Herpetology Notes, volume 3: 027-030 (2010) (published online on 29 January 2010)

The herpetofauna of Pessegueiro Island, including the first Portuguese insular population of *Blanus cinereus*

Neftalí Sillero*

Abstract. Three reptile species were found in Pessegueiro Island (west coast of Portugal): *Chalcides bedriagai*, *Podarcis carbonelli* and *Blanus cinereus*. The first two are confirmations of species already known, but the discovery of *B. cinereus* is the first record of an insular population in Portugal. The species richness of the island is higher than the expected by its extension. The conservation status of vegetation on the island is poor but the island is nevertheless included in the Natural Park Southwest Alentejo and Costa Vicentina.

Keywords. Island, reptiles, *Blanus cinereus*, Portugal, distribution, conservation.

Introduction

During a marine expedition along the Portuguese coast in the research vessel Clavadel, I had the opportunity to visit Pessegueiro Island. This island is located on the western coast of Portugal (municipality of Porto Covo, Sines; Fig. 1) and is part of the Natural Park of Sudoeste Alentejano e Costa Vicentina. Crespo (1972) reported only one species of skink (*Chalcides bedriagai*) from the collections of the Bocage Museum in Lisbon, and Sá-Sousa (2000) provided the first record of *Podarcis carbonelli*. After these works, no other records were reported or confirmed (Loureiro et al., 2008).

Pessegueiro is a small island (length: 340 m; width: 235 m), 250 m from the mainland. It is entirely composed of dune sand rocks placed over schists. It was connected to the mainland during the last glaciation (Würm) when the sea level dropped about 120 m from the current level. Currently, the maximum depth of the channel between island and mainland is 10 m. The island has a pyramidal form: the major axis is orientated towards north-south (Fig. 1). The average altitude is 15 m, with a maximum altitude of 27 m. The main vegetation is composed by *Suaeda vera*, *Sarcocornia perennis* subsp. *alpini*, *Sarcorconia fruticosa*, *Halimione portulacoides*, *Arthrocnemum glaucum*, *Asparagus albus*, *Phillyrea angustifolia*, *Pistacia lentiscus* and *Carpobrotus edulis* (an invasive plant originally from Southern Africa).

CICGE, Centro de Investigação em Ciências Geo-Espaciais; Universidade do Porto, Departamento de Matemática Aplicada, Rua do Campo Alegre, 687, 4169-007 Porto, Portugal; e-mail: neftali.pablos@fc.up.pt

* corresponding author

Methods

I sampled the entire island for herptofauna for two hours (from 9:00 to 11:00 UTC; 28/7/2009), using systematic search-and-seize and visual encounter survey sampling methods. Specifically, I looked for reptiles under stones, within vegetation, and on archaeological buildings. All individuals were recorded with a GPS Pocket PC (Mio DigiWalker P350). The animals were captured for identification and immediately released in the same place.

Results and Discussion

I found three species in Pessegueiro Island (Table 1): *Podarcis carbonelli*, *Chalcides bedriagai*, and *Blanus cinereus*. This is the first time that *B. cinereus* is reported from an island in Portugal (Ribeiro, 2008). *B. cinereus* can be found also in the island of Barón in Spain (Mar Menor; Mateo, 1997); *C. bedriagai,* in Cies islands (Ons, Monteagudo-Faro, San Martín), Sancti Petri, Mar Menor islands (Barón, Sujeto, Cierva, Redonda and Escull Mayor), Nueva Tabarca, Descubridor (Spain; Mateo, 1990; Mateo, 1997; Pollo, 2002), and Ilha de Faro (Portugal; Crespo, 1975; Sillero, 2008); and *P. carbonelli* in the Berlengas islands (Portugal: Sá-sousa, 2000; Sá-sousa, 2008), where a subspecies was described: *P. carbonelli berlenguensis* (Vicente, 1985; Sá-Sousa and

