Extreme Insular Evolution in *Myotragus balearicus* Bate 1909 (Artiodactyla, Caprinae)

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ABSTRACT *Myotragus balearicus* Bate, 1909 (Artiodactyla, Bovidae) is an endemic fossil Caprinae that lived until human arrival in the Balearic Islands (western Mediterranean Sea). Following the recent discovery of new deposits, some anatomical and ecological features of *M. balearicus* were studied. Its diet, consisting mainly of *Buxus balearica*, a poisonous plant nowadays relictual in these islands, and its peculiar dentition, including a sole incisor in each dentary that has been identified as the second primary incisor tooth (dI₂), are among the recent findings concerning this species. This paper updates studies made on *M. balearicus* since 1985.

Key words: *Myotragus balearicus* / island evolution / diet / dentition / Balearic Islands

The Balearic Islands are situated in the western Mediterranean Sea (Fig. 1). During the Pleistocene, a dwarf bovid, *Myotragus balearicus*, was present on some of them - Mallorca, Menorca, Cabrera, and Sa Dragonera. Ancestors of *M. balearicus* colonized Mallorca about 5.7 - 5.35 million years ago, crossing the saline deserts that surrounded the Balearic Islands during the Messinian, when the Mediterranean Sea dried up.

Bate (1909) described this bovid genus and species. It was a very modified dwarf caprine that displays very peculiar derived anatomical characteristics (autapomorphies), acquired through its long evolution under insularity conditions. Its most characteristic feature, giving its generic name, is the presence of a single evergrowing incisor (with an open root) in each dentary, like rodents. Andrews (1915) made an accurate description of the species comparing its skeleton to those of *Capra*, *Nemorhaedus*, *Ovis*, *Oreamnos* and *Budorcas*.

Its limb bones, specially in the stylopodium and metapodials, have a larger robustness index than those exhibited by all recent bovids (Table 1) (Speer, 1988 a and b). Its vision was not lateral, as occurs in all the extant bovids, but the eye sockets planes display a more frontal position, due to the shortening of the rostrum and the lengthening of frontal bones (Alcover *et al.*, 1981). Some bone fusions, such as the fusion of the tarsal bones among them (naviculocuboidal) and to the metatarsal bone, are also among the autapomorphic characters of *M. balearicus*. All these features have been related to the acquisition of a low gear locomotion in an insular environment free of mammal predators (Leinders & Sondaar, 1974; Leinders 1979; Alcover *et al.*, 1981).

Fig. 1. Map of the Western Mediterranean Sea, with the Balearic Islands detailed.

Table 1.- Robustness index (sagittal diameter/length $\times 100$) for *Myotragus balearicus* bones and recent Caprinae (*Budorcas taxicolor* and *Ovibos moschatus* excluded). Data from Spoor (1988b).

Bone	<i>Myotragus balearicus</i>	Recent Caprinae
Humerus	17	11-14
Radius/ulna	11	7-12
Os metacarpale	22	7-16
Os femoris	13	8-10
Tibia	10	6-8
Os metatarsale	21	6-16
Phalanx I	56	31-43
Phalanx II	73	42-63

The dentition of *M. balearicus* was highly modified. It had a very hypsodont dentition with a single evergrowing incisor in each dentary in the adults, and with a reduced the number of cheekteeth. The functional significance of such dentition has been controversial. Andrews (1915) proposed that incisors were used to obtain lichens and mosses growing on rocks, while other authors (Angel, 1966; Adrover & Angel, 1967) proposed that they might have been powerful tools to make one's way through the caves moving round stones and rocks. The very hypsodont dentition together with the great wear of the cheekteeth in the older specimens have been interpreted as the result of an adaption to eat very

Fig. 2. Mounted skeleton of *Myotragus balearicus*. Shoulder height, 47.5 cm.

abrasive plant tissues (Freudenberg, 1914; Sondaar, 1977).

M. balearicus reached approximately 45 cm at the shoulder in adult specimens (Fig 2); however, skeletons of adults of only about 25 cm of height are known. The estimated weight for adult specimens ranges between 6 kg (minimum estimate provided by Waldren, 1982) and 60 kg (maximum estimate provided by Köhler, 1993) or even 70 kg (Alcover *et al.*, 1999). Spoor (1988b) calculated that the weight of adults was between 30 and 40 kg for specimens of Würmian age (last ice age), whereas the Holocene specimens weighed between 20 and 30 kg.

The phylogenetic relationships of *Myotragus* are still not clearly understood. Usually (since the work by Andrews, 1915; see also Gliozzi & Malatesta, 1980) it has been related to *Nemorhaedus* and *Capricornis* (and consequently it would be also related to the recently described *Pseudoryx*; see Thomas, 1994). The first two genera were classically related to *Rupicapra* and *Oreamnos* and were included with the former in Rupicaprini (see Simpson, 1945). Further approaches (Gentry 1978, 1980, 1992, Gliozzi & Malatesta, 1980, Hartl *et al.*, 1990; Thomas, 1994; Groves & Shields, 1996, Gatesy *et al.*, 1997) have questioned the monophyly and recognition of the Rupicaprini and Caprini by Simpson (1945). Therefore, it seems at present prudent to include *Myotragus* exclusively within the Caprinae subfamily until new studies shed light on the tribal relationships within this subfamily.

The causes of the extinction of *Myotragus balearicus* are still under discussion. Nowadays it is accepted that it was extirped due to the direct (hunting) or indirect (introduction of predators and competitors) activities of the first human settlers on these islands (Waldren, 1982; Guerrero, 1996).

THE DIET OF *MYOTRAGUS BALEARICUS*

Recent findings on the deposit in Cova Estreta (Northern Mallorca, Encinas & Alcover, 1997) allowed us to obtain bones and coprolites of this species in an excellent state of preservation. Finds of coