L@CERTIDAE
EIDECHSEN ONLINE

2015 Artikel article 8

L@CERTIDAE Eidechsen Online 2015 № 8 - Online veröffentlicht / published online: 2015-12-24
www.lacerta.de

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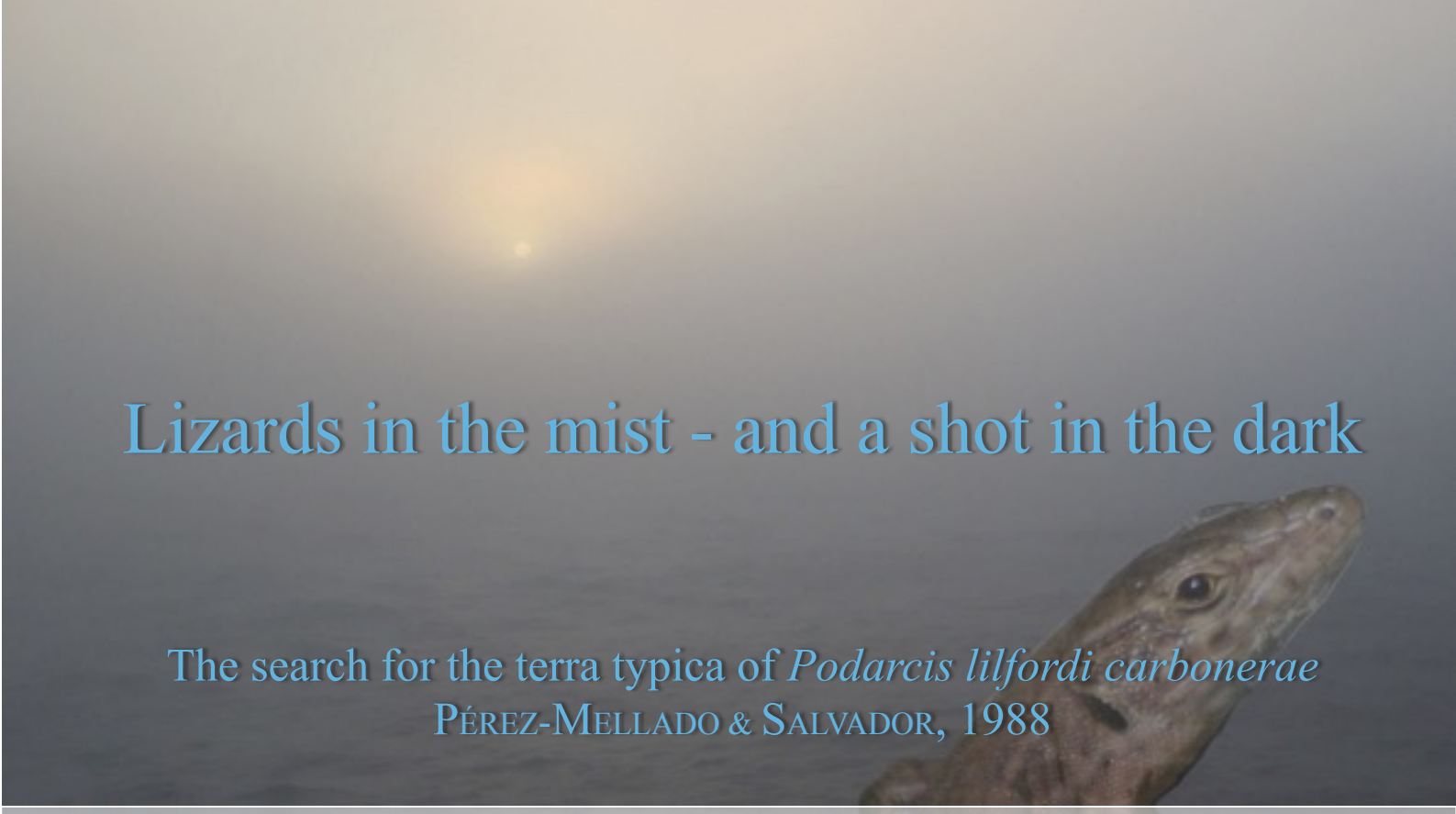
Zitat / Citation:
ZAWADZKI, M. & M.P. van den BERG (2015): Lizards in the mist - and a shot in the dark. The search for the terra typica of *Podarcis lilfordi carbonerae* PÉREZ-MELLADO & SALVADOR, 1988 - L@CERTIDAE (Eidechsen Online), 2015 [8]: 160-191.



Lizards in the mist - and a shot in the dark

The search for the terra typica of *Podarcis lilfordi carbonerae* Pérez-Mellado & Salvador, 1988

Mike Zawadzki and Marten van den Berg, December 2015.

Summary: As a result of their taxonomical study of the populations of the Balearic lizard of Menorca Pérez-Mellado & Salvador (1988) described three new subspecies of *Podarcis lilfordi*. The type series of one of them, *Podarcis lilfordi carbonerae*, had been collected on an island called "Isla Carbonera" in 1933. The fact that their describers could not find this islet on any map, but did not hesitate to describe these lizards as a new subspecies, was not very reasonable and surely contributed to the mystery that should surround this subspecies from now on. But it was not this fact alone that casted a bad light on this taxonomic revision, because in-depth analyses revealed more awkward mistakes. Even the rediscovery of *Podarcis lilfordi carbonerae* by Pérez-Mellado et al. (2002) was only based on assumptions but did not contain any scientific proof. In this paper we give new information on the possible terra typica of *Podarcis lilfordi carbonerae* by introducing the Illa de Ses Mones. Because neither the En Carbó nor the Ses Mones lizards can be separated from the populations of the two nearby islands Illa Gran d'Addaia and Illa Petit d'Addaia by means of coloration or meristic and metric characters, we consider *Podarcis lilfordi carbonerae* Pérez-Mellado & Salvador, 1988 as a synonym of *Podarcis lilfordi addayae* (Eisentraut, 1928).

Zusammenfassung: In ihrer taxonomischen Studie über die Baleareneidechsen von Menorca beschrieben Pérez-Mellado & Salvador (1988) drei neue Unterarten von *Podarcis lilfordi*. Die Typenserie der Unterart *Podarcis lilfordi carbonerae* wurde im Jahre 1933 auf der Insel „Isla Carbonera" gesammelt. Die Tatsache, dass ihre Beschreiber die Insel auf keinem Kartenmaterial finden konnten, jedoch nicht zögerten, die Exemplare als neue Unterart zu beschreiben, war mehr als unglücklich und trug sicherlich zur Verwirrung um den Status dieser Eidechsen bei. Doch nicht nur diese Tatsache allein warf ein schlechtes Licht auf diese taxonomische Studie. Wie unsere Analysen zeigen, enthielt diese nämlich weitere grobe Fehler, die in nachfolgender Literatur übernommen wurden. Auch die Wiederentdeckung von *Podarcis lilfordi carbonerae* durch Pérez-Mellado et al. (2002) beruhte lediglich auf Annahmen und enthielt keinen wissenschaftlichen Nachweis. In dieser Arbeit stellen wir die Illa de Ses Mones als mögliche Terra typica von *Podarcis lilfordi carbonerae* vor. Da sich weder die Eidechsen von En Carbó noch von der Illa de Ses Mones von den Populationen der beiden nahe gelegenen Inseln Illa Gran d'Addaia und Illa Petit d'Addaia bezüglich ihrer Färbung sowie meristischer und metrischer Werte unterscheiden, betrachten wir *Podarcis lilfordi carbonerae* Pérez-Mellado & Salvador, 1988 als Synonym von *Podarcis lilfordi addayae* (Eisentraut, 1928).

Keywords: *Podarcis lilfordi carbonerae*, *Podarcis lilfordi addayae,* Menorca, Illot d'en Carbó, Illa de Ses Mones, terra typica.

Introduction

The Balearic wall lizard *Podarcis lilfordi* (GÜNTHER, 1874) is endemic to small islands around Menorca and Mallorca as well as to the Cabrera archipelago (Balearic Island, Spain). It is generally considered to be divided into 25 more or less differentiated subspecies (PÉREZ-MELLADO 2005; PÉREZ-MELLADO 2009; SALVADOR 2015). From these 25 subspecies 5 are distributed around Mallorca, 10 on the Cabrera archipelago and another 10 around the coast off Menorca. The populations of *Podarcis lilfordi* inhabiting the islets around Menorca have been the object of a taxonomic study by PÉREZ-MELLADO & SALVADOR (1988) that – among others things – led to the description of *Podarcis lilfordi carbonerae*, a subspecies that remained kind of a mystery for many years.

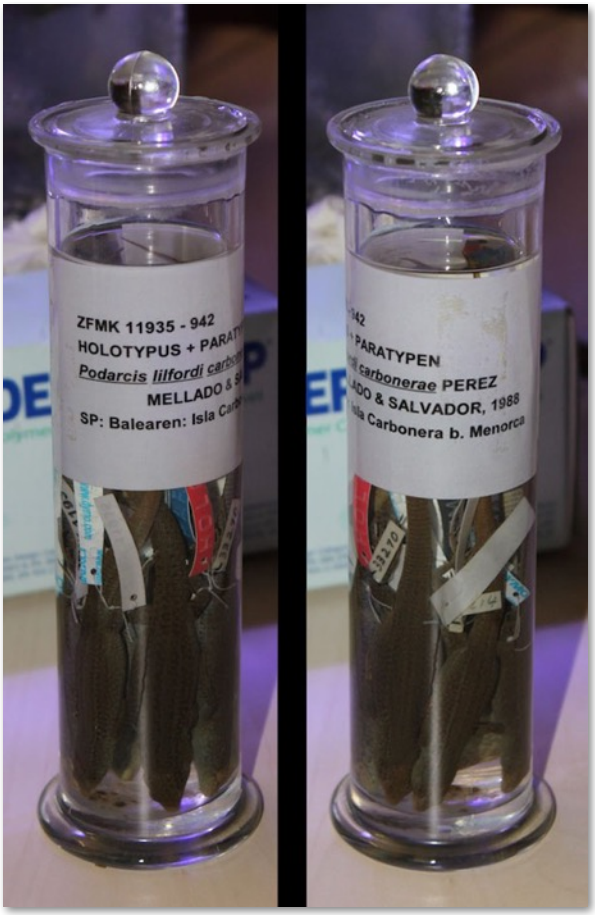


Figure 1.
Container with the Isla Carbonera lizards at ZFMK.

Collected in 1933 by German KARL GRÜN and stored in the collection of the Zoologisches Museum und Forschungsinstitut A. Koenig (ZFMK), Bonn, Germany, the series of 8 specimens from "Isla Carbonera bei Menorca" caused confusion, not only to their describers, as the exact location of this island remained mere suspicion. PÉREZ-MELLADO & SALVADOR (1988) had not been able to detect the location of this island on any map and were just assuming that Carbonera is possibly a small islet without any name in the maps off the NW coast of the island facing Cala d'En Carbo in which they did not find any lizards.

14 years later PEREZ-MELLADO et al. (2002) were finally able to give new information on the geographical location of the population described as *Podarcis lilfordi carbonerae*: The records of the herpetological collection of the ZFMK, the capture dates of specimens and three recent surveys to coastal islets of Menorca showed that the capture locality so-called "Isla Carbonera" corresponds to "En Carbó" islet, off northern Minorcan coast. But with this "rediscovery" of the subspecies *carbonerae* the mist surrounding these lizards did not really disappear. PÉREZ-MELLADO & SALVADOR (1988) included four juvenile lizards from En Carbó island – in their taxonomic revision called "A3" – to the subspecies *P. l. addayae* from the nearby islands Isla Gran Addaya and Isla Petita Addaya. By doing this they unintentionally synonymized their new subspecies *Podarcis lilfordi carbonerae* with *P. l. addayae* right away!

Things got worse when PEREZ-MELLADO (1989) introduced two islands located on the north-west coast off Menorca: Illa de Ses Mones and Isla de Port d'Addaia. According to PEREZ-MELLADO (1989) Illa de Ses Mones is a small island situated between Cala Molins and Illa Gran d'Addaia that is inhabited by lizards of the subspecies *P. l. addayae*. In fact, this is the same island that was called "A3" in PÉREZ-MELLADO & SALVADOR (1988) and later "En Carbó" in PEREZ-MELLADO et al. (2002), where it is claimed that the lizards living on this island represent the subspecies *P. l. carbonerae*. The island called Isla de Port d'Addaia is an island much higher than the previous one and has not been studied before – but actually it is the real Illa de Ses Mones.

And to make things even more complicated this Illa de Ses Mones hosts its own population of *Podarcis lilfordi* that was supposed to be extinct through displacement by the introduced Italian wall lizard *Podarcis siculus* (PEREZ-MELLADO 2002; PEREZ-MELLADO 2005). This turned out to be wrong, as VAN DEN BERG & ZAWADZKI (2010a) reported on the rediscovery of the *Podarcis lilfordi* population that lives in sympatry with *Podarcis siculus* on the Illa de Ses Mones.

Not satisfied with the interpretation of the results and conclusions in PÉREZ-MELLADO et al. (2002), and suspicious by previous misconceptions, such as the description of *Podarcis lilfordi rodriquezi* in PÉREZ-MELLADO & SALVADOR (1988) that is actually based on four obvious specimens of *Podarcis pityusensis* (!) originating from the homonymic island Ratas near Ibiza (ZAWADZKI 2010), we finally decided to dig into this matter once more. Is it possible that the Illa de Ses Mones is more likely the origin of the "Isla Carbonera" lizards instead of Illot d'en Carbó? Lizards in the mist …

History

The story of the lizards from the "Isla Carbonera" surely began when their territory – a small islet in the Western Mediterranean – got isolated from the coast of the Balearic island of Menorca around 2.000 years ago. Their discovery took place almost in silence, on the 1st of January 1933, a few years after the "heydays" of descriptions of subspecies of *Podarcis lilfordi* and its sister species *Podarcis pityusensis* by German scientists MARTIN EISENTRAUT and LORENZ MÜLLER in 1927/1928. It was KARL GRÜN who had collected a series of eight lizards on an island designated as "Isla Carbonera" on New Year's day back in 1933 and sent them to the Zoologisches Museum und Forschungsinstitut A. Koenig (ZFMK), Bonn, Germany.

But science did not take notice of the "Carbonera" lizards for a long time, except for KARL BUCHHOLZ who was employed in 1951 as the first curator of a newly created herpetology department at the ZFMK. Although he never visited the Balearics himself, BUCHHOLZ had rich material of lacertids from these islands at his disposal in the ZFMK collection (BÖHME 2004). The majority of this material had been acquired by two German professional collectors: J. JOKISCH and HERMANN GRÜN, the brother of KARL GRÜN.

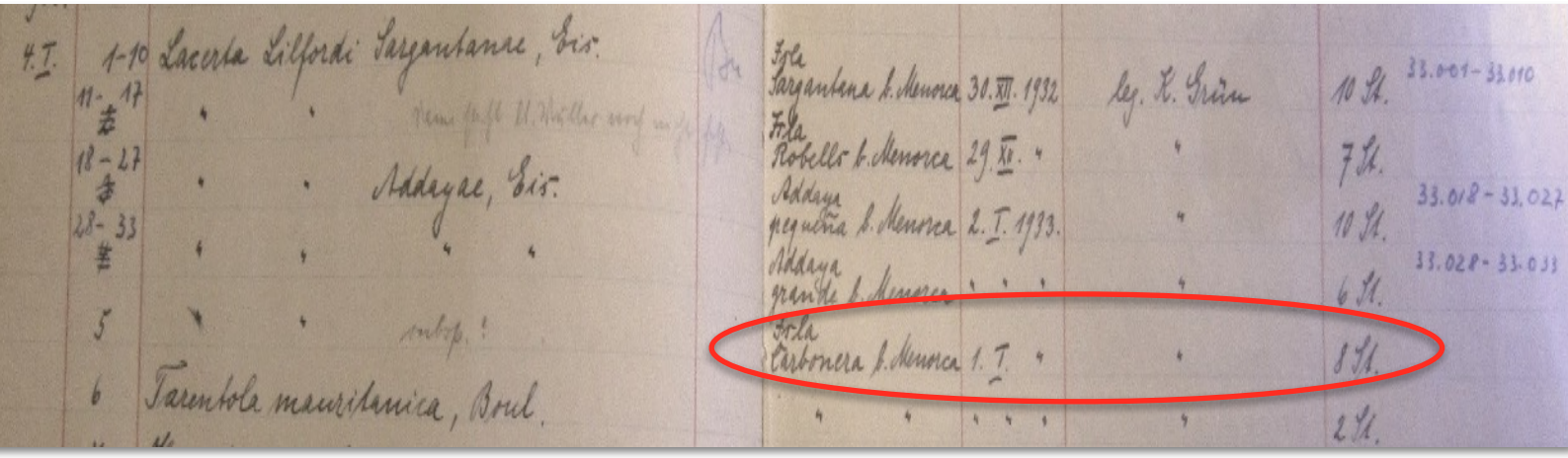


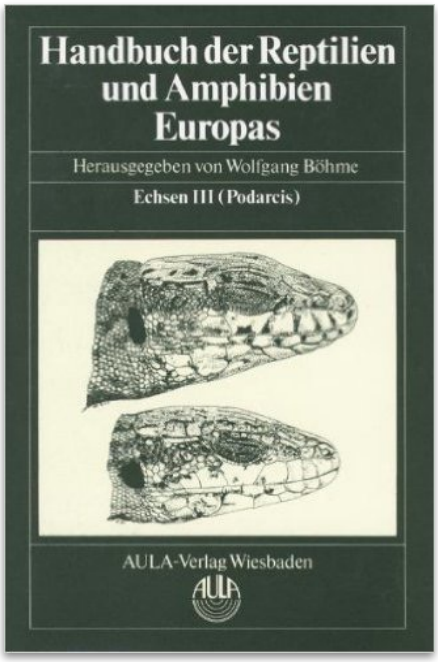
Figure 2. Part of the pre-war catalog at ZFMK.

Within the large material from the Balearic islands BUCHHOLZ detected some lizards he planned to describe as new subspecies, but in the cases of "Isla Carbonera", "Isla Entusqueta" and "Scuy de Bledas I." he could not find the names of the islands on any nautical chart available to him. So, in order to obtain detailed information on the exact localities of these islands, BUCHHOLZ corresponded with HERMANN GRÜN in November 1953. In his reply HERMANN GRÜN clarified that he could not provide this information, because he had never collected on Menorca, it was his brother KARL GRÜN who did!

There is no record of BUCHHOLZ contacting KARL GRÜN about this issue, but we doubt that this happened, because BUCHHOLZ never realized his plan to describe the three lizard populations from "Isla Carbonera", "Isla Entusqueta" and "Scuy de Bledas I." as new subspecies of *Podarcis lilfordi*. BUCHHOLZ later contributed to the taxonomy of the Balearic herpetofauna by describing eight subspecies of *Podarcis pityusensis* (BUCHHOLZ 1954a) and the gekkonid taxon *Hemidactylus turcicus spinalis* from the Menorcan island Illa Gran d'Addaia (BUCHHOLZ 1954b). The subspecific status of the latter has recently been rejected by ŠMÍD et al. (2015). The lizards of "Isla Carbonera" fell into oblivion. For a long time.

53 years after KARL GRÜN collected the "Isla Carbonera" lizards the world finally got to know about their existence: SALVADOR (1986) presented them as an yet undescribed *Podarcis lilfordi* subspecies from Carbonera, Menorca. But still it was not an official description, just a pointer that this population soon would be described.

Strangely BARBADILLO-ESCRIVÁ (1987) mentioned that recently *Podarcis lilfordi carbonerae* from Islote Carbonera as well as *P. l. codrellensis* from islote del Codrell and *P. l. porrosicola* from islote del Porrós have been described. But the official paper in which these subspecies have been described by PEREZ-MELLADO & SALVADOR was published on 29th of January 1988! This taxonomic study with the title "The Balearic lizard: *Podarcis lilfordi* (GÜNTHER, 1874) (Sauria, Lacertidae) of Menorca" contains the descriptions of the aforementioned subspecies of *Podarcis lilfordi*. In the case of *P. l. carbonerae* the description was based on the 8 specimens (4 males, 4 females) from the ZFMK that KARL GRÜN collected back in 1933.



– *P. l.* ssp.: Kleinwüchsige Form, KR ♂ 60–65, x̄ = 63, KR ♀ 55–60, x̄ = 57,5 mm. Oberseits dunkeloliv, Zeichnung aufgelöst, aber deutlich. Unterseite hellblau, die schwarzen Flecken und Ozellen der äußeren Ventralia sind sehr groß und leuchtend. Carbonera, Menorca (alle Angaben n. unpubl. ZFMK-Material).

Figure 3.

SALVADOR, A. (1986): *Podarcis lilfordi* (GÜNTHER, 1874) – Balearen-Eidechse. – p. 83-110 in: BÖHME, W. (Ed.): Handbuch der Reptilien und Amphibien Europas. Band 2/II Echsen III (*Podarcis*). – Aula-Verlag, Wiesbaden.

In the descriptions of the studied populations the lizards from "Isla Carbonera" are presented as follows (PEREZ-MELLADO & SALVADOR 1988; p. 157):

"Islote de Carbonera.
Material examined: 8 specimens, 4 males, 4 females.
Population of medium body size. Rounded form with neck slightly wider than head.
Males: Back dark olive green. Conspicuous pattern but broken by discontinuous lines lighter in color than background. Ventral zone light blue with black spots and blue ocelli on the outermost ventral scales. Females similar to males though dorsal parts are browner. Well defined narrow dorsolateral lines."

In the taxonomic results of the cited paper the official description (PEREZ-MELLADO & SALVADOR 1988; p. 173-174) reads as follows:

"***Podarcis lilfordi carbonerae*** ssp. n.
Terra typica: Isla Carbonera.
Holotype: ZFMK 11935, Isla Carbonera, Menorca, male ad. K. GRÜN Col. 1 January 1933.
Paratypes: ZFMK 11936-42, the same locality and date as the Holotype.
Diagnosis: Subspecies of medium size. Dorsal coloring dark brown. Neck wider than head. Hind legs relatively short. Large number of dorsal, gular, collar and ventral scales.
Distribution: Isla Carbonera.
Discussion: The impossibility of locating exactly this islet does not permit any inferences regarding the relative age of this subspecies which might be presently extinct."

The last remark is clarified by the following comment in the material and methods section (PEREZ-MELLADO & SALVADOR 1988; p. 140):

"Possibly it [Isla Carbonera] is a small islet without any name in maps off the northwestern coast of the island facing Cala d'en Carbó in which we did not find lizards."

The fact that these authors could not find the "Isla Carbonera" on any map, but did not hesitate to describe these lizards as a new subspecies, does not sound very reasonable and surely contributed to the mystery that should surround the subspecies from now on.

Figure 4.
Aerial view of Cala d'en Carbó, on the NW coast of Menorca.

Figure 5.
The suggested islet without name nor lizards near Cala d'en Carbó.

