

First record of *Tarentola mauritanica* (LINNAEUS, 1758) on Porto Santo Island

Madeira is a relatively large volcanic island (circa 770 km²) lying about 700 km from the western coast of Africa and about 900 km from the southwestern coast of Europe (Portugal) (from 32°37'52"N to 32°52'08"N, and from 16°39'19"W to 17°15'54"W; PEREIRA 1989). The subaerial part of the island is about 4.6 – 5.2 million years old (GELDMACHER et al. 2000; PRADA & SERRALHEIRO 2000). Porto Santo is a small island (circa 41 km²) located 38 km north-east from Madeira (from 33°07'35"N to 33°59'40"N, and from 16°24'35"W to 16°16'35"W; PEREIRA 1989) and the oldest island of the Archipelago, aged about 14 million years (GELDMACHER et al. 2000). The sea depth between the two islands is greater than 2000 m, indicating that they have never been joined. The native herpetofauna is very depauperate, probably due to the great geographical isolation of these islands from any continental source populations.

Lacerta dugesii MILNE-EDWARDS, 1829 is the sole extant flightless vertebrate endemic to Madeira. Introduced *Hemidactylus mabouia* (MOREAU DE JONNÉS, 1818) was first reported in Funchal (Madeira island) almost five years ago (JESUS et al. 2002). Since then several observations were made in the Funchal area.

Tarentola mauritanica (LINNAEUS, 1758) is also a recent introduction and was first reported to Madeira almost 15 years ago (BÁEZ & BISCOITO 1993). The first data of its occurrence referred only to a small locality, Garajau, 7 km east of Funchal. Since this report, the species has been observed in several places as far as 20 km from its initial location. This species was unknown to Porto Santo Island until now. We captured one individual and further surveying revealed many more individuals on this island. This leads us to believe that a larger population exists.

The genus *Tarentola* (Reptilia, Gekkonidae) contains about 22 species that are very similar in their external morphology. These species occur in North Africa, coastal regions of Mediterranean Sea, Macaronesian archipelagos (Madeira, Selvagens,

Canaries and Cape Verde), Cuba and the Bahamas (HARRIS et al. 2004b).

The Moorish Gecko *Tarentola mauritanica* is widespread in North Africa from Mediterranean to Sahara, Iberian Peninsula, the Mediterranean coast of France and Italy and isolated populations in Greece, Israel, and many Mediterranean islands (ARNOLD et al. 1978; ANDRADA 1985; ESCRIVA 1987; MARTÍNEZ-RICA 1997a, 1997b; MATEO 1997). Due to its anthropophilic behavior and adaptive capacity, the species spread in Europe and was introduced to some distant places such as North and South America and some places in Africa (MARTÍNEZ-RICA 1997b), as well as some islands like the Canaries (MARTÍNEZ-RICA 1997b).

According to HARRIS et al. (2004b), a single mitochondrial (mtDNA) haplotype was found among the individuals from Portugal, Spain, Italy, Tunisia, Menorca, Crete and Madeira, suggesting that *T. mauritanica* may be introduced across Europe. However, HARRIS et al. (2004a), with additional sampling found that at least some Iberian populations appeared to be different, and thus, possibly native.

One individual was captured in Funchal (Rua Imperatriz Dona Amélia), two in Garajau, one in Porto Santo and one in the Algarve (mainland Portugal). All, except the Porto Santo individual, are vouchers housed in the collection at the University of Madeira (collection codes: 361 for the individual from Algarve, 363 and 367 for the two individuals from Garajau, and 400 for the Funchal specimen). The individual from Porto Santo was observed and photographed in the field, and the tip of the tail was clipped and subject to DNA analysis, and then the gecko was released. Morphological analysis indicates that these five geckos captured in these islands were *T. mauritanica mauritanica* (Figs. 1-2).

Genomic DNA was extracted following standard phenol-chloroform protocols. For each individual 12S rRNA fragments were amplified by PCR using the primers according to KOCHER et al. (1989) and conditions described in HARRIS et al. (1998). For one individual from Porto Santo and one from Funchal 16S rRNA fragments were amplified by PCR using primers according to SIMON et al. (1990).



Figs. 1-2: *Tarentola mauritanica* (LINNAEUS, 1758) from Porto Santo Island, Madeira Archipelago.
Photos: Miguel SEQUEIRA.

Amplified products were sequenced on an automated sequencer (ABI[®] 310) in both directions. This resulted in unambiguous sequences of 360 base pairs for the 12S rRNA and 485 base pairs for the 16S rRNA. New sequences were deposited on GenBank, accession numbers EU148479 to EU148485.

The alignment by eye of sequences showed them all to be identical. Comparison of these sequences to sequences from GenBank, shows they are also identical for both regions to four sequences of *T. mauritanica mauritanica* obtained by HARRIS et al. (2004a). These sequences belong to the following individuals (according to HARRIS et al. 2004a): Tm30 (16S - AY828485, 12S - AY828459), Tm29 (AY828484, AY828459) Tm27 (AY828483, AY828458) from the Iberian Peninsula and Tm58 (AY828482,

AY828457) from Morocco. All these animals belong to a clade that includes individuals of Portugal, Spain, Italy, Tunisia, Menorca, Crete, Madeira and Morocco (see HARRIS et al. 2004a), and could be considered as an introduced lineage in Europe.

The absence of variability among Madeiran samples and between these samples and one of the European lineages seems to indicate that the geckos found in Madeira and Porto Santo were introduced individuals probably originating from the same lineage that occurs in most of Europe. Although it is not possible to define the place of origin with these markers, they were likely to come from the Iberian Peninsula. This interpretation is most probable, because it is between the Iberian Peninsula and Madeira that the main maritime traffic occurs.

However, in the study of NOGALES et al. (1998), two individuals from Madeira were sequenced for 12S and they were not identical, differing in 9 sites in Cytochrome b. If this is the case, there is still the possibility that not all geckos from Madeira may be introduced, or they were introduced from different origins. Our data does not support this hypothesis but further sampling is needed.

With these results it is not possible to elucidate the origin of the geckos found in Porto Santo Island. Two possibilities arise; one that the origin was continental and the other that the origin was from Madeira. It is also impossible to say if it was one, two or more introduction events in Madeira and Porto Santo.

Originally referred only to Garajau, the species has since been found in other areas such as Funchal, São Martinho, Caniço, etc., places 10 km or more from the original locality, suggesting a quick spread of the species.

Only one individual from Porto Santo was analyzed but others were frequently seen in the last months in the island.

In just 15 years the species increased their geographic distribution, including the spreading to another island, and this increase seems gradual, as in intermediate reports the area of distribution was smaller (see JESUS et al. 2002).

The spread of the species is worrisome from a conservation point of view, because Porto Santo is a very small and dry island with just one extant native lizard. This situation clearly deserves careful monitoring.

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REFERENCES: ANDRADA, J. (1985): Guía de campo de los anfibios y reptiles de la Península Ibérica. Barcelona (Ediciones Omega), pp. 160. ARNOLD, E. N. & BURTON, J. A. & OVENDEN, D. W. (1978): A field guide to the reptiles and amphibians of Britain and Europe. London (Collins), pp. 272. BÁEZ, M. & BISCOITO, M. (1993): First record of *Tarentola mauritanica mauritanica* form the island of Madeira (NE Atlantic). First symposium of fauna and flora of the Atlantic islands. October, 1993, Funchal, Madeira. Abstracts. p. 7. ESCRIVA, L. J. (1987): La guía de INCAFO de los anfibios y reptiles de la Península Ibérica, Islas Baleares y Canarias. Madrid (INCAFO), pp. 694. GELDMACHER, J. & VAN DER BOGAARD, P. & HOERNLE, K. &

SCHMICKE, H. (2000): The $^{40}\text{Ar}/^{39}\text{Ar}$ age dating of the Madeira Archipelago and hotspot track (eastern North Atlantic).- Geochemistry Geophysics Geosystems [electronic Journal <http://www.g-cubed.org/>], Washington D.C.; 1: 1999GC000018. HARRIS, D. J. & ARNOLD, E. N. & THOMAS, R. H. (1998): Rapid speciation, morphological evolution and adaptation to extreme environments in Sand Lizards (*Merolles*) as revealed by mitochondrial gene sequences.- Molecular Phylogenetics and Evolution; San Diego; 10: 37-48. HARRIS, D. J. & BATISTA, V. & CARRETERO, M. A. & FERRAND, N. (2004a): Genetic variation in *Tarentola mauritanica* (Reptilia: Gekkonidae) across the Strait of Gibraltar derived from mitochondrial and nuclear DNA sequences.- Amphibia-Reptilia, Leiden; 25: 451-459. HARRIS, D. J. & BATISTA, V. & LYMBERAKIS, P. & CARRETERO, M. A. (2004b): Complex estimates of evolutionary relationships in *Tarentola mauritanica* (Reptilia: Gekkonidae) derived from mitochondrial DNA sequences.- Molecular Phylogenetics and Evolution, San Diego; 30: 855-859. JESUS, J. & FREITAS, A. & BREHM, A. & HARRIS, D. J. (2002): An introduced population of *Hemidactylus mabouia* (MOREAU DE JONNÉS, 1818) on Madeira Island.- Herpetozoa, Wien; 15 (3/4): 179-180. MARTÍNEZ-RICA, J.-P. (1997a): *Tarentola mauritanica*. pp. 214-215. In: GASC, J. P. & CABELA, A. & CRNOBRNJIA-ISAILOVIC, J. & DÖLMEN, D. & GROSSENACHER, K. & HÄFFNER, P. & LESCURE, J. & MARTENS, H. & MARTÍNEZ-RICA, J. P. & MAURIN, H. & OLIVEIRA, M. E. & SOFIANDIDOU, T. S. & VEITH, M. & ZUIDERWIJK, A. (eds.): Atlas of amphibians and reptiles in Europe. Paris (Societas Europaea Herpetologica and Muséum National d'Histoire Naturelle). MARTÍNEZ-RICA, J. P. (1997b): *Tarentola mauritanica* LINNAEUS 1758; pp. 202-204. In: PLEGUEZUELOS, J. M. (ed.): Distribución y biogeografía de los anfibios y reptiles en España y Portugal. Granada (Universidad de Granada y asociación Herpetológica Española). MATEO, J. A. (1997): Las islas e islotes del litoral ibérico; pp. 343-350. In: PLEGUEZUELOS, J. M. (ed.): Distribución y biogeografía de los anfibios y reptiles en España y Portugal. Granada (Universidad de Granada y asociación Herpetológica Española). NOGALES, M. & LÓPEZ, M. & JIMÉNEZ-ASENSIO, J. & LARRUGA, J. M. & HERNÁNDEZ, M. & GONZÁLEZ, P. (1998): Evolution and biogeography of the genus *Tarentola* (Sauria: Gekkonidae) in the Canary islands, inferred from mitochondrial DNA sequences.- Journal of Evolutionary Biology, Basel; 11: 481-494. PEREIRA, E. (1989): Ilhas de Zargo; vol. 1, 4th ed.. Funchal (Câmara Municipal do Funchal), pp. 767. PRADA, S. & SERRALHEIRO A. (2000): Stratigraphy and evolutionary model of Madeira Island.- Bocagiana, Funchal; 200: 1-13. SIMON, C. & FRANK, A. & MARTIN, A. (1990): The polymerase chain reaction: DNA extraction and amplification; pp 329-357. In: HEWITT, G. & JOHNSON, A. & YOUNG, J. (eds.): Molecular techniques in taxonomy. Vol. H57. NATO ASI series. Berlin (Springer).

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