Ann. Parasitol. Hum. Comp., 1991, *66* : n° 3, 121-125.

Mémoire.

Key-words: Helminths. *Microtus (Microtus) cabrerae.* Arvicolids. Iberian Peninsula.

Mots-clés : Helminthes. *Microtus (Microtus) cabrerae.* Arvicolidés. Péninsule Ibérique.

HELMINTHFAUNA OF *MICROTUS (MICROTUS) CABRERAE* (THOMAS, 1906) (RODENTIA: ARVICOLIDAE) IN THE IBERIAN PENINSULA: FAUNISTIC AND ECOLOGICAL CONSIDERATIONS

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SUMMARY

Faunistic and ecological study of parasitic helminths of *Microtus (Microtus) cabrerae* (Thomas, 1906) (Rodentia: Arvicolidae) in the Iberian Peninsula. 70 specimens have been dissected, coming from 8 enclaves located in three Spanish provinces; 6 species of helminths have been detected (1 Digenetic Trematode, 4 Cestodes and 1 Nematode). Structure of helminthfauna of *M. (M.) cabrerae* in relation to remaining Iberian Arvicolids and the most conditionating ecological factors of the helminthfauna of the Rodent are analyzed.

RÉSUMÉ : **Helminthofaune de *Microtus (Microtus) cabrerae* (Thomas, 1906) (Rodentia : Arvicolidae) dans la Péninsule Ibérique : étude faunistique et écologique.**

Les résultats d'une étude faunistique et écologique des helminthes parasites de *Microtus (Microtus) cabrerae* (Thomas, 1906) (Rodentia : Arvicolidae) dans la Péninsule Ibérique sont exposés. Au total, 70 individus hôtes, provenant de 8 localités et de 3 provinces, ont été disséqués. Ils étaient parasités par 6 espèces d'helminthes (1 Trématode, 4 Cestodes et 1 Nématode). Les caractéristiques écologiques et la structure de l'helminthofaune de *M. (M.) cabrerae* sont analysées et comparées à celles des autres Arvicolidés ibériques.

INTRODUCTION

At present ten species of Arvicolid Rodents live in the Iberian Peninsula, of which, only in a few *(Clethrionomys glareolus* Schreber, 1780; *Arvicola terrestris* Linnaeus, 1758; *Microtus agrestis* Linnaeus, 1761) their helminthfaunas have been made known (Mas-Coma *et al.*, 1978; Feliu *et al.*, 1984; Feliu, 1987). The available data concerning to the structure of helminthfauna of the remaining Arvicolids in the Iberian Peninsula, suggests that the parasitofauna of said Rodents is conditioned mainly by three factors; that is to say, way of life (terrestrial, subterranean, amphibian), feeding habits (which are chiefly vegetarian) and peninsular geographic distribution (large part of species inhabit only northern of the Peninsula, while having continuity with continental populations) (Feliu, unpublished data).

The parasitic survey of *Microtus (Microtus) cabrerae* (Thomas, 1906) has allowed access to new information related to the characteristics of helminthfauna of iberian Arvicolids, since it is an endemic species of the Peninsula, which is uncommon; furthermore, essentially, it is not applicable to relate their helminthfauna with Paleartic dispersion of the host, starting from an european origin, as occurs in the majority of peninsular Arvicolids (Feliu, 1987). At the same time the rather exact geographic location of this Rodent in Iberian (Ayarzagüena *et al.*, 1975, Niethammer, 1982) suggests that populations are discontinous or isolated, limited to biotopes of a rather peculiar nature (Niethammer *et al.*, 1964). These phenomena together with semisubterraneous habits of this Rodent which builds most characteristic « tracks » (Ayarzagüena *et al.*, 1976) are aspects that do not occur in other species of Arvicolids, and therefore, must be taken into account within the global helminthecological study of Arvicolids.

Up to now, the only data well known concerning the parasitic helminths of *Microtus cabrerae* have arisen from definite systematic or faunistic studies (Murai *et al.*, 1980;

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Accepté le : 3 juin 1991.

FIG. 1. — Map of the Iberian Peninsula showing localities supplied material for the present study.

Feliu *et al.*, 1986) or from writings in which the helminthfauna of iberian Arvicolids has been analyzed from a global point of view (Rocamora *et al.*, 1978; Climent *et al.*, 1987; Sol *et al.*, 1987; Feliu *et al.*, 1988 y 1989).

MATERIAL AND METHODS

70 specimens of *Microtus cabrerae* coming from 8 enclaves located in three Spanish provinces have been studied in this study *(Fig. 1)*. Said enclaves are: Prov. of Cáceres (CC) : 1) Santiago de Alcántara (2 specimens); 2) Villanueva de la Vera (1). Prov. of Cuenca (Cu) : 3) Colliga (1); 4) Hortizuela (1); 5) Villanueva de los Escuderos (12). Prov. of Madrid (M) : 6) Cadalso de los Vidrios (2); 7) El Pardo (5); 8) Pelayos de la Presa (46).

