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Herpetological Explorations of the Balearic Islands During the Last Two Centuries

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Knowledge of Balearic amphibians and reptiles is closely linked to the development of European herpetology itself. The first herpetological study of the Balearic Islands was made at the end of the 18th century and during the first decades of the 19th century. We divide herpetological explorations of the Balearic Islands into three periods: first, a general approach by local naturalists and travellers; second, scientific exploration of the archipelago by professional collectors and herpetologists from the most important European museums and universities, with studies mainly focused on systematics and taxonomy; and third, scientific description of evolutionary processes observed on islands and their relationship to emergent disciplines such as island biogeography and insular ecology. In this work, we review these most important steps in the development of herpetological knowledge of the Balearic Islands from two different and complementary approaches: the origin, personality and objectives of researchers, and the discoveries they made during more than two centuries.

Riassunto

La conoscenza delle specie di Anfibi e Rettili delle Baleari è strettamente connessa allo sviluppo dell'erpetologia europea. Il primo vero studio sulle specie erpetologiche delle Baleari, risale alla fine del XVIII secolo e alle prime decadi del XIX secolo. Le esplorazioni erpetologiche di queste isole possono essere suddivise nei tre seguenti periodi: un primo, relativo a un approccio molto generale a questa disciplina, si è avuto grazie a naturalisti e viaggiatori locali; un secondo, dedicato alle esplorazioni scientifiche dell'arcipelago, è stato intrapreso da raccoglitori ed erpetologi professionisti provenienti dalle università e dai musei più importanti d'Europa, con studi prevalentemente incentrati sulla sistematica e la tassonomia; e un terzo periodo dedicato alla descrizione scientifica dei processi evolutivi osservati sulle isole e la loro relazione con discipline emergenti quali la biogeografia e l'ecologia insulari. Nel presente lavoro sono presentati i passi più importanti dello sviluppo delle conoscenze erpetologiche relative alle Isole Baleari, si affrontata no pertanto l'origine, la personalità e l'obiettivo dei singoli ricercatori da un lato e, dall'altro, le scoperte da loro fatte durante un periodo della durata di oltre due secoli.

Resumen

El conocimiento de los anfibios y reptiles de las Islas Baleares ha estado ligado al propio desarrollo de la herpetología europea. Las primeras contribuciones al conocimiento de la herpetofauna balear tuvieron lugar en las postrimerías del siglo

XVIII y las primeras décadas del XIX. Podemos dividir la exploración herpetológica de las Islas Baleares en tres períodos diferentes: Una primera aproximación por parte de naturalistas locales y viajeros, un segundo período de exploración científica del archipiélago de colectores profesionales y herpetólogos de los más importantes museos y universidades de Europa, principalmente interesados en la sistemática y la taxonomía y un tercer período de descripción científica del proceso evolutivo observado en las islas y su relación con disciplinas emergentes como la biogeografía y la ecología insular. En este trabajo presentamos los hitos más relevantes en el desarrollo del conocimiento herpetológico de las islas Baleares desde dos ópticas complementarias, el origen, personalidad y objetivos de los investigadores por un lado y los descubrimientos que llevaron a cabo durante más de dos siglos por otro.

The herpetological exploration of the Balearic Islands has been an exciting intellectual and scientific adventure involving the majority of European herpetologists for more than two hundred years. The history of this exploration has received little attention, and only a few short summaries are available (Montori et al. 1985; Vives-Balmaña 1987; Böhme 2004; Pérez-Mellado 2005). The knowledge of amphibians and reptiles of the Balearic Islands was closely linked to the development of European herpetology itself, and during the 19th and 20th centuries most of its leading figures explored or studied the Balearic herpetofauna.

We can divide the herpetological exploration of Balearic Islands into three periods: first, the very general approach taken by local naturalists and travellers; second, scientific exploration of the archipelago by professional collectors and herpetologists from European museums and universities, mainly focusing on systematics and taxonomy; and third, scientific description of the evolutionary processes observed on the islands and their relationship to the emerging disciplines such as island biogeography and insular ecology.

Why did so many important herpetologists visit the Balearic Islands during the last two centuries? Were attracted by the exotic nature of the region and its sunny weather? Were they seeking a geographical area inhabited by a diverse and undescribed fauna? The answer to the latter two questions, in response to the first, is probably yes, but . . . the herpetofauna of the Balearic Islands is fairly poor, in comparison to other larger Mediterranean islands or with adjacent continental areas. In fact, most of Balearic amphibians and reptiles are introduced and are more common in other places, although this fact has not always recognized (see below). Thus, we have to search for reasons that are probably linked to the development of modern zoology during the second half of the 19th century and, particularly, with the increasing influence of the evolutionary thought after the publication of the *Origin* by Darwin. Indeed, research on the Balearic Islands included not only formal and traditional systematics but also the exploration of evolutionary topics that related to the main theoretical questions raised by Darwin.

The history of herpetological studies of the Balearic Islands is clearly biased towards Menorca Island, with less information concerning Mallorca than Menorca. Thus, our present-day knowledge is a consequence of the availability of historical documents and the limited exploration of Mallorca and Ibiza. This is probably a result of the higher intellectual, scientific, and cultural activity on Menorca in comparison to the other islands of the archipelago, at least toward the end of the 18th and all of the 19th century (Vidal Hernández 2002).

First Period: A Basic Look on Faunas

If we exclude anecdotal comments found in travel books and general descriptions of the Balearic Islands, the first scientific commentaries on the islands' fauna and flora are found in offi-

The Western Mediterranean showing the relations of the Balearic Islands to the mainland and neighboring islands, including Corsica, Sardinia, and Sicily. Courtesy Google Earth, 2007.

cial documents and observations from the 18th century, by Spanish officials for Mallorca and Ibiza, and military officers and British administrators for Menorca. The Scottish physician George Cleghorn (1716–1789), who served as surgeon of the 22nd Foot Regiment, published a book with observations on endemic and epidemic diseases, plants, and animals of Menorca (Cleghorn 1751). Unfortunately, amphibians and reptiles are not mentioned in his book, which can be considered the first account of the natural history of the Balearic Islands (Pérez-Mellado 2005). In 1752, John Armstrong published a volume titled *The History of the Island of Menorca* (Spanish translation in Armstrong 1781) in which, for the first time, we can read some comments with regard to amphibians and reptiles of Menorca Island. To the best of our knowledge, this is the first contribution to the knowledge of amphibians and reptiles of Balearic Islands. Armstrong was a military engineer with a wide range of interests (Vidal Hernández 2005); he described terrestrial tortoises as well as the abundant lizards inhabiting Menorca.

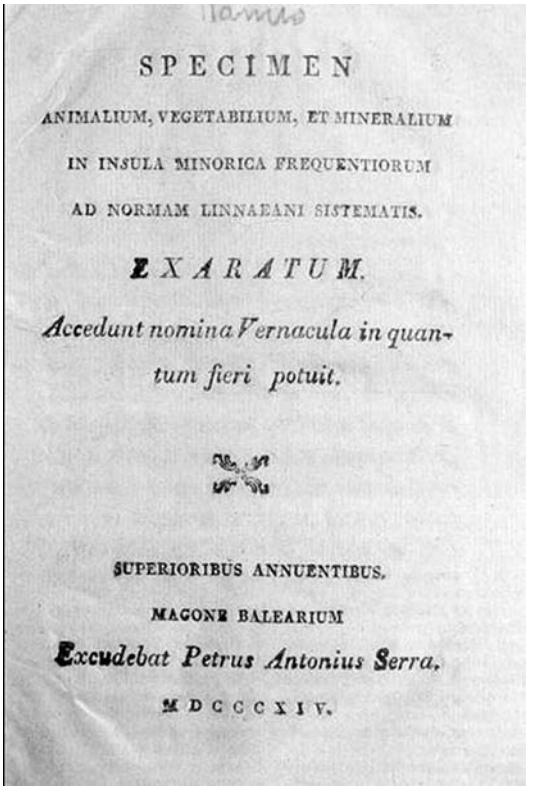
In 1787, an anonymous catalogue of six pages appeared in Menorca with the title *Catalogus plantarum, Arborum, Arbusculorum, Piscium, Animalium terrestrium et Insectorum et Mineralium Secundum Systema Linnearum Exaratum,* later reprinted by Castaños (1943 and 1944). Supposedly, the author of this book was Joan Ramis i Ramis (1746–1819), a lawyer, writer, and archaeologist (Fig. 1), who probably assembled the *Catalogus* by copying and enlarging the previous book of Cleghorn (Vidal Hernández 1999). A second version of the *Catalogus,* written in 1788, was published in 1814 (Fig. 2). It, too, was signed by Joan Ramis (Ramis, 1814), but the improvement of this new version was so great that Vidal Hernández (1999) was led to suggest that Ramis' brother, Bartolomeu Ramis (1751–1837), a medical doctor, actively participated in its preparation. In the first version of the *Catalogus*, we can readily recognize some of the species such as the loggerhead turtle, recorded as *Testudo marina,* placed within the group *Pisces Testacei*, and *Rana* (*Hyla meridionalis*?), *Stellio* (*Tarentola mauritanica*?), *Testudo* (*Testudo hermanni*?), *Bufo* (*Bufo viridis*?), *Lacertus viridis caudata bifida, Lacertus vulgaris* and *Anguis Esculapii*, all placed within the group called *Animalia terrestria frequentiora*. The version published in 1814 had a better systematic arrangement, including among the Reptiles, the sea turtle, as *Testudo mydas* (*Caretta caretta*), the pond turtle, *Testudo lutaria* (*Emys orbicularis*), the terrestrial turtle, *Testudo graeca* (*Testudo hermanni*), *Rana Bufo* (which we can surely identify as the green toad, *Bufo viridis,* because Ramis, for the first time, employed the current Minorcan name of the species: *calàpet*), *Rana temporaria, Rana esculenta, Rana arborea* (*Hyla meridionalis*), *Lacerta vulgaris*, *Lacerta aquatica,* and *Lacerta salamandra*. In Group II, Serpentes, Ramis included *Coluber natrix,* which we identify as the "viperine snake", *Natrix maura* (Pérez-Mellado 2005). It should be noted that one of the useful results of catalogues and faunistic lists of this first period is

FIGURE 1. Joan Ramis i Ramis (1746–1819), a lawyer, writer and archaeologist who published the first comprehensive list of amphibians and reptiles from Menorca Island in 1814.

the confirmation of the presence of several introduced species of amphibians and reptiles.

Second period: Scientific Exploration and Collections

We can consider that the first period ended and the second period began with the founding of the first cultural and scientific institutions that played an important role in the development of natural history research in the Balearic Islands. This is the case of Ateneu de Maó in Menorca, which housed a natural history museum where the first herpetological specimens were deposited. The Ateneu was the meeting point of local and foreign scientists, organizing conference cycles, exhibitions and different events. Thus, herpetological research in the Balearic Islands becomes linked to such institutions, usually with the collaboration of local naturalists, foreign scientists, as well as professional collectors.


SPECIMEN

ANIMALIUM, VEGETABILIUM, ET MINERALIUM

IN INSULA MINORICA FREQUENTIORUM

AD NORMAM LINNAEANI SISTEMATIS.

EXARATUM.

Accedunt nomina Vernacula in quantum fieri potuit.

SUPERIORIBUS ANNUENTIBUS.

MAGONE BALEARIUM

Excudebat Petrus Antonius Serra.

M D C C C X I V.

Figure 2. Title-page of the first "improved" edition of the *Catalogus* of Ramis I Ramis published in 1814.

As for other areas of the Mediterranean basin, the role of wealthy gentlemen and aristocrats of the Enlightment in the scientific exploration of the Balearic Islands was very important. Two individuals deserve immediate recognition, Lord Lilford (1833–1896) from England and the Archduke Luis Salvador (1847–1915) from Austria. The Archduke was a great traveller, explorer, and writer (Fig. 3). He is generally considered to be the first to show the unusual natural history value of the Balearic Islands to the rest of the European countries. His inclination to the natural sciences was, according to some biographers, the result of the Tuscan side of the Habsburg-Lorena House. He published several books describing islands and countries visited during his life. His first trip to the Balearic Islands, in 1867, was made while he was a student. He owned several properties in Mallorca Island and spent more time in the Balearics than in any other place. Thanks to the help of a close collaboration with local naturalists such as Francesc Cardona i Orfila from Menorca (Vidal Hernández 1997), he included observations on the natural history of the Balearic Islands in his publications (see A. Luis Salvador, *Die Balearen in Wort und Bild* [1869–1891]; also the 2000 edition for Menorca Island). Although his observations on amphibians and reptiles are limited, he did comment on melanistic lizards from Aire Island in Menorca, that he erroneously assigned to *Lacerta agilis*, as well as on terrestrial tortoises, terrapins, and snakes (Pérez-Mellado 2005). The Archduke's

Figure 3. The Archduke Luis Salvador (1847–1915), a great traveller, explorer and writer who made an important contribution to the knowledge of natural history of Balearic Islands.

scientific activity within the Balearic Islands influenced several European scientists and served as a basic reference and starting point for further studies (Vidal Hernández 2003).

Herpetological knowledge of the Balearic Islands received an additional boost with the visit of an ornithologist, Thomas Littleton Powys (Fig. 4), 4th Baron Lilford (18 March 1833–17 June 1896). Lilford spent several years at Oxford University but left without completing a degree. He was one of the eight founders of the British Ornithologists' Union in 1858 and its President from 1867 until his death. He travelled widely, especially in the Mediterranean region, making an extensive bird collection. His first travel was to Sicily, followed by a long trip with Hercules Rowley on a yachting cruise in the Mediterranean from 1856 to 1858. Between 1864 and 1882, he made several trips to Spain and other Mediterranean countries. In the course of these, he rediscovered the endangered Audouins' seagull, *Larus audouini*. He captured the first known Balearic lizards from Aire Island, south-eastern Menorca, in 1865. He donated some living specimens to the British Museum (Natural History) in London, that later were described and dedicated to him by Albert Günther as *Zootoca lilfordi* (Fig. 5) (the Lilford's wall lizard or Balearic lizard [*Podarcis lilfordi*]).

FIGURE 4. Thomas Littleton Powys, 4th Baron Lilford (1833–1896), discovered the Balearic lizard and collected the first specimens for the British Museum (Natural History) in London.

FIGURE 5. The Balearic lizard, *Podarcis lilfordi* from its type locality, Aire Island (Menorca).

Albert Karl Ludwig Gotthilf Günther (1830–1914) was a leading ichthyologist and herpetologist (Fig. 6) of the mid-19th century who spent most of his scientific career in London at the British Museum (Natural History). He was an early champion of the emerging field of zoogeography (Smith 2005). Born in Esslingen, Württemberg, Germany, Günther completed his M.D. degree at Tübingen. However, he scarcely had time to put his medical training into practice because in 1857 he was offered a place in the Zoology Department of the British Museum (Natural History) by John E. Gray, whom he succeeded as Keeper in 1875. Günther published more than 200 herpetological works. During his many years in England, he also had a close epistolary relation with Charles Darwin, who frequently cited Günther's observations on sexual dimorphism of lower vertebrates in his *Descent of Man* (Adler 1989). In fact, Günther provided so many observations to Darwin that Darwin acknowledged him in writing: "My essay, as far as fishes, batrachians, and reptiles are concerned, will be in fact yours, only written by me". Günther had a similar influence on Alfred Russell Wallace's magnum opus, *Geographical Distribution of Animals*, contributing basic information about the distribution and classification of amphibians and reptiles of the Galapagos and Mascarene Islands.

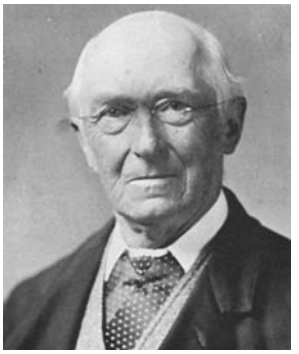


FIGURE 6. Albert Karl Ludwig Gotthilf Günther (1830–1914), in 1874 described the Balearic lizard, *Zootoca lilfordi* (now known as *Podarcis lilfordi*)

Among German-speaking herpetologists, one important figure of that time who worked with reptiles from the Balearic Islands was Jacques Vladimir von Bedriaga (1854–1906) (Fig. 7).

Bedriaga was born in Kriniz, Russia. He entered the University of Moscow in 1872, but left the following year because of health problems. He went to Germany and attended the University of Jena, where he made contact with several of the leaders of Darwinian revolution. For instance, his modern viewpoint in the descriptions of species and varieties was likely influenced by his professor, Ernst Haeckel (Böhme 1996), a strong supporter of evolutionary ideas. To improve his health, he moved to Nice and then to Florence, where he died in 1906 (Adler 1989). The Balearic lizard described by Günther in 1874 was the object of the description of three infraspecific taxa by Bedriaga (1879) in a work of a wider scope. Later, Bedriaga considered the species a synonym of *Lacerta muralis* (Bedriaga 1886), as he did several other supposedly good species described from the Mediterranean basin. Thus, Bedriaga (1886) recognized the subspecies *Lacerta muralis balearica* with three varieties: *lilfordi* Günther, *gigliolii* Bedriaga (Fig. 8) and *pityusensis* Boscá. In this sense, he can be included in the group of "lumpers", those specialists who try to produce a classification in which the emphasis is placed on relationships, avoiding fine division of taxa (Mayr and Ashlock 1991, also see below). Interestingly, Bedriaga (1886) cited *L. muralis balearica* from islets of Rey and Colom, as well as from the main part of Menorca Island. We do not know if it was a collecting error, or whether, at that time, the Balearic lizard was still present on Menorca Island, but it is not to be found there now.

FIGURE 7. Jacques Vladimir von Bedriaga (1854–1906), a leading Russian herpetologist, studied the lacertid lizards from Balearic Islands; he placed them within the wall lizard, *Lacerta muralis*.

FIGURE 8. Bedriaga described this variety as *Lacerta muralis balearica* var. *gigliolii* (now *Podarcis lilfordi gigliolii*) from Dragonera Island (Mallorca).

During these years, Maximiliam Gustav Christian Braun (1850–1930) published observations on the Balearic lizards from Menorca, correctly ranking "*lilfordi*" as a full species within the genus *Lacerta* (Braun 1877). Braun maintained an intense epistolary relationship with the great Minorcan naturalist, Joan J. Rodríguez Femenias (1839–1905). Braun was a botanist (Fig. 9) but with a wide range of scientific interests. Rodríguez Femenias sent herpetological material to Braun as well as other scientists of his time, including Bedriaga. Indeed, some lizards collected by Rodriguez Femenias were not studied until examined by Martin Eisentraut in the late 1920s (Eisentraut 1928b). It was during a visit in the spring and summer of 1882 to Menorca (Vidal Hernández 1995) that Braun made the first observations on the ecology and behavior of the Balearic lizard on the coastal islets of Rey and Aire.

Few Spanish scientists took an interest in the Balearic herpetofauna during this period. Martínez y Sáez (1875) was a brilliant entomologist who had also published several notes on herpetology. He was professor of Zoology at Madrid University and keeper of collections at the National Museum of Natural Sciences (Gómez and Sanchíz 1987). Martínez y Sáez described a small collection sent by Francesc Cardona from Menorca (see above regarding the relationship of Cardona and the Archduke Luis Salvador), from which we can extract the first record of the false smooth snake, *Macroprotodon mauritanicus* (mentioned as *Psammophylax cucullatus*), as well as some records of the viperine snake, *Natrix maura* (as *Tropidonotus viperinus*), the European pond

terrapin, *Emys orbicularis* (as *Emys lutaria*), the Moorish gecko, *Tarentola mauritanica*, the common tree frog, *Hyla arborea*, the green toad, *Bufo viridis*, the Balearic lizard, *Podarcis lilfordi* (as *Zootoca muralis*) and *Coronella quadrilineata* that corresponds to Ladder snake, *Rhinechis scalaris* (Alonso-Zarazaga 1998). This paper gave an almost complete list of the Menorca herpetofauna (with the exception of the Hermann's tortoise, *Testudo hermanni*). In addition, Martínez y Sáez (1875) mentioned some very interesting observations of Francesc Cardona that detected the presence of Balearic lizards only in coastal islets around Menorca. Hence, here we can have a first confirmation of the extinction of this species from the main island of Menorca. Francesc Cardona i Orfila (1833–1892) was a priest and naturalist from Menorca who had an intense scientific activity as malacologist and entomologist, with some contributions to geology and palaeontology. He assembled an extraordinary collection of shells, usually considered the second most important collection of its kind in Spain (Vidal Hernández 2003).

FIGURE 9. Joan J. Rodríguez Femenias (1839–1905, in the centre of picture), an excellent naturalist from Menorca who for many years maintained an epistolary relation with some of Europe's leading herpetologists and supplied them with herpetological material.

Rodriguez Femenias, in his own work on Menorcan natural history (Rodríguez Femenias 1887), presents the same list of amphibians and reptiles published by Martínez y Sáez in 1875. A similar list, with some comments rejecting traditional legends for some species, was also published by Oleo i Quadrado (1876) in his *Historia de Menorca*. And, in that same year, Barceló i Combis published a list of the Balearic herpetofauna that, in fact, is the first account for the whole archipelago.

Francesc Barceló i Combis (1820–1889) (Fig. 10) was a medical doctor and teacher of physics, chemistry, and natural sciences at the High School Institut Balear (Jurado 2006) on Mallorca Island. In 1876, he recorded for the first time in the Balearic Islands the Iberian water frog, *Rana perezi* (as *Rana escubente* L. [*sic*]), as well as many other species. It is also noteworthy that Barceló recorded the introduction of the Spanish terrapin, *Mauremys leprosa* (as *Terrapene leprosa*) from Algeria onto the Balearics.

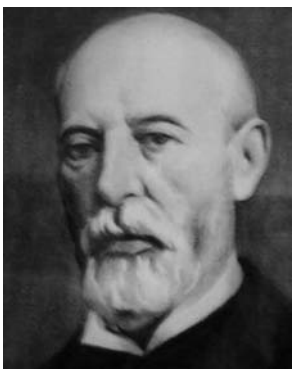


FIGURE 10. Francesc Barceló i Combis (1820–1889) published the first list of amphibians and reptiles for the Balearic Islands.