But it was not this fact alone that casted a bad light on this taxonomic revision because in-depth analyses revealed awkward mistakes that imply it was done in a haste. It is astonishing that in the diagnosis the dorsal coloring is described as dark brown, but in the descriptions of the studied lizard populations the males from "Isla Carbonera" are said to have a dark olive green back and the females are similar to them, though dorsal parts are browner. Clearly a bit of contrasting descriptions here. Apart from this we might ask, how much of their original coloration these lizards really show after being preserved in ethanol for more than 50 years?

But the taxonomical revision of PEREZ-MELLADO & SALVADOR (1988) was not only based on coloration. They also presented morphometrical and folidotic data of all studied populations and even included data from *P. l. rodriquezi* from the Isla de Ratas, presently non-existing as this island was destroyed in 1936 after dynamiting in a reconstruction of the port of Mahon (COMPTE-SART 1968). PEREZ-MELLADO & SALVADOR (1988) describe this subspecies as follows:

"Discussion: In spite of the small number of specimens studied, this is undoubtedly a valid subspecies, strongly divergent to the rest of the Menorcan populations."
"Diagnosis: A giant subspecies with very large head, low number of dorsal scales and few collar scales. Numerous ventral scales and relatively short hindlegs. Color: Greenish brown."

Even in the comparative analyses these authors emphasize that "specimens from Isla de Ratas show a significantly lower dorsalia than any other population."

And in the Appendix I ("Tables of biometry and folidosis") we can read these data: Dorsalia: 62,5 (60-64; n = 4)

Remarkably, no one ever seemed to mind these characteristics as they did not correspond with the original description of this subspecies made by MÜLLER (1927) or the data given by EISENTRAUT (1949). The noticeable low number of dorsal scales as well as the large snout-vent length undoubtedly argue not even for a different subspecies of *Podarcis lilfordi*, but for a different species. ZAWADZKI (2010) showed that the specimens investigated by PÉREZ-MELLADO & SALVADOR (1988) were wrongly labeled in the ZFMK and actually present *Podarcis pityusensis ratae* (!) originating from the homonymic island Ratas near Ibiza.

Both species can easily be separated from each other by means of scale count across the midbody. *Podarcis lilfordi* usually has 70–90 and *P. pityusensis* 55–68 scales around the midbody (EISENTRAUT 1949). Because PÉREZ-MELLADO & SALVADOR (1988) unfortunately did not recognized that they included a wrong species in their taxonomic study of the *Podarcis lilfordi* populations of Menorca, from that point on this wrong description found its way into literature (e. g. PEREZ-MELLADAO 1999, SALVADOR & PLEGUEZUELOS 2002, SALVADOR 2006). According to FRANZEN & GLAW (2007) only the two paratypes of *P. l. rodriquezi* are lost, but the holotype is still in the collection of the Zoologische Staatssammlung München (ZSM) and therefore represents the only specimen of this extinct subspecies available in collections (ZAWADZKI 2010).

	Podarcis lilfordi rodriquezi EISENTRAUT (1949) n=5	ZFMK 11970-11973 PEREZ-MELLADO & SALVADOR (1988) n=4	*Podarcis pityusensis ratae* SALVADOR (1984) n=10
Snout-Vent Length (mm)	67.2 (61-78)	76.75 (76-78)	78.1 (74-82)
Dorsalia	80.6 (73-86)	62.25 (60-64)	63 (61-66)

Table 1. Comparison of dorsal scales around midbody in males from *P. lilfordi rodriquezi* (see MÜLLER 1927, EISENTRAUT 1949), from the four specimens from the ZFMK wrongly declared as *"P. l. rodriquezi"* (see PEREZ-MELLADO & SALVADOR 1988) and from *P. pityusensis ratae* (see SALVADOR 1984, 1986). The range is given in parentheses.

According to PÉREZ-MELLADO & SALVADOR (1988) the Menorcan populations of *Podarcis lilfordi* should be divided into nine subspecies:

1. *Podarcis lilfordi lilfordi* (GÜNTHER, 1874): Illa de l'Aire
2. *Podarcis lilfordi balearicus* (BEDRIAGA, 1879): Illa del Rei , Illa d'en Colom [previously *Podarcis lilfordi brauni* (MÜLLER, 1927)]
3. *Podarcis lilfordi rodriquezi* (MÜLLER, 1927): Illa Ratas [= presently non-existent]
4. *Podarcis lilfordi fenni* (EISENTRAUT, 1928a): Illa d'es Porros (Nitge)
5. *Podarcis lilfordi addayae* (EISENTRAUT, 1928a): Illa Gran d'Addaia, Illa Petit d'Addaia and "A3"
6. *Podarcis lilfordi sargantanae* (EISENTRAUT, 1928b): Illa Sargantana, Illa d'es Ravells, Illot d'en Tosqueta, Illa de ses Bledes
7. *Podarcis lilfordi carbonerae* PÉREZ-MELLADO & SALVADOR, 1988: Isla Carbonera
8. *Podarcis lilfordi codrellensis* PÉREZ-MELLADO & SALVADOR, 1988: Escull de Binicodrell Gros, Escull de Binicodrell Petit
9. *Podarcis lilfordi porrosicola* PÉREZ-MELLADO & SALVADOR, 1988: Illot d'es Porros (Fornells)

The population of the Illot de Ses Áligues was not included in the taxonomic study because no specimens were captured for protectionist reasons. The following populations were discovered later and therefore had not been included in their work.

- Illa de Ses Mones (PÉREZ-MELLADO 1989)
- Illot d'en Mel (TRIAY 1998)
- Illot d'en Carbó Petit (VAN DEN BERG & ZAWADZKI 2010b, ZAWADZKI & VAN DEN BERG 2011)

But let's get back to *Podarcis lilfordi carbonerae.* It is not only the unsatisfactory situation of the un-locatable home of this subspecies that raise issues as we will show later.

In the subsequent period *P. l. carbonerae* seemed to be almost forgotten, even by one of its describers: PÉREZ-MELLADO (1989) did not mention this subspecies anymore, the same in PÉREZ-MELLADO (1997), where he listed all valid subspecies of *Podarcis lilfordi* but did not mention *P. l. carbonerae*. Surprisingly in a different chapter of the same book MAYOL (1997) brings up the island name Carbonera for the first time and even gives its locality with N-Menorca together with some other details (see below). But strangely nobody seemed to take

Anejo 1. Características topográficas y herpetofauna de los islotes de las islas Baleares. Datos de Rodríguez (1974), Mayol (1979), Martínez-Rica & Cirer (1982), Salvador & Pérez- Mellado (1984), Alomar (com.pers.) y datos propios. Abreviaturas: Ht: Hemidactylus turcicus; Pl: Podarcis lilfordi; Pp: Podarcis pityusensis; Tm: Tarentola mauritanica; Es: Elaphe scalaris; +: extinguida.

NOMBRE	GRUPO O SITUACIÓN	SUPERFICIE	ALTURA	ESPECIES
COLOM	E. MENORCA	59,5 Ha	40 m	Pl,Tm,Es
ADDAIA GRAN	N. MENORCA	75.500 m²	22,1 m	Pl,Ht
ADDAIA PETITA	N. MENORCA	50.000 m²	7,8 m	Pl
CARBONERA	N. MENORCA	5.000 m²	2,5 m	Pl ?
EN TOSQUETA	N. MENORCA	6.250 m²	6,1 m	Pl

Figure 6. JOAN MAYOL (1997): Capítulo 10: Biogeografía de los Anfibios y Reptiles de las Islas Baleares.

notice of the Isla Carbonera. PÉREZ-MELLADO (1998) repeated that unfortunately it was not possible to clearly locate an island with the name Carbonera at the coast of Menorca, but he mentioned an Islote de Corberana, a small rock in front of the southern coast of Mallorca near Colònia de Sant Jordi. He states that in case of an existence of a current lizard population a comparison with the type series could help to proof the validity of the subspecies *Podarcis lilfordi carbonerae*.

Finally, 14 years after its description, PÉREZ-MELLADO et al. (2002) rediscovered *P. lilfordi carbonerae*. The study of the catalogues of the ZFMK as well as analyses of ancient and modern charts revealed a cluster of three tiny islets in front of Port d'Addaia. One of them, Illot d'en Carbó, hosts a *Podarcis lilfordi* population. The quest for the missing Isla Carbonera was completed!

Because the original information on coloration was based on 8 ethanol preserved specimens, an additional 21 specimens were caught on Illot d'en Carbó and investigated. In most specimens the dorsal and lateral sides were brown. Only 3 males, 1 female and 1 juvenile showed some greenish color on the back, but always mixed with brown. According to PÉREZ-MELLADO et al. (2002) this characteristic separates these lizards from the ones of the nearby Addaia islands, described as *Podarcis lilfordi addayae.* The dorsal and lateral coloration is assessed as comparable to the Illa de Porros lizards (*Podarcis lilfordi fenni*).

"Therefore, the olive tones indicated in four males by PÉREZ-MELLADO & SALVADOR (1988) are a minority in the adults of Illot d'en Carbó."

The dorsolateral lines are barely visible, except for some juveniles and females. The ventral region is uniform gray or gray mixed with salmon pink shades, both in males and females. The gular zone is mostly gray, mottled with irregular blackish spots and, in many cases, with salmon pink or ferruginous shades, which is also assessed as comparable to *Podarcis lilfordi fenni,* even to some other species like *Podarcis muralis.*

Furthermore only a few characteristics like weight and length of the intact tail, which were not included in the original description, as well as data on the snout-vent length are given.

"The characteristics of color, design and body size of specimens studied recently coincide with those included in the diagnosis of *Podarcis lilfordi carbonerae* and confirm not only the validity of this subspecies, but the location of it in Illot d'en Carbó"

(PÉREZ-MELLADO et al. 2002).

	adult males			adult females			juveniles		
	mean	se	n	mean	se	n	mean	se	n
Snout Vent Length (mm)	62.86	0.73	7	58.25	0.59	4	52.21	1.12	7
Weight (gram)	6.73	0.35	7	4.10	0.30	2	3.67	0.15	7
Tail Length of complete tails (mm)	110.00	6.50	2	94.50	1.50	2			

Table 2.
Extra metric data provided by PÉREZ-MELLADO et al. (2002) to the description of *Podarcis lilfordi carbonerae*.

Clearing the mist

Figure 7. Pérez-Mellado & Salvador (1988): Figure 4 on page 131.

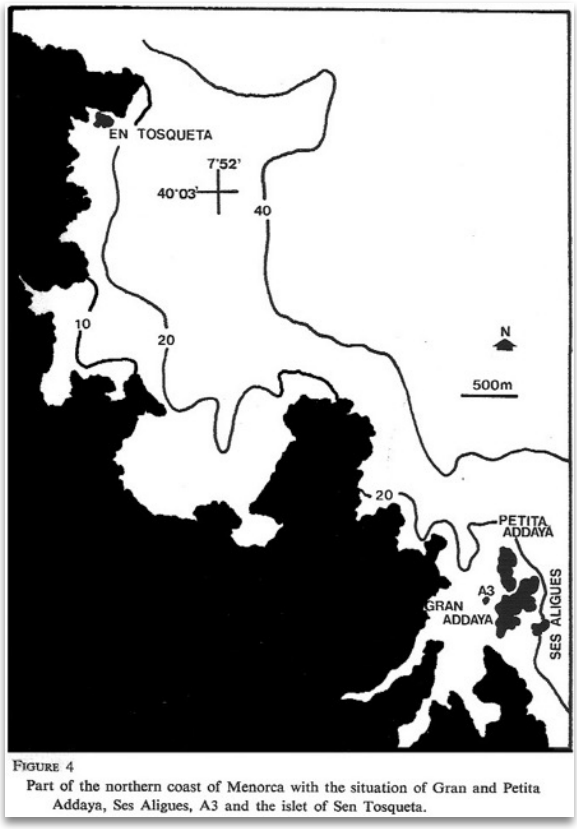


FIGURE 4
Part of the northern coast of Menorca with the situation of Gran and Petita Addaya, Ses Aligues, A3 and the islet of Sen Tosqueta.

