

Mitochondrial DNA sequence data confirms the presence of *Podarcis carbonelli*, PÉREZ-MELLADO, 1981 in southern Spain

Since its formal description as a subspecies of Bocage's Wall Lizard (i. e., *Podarcis bocagei carbonelli* PÉREZ-MELLADO, 1981), Carbonell's Wall Lizard has been considered endemic to the western Central Mountain System in Spain and Portugal. Morphological and molecular data have since suggested that *P. carbonelli* is a distinct species (HARRIS & SÁ-SOUSA 2001, 2002; SÁ-SOUSA & HARRIS 2002), and populations have been reported along the Portuguese Atlantic coast (SÁ-SOUSA 1999, 2000, 2001a).

The first report of *P. carbonelli* outside of the Central Mountain System was of a population near Doñana National Park, Andalusia, Spain (MAGRANER 1986), where it was reported in sympatry with *Podarcis hispanica* (STEINDACHNER, 1870). However *P. hispanica* is morphologically highly polymorphic, and almost all subsequent authors did not recognize this population as *P. carbonelli*, but rather argued that green *P. hispanica* individuals had been mistaken for *P. carbonelli* (e.g., PÉREZ-MELLADO 1997). Although the presence of *P. carbonelli* has again recently been reported (SÁ-SOUSA et al. 2001), until now no molecular studies have been performed to confirm the morphological diagnosis. Here we have sequenced part of the 12S rRNA mitochondrial gene from an individual morphologically identified as *P. carbonelli* from Playa de Rompeculos (figs. 1 and 2) to compare with sequences from all the genetically distinct groups of *Podarcis* known from the Iberian Peninsula (HARRIS & SÁ-SOUSA 2002).

Genomic DNA was extracted following standard high-salt protocols. The 12S rRNA fragment was amplified by PCR using the primers published in KOCHER et al. (1989) and conditions described in HARRIS et al. (1998). The amplified product was sequenced on an automated sequencer (ABI 310). This resulted in an unambiguous sequence 414 base pairs long. The sequence was deposited on Genbank, accession number AY214449.

The new sequence was analysed with 31 published sequences of Iberian *Podarcis* lizards, including all previously identified genetic lineages (HARRIS & SÁ-SOUSA 2002). Two individuals of *Podarcis muralis* (LAURENTI, 1768) (from Genbank) were designated as the outgroup. The data was analysed using PAUP* ver. 4.0b10 software package (SWOFFORD 2002). Of the 414 characters, 47 were parsimoniously informative. Using maximum parsimony, a 100 replicate heuristic search recovered 17 equally parsimonious trees of 85 steps. The strict consensus is shown in figure 3. All genetic lineages of *P. hispanica* are labelled following HARRIS & SÁ-SOUSA (2002). The individual of *P. carbonelli* from Doñana is marked with an asterisk. To estimate nodal support we used the bootstrap support (FELSENSTEIN 1985) with 1000 replicates. Bootstrap values above 50% are indicated above the respective nodes on figure 2.

Our analysis clearly shows that the individual belongs to the *P. carbonelli* lineage, the 12S rRNA sequence being identical to some other *P. carbonelli* previously published, all of which differ by at most two base pairs within this region of the gene. Although mitochondrial DNA sequence data alone should not be used to denote species status, our results corroborate our a priori morphological diagnosis. Our preliminary analysis of allozyme electrophoretic data similarly support this conclusion (PINHO et al. 2002). Therefore we can be confident that a population of *P. carbonelli* exists in south-west Andalusia. The closest known population of *P. carbonelli* to this one is in south-west Portugal, over 150 km to the West. Predictive modelling of distribution of *P. carbonelli* suggests that suitable habitat exists between these sites, as well as in the Toledo Mountains and the Sierra Morena (SÁ-SOUSA 2001b). Further prospecting in this area is needed to determine the full distribution of *P. carbonelli*. Recent detailed morphological identification keys for identifying *P. carbonelli* in the field relative to *P. hispanica* (SÁ-SOUSA 2001b) should be useful in this respect.

ACKNOWLEDGEMENTS: This project was supported by grants from Fundação para a Ciência e Tecnologia POCTI/34547/BSE/2000 and SFRH/BPD/



Fig. 1: Male *Podarcis carbonelli* PÉREZ-MELLADO, 1981 from Playa del Rompeculos, Andalusia, Spain.



Fig. 2: Playa del Rompeculos, Andalusia, Spain, habitat of the male *Podarcis carbonelli* of figure 1.