During these years, the activity of European herpetologists continued, not only with visits to the archipelago, but also with the study of museum specimens. In this way, Oskar Boettger (1844–1910) described a new subspecies of the green toad, *Bufo viridis balearica* (Boettger 1880), from Mallorca and Menorca and confirmed its presence on Ibiza Island (Boettger 1881). Boettger was also one of the leading herpetologists of his time and was responsible for establishing the Senckenberg Museum in Frankfurt am Main as a world centre for herpetology (Adler 1989).

Without doubt, the leading figure of Spanish herpetology during 19th century was Eduardo Boscá i Casanoves (1844–1924), a biologist and medical doctor born in Valencia (Fig. 11). He started his career as a teacher in a high school but then moved to Valencia University as professor of natural history. Boscá made extensive collections in several areas of the Iberian Peninsula. He also traveled to the Balearic Islands making one of the first Spanish contributions to the herpetological knowledge of the archipelago. His most important herpetological work was the first catalogue of Spanish amphibians and reptiles (Boscá 1877). This was greatly improved in two subsequent revised editions (Boscá 1880, 1881). Boscá was deeply influenced by Ferdinand de Lataste, a leading French herpetologist. Lataste helped him with more difficult systematic tasks during the description of new taxa (Fraga 1989), including the endemic lacertid lizard from Pityusic Islands, *Lacerta muralis* var. *pityusensis* (Fig. 12), described in one of Boscá's last herpetological works published after he visited Ibiza Island (Boscá 1883). Earlier Boscá (1877) recorded several species for the Balearic Islands in his catalogue, including the spur-thighed tortoise, *Testudo graeca*, which he recognized as an introduced species.

FIGURE 11. Eduardo Boscá i Casanoves (1844–1924), a leading Spanish herpetologist, published the first catalogue of amphibians and reptiles of Spain in which he included observations on the Balearic herpetofauna.

As with the works of other 19th century Spanish zoologists, in the works of Eduardo Boscá we can distinguish two distinct periods. Boscá's first version of the catalogue of Spanish amphibians and reptiles (Boscá 1877) is somewhat old-fashioned, i.e., of the "classical school" work (Fraga 1989), as are those of Barceló i Combis or Pérez Arcas. But, after 1877, Boscá's works take on a more modern tone, thanks to increasingly frequent contacts with other European specialists, and he began to express views reflecting newly emerging ideas in zoogeography, ecology, and evolution. Indeed, during this second period of his scientific career, Boscá became a confirmed evolutionist, so much so that he participated in and presented a lecture (read by another person, because he was ill the day of the presentation) at a celebration held in Valencia to pay homage to Darwin on the occasion of the centennial of Darwin's birth in 1909. In Spain, this event served to confirm Darwinism as the main evolutionary theory (Glick 1982). Thus, under the influence of Darwinian ideas, Boscá's herpetological works include, for the first time in Spanish scientific literature, ecological, biogeographical, and embryological observations (Sánchez Arteaga 2005). Special attention was given to variability within species, and varieties were widely treated in systematic revisions (Fraga 1989). For example, in his work on the Ibiza herpetofauna (Boscá 1883), Boscá made interesting comments about the "…problems of adaptation and other life factors", from a clearly evolutionary position. Although Boscá (1883) recorded, erroneously, the Balearic lizard from the town of Ibiza, he did clearly distinguish it from the "variety" he described as *Lacerta muralis* var. *pityusensis*. His description of the Ibiza wall lizard was quite precise. He also presents a short list of coastal islets where the variety is present as well as observations of individuals with clipped toes. Also in his Ibiza paper, he comments about

FIGURE 12. Boscá described the Ibiza's wall lizard as *Lacerta muralis* var. *pityusensis*.

the scarcity of the Balearic lizard on Mallorca. Lastly, it is noteworthy that Boscá was the first to record what he thought to be *Alytes obstetricans* on Mallorca Island (Boscá 1881). He had observed only tadpoles. Later it would be as a new species, endemic to the Balearic Islands, the Majorcan midwife toad, *Alytes muletensis* (see below).

Balearic amphibians and reptiles also received the attention of herpetologists from Catalunya such as Joaquim Maluquer i Nicolau (1892–1986) who published three papers dealing with the distribution of Balearic species (Maluquer 1917, 1918 and 1919).

Almost 50 years after the visit of Braun to Menorca, the Balearic lizard again drew the attention of German herpetologists, especially Lorenz Müller (Fig. 13), who described several subspecies (Müller 1927a and b, 1928a, b, c and d), and Martin Eisentraut, who recognized additional subspecies, even if earlier they had been included as synonyms of previous taxa (Eisentraut 1928a and b). Lorenz Müller (1869–1953) was one of the most important European herpetologists of his time and the mentor of Robert Mertens, who would become the one of the world's leading herpetologists of the mid-20th century. Müller described several subspecies of lizards from the Balearic Islands, competing in this task with Martin Eisentraut (Eisentraut 1928a and b; Müller 1927a and b, 1928a, b, c and d). To gain the priority over Müller in the naming of new taxa, Eisentraut published several of his early descriptions in weekly amateur magazines (Böhme 2004); but, as a matter of fact, Müller did too! Martin Eisentraut (1902–1994) had a wide range of scientific interests, from bats, marsupials, and rodents to insects, birds, ascidians, and reptiles (Fig. 14). He mainly worked with the African and South American fauna. During his productive scientific life, he published about 240 papers and books of which his research on Balearic lizards included seven systematic papers, one book, and two additional papers on insular melanism (Böhme and Hutterer 1999). Hence, his research on Balearic Islands can be considered a "lizard *intermezzo*" (Böhme 2005). Rarely has so short an *intermezzo* produced so excellent results! Eisentraut described in a short period 18 subspecies of *Podarcis lilfordi* (Fig. 15) and *Podarcis pityusensis* (Fig. 16; Eisentraut 1928a and b, 1929, 1930). The most interesting point is that he himself travelled to the Balearic Islands, where he made extensive collections, including sampling populations on many of the islets. He kept careful field notes in which he recorded the life colors of the lizards as well as observations on their behavior and ecology. Noteworthy is that these observations are scarcely mentioning his first systematic works. A second *intermezzo* devoted to the study of tropical areas took place following this period and up to 1949, when he would again rethink his ideas about insular lizards (see below).

FIGURE 13. Lorenz Müller (1869–1953) described several subspecies of both endemic lizards from Balearic Islands.

FIGURE 14. Martin Eisentraut (1902–1994) was one of the most important herpetologists who worked in Balearic Islands. He described several subspecies of *Podarcis lilfordi* and *Podarcis pityusensis* and made important contributions to our understanding of the factors that influence the evolution of lizards in insular environments.

Although other German herpetologists contributed to the description of the outstanding variability of Balearic lizards, we mention here only Otto Wettstein von Westersheimb (1892–1967), who described two subspecies, *Lacerta pityusensis algae* and *Lacerta lilfordi hartmanni* (Wettstein 1937).

At the end of this second period, only a few short contributions

from local naturalists dealt with amphibians and reptiles. Castaños (1930) gave us one of the very few descriptions of the most differentiated Balearic lizard subspecies, *Podarcis lilfordi rodriquezi* from Ratas islet, within the Port of Maó (Menorca). The islet was destroyed five years later to allow for the enlargement of the port (Fig. 17).

Third Period: Modern Research

We can start the third period of herpetological research of the Balearic Islands with the leading taxonomic herpetologist of his era, George A. Boulenger (1858–1937). Born in Brussels, Belgium (Fig. 18), he was appointed Assistant Naturalist at the Musée Royal d'Histoire Naturelle de Belgique. Albert Günther hired him as assistant in charge of lower vertebrates at the British Museum (Natural History) in London. During his lifetime, Boulenger published more than 900 scientific papers and books (Adler 1989). He had a great influence on European herpetology, in the case of lizards with the publication of his monumental *Catalogue of the Lizards in the British Museum* (*Natural History*) in three volumes (Boulenger 1887) and later with his monograph of the Lacertidae (Boulenger 1920). Boulenger was clearly a "lumper", combining within the genus *Lacerta* the genera *Lacerta, Gallotia, Zootoca*, and *Podarcis*. In this way, he recognized 23 varieties within *Lacerta muralis*, including the whole set of known Mediterranean species. From his viewpoint, *Lacerta muralis* shows the highest polymorphism within Reptilia (Boulenger 1920). He also studied living specimens from Aire Island (Menorca) sent to him by Jaume Ferrer Aledo (1856–1956), a Minorcan ichthyologist.

During the second half of the 20th century, interest in the herpetological fauna of the Balearic Islands by Europeans declined. Karl F. Buchholz (Fig. 19; 1911-1967) described *Hemidactylus turcicus spinalis*, a subspecies of the Turkish gecko, from Addaia Gran Islet (Fig. 20), Menorca (Buchholz 1954). Buchholz

Figure 15. *Podarcis lilfordi fenni* from Sanitja Islet (Menorca) was one of the subspecies of the Balearic lizard described by Martin Eisentraut.

Figure 16. Eisentraut described, among other subspecies, *Podarcis pityusensis negrae* from Ses Illetes Negres, close to Ibiza harbour.

Figure 17. Ratas Islet, within the port of Maó (Menorca). On this small islet lived *Podarcis lilfordi rodriquezi*, the most differentiated subspecies of the Balearic lizard. The islet was destroyed in 1935.

actively participated in the discussion of the evolutionary process of the Balearic lizards entertained by Martin Eisentraut and Max Hartmann (Fig. 21). Letters conserved at Zoologisches Forschungsinstitut of Bonn reveal the strong criticisms of Buchholz and Max Hartmann (1876–1962) of the supposedly Lamarckian explanations proffered by Eisentraut in his early papers, but which were abandoned in his later works (Eisentraut 1949, 1950 and 1954). Buchholz (1954) also described eight new subspecies of *Podarcis pityusensis* from material collected by Hermann Grün and Walter Jokisch (Böhme 2004). Max Hartmann, a geneticist, described two subspecies, *Lacerta lilfordi toronis* and *Lacerta pityusensis isletasi* (Hartmann 1953). Dieter Lilge published the first systematic revision of the subspecies of *Podarcis pityusensis*, employing biometrical techniques in his character analyses (Lilge 1975). Amphibians were also studied by European herpetologists. For instance, Helmuth Hemmer confirmed the specific status of the Iberian water frog, *Rana perezi*, for the Balearic Islands (Hemmer and Kadel 1980).

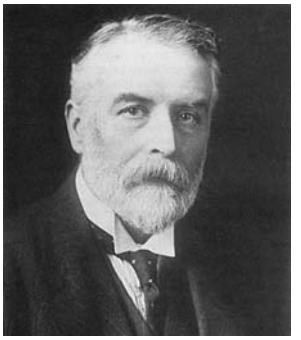


FIGURE 18. George A. Boulenger (1858–1937), one of Europe's leading herpetologists. He studied Mediterranean lizards, including those from the Balearic Islands. He classified all of the subspecies of the two Balearic species as varieties of *Lacerta muralis*.

FIGURE 19. Karl F. Buchholz (1911–1967) described the only known subspecies of a gecko from the Balearics, *Hemidactylus turcicus spinalis,* from Addaia gran Islet (Menorca).

