

DORMICE AND MAN: A REVIEW OF PAST AND PRESENT RELATIONS

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ABSTRACT – The past and present relations between dormice (Myoxidae) and man were reviewed through an interdisciplinary approach. All the data available from several fields of research have been assembled in order to consider the influence of human civilisation on dormice as well as the importance of these rodents in ancient and rural economies. A remarkable human impact on the geographical distribution of some dormouse species (*Myoxus glis* and *Muscardinus avellanarius*) and their population density was suggested through an historical and biogeographical analysis, supported by paleontological data. An ethnozoological enquiry was carried out to describe the utilisation of dormice as food or medicine and the traditional hunting techniques, in Mediterranean and Afrotropical areas. An archaeozoological survey was attempted to describe the captive husbandry of dormice by the ancient Romans and to arrange an updated checklist of so called "*gliraria*". The role of dormice as pests in agroforestry and in the transmission of diseases is discussed together with perspectives on wildlife management and conservation.

Key words: Zoogeography, Ethnozoology, Archaeozoology, Mammalia, Rodentia, Myoxidae.

RIASSUNTO – *I ghiri e l'uomo: relazioni antiche ed attuali* – Le antiche ed attuali relazioni fra i Mioxidi e l'uomo vengono passate in rassegna attraverso un approccio interdisciplinare, mettendo insieme tutti i principali risultati di ricerche effettuate nei più diversi settori (sia biologici che umanistici). In questo modo si è potuto tracciare un quadro generale che tiene conto sia dell'influenza delle attività umane sulla distribuzione geografica ed ecologica delle diverse specie di Mioxidi che della loro importanza nelle civiltà antiche o rurali. Attraverso un'analisi storica e biogeografica, basata anche su dati paleontologici, si può ipotizzare una notevole influenza positiva dei popoli mediterranei sugli areali attuali di alcune specie (*Myoxus glis* and *Muscardinus avellanarius*) e sulla loro densità di popolazione. Un'indagine etnozoologica ha permesso di ricavare dettagli sull'utilizzazione di alcune specie come cibo o medicinale e sulle tecniche tradizionali di caccia in paesi mediterranei e dell'Africa tropicale. Con l'esame dei dati archeozoologici si è ottenuto una ricostruzione delle tecniche di allevamento del ghirò presso gli antichi Romani e un aggiornato inventario dei cosiddetti "*gliraria*". Il ruolo dei Mioxidi come animali nocivi in agricoltura e come veicoli di malattie viene infine discusso insieme a prospettive di gestione e di conservazione della fauna.

Parole chiave: Zoogeografia, Etnozoologia, Archeozoologia, Mammalia, Rodentia, Myoxidae.

INTRODUCTION

The aim of this work is to give an outline of past and present relations between dormice and man through an historical and zoogeographical analysis. In particular, we consider the following subjects:

- the influence of man on the geographical distribution of dormice;
- the influence of man on the population density of dormice;
- the ethnotaxonomy of dormice, i.e. the study of vernacular names and etymological derivations;
- the traditional hunting of dormice in Mediterranean and Afrotropical areas;
- the keeping of dormice in captivity and their utilisation as food since the Roman Age;
- the utilisation of dormice in popular and ancient medicine;
- the role of dormice as pests in agriculture and forestry;
- the role of dormice in the transmission of diseases;
- the role of dormice as components of ecosystems and the management of their natural populations.

The life history of dormice attracted attention mainly because of the physiological and anatomical changes (fatness) occurring in relation to torpor. Even though their hibernation was reported for the first time by Aristotle (384-322 B.C.), we can suggest this natural phenomenon was well known earlier by the ancient Mediterranean people. At present, like many other small mammals, dormice have become a subject of considerable interest for scientific research on biology and evolution (Capanna, 1995).

During the II Conference on Dormice (Fuscaldo, Italy, 15-19 May 1993), much information was assembled, providing a better knowledge of dormouse distribution and status (zoogeography and ecology), as well as techniques for conserving and monitoring their populations.

In the past, all small mammals were reputed to be unsuitable as human food. They were considered as agricultural pests or as unimportant to people. The Edible Dormouse is an exception, because it was appreciated as a food source for many European people and is still eaten in some regions.

In this article, we shall compare the relations between dormice and different human cultures, mainly from Europe and the Afrotropical Region.

Five genera and **five** species of dormice occur throughout Europe (Holden, 1993) but only four species are widespread in Mediterranean and southern European countries. They are: the Edible or Fat Dormouse, *Myoxus glis* (Linnaeus, 1766); the Hazel Dormouse, *Muscardinus avellanarius* (Linnaeus, 1758); the Garden Dormouse, *Eliomys quercinus* (Linnaeus, 1766); the Forest Dormouse, *Dryomys nitedula* (Pallas, 1778). On the other hand, the Afrotropical Region is inhabited by only one genus, *Graphiurus* Smuts, 1832, represented by an uncertain number of species (Misonne, 1974; Genest-Villard, 1979; Robbins & Schlitter, 1981; Schlitter et al., 1985); 14 species were provisionally listed in the last taxonomic account (Holden, 1993).

THE INFLUENCE OF MAN ON DORMOUSE GEOGRAPHICAL DISTRIBUTION

The geographical ranges of the European dormice are illustrated by Storch

(1978) and recently updated by Amori (1994).

Both the Garden Dormouse and the Forest Dormouse are of great zoogeographical and evolutionary interest, because of their parapatric ranges, patchy distribution and geographic variation. They have respectively a "Western" and an "Eastern" distribution pattern in Europe, but their ranges overlap throughout the Danube Valley, the Dalmatian coast and southwestern Italy. In the latter country, relict populations of the Forest Dormouse occur in Calabria and Lucania (= Basilicata) (von Lehmann, 1964; Filippucci, 1986; Aloise & Cagnin, 1988). During the late Pleistocene (Würm), an interesting community of rodents was found in central Italy at Monte Circeo where the two species lived together (Kotsakis, 1991). It is likely that the two species are in competition: the Forest Dormouse was probably never able to colonize western Europe because of competitive exclusion by the Garden Dormouse. Among more than 10,000 specimens of small mammals caught all over ex-Yugoslavia by Kryštufek (1985) there were only 51 specimens of Forest Dormouse, often found syntopically with the Edible Dormouse and the Hazel Dormouse, but never with the Garden Dormouse. According to Kratochvíl (1967), who studied the occurrence of dormice in Czechoslovakia, the Garden Dormouse migrated to Central Europe from the Southwest before the expansion of the Forest Dormouse into this area from the East. In Lucania, they occur together in the same biotope (Mt. Pollino): this syntopic occurrence (Filippucci, in verbis) provides an opportunity to perform detailed research on their local distribution and ecology. The other two species, the Hazel Dormouse and the Edible Dormouse, have a minor zoogeographical interest (because of their wide range) but the latter also had a significant role in the history of ecological relations between man and wild animals.

For many centuries, Mediterranean people have had a great influence on the natural vegetation cover because of their agriculture and pastoral activities, mainly by fire, goat grazing and timber exploitation which resulted in deforestation of large areas. Under the Romans' civilisation, some tree species were favoured (especially pine, chestnut and hazel) and this affected positively the animal communities associated with them. Both the geographical and ecological distribution of dormice have been greatly affected by the cultural evolution of European people and the strong environmental changes produced by man.

In Mediterranean countries, the geographical distribution of dormice has probably been favoured by man in two different ways. The first has been the development of agriculture which caused the wide dissemination of several species of edible fruit trees. The second has been the direct introduction of the Edible Dormouse and probably also the Garden Dormouse into areas outside their primary range.

All the dormouse species live on trees or shrubs and are forest or scrub dwellers, even though the Garden Dormouse is more terrestrial and often occurs in open shrublands. In Mediterranean and southern European ecosystems, the dominant forest trees are oaks and beech trees. The oaks belong to the genus *Quercus* which includes almost twenty species in the Mediterranean region. Most of these species are deciduous (only few are evergreen) and dominant in lowland forest and scrub, from sea level up to 800-1000 m. The oak fruit (acorn), is much

appreciated by all the dormouse species. The beech (*Fagus sylvatica*) is the dominant tree species of the deciduous forest which cover large areas of southern European mountains. The geographic range of the beech trees (*F. sylvatica* and *F. orientalis*) approximatively coincides with the range of the Edible Dormouse. The center of origin of the Sweet Chestnut tree (*Castanea sativa*) is not well known but this seems to be an indigenous species of the Mediterranean region; only later, was it introduced northwards into other European countries (up to southeastern England) (Lieutaghi, 1982). According to Pignatti (1982), the main period of expansion of this tree occurred during the Roman Age. Beech-mast, acorns and chestnuts are preferred foods of the Edible Dormouse. Nevertheless, the chestnut economy, also named "chestnut-tree civilisation" by Lieutaghi (1982), has been the main factor which favoured the spread of the Edible Dormouse and its increasing population density. This rodent and this tree had a common history, both being a food resource for the ancient Romans.