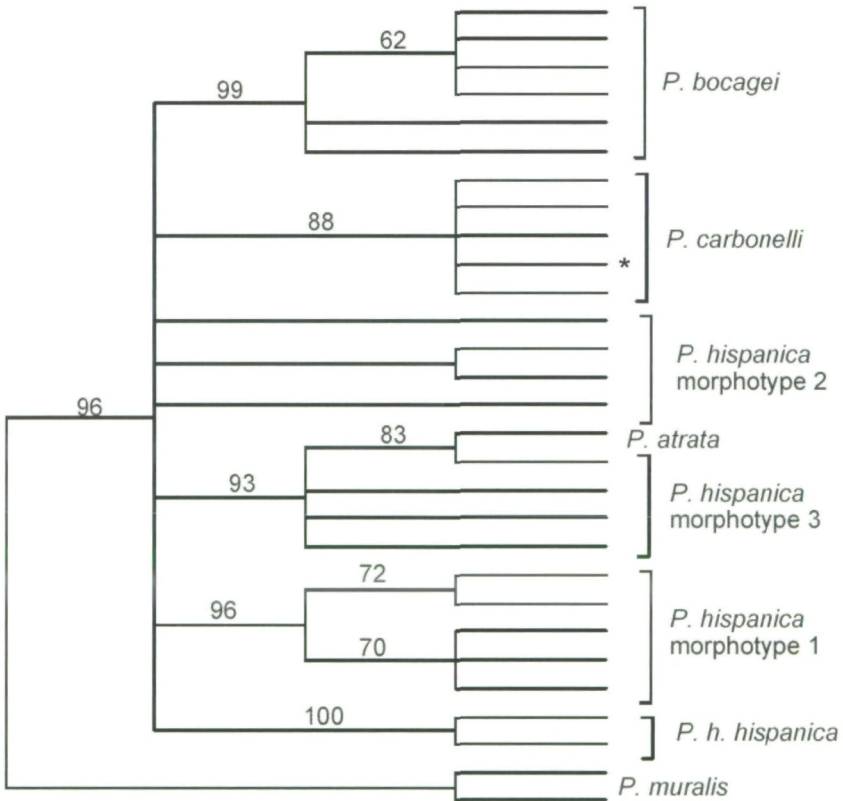


Fig. 3: Strict consensus of 17 Maximum Parsimony trees. Bootstrap support (>50%) is indicated above nodes. Major genetic lineages identified in previous analyses (HARRIS & SÁ-SOUSA 2002) are indicated. The individual from Doñana is marked with an asterisk (*).

5702/2001 (to DJH). Thanks to D. BARBOSA (CIBO, University of Porto) who assisted in fieldwork in Andalusia.

REFERENCES: FELSENSTEIN, J. (1985): Confidence limits on phylogenies: an approach using the bootstrap.- *Evolution*, Lawrence; 39: 783-791. HARRIS, D. J. & ARNOLD, E. N. & THOMAS, R. H. (1998): Rapid speciation, morphological evolution and adaptation to extreme environments in Sand Lizards (*Meroles*) as revealed by mitochondrial gene sequences.- *Molecular Phylogenetics and Evolution*, San Diego; 10: 37-48. HARRIS, D. J. & SÁ-SOUSA, P. (2001): Species distinction and relationships of the western Iberian *Podarcis* lizards (Reptilia, Lacertidae) based on morphology and mitochondrial DNA sequences.- *Herpetol. J.*, London; 11: 129-136. HARRIS, D. J. & SÁ-SOUSA, P. (2002): Is *Podarcis hispanica* a species complex? Evidence from mitochondrial DNA sequence data.- *Molecular Phylogenetics and Evolution*, San Diego; 23: 75-81. KOCHER, T. D. & THOMAS, W. K. & MEYER, A. & EDWARDS, S. V. & PAÄBO, S. & VILLABLANCA, F. X. & WILSON, A. C. (1989): Dynamics of mitochondrial evolution in animals: Amplification and sequencing with conserved primers. *Proc. Natn. Acad. Sci. U.S.A.*, Washington; 86: 6196-6200. MAGRANER, J. (1986): Nouvelle donnée sur la répartition de *Podarcis bocagei carbonelli* (V. PÉREZ-MELLADO, 1981) (Sauria, Lacertidae) dans la Péninsule Ibérique et observations sur son écologie à Doñana (Andalousie, Espagne).- *Bull. Soc. Herpetol. France*, Paris; 38: 6-12. PÉREZ-MELLADO, V. (1997): *Podarcis bocagei* (SEOANE, 1884); pp. 272-273. In: GASC, J.-P. & CABELA, A. & CRNOBRNJA-ISAILOVIC, J. & DOLMEN, D. & GROSSEN-BACHER, K. & HAFFNER, P. & LESCURE, J. & MARTÍNEZ, RICA, J. P. & MAURIN, H. & OLIVEIRA, M. E. & SOFIANIDOU, T. S. & VEITH, M. & ZUIDERWIJK, A. (eds): Atlas of amphibians and reptiles in Europe. *Societas Europaea Herpetologica & Museum National d'Histoire Naturelle de Paris*, Paris. PINHO, C. & HARRIS, D. J. & CARRETERO, M. A. & FERRAND, N. (2002): Análise de variação genética de marcadores proteicos em *Podarcis carbonelli*. VII Congr. Luso-Espanhol Herpetol., Évora, Portugal, October 2002. SÁ-SOUSA, P. (2000): Distribución de la lagartija *Podarcis carbonelli* (PÉREZ-MELLADO, 1981) en Portugal.- *Bol. Asoc. Herpetol. Española*, Madrid; 11(1): 12-16. SÁ-SOUSA, P. (2001a): Comparative chorology between *Podarcis bocagei* and *P. carbonelli* (Sauria: Lacertidae) in Portugal.- *Rev. Española Herpetol.*, Barcelona; 15: 85-97. SÁ-SOUSA, P. (2001b): A controversa sistemática das lagartixas do género *Podarcis* WAGLER, 1830 (Sauria, Lacertidae) em Portugal. PhD. Univ. Lisboa. SÁ-SOUSA, P. & GONZÁLEZ DE LA VEGA, J. P. & BARNESTEIN, J. A. M. (2001): Presencia de la lagartija *Podarcis carbonelli* en Andalucía.- *Bol. Asoc. Herpetol. Española*, Madrid; 12(2): 77-79. SÁ-SOUSA, P. & HARRIS, D. J. (2002 in press): *Podarcis carbonelli* PÉREZ-MELLADO, 1981 is a distinct species.- *Amphibia-Reptilia*, Leiden; 23 (4). SWOFFORD, D. L. (2001): PAUP*: Phylogenetic Analysis Using Parsimony (and other methods) 4.0.b5. Sinauer Associates, Sunderland, Massachusetts, USA.