Why did the description of *Podarcis lilfordi carbonerae* caused so much confusion? First, we agree with Salvador (1984) on his statement that many descriptions of subspecies are based only on a very small number of specimens which did not necessarily reflect exactly the characteristics of the entire population. Furthermore the collectors of this material were not generally the same people as those who later studied it, and they sometimes produced errors through having confused some of the islands with others. He also commented on the study of coloration of specimens preserved in alcohol for a long period of time, that do not show the exact coloration anymore.

He was probably his own best example, because every single point of his criticism (Salvador 1984) was applied in the description of *Podarcis lilfordi carbonerae* (Pérez-Mellado & Salvador 1988).

As we already learned Pérez-Mellado & Salvador (1988) described *P. l. carbonerae* without knowing the exact location of its terra typica. Even if the taxonomical study of these authors is based on an analyses of variance as well as a cluster analyses some of their results are at least questionable. For one point they accidently included 4 specimens of *Podarcis pityusensis ratae* in their study that were supposed to be specimens of *Podarcis lilfordi rodriquezi*. Their taxonomic study contains only the *Podarcis lilfordi* of Menorca, but without knowing the exact location of Isla Carbonera – even years later they supposed that it could be situated off the coast of Mallorca (Pérez-Mellado 1998; Pérez-Mellado et al. 2002) – does not make it understandable why they described *P. l. carbonerae* despite this lack of important information.

Unfortunately these lizards have been surrounded by mist right from their description. Probably as a result of this mist, something very odd happened in the taxonomic study of Pérez-Mellado & Salvador (1988). In Figure 4 (p. 131) [see Fig. 7] you can see part of the northern coast of Menorca with the situations of Gran and Petita Addaya, Ses Aligues, A3 and the islet of En Tosqueta. While the lizards of Ses Aligues were not included in this study, three juvenile specimens from the islet "A3" were included with the lizards of Gran Addaya (= *Podarcis lilfordi addayae*). This turned out to be an own goal as Pérez-Mellado & Salvador (1988) inadvertently put their new subspecies *Podarcis lilfordi carbonerae* into the synonymy of *P. l. addayae* right away, because the islet A3 is actually Illot d´en Carbó (Pérez-Mellado et al. 2002). This means that while the juveniles from this island had been considered to be *P. l. addayae*, the adult lizards are supposed to represent the "lost" *P. l. carbonerae*.

But somehow the mist did not only affect the lizards from A3/En Carbó: While Pérez-Mellado & Salvador (1988) stated that they did not study the lizards from Ses Aligues because of protectionist reasons, Pérez-Mellado (1989) claimed the lizards to be *P. l. addayae*. As we can read in Pérez-Mellado (1989) he spotted only 4 lizards on Ses Aligues in 1982, but no specimens in 1988 and 1989. This could only mean that this population of Ses Aligues is only regarded to be *P. l. addayae* because of its proximity to these islands. This was probably the same with the three juvenile lizards from A3 (Perez-Mellado & Salvador 1988).

Separation between		Depth	EDT
Ses Àguiles (Ses Aligues)	Gran Menorca (Gran d'Addaia)	7.7 m	6175
Addaia complex	Gran Menorca (Menorca)	1.2 m	4100
Petit d'Addaia	Gran d'Addaia	0.5 m	< 2000
Carbó complex	Menorca	0.5 m	< 2000
En Carbó Petit	En Carbó	0.5 m	< 2000
Ses Mones	Menorca	0.5 m	< 2000

Table 3. Estimated Divergence Times in years before present of the islands in the Addaia area according to VAN DEN BERG (2015).

In PÉREZ-MELLADO (1989) the islet A3 is now called Illa de ses Mones, which leads just to even more confusion as there already is an island with the name Illa des Ses Mones in the Port of Addaia, which he calls Isla de Port d'Addaia. From the latter one he introduces a new lizard population for the first time, although no further data is provided.

As a consequence of this mistake PÉREZ-MELLADO (1989) gave the following distribution for *P. l. addayae*: Islas Addaya Gran y Petita, Ses Aligues y Ses Mones. The latter one is actually A3, which later turned out to be En Carbó, the presumed home of *P. l. carbonerae*. From the Illa de Ses Mones PEREZ-MELLADO (2002) reports a population of *Podarcis siculus* that is said to have replaced the *Podarcis lilfordi* population (PRETUS et al. 2004, PEREZ-MELLADO 2005, SALVADOR 2006). But VAN DEN BERG & ZAWADZKI (2010a) reported on the rediscovery of *Podarcis lilfordi* on the Illa de Ses Mones and showed that it has not become extinct at all, but actually lives in sympatry with *Podarcis siculus* on the island.

What was presented to be the solution of the riddle of *Podarcis lilfordi carbonerae* in PÉREZ-MELLADO et al. (2002) only looks good at first sight as it does not contain a scientific form of a morphometric or folidotic comparison between the lizards from Illot d'en Carbó and the *Podarcis lilfordi carbonerae* specimens from the ZFMK. From the 21 specimens caught on Illot d'en Carbó only the snout-vent length, weight and the length of the complete tail are given together with a comparison of the coloration. Sadly it does not contain values for dorsalia, ventralia, collaria or gularia. There is also no comparison of the length or width of the head, although all these features had been used in PÉREZ-MELLADO & SALVADOR (1988) to distinguish subspecies and to describe *P. l. carbonerae* as well as *P. l. codrellensis* and *P. l. porrosicola*. In case of the coloration we have to keep in mind that PÉREZ-MELLADO et al. (2002) described living specimens from the Illot d'en Carbó and compared them with the lizards from the ZFMK that had been in ethanol for almost 70 years!

Finally PÉREZ-MELLADO et al. (2002) dedicate some words to the conservation status of the population:

"*Podarcis lilfordi* is only present on Illot d'en Carbó. It is likely that the absence on En Carbonet it is due to its sparse vegetation and even smaller area available for the lizards. We have not made an estimate of the quantitative size of the population, but this must be extremely low, judging by the little land available for the lizards. The existence of a population of Balearic lizard on an island of such small dimensions and low height above sea level is only explicable by the protection provided by the Addaia islands in regard to the northern winds. However, during strong winter storms the entire island is covered with spray water from large waves that penetrate through the mouth of Port d'Addaia, as evidenced by deposits of dry *Posidonia*. These precarious conditions still support more strongly the need for strict protection for this fragile population. The first threat that hangs over *Podarcis lilfordi carbonerae* is derived from its own population size. A small population is extremely prone to rapid extinction through an unpredictable event, such as a particularly severe storm or the arrival of a predator to the island (including scientific collectors)".

	P.l.carbonerae	*P.l.addayae*	Illot d'en Carbó	Illa de Ses Mones	Ses Àguiles (Ses Aligues)
Pérez-Mellado & Salvador (1988)	Isla Carbonera	Illa Gran d'Addaia, Illa Petit d'Addaia and "A3"	"A3" *P.l.addayae*	- - -	not studied
Pérez-Mellado (1989)	- - -	Addaya Pequeña Addaya Grande Illa de Ses Mones	Illa de Ses Mones *P.l.addayae*	Isla de Port d'Addaia undescribed population	1982: 4 lizards 1988: no lizards 1989: no lizards
Pérez-Mellado & Corti (1993)	- - -	- - -	Ses Mones	- - -	- - -
Pérez-Mellado (1997)	- - -	Islas Addaya Gran y Petita, Ses Aligues and Ses Mones	Ses Mones *P.l.addayae*	- - -	*P.l.addayae*
Pérez-Mellado (1998)	Isla Carbonera (and maybe Isla Carbonera is Corberana, Mallorca)	Islas Addaya Gran y Petita and probably Ses Aligues as well as individuals from the small islet Ses Mones in Port Addaya	- - - [*P.l.addayae* ?]	Small islet Ses Mones in Port Addaya [*P.l.addayae* ?]	most likely extinct during the last 20 years *P.l.addayae*
Pérez-Mellado (2002)	- - -	- - -	- - -	Illot de Ses Mones en Port d'Addaia *P.siculus* !	- - -
Pérez-Mellado, Cortázar, Perera & Corti (2002)	Illot d'En Carbó	Islas Addaya Gran y Petita	En Carbó *P.l.carbonerae*	- - -	- - -
Salvador & Pleguezuelos (2002)	Isla En Carbó	Islas Addayas y Ses Mones	Isla En Carbó *P.l.carbonerae*	?	mentioned
Catalogo Nacional de especies amenazadas (2003)	- - -	Islas Addaya Gran y Petita, Ses Aligues y Ses Mones en Menorca	Ses Mones	?	*P.l.addayae*
Pretus, Marquez & Pérez-Mellado (2004)	Carbó islet	Addaia Gran, Addaia Petita and Carbó	Carbó islet *P.l.carbonerae*	extinct within the XX century, occupied around 1995 by the invader *Podarcis siculus* (Pérez-Mellado unpubl.)	"The status of several individuals in Ses Aligues, previously believed to be extinct, is still unclear" (Pérez-Mellado unpubl.)
Pérez-Mellado (2005)	Illot d'en Carbó	Addaia Gran, Addaia Petita i Ses Àguiles	Illot d'en Carbó *P.l.carbonerae*	*P.lilfordi* population extinct in the 1990s because of invader *P.siculus*	*P.l.addayae*
Salvador (2006)	En Carbó	Gran Addaya Petita Addaya	En Carbó *P.l.carbonerae*	*Podarcis lilfordi* replaced by *P.siculus*	4 specimens in 1982

Table 4. "The table of confusions".