Although there is no written historical record of the translocation of dormice out of their primary range, such a happening is very likely. The habit of the ancient Romans of introducing both domestic and wild animals throughout their Empire is well known and documented (e.g. the importation of the rabbit from Spain, as reported by Varro, in *De re rustica*, 37 B.C., 111). As the Edible Dormouse had an important role as delicacy in the cuisine of the ancient Romans, its introduction into areas where it did not occur naturally is highly probable. According to Cristaldi & Amori (1988), such dormouse importation would be associated with the introduction of edible fruit trees where this mammal found its food and shelter.

Remains of the Garden Dormouse were found in southern England by sieving archaeological deposits of Roman date (O'Connor, 1986). These findings are very interesting because neither Pleistocenic fossils nor living populations of this species have been found in the British Isles. According to O'Connor (1986), the Romans deliberately imported the Garden Dormouse from the French coast to supplement their own alimentation. They were obliged to introduce this species because the more appreciated Edible Dormouse did not occur in northern France.

The occurrence of the Edible and Garden Dormouse respectively on Salina and Lipari (two Eolian islands) could be explained by other cases of deliberate importation by the ancient Romans (Cristaldi & Amori, 1982; 1988). According to the local people on Salina, the Edible Dormouse only occurs in the areas covered by the ancient chestnut-tree cultivations (Cristaldi & Amori, 1982; Cristaldi et al., 1987). According to Vigne (1988) the Edible Dormouse populations in Corsica and Sardinia were also introduced by man. The occurrence of the Garden Dormouse on the Isle of Capri, based upon a single molar tooth from bird of prey pellets (Barbera & Cimmino, 1990), should be confirmed by records of living animals.

On the other hand, fossil and subfossil remains of the Garden Dormouse were found on the Balearic Islands, respectively on Mallorca (Kahmann & Alcover, 1974) and Ibiza (Alcover & Kahmann, 1980).

Some authors have suggested dormouse dispersal in continental areas has also been favoured by man. Van Laar (1977) and Foppen et al. (1989) suggested that the original populations of Garden Dormouse in the Netherlands are confined to

the southern province of Limburg and all the other records refer to accidental introduction.

Two other possible effects of man upon dormouse populations can be suggested. The first effect (negative) is the introduction of diseases transmitted by synanthropic species such the Black Rat (*Rattus rattus*) which can also be an ecological competitor of dormice. The second effect (positive) is the possibility of a dispersal of dormice by boats and the colonization of islands. According to some authors, during the Neolithic, the transportation of chert and obsidian across the Tyrrhenian Sea gave dormice (like other rodents) the opportunity to spread into the islands.

According to Horacek (1986), a number of Pleistocene records proved that representatives of the genus *Myoxus* were autochthonous elements of mid-European mammal communities present during interglacial periods. By contrast, the lack of fossil records on Mediterranean islands leads one to search for evidence of anthropic dispersal. The fossil dormouse recorded from Sardinia (*Tyrrhenoglis majori* Engesser, 1976) became extinct during the Middle Pleistocene (Vigne, 1988: Kotsakis, in verbis). It was an endemic species and occurred in dry and open environments. We do not know the cause of its extinction: but this species was replaced by the Edible Dormouse. The latter was introduced by Neolithic people as suggested by fossil remains dated circa 4300 B.P. (Vigne, 1988). According to Vigne & Marinval-Vigne (1991) the arrival in Corsica of the Black Rat (probably during the VIth Century A.D.) brought about a major increase in competition pressure so that the Edible Dormouse took refuge in densely forested areas; later, perhaps during the major phase of agricultural expansion (XIIIth century A.D.), the massive man-made denudation of the island's forest cover exacerbated the isolation of the Edible Dormouse in high altitude beech-forests. As a result of geographic isolation, the Corsican population of the Edible Dormouse shows some small morphological difference and was assigned to an insular race (*M. g. melonii* Thomas, 1907).

During the glacial periods, according to Horacek (1986), the Garden Dormouse was confined to western mediterranean areas; its dispersal northwards and eastwards occurred in very recent times. The earliest exactly dated records of this species from central Europe are from the Neolithic (3000 B.C.) and proved its common occurrence before the expansion of the invasive Black Rat. At present, the Garden Dormouse shows a patchy distribution within its range because of its preference for rocky habitats and probably because of competition with the Black Rat. Sardinia and Corsica have populations which differ between them and from those of the continent, in both morphological and caryological characters (Orsini, 1987). The Corsican populations of the Garden Dormouse would have colonized the island recently, but before the arrival of the Black Rat. The latter excluded the Garden Dormouse from many areas of the island, by competition and probably also by the transmission of diseases. Competition between the Garden Dormouse and the Black Rat was suggested by Kahmann & Lau (1972) for *Eliomys quercinus ophiusae* a subspecies endemic of Formentera (Balearic Islands), which shows a high population density and the largest body size within the species. The success of the Garden Dormouse on this island may be explained by the large size of these

insular individuals being an adaptation to fight the Black Rat "that occupies in the open country the same ecological niche" (Kahmann & Lau, 1972). The expansion of the Black Rat into Mediterranean islands is dangerous for many species of both vertebrates and invertebrates in these fragile insular ecosystems. For this reason, it should be eliminated from islands and strictly controlled also in continental areas that harbour valuable biological communities (Cristaldi et al., 1987).

THE INFLUENCE OF MAN ON DORMOUSE POPULATION DENSITY

Several species of fruit trees, introduced by man from the Near East and farther afield from Asia (Lieutaghi, 1982), enriched the Mediterranean environments with new alimentary resources, much appreciated also by frugivorous wild mammals and birds. The Walnut tree (*Juglans regia*) was introduced since the Bronze Age and then cultivated by the Greeks and the Romans. The Hazel (*Corylus avellana*), like the sweet chestnut tree, is another autochthonous Mediterranean plant species, favoured by humans since prehistoric times. The Almond tree (*Prunus amygdalus*), was introduced from western Asia into Greece since the Sixth century B.C. The Fig-tree (*Ficus carica*) became widespread along the Mediterranean coasts, introduced by the ancient navigators such as the Phocaeans. Other fruit-trees were imported later by the ancient Romans from Asia: Cherry (*Prunus* spp.), Peach (*Persica vulgaris*), Apricot (*Armeniaca vulgaris*), and Medlar (*Mespilus germanica*). Such introduction of fruit-trees widened the range and increased the populations of many wild animals. These became food resources for men too, as secondary products of these primitive agro-ecosystems where people gathered both fruit and wild meat. During their hunting-gathering activities, the ancient people must have noticed many details of the life history of dormice. Surely, they noticed the fatness of the Edible Dormouse when it takes refuge in its winter shelter, and found it delicious to eat. Furthermore, the hunting activities of Mediterranean people through their cultivated lands produced a decrease of many predators such as the Pine Marten (*Martes martes* Linné, 1758) and predatory birds. Probably, the reduced number of predators favoured dormice populations.

According to Kahmann (1974), an increase of the Garden Dormouse population density has been produced at Forinentera (Balearic Islands) by tourist development, because of the synanthropic behaviour of this species which was favoured by the establishment of bungalows and other settlements. On the contrary, logging of beech forest in Corsica has brought about a strong decrease of the Edible Dormouse population (Salotti, 1993). Also cutting old chestnut trees and plantations caused a reduced population size of the same species in other regions, e.g. some localities of the Ligurian Apennines (V. Raineri, in verbis).

LINGUISTICS AND ETHNOTAXONOMY

The ancient Greeks had two words to name dormice: *ἐλειώς* and *μωξός*. The first was used by the majority of the classic authors to refer to the Edible Dormouse: Hesiodus (Eighth Century B.C.), Aristotle (Fourth Century B.C.), Dioscorides (First Century A.D.), etc. Perhaps it derived from the Greek verb *ἐλῶ* which means "to wrap oneself up" with reference to the sleeping behaviour

of dormice in winter (Kroll & Witte, 1923). The second word, *μνοξός*. was reported by Oppianus (Third Century A.D.) in its work *Cynegetica* (II, 570), and derived by *mus* (=mouse). Some authors thought this second name referred to the Garden Dormouse but no evidence has been found to confirm this. The ancient Greeks were not very interested in dormice because they did not eat them. None of the classic authors wrote about dormice as food. Oribatius (Fourth Century A.D.), a Byzantine author on medicine, wrote that their meat is untasty and purgative. He also wrote that men who eat dormice were "very negligent". Because of this scant interest, we have little information on dormice from the Greek literature. Probably, the Greeks did not separate all the different species.