The most important German-speaking (though Russian by birth) herpetologist of the period was Robert Mertens (1894–1975), who has had a sustained influence on Mediterranean herpetology (Böhme 2004). Mertens (Fig. 22) was born in St. Petersburg, Russia and completed a Ph.D. dissertation at Leipzig University on lacertid lizards from Italy. Like Boulenger before him, Mertens was extraordinarily productive, publishing nearly 800 titles during his lifetime. Among these are several contributions to the study of insular herpetology in which the Balearic amphibians and reptiles are discussed in whole or in part (Mertens 1921, 1924, 1927, 1929, 1934, 1957, 1958). Mertens and Müller (1928, 1940)

FIGURE 20. Addaia gran islet (Menorca), the type locality of *H. turcicus spinalis*.

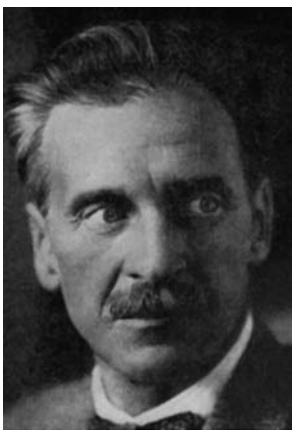


FIGURE 21. Max Hartmann (1876–1962), a geneticist, described two subspecies of lizards from the Balearics. He actively participated in discussions with Eisentraut and Buchholz about the origin of melanism in insular populations of lizards.

FIGURE 22. Robert Mertens (1894–1975) was the leading German herpetologist of the mid-20th century. He published several contributions to the knowledge of the Balearic herpetofauna. In the last edition of his catalogue of European reptiles and amphibians, he treated both endemic lizards as full species.

and Mertens and Wermuth (1960) collaborated on several catalogues of the European herpetofauna in which they include information about the amphibians and reptiles of the Balearics. In fact, the catalogue from Mertens and Wermuth (1960) can be considered the starting point of a modern systematic approach to the European and, by extension, the Balearic herpetofauna. In this work, both authors finally recognized the full specific status of the two endemic lacertid lizards from the Balearics and proposed a synthetic arrangement of subspecies that Salvador (1974) fully followed in his Spanish catalogue. Heinz Wermuth also described the subspecies *Testudo hermanni robertmertensi* (Wermuth 1952), which for many years was thought to be the form present in the Balearic Islands. But Bour (1987) showed that the subspecies present in the Balearics is *T. hermanni hermanni*. Additional contributions dealin with the terrestrial tortoises and pond terrapins were published by Raxworthy (1984) and Vickers (1983).

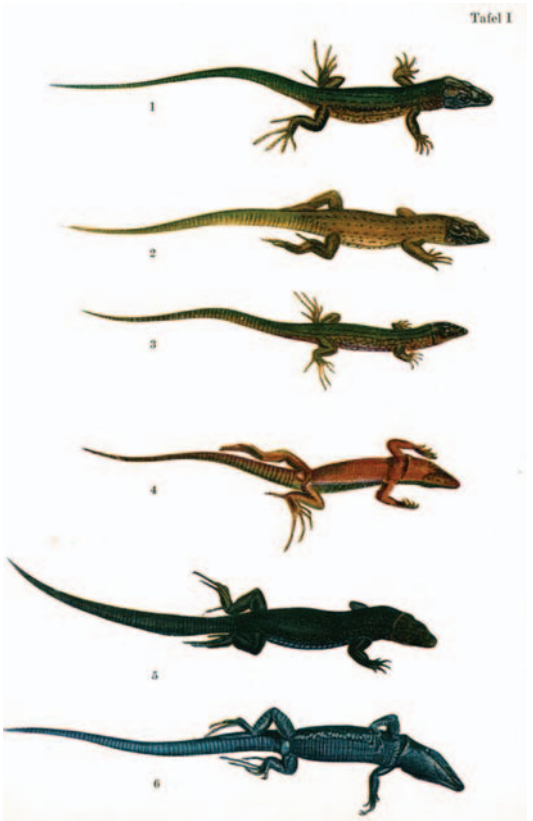


FIGURE 23. Eisentraut (1950) gave a large amount of information on the natural history, ecology and behaviour of Balearic lizards, including excellent drawings with coloration of living specimens.

Even though it was published in 1929, the paper by Martin Eisentraut about the variation of insular lizards must be included within this third period of modern research because Eisentraut (1929) addressed a modern topic with an original vision of the problem. Eisentraut studied the chromatic variation of Balearic lizards and the rise of melanistic populations, observing more than 1200 living lizards from almost 50 different populations (Fig. 23). He advanced a rather confusing hypothesis concerning the rise of melanism that was quickly interpreted as a Lamarckian explanation by Buchholz and Hartmann. Then, after a period of almost 30 years devoted to tropical faunas of different groups of vertebrates, Eisentraut returned again to think about insular lizard and evolution. He clarified his position regarding how, from his viewpoint, melanism appeared, and he stressed the important contribution of herbivorous diet in the origin of melanistic populations (Eisentraut 1950, 1954). But he also accepted some of the criticisms made by Hartmann (1953), so that he now allowed for a neutral value for melanism among insular lizards. This then led him to reexamine the question of the origin of herbivory on islands and its effect on intestinal length, a topic he had taken up in his 1929 paper (see above). Others who participated in these discussions were Karl Buchholz and Robert Mertens (Böhme 2004).

Eisentraut was the pioneer of some of the more interesting topics of insular evolution of lizard populations. The distinguished Harvard evolutionary biologist, Ernst Mayr, recognized this fact in his seminal book *Animal Species and Evolution* (Mayr 1963), in which in four different places he cites the studies of Eisentraut and other herpetologists in the Mediterranean Basin to illustrate the origin of morphological traits such as melanism, as well as the extraordinary variability among populations and the appearance of characters related to the relaxation of predation pressure.

The so-called "Silver Age" of Spanish science and culture, during the last years of the 19th century and the first third of the 20th century (Otero 2001), was a time of extraordinary productivity, but it failed to have any significant influence on herpetological studies. In the late 1930s, and throughout the period of the Franco dictatorship, Spain suffered through a dismal period of low scientific output. Few studies were undertaken in the Balearic Islands, and only a few researchers published short accounts on the amphibians and reptiles. Due to the strong influence of the Catholic religion and conservative ideology, which were pervasive during the more than 40 years of Franco's rule, and for other sociological reasons, classical dispersal biogeography and Linnaean taxonomy coexisted with modern evolutionary approaches to explain the composition of the Balearic herpetofauna.

Guillem Colom Casasnovas (1900–1993) represents the classical naturalist trying to explain faunal composition of the Balearics strictly in terms of traditional dispersal biogeography. Colom (Fig. 24), a geologist and palaeontologist specializing on Foraminifera and other groups of microfossils, sought to explore other natural history fields as well. He published more than 200 scientific works during his professional career, which spanned 68 years, mostly on the Balearic Islands (Usera and Alberola 2005).

FIGURE 24. Guillem Colom Casanovas (1900–1993) was a palaeontologist and geologist who published several papers on the biogeography of the Balearic Islands, maintaining controversial opinions about the origin of amphibians and reptiles of the archipelago.

He published a few papers devoted to amphibians and reptiles (Colom 1951, 1952 and 1953) and later summarized his ideas on the biogeography of amphibians and reptiles in three general works (Colom 1957, 1978, 1988). The nomenclature employed by Colom, even in the books published in 1978 and 1988, was out of date; indeed, in some cases he used scientific names from the 19th century. Nevertheless, he correctly interpreted the North African origin for the false smooth snake, *Macroprotodon mauritanicus* (Fig. 25). Colom also thought that the origin of the Balearic lizard could be traced to a stock of *Lacerta muralis* that entered the islands thanks to a connection between them and the Iberian Peninsula at the end of the Pliocene (Colom 1978).

Colom's position regarding the systematic status of the Balearic lizard is confusing. On the one hand, he accepted Boulenger's (1920) treatment that included all wall lizards of the western Mediterranean within *Lacerta muralis*, but on the other, he wrote about the slow speciation process in the Balearics and recognized the existence of several "vicariant races" within the archipelago. His use of the genus *Lacerta* to classify the small wall lizards is not surprising, even in 1978, and even coming as it did five years after publication of Edwin N. Arnold's seminal paper resurrecting the genus *Podarcis* (Arnold 1973). What is surprising is Colom's propensity to consider both endemic species of Balearic lizards as mere varieties of *Lacerta muralis* (Colom 1978). Another surprising point is his detailed presentation of the distribution of *Podarcis lilfordi* on Mallorca Island, where he considered that the species to be present along a narrow strip of south-west-

FIGURE 25. Guillem Colom correctly concluded that the false smooth snake, *Macroprotodon mauritanicus* was a species introduced from North Africa.

ern, south and south-eastern coasts (Colom 1978). All indications from other authors confirmed that the species was completely extinct on both Mallorca and Menorca islands, probably dating back to Roman times (Sanders 1984).

FIGURE 26. The Italian wall lizard, *Podarcis sicula*, introduced onto Menorca Island.

Colom's position is also unsound with respect to the Italian wall lizard, *Podarcis sicula* (Fig. 26), which he considered a relict of the Tyrrhenian fauna, and clear proof of a land connection of Balearics and the rest of the so-called Tyrrhenian massif. The opinion of all other herpetologists is that the Italian wall lizard is an introduced species in Menorca. Defending his position, Colom (1978) also suggested that *P.sicula* is really scarce in Menorca and close to extinction because of its lower "vitality" compared to the Balearic lizard. In fact, the situation in Menorca is exactly the opposite; the Italian wall lizard is abundant whereas *P. lilfordi* is absent from the main island. In addition, Colom (1978) also proposed that the Balearic populations of *Testudo graeca* and *Rana perezi* were derived from the Iberian Peninsula and *T. hermanni, Bufo viridis* and *Hyla meridionalis* from the Tyrrhenian massif.

The case of Guillem Colom is, from our viewpoint, interesting because it represents a clear example of a non-specialist in herpetology disregarding the preponderance of herpetological knowledge of his time. Even more, it is surprising that his biogeographical hypothesis, being that of a palaeontologist, did not take into account the complete absence of a Balearic fossil record for all present-day species of amphibians and reptiles, excepting the three endemics, *P. lilfordi, P. pityusensis* and *A. muletensis*.

During this period of low scientific activity in Spain, only three or four researchers dealt with the Balearic amphibians and reptiles. One of them was Arturo Compte Sart, an entomologist from the National Museum of Natural History in Madrid, who made an expedition in 1965 to Ibiza Island (Compte 1966) and who had previously collected data from the remaining Balearics across a period spanning at least ten years (Compte 1977, 1968). Compte (1966) recorded six species of amphibians and reptiles from Ibiza. In his paper, Compte talked about doubtful records for the spiny-footed lizard, *Acanthodactyus erythrurus,* from Ibiza (Colom 1957) and the presence of two terrestrial tortoises, *Testudo hermanni* and *T. graeca,* at Ibiza and Formentera islands. At that time, it was widely accepted that the spur-thighed tortoise was introduced to the Balearic Islands, whereas Hermann's tortoise was, erroneously, considered an autochthonous species. From an historical viewpoint, the work of Compte (1966) is the first to confirm the extinction of *Testudo hermanni* on Ibiza Island.

