelin, 1789) is widespread on tiny islets around Corsica and Sardinia; an extreme case is represented by the Isolotto Settentrionale dei Paduleddi (La Maddalena Archipelago), which surface is about 1.500 m², where the species was found by Cesaraccio and Lanza (1984), although it was not confirmed during recent surveys (Corti et al., 2013). Pérez-Mellado and Salvador (1988), Pérez-Mellado et al. (2008) and Van Der Berg and Zawadzki (2010) reported a dozen of populations of *Podarcis lilfordi* (Günther, 1874) and *P. pityusensis* (Boscá, 1883) inhabiting coastal islets and rocks of the Balearic and the Pityusic Archipelagoes, whose surface is less than 1.000 m² and the elevation is just few meters above the sea level. For most of these populations occurring on islets where just one plant species grows density was estimated in 10-20 individuals (Van Der Berg and Zawadzki, 2010). Moreover, other striking examples can be found among insular populations of *P. melisellensis* (Braun, 1877), *P. erhardi* (Bedriaga, 1882), and *P. siculus* (Chondropoulos, 1986; Henle and Klaver, 1986; Tiedemann and Henle, 1986). It is indisputable that all these populations live on islets smaller than Lisca Nera as it was until the second half of the 20th Century.

The biological scenario where the extinction took place seems to be extremely simplified, even though few data are available for an exhaustive evaluation. In the early 19th Century, the islet was visited by the botanist Giovanni Gussone, who recorded the occurrence of three plant species (*Suaeda vera* Gmelin, *Hyoseris radiata* L., *Senecio leucanthemifolius* Poir.) (Gussone, 1832; Gussone, 1842-1845). Unexpectedly, during a survey carried out in 1996, when the islet was already largely destroyed by erosion, we detected few individuals of *Mesembrianthemum nodiflo-*



Figure 5. Lisca Nera Islet in 2006, strongly reduced in surface by erosion.

rum L., *Matthiola incana* (L.) R. Br. and *Dactylis glomerata* L., while none of the previously recorded species was found (P. Lo Cascio and S. Pasta, unpubl. data). Within the islets' group located East off Panarea, Lisca Nera is certainly the one that over the last century underwent the most dramatic and fast surface reduction due to erosion (Fig. 5). Besides of the waves, the whole area is affected by intense gas emissions related to the presence of a submarine volcano which significantly increased since 2002 (Aliani et al., 2010). During normal degassing activity periods, the chemical composition is that typical of a hydrothermal environment, rich in CO_2 and H_2S , but in its cyclic crises it becomes strongly acidified by magmatic compounds, such as SO_2 , HCl and HF (Capaccioni et al., 2010). This, in a long-term perspective, contributed to alter the physical-chemical features of the dacitic-andesitic lavas of the islets, emphasizing the erosive processes.

Until mid-20th Century, however, Lisca Nera maintained both surface and morphology suitable for hosting a small lizard population. In 1947, few years before the unsuccessful visit of Trischitta, the archaeologist Luigi Bernabò Brea discovered on the islet many records testifying, at least, that humans visited the islet since the Upper Neolithic and during the Hellenistic and Roman ages (Bernabò Brea, 1949; Cavalier, 1991). A picture taken in 1960 from the nearby islet of Lisca Bianca, during the shooting of the movie "L'avventura" directed by Michelangelo Antonioni, clearly shows the occurrence on Lisca Nera Islet of a "flat top" seemingly provided by some plants and possibly still suitable to host a narrow lizard population (Fig. 6).

CONCLUSION

It cannot be excluded that Lisca Nera was colonized by few individuals of lizards coming from the nearby islands, which later underwent extinction because of natural causes. However, if we assume that the islet was inhabited by a stable pop-