In contrast, the ancient Romans appreciated the Edible Dormouse as highly valued food. Thus, starting from T.M. Plautus (Third-Second Century B.C.), many authors quoted it under the name *glis* and derived (*glir*, *gliris*, *glirus*). We owe to Dioscorides the etymological explanation "*ἐλεῖός* which the Romans call *gliris*". The origin of the latter as well as the current Italian name *ghiro* may be found in the Sanskrit word *girich* (Cortelazzo & Zolli, 1984). According to St. Isidorus from Seville (Sixth-Seventh Century A.D.) the name *glis* derived from the verb *gliscere* which means "to grow". In his work *Etymologiarum sive originum libri XX* (XIII, 3, 6), as suggested by other authors, he wrote: "*glires dicti sunt qui pingues eos efficit somnus; nam gliscere dicimus crescere*".

The name *nitela* and its derivatives (*nitella*, *nitedula*) have an uncertain etymology. They have been utilised by some Latin authors for an other species of dormouse. Kroll & Witte (1923) assigned these names to both Garden and Forest Dormouse. Nevertheless, a line of M.V. Martialis (40-104 A.D.) makes a comparison between "*aurea nitella*" and a fair-haired girl (*Epigrammata*, V, 37, 8): from this simile, the name *nitella* seems more appropriate to the Hazel Dormouse than for grey-haired species. It is very likely that the ancient Romans (like the ancient Greeks) easily confused the smaller dormouse species.

Thus, the generic names presently used by modern taxonomists (*Myoxus*, *Eliornys*, *Dryomys*, *Muscardinus*, etc.) do not agree with the ancient terminology of both Greek and Roman people. *Myoxus* is not the name which the ancient Romans assigned to the Edible Dormouse. *Nitedula*, which was probably the name of the Hazel Dormouse, has been chosen as the specific term for the Forest Dormouse. As for the etymology of the other scientific names, they are not always easily explainable. *Dryomys* has a common origin with the Greek words *δρῖός*. (=forest) and *δρῦς* (=oak), and means "mice of oak forests". The specific terms *quercinus* and *avellanarius* refer to the feeding habits of these species (*Quercus* = oaks) (*Corylus avellana* = Hazel tree). The term *Graphiurus* derived from *γραφίς*. (= brush), referred to the brushed tail of this African genus.

To study the ethnotaxonomy of animals in Mediterranean languages and dialects is very hard because of frequent linguistic contamination and recent loss of culture. The vernacular names of dormice utilised by Calabrian people have been gathered by Lucifero (1907) and Mirabelli (1989). According to them, the Garden Dormouse and the Forest Dormouse are not kept as distinct categories and have the same vernacular name *fiedulu* or *agghiru fiedulu*, meaning "stinking dormouse" (Aloise, in verbis). The Edible Dormouse (*gljru*, *aglieru*, *agghieru*)

and the Hazel Dormouse (*natiliu, nucillaru, viellula*) are well known by Calabrian countrymen and clearly distinct from the other two species. A more thorough linguistic approach was possible by gathering vernacular names of dormice from a comprehensive dictionary of Calabrian dialects, written by Rohlf (1982). This identified a high number of lemmas dedicated to dormice and evidenced the importance of these animals in the Calabrian culture. Almost 110 headwords are still used to name dormice in Calabria today (Tables 1-2). Many words are used to indicate female, mother, newborn and young dormice. Special terms refer to the dormouse-hunter (*agghjiraru*), to the jars for keeping them (*aglierera, aglieraru*) and to dormouse litter (*cárfata*). Moreover, a special name (*carrisi*) is used for young dormice who (according to Calabrian countrymen) "bear food to the elders before lethargy".

In some parts of Calabria, according to Lucifero (1907), but not confirmed by recent data, the Garden Dormouse is also named *agghiru i marina* (= sea dormouse) because it is common along the coastal areas. A similar name (*agliere i marina*) is used nowadays in Rossano (province of Cosenza), according to G. Garofalo (in verbis).

Tab. I – Vernacular names for the Edible Dormouse in Calabrian dialects (assembled from the dictionary of Calabrian dialects, (Rohlf, 1982). Abbreviations of Calabrian provinces: CS = Cosenza; CZ = Catanzaro; RC = Reggio Calabria.

FEMALE	MOTHER	NEWBORN	YOUNG
sdriga (CS)	calfa (CS)	azzardacu (RC)	agghiópulu (CZ)
losa (CS)	carfa (CS,CZ)	zardacu (RC)	agghiópudu (RC)
lessa (CZ)	cárfina (CS)	zarracu (RC)	agghiópadu (CZ)
agghjira (M,R)	carpa (CZ)	zarracheddu (RC)	agghiricchiu (RC)
ógghjina (CZ,RC)	cárpina (CS)	zarricu (RC)	scardacu (RC)
gogghjina (RC)	cajonza (CS)	zorracu (CZ)	scárdamu (CZ,RC)
gúddina (RC)	vójina (RC)	sardacu (RC)	sartuni (CZ)
ogghicna (RC)	ógghjina (CZ,RC)	zardacuni (RC)	jerópallu (RC)
ógghiana (CZ)	gogghjina ((RC)	zarracottu (RC)	fujentuni (RC)
uógghjina (CZ)	gojina (RC)	scardacu (RC)	fujuntuni (RC)
ógghjila (RC)	gódina (KC)	scardamu (RC)	ógghjimu (CZ)
	gúddina (RC)	scardamune (CZ)	
	stola (CS)	scardapunc (CZ)	
	stowa (CS)	cárdamu (CZ)	
	stogua (CS)	cardamune (CZ)	
	losa (CS)	cardascu (CS)	
	lessa (CZ)	cardacchiu (CS,CZ)	
	desa (CS)	cardágliu (CS)	
	ogghiana (RC)	caramanti (RC)	
	ógghiana (CZ)		
	uógghjina (CZ)		
	ógghjila (RC)		

On Lipari Island (Eolian Islands), *surice mastruognolo* is the vernacular name for the Garden Dormouse and means "smart mouse" (Cristaldi et al., 1987).

The vernacular names from different areas of Sardinia (indicated below within brackets) have been gathered and published by Casu, Lai & Pinna (1984): Edible Dormouse: *ghiru* (Logudoro and Campidano); *soriche de padente* (= forest mouse); *cane 'e serra* (Barigadu, south of Ogliastra); *dormillone* ? (Mandrolisai); *sorighe ilixi* (= mouse of holm-oak) (Ogliastra); *mailloni* ? (Marmilla). Garden Dormouse: *topi de sonnu* (= mouse of sleep) (Campidano); *topi de matta* (= mouse of plants) (Sulcis); *mailloni* (Marmilla); *sorighe 'e monte* (= montane mouse) (Barigadu, south of Ogliastra). The very strange name *can'e serra*, was formerly reported by Cetti (in: Lessona, 1889) for the Garden Dormouse; a similar name *rato da serra* is quoted by Cabrera (1914) among the Portuguese vernacular names.

The vernacular name used for the Edible Dormouse by Corsican people *ghjira* is very near to those from southern Italian regions while the Garden Dormouse is called *u topu mascaradu* or *a ghjira ochjata* suggesting the black mask on the head and its aspect similar to both mice and dormice (Salotti, 1984, 1993).

Tab. 2 – Attempted taxonomic interpretation of the vernacular names of dormice in Calabrian dialects (source and abbreviations as in Tab.1). The taxonomic interpretation is unreliable because the names were gathered by a linguistic researcher (Rohlf, 1982). without an ethnozoological method.