Another noteworthy is Antonio Vidal, a specialist of freshwater fauna, who studied Balearic amphibians and presented his work in two publications (Vidal 1965, 1966). This author, not only produced a faunistic work, but he also included observations on breeding biology and phenology of Balearic anurans.

Between 1950 and 1974, Juan Pablo Martínez-Rica, a researcher at the Instituto Pirenaico de Ecología (CSIC, National Council of Research), visited the Islands to study the herpetofauna, occasionally accompanied by Enrique Balcells (Balcells 1955; Martínez-Rica 1965a and b, 1967a and b). Martínez-Rica studies resulted in a Ph.D. dissertation on the natural history and ecology of geckonid lizards (Martínez-Rica 1974).

Somewhat earlier, Balcells (1955) had recorded the presence of lacertid lizards at the ancient

walls of Palma de Mallorca, assigning them, erroneously, to *Podarcis lilfordi* (they were actually an introduced population of *Podarcis pityusensis* from Ibiza).

In the late 1960s, and overlapping the period of Martínez-Rica, the situation began to change drastically with the arrival of a new group of young Spanish researchers. The most important of these younger entrants was and still is Alfredo Salvador Milla, an active researcher at the CSIC (National Research Council) at the National Museum of Natural History, Madrid. Alfredo Salvador completed his M.D. thesis on the feeding ecology of the Balearic lizard from the Cabrera Archipelago (Salvador 1976a) thus initiating a fruitful period of research in the Balearic Islands. He produced a systematic revision of the subspecies of *Podarcis lilfordi* the from Cabrera Archipelago and Mallorca islets, coauthored a systematic revision of *Podarcis lilfordi* from Menorca islets (Pérez-Mellado and Salvador 1988), and studied many other aspects of the Balearic herpetofauna, the results of which he presented in a series of papers collectively titled *Herpetofauna balearica* (Salvador 1976b, 1978, 1979a and b, 1980a and b). For the seminal *Handbuch der Reptilen und Amphibien Europas,* edited by Wolfgang Böhme, Salvador contributed the chapters dealing with the two endemic Balearic lacertid lizards as well as a number of Iberian species (Salvador 1986a and b). He published a revision of the *Podarcis pityusensis* species group in 1984, earlier a study on its thermal biology (Pérez-Mellado and Salvador 1981), and, lastly, a general account of the Ibiza's herpetofauna (Salvador and Pérez-Mellado 1984).

Activity in the Balearic Islands during the second half of 20th Century involved also resident scientists such as Josep Antoni Alcover, Joan Mayol, Miquel Palmer, Guillem X. Pons and Antonia María Cirer, Encarna Sáez, and Núria Riera. Alcover is a palaeontologist, Mayol an ornithologist and conservationist, and Palmer an entomologist. But each of them is also interested in living vertebrates and all have published short papers and monographs on the origin, diversity, and biogeography of Balearic amphibians and reptiles (e.g., Alcover 2000; Alcover and Gosálvez 1988; Alcover and Mayol 1981, 1982; Pons and Palmer 1996; Palmer et al. 1999). Alcover and Mayol were also involved in the rediscovery of the Majorcan midwife toad (Alcover and Mayol 1980; Alcover et al. 1981; Mayol and Alcover 1981; Hemmer and Alcover 1984). In 1981, Alcover et al. published an updated account of the fossil record of amphibians and reptiles of Balearic Islands that provides essential information needed to understand the history of the present-day faunistic composition of the archipelago. Joan Mayol studied different aspects on the distribution, conservation, and natural history of the Balearic herpetofauna and published two editions of a well-known field guide for these islands (Mayol 1981; Mayol 1985, 1992, 2003; Mayol et al. 1988). Antonia María Cirer did her M.D. thesis (Cirer 1981, 1982) and her Ph.D. dissertation on the systematics of *Podarcis pityusensis* (Cirer 1987a). She published several other related papers (Cirer 1987b, 1987c, 1988; Cirer and Guillaume 1986; Cirer and Martínez-Rica 1986, 1990) concluding that only seven subspecies of the Ibiza wall lizard can be recognized.

Today, flooded by the new discoveries of molecular systematics, it is clear that the description of a new vertebrate species is a frequent event. But during last fifty years, the European fauna of amphibians and reptiles was thought to be mostly described and novelties were rare. In the synthetic atmosphere constructed by George A. Boulenger, the discovery of a new amphibian or reptile species within European boundaries was an extraordinary event. Such was the case of the midwife toad, *Alytes muletensis,* from Mallorca. Larvae of this species were previously detected by Eduardo Boscá during the 19th century and assigned to the continental midwife toad, *Alytes obstetricans* (Boscá 1881 and see above). Then, the sceptical 20th century herpetologists rejected this record and left this species unstudied for almost one hundred years, considering the observation of Boscá an identification mistake. Sanchíz and Adrover (1977) described a new fossil species of anuran from an archaeological site, the cave of Sa Muleta on Mallorca Island. They named the species

Baleaphryne muletensis, the Balearic toad from Sa Muleta, and dated the fossil from the Middle and Upper Pleistocene. Sanchíz and Adrover (1977) described the differences between the new genus and the closest genus *Alytes.* In 1980, a team of speleologists and biologists rediscovered the species living in an almost inaccessible habitat in north-western Mallorca (Fig. 27). Immediately, an international team of researchers undertook the task of studying this relic population of the Majorcan midwife toad, comparing it with Iberian species of the genus *Alytes*, with which the living fossil was classified (Hemmer and Alcover, 1984). The study of this endangered and extremely interesting species continues today with the participation of research teams from different countries (see, for example, Buley and García, 1997; Kraaijeveld et al. 2003 or Kraaijeveld et al. 2005).

Endemic Balaeric Island species were not the only animals studied during the past two centuries. All of the Balearic herpetofauna attracted attention, especially of herpetologists. Authors, like Martin Eisentraut, would recognize that most of the amphibians and reptiles inhabiting the Balearics were introduced by humans during historic times. But, because the Balaerics have a paraoceanic origin, and because most of the species appear to have been introduced, intentionally or not, by human intervention, current postulates of island biogeography theory cannot be applied directly to explain the faunal composition.

Thus, more recently, herpetologists have turned their attention to archaeology and history to understand first the events of human colonization. To explain the arrival of some species, it is necessary to uncover the existence of shipping lanes that linked, for example, the Balearic Islands with North Africa that could help account for the arrival of the Moroccan rock lizard, *Lacerta perspicillata* or the false smooth Snake, *Macroprotodon mauritanicus*. Their occurrence in Menorca, but not in Mallorca and Ibiza, must have been a result of the fact that those last two islands lay outside of the commercial routes of ships coming from North Africa, that stopped at Menorca enroute, in some instances, to ports in southern France or elsewhere along the southern European coast. Moreover, the explanation of the widespread presence of the European pond terrapin, *Emys orbicularis*, in Menorca and Mallorca, does not need abstruse biogeographical hypotheses, but the knowledge of different religious rules, culinary traditions or practical uses. For example, pond terrapins were eaten during Lent, when meat is forbidden for Catholics, because pond turtles were considered fish. Also well known is the use of fat from terrapins as excellent oil for textile mills and other machines in Menorca during 18th and 19th centuries (Archduke Luis Salvador, 1890 *in* Braitmayer et al. 1998; Fritz et al. 1998). The most recent molecular studies for the false smooth snake as well as for the Moroccan rock lizard and European pond turtle (Fritz et al. 1998) confirm this recent introduction. The population of *Emys orbicularis* from Menorca was also studied by Klaus Methner who proposed the existence of a dwarf population in some localities of Menorca (Methner 1980, 1988).

Conclusions

The herpetological exploration of the Balearic Islands focused on the study of two very different groups of species. A large set of introduced amphibians and reptiles came from several sources and probably always with human help. The explanation of these introductions links frequently with history and archaeology and has less to do with insular biogeography and colonization of oceanic islands (Corti et al. 2000). On the other hand, the Balearic Islands are the home of only three endemic species of terrestrial vertebrates, the Majorcan midwife toad, the Ibiza wall lizard and the Balearic lizard. These three species were discovered during the 19th century, but their scientific study began during the 20th century with the pioneering works of Lorenz Müller, Martín Eisentraut, and Eduardo Boscá.

Why did European eminent herpetologists such as Bedriaga and Boulenger not recognize the

variety of insular lizards from the Balearic Islands and other insular areas of the Mediterranean basin as full species? In his book on systematic zoology, Mayr (1969) divided the history of theories of classification into six periods. According to Mayr (1969), the fifth period of "population systematics" did not begin until the 1920s. Thus, before that time, and for practical reasons, taxonomists treated species in a typological manner, as invariant units, and this long after the invalidity of the typological species concept was apparent, and long after the general acceptance of evolutionary theory. But, at the same time, the comparison of population samples from different geographical areas within the distribution range of a supposed single species, showed smaller or greater differences. The solution to this problem was the replacement of the typologically defined species by the polytopic species with several populations (Mayr 1969).

In the case of Mediterranean lizards, this influenced the taxonomic attitude of European herpetologists, who accepted the existence of a few polytypic species, as *Lacerta muralis* (*sensu* Boulenger 1920), with several highly differentiated populations within a very large distribution range. Hence, although the "new systematics" (Huxley 1940) led to a reevaluation of the species concept and to a more biological approach in taxonomy (Mayr 1969), at the same time it hampered the recognition of full species *status* for several populations of lacertid lizards within the Mediterranean Basin.

As we see in works of Bedriaga (1886), Boulenger (1920) and many of those active during the early years of the 20th century, such as Mertens (1925), the influence of these evolutionary ideas had a direct and interesting effect on the systematic arrangement of the extreme variability of Mediterranean amphibians and reptiles, and a good example can be extracted from Balearic lacertid lizards. These authors were conscious of the morphological variability of insular populations but, deeply influenced by the difficulties of defining a "good species" under new perspectives of evolutionary theory (see, for example, Dennett 1999), they turned to a lumping position, recognizing only a myriad of varieties within a reduced number of subspecies within very large species, like *Lacerta muralis*. In Europe, the situation began to improve in the mid-20th century, mainly with the publication of the European list of Mertens and Wermuth (1960). By then, leading European herpetologists turned again to recognize as full species the endemic populations of Mediterranean islands, including the two species from the Balearic Islands. The concept of variety was then abandoned, at least in vertebrate zoology, and the present-day taxonomical arrangement took shape.

Paradoxically, the influence of evolutionary ideas that obscured a more current systematic interpretation of insular variability helped the same herpetologists to recognize the evolutionary significance of this morphological variability and the need to include in their studies non-morphological elements from natural history, ecology, behavior, and development of these populations. In this way, Martin Eisentraut and, to a lesser extent, other authors like Max Hartmann and Robert Mertens, described, from a modern viewpoint, the ecological adaptations of insular lizards, trying for the first time to interpret some morphological adaptations like melanism, as well as ecological traits such as omnivory and population densities (Eisentraut 1950, 1954). The route of actual studies on behavioral ecology of insular lizards was opened. This route would not have been posssible to follow were it not for the insights in the pioneering works of Eisentraut, Braun, Boscá, Müller, Hartmann or Mertens.