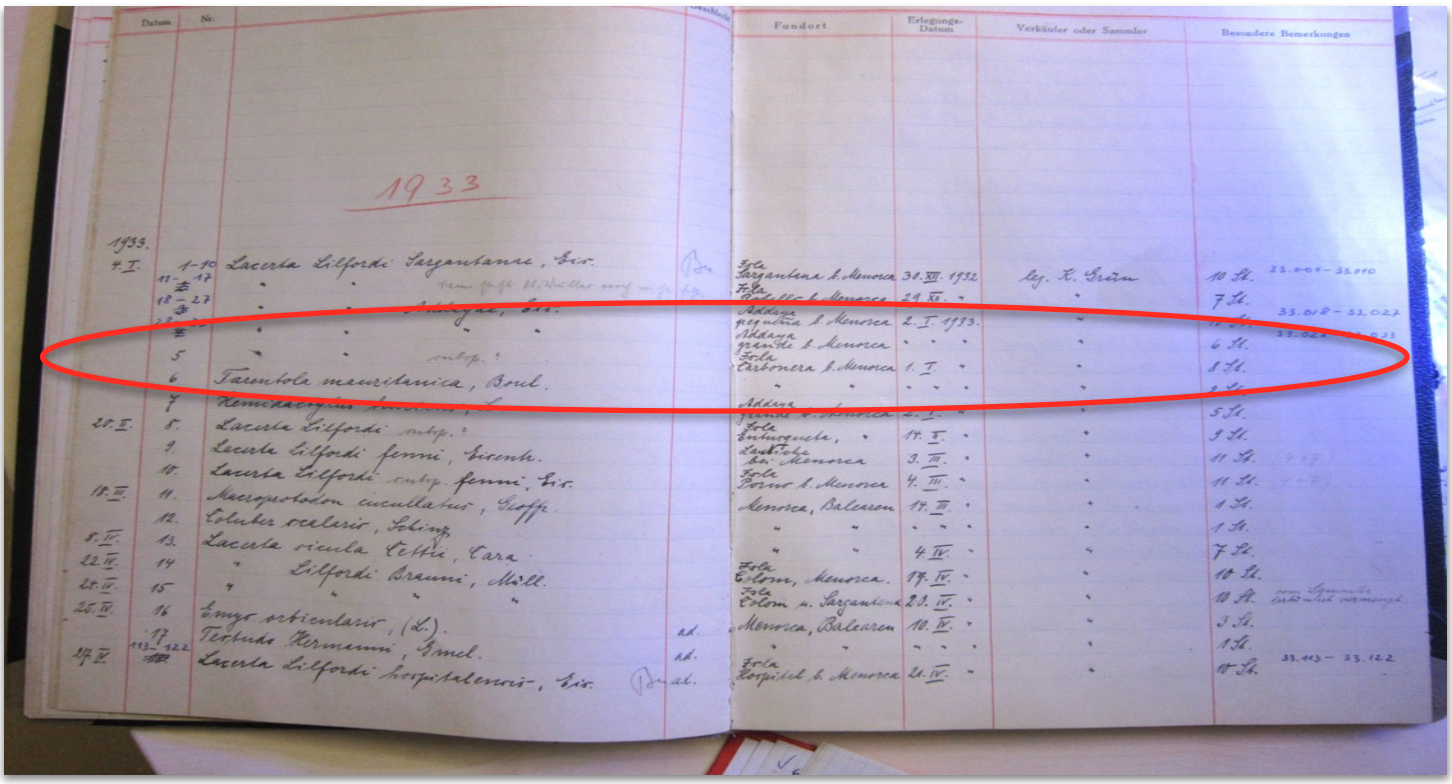


Figure 8. Pre-war entry catalog of the ZFMK: On 1st of January 1933 KARL GRÜN did not only collect *Podarcis lilfordi* on Isla Carbonera, but also two specimens of *Tarentola mauritanica*. What may only looks like an additional collecting note might be a major hint in the search of the terra typica of *Podarcis lilfordi carbonerae*.

Material and methods

Besides a critical in-depth analyses of the taxonomic study of PEREZ-MELLADO & SALVADOR (1988) as well as other existing literature we examined the type series of *Podarcis lilfordi carbonerae* in the ZFMK and checked the entry catalogs as well as the correspondence between KARL BUCHHOLZ and HERMANN GRÜN for new clues. The data from the lizards from Isla Carbonera were compared to our existing datasets of *Podarcis lilfordi* lizards from Illot d'en Carbó and Illa de Ses Mones collected in the years 2010, 2011 and 2012. These lizards were caught by hand or trap, photographed close-up from different points of view, measured on a number of metric and meristic characters, and from 2011 also buccal swabbed to obtain some mucous tissue for later DNA research. This was done under the proper CEP permits issued by the Servei de Protecció d'Espècies / Govern de les Illes Balears. We have additional "in the field" photos at our disposal that can help in the comparison of coloration (between the En Carbó and Ses Mones lizards).

Figure 9. Our visits to Illa de Ses Mones:
7. & 10. June 2009
9., 10., 11. & 12. May 2010
2. & 3. September 2010
8. & 9. October 2011
3. May 2012

Figure 10. Our visits to Illa d'en Carbo:
24. April 2008
9. June 2009
15. May 2010
14. October 2011
9. May 2012

Searching for traces

It is certainly needful to travel back in time to get an impression of the actual situation that Karl Grün was facing on Menorca at the end of 1932 and the beginning of 1933. With the help of WOLFGANG BÖHME and URSULA BOTT we were able to study the pre-war catalog of the herpetological section of the ZFMK and find out about the collecting dates of KARL GRÜN on Menorca. Compared to his brother HERMANN GRÜN he was definitely not a professional collector, and his "career" only lasted for five months (see table 5). With this in mind we get a good idea of how new to the job he was when he looked at the islands in the bay of Fornells and planned his first collecting trips to Illa Rovells (29.12.1932) and Illa Sargantana (30.12.1932).

Date	Collecting Place	Collected Animals	Comment	Current Name
29.12.1932	Isla Robells bei Menorca	7 *Lacerta lilfordi*	* Catalog entry: "Name steht laut MÜLLER noch nicht fest"	*Podarcis lilfordi sargantanae*
30.12.1932	Isla Sargantana bei Menorca	10 *Lacerta lilfordi sargantanae*		*Podarcis lilfordi sargantanae*
01.01.1933	Isla Carbonera bei Menorca	8 *Lacerta lilfordi* * *2 Tarentola mauritanica*	* Catalog note: ssp. ?	*Podarcis lilfordi carbonerae* *Tarentola mauritanica*
02.01.1933	Addaya pequeña bei Menorca	10 *Lacerta lilfordi addayae*		*Podarcis lilfordi addayae*
02.01.1933	Addaya grande bei Menorca	6 *Lacerta lilfordi addayae* *5 Hemidactylus turcicus* *	* Described by BUCHHOLZ (1954) as *Hemidactylus turcicus spinalis* ** See ŠMÍD et al. (2015)	*Podarcis lilfordi addayae* *Hemidactylus turcicus* **
14.02.1933	Isla Entusqueta bei Menorca	9 *Lacerta lilfordi* *	* Catalog note: ssp. ?	*Podarcis lilfordi sargantanae*
03.03.1933	La Niche bei Menorca	11 *Lacerta lilfordi fenni*		*Podarcis lilfordi fenni*
04.03.1933	Isla Porcus bei Menorca	11 *Lacerta lilfordi* *	* Catalog note: ssp. ? Later erroneously named "*Lacerta lilfordi fenni*" in the catalog	*Podarcis lilfordi porrosicola*
14.03.1933	Menorca, Balearen	1 *Macroprodoton cucullatus* 1 *Coluber scalaris*		*Macroprodoton cucullatus* *Rhinechys scalaris*
24.03.1933	Escui de Bledas I	5 Eidechsen *	* Catalog entry: "Name steht laut MÜLLER noch nicht fest"	*Podarcis lilfordi sargantanae*
04.04.1933	Menorca, Balearen	7 *Lacerta sicula cetti*		*Podarcis siculus siculus*
10.04.1933	Menorca, Balearen	3 *Emys orbicularis* 1 *Testudo hermanni*		*Emys orbicularis* *Testudo hermanni*
17.04.1933	Isla Colom bei Menorca	11 *Lacerta lilfordi brauni*		*Podarcis lilfordi brauni*
20.04.1933	Isla Colom und Sargantana	10 *Lacerta lilfordi* *	* Catalog entry: "vom Sammler irrtümlich vermengt"	*Podarcis lilfordi brauni* *Podarcis lilfordi sargantanae*
21.04.1933	Isla Hospital bei Menorca	10 *Lacerta lilfordi hospitalensis*		*Podarcis lilfordi balearica*
07.05.1933	Fornells, Menorca	2 Tropidonotus viperinus		*Natrix maura*
22.05.1933	La Nitge, Menorca	*2 Tarentola mauritanica*		*Tarentola mauritanica*
30.05.1933	Scuy de Codrell II	4 Eidechsen *	* Catalog entry: "Name steht laut MÜLLER noch nicht fest"	*Podarcis lilfordi codrellensis*
30.05.1933	Scuy de Codrell I	7 Eidechsen *	* Catalog entry: "Name steht laut MÜLLER noch nicht fest"	*Podarcis lilfordi codrellensis*

Table 5. The collecting dates of KARL GRÜN on Menorca. Especially the dates around the turn of the year are very interesting as they also include the Isla Carbonera.

Figure 11. Mapa General de Menorca by J. MASCARÓ PASARIUS (1951). First collecting days of KARL GRÜN near Fornells (circled in green).

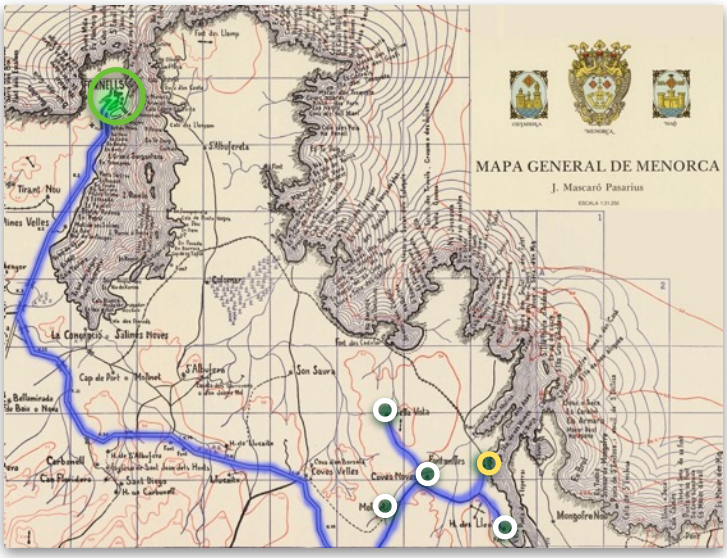


Figure 12. Traveling day (31.12.1932) of KARL GRÜN from Fornells to the Addaia area, with Finca Fontanilles (circled in yellow).

It is likely that KARL GRÜN stayed at Fornells, a very small fishermen village in those days at the Bay of Fornells. It is also plausible that he used the 31st of December to get transferred to the Port d'Addaia area, a rural area back in 1933 with the choice of only 5 fincas to be used as accommodation (see figure 12/13/14). If KARL GRÜN had the free choice, he would probably have chosen finca Fontanilles, with closest access to the islands, and coincidentally facing Illa de Ses Mones (see figure 16).

But no matter in which finca KARL GRÜN really stayed, if we consider he had only collected on Illa Rovells and Illa Sargantana before, two islands that are known to have their population of lizards that had already been described as *P. l. sargantanae*, what kind of island would have been the next to collect a good number of lizards on New Year's Day 1933? If we put ourselves in his situation, we would choose the nearby island with good plant cover and looking very promising, instead of a small flat and shabby rock much farther away, wouldn't we? And please remember that the 1st of January was a holiday and therefore it does not seem to be very likely that KARL GRÜN hired a fisherman on this special day. Isn't it more probable that he had already made plans to visit Addaia Gran and Addaia Petit on 2nd of January and spent New Year's Day for a walk and discovered the

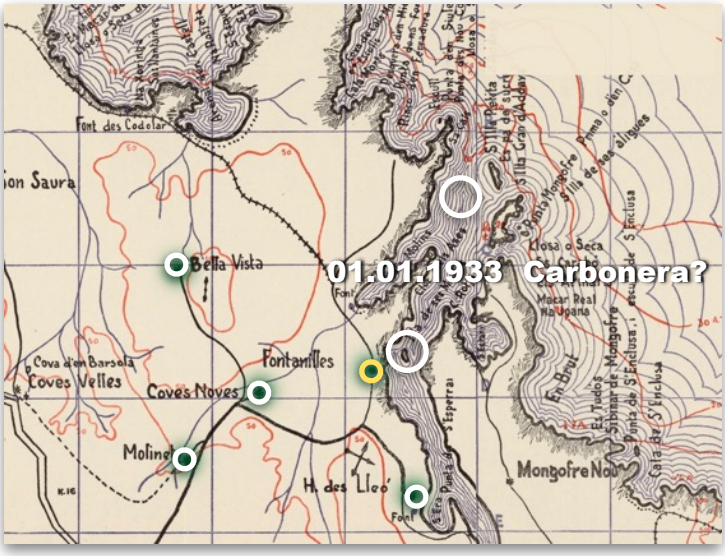


Figure 13. KARL GRÜN collecting on Isla Carbonera (01.01.1933).

Figure 14. KARL GRÜN collecting on both Addaia islands (02.01.1933).

Figure 15.

