

## SHORT NOTES

## The karyotype of the Formentera island garden dormouse, *Eliomys quercinus ophiusae*

Maria da Graça Ramalhinho<sup>1</sup> and Roland Libois<sup>2</sup>

<sup>1</sup> Centro de Biologia Ambiental, Museu Zoológico e Antropológico, Universidade de Lisboa, Rua da Escola Politécnica, 58, Pt-1269-102 Lisboa, Portugal

<sup>2</sup> Unité de recherches zoogéographiques, Institut de Zoologie, Université de Liège, Quai Van Beneden, 22, B-4020 Liège, Belgique and Museu Zoológico e Antropológico, Universidade de Lisboa, Rua da Escola Politécnica, 58, 1269-102 LISBOA

KEY WORDS: *Eliomys quercinus*, Karyotype, Biogeography, Balearic Islands.

The present terrestrial mammal fauna of the Balearic archipelago is the result of human introductions having occurred merely during the Holocene (1,2). Along with the wood mouse (*Apodemus sylvaticus*), the garden dormouse, *E. quercinus*, is the most ancient immigrant mammal on the archipelago. Its presence has been reported on all the four main islands but it is now extinct in Ibiza (2). Subfossil remains date back at least to 6000 y. BP in Mallorca and Menorca (2,3). Commercial exchanges are known to have occurred since that time between the human populations of the archipelago and those living around the Mediterranean Sea, including African coasts (4). Therefore, the geographic origin of the populations inhabiting the various islands may be different as well as their genetic characteristics. This assumption is reinforced by the fact that the endoparasitic spectrum of the garden dormouse differs from one island to another (5).

Morphology also differs; two distinct subspecies have been described from the area:

*E. q. gymnesicus* Thomas, 1903 from Menorca is included in the "*quercinus* group", the ventral part of its tail being entirely white. Though considered similar to the central European form, its subspecific status was retained in view of the geographic isolation of the island population (6,7). The form of Mallorca has been included in that subspecies (8,9). However, more recently, it has been considered as a transitional form between the "*lusitanicus*" and the "*quercinus*" groups, most of the specimens having a typical black ring at the end of the tail.

*E. q. ophiusae* Thomas, 1925 is the biggest form of the garden dormouse known in the world. Undoubtedly, it

belongs to the "*lusitanicus*" group. Its geographic distribution is restricted to the island of Formentera.

However, there is no correspondence between these morphotypes and the five karyotypes described in the garden dormouse (genus *Eliomys*) either in Europe (*E. quercinus*: 2n = 48, 50, 52 or 54, ), northern Africa (*E. melanurus*: 2n = 46) or Israel (*E. melanurus*: 2n = 48) (10, 11, 12, 13,14).

As far as the Balearic islands are concerned, a diploid number of 2n = 48 has been reported (15 and not 16, as stated in 12). Unfortunately, no details are given about the precise location (island) of the capture site and the source of information is not mentioned.

Therefore, we here report our analyses of the karyotype of the garden dormouse from Formentera, endeavouring to throw some light on the origin of the settlement of the species in this area.

Two specimens from Formentera were cytologically analysed. Microscope slides for observation of the chromosomes in somatic metaphases were prepared by direct treatment of the bone marrow (17). G-banding was obtained by the technique of Seabright (18). The diploid number (2n) and chromosome morphological characteristics were analysed using a Leica Q500 image analyser and Leica Chantal and Qwin software.

The karyotype of both specimens has a diploid number of 2n = 48 (fig. 1). It is composed of four pairs of large sized subtelocentric chromosomes, eight pairs of meta and ten pairs of submetacentric chromosomes, and one pair of acrocentric chromosomes. The X chromosome is large metacentric and Y is punctiform. The G-band pattern of the largest autosome pair shows complete band correspondence between karyotypes from Spain (15,16), mainland Italy (10,12) and Dalmatia (19) and is well differentiated from the pattern observed in the Israeli dormice (11).