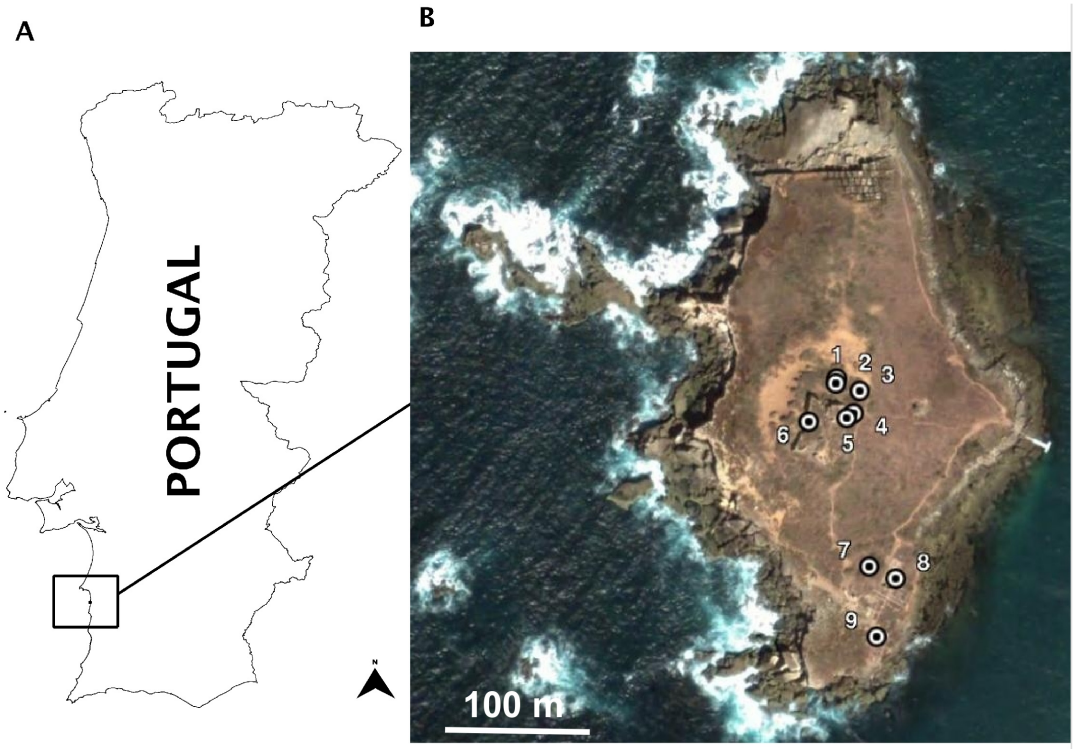

Figure 1. Location of Pessegueiro Island in Portugal (Map A) and aerial photograph of the island (Map B) with the distribution of species records. Numbers correspond to the species records of Table 1. The vegetation of the eastern part of the island was degraded at the time of the visit. The aerial photography was recorded on 19th October 2004 by the Portuguese Geographical Service.

Harris, 2002). All the specimens were inactive, found under stones, frequently close to buildings (Fig. 1). The number of specimens for *C. bedriagai* and *P. carbonelli* (four individuals in both species; Table 1) suggested that these species may maintain good density populations in the island considering the hot conditions during this period of the year. These species densities are not found in the mainland (pers. obs.). However, this is probably not the case for *B. cinereus*, as I found only one shed skin. Nevertheless, high density populations are not frequently reported for this species which is extremely sensitive to the soil moisture conditions (López, 2002).

Table 1. Reptile species recorded on Pessegueiro Island (Porto Covo, Portugal) and specimens' age. Longitude and latitude coordinates, as well as altitude, are provided in datum WGS84. Record numbers can be placed in Fig. 1.