The southern half of the vegetated part of Illot d'en Carbó, with a wind flow velocity of 6 Bft.

A Small part of En Carbonet is still visible in the middle right of the image, and the coastline of Illa Gran d'Addaia is in the background.

nearby Illa de Ses Mones? At least it would have meant only a few meters wading through calm water to a much more promising island that does not look like a flat, flooded reef.

That would leave us with the issue of the name of the island. "Isla Carbonera" is of course more resembling "Illot d'en Carbó" than "Illa de Ses Mones". But we can be assured that KARL GRÜN was unaware of the names of the islands prior to his visit, besides maybe both Addaia islands. So it is likely that he inquired for the name of the island he visited, and got "Isla Carbonera" as response, probably what the local folks used for that island in those days. This does not have to be identical to what officially was used, and maybe back in 1933 there was even no official name.

We know of many other cryptic island names that are among the entries in museum catalogs as well as from many island name mismatches in literature.

Figure 16. Impression of the Port d'Addaia area back in 1933.

Figure 17. A *Tarentola mauritanica* on Ses Mones. Not a rare encounter on this island.

Maybe the most important hint to the type locality of *Podarcis lilfordi carbonerae* is found in the pre-war catalog in the line below the entry of the lizards from Isla Carbonera. On the same day, the 1st of January 1933, KARL GRÜN also collected two specimens of *Tarentola mauritanica* on Isla Carbonera! Why is this so important? During our visits to Illa de Ses Mones we have encountered several specimens of *Tarentola mauritanica.* On Illot d'en Carbó on the other hand, we never ever spotted this gecko, although we probably turned every stone possible. PÉREZ-MELLADO et al. (2002) did not mention *Tarentola mauritanica* from the Illot d'en Carbó neither. Although this fact does not prove that the Isla Carbonera lizards may not originate from the Illot d´en Carbó but from Illa de Ses Mones, it seems to be a very strong point in favor of this hypothesis.

And even if we cannot prove that KARL GRÜN collected the "Carbonera" lizards on Ses Mones, and some people still believe that just the name of an island given by the collector is enough proof of the real origin, we would like to quote HERMANN GRÜN, who was a lizard collector himself and who knew not only lots of local fishermen on Ibiza, but also EISENTRAUT as well as J. JOKISCH, his follower lizard catcher on Ibiza, and of course his brother KARL GRÜN:

> "JOKISCH was a beginner at that time, and maybe he misheard the (islands) names. For EISENTRAUT it was difficult, too, to find out the correct names of the islands."

Unnecessary to mention that his own brother KARL GRÜN was a beginner himself and probably made similar mistakes like JOKISCH and EISENTRAUT.

Figure 18.

It gets wet on En Carbó quite often. A habitat for *Tarentola mauritanica*?

Figure 19.

Is this what KARL GRÜN saw on 1st of January 1933? Does it look like a place to look for lizards? Those small wet riffs in the middle …

Figure 20. Ses Mones island as seen from the area of the former finca Fontanilles.
Imagine this image with some boathouses instead of the present constructions, cars and marina.

Figure 21. ZFMK 11935 from Isla Carbonera (Holotype *Podarcis lilfordi carbonerae*), dorsal and lateral view.

Results and discussion

Coloration. As we can see in figure 21 and 22 it is difficult to say something about the original coloration of the Illa Carbonera lizards after they have been preserved in ethanol for more than 80 years. We are convinced that this was already the case when PÉREZ-MELLADO & SALVADOR (1988) gave their descriptions:

> "Back dark olive green. Conspicuous pattern but broken by discontinuous lines lighter in color than background. Ventral zone light blue with black spots and blue ocelli on the outermost ventral scales."

How informative and reliable are these descriptions of lizards that had been stored in ethanol for more than 50 years at that point of time? To us it sounds like an ethanol artifact, and not like the live coloration of either the Illot d'en Carbó nor the Illa de Ses Mones lizards. It is therefore incomprehensible that in PÉREZ-MELLADO et al. (2002) still an attempt was made, which turned out to be unsatisfactory and led to the following conclusion:

> "Therefore, the olive tones indicated in four males by PÉREZ-MELLADO & SALVADOR (1988) are a minority in the adults of Illot d'en Carbó."

Problem solved again? Seriously not.

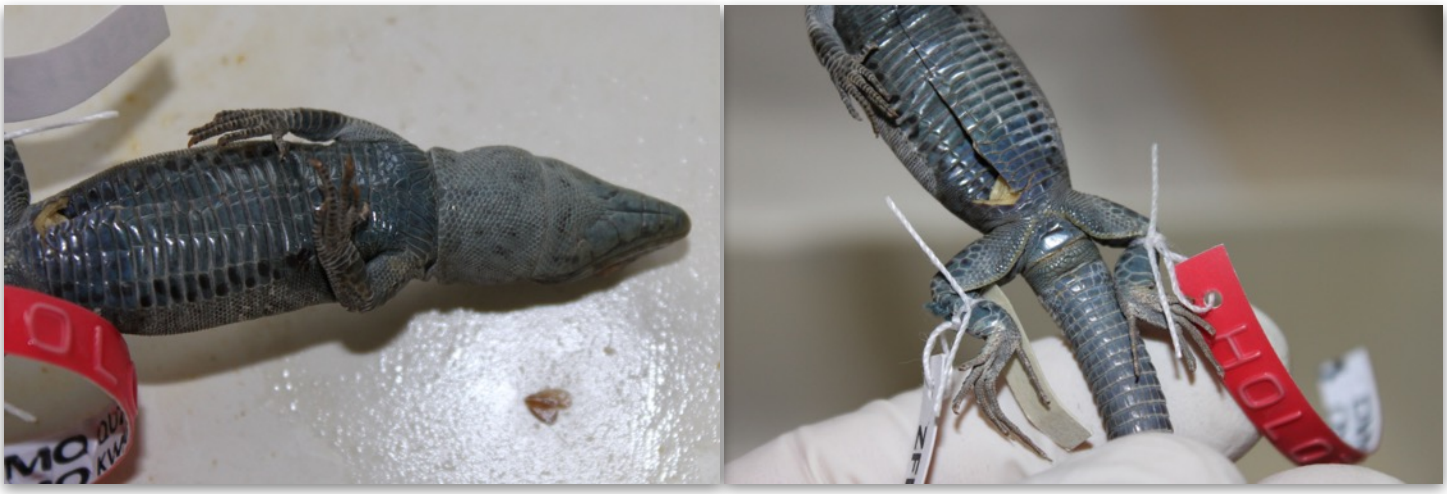


Figure 22. ZFMK 11935 from Isla Carbonera (Holotype *Podarcis lilfordi carbonerae*), ventral views.

Doesn't it look more like an attempt to bend the results to match the desired outcome? Our position is that no real comparison regarding coloration with the Isla Carbonera lizards can be made on a scientific basis. Not now. Not 13 years ago. Never again.

In our opinion the En Carbó lizards and the Ses Mones lizards are an average cross-section of what can be observed in most Minorcan *Podarcis lilfordi* populations where the lizards display brown or greenish dorsal colors. In the majority their ventral coloration differs from the homogeneous dark reddish ventral coloration found in the population of Illa de Porros/Sa Nitja (*Podarcis lilfordi fenni*). And generally they do not show very conspicuous greenish or even bluish dorsal coloration often seen in populations like Illa d'en Colom, Illa Sargantana, Rovells and Porros (Fornells).

In the Addaia region the coloration of the lizards from En Carbó and Ses Mones resembles most the Illot de Ses Àguiles lizards, although that is the oldest separated islet in this corner of Menorca, while both En Carbó and Ses Mones are relatively and equally young (see table 3). The lizards on both Addaia islands generally express more greenish dorsal coloration, nevertheless the more brownish En Carbó and Ses Mones lizards have their lookalikes on the Addaia islands as well. To our opinion this characteristic is not enough to separate either the En Carbó nor the Ses Mones lizards from both Addaia lizards.

However, there is something peculiar going on in the Addaia area regarding coloration. In the Addaia populations (Pérez-Mellado pers. comm.) and on Illot d'en Carbó once in a while melanistic specimens can be observed (van den Berg & Zawadzki 2010b ; van den Berg et al. 2013), and on Illot de Ses Àguiles melanistic specimens have become an important part of the population nowadays (van den Berg & Zawadzki 2011 ; van den Berg et al. 2013). This in contrast with Ses Mones, where we never observed this phenomenon, nor any other population on Menorca, besides the melanistic population on Illa del Aire.

Metric and meristic characters. With coloration out of the question, there are only two paths left to walk on the quest for the real origin of the Isla Carbonera lizards. We start with possible clues from metric and meristic characters. First of all we have to apologize for the, to our opinion, meager sized dataset we have to offer (table 6-8). However, the Isla Carbonera dataset is not likely to be enhanced in the future and is what it is. Our dataset of the other populations should have been much bigger in order to be able to make some relevant comparisons, but for now it must suffice. In these comparisons we will cluster both En Carbó populations (En Carbó and En Carbó Petit), because we are convinced that separation must be quite recent, and complete isolation is not guaranteed; think of seagrass aggregation or other temporary "bridges" like stranded whales.

Figure 23. Some leftovers of a whale found right inside the channel between En Carbó and En Carbó Petit (09.06.2009).

	Isla Carbonera			Illots d'en Carbó			Illa de Ses Mones		
	mean	sd	n	mean	sd	n	mean	sd	n
Ventralia males	29.25	1.71	4	27.45	1.08	11	27.50	0.00	3
Ventralia females	29.50	1.00	4	28.75	0.76	6	31.63	3.73	4
Dorsalia	76.71	2.06	7	76.20	4.06	15	77.14	2.41	7
Submaxillaria	4.94	0.42	8	4.89	0.32	19	5.00	0.00	7
Supralabialia	4.00	0.00	8	4.05	0.16	19	4.00	0.00	7
Sublabialia	6.13	0.23	8	5.95	0.33	19	6.29	0.27	7
Gularia	33.14	2.27	7	33.08	2.87	12			
Collaria	13.00	1.15	7	12.71	2.52	17	12.71	1.70	7
Preanalia	6.00	0.00	8	6.16	0.60	19	6.29	0.49	7
Femoralia	21.75	1.06	2	20.41	1.86	17	21.21	1.55	7

Table 6. Meristic means, standard deviations and numbers for all genders and age groups, except ventralia (sex dependent).

	Isla Carbonera adult males			Illots d'en Carbó adult males			Illa de Ses Mones adult males		
	mean	sd	n	mean	sd	n	mean	sd	n
Length	161.00	5.35	4	156.80	11.26	10	171.50	2.12	2
Snout-vent length	65.50	0.58	4	63.20	2.15	10	64.00	4.24	2
Head length	16.23	0.67	4	16.04	0.46	10	16.25	1.20	2
Head width	10.53	0.19	4	9.51	0.21	10	9.45	0.35	2
Head height	9.15	0.47	4	8.06	0.25	10	7.95	0.35	2
HL/SVL	24.50	1.29	4	25.40	0.52	10	25.50	0.71	2
HW/SVL	16.25	0.50	4	15.10	0.74	10	14.50	0.71	2
HH/SVL	14.00	0.82	4	12.80	0.63	10	12.50	0.71	2
Hvol/SVL	1195.00	115.35	4	974.10	62.43	10	954.50	85.56	2

Table 7. Metric means, standard deviations and numbers for adult males. "Significant" differences indicated by color.