<i>Myoxus glis</i>	<i>Muscardinus avellanarius</i> ?	<i>Eliomys</i> and/or <i>Dryomys</i> ?
agghjiru (CZ,RC)	rúsola (RC)	cilidona (RC)
agghjire (CS)	rusóla (RC)	xuriona (RC)
regliere (CS)	rusúla (RC)	natalicchiu (CZ)
agliru (CS,CZ)	rusuledda (RC)	nitala (RC)
aglire (CS,CZ)	rusuleja (RC)	nitila (CS,CZ)
agliri (CS)	rusciuledda (CZ)	natila (RC)
aglieru (CZ)	risciola (CZ,RC)	notili (CZ)
gliru (CS)	grisciola (RC)	ranuledda (CS)
gliéri (CS)	artisciola (RC)	pondacu (RC)
glire (CS)	rasciola (RC)	agghjiru-póndacu (CZ,RC)
gliri (CS)	rasola (RC)	shrici-puondicu (RC)
gliru (CS)		surici-ponticu (CZ)
		surici-pondacu (CZ)
		xarapondacu (RC)
		sarapóndacu (RC)
		xerapondacu (RC)
		xerapondulu (RC)
		jerapondacu (RC)
		agghjiru-xélinu (CZ)
		agghjiru-xédulu (CZ)
		agghjiru-xicédulu (CZ)
		agghjiru-xélandru (CZ,RC)
		agghjiru-félinu (CZ)
		agghjiru-hétulu (CZ)
		agghjiru-pardu (CZ)
		agghjiru-conditu (CZ)
		jirapóndulu (CZ)
		xarapondamu (RC)
		xarapóndulu (RC)

The lack of information on all the Italian dialects permits few conclusions; a large scale investigation should be carried out to gather the vernacular names from all the Italian regions and it would be very interesting to examine differences and similarities in ethnotaxonomy. An interesting review of vernacular names used by Iberian people (including Basques) was published by Puente y Amestoy (1927). According to him, the Basque name *missarr* and its derived names in some Castilian dialects of the Western Pyrenean Region (*micharro*, *mucharro* etc.), all for the Edible Dormouse, take their origin from a Basque expression for an animal that is looking at/for something. One of the Basque name for the Garden Dormouse *lumissar* is derived from the same root.

DORMICE AS GAME, DOMESTIC ANIMALS AND HUMAN FOOD

We have no information about the utilisation of dormice as food by the ancient Greeks. By contrast, during the Roman age, not only the Edible Dormouse but perhaps also the Garden Dormouse were utilised as food (O'Connor, 1986). Unfortunately, there are no dormouse figures from Roman archaeological sites to allow us a sure identification of the two species. The first known drawing of a reliably recognizable dormouse is that published by Topsell (1607). It is a strange Garden Dormouse represented with sharp teeth (Fig. 1).

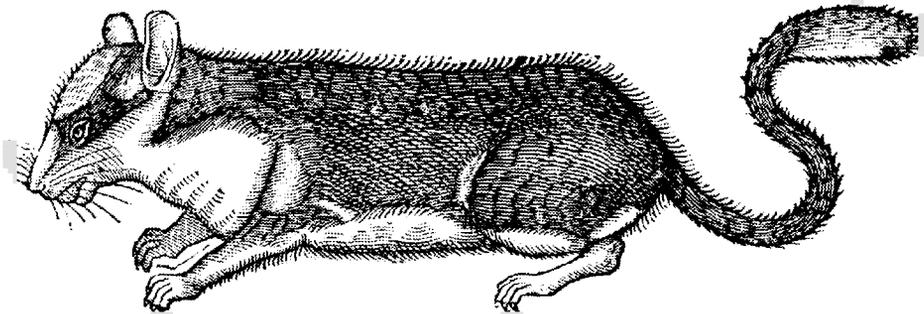


Fig. 1 – The first known drawing of a dormouse (Topsell, 1607): a Garden Dormouse with unusually prominent teeth.

During the Roman Empire, a refined cuisine took the place of the former poor and plain one. Dormice had an important role in the sophisticated cuisine of the Roman patricians, together with other game. A recipe was reported by the gourmet Marcus Gavius Apicius (First Century A.D.) in his work *De Re Coquinaria* (VIII, 9): dormice were served with sophisticated sauces containing fish and spices (pepper, "*laserpicium*" pine-seeds) often filled with pork meat and with dormouse entrails. Petronius (20?-66 A.D.) in his novel *Satyricon* (XXXI, 10) described edible dormice served with honey and poppy-seeds during a luxurious dinner. Ammianus Marcellinus (330-400 A.D.) wrote as follows: "Sometimes at their banquets the scales are even called for, in order to weigh the fish, birds, and dormice that are served, whose great size they commend again and again" (*Rerum gestarum libri XXXI*: XXVIII, 4, 13).

In the first half of this century, dormice were still hunted and eaten at Valmontone, Latium (V. Sbordoni, in verbis), and at S. Rossore, Tuscania (L. Santini, in verbis). Mattioli (1559) described an effective hunting technique for dormice, probably referring to the Tuscan tradition. These animals were captured by night in their sleep, then skinned and put into sacs. Salt was added to conserve them. The same author also wrote that their fatness affected the appetite and also preserved the human body from diseases. A traditional recipe consisted of filling them with honey and with their own entrails, as described by Apicius.

Recipes similar to those of Apicius were reported by Turano (1980) from the Calabrian traditional cuisine, which, according to him, are still used in some villages. Two recipes are also reported by Ferretti and Serra (1993) in their handbook of Calabrian gastronomy. The animals, skinned and drawn, are put in running water for about 48 hours, then in diluted vinegar for 1 hour. Pieces of dormouse and thrush are cooked together to prepare a tomato sauce for serving "*maccaruni*". According to a woman from San Pietro in Guarano (Cosenza Province), dormice are fried lightly together with plenty of onions. According to G. Bruzzese (in verbis), a restaurant serves dormice at Bivongi (Reggio Calabria Province) where the animals are set on fire to burn off the fur and then stewed.

Enquiries were made by us to discover which are the Italian regions where dormice are still consumed as food. Although domestic keeping is not practised any more, dormice are captured by traps or killed by guns at least in the following areas:

Calabria: Aspromonte, Savelli, Bivongi and other places (G. Aloise, G. Bruzzese, M. Cagnin and M. D'Adamo, in verbis; Mirabelli, 1989); Basilicata: Mt. Pollino (M. D'Adamo and M.G. Filippucci, in verbis); Puglia: Mt. Gargano (L. Bosco, in verbis); Campania: Lattari Mountains (M. Rocco, in verbis) and S. Martino Valle Caudina (C. Franciosi, in verbis); Toscana: Migliarino (L. Santini, in verbis); Liguria: Ligurian Apennines (V. Raineri, in verbis); Lombardia: near Bergamo (M. Cantini, in verbis).

According to A. Tartaglia (in litteris), *u gliere* (=the Edible Dormouse) was actively hunted until the early 1940s, by the villagers of Altavilla Irpina (province of Avellino, in Campania). The optimal period was August-September, at night. Dormice were depilated with the aid of boiling water or skinned with a knife, and then cooked according three different recipes. The Edible Dormouse was the traditional dish during the feast of S. Pellegrino (August 24-25), but only few people still consume its meat. A traditional trap used in Campania consisted of a large jar containing hazel-nuts, placed along the dormouse track. The animals entered the jar and could not escape because of the smooth internal surface.

In summer, nocturnal hunting of dormouse family groups is still illegally practised by torch and rifle, on the Lattari Mountains (Campania). Dormice are sought out on tree branches and 2-5 specimens can be killed by a single rifle-shot (M. Rocco, in verbis). Elsewhere, special traps (nestboxes) are arranged to catch them in number (Scaramella, 1969). Survival of the practice of eating dormice in Campania is confirmed by the authors of a local treatise of gastronomy (Serra & Serra, 1993) who reported a traditional recipe from the village of S. Martino Valle Caudina.

According to Lucifero (1907), in Calabria there were three techniques for hunting dormice: (1) nocturnal hunting with a gun; (2) introducing a stick inside the nest to flush the animal out; (3) capturing it during hibernation. The same author wrote that the Edible Dormouse fetched a high price on the market and that its taste was not good during the summer and autumn. The hunting techniques mentioned above are still practised in Aspromonte (G. Aloise, in verbis) where dormice are usually eaten by countrymen. A cultivator of Aiello Calabro said to one of us (G. Carpaneto) that nocturnal hunting consists of shooting at dormice walking on tree branches, silhouetted against the moon-light. An extensive enquiry on the present hunting of dormice and their utilisation as food has been carried out by G. Garofalo (in verbis). According to him, the technique of hunting dormice by moonlight is now most widespread in Calabria and practised in summer. In the same season, special traps are used: (1) a conical wicker-work trap, like those for catching mice or fish; (2) spring traps, supplied with bait consisting of fresh fruit or nuts; (3) a stone placed on a tree branch and tied with string to a bait below, in order to crush the animal (the latter trap system is named *castamuni*). Spring traps with a wooden base are made and sold by an old man in Savelli (province of Catanzaro). In winter, dormice are driven out from their den by sulphur and killed with a stick; otherwise a small wicker-cage is placed outside the hole; in other cases, the hole may be widened and dormice caught by hand. An old jar for keeping dormice is still present in Savelli even though it is not used nowadays. According to a shepherd of S. Giovanni in Fiore (province of Cosenza) dormice were kept in jars up to 50 years ago (G. Garofalo, in verbis).

In the Eolian Islands, Salina and Lipari, the Edible Dormouse and the Garden Dormouse have been overhunted and now seem to be on the verge of extinction in both islands.