N	Species	Age	Latitude	Longitude	Altitude (m)
1	*Podarcis carbonelli*	Juvenile	37.83368	-8.79754	29.1
2	*Podarcis carbonelli*	Adult	37.83371	-8.79753	10.6
3	*Chalcides bedriagai*	Adult	37.83365	-8.79739	19.4
4	*Chalcides bedriagai*	Adult	37.83354	-8.79743	19.9
5	*Blanus cinereus*	Shed skin	37.83351	-8.79747	21.6
6	*Podarcis carbonelli*	Adult	37.83349	-8.79771	27.7
7	*Chalcides bedriagai*	Juvenile	37.83278	-8.79733	8.6
8	*Podarcis carbonelli*	Adult	37.83272	-8.79716	10.4
9	*Chalcides bedriagai*	Adult	37.83244	-8.79728	4.6

Pessegueiro Island belongs to the Mediterranean biogeographical region (Sillero et al., 2009). The species *C. bedriagai* and *B. cinereus* have a Mediterranean affinity, but *P. carbonelli* has an Atlantic one (Sillero et al., 2009). However, a large part the distribution of *P. carbonelli* is included in the Mediterranean region of the Iberian Peninsula, but only in coastal areas (Sá-Sousa, 2008; Sillero et al., 2009). Historical factors are involved: the gradual aridification of the climate after the last glacial period in SW Iberia has recently made *P. carbonelli* disappear from most of its former range, only surviving in those sites where sea influence locally keeps environmental humidity high (Sá-Sousa, 2001, Pinho, Harris and Ferrand, 2007). Significantly, *P. carbonelli* inhabits the Portuguese coastal islands (Berlenga, Estela, Farilhões and Pessegueiro) whereas *Podarcis hispanica* and other lacertids dominate the adjacent mainland.

Pessegueiro is a continental island, following the

Table 2. List of Iberian islands. The locality refers to the municipality where the island belongs. The islands from Valencia do Minho, Leiria and Porto Covo are Portuguese; the remainder are Spanish. Island area is given in hectares. Modified from Mateo (1990) and Mateo (1997).

Island	Province	Area (ha)	N sp	Island	Province	Area (ha)	N sp
Santa Clara	Guipuzcoa	5	2	Rua	Pontevedra	4	1
Izaro	Vizcaya	3	1	Cortegada	Pontevedra	61	6
Santa Marina	Cantanbria	6	1	Arosa	Pontevedra	525	11
Mouro	Cantanbria	4	1	Toja Grande	Pontevedra	45	2
Virgen del Mar	Cantanbria	10	1	Toja Pequeña	Pontevedra	8	1
Cabrera	Cantanbria	5	1	Beiró	Pontevedra	3	1
Conejera	Cantanbria	5	1	Ons	Pontevedra	420	14
Pasiega	Cantanbria	3	1	Onza	Pontevedra	26	1
Castrón Santiuste	Asturias	4	1	San Clemente	Pontevedra	1	1
Castro Ballota	Asturias	2	1	Monteagudo-Faro	Pontevedra	287	7
Islona	Asturias	2	1	San Martín	Pontevedra	146	5
Castro de Poo	Asturias	1	1	Toralla	Pontevedra	5	1
Palo de Poo	Asturias	1	1	Estela de fora	Pontevedra	4	1
Castro de Olla	Asturias	1	1	Estela de Terra	Pontevedra	5	1
Almenada	Asturias	2	1	Las Palomas	Cádiz	3	2
San Martín	Asturias	2	1	Sancti Petri	Cádiz	5	2
Borizo	Asturias	2	1	San Andrés	Almería	3	2
Llubiece	Asturias	2	1	de Dentro	Murcia	7	3
Celorio	Asturias	2	1	Plana de Mazarrón	Murcia	1	1
Bamón	Asturias	2	1	Palomas	Murcia	2	2
Erbosa	Asturias	2	1	Escombreras	Murcia	3	2
Deva	Asturias	5	1	Sujeto	Murcia	2	2
Chouzano	Asturias	1	1	Redonda	Murcia	3	2
Fariñón	Asturias	1	1	Barón	Murcia	80	6
Percebera	Asturias	1	1	Perdigueira	Murcia	35	4
Cogolla	Asturias	2	1	Grossa	Murcia	5	2
Vega	Asturias	1	1	Cierva	Murcia	12	5
Illones	Asturias	2	1	Escull mayor	Murcia	3	2
Pantorga	Asturias	2	1	Nueva Tabarca	Alicante	60	5
Pancha	Lugo	1	1	Olla	Alicante	1	2
S. Ciprián Chico	Lugo	1	0	Benidorm	Alicante	2	2
Ansarón	Lugo	12	1	Descubridor	Alicante	1	4
Coelleira	Lugo	20	3	Portichol	Alicante	1	2
San Pelayo	Lugo	7	2	Mitjana	Alicante	1	2
San Vicente	La Coruña	4	3	Columbrete Grande	Castellón	13	2
Sisarga Pequeña	La Coruña	6	1	Mancolibre	Castellón	1	1
Sisarga Grande	La Coruña	40	3	La Horadada	Castellón	2	1
Malante	La Coruña	4	1	Meda Gran	Girona	10	4
Lobeira Grande	La Coruña	7	1	Insua	Valencia do Minho	3	1
Sagres	La Coruña	5	1	Berlenga	Leiria	79	2
Sálvora	La Coruña	180	7	Estela	Leiria	3	1
Erbosa	La Coruña	4	1	Farilhoes	Leiria	12	1
Benencia	La Coruña	4	1	Pessegueiro	Porto Covo	8	3
Noro	La Coruña	3	1				