	Isla Carbonera adult females			Illots d'en Carbó adult females			Illa de Ses Mones adult females		
	mean	sd	n	mean	sd	n	mean	sd	n
Length	130.00	9.42	4	119.33	13.05	3	117.67	18.01	3
Snout-vent length	57.50	1.73	4	60.00	5.57	3	58.00	0.00	3
Head length	13.65	0.33	4	13.50	0.36	3	14.17	0.40	3
Head width	8.78	0.30	4	7.70	0.30	3	8.07	0.23	3
Head height	7.00	0.49	4	6.70	0.10	3	6.40	0.26	3
HL/SVL	23.75	0.96	4	22.67	1.53	3	24.67	0.58	3
HW/SVL	15.25	0.96	4	13.00	1.00	3	13.67	0.58	3
HH/SVL	12.25	0.96	4	11.00	1.00	3	11.00	0.00	3
Hvol/SVL	731.75	93.12	4	582.33	35.50	3	630.67	40.53	3

Table 8. Metric means, standard deviations and numbers for adult females. "Significant" differences indicated by color.

When we compare the meristic data given in table 6 no significant differences are to be expected between all three populations. This is in accordance with prior comparisons we made between other populations, also on populations with relevant numbers of specimens. Meristic values seem not to be very useful, certainly not in the case of our query.

In most metric characters (table 7 and 8) we expect also no significant differences. However, in the head width comparison between Isla Carbonera and both our candidates, there are significant differences to be expected, both in males and females, but not in the related characters HW/SVL and Hvol/SVL. The same is applicable to head height in adult males. We present this information for what it is worth, considering the very small sample size, and not giving any of our two candidates, Illot d'en Carbó nor Illa de Ses Mones, the benefit.

Like coloration these metric and meristic characters cannot provide any clues, not to think of any evidence.

There is still one path left to explore, the path of population genetics, such as performed on *Podarcis muralis* (GASSERT 2005), *Podarcis gaigeae* (RUNEMARK et al. 2010), and *Podarcis muralis* in combination with *Podarcis liolepis* (SCHULTE et al. 2012). Microsatellite loci are already developed for *Podarcis lilfordi* with the aim of examining the evolutionary history of different forms, the occurrence of cross-islet introductions, and the significance of subspecific designations for this species (BLOOR et al. 2010), but no such project has yet been finalized. If microsatelites has proved its merits, it could also provide the answer where the Isla Carbonera lizards really originate from, Illot d'en Carbó or Illa de Ses Mones, assuming the tissue of the Isla Carbonera lizards still can provide the necessary DNA.

Conclusions

1. It is highly probable that "Isla Carbonera" is located in the Port d'Addaia area, and only Illot d'en Carbó and Illa de Ses Mones are candidates for the terra typica of the Isla Carbonera lizards. However, real proof is not given. At this moment it is impossible to prove the real location of Isla Carbonera.
2. It is more logical that KARL GRÜN would have opted to visit Ses Mones over En Carbó in order to catch lizards, because of its size, prospects and location.
3. The presence of *Tarentola mauritanica* on Ses Mones and its absence on En Carbó is a strong plea in favor of Illa de Ses Mones.
4. The conclusion of PÉREZ-MELLADO et al. (2002) "The characteristics of color, design and body size of specimens studied recently coincide with those included in the diagnosis of *Podarcis lilfordi carbonerae* and confirm not only the validity of this subspecies, but the location of it in Illot d'en Carbó" is not evidence-based, and the only valid character that remains – body size – could apply to most other *Podarcis lilfordi* populations in Menorca.
5. The discrepancies around this subspecies do not justify its validity. The mere fact of the unresolved discussion on its terra typica should be enough reason to abolish this subspecies. The Isla Carbonera lizards cannot be distinguished from neither the En Carbó nor the Ses Mones lizards.
6. Neither the En Carbó nor the Ses Mones lizards can be separated from both Addaia populations by means of coloration or meristic and metric characters and should therefore be addressed as *Podarcis lilfordi addayae*. Therefore we treat *Podarcis lilfordi carbonerae* as a synonymon of *Podarcis lilfordi addayae.*

Figure 24. Holotype *Podarcis lilfordi addayae* (ZMB 36069).

Podarcis lilfordi addayae (EISENTRAUT, 1928)

Distribution: Illa Gran d'Addaia, Illa Petit d'Addaia, Illot d'en Carbó, En Carbó Petit and Illa de Ses Mones.

Diagnosis: Medium sized subspecies with an average SVL of 61,79 mm in males and 56,30 mm in females. On Illa Gran d'Addaia the average SVL is 61,36 in males and 55,36 in females; on Illa Petit d'Addaia 60,40 in males and 54,33 in females; on Ses Mones 64,00 mm in males and 58,00 in females; on Illot d'en Carbó 64,00 and 60,00 in females and on En Carbó Petit 60,00 in males (no data for adult females).

Coloration: All "normal" colored (non-melanistic) juveniles with a SVL under 40 mm start with a conspicuous green and cyan colored tail. Most older juveniles (SVL > 40 mm) show a brown tail, varying from light brown to dark brown, in the minority of cases combined with green. However, in some adult females we have observed a persisting conspicuous green and cyan colored tail.

Most juveniles have a brownish dorsum, consisting of a darker brownish basis, with 4 lighter brownish longitudinal "stripes". Between these stripes black spots of different sizes compose a pattern, from simple lines to more complicated grid patterns, but there are also specimens without black areas. In the "light brown stripes" area of a minority of the juvenile specimens, we observe additional green or cyan coloration.

This dorsal coloration is continued in adult males and females. It looks if the green parts will appear more frequent, and become more prominent in taller specimens, also manifesting in the more dark brown parts, finally forming two green bands, but certainly not always. There are still adult specimens, with an almost complete brownish dorsal coloration, without showing much green. Concerning the green coloration, we observe in both adult males and females a variation in brightness and hue. In a very small number of the adults, a dark greenish-cyan coloration of the back can be observed, but not as often as in some of the other *Podarcis lilfordi* subspecies.

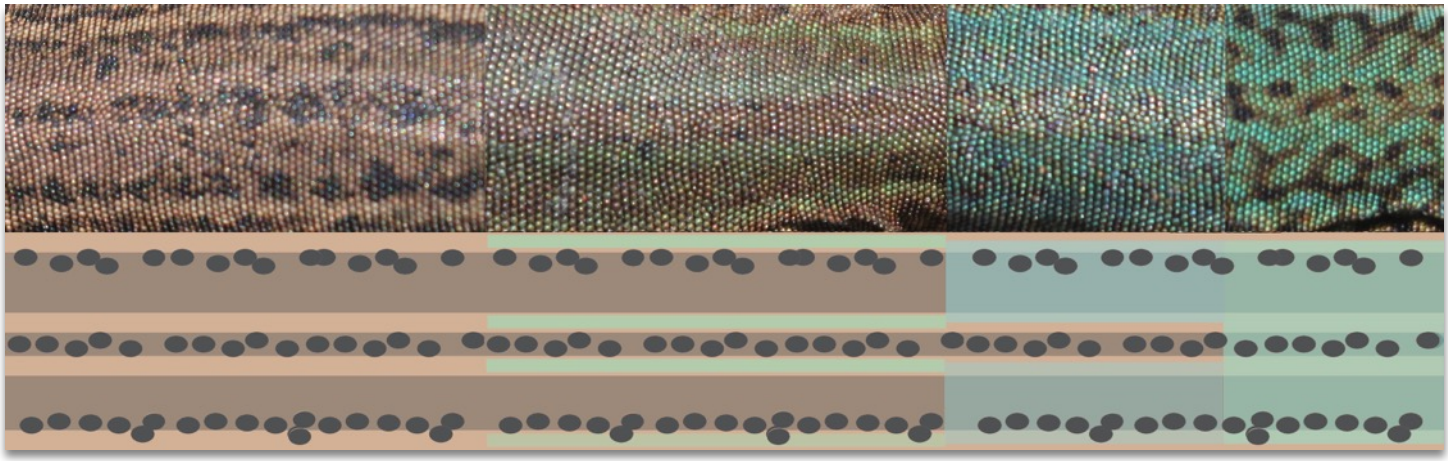


Figure 25. Dorsal coloration in *Podarcis lilfordi addayae.*

The lateral parts consist of the the same light brown and dark brown coloration as on the back. Instead of stripes reveal the light brown parts as dots of different sizes against a darker background. When the lighter dots become bigger, or the background becomes darker, a reticulated pattern is shaped. In many cases green or cyan is present in the lighter parts.

The ventral coloration varies from a grayish white, over darkened yellow and some kind of orange to brownish darkened red coloration. In most cases there are no black spots on the belly. Still 20 % of the lizards in our dataset show these black spots more or less intense.

Juveniles show the same spectrum of ventral coloration as the adults, so we expect that this coloration doesn't change dramatically during aging.

Figure 26. Lateral coloration in *Podarcis lilfordi addayae.*

Figure 27. Ventral coloration in *Podarcis lilfordi addayae.*

Adult males *Podarcis lilfordi addayae*				
n = 33	mean	sd	range	n
L	151.70	16.01	107 - 180	33
SVL	61.79	2.86	55 - 67	33
TL	89.91	14.81	50 - 114	33
HL	15.83	0.79	14.0 - 17.6	33
HW	9.22	0.57	8.2 - 10.6	33
HH	7.78	0.48	6.4 - 8.8	33
HL/SVL	25.67	0.74	25 - 27	33
HW/SVL	14.91	0.80	14 - 17	33
HH/SVL	12.61	0.66	11 - 14	33
Hvol/SVL	921.70	109.73	644 - 1138	33
Ventralia	27.38	0.98	25 - 30	33
Dorsalia	76.19	3.38	71 - 83	32
Submaxillaria	5.00	0.00	5 - 5	33
Supralabialia	4.02	0.09	4 - 5	33
Sublabialia	6.12	0.33	5 - 8	33
Gularia	33.55	2.44	28 - 38	22
Collaria	12.73	2.29	9 - 18	30
Preanalia	6.19	0.54	6 - 8	32
Femoralia	20.73	1.56	17 - 25	33

Adult females *Podarcis lilfordi addayae*				
n = 20	mean	sd	range	n
L	125.50	19.49	71 - 152	20
SVL	56.30	3.57	50 - 66	20
TL	69.20	19.51	16 - 94	20
HL	13.41	0.59	11.9 - 14.4	20
HW	7.42	0.54	6.2 - 8.2	20
HH	6.18	0.46	5.1 - 6.8	20
HL/SVL	24.00	1.30	21 - 26	20
HW/SVL	13.25	1.07	11 - 15	20
HH/SVL	10.85	0.75	10 - 12	20
Hvol/SVL	549.55	81.07	362 - 672	20
Ventralia	29.25	2.12	26 - 37	20
Dorsalia	74.39	2.45	69 - 79	18
Submaxillaria	4.95	0.22	4 - 5	20
Supralabialia	4.18	0.59	3 - 7	20
Sublabialia	6.18	0.34	5 - 8	20
Gularia	33.13	2.75	29 - 38	8
Collaria	12.56	1.58	10 - 15	18
Preanalia	6.10	0.79	5 - 8	20
Femoralia	19.75	1.20	17 - 23	18

Table 9. Means, standard deviations and numbers for adult males and females of all populations of *Podarcis lilfordi addayae* in our dataset. L=Length, SVL=Snout-vent length , TL=Tail length, HL=Head length, HW=Head width, HH=Head height, HL/SVL=Head length by SVL, HW/SVL=Head width by SVL, HH/SVL=Head height by SVL, Hvol/SVL=Head volume by SVL=(((HLxHWxHH)/2)/SVL)x100.

Figure 28. Male *Podarcis lilfordi addayae* from the type location Illa Gran d'Addaia.