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about the life and works of Martin Eisentraut and, in general, the key role played by German researchers in the herpetological studies of the Balearic Islands. During our visits to the Alexander Koenig Museum and its excellent herpetological collection, we were able to examine the letters and documents from scientists and collectors that were extremely useful. Lastly, we greatly appreciate the thoughtful comments by Terry Gosliner on an early draft of the manuscript.

References

Adler, K. 1989. Herpetologists of the Past. Pages 5–141 *in* K. Adler, ed., *Contributions to the History of Herpetology.* Contributions to Herpetology 5. Society for the Study of Amphibians and Reptiles, Oxford, Ohio, USA.

Alcover, J.A. 2000. Vertebrate Evolution and Extinction on Western and Central Mediterranean Islands. *Tropics* 10(1):103–123.

Alcover, J.A., and J. Gosálvez. 1988. Los vertebrados terrestres de las Islas Baleares y Pitiusas: una aproximación biogeográfica. Pages 153–158 *in* C.P. Blanc and J.N. L'Héritier, eds., *Actes du Colloque International sur les Vertébrés terréstres et dulcéaquicoles des îles méditérranées.* Bulletin d'Écologie 19(2–3). Evissa, Corse, France.

Alcover, J.A., and J. Mayol. 1980. Noticia del hallazgo de *Baleaphryne* (Amphibia: Anura: Discoglossidae) viviente en Mallorca. *Doñana Acta Vertebrata* 7:266–269.

Alcover J.A., and J. Mayol. 1981. Espécies reliquies d'amfibis i de rèptils a les Balears i Pitiüses. *Bolletí de la Societat d'Historia Natural de les Balears* 25:151–167.

Alcover J.A., and J. Mayol. 1982. Espèces relictuelles d'amphibiens et de reptiles des îles Baléares et Pityuses: un extension des résultats. *Bulletin de la Société Hérpétologique de France* 22:69–74.

Alcover J.A., S. Moyá-Solá, and J. Pons-Moyá. 1981. *Les Quimeres del Passat. Els vertebrats fossils del Plio-Quaternari de les Balears i Pitiüses*. Monografies Cientifiques, 1. Editorial Moll. Ciutat de Mallorca, Spain. 260 pp.

Alonso-Zarazaga, M.A. 1998. Apéndice 1. Nomenclatura: Lista de sinónimos y combinaciones. Pages 645–685 *in* A. Salvador, ed., *Reptiles, Fauna Ibérica 10*, Museo Nacional de Ciencias Naturales. CSIC. Madrid, Spain.

Archiduque Luis Salvador. 2000. *Menorca. Las Baleares. Descritas por la palabra y el dibujo* (*Die Balearen II*). La Foradada (*Serie Mayor*), José J. de Olañeta, Editor. Palma de Mallorca, Spain. 212 pp.

Armstrong, J. 1781. *Historia civil, y natural de la isla de Menorca: descripción topográfica de la cuidad de Mahon, y demás poblaciones de ella: número de sus habitantes, y ganados de todas especies: estado de su comercio activo y pasivo, y cantidad de los frutos que produce.* Imprenta de Pedro Marín**.** Madrid, Spain. 283 pp.

Arnold, E.N. 1973. Relationships of the Palearctic lizards assigned to the genera *Lacerta*, *Algyroides* and *Psammodromus* (Reptilia: Lacertidae). *Bulletin of the British Museum* (*Natural History*) 25(8):289–366.

Balcells, E. 1955. Datos para el estudio del ciclo biológico de los gecos del N.E. de España e Islas Baleares. *Publicaciones del Instituto de Biología Aplicada* 20:33–45.

Barceló, F., and F. Combis. 1876. *Catálogo de los reptiles y los moluscos terrestres y de agua dulce observados en las Islas Baleares*. Imprenta P.J. Gelabert, Palma de Mallorca, Spain.

Bedriaga, J.v. 1879. Mémoire sur les varietés européennes du Lézard des Murailles. *Bullétin de la Société Zoologique de France* 4:194–228.

Bedriaga, J.v. 1886. Beiträge zur Kenntniss der Lacertiden-Familie (*Lacerta, Algyroides, Tropidosauria, Zerzoumia* und *Bettaia*). *Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft* 14:17–444.

Boettger, O. 1880. Neue Kroenvarietat von den Balearen. *Zoologische Anzeiger* 72:642–643.

Boettger, O. 1881. Beitrag zur Kenntnis der Amphibien und Reptilien Spaniens und der Balearen. *Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft* 12:371–392.

Böhme, W. 1996. Biographische Notizien zur Doktorarbeit von Jacques von Bedriaga (1854–1906). *Salamandra* 32(3):193–198.

Böhme, W. 2004. The German contributions to Mediterranean Herpetology with special reference to the

Balearic Islands and their lacertid lizards. Pages 63–82 *in* V. Pérez-Mellado, N. Riera, and A. Perera, eds., *The Biology of Lacertid lizards. Evolutionary and Ecological* Perspectives. Institut Menorquí d'Estudis, Maó, Menorca, Spain.

Böhme, W. 2005. Commemorating Martin Eisentraut (1902–1994) — important explorer of tropical African vertebrates. Pages 85–98 *in* B.A. Huber, B.J. Sinclair, and K.H. Lampe, eds., *African Biodiversity: Molecules, Organisms, Ecosystems*. *Proceedingsoof the 5th International Symposium of Tropical Biology, Museum Koenig*. Springer Verlag, Bonn, Germany.

Böhme, W., and R. Hutterer. 1999. Leben und Werk von Martin Eisentraut (1902–1994). *Bonner zoologische Beiträge* 48 (3–4):367–382.

Boscá, E. 1877. Catálogo de los Reptiles y Anfibios observados en España, Portugal e Islas Baleares. *Anales de la Sociedad Española de Historia Natural* 6:39–69.

Boscá, E. 1880. Catalogue des reptiles et amphibiens de la Peninsule Ibérique et des îles Baléares. *Bulletin de la Société Zoologique de France* 5:240–287.

Boscá, E. 1881. Correcciones y adiciones al catálogo de los reptiles y anfibios de España, Portugal y las islas Baleares, seguido de un resumen general sobre su distribución en la Península. *Anales de la Sociedad Española de Historia Natural* 10:89–112.

Boscá, E. 1883. Exploración herpetológica de la Isla de Ibiza. *Anales de la Sociedad Española de Historia Natural* 12:241–250.

Boulenger, G.A. 1885–1887. *Catalogue of the Lizards in the British Museum* (*Natural History*). The Trustees of the British Museum, London, England, UK. 3 vols. (Lacertidae in vols. 1 and 2 [1885])

Boulenger, G.A. 1920. *Monograph of the Lacertidae*. Trustees of the British Museum (Natural History). London, England, UK. 2 vols., 803 pp.

Bour, R. 1987. L'identité des tortues terrestres européennes – spécimens-types et localités-types. *Revue Française d'Aquariologie* 13(4):111–122.

Braitmayer N., U. Fritz, J. Mayol, and A. Pieh. 1998. Die Europäische Sumpfschildkröte (*Emys orbicularis*) Menorcas. *Elaphe* 6(4):57–60.

Braun, M. 1877. *Lacerta lilfordi* und *Lacerta muralis*. Zugleich ein Beitrag zur Reptilienfauna der Kleinen Inseln des Mittelmeeres. *Arbeiten aus den zoologischen-zootomischen Institut in Wurzburg* 4:1–64.

Buchholz, K.F. 1954. Ein neuer *Hemidactylus* von der Balearen (Rept. Gekkonidae). *Bonner Zoologische Beitrage* 5:68.

Buley, K.R., and G. García. 1997. The recovery programme for the Mallorcan midwife toad *Alytes muletensis*: an update. *Dodo, Journal of the Wildlife Preservation Trusts* 33:80–90.

Castaños, E. 1930. Las lagartijas negras de Menorca. *Revista de Menorca* 25:53–55.

Castaños, E. 1943. Catálogo de la historia natural de Menorca en el siglo XVIII. *Revista de Menorca*, año XXXVIII, 6ª época, primer trimestre: 276–281.

Castaños, E. 1944. Catálogo de la historia natural de Menorca en el siglo XVIII (Continuación). *Revista de Menorca*, año 46, 6ª época, primer trimestre: 49–54.

Cirer, A.M. 1981. *La lagartija ibicenca y su círculo de razas*. Consell d'Ecologi i Medi Ambient d'Eivissa, Ibiza, Spain. 106 pp.

Cirer, A.M. 1982. Estudio de las poblaciones de lacértidos de los islotes en torno a la isla de Ibiza. *Publicaciones del Centro Pirenaico de Biología Experimental* 13:83–88.

Cirer, A.M. 1987a. *Revisión taxonómica de las subespecies del lacértido Podarcis pityusensis, BOSCÁ, 1883.* Ph.D. dissertation. University of Barcelona, Spain. 445 pp.

Cirer, A.M. 1987b. Aplicación de técnicas estadísticas multivariantes a las poblaciones del lacértido *Podarcis pityusensis* (Boscá, 1883). *Revista Española de Herpetología* 2:145–164.

Cirer, A.M. 1987c. New taxonomy proposition for *Podarcis pityusensis* Boscá, 1883. Pages 95–101 *in* J.J. van Gelder and H. Strijbosch, eds., *Proceedings of the 4th Ordinary General Meeting of the Societas Europaea Herpetologica*. Faculty of Sciences Nijmegen. Nijmegen, Netherlands.

Cirer, A.M. 1988. Algunos datos colorimétricos de *Podarcis pityusensis*. *Revista Española de Herpetología* 3(2):197–208.

Cirer, A. M., and Guillaume, C.P. 1986. Electrophoretic analysis of the Pityusic Islands Lizard. Pages 201–206 *in* Z. Roček, ed., *Studies in Herpetology* (*Proceedings of the Third Ordinary General Meeting of*

the Societas Europaea Herpetologica). Charles University, Prague, Czechoslovakia.

Cirer, A.M., and J.P. Martínez-Rica. 1986. Application of colorimetric techniques to the taxonomy of *Podarcis pityusensis*. Pages 323–326 *in* Z. Roček, ed., *Studies in Herpetology* (*Proceedings of the Third Ordinary General Meeting of the Societas Europaea Herpetologica*). Charles University, Prague, Czechoslovakia.

Cirer, A.M., and J.P. Martínez-Rica. 1990. The polymorphism of *Podarcis pityusensis* and its adaptative evolution in Mediterranean isles. *Herpetological Journal* 1:465–473.

Cleghorn, G. 1751. *Observations on the Epidemical Diseases in Minorca. From the year 1744 to 1749. To wich is Prefixed, a Short Account of the Climate, Productions, Inhabitants, and Endemical Distempers of that Island*. T. Cadell, D. Wilson and G. Nicol, London, England, UK. xix + 288 pp.

Colom, G. 1951. Extraña distribución del "*Bufo viridis* Laur." *Iberica* 206:261–264, 277.

Colom, G. 1952. Notas de biogeografía baleárica. Los Saurios, *Iberica* 15(234):426–429, 434, fig. [p. 434].

Colom, G. 1953. Biogeografía balear. Los Saurios: su origen y su actual distribución. *Boletín de la Sociedad de Historia Natural de las Baleares* 2:5–20.

Colom, G. 1957. *Biogeografía de las Baleares*. Diputación provincial de Baleares. Palma de Mallorca, Spain. 568 pp.

Colom, G. 1978. *Biogeografia de las Baleares. La formación de las islas y el origen de su Flora y de su Fauna*. Diputación Provincial de Baleares, Instituto de Estudios Baleáricos C.S.I.C., Palma de Mallorca, Spain. 515pp.

Colom, G. 1988. *El medio y la vida en las Baleares*. Direcció General de Cultura. Govern Balear. Palma de Mallorca, Spain. 292 pp.

Compte, A. 1966. Resultados de una expedición zoológica a las islas Pitiusas. I. Vertebrados. *Boletín de la Real Sociedad española de Historia Natural* 64:5–46.

Compte, A. 1968. La fauna de Menorca y su origen. *Revista de Menorca*, *Número extra.* 330 pp.

Compte, A. 1977. Los ofidios de las islas Baleares. *Boletín de la Real Sociedad Española de Historia Natural* (*Sección Biológica*) 73:263.

Corti, C., P. Lo Cascio, S. Vanni, G.F. Turrisi, and A. Vaccaro. 1997. Amphibians and reptiles of the circumsicilian islands: new data and some considerations. *Bollettino del Museo regionale di Scienze naturali di Torino* 15(1):179–211.

Corti, C., M. Masseti, M. Delfino, and V. Pérez-Mellado. (2000). Man and herpetofauna of the Mediterranean islands. *Revista Española de Herpetología* 13:83–100.

Dennett, D.C. 1999. *La peligrosa idea de Darwin. Evolución y significados de la vida*. Galaxia Gutenberg, Barcelona, Spain. 926 pp.

Eisentraut, M. 1928a. Vorlaüfige Diagnosen einiger neuer Rassen der Balearischen Inseleidechse *Lacerta lilfordi* Gthr. *Das Aquarium* 1928:121–124.

Eisentraut, M. 1928b. Weitere neue Rassen der Balearischen Inseleidechse *Lacerta lilfordi*. *Mittelungen Zoologische Museum Berlin* 14:465–468.

Eisentraut, M. 1929. Die Variation der balearischen Inseleidechse *Lacerta lilfordi* Gthr. *Sitzungsberiche der Gesellschaft naturforschender Freunde* 1929:24–36.

Eisentraut, M. 1930. Beitrag zur Eidechsenfauna der Pityusen und Columbreten. *Mitteilungen aus dem Zoologische Museum Berlin* 16:397–410.

Eisentraut, M. 1949. Das Fehlen endemischer und das Auftreten landfremder Eidechsen auf den ebiden Hauptinseln der Balearen, Mallorca und Menorca. *Zoologische Beitrage* 1:3–11.

Eisentraut, M. 1950. Eidechsen der Spanischen Mittelmeerinseln und ihre Rassennaufspaltung im Lichte der Evolution. *Mittelungen Zoologische Museum Berlin* 26:1–228.

Eisentraut, M. 1954. Der inselmelanismus der Eidechsen und seine Entstechung im Streit der Meinungen. *Zoologischer Anzeiger* 152:317–321.

Fraga, X.A. 1989. A modernizacion da taxonomia herpetoloxica a fins do XIX no Estado Español: as aportacions de Boscá e López Seoane. *Treballs Societat Catalana d'Ictiologia i Herpetologia* 2:26–33.

Fritz, U., A. Pieh, P. Lenk, J. Mayol, B. Sättele, and M. Wink. 1998. Is *Emys orbicularis* introduced on Majorca? Pages 123–133 *in* U. Fritz, ed., *Proceedings of the EMYS Symposium Dresden 96 – Mertensiella*, 10.

GLICK, T.F. 1982. *Darwin en España*. Ediciones Península, Barcelona, Spain. 122 pp.

GÓMEZ, R.M., AND B. SANCHÍZ. 1987. Notes on the Spanish XIX century herpetology, Pages 151–154 *in* J.J. van Gelder and H. Strijbosch, eds., *Proceedings of the 4th Ordinary General Meeting of the Societas Europaea Herpetologica*. Faculty of Sciences Nijmegen. Nijmegen, Netherlands.

HARTMANN, M. 1953. Die Rassenaufspaltung der balearischen Inseleidechsen. *Zoologische Jahrbuch Physiologie* 64:88–96.

HEMMER, H., AND J.A. ALCOVER, EDS. 1984. *Història Biològica del ferreret*. Editorial Moll, Ciutat de Mallorca, Spain. 252 pp.

JURADO, J.R. 2006. Lluís Pou i Francesc Barceló, dues FIGURES senyeres. *El Busqueret* 12:1–19.

HEMMER, H., AND B. KADEL. 1980. Studien am Wasserfrosch – *Rana perezi* (Seoane, 1885) – der Balaearen (Amphibia, Anura, Ranidae). *Bulletí de la Societat d'Historia Natural de les Balears* 24:55–70.

HUXLEY, J.S., ED. 1940. *The New Systematics*. Clarendon Press, Oxford, England. 583 pp.

KRAAIJEVELD-SMIT, F.J.L., G. ROWE, T.J.C. BEEBEE, AND R.A. GRIFFITHS. 2003. Microsatellite markers for the Mallorcan midwife toad *Alytes muletensis*. *Molecular Ecology Notes* 3:152–154.

KRAAIJEVELD-SMIT, F.J.L., T.J.C. BEEBEE, R.A. GRIFFITHS, R.D. MOORE, AND L. SCHLEY. 2005. Low gene flow but high genetic diversity in the threatened Mallorcan midwife toad *Alytes muletensis*. *Molecular Ecology* 14:3307–3315.

LILGE, D. 1975. Systematisch-biometrische Untersuchungen an *Lacerta pityusensis* (Sauria, Lacertidae). *Salamandra* 11(3/4):145–178.

MALUQUER, J. 1917. Noves herpetològiques. *Institució Catalana d'Historia Natural* 17:108–111.

MALUQUER, J. 1918. I. Sobre el *Coluber longissimus* Laurenti. –II. Presencia de la *Lacerta viridis* Daudin, en Cataluña. – III. ¿La *Testudo graeca* Linné, en Formentera? *Boletín de la Real Sociedad Española de Historia Natural* 18 402–406.

MALUQUER, J. 1919. Presencia de la *Testudo ibera* Pallas, en Formentera. *Boletín de la Real Sociedad Española de Historia Natural* 19:384–385.

MARTÍNEZ Y SÁEZ, F. 1875. Nota sobre algunos reptiles de Menorca. *Anales de la Sociedad Española de Historia Natural Actas* 4:93–94.

MARTÍNEZ-RICA, J.P. 1965a. La distribution des geckos dans les Pithyuses. *Rapports et Procès-verbaux des réunions de la C.I.E.S.M.M.* 18(2):42–43.

MARTÍNEZ-RICA, J.P. 1965b. Exploración de las Islas Pitiusas: Gecónidos. *Miscelánea Zoológica* 2(1): 133–137.

MARTÍNEZ-RICA, J.P. 1967a. Reptiles hallados o citados en Menorca. *Revista de Menorca* 1967(3):211–216.

MARTÍNEZ-RICA, J.P. 1967b. Las comunidades naturales del sur de Menorca. *Revista de Menorca* 1967(4): 233–311.

MARTÍNEZ-RICA, J.P. 1974. Contribución al estudio de la Biología de los gecónidos ibéricos (Rept., Sauria). *Publicaciones del Centro Pirenaico de Biología Experimental* 5:1–291.

MAYOL, J. 1981. Presencia de gecònids (Rept., Sauria) als illots Balears. *Mayurqa* 17:167–173.

MAYOL, J. 1985. *Rèptils i amfibis de les Balears*. Editorial Moll. Palma de Mallorca, Spain. 234 pp.

MAYOL, J. 1992. Mortalidad de *Tarentola mauritanica* en caminos rurales de Menorca. Nota preliminar. *Boletín de la Asociación Herpetológica Española* 3:25–26.

MAYOL, J. 2003. *Rèptils i amfibis de les Balears*. Editorial Moll. 2nd edition. Palma de Mallorca, Spain. 249 pp.

MAYOL, J., AND J.A. ALCOVER. 1981. Survival of *Baleaphryne* Sanchiz and Adrover, 1977 (Amphibia: Anura: Discoglossidae) on Mallorca (Short Note). *Amphibia-Reptilia* 1(3/4):343–346.

MAYOL, J., J. MUNTANER, AND R. AGUILAR. 1988. Incidencia de la pesca accidental sobre las tortugas marinas en el Mediterráneo español. *Bolletí de la Societat d'Historia Natural de les Balears* 32:19–31.

MAYR, E. 1963. *Animal Species and Evolution*. The Belknap Press, Harvard University Press, Cambridge, Massachusetts, USA. 797 pp.

MAYR, E. 1969. *Principles of Systematic Zoology*. Tata McGraw-Hill Publising Company Ltd., New Delhi, India. 428 pp.

MAYR, E., AND P.D. ASHLOCK. 1991. *Principles of Systematic Zoology*. McGraw-Hill, New York, New York, USA. 475 pp.