Since the karyotype of North African garden dormice is 2n = 46 (12, 20, 21) while the 2n = 48 karyotype has only been reported in southern Europe (either in the Iberian

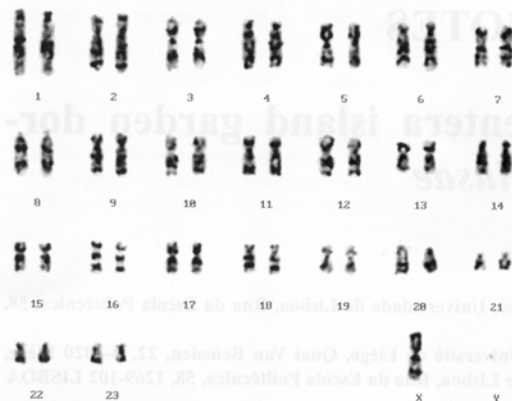


Fig. 1. – Karyogramme of a male garden dormouse (*Eliomys quercinus*) from the Formentera island (Balearic Islands, Spain). The chromosomes are numbered according to their homology with those presented in ref. 15. Sex chromosomes are in the bottom right hand corner.

Peninsula (16, 22), Italy (10,11), Dalmatia (23), Romania (24) or in some islands (Sicily, 10; Lipari, 25; Corsica, 26)) it can be assumed that the origin of the Formentera dormouse is southern Europe. Furthermore, the presence of only one acrocentric pair indicates a correspondence with the Iberian karyotypes (15, 16, 22) since the central Mediterranean *Eliomys* karyotypes are characterised by three pairs of acrocentric autosomes (12, 19). Therefore, it seems that the Garden dormouse of Formentera has been introduced there from mainland Spain, as was also the wood mouse to Ibiza, Menorca and Mallorca (27).

Thanks are expressed to Catherine Hallet for her help in the field and to Jorge Prudêncio for his technical assistance.

## REFERENCES

- VIGNE, J.D. & J.A. ALCOVER (1985). Incidences des relations historiques entre l'homme et l'animal dans la composition actuelle du peuplement amphibien, reptilien et mammalien des îles de Méditerranée occidentale. *Actes 110<sup>e</sup> Congrès nat. Soc. Savantes (Montpellier, 1985), Section Sciences*, 2: 79-91.
- ALCOVER, J.A. (1988). *Els Mamífers de les Balears*. Ed. Moll, Palma de Mallorca, 194 p.
- REUMER, J.W.H. & E.A.C. SANDERS (1984). Changes in vertebrate fauna of Menorca in Prehistoric and classical times. *Zeitschr. f. Säugetierkunde*, 49: 321-325.
- CAMPS, G. (1990). *Navigation et migrations en Méditerranée de la Préhistoire à nos jours*. Collioure, 1983 – Sète 1985. CNRS, Paris, p. 138-156.
- ESTEBAN, J.G., M.D. BARGUES, M.A. VALERO & S. MAS-COMA (1987). Analisis bioecológico comparado de las helmintofaunas del liron careto, *Eliomys quercinus* Linnaeus, 1766 (Rodentia, Gliridae) en el archipiélago balear (España). In: *Mamíferos y helmintos*, V. SANS-COMA, S. MAS-COMA Y J. GOSALBEZ (Eds.), Ketres, Barcelona: 167-173.
- KAHMANN, H. & TIEFENBACHER (1969). Der Gartenschläfer, *Eliomys quercinus*, der Baleareninsel Menorca. *Säugetierkd. Mitt.*, 17: 242-247.
- KAHMANN, H. & G. THOMS (1973). Der Gartenschläfer (*Eliomys*) Menorca. *Säugetierkd. Mitteil.*, 21: 65-73.
- COLOM G. (1957). *Biogeografía de las Baleares*. Est. Gral. Lul., Mallorca, 568 p.
- COMPTE, A. (1968). Una captura de *Nyctinomus taeniotis* (Rafinesque) en Mallorca. *Bol. Soc. Hist. Nat. Baleares*, 4: 7-8.
- CRISTALDI, M. & R. CANIPARI (1976). À propos de la caryologie du lérot (*Eliomys quercinus*). *Mammalia*, 40: 475-488.
- FILIPPUCCI, M.G., S. SIMSON, E. CAPANNA & E. NEVO (1988). The chromosomes of Israeli garden dormouse, *Eliomys melanurus* Wagner, 1840 (Rodentia, Gliridae). *Boll. Zool.*, 55 (1): 31-33.
- FILIPPUCCI, M.G., M.V. CIVITELLI & E. CAPANNA (1988). Evolutionary genetics and systematics of the garden dormouse, *Eliomys* Wagner, 1840. 1. Karyotype divergence. *Boll. Zool.*, 55 (1): 35-45.
- FILIPPUCCI, M.G., E. RODINO, E. NEVO & E. CAPANNA (1988). Evolutionary genetics and systematics of the garden dormouse, *Eliomys* Wagner, 1840. 2. Allozyme diversity and differentiation of chromosomal races. *Boll. Zool.*, 55 (1): 47-54.
- FILIPPUCCI, M.G., F. CATZEFELIS & E. CAPANNA (1988). Evolutionary genetics and systematics of the garden dormouse, *Eliomys* Wagner, 1840 (Gliridae, Mammalia). 3. Further karyological data. *Boll. Zool.*, 57: 149-152.
- ARROYO-NOMBELA, J.J., C. RODRIGUEZ MURCIA, M. DELIBES, & F. HIRALDO (1982). Comparative karyotype studies between Spanish and French populations of *Eliomys quercinus* L. *Genetica*, 59: 161-166.
- DIAZ DE LA GUARDIA, R.S. & M. RUIZ GIRELA (1979). The chromosomes of three Spanish subspecies of *Eliomys quercinus* (Linnaeus). *Genetica*, 51 (2): 107-109.
- BAKER, R.J., M.W. HAIDUK, L.W. ROBBINS, A. CADENA & B.F. KOOP (1982). Chromosomal studies of south American bats and their systematic implications. *Spec. Publ. Pymatuning Lab. of Ecology*, 6: 303-327.
- SEABRIGHT, M.A. (1971). A rapid banding technique for human chromosomes. *Lancet*, 2: 971-972.
- VUJOSEVIC, M., M.G. FILIPPUCCI, J. BLAGOJEVIC & B. KRYS-TUFEK (1993). Evolutionary genetics and systematics of the garden dormouse, *Eliomys* Wagner, 1840. 4. Karyotype and allozyme analyses of *E. quercinus dalmaticus* from Yugoslavia. *Boll. Zool.*, 60: 47-51.
- TRANIER, M. & F. PETTER (1978). Les relations d'*Eliomys tunetae* et de quelques autres formes de lérots de la région méditerranéenne (Rongeurs, Muscardinidae). *Mammalia*, 42: 349-353.
- DELIBES, M., F. HIRALDO, J.J. ARROYO NOMBELA & C. RODRIGUEZ MURCIA (1980). Disagreement between morphotypes and karyotypes in *Eliomys* (Rodentia, Gliridae): the chromosomes of the central Morocco Garden dormouse. *Säugetierkd. Mitt.*, 28: 289-292.
- PRUDÊNCIO, J. (1998). *Contribuição para o estudo dos padrões de reprodução, crescimento pós-natal e cariotipos*