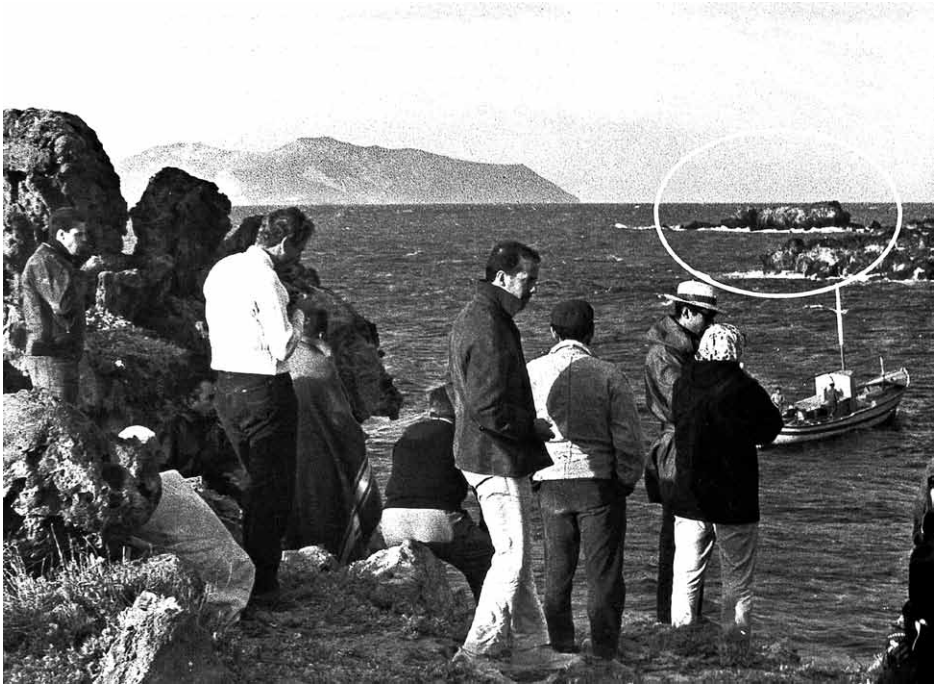


Figure 6. Lisca Nera Islet (in the white circle) view from Lisca Bianca in 1960 (courtesy of Centro Studi di Lipari).

ulation, in the light of the above mentioned considerations two main conclusions can be drawn:

- 1) it seems pretty clear that the extinction of the Lisca Nera lizards occurred between 1878 and 1891;
- 2) the causes that may have driven this extinction process need to be reconsidered. Apart from human intervention, there are many “natural” factors that can lead to the extinction of small lizard populations: e.g. temporary increase of a predator (e.g. avian predators), an epizootic event, a particularly intense meteorological event.

It should be also considered that, albeit with certain exceptions (see Capula and Corti, 2010), a small population is generally exposed also to endogenous factors, such as loss of genetic variability and meiotic drive (Capula, 2006; Pérez-Mellado et al., 2008). The list of possible causes is therefore long, but a non-negligible element is the fact that Giglioli collected two sub-adult females. Although no data are available on the demographic structure of this population, it is reasonable to assume that it was really a very small one (< 20 individuals). On the nearby islet Bottaro, the population density is very low indeed (< 40 individuals: P. Lo Cascio, un-

publ. data, May 2005), and although island biotic capacity (*sensu* Cheylan, 1992) and lizard density are not necessarily correlated (see Pérez-Mellado et al., 2008), it is easy to guess that a small islet with scarce resource availability can host only few individuals. In *Podarcis siculus*, females can reach sexual maturity in the first year of life, but only those individuals that at the reproductive season are at least 50 mm long (SVL = snout-vent) are able to reproduce (Henle, 1988). The two individuals collected by Giglioli at the end of the summer had not yet reached sexual maturity (SVL is 39.12 and 46.31 mm) and we can hypothesize that their sampling might have produced a highly negative impact on the reproductive potential of the local, small population.

It is therefore possible that the discovery of this population could have accelerated its demographic decline acting as a driving force for its extinction; the latter would have probably occurred anyway within a relatively short span of time, as the result of the significant reduction of the islet's surface. Both Mertens and Trischitta probably didn't know Douglas's work – the “Three of them” – because otherwise they would have been informed about the disappearance of the Lisca Nera lizards. On the other hand, Douglas probably was unaware that their occurrence was previously detected by Giglioli (1878). However, by a curious coincidence, Douglas came into contact with Giglioli because of the observations he made on the green toads inhabiting the thermal springs of Lipari Island. This appeared to him as a discovery of some interest in the light of Darwin's hypothesis on the lack of amphibians on the islands (Darwin, 1872). In the letter dated April 20th, 1891, now kept in the MZUF archives, Douglas apologizes for not knowing the Italian herpetological literature and asks «s'ella mi volesse gentilmente fare sapere se l'esistenza di qualsiasi specie di batraco sia già stata annunciata (sulle isole Eolie), poiché, se ciò non fosse, avrei intenzione di farlo» [if you could kindly let me know if the existence of any batrachians species has already been reported (for the Aeolian Islands), otherwise I would like to do it], but unfortunately he did not mention the lizards. Giglioli already published his data (Giglioli, 1880) and probably Douglas didn't receive any answer from him. His observations will be published a few years later by Boulenger (1898). Perhaps a more intense epistolary exchange between them would have allowed us to know earlier and more in detail on the extinction of the Lisca Nera lizards.

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