On the Ligurian Apennines, near Crocetta di Orero, some families often consumed the Edible Dormouse before the decrease in its numbers, brought about by the logging of old chestnut trees (V. Raineri, in verbis). The hunters shot dormice by night on tree branches when the animals came to eat fruits in the orchards.

Since the end of the 1950s, the Edible Dormouse has become rare in Sardinia, probably because of forest destruction by fire and goat grazing. In the montane area of Supramunte, it was usually eaten by shepherds while its skin was used to make soft and warm coverlets for babies. An old woman of Orgosolo remembers small carts full of dormouse skins for sale (C. Murgia, in verbis).

The traditional hunting of the Edible Dormouse in Corsica has been well described by Salotti (1993) as well as the utilisation of this rodent as food by local people. According to her, dormice are only hunted in a limited zone of the island, near the main beech forests, by the villagers of Zicavu, Cozzano and Pallica. In this area, *a ghjira* (= the Edible Dormouse) is mainly hunted in autumn (October-November) when the skin and the fat together form almost 42 % of the body mass (i.e. >100 g). Corsican people say that dormouse hunting may also be practised in spring (May-June) when the animals are well fed from eating buds of beech trees. Nevertheless the hunters themselves admit that such vernal hunting is dangerous for the species because females are pregnant and only males should be

captured. The weapons are a good knife, a box of matches (or a lighter) and tablets of sulphur. This is a kind of solitary hunting but may also be conducted by two or three persons of the same family or village. Every hunter has their own private range or holes (dormouse dens) where he usually goes to capture dormice. With the aid of the knife, a hook-like long stick is cut to explore the interior of the den in order to verify the presence of dormice. The occurrence of fresh leaves and of excrementits are evidence of dormice inside the den, as well as the typical grumbling they give out when disturbed. If the den has other entrances besides the main one, those are stopped up with moss. A burning tablet is put at the entrance of the hole to oblige dormice to quit their den. When the animals come out they have burnt eyes and whiskers, and can easily be caught by hand. Sometimes dormice are asphyxiated inside and must be drawn out by a hook. In the past, before the utilisation of sulphur, a simple rag or dried moss were burnt and put into the hole. The hunting yield has never been measured by scientific methods; however, according a rough estimation made by local hunters, almost one thousand dormice may be killed in one year (about 200 in Zicavu, 500 in Cozzano and 300 in Palleca). In the past, a single hunter could catch 40-50 during a day's hunt but this number is less nowadays. The record was attained at Vizzavona by a hunter who gathered 80 specimens in a single day. Skins are never used in Corsica. The animals are eviscerated and burnt but not skinned in order to protect the fat layer between the skin and the muscles. Then they are roasted on a grate and the dripping fat gathered on slices of bread. In the past, excess dormice were also salted, dried and stored.

According to Vietinghoff-Riesch (quoted by Piechocki, 1974), at the beginning of the nineteenth century, the Ukrainian people used the fat of the Edible Dormouse in their cookery. The same author also wrote that the Edible Dormouse was still much appreciated as food by the French and other "southeastern European people" who ate roasted dormice after having thrown them into boiling water.

Traditional hunting of dormice and their utilisation as food is also recorded by Kryštufek (1991) from Slovenia. A special trap for dormice was found in the Ljubljana market by S. Simson and M.G. Filippucci (in verbis). Comparing this trap (Fig. 11) with those used by Calabrian people (Fig. 12), we noticed it has the same mechanism but could not state whether this is due to convergence or to cultural exchange. According to Tvrtkovic (in verbis), dormice are also eaten in Croatia, on the Hvar Island.

The Edible Dormouse is also eaten by Iberian people living in the western Pyrenean region (Alava and Navarra). The hunting techniques are not quite different from those used by Corsican people: the animal is dug out by a stick or smoking the hole. Its meat is very appreciated and consumed by the hunter's family: the traditional recipes are similar to those of Corsican and Calabrian people (Puente y Amestoy, 1927).

Lucifero (1907) wrote that the Garden Dormouse was also much appreciated by gourmets in Calabria and considered more tasty than the Edible Dormouse itself. By contrast, Guenaux (1905) asserted that the meat of the Garden Dormouse is not edible because of its bad smell. Probably, the specimens tasted by Guenaux (if he really tasted them) were captured during a non optimal period, or perhaps the

tastes of these two authors were different! Also Cornalia (1872) wrote that the Garden Dormouse is edible. Recently, a Calabrian shepherd of Rossano (province of Cosenza) confirmed this species is often eaten (G. Garofalo, in verbis). The peasants of Siniscola, in northeastern Sardinia, told one of us (M. Cristaldi) that in the past a hermit living alone on the mountains near to Su Cantaru, often ate Garden Dormice.

An undetermined species called *nitela* (Garden, Forest or Hazel Dormouse ?) was reported as human food by the Greek physician Galen (129-201 A.D.); according to him, this species was eaten in Lucania as well as in other Italian regions (see: Andrè, 1981).

The Hazel Dormouse is the smallest European representative of its family. It is never eaten because of its small size but, according to Lucifero (1907) also because of the bad smell and taste of its meat. Nevertheless, both Costa (1839) and Pugliese (1849) wrote that this species was commonly eaten in central and southern Calabria, where gourmets considered its meat more delicate than that of the Edible Dormouse. Sometimes, it is considered a pest by hazelnut cultivators but more often ignored. In many countries it is kept alive in cages as a pet, in place of the Golden Hamster. Lydekker (1896), reported it as one of the "favourite pets of children". The Japanese Dormouse, *Glirulus japonicus* (Schinz, 1845), is also sometimes raised by local people in bird cages (Walker, 1975).

The zoological culture of African people is poorly known. Most information about the role of animals in native cultures has usually been gathered by ethnologists, cultural anthropologists and missionaries. Much of these data are erroneous or unreliable regarding the identification of the animals. In translations of traditional African stories, many impossible animals appear in Afrotropical rain forests such as foxes, deer, badgers, vampires, caimans, boas and iguanas! Only latterly did zoologists begin to write about native zoological culture, but then often neglected to name the tribe about whom their observations were concerned. Only an interdisciplinary approach ("ethnozology") will succeed in gathering reliable information on both cultural and ecological relationships between animals and people.

A lot of etlinozoological information has been gathered during a decade of research in the tropical forests of Congo, Zaire and Uganda (Carpaneto & Germi, 1990; 1992; Carpaneto, 1994). Even though many species of small rodents are frequently eaten by several ethnic groups, the African Dormice (*Graphiurus* spp.) are normally neglected by forest dwelling people. In the course of interviews, all the traditional hunters admitted their ignorance of these animals which, in many cases, do not have even a vernacular name.

In northern Congo, the people inhabiting the Mbomo district (Mboko, Kota and Mongom tribes) make use of specific vernacular names for several species of small rodents (Sciuridae and Muridae). Six species of squirrels belonging to four genera (*Protoxerus*, *Heliosciurus*, *Funisciurus* and *Paraxerus*) are captured by young people, using traps or crossbows, and directly eaten by themselves. Three species of wild mice are often consumed, mainly by children. These are *Lemmyscomys striatus* (Linnaeus, 1758), *Hybomys univittatus* (Peters, 1876), and *Oenomys hypoxanthus* (Pucheran, 1855). Nevertheless, the Mboko and Kota people use a

single name for both the African Dormouse (*Graphiurus lorraineus* Dollman, 1910) and the Pygmy Squirrel, *Myosciurus pumilio* (Leconte, 1857); only the Mongom people, the most skilful hunters of the region, distinguish these two animals, and the latter is called *ipongwi*. However, these two species are rarely captured, and never eaten. If they are incidentally captured by traps they are thrown away, being not considered as food (Carpaneto, 1994).

In the mountains of eastern Zaire, east of Lake Edward, the Nande people are specialized hunters of small rodents. Larger mammals have almost disappeared from these densely populated areas which have been severely affected by logging. Mountain forests have now been reduced to small patches or replaced by grasslands and cultivated fields. Thus, the Nande people have become very active trappers and consumers of Murids and of other small rodents which are still common and widespread in the region (Carpaneto & Germi, 1992). Their ethnotaxonomy of rodents is very sophisticated: the local hunters are able to distinguish three sibling species of the genus *Otomys*. They recognize and eat many species of Muridae, and have 24 vernacular names for them. The correlation between these vernacular names and formal taxa is the subject of ongoing ethnozoological research (Carpaneto & Kanyinyi, in preparation). The African Dormouse is well known and has its own vernacular name (*embutwe*). Nevertheless, it is neither hunted nor eaten by the Nande or by the people of northern Congo.

Limitations on the use of African dormice as food have not been explained but could be due to a combination of the following factors: (1) small size of the animals; (2) unpredictability of their capture; (3) lack of hibernation and consequent seasonal fatness; (4) occurrence in human houses like some unpalatable mouse species.