Adult males - Gran d'Addaia				
n = 11	mean	sd	range	n
L	150.55	20.47	107 - 170	11
SVL	61.36	3.29	55 - 66	11
TL	89.18	18.43	50 - 105	11
HL	16.05	0.88	14.6 - 17.6	11
HW	9.32	0.72	8.2 - 10.6	11
HH	7.81	0.54	6.7 - 8.8	11
HL/SVL	26.27	0.65	25 - 27	11
HW/SVL	15.27	0.90	14 - 17	11
HH/SVL	12.82	0.60	12 - 14	11
Hvol/SVL	954.55	122.32	729 - 1138	11
Ventralia	27.50	0.87	25 - 29	11
Dorsalia	74.45	2.25	71 - 79	11
Submaxillaria	5.00	0.00	5 - 5	11
Supralabialia	4.05	0.15	4 - 5	11
Sublabialia	6.18	0.34	6 - 7	11
Gularia	34.20	0.84	33 - 35	5
Collaria	12.30	1.42	9 - 14	10
Preanalia	6.20	0.63	6 - 8	10
Femoralia	19.86	1.67	17 - 22	11

Adult females - Gran d'Addaia				
n = 11	mean	sd	range	n
L	126.27	22.93	71 - 152	11
SVL	55.36	2.98	50 - 60	11
TL	70.91	21.47	16 - 94	11
HL	13.20	0.56	11.9 - 13.9	11
HW	7.22	0.48	6.2 - 7.9	11
HH	6.03	0.50	5.1 - 6.7	11
HL/SVL	24.00	0.89	23 - 26	11
HW/SVL	13.18	0.98	12 - 15	11
HH/SVL	10.73	0.79	10 - 12	11
Hvol/SVL	521.82	78.32	362 - 645	11
Ventralia	28.73	0.98	26 - 30	11
Dorsalia	74.09	2.91	69 - 79	11
Submaxillaria	5.00	0.00	5 - 5	11
Supralabialia	4.23	0.79	3 - 7	11
Sublabialia	6.14	0.39	5 - 8	11
Gularia	32.80	2.39	29 - 35	5
Collaria	11.90	1.20	10 - 14	10
Preanalia	6.18	0.98	5 - 8	11
Femoralia	19.36	1.00	17 - 21	11

Table 10. Means, standard deviations and numbers for adult males and females from Illa Gran d'Addaia.

Figure 29. Adult males from Illa Gran d'Addaia.

Figure 30. Adult females from Illa Gran d'Addaia.

Adult males - Petit d'Addaia				
n = 10	mean	sd	range	n
L	143.90	11.53	125 - 159	10
SVL	60.40	2.17	57 - 63	10
TL	83.50	12.57	62 - 100	10
HL	15.30	0.73	14.0 - 16.4	10
HW	8.78	0.42	8.2 - 9.4	10
HH	7.42	0.40	6.4 - 7.7	10
HL/SVL	25.30	0.67	25 - 27	10
HW/SVL	14.40	0.52	14 - 15	10
HH/SVL	12.20	0.63	11 - 13	10
Hvol/SVL	826.60	82.55	644 - 909	10
Ventralia	27.05	1.09	25 - 30	10
Dorsalia	75.60	3.06	72 - 82	10
Submaxillaria	5.00	0.00	5 - 5	10
Supralabialia	4.00	0.00	4 - 4	10
Sublabialia	6.15	0.41	5 - 8	10
Gularia	33.56	2.70	31 - 38	9
Collaria	14.00	5.24	9 - 27	9
Preanalia	6.10	0.32	6 - 7	10
Femoralia	20.75	0.95	19 - 23	10

Adult females - Petit d'Addaia				
n = 3	mean	sd	range	n
L	136.67	12.10	123 - 146	3
SVL	54.33	3.21	52 - 58	3
TL	82.33	9.81	71 - 88	3
HL	13.33	0.60	12.7 - 13.9	3
HW	7.20	0.62	6.5 - 7.7	3
HH	6.00	0.26	5.8 - 6.3	3
HL/SVL	24.67	2.31	22 - 26	3
HW/SVL	13.33	2.08	11 - 15	3
HH/SVL	11.00	1.00	10 - 12	3
Hvol/SVL	537.33	113.69	413 - 636	3
Ventralia	28.67	1.53	27 - 30	3
Dorsalia	75.00	1.00	74 - 76	3
Submaxillaria	5.00	0.00	5 - 5	3
Supralabialia	4.17	0.29	4 - 5	3
Sublabialia	6.17	0.29	6 - 7	3
Gularia	35.00	4.24	32 - 38	2
Collaria	13.33	2.08	11 - 15	3
Preanalia	5.67	0.58	5 - 6	3
Femoralia	19.50	1.50	18 - 21	3

Table 11. Means, standard deviations and numbers for adult males and females from Illa Petit d'Addaia.

Figure 31. Adult males from Illa Petit d'Addaia.

Figure 32. Adult females from Illa Petit d'Addaia.

Adult males - Illa de Ses Mones				
n = 2	mean	sd	range	n
L	171.50	2.12	170 - 173	2
SVL	64.00	4.24	61 - 67	2
TL	107.50	6.36	103 - 112	2
HL	16.25	1.20	15.4 - 17.1	2
HW	9.45	0.35	9.2 - 9.7	2
HH	7.95	0.35	7.7 - 8.2	2
HL/SVL	25.5	0.71	25 - 26	2
HW/SVL	14.50	0.71	14 - 15	2
HH/SVL	12.50	0.71	12 - 13	2
Hvol/SVL	954.50	85.56	894 - 1015	2
Ventralia	27.50	0.00	27 - 28	2
Dorsalia	79.00	2.83	77 - 81	2
Submaxillaria	5.00	0.00	5 - 5	2
Supralabialia	4.00	0.00	4 - 4	2
Sublabialia	6.25	0.35	6 - 7	2
Gularia				0
Collaria	12.50	0.71	12 - 13	2
Preanalia	6.50	0.71	6 - 7	2
Femoralia	22.00	0.71	21 - 23	2

Adult females - Illa de Ses Mones				
n = 3	mean	sd	range	n
L	117.67	18.01	100 - 136	3
SVL	58.00	0.00	58 - 58	3
TL	59.67	18.01	42 - 78	3
HL	14.17	0.40	13.7 - 14.4	3
HW	8.07	0.23	7.8 - 8.2	3
HH	6.40	0.26	6.1 - 6.6	3
HL/SVL	24.67	0.58	24 - 25	3
HW/SVL	13.67	0.58	13 - 14	3
HH/SVL	11.00	0.00	11 - 11	3
Hvol/SVL	630.67	40.53	591 - 672	3
Ventralia	32.67	3.79	30 - 37	3
Dorsalia	75.33	2.08	73 - 77	3
Submaxillaria	5.00	0.00	5 - 5	3
Supralabialia	4.00	0.00	4 - 4	3
Sublabialia	6.33	0.29	6 - 7	3
Gularia				0
Collaria	13.67	2.31	11 - 15	3
Preanalia	6.00	0.00	6 - 6	3
Femoralia	21.33	0.58	20 - 23	3

Table 12. Means, standard deviations and numbers for adult males and females from Illa de Ses Mones.

Figure 33. Adult males from Illa de Ses Mones.

Figure 34. Adult females from Illa de Ses Mones.

Adult males - Illot d'en Carbó				
n = 8	mean	sd	range	n
L	157.38	12.47	138 - 180	8
SVL	64.00	1.41	62 - 66	8
TL	93.38	11.73	76 - 114	8
HL	16.21	0.32	15.7 - 16.8	8
HW	9.53	0.23	9.1 - 9.8	8
HH	8.13	0.24	7.8 - 8.4	8
HL/SVL	25.38	0.52	25 - 26	8
HW/SVL	15.00	0.76	14 - 16	8
HH/SVL	12.75	0.71	12 - 14	8
Hvol/SVL	981.63	65.04	898 - 1059	8
Ventralia	27.13	0.69	26 - 28	8
Dorsalia	79.57	3.36	73 - 83	7
Submaxillaria	5.00	0.00	5 - 5	8
Supralabialia	4.00	0.00	4 - 4	8
Sublabialia	6.00	0.27	5 - 7	8
Gularia	34.17	2.32	32 - 38	6
Collaria	14.00	3.00	10 - 18	7
Preanalia	6.00	0.00	6 - 6	8
Femoralia	21.75	1.60	19 - 25	8

Adult females - Illot d'en Carbó				
n = 3	mean	sd	range	n
L	119.33	13.05	109 - 134	3
SVL	60.00	5.57	55 - 66	3
TL	59.33	18.23	43 - 79	3
HL	13.50	0.36	13.1 - 13.8	3
HW	7.70	0.30	7.4 - 8.0	3
HH	6.70	0.10	6.6 - 6.8	3
HL/SVL	22.67	1.53	21 - 24	3
HW/SVL	13.00	1.00	12 - 14	3
HH/SVL	11.00	1.00	10 - 12	3
Hvol/SVL	582.33	35.50	547 - 618	3
Ventralia	28.33	0.58	27 - 29	3
Dorsalia	73.00	0.00	73 - 73	1
Submaxillaria	4.67	0.58	4 - 5	3
Supralabialia	4.17	0.29	4 - 5	3
Sublabialia	6.17	0.29	6 - 7	3
Gularia	31.00	0.00	31 - 31	1
Collaria	13.00	0.00	13 - 13	2
Preanalia	6.33	0.58	6 - 7	3
Femoralia	20.00	0.00	20 - 20	1

Table 13. Means, standard deviations and numbers for adult males and females from Illot d'en Carbó.

Figure 35. Adult males from Illot d'en Carbó.

Figure 36. Adult females from Illot d'en Carbó.

Adult males - En Carbó Petit				
n = 2	mean	sd	range	n
L	154.50	6.36	150 - 159	2
SVL	60.00	1.41	59 - 61	2
TL	94.50	4.95	91 - 98	2
HL	15.35	0.21	15.2 - 15.5	2
HW	9.45	0.21	9.3 - 9.6	2
HH	7.80	0.00	7.8 - 7.8	2
HL/SVL	25.50	0.71	25 - 26	2
HW/SVL	15.50	0.71	15 - 16	2
HH/SVL	13.00	0.00	13 - 13	2
Hvol/SVL	944.00	56.57	904 - 984	2
Ventralia	29.25	0.35	29 - 30	2
Dorsalia	74.00	1.41	73 - 75	2
Submaxillaria	5.00	0.00	5 - 5	2
Supralabialia	4.00	0.00	4 - 4	2
Sublabialia	6.00	0.00	6 - 6	2
Gularia	30.00	2.83	28 - 32	2
Collaria	10.00	1.41	9 - 11	2
Preanalia	7.00	1.41	6 - 8	2
Femoralia	20.00	1.41	19 - 21	2

Adult females - En Carbó Petit				
n = 0	mean	sd	range	n
L				0
SVL				0
TL				0
HL				0
HW				0
HH				0
HL/SVL				0
HW/SVL				0
HH/SVL				0
Hvol/SVL				0
Ventralia				0
Dorsalia				0
Submaxillaria				0
Supralabialia				0
Sublabialia				0
Gularia				0
Collaria				0
Preanalia				0
Femoralia				0

Table 14. Means, standard deviations and numbers for adult males and females from En Carbó Petit.

Figure 37. Adult males from En Carbó Petit.

Figure 38. En Carbó Petit.

Figure 39. Adult female from En Carbó Petit.

Acknowledgment

We want to express our gratitude to IVAN RAMOS TORRENS for providing the permissions by the Govern de les Illes Balears to conduct research on *Podarcis lilfordi*, the staff of the National Park of S'Albufera des Grau, especially RICARD BORRÀS TEJEDOR, for their hospitality and in providing assistance during our trips. We thank WOLFGANG BÖHME, DENNIS RÖDDER and URSULA BOTT for giving us the opportunity to study the lizards and additional data at ZFMK, recommending us and quick assistance to every request we made.

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