RESULTS

In the analyzed Rodents it has been possible to verify the presence of 6 species of helminths.

Trematoda.
Fam. Notocotylidae Lühe, 1909.
Notocotylus neyrai González Castro, 1945.
Prevalence of infestation: 2.8 %.

Found merely in two hosts proceeding from Villanueva de los Escuderos, this worm was easily identifiable from the thorough study of Simón Vicente *et al.* (1985*a*). The existence of a cirrus spinous and a short metraterm, funnel-shaped and surrounded by a glandular ring, could be verified in our material. These are the most characteristic features of this species, which parasitizes in caecum.

Cestoda.
Fam. Taeniidae Ludwig, 1886.
Taenia taenuicollis Rudolphi, 1819 *larvae.*
Prevalence of infestation: 2.8 %.

In the liver of two *M. cabrerae* from Pelayos de la Presa it was possible to detect the larval stage of a species of Taeniid, whose size and general morphology, in particular shape, number and size of scolex hooks, corresponded to that described by Murai (1982) and Murai and Tenora (1973) for *T. taenuicollis.*

Fam. Anoplocephalidae Cholodkowsky, 1902.
Anoplocephaloides dentata (Galli-Valerio, 1905).
Prevalence of infestation: 25.7 %.

In the caecum of several specimens captured at Villanueva de los Escuderos and Pelayos de la Presa this small Cestode was found, easily recognizeable by means dimensions of its scolex, number of strobila segments and presence of an unarmed cirrus (Rausch, 1976; Meszaros and Murai, 1979; Tenora and Murai, 1980; Genov, 1984; Genov and Georgiev, 1988).

Paranoplocephala omphalodes (Hermann, 1783).
Prevalence of infestation: 4.2 %.

Studies carried out by Tenora and Murai (1980) and Tenora *et al.* (1984, 1985, 1986) regarding the genus *Paranoplocephala* allowed identification of this species, discovered in small intestine of three specimens of *M. cabrerae,* from Villanueva de los Escuderos and Pelayos de la Presa.

Paranoplocephala mascomai Murai, Tenora et Rocamora, 1980.
Prevalence of infestation: 12.8 %.

This enteric and stenoxenous species, was isolated from hosts captured at Santiago de Alcántara, Villanueva de los Escuderos and Pelayos de la Presa. In the original description of the Cestode (Murai *et al.*, 1980) as well as in a later work (Tenora *et al.*, 1986) it was possible to corroborate morphologic correspondency among our material and the species in question.

Nematoda.
Fam. Oxyuridae Cobbold, 1864.
Syphacia nigeriana Baylis, 1928.
Prevalence of infestation: 34.2 %.

The only species of Nematode, discovered within large intestine and caecum, was detected in Villanueva de la Vera y Pelayos de la Presa. The papers of Quentin (1971), Tenora and Meszaros (1975), Genov and Jancev (1980) and Hugot (1986) were the basis for our specific determination of this Oxyurid.

DISCUSSION

The helminthfauna of *M. cabrerae* presents differential features in relation to that of the remaining iberian Arvicolids. Initially, the small number of species (6) is surpris-

TABLE I. — *Helminth species in iberian Arvicolids.*

ARVICOLIDS	TREMATODES	CESTODES	NEMATODES	TOTAL SPECIES
C. glareolus	3	10	7	20
A. sapidus	5	6	6	17
A. terrestris	-	4	6	10
M. arvalis	1	6	6	13
M. cabrerae	1	4	1	6
M. agrestis	3	8	6	17
M. nivalis	-	6	8	14
M. duodecimcostatus	1	6	7	14
M. lusitanicus	1	5	6	12

ing. This represents, from a qualitative point of view, the most reduced among all the available helminthfauna, at present, in Arvicolid's species [Mas-Coma *et al.*, 1978; Feliu *et al.*, 1984; Feliu, 1987 and unpublished data; merely is left to complete the helminthfauna of *Microtus (Pitymys) pyrenaicus* (De Selys-Longchamps, 1938)] *(table I).* The detriment in number of parasitic species is especially manifest in the case of Nematodes, with absence of oligoxenous or eurixenous species—*Trichuris* sp.; *Eucoleus bacillatus* Eberth, 1863; *Mastophorus muris* (Gmelin, 1790); *Heligmosomoids laevis* (Dujardin, 1845); *Heligmosomoides glareoli* Baylis, 1928; *Heligmosomum costellatum* (Dujardin, 1845) and *Carolinensis minutus* (Dujardin, 1845)—which infest the majority of species of Iberian Arvicolids. *S. nigeriana*—a monoxenous ageohelminth, infesting species of *Arvicola* and *Microtus*—seems to be, for the moment, the only species well adapted to this Rodent.