KEEPING OF DORMICE AND THEIR UTILISATION AS FOOD BY THE ANCIENT ROMANS

During the Roman age, exploitation of the Edible Dormouse as prized food became so intensive that it gave rise to special techniques of rearing them in country villas. Marcus Terentius Varro (116-27 B.C.), in his work *De re rustica* (37 B.C.), described the rural economy of the ancient Romans which was based on three main activities (III, 1, 9): agriculture (*agri cultura*), animal husbandry (*res pecuaria*), and the husbandry of the steading (*pastio villatica*). The latter was defined as the husbandry of wild animals in association with fruit-trees, around the country villas. Wild boar, wild sheep, red deer, roe deer, hares, geese, ducks, pigeons, turtle-doves, peacocks, cranes, thrushes, and other mammals and birds, as well as fish, frogs, bees and snails, were kept and bred in special "gardens". These were fenced areas with ponds, shrubs and trees suitable to feed animals and their offspring. Special servants provided the animals daily with further food. According to Varro (III, 3, 1-3) there were "three divisions of this science: the aviary, the hare-warren, and the fish-pond" called respectively *ornithones*, *leporaria* and *piscinae*. The first was dedicated to birds, the second to mammals and the third to fish of either fresh or salt water.

Dormice were kept and bred in so-called *gliraria*, a specialised kind of

"hare-warren". These places were described by Varro (III, 15) as areas surrounded by a wall "covered on the inside with smooth stone or plaster over the whole surface, so that they cannot creep out of it. In this place there should be small nut-bearing trees. When they are not bearing, acorns and chestnuts should be thrown inside the walls for them to gorge themselves. They should have rather roomy cavities built for them in which they can bring forth their young. The supply of water should be small, as they do not use much, but prefer a dry place. They are fattened in jars, which many people keep even inside the villa. The potters make these jars in a very different form from other jars, as there run channels along the sides which make a hollow for holding the food. In such a jar acorns, walnuts, or chestnuts are placed. When a cover is placed over the jars they grow fat in the dark."

The custom of keeping dormice and other animals in captivity was also introduced to remote areas of the Roman Empire as reported by Varro (III, 12, 2): "in Transalpine Gaul, Titus Pompeius has a hunting preserve so large that he keeps a tract of about four square miles enclosed... in the same enclosure are usually kept places for snails and bee-hives, and also casks in which dormice are kept confined."

The special jars (*dolia*) in which dormice were fattened attracted the attention of archaeologists who used improperly the term "gliraria" to name them (see: Daremberg & Saglio, 1969; Bruckner, 1976; Graham, 1978). Plinius (Naturalis Historiae, VIII, 211, 224) called them *vivaria in doliis* and attributed their invention to Quintus Fulvius Lippinus a wealthy person who also invented the hunting reserves and the techniques for rearing edible snails. According to Plinius, only dormice captured in the same locality could be put together in a jar; otherwise they began to fight.

The inner surface of these jars was crossed by parallel and concentric channels (*semitae*) or by a continuous helicoidal channel where the animals could walk without dirtying themselves with their feces. Many ventilation holes were made all around the surface of the jar. There were also special openings joined with small cups, probably to provide the animals with drinking water and/or liquid food.

According to Mielsch (1990) the inventions of Lippinus are considered some of the few examples of original things made by Romans to ameliorate the quality of life in their country houses. In these houses, many patricians spent a life of idleness (*otium in villa*), dedicated to overseeing their domestic husbandry (*pastio villatica*). Among these patricians (all followers of Q.F. Lippinus), we remember: Lucius Marcius Philippus, the two brothers Lucius and Marcus Licinius Lucullus and Quintus Hortensius Hortalus, all contemporaries of Varro. In these country villas, domestic rearing of small animals was carried out by special servants named *familia rustica*, who were experienced in the local arts (*ars topiaria*), including the techniques of gardening and animal keeping according to local traditions.

A distinctive feature of the Roman civilisation, in comparison with other cultures of ancient times, was the great impact of man on wildlife. According to the ancient Romans, both landscape and wildlife increased in value when modified and adapted to human needs. This philosophy of life remained unchanged to the present day in the mentality of Mediterranean people, in their way of arranging

gardens (where exotic plants usually replace native shrubs). The *pastio villatica* is the true symbolic expression of this philosophy: animals and plants together under human control, like a buffer zone between the "home" and the "wild".

A list of all the "*gliraria*" (i.e. the jars), till now discovered at archaeological sites, is provided in Appendix 1, together with bibliographic references. The external shape and the internal structure of these jars are shown in Figs. 2-10.

Three models of "*gliraria*" may be recognized according to their shape (see Appendix 1):

- 1) cylindrical: 5 specimens, from Slovenia and Pompeii;
- 2) globular: 5 specimens, from Siena, Rome, Castelvenere and Pompeii;
- 3) bucket-like: 1 specimen, from the Vesuvian plain.

The smallest jar (height: 26.5 cm; maximum width: 28.5 cm) was discovered at Pompeii and has a cylindrical shape; the largest one (height: 81.5 cm; maximum width: 71 cm) is the bucket-like jar from the Vesuvian plain (Lista, 1986).

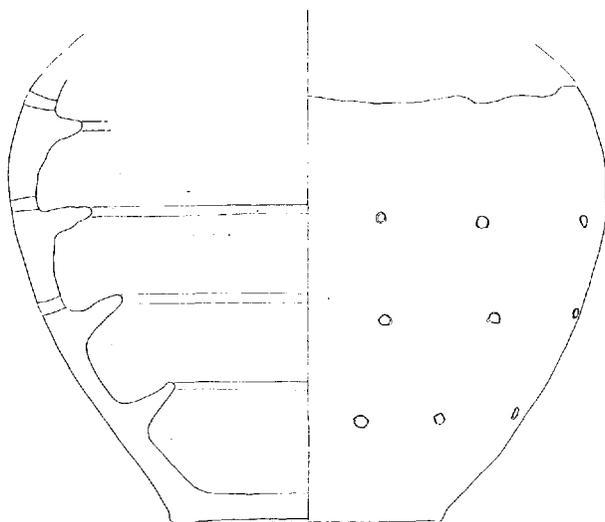


Fig. 2 – A sketch showing the external view and the inner part of a "glirarium" found by B. Franciosi at Castelvenere, loc. Foresta (Campania) (drawn by M.C. Porcaro for the "Istituto Universitario Orientale"; Franciosi. in litteris).

The majority of the jars we could examine (from Pompeii and Naples) have parallel and concentric channels. Nevertheless, the unique jar from Rome, one of those found at Pompeii (exhibited at the Museum of Boscoreale) and the one at Chiusi Museum show an inner structure formed by a continuous helicoidal channel. The distinct and parallel channels in most jars meant that the dormice had to jump from one level to another to reach water or food.

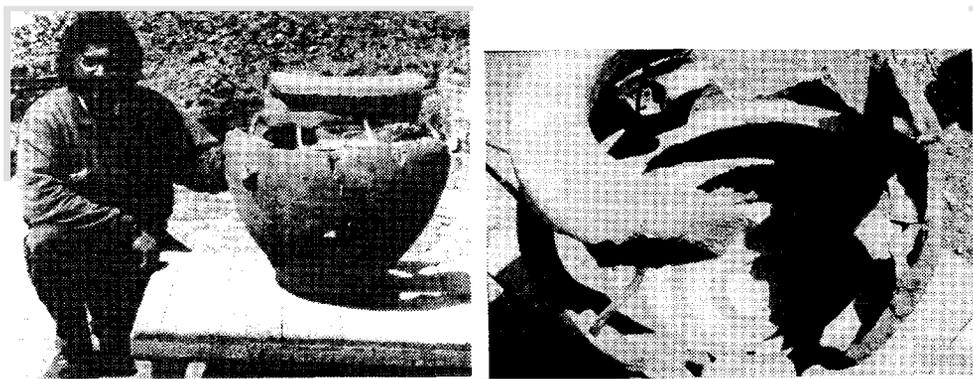
Three other jars were found at Ercolano and described by Bayardi (1755) but we could not discover their present location. From the author's accurate description, each of these jars (quoted as *Saginarium Glirarium*) had 4 distinct *semitae*.

An interesting jar was mentioned by Donaldson (1827) with a brief description.

It was made of bronze, found at Pompeii and preserved in the Museum of Naples. We have been unable to find such a bronze jar, either in the Naples Museum or in **any** other collection. According to Graham (1978) this mysterious jar could not be made of bronze because such material would be unsuitable for keeping dormice and the vessel itself too heavy.

