

## Cenozoic herpetofaunas of Apulia (Southern Italy)

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**Riassunto.** *Le erpetofaune cenozoiche della Puglia (Italia meridionale).* Le erpetofaune cenozoiche della Puglia sono fra quelle meglio rappresentate d'Italia. La loro conoscenza è basata su circa 140 dati taxon/località che provengono da circa 100 lavori pubblicati sin dal 1848. Circa la metà dei dati riguarda il Pleistocene. La restante metà è equamente distribuita fra Olocene e Miocene. Non sono conosciuti resti (certamente) pliocenici e paleogenici. Sino ad ora sono stati identificati i seguenti taxa (otto anfibi e 27 rettili) in circa 45 località († indica i taxa estinti): *Ichthyosaura alpestris*, *Lissotriton* gr. *L. vulgaris*, *Latonia* cf. *L. gigantea*†, *Pelobates* sp., *Bufo bufo*, *Bufo* gr. *B. viridis*, *Hyla* gr. *H. arborea*, *Pelophylax* sp., *Crocodylus* sp., Tomistominae indet., *Emys orbicularis*, *Mauremys* sp., *Testudo graeca*, *Testudo hermanni*, *Trionyx* sp., *Psephophorus polygonus*†, *Caretta caretta*, *Procolpochelys melii*†, *Trachyaspis lardyi*†, Gekkonidae indet., *Pseudopus* sp., *Lacerta* gr. *L. viridis*, *Podarcis muralis*, *Chalcides chalcides*, *Blanus* sp., *Palaeoblanus* sp.†, *Coronella* cf. *C. austriaca*, *Zamenis* gr. *Z. longissimus*, *Elaphe quatuorlineata*, *Coluber planicarinatus*†, *Hierophis viridiflavus*, *Telescopus* sp., *Natrix natrix*, *Vipera* gr. *V. aspis*, *Vipera* sp. (“vipere orientali?”).

**Keywords.** Neogene, Quaternary, palaeoherpetology, palaeobiogeography, Apulia.

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### INTRODUCTION

The oldest information about the fossil herpetofaunas of Apulia comes from the papers by Costa (among others, Costa, 1850) who described a few remains from the “Pietra Leccese”, a sandstone extensively cropping out in the Salento area, whose age was traditionally considered as being latest early-earliest late Miocene, but that now has been, at least partially, constrained to the Burdigalian (early Miocene; Margiotta, 2004). Since then, about 100 papers describing or mentioning the fossil amphibians and reptiles of Apulia have been published. The relative richness in fossil vertebrates of this region is due to three main factors related to human activities: 1) the active quarrying of the fossiliferous “Pietra Leccese” frequently yields Miocene vertebrate remains, crocodylians and turtles included; 2) karstified carbonate rocks are extensively present in Apulia and their quarrying regularly exposes fissure fillings rich in continental vertebrates dating to the Neogene and Quaternary; 3) Pleistocene and Holocene archaeological sites are relatively abundant and

well studied. This overview is an attempt of summarizing the state of the knowledge of the Apulian Cenozoic herpetofaunas. It is based on the latest version of the Italian Palaeoherpetofaunas Database (Delfino, 1997), which is essentially a collection of published data. Original data come from Delfino (2002) if not otherwise stated.

## RESULTS

Amphibians are much less represented than reptiles in the Cenozoic record of Apulia, both in terms of taxon/locality data (about 30 data correspond to amphibians, nearly 110 correspond to reptiles) and taxa (eight amphibians and 27 reptiles).

The caudates are represented by few trunk vertebrae from the early Pleistocene of Cava dell'Erba (FG) that were referred to *Ichthyosaura* cf. *I. alpestris* and *Lissotriton* gr. *L. vulgaris* (Delfino & Bailon, 2000). The latter could belong to *Lissotriton italicus* that still inhabits the Gargano Promontory. The presence of *I. alpestris*, if confirmed by more representative (i.e., cranial) remains, could contribute to fill the present gap in the Italian range of this species.

All the anurans have been retrieved, at least, in the fissure fillings opening in the several quarries of Monte Gargano between Apricena and Poggio Imperiale (FG). The age of these fillings varies from late Miocene-early Pliocene (the so-called "Terre Rosse") to middle Pleistocene. Besides the extinct large-sized discoglossid frog *Latonia* cf. *L. gigantea* (found only in the "Terre Rosse"), a few extant taxa have been identified: *Pelobates* sp., *Bufo bufo*, *Bufo* gr. *B. viridis*, *Hyla* gr. *H. arborea*, and *Pelophylax* sp. (Delfino & Bailon, 2000; Delfino & Atzori, 2013). All but *Pelobates* come from both the "Terre Rosse" fillings and the early Pleistocene fillings in the area of Cava Dell'Erba and Cava Pirro. *B. bufo* was also identified in the middle Pleistocene of the Maglie area (Dolina and Fondo Cattìe; LE) and Grotta Romanelli (LE; Regalia, 1904), as well as in the late Pleistocene of Grotta di Paglicci (LE; Sorbini & Durante Pasa, 1974). Remains of green toads of the *B. viridis* group (not including *B. calamita*) have also been collected in the above mentioned sites of the Maglie area, in the late Pleistocene of Sternatia (LE; Rustioni et al., 1994), and in the Holocene of the Grotta della Tartaruga (BA; Wilkens, 2003). Rather unexpected has been the recent retrieval, among tens of thousands of herpetofaunistic remains from the early Pleistocene of Pirro Nord, of a single trunk vertebra clearly belonging to a unidentified *Pelobates* species (Delfino & Atzori, 2013).