Among Platyhelminthes, the fall in number of species is not as evident, chiefly showing either oligoxenous helminths *(A. dentata, P. omphalodes)* or helminths with ecological specificity *(N. neyrai, T. taenuicollis larvae),* which habitually extend everywhere in peninsular biotopes (Feliu *et al.*, 1986 and 1989).

The lack of fauna of Nematodes is manifest as well when total or partial prevalence is analyzed *(table II).* Percentages of total infestation and infestation by Digenetic Trematodes show certain parallelism with those that turn-up in the remaining Arvicolids and could even be included among the highest. On the other hand percentage of infestation by Nematodes is much lower than the others, only that of *M. (P.) duodecimcostatus* being inferior. The prevalence of total infestation appears higher owing to the percentage of infestation by Cestodes (44.2 %), the highest among all Arvicolids, the motive for which, at the moment, we have not find any reasoned explanation.

TABLE II. — *Prevalences in iberian Arvicolids.*

ARVICOLIDS	TREMATODES	CESTODES	NEMATODES	TOTAL
C. glareolus (n=461)	5,8	41,6	39,9	66,1
A. sapidus (n=139)	23,0	12,2	77,7	92,8
A. terrestris (n=257)	----	11,2	55,2	57,2
M. arvalis (n=311)	0,4	31,2	70,4	78,8
M. cabrerae (n=70)	4,2	44,2	34,2	67,1
M. agrestis (n=171)	5,2	31,5	46,2	60,2
M. nivalis (n=190)	----	31,0	66,3	72,1
M. duodecimcostatus (n=469)	0,2	6,1	28,1	28,1
M. lusitanicus (n=172)	0,6	12,2	43,5	56,4

Qualitative and quantitative structure of the helminthfauna of *Microtus cabrerae* in the Iberian Peninsula finally suggests that geographic distribution of this Rodent in the Peninsula, its endemic nature and semisubterraneous habits, are the factors which condition it primarily.

It is fair to believe that location of this Arvicolid in limited areas of the Peninsula restricts the possibility of them picking up eurixenous and oligoxenous parasitic species, typical of Miomorphes Rodents, mainly for two reasons: A) the limited capacity of the Rodent for gaining new territories and B) the obvious limited cohabitability with the most extended Arvicolids throughout the Peninsula *[M. (M.) agrestis, M. (P.) duodecimcostatus, C. glareolus].* The nature of biotopes occupied by *M. cabrerae* explains the appearance, although occasional, of helminths whose usual hosts are other Arvicolids less dispersed through peninsular territory, but with more punctual habitats. This is the case of *N. neyrai* which has a high prevalence of infestation in *A. sapidus* (Simón Vicente *et al.*, 1985*a* and *b*; Segú *et al.*, 1987).

The origin and the geographic distribution of *M. cabrerae* may explain why this Rodent is the only one among Arvicolids that turns up infested by a stenoxenous and endemic species *(P. mascomai).* In regard to which it is fair to interpret, in terms of morphologic resemblance between

P. mascomai and *P. omphalodes* (Murai *et al.*, 1980; Tenova *et al.*, 1986) and the origin of *M. cabrerae* (Niethammer, 1982), that the differentiation of *P. mascomai*—which is the species within its genus of smaller dimensions—has been recent and derivative from a former presence of *P. omphalodes* among Iberian Arvicolids (Feliu *et al.*, 1989).

Semisubterranean way of life of *M. cabrerae* should be the last feature to be considered. As showed in *tables I* and *II*, species with obvious terrestrial tendency *(C. glareolus, M. agrestis, M. nivalis)* bear an helminthic fauna rich from a qualitative and quantitative point of view; *A. sapidus*, an amphibian Rodent, acquires Digenetic species with aquatic cycle which noticeably enrich its helminthfauna; while species typically subterranean *[A. terrestris, M. arvalis, M. (P.) lusitanicus, M. (P.) duodecimcostatus]* show a detriment, more or less emphasized, in the qualitative and quantitative composition of their parasitofaunas, owing to the lower probability of them being affected by infestative forms present in their environment. Another example of these would be *M. cabrerae*.

Acknowledgements. — The authors would like to thank the technical collaboration given by Dr. Santiago Mas-Coma (Valencia, España) and D. José Maria Rocamora Ramonet (Barcelona, España) in certain moments of this study. Study supported by Spanish DGICYT, Project PB 87-0135.

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