With permission from the Archaeological Superintendent of Rome, we could examine the only "*glirarium*" so far discovered from Latium. It was found at Rome (Tor Bella Monaca) and is presently stored by the National Roman Museum. This jar (Figs. 3-4) has the following features:

- holes to the outer surface (to change air);
- small cup, probably for supplying water or liquid food, and the associated opening;
- continuous helicoidal channel, along the inner surface of the jar.



Figs. 3-4 – Jar for keeping dormice ("*glirarium*"), in the National Museum of Rome: 1, external view; 2. inside with a continuous helicoidal channel (*semita*).

Some questions remain concerning the functional details of this technique for keeping dormice in jars. What is the function of the lateral cups and of the jointed openings? Were they arranged to provide the animals with water or rather with liquid food (e.g. honey) to improve fatness and the quality of their meat? How many dormice were kept together inside a jar? If solid food (nuts and acorns) was thrown inside by opening the lid, it would be contaminated with animal feces, but no other structure was present to permit administration of solid food.

According to Lessona (1889), the Sicilian people of the 19th century kept the Edible Dormouse in jars (*ghiraje*), as did the ancient Romans. Similar jars still occurred at the beginning of this century in several regions of southern Italy (Anecchino, 1982; Lucifero, 1905). According to Turano (1980), in Calabria, even today dormice are kept in jars to grow fat in the dark. Jars are sometimes replaced by drums or barrels and the animals nourished with leaves from pear trees which would improve the taste of their meat.

MEDICAL UTILISATION

Latin recipes for medical use of dormice were written by Plinius and then reported by several authors at least until the Italian Renaissance. Eye-troubles were treated with ash of dormice and other wild rodents mixed with honey; ear disorders with dormice skinned, gutted and flavoured with honey, to be kept into jars. Scars and ulcers were treated with oil containing burnt dormice and shrews. Paralysis was treated with boiled dormouse fat. The meat of *Eliomys* and/or *Dryomys* was recorded as uneatable but useful as a purgative (Mnesitheos, in Kroll & Witte, 1923). The fat of the Edible Dormouse is used by local people of Viggianello (Basilicata region of southern Italy) to treat chapped lips (M.G. Filippucci, in verbis). At the beginning of this century, *l'untu di a ghjira* (= dormouse oil) was still utilised by the villagers of Bastelica, in Corsica (Salotti, 1993). It was prepared in October, according to the following recipe: the edible dormice were eviscerated, burnt all over their surface, cut into small pieces and then fried. The oil was gathered into jars and used to take care of wounds and burns. Bird feathers were used to apply the remedy to the body. Domestic animals were also sometimes treated with the same medicament. In the western Pyrenean region, the oil of the Edible Dormouse is sought-after as traditional antirheumatic remedy. Every dormouse may give 80-125 g of oil. The very low gelation point (-18°C) of the oil is probably the reason of this traditional use (Puente y Amestoy, 1927).

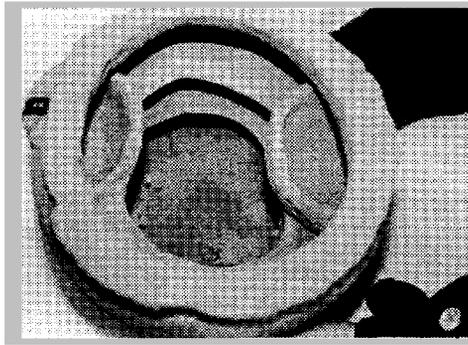


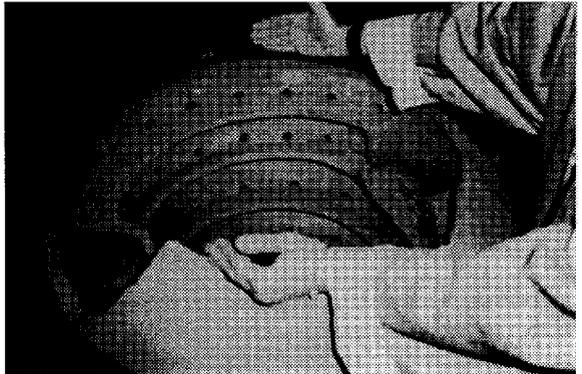
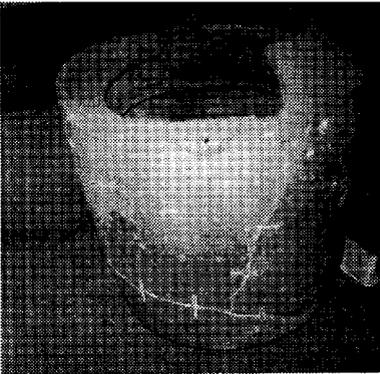
Fig. 5 – Inner view of a jar for keeping dormice ("*glirarium*") at the Phorum of Pompeii. This is the smallest of the dormouse jars discovered so far.



Fig. 6 – Outer view of jars for keeping dormice ("*gliraria*"), in the National Museum of Naples; note the different shape and size of the three specimens.

DORMICE AS PESTS AND THEIR CONTROL,

Sometimes dormice become abundant due to various factors such as increase in their food supply through fruit-tree cultivation or decrease in their natural enemies. Marked fluctuations in their population density may also occur independently of fruit trees or predators. When this happens, dormice are considered pests in both agriculture and forestry. According to Piechocki (1974), the Edible Dormouse damaged fig and walnut crops in Crete. According to Heptner (in: Piechocki, 1974) a large quantity of cultivated fruits was often consumed by the Edible Dormouse in the northeastern Caucasus. Damage to tree bark (bark-stripping), hazel crops and cultivated fruits were also reported from Italy (Sampo, 1971; Santini, 1983; Currado & Scaramozzino, 1990; Santini, 1993). According to Franco (1988), a population of Edible Dormouse in the woodlands of Asiago Plateau (Venetian Pre-Alps) was considered harmful because the animals gnawed away in a ring-like manner the branches of various trees, especially young Norway Spruce. The 221 specimens trapped to control this increasing population were used for biometrical and ecological studies (Franco, 1988, 1990).



Figs. 7-8 – Outer and inner views of an ajar for keeping dormice ("*glirarium*") at the National Museum of Naples; note the parallel and distinct channels (*semitae*). This is the only bucket-like specimen.

The Edible Dormouse was introduced to England in 1902 by Lord Rothschild (Walker, 1975). He imported several individuals which rapidly increased in numbers, causing much damage. Despite a campaign for their extermination, the species is still common in some localities in southern England.

Dormice may also reduce bird populations in areas where they are numerous. They may deprive birds of nesting sites and prey on their eggs and young (Walker, 1975). In some hunting reserves they are considered as vermin and some European country people accuse dormice of damaging their poultry. Similarly in tropical Africa, some dormouse species may become a nuisance by raiding poultry yards (Walker, 1975). The Common African Dormouse (*Graphiurus murinus*) has been recorded eating the eggs and nestlings of captive birds (Kingdon, 1974).

Some dormouse species show a tendency to enter human houses to find shelter and food. In Mediterranean countries, the Garden Dormouse often lives near rural houses or in their roof. Frequently it winters inside storehouses or barns and may plunder orchards by night. The Common African Dormouse is also found in traditional huts in villages and plantations.

Dormouse infestations have been treated with clorophacinone, the most active anticoagulant. However, this chemical is now becoming obsolete because it endangers non-target species. It is still employed only to deal with very serious rodent invasions (Santini, 1983). A new relationship between pest control and wildlife conservation has led the agro-ecosystem operators to take account of the danger to specialized rodent populations and risk to non-target species including pest predators.

DORMICE AND TRANSMISSION OF DISEASES

The role of dormice in the transmission of diseases to domestic animals and man is not yet well understood. A recent investigation by Amaddeo et al. (1991) led to the isolation of two viral strains from two edible dormice captured in the Italian region of Tuscania. These viral strains were lethal to mice and showed cytopathogenic effects on kidney cells of baby hamsters. Morphological characteristics, physical, chemical and seroimmunological tests identified the virus as an Encephalocarditis virus (EMCV). A subsequent paper (Cardeti et al., 1993) indicated that EMCV infection in man is fairly common (17.9 % of seropositivity) but that most human cases are probably asymptomatic.