classification by Mateo (1990). It is a small island (8 ha) with a relatively high species richness, in comparison with other islands (Table 2; Mateo, 1990; Mateo, 1997). Islands with a similar size (7-10 ha; Table 2) are: Lobeira Grande, San Pelayo, de Dentro, of 7 ha and one to three species; Toja Pequeña, of 8 ha and one species;

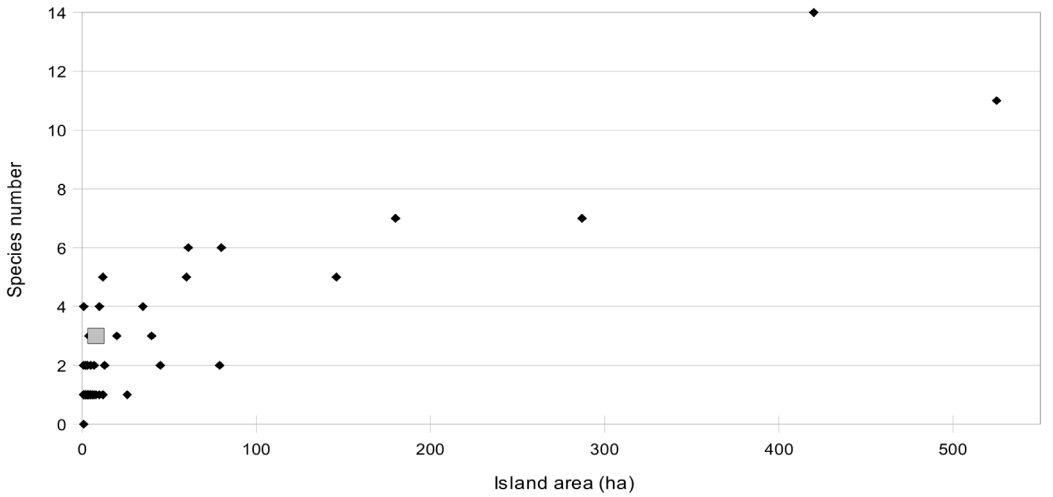

Figure 2. Relationship between number of reptile species and area of Iberian islands (see Table 2 for graph data). Pessegueiro Island is marked with a light gray square. Modified from Mateo (1990) and Mateo (1997).