KEY WORDS: Reptilia, Squamata, Lacertidae, *Podarcis carbonelli*, Spain

SUBMITTED: November 6, 2002

AUTHORS: D. James HARRIS PhD; Vasco BA-

TISTA; Miguel A. CARRETERO PhD; Catarina PINHO, Centro de Investigação em Biodiversidade e Recursos Genéticos (CIBIO\UP), ICETA, Campus Agrário de Vairão, 4485-661 Vila do Conde, Portugal < james@mail.icav.up.pt >; Paulo SÁ-SOUSA, Laboratório de Biologia da Conservação, Departamento de Biologia, Universidade de Évora, P-7002-554, Évora, Portugal.

New records of *Lacerta horvathi* MÉHELY, 1904, in Carinthia (Austria)

During herpetological field studies on the biology and distribution of *Zootoca vivipara* (JACQUIN, 1787) (MAYER et al. 2000), three new locations were discovered in Carinthia (southern Austria) in which Horvath's Rock Lizard *Lacerta horvathi* MÉHELY, 1904, occurs.

Two record localities are situated in the mountain range of the eastern 'Gailtaler Alpen' (municipality of 'Berg im Drautal'), one in the 'Lienzer Dolomiten' mountains (municipality of Oberdrauburg) (fig. 1). The valley of the river Gail separates the above massifs from the hitherto known Carinthian distribution area of *L. horvathi* in the Southern Limestone Alps (Carnic Alps and Karawanken Mountains). The new records extend the known Carinthian range of *L. horvathi* about 5 km to the north. Minimum distance to the nearest 'old' record locations is about 10 km linear distance in each case.

In two of the new record localities, *L. horvathi* occurs syntopic with *Podarcis muralis* (LAURENTI, 1768) (at altitudes between 900 m and 1,000 m a.s.l.). In close vicinity to the new *L. horvathi* records, *Zootoca vivipara carniolica* MAYER et al., 2000 was observed in two locations (at altitudes of about 950 m a.s.l.) and *Anguis fragilis* LINNAEUS, 1758 in one case (at 1,000 m a.s.l.). In the last years, syntopy of *L. horvathi* and *P. muralis* was also observed at the Bärenthal valley location in the Karawanken Mountains (at 650-750 m a.s.l.). In Austria, *L. horvathi* shares its habitats also with *Zootoca vivipara vivipara* (JACQUIN, 1787) (FRANZEN et al. 1993; SCHMIDTLER & SCHMIDTLER 1996; GRILLITSCH & CABELA 2001), and reportedly also with *Vipera berus* (LINNAEUS, 1758), *Natrix natrix* (LINNAEUS, 1758), and *Elaphe longissima* (LAURENTI, 1768) (MARKERT 1990). Syntopic occurrence of *L. horvathi* and *P. muralis* or *Z. vivipara* was also

ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Herpetozoa](#)

Jahr/Year: 2002

Band/Volume: [15_3_4](#)

Autor(en)/Author(s): Harris James, Batista Vasco, Carretero Miguel A., Pinho Caterina, Sa-Sousa Paulo

Artikel/Article: [Mitochondrial DANN sequence data confirms the presence of Podarcis carbonelli, PEREZ-MELLADO, 1981 in southern Spain 188-190](#)