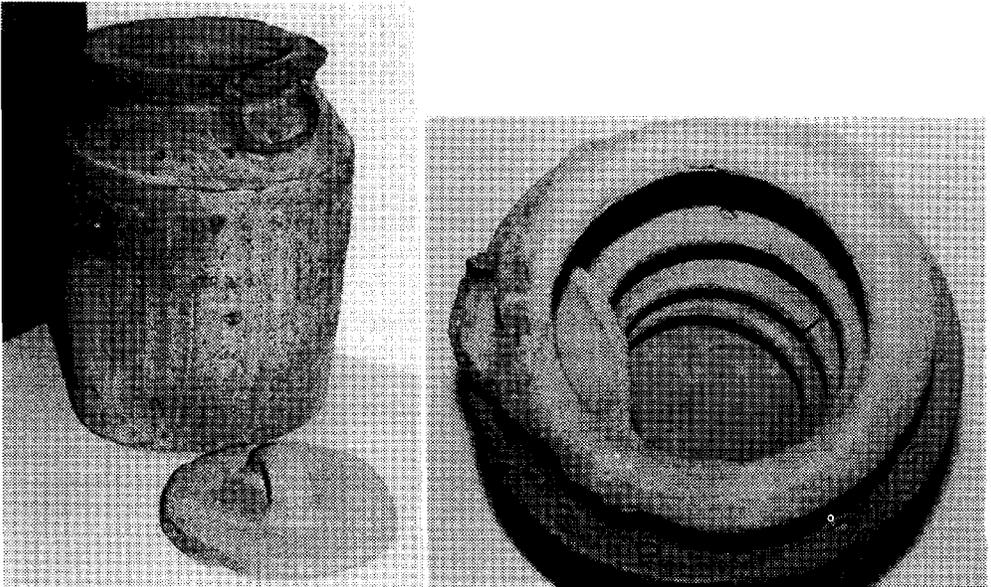


Fig. 9-10 – Outer and inner view of a jar for keeping dormice (“*glirarium*”) at the Museum of Boscoreale.

DORMICE, LAWS AND WILDLIFE MANAGEMENT

During the late Roman Republic (II-I B.C.), laws were made in order to control the immoderate luxury and idleness which dominated the social life of Roman patricians. These laws were named *leges sumptuariae* and forbade food wastage and excessively refined cuisine. The aim of these laws was to encourage Roman people to a moderate way of life, dedicated to work, family and the State. The first law referring to food and banquets is dated circa 180 B.C. Subsequent laws (the *lex fannia cibaria*, 161 B.C. and the *leges aemiliae*, 115 and 78 B.C.) dealt with the same subjects and compelled patricians to reduce the cost of their banquets. According to Plinius (*Naturalis historiae*, VIII, 233; XXXVI, 4) and other authors (see: Dosi & Schnell, 1984,1992), during the consulate of M. Aemilius Scaurus, the *leges aemiliae* expressly forbade the use of dormice as food.

In Italy, the philosophical concept of wild animals as *res nullius* (things belonging to everybody) has been apparent in all past legislation concerning hunting activities and game. Article 2 of the former Italian hunting law (nr. 799, 1967) considered "game" as all "Mammals and Birds living in nature excluding Moles, Shrews, Dormice, Mice and Voles" (De Leo, 1968). These animals were not protected and could be killed by everybody. Even though this law was later modified to exclude dormice from the unprotected species (nr. 968, 1977), the traditional hunting of dormice is still practised in many Italian regions. Amori et al. (1995) report that Italy has now aligned itself with new European legislation (nr. 157/1992). At present, dormice are protected from hunting; but no rules have been established for their control as agricultural and forestry pests. European legislation has also included some paradoxes. For instance, according to the EEC Directive nr. 609/1986, all the infesting synanthropic Murids were protected from experimental use in research laboratories (!), but not dormice. In our opinion, utilisation of dormice, like that of any other animal, for food, experimental research, domestic pets, skin exploitation etc., should be allowed only if conservation measures are taken to ensure the survival of natural populations.

CONCLUSIONS

In comparison with other genera and species of small rodents, the Edible Dormouse had a significant role in the diet of ancient and/or rural peoples in southern Europe. This alimentary custom, still persists in some places (chiefly in southern Italy) but is now disappearing together with many cultural aspects of rural life.

The majority of the special jars used by the Ancient Romans for fattening dormice have been found in Campanian archaeological sites (Pompeii and Benevento). Single jars were found in the provinces of Rome and Siena as well as in Slovenia.

Dormice are threatened by their own tendency to increase in number and damage crops when habitat conditions are optimal. This tendency to become a pest may provoke human reactions and result in local reduction of dormouse populations, perhaps below the viable minimum. The major threats are nevertheless deforestation, the abandoning of fruit-tree cultivation, and

competition with the Black Rat.

A specific action plan for dormouse conservation should be prepared, after evaluation of all the threats to the most significant populations of each species. The objective should be to guarantee effective protection for populations of scientific importance, including the most representative populations within the range of geographic variation of each dormouse species. The second objective should be to identify management strategies which allow the coexistence of dormouse populations and economic development of ago-ecosystems. Concerning the first goal, small protected areas should be established to protect important living sites of dormice, like the "mini-sanctuary" created in 1979 in Latvia to conserve one of the northernmost populations of the Edible Dormouse (Pilats, 1993). To attain the second objective, all possible ways of managing dormouse populations should be explored, through a detailed knowledge of all their habitat requirements (Bright & Morris, 1990). A comprehensive review of this subject was compiled by Bright & Morris (1989) who assembled strategies for conserving and improving natural populations of the Hazel Dormouse in England. Similar popular handbooks, also dealing with the other species, and suitable for any habitat condition, should be available in every European country and language.

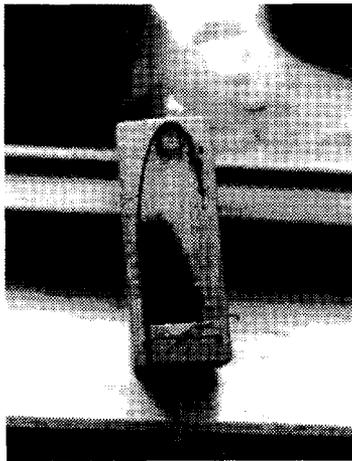


Fig. 11 – Traditional trap for dormice from southern Italy (Calabria).

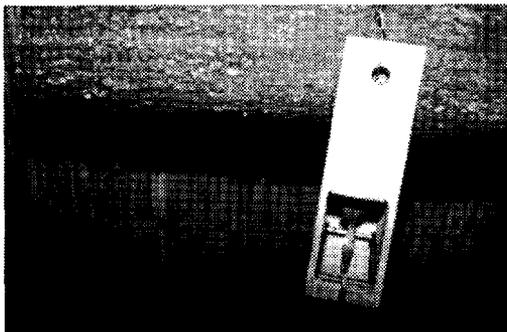


Fig. 12 – Traditional trap for dormice from Slovenia (Ljubljana).

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APPENDIX I – Checklist of "*gliraria*" (*vivaria in doliis*) with original archaeological sites, present museum location (within brackets) and references. Shape of the jar: C = cylindrical; G = globular; B = bucket-like. Italian provinces and respective regions: BN = Benevento (Campania); NA = Naples (Campania); RM = Rome (Latium); SI = Siena (Tuscania).

N	SITES	PRESENT LOCATION	REFERENCES	SHAPE
1)	Slovenia. Ptuj	(Provincial Museum Ptuj)	(Subic, 1972; Bruckner, 1976)	(C)
2)	Castelluccio (SI)	(Nat. Archaeological Museum of Chiusi)	(Gamurrini, 1895; Anecchino, 1982)	(G)
3)	Tor Bella Monaca	(RM) (Nat. Mus. Rome)	(Lissi Caronna, 1968; Messinco, 1985)	(G)
4)	Castelvenere	(Montesarchio, BN)	(Franciosi, in verbis)	(G)
5)	S. Salvatore Telesino	(Montesarchio, BN)	(Franciosi, in verbis)	(fragment)
6)	Altavilla Irpina	(Montesarchio, BN)	(Franciosi, in verbis)	(fragment)
7)	Altavilla Irpina	(Montesarchio, BN)	(Franciosi, in verbis)	(fragment)
8)	Between Benevento and Telesia	(Montesarchio, BN)	(Franciosi, in verbis)	(fragment)
9)	Pompeii (NA)	(Phorum of Pompeii)	(Messinco, 1985; d'Amrosio, in verbis)	(C)
10)	Pompeii (NA)	(Phorum of Pompeii)	(Messinco, 1985; d'Amrosio, in verbis)	(C)
11)	Pompeii (NA)	(Museum of Boscoreale)	(Anecchino, 1977)	(C)
12)	Pompeii (NA)	(Nat. Mus. Naples)	(Anecchino, 1982)	(G)
13)	Pompeii (NA)	(Nat. Mus. Naples)	(Anecchino, 1982)	(C)
14)	Pompeii (NA)	(Nat. Mus. Naples ?)	(Donaldson, 1827; Graham, 1978)	(G)
IS)	Vesuvian plain	(NA) (Nat. Mus. Naples)	(Gamurrini, 1895; Anecchino, 1977; Graham, 1978; Lista, 1986)	(B)