Apulia was inhabited by crocodylians during the Miocene: undetermined tomistomines from the "Pietra Leccese" (Iola and Melpignano; LE; Costa, 1848; Delfino et al., 2003) and the *Crocodylus* remains from the "Terre Rosse" of Monte Gargano. The latter represents at the same time the youngest European crocodylian and the only European evidence for the presence of this genus based on phylogenetic characters (Delfino et al., 2007).

Chelonians are represented by extinct taxa from the "Pietra Leccese": the dermochelyid *Psephophorus polygonus* from Cursi (LE; Chesi et al., 2007), the cheloniid *Trachyaspis lardyi* from Iola, and the enigmatic *Procolpochelys melii* from a undetermined locality of the Lecce Province. The "Pietra Leccese" yielded also trionychid remains from Muro Leccese and Surbo (LE, see references in Chesi, 2008). *Caretta caretta* has been reported for the Holocene archaeological sites of Monopoli (BA; Wilkens, 2003) and Roca (LE; De Grossi Mazzorin et al., 2006). *Emys orbicularis* and *Mauremys* sp. were syntopic

in the early Pleistocene of Cava Dell'Erba and Cava Pirro (FG; Delfino & Bailon, 2000). The first was also reported for the middle Pleistocene site of Grotta Romanelli (Vaufrey, 1929), and the Holocene of Coppa Nevigata (Cassano et al., 1987) and Roca (Pagliara et al., 2005). Testudinids were mentioned or described in a number of sites. All the well-studied remains testifying for wild populations can be referred to *Testudo hermanni*: the oldest remains referable to *T. hermanni* are from the early Pleistocene (Delfino & Bailon, 2000). Worth noting are the archaeological remains of *T. graeca* from Roca, not described in detail and not figured, that were considered alloctonous being represented by food leftovers and musical instruments (Melendugno, LE; Pagliara et al., 2005). Relatively large, likely extinct testudinids from the "Terre Rosse" of Gargano are still waiting to be properly studied and identified.

Squamates are rather abundant in the fissure fillings. Undetermined gekkonids and the anguid *Pseudopus* sp. were described only for the "Terre Rosse". The presence of a single osteoderm of the latter found in the early Pleistocene assemblage of Cava dell'Erba (Delfino & Bailon, 2000) has been recently reinterpreted as a likely contamination from the Miocene "Terre Rosse (Delfino & Atzori, 2013). Relatively large lacertid remains referred to *Lacerta* gr. *L. viridis* were reported from the Pleistocene of Fondo Cattie, Grotta Romanelli, Sternatia and the Holocene of Grotta delle Mura (Vaufrey, 1929; Bon & Boscato, 1993; Rustioni et al., 1994). The specific identification of fossil remains of *Podarcis* lizards is so difficult that the report of *Podarcis muralis* at Grotta Romanelli (Regalia, 1904) should be treated with caution. Undetermined *Lacerta* and *Podarcis* remains have been respectively reported in Apulia since the late Miocene and early Pleistocene. The only Italian remains of the skink *Chalcides chalcides* were described from the middle Pleistocene of Maglie on the basis of a fragmentary dentary and few isolated vertebrae, some of which containing fragmentary osteoderms.

Amphisbaenians are represented in the Gargano area by both extinct (*Palaeoblanus* sp.; "Terre Rosse") and extant taxa (*Blanus* sp.; Cava Dell'Erba; Delfino & Bailon, 2000).

*Coluber planicarinatus* from the "Terre Rosse" is the only extinct snake species found in Apulia so far, but a large-sized colubrid from the same fissure fillings still awaits to be described. Few vertebrae in the same assemblage have been tentatively referred to *Telescopus* sp. Colubrids are represented also by *Coronella* cf. *C. austriaca*, *Zamenis* gr. *Z. longissimus*, *Hierophis viridiflavus* and *Natrix natrix* that were identified in the early Pleistocene at Cava dell'Erba and Cava Pirro. *Coronella* cf. *C. austriaca* and *Natrix natrix* were also reported for the middle Pleistocene site called "I Tre fossi" (FG; Delfino & Bailon, 2000). *Vipera* gr. *V. aspis* was described for Cava dell'Erba and both Dolina and Fondo Cattie at Maglie. Large vipers of the so-called "oriental group" were present in the "Terre Rosse".

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