and Virgen del Mar, of 10 ha and one species. Only Meda Gran, of 10 ha, has a larger number of species (four). On the other hand, islands with three species (Table 2) have a variable size, i.e. San Vicente (4 ha), de Dentro (7 ha), Coelleira (20 ha), and Sisarga Grande (40 ha). Therefore, it seems that Pessegueiro has more species than predicted by the island biogeography theory (MacArthur and Wison, 1967), where the species number depends on the area of the island (Fig. 2). Current studies showed however that species richness does not depend exclusively on island area but on other variables like habitat diversity (Kalmar and Currie, 2006; Triantis et al., 2008). Thus, the relatively high number of species on Pessegueiro could be the result of the proximity of the mainland. In fact, several species of amphibians and reptiles have been reported in the contiguous UTM squares (Table 3; Loureiro et al., 2008). However, Pessegueiro Island has conditions unsuitable for amphibian species (there is no freshwater available), as well as for some Atlantic reptiles (e.g. *L. schreiberi*). Moreover, only *Salamandra salamandra* can be found in islands smaller than 25 ha, but islands with a size around 3 ha can have some lizard species (e.g. *Podarcis* sp.; Mateo, 1997). Similarly, Pessegueiro could be too small for holding snakes and large lizards (e.g. *T. lepidus*); in the Iberian Peninsula, only islands larger than 10 ha have snakes or large lizards (Mateo, 1990; Mateo, 1997). *P. hispanica* and *Psammodromus algirus* do not appear in Pessegueiro probably due to the high atmospheric humidity. Other Mediterranean species might be found although as yet unrecorded, such as *T. mauritanica*, as a result perhaps of ancient introductions by humans (this species is supposed to be introduced in the Iberian Peninsula: Harris et al., 2004). This species is typical of Mediterranean islands (Mateo, 1997).

Currently, the island presents diverse conservation problems, such as vegetation degradation in the eastern part (probably due to tourist visits; see Fig 1), hunting and a very high bird mortality. In fact, I found many corpses of *Larus michahellis*, *Corvus monedula* and *Bubulcus ibis*, distributed along the whole island. The latter species formed groups in some cases up to 10 individuals. These groups could be the results of poison actions (J. Povoa, pers. comm). Future conservation problems might be caused by the release of aloctone species. People could release other lizard species (.e.g *Podarcis sicula*) or predator species (e.g. cats and rats). These introductions have caused the extinction of autochtone species (*Podarcis lilfordi*) in other Iberian islands (Menorca and Mayorca; Pérez-Mellado, 1998). Future research should be performed in Pessegueiro Island, in order to determine with accuracy the population densities for the three species; to evaluate the effect of tourist visits and other conservation problems on the flora and fauna; and to propose conservation measures, if necessary. These conservation measures should be easily applied, as the island belongs to the Natural Park of Sudoeste Alentejano e Costa Vicentina.

Table 3. Species reported on the mainland adjacent to Pessegueiro Island. Species record data were obtained from Loureiro et al., (2008). Species present also in Pessegueiro Island are bolded.

Amphibians	Reptiles
Salamandra salamandra	*Mauremys leprosa*
Triturus marmoratus	*Tarentola mauritanica*
Lissotriton boscai	*Lacerta schreiberi*
Pleurodeles waltl	*Timon lepidus*
Alytes cisternassi	*Podarcis hispanica*
Discoglossus galganoi	***Podarcis carbonelli***
Pelobates cultripes	*Psammodromus algirus*
Bufo bufo	*Psammodromus hispanicus*
Bufo calamita	***Chalcides bedriagai***
Pelodytes sp	***Blanus cinereus***
Hyla arborea	*Rhinechis scalaris*
Hyla meridionalis	*Haemorrhois hippocrepis*
Pelophylax perezi	*Malpolon monspessulanus*
	Macroprotodon brevis
	Natrix maura
	Vipera latastei

Acknowledgements. Many thanks to Clavadel's skipper A. Moura and to my crew mates J. Povoa, T. White and G. Saldanha for providing conditions to perform sampling on Pessegueiro. Many thanks to M.A. Carretero for revising the manuscript, and together with A. Loureiro, for their constant support and encouragement for sampling Pessegueiro, to P. Sá-Sousa for resolving doubts; and to J. Torres and P. Alves for providing information about Pessegueiro's vegetation.

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Accepted by Angelica Crottini; Managing Editor: Graham Walters