MERTENS, R. 1921. Eine neue Eidechse von den Pityusen. *Senckenbergiana* 3:142–146.
MERTENS, R. 1924. Herpetologische Mitteilungen II. Bemerkungen über einige Eidechsen Süditaliens, Siziliens und Menorcas. *Senckenbergiana* 6:178–180.
MERTENS, R. 1927. Über die rassen der Pityuseneidechse (*Lacerta pityusensis*). *Zoologische Anzeiger* 69:299–304.
MERTENS, R. 1929. *Lacerta (Scelaris) perspicillata* Dumeril et Bibron-eine für Europa neue Eidechse. *Zoologische Anzeiger* 85:1–2.
MERTENS, R. 1934. Die Insel-Reptilien, ihre Ausbreitung, Variation und Artbildung. *Zoologica* 84:1–108.
MERTENS R. 1957. Mallorca: ein herpetogeographisches Problem. *Zoologische Beiträge Berlin* 3:1–16.
MERTENS, R. 1958. Über die balearische Toro-Eidechse, *Lacerta lilfordi toronis*. *Senckenbergiana biologie* 39 (1/2):47–50.
MERTENS, R., AND L. MÜLLER. 1928. Die Amphibien und Reptilien Europas. *Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft* 41:1–62.
MERTENS, R., AND L. MÜLLER. 1940. Die Amphibien und Reptilien Europas (Zweite Listen ach dem Stande von Januar 1940). *Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft* 451:1–56.
MERTENS, R., AND H. WERMUTH. 1960. *Die Amphibien und Reptilien Europas* (*Dritte Liste nach dem Stand vom 1.Januar 1960*). G. Kramer, Frankfurt am Main, Germany. 264 pp.
METHNER, K. 1980. Zur Vorkommen der Europäischen Sumpfschildkröte (*Emys orbicularis*) auf Menorca/Balearen (Spanien). *Salamandra* 16:132–134.
METHNER, K. 1988. Zum Vorkommen von *Emys orbicularis* (Linnaeus, 1758) auf Menorca (Balearen) II (Testudines: Emydidae). *Salamandra* 24(4):302–305.
MONTORI, A., J. MALUQUER MARGALEF, AND X. PASCUAL. 1985. Síntesi històrica dels estudis herpetològics als Països Catalans. *Butlletí de la Institució Catalana d'Història Natural* 50:173–185.
MÜLLER, L. 1927a. Beitrag zur Kenntnis der Rassen von *Lacerta lilfordi*. *Zoologische Anzeiger* 73:257–269.
MÜLLER, L. 1927b. Zwei weitere Rassen der *Lacerta lilfordi*. *Zoologische Anzeiger* 74:185–194.
MÜLLER, L. 1928a. Zweiter Beitrag zur Kenntnis der Rassen von *Lacerta lilfordi* von del Pityusen. *Zoologische Anzeiger* 78:261–273.
MÜLLER, L. 1928b. Vorläufige Mitteilung über eine weitere Rasse der *Lacerta lilfordi* von den Pityusen. *Blätter für Aquarien- und Terrarienkunde* 39:386–388.
MÜLLER, L.1928c. Die Inselrassen der *Lacerta lilfordi*. *Verhandlungen der Deutschen Zoologischen Gesellschaft* 1928:333–337.
MÜLLER, L. 1928d. Vorläufige Mitteilung über eine weitere Rasse der *Lacerta lilfordi*. *Blätter für Aguarien- und Terrarien-kunde* 39:471–473.
OLÉO Y QUADRADO, R. 1876. *Historia de la isla de Menorca*. (Edición Facsímil). Tomo I. Ediciones Nura. Menorca, 2000.
OTERO CARVAJAL, L.E. 2001. La destrucción de la ciencia en España: Las consecuencias del triunfo militar de la España franquista. *Historia y Comunicación Social* 6:149–186.
PALMER, M., PONS, G.X., J. CAMBEFORT, AND J.A. ALCOVER. 1999. Historical processes and environmental factors as determinants of inter-island differences in endemic faunas: the case of the Balearic Islands. *Journal of Biogeography* 26:813–823.
PÉREZ-MELLADO, V. 2005. Amfibis i Rèptils, Pages 117–295, *in* J.M. Vidal Hernández, ed., *Enciclopèdia de Menorca. V: Vertebrats* (*volum 2*). *Peixos, Amfibis i Rèptils*, Obra cultural de Menorca. Maó, Menorca, Spain.
PÉREZ-MELLADO V., AND A. SALVADOR. 1981. Actividad y termorregulación estival de *Podarcis pityusensis* Bosca, 1883 (Sauria, Lacertidae) en Ibiza y Formentera. *Amphibia-Reptilia* 2:181–186.
PÉREZ-MELLADO, V., AND A. SALVADOR. 1988. The Balearic lizard: *Podarcis lilfordi* (Günther, 1874) (Sauria, Lacertidae) of Menorca. *Arquivos do Museu Bocage* 1(10):127–195.
PONS, G., AND M. PALMER. 1996. *Fauna endémica de les Illes Balears*. IDER. Govern Balear y Societat d'Historia Natural de les Balears, Palma de Mallorca, Spain. 307 pp.
RAMIS I RAMIS, J. 1814. *Specimen animalium, Vegetabilium et mineralium in insula Minorica frecuentiorum ad norman Linneani sistematis*. *Exaratum. Accedunt nomina Vernacula in quantum fieri potuit.* Excudebat Petrus Antonius Serra, Maó, Menorca, Spain. 60 pp.

RAXWORTHY, C.J. 1984. Hermann's tortoise (*Testudo hermanni robertmertensi* Wermuth) on Minorca, Balearic Islands (Short note). *British Journal of Herpetology* 6:385–386.

RODRÍGUEZ FEMENIAS, J.J. 1887. *Historia Natural de las Baleares. Zoolojía. Adiciones á la fauna balear*. Imprenta Fábregas, Mahón, Spain. 6 pp.

SALVADOR, A. 1974. *Guía de los anfibios y reptiles españoles.* Instituto Nacional para la Conservación de la Naturaleza, Madrid, Spain. 282 pp.

SALVADOR, A. 1976a. *La Alimentación de los reptiles de Cabrera*. M.D. dissertation. Universidad Complutense de Madrid. 20 pp.

SALVADOR, A. 1976b. Materiales para una "Herpetofauna balearica". 1. Las lagartijas baleares de la isla Malgrats. *Boletín de la Estación Central de Ecología* 5:73–79.

SALVADOR, A. 1978. Materiales para una "Herpetofauna balearica". 5. Las salamanquesas y tortugas del archipiélago de Cabrera. *Doñana Acta Vertebrata* 5:5–17.

SALVADOR, A. 1979a. Materiales para una "Herpetofauna balearica". 2. Taxonomía de las lagartijas baleares del archipiélago de Cabrera. *Bonner Zoologische Beitrage* 30(1/2):176–191.

SALVADOR, A. 1979b. Una nueva subespecie melánica de lagartija balear (*Lacerta lilfordi*). *Boletín de la Real Sociedad Española de Historia Natural* (*Biología*) 77:491–492.

SALVADOR, A. 1980a. Interaction between the balearic lizard (*Podarcis lilfordi*) and Eleonora's falcon (*Falco eleonorae*). *Journal of Herpetology* 14:101.

SALVADOR, A. 1980b. Materiales para una "Herpetofauna balearica". 4. Las poblaciones de lagartija balear (*Lacerta lilfordi*) del archipiélago de Cabrera. Pages 401–454 in *Actas de la I Reunión Iberoamericana de Zoología de Vertebrados*. Mérida, Spain.

SALVADOR, A. 1984. A taxonomic study of the Eivissa wall lizard. Pages 393–427 *in* H. Kuhbier, J.A. Alcover, and T. Guerau d'Arellano, eds., *Biogeography and Ecology of the Pityusic Islands.* Dr W.Junk Publishers, The Hague, Netherlands.

SALVADOR, A. 1986a. *Podarcis lilfordi* (Günther, 1874) — Balearen Eidechse. Pages 83–110 *in* W. Böhme, ed., *Handbuch der Amphibien und Reptilien Europas*, *Echsen III* (*Podarcis*). Aula-Verlag, Wiesbaden, Germany.

SALVADOR, A. 1986b. *Podarcis pityusensis* (Boscá, 1883) — Pityusen Eidechse. Pages 231–253 *in* W. Böhme ed., *Handbuch der Amphibien und Reptilien Europas*, *Echsen III* (*Podarcis*). Aula-Verlag, Wiesbaden, Germany.

SALVADOR, A., AND V. PÉREZ-MELLADO. 1984. The Amphibians and Reptiles of the Pytiusic Islands. Pages 429–439 *in* H. Kuhbier, J.A. Alcover, and T. Guerau d'Arellano, eds., *Biogeography and Ecology of the Pityusic Islands*. Dr W.Junk Publishers, The Hague, Netherlands.

SÁNCHEZ ARTEAGA, J.M. 2005. Eduardo Boscá Casanoves y la renovación taxonómica de los catálogos faunísticos en España durante el último tercio del siglo XIX. *Asclepio* 57(2):81–108.

SANCHÍZ, F.B., AND R. ADROVER. 1977. Anfibios fósiles del Pleistoceno de Mallorca. *Doñana Acta Vertebrata* 4:5–25.

SANDERS, E.D. 1984. Evidence concerning late survival and extinction of endemic Amphibia and Reptilia from the Bronze and Iron Age settlement of Torralba d'en Salort (Alayor, Menorca). Pages 123–127 *in* H. Hemmer, and J.A. Alcover, eds., *Historia Biologica del Ferreret* (*Life History of the Majorcan Midwife Toad*). Monografies Cientifiques 3, Editorial Moll, Palma de Mallorca, Spain.

SMITH, C.H. 2005. Günther, Albert Charles [Karl] Lewis [Ludwig] Gotthilf (Germany-England 1830–1914). In Some Biogeographers, Evolutionists and Ecologists, Chrono-Biographical Sketches. <*http://www.wku.edu*> Cited 30 October 2006.

USERA, J., AND C. ALBEROLA. 2005. La obra científica y de divulgación de Guillem Colom Casasnovas (1900–1993). In Galería de Paleontólogos, <*http://www.ugr.es*> Cited 30 October 2006.

VICKERS, B.R. 1983. History of *Emys orbicularis* on Menorca (Short note). *British Journal of Herpetology* 6: 310.

VIDAL, A. 1965. Les Batraciens des îles Pituyuses. *Communications int. Exploration scientifique Mer Méditérranée Rapports* 18(2):561–564.

VIDAL, A. 1966. Estudio biológico de las islas Pitiusas: Anfibios. *Publicaciones del Instituto de Biología Aplicada* 40:81–112.

VIDAL HERNÁNDEZ, J.M. 1995. La historia natural menorquina de la segona mitat del segle XIX i el naixement de l'algologia de la Mediterrània Occidental. Pages 427–455 *in* J.M. Camarasa and A. Roca, eds., *Ciència y tècnica als Països Catalans: una aproximació biogràfica.* Fundació Catalana per a la Recerca, Barcelona, Spain.

VIDAL HERNÁNDEZ, J.M. 1997. Las ciencias naturales en Menorca a lo largo del siglo XIX. *Zubía Monográfico* 9:53–70.

VIDAL HERNÁNDEZ, J.M. 1999. Joan Ramis, naturalista de camp o naturalista de cap. Pages 219–256 *in* M. Paredes, M., and J. Salord, eds., *Joan Ramis i Josep M. Quadrado: de la Il-lustració al romanticisme.* Publicacions de l'Abadia de Montserrat, Barcelona; Palma de Mallorca: Universitat de les Illes Balears and Institut Menorquí d'Estudis (Biblioteca Miquel dels Sants Oliver, 9), Maó, Menorca, Spain.

VIDAL HERNÁNDEZ, J.M. 2002. Les dècades prodigioses de la ciència a la Menorca del XIX. *Randa* 47:5–34.

VIDAL HERNÁNDEZ, J.M. 2003. Naturalistes menorquins i estrangers a Menorca en el darrer terç del segle XIX. Un model de xarxa científica. Pages 135–143 in *Actes de la VII Trobada d'Historia de la Ciència i de la Técnica*. Societat Catalana d'Historia de la Ciència i de la Tècnica, Barcelona, Spain.

VIDAL HERNÁNDEZ, J.M. 2005. Addenda II. Biografies d'alguns ictiòlegs que van escriure sobre els peixos de Menorca. Pages 101–107 *in* J.M. Vidal Hernández, ed., *Enciclopèdia de Menorca. V: Vertebrats* (*volum 2*)*. Peixos, Amfibis i Rèptils*. Obra cultural de Menorca, Maó, Menorca, Spain.

VIVES-BALMAÑA, M.V. 1987. 1. Generalitats. 2. Aspectes històrics de l'estudi dels rèptils als Països Catalans. Pages 121–122 in *Història Natural dels Països Catalans. 13. Amfibis, Rèptils i Mamífers.* Enciclopèdia Catalana S.A., Barcelona, Spain.

WERMUTH, H. 1952. *Testudo hermanni robertmertensi* n. subsp. und ihr Vorkommen in Spanien. *Senckenbergiana* 33(1/3):157–164.

WETTSTEIN, O. 1937. Über Balearen-Eidechsen. *Zoologischer Anzeiger* 117:293–297.

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