- de alguns micromamíferos da Serra da Samarra*. Rel. estagio Lic. Biol. Fac. Ciências, Univ. Lisboa, 46 p. + ann.
23. DULIC, B. (1978). Chromosomes of small mammals from the southwest karstic regions of Yugoslavia. In: Obrtel, R., Foll, C. & Pellantova, J. (eds.) *Abstracts IInd Intl. Theriol. Congress*, Brno, p. 133.
24. MURARIU, D., A. LUNGEANU, L. GAVRILA & C. STEPAN (1985). Preliminary data concerning the study of the karyotype of *Eliomys quercinus* (Linnaeus, 1766) (Mammalia, Gliridae). *Trav. Mus. Hist. Nat. Grigore Antipa*, 27: 325-327.
25. GODENA, G., F. D'ALONZO, F. & M. CRISTALDI (1978). Corrélations entre caryotypes et biotypes chez le lérot (*Eliomys quercinus*) et les autres rongeurs de l'île Lipari. *Mammalia*, 42: 382-384.
26. ORSINI, Ph. 1987. Le lérot. In: *Les mammifères en Corse*. Ed. Parc nat. reg. Corse, Ajacciu, Gallia Préhistoire, 26 (suppl.): 99-101.
27. MICHAUX, J.R., R. LIBOIS, M.G. RAMALHINHO & C. MAUROIS (1998). On the mtDNA restriction patterns variation of the Iberian wood mouse (*Apodemus sylvaticus*). Comparison with other west Mediterranean populations. *Hereditas*, 129: 187-194.

Received: October 25, 2000

Accepted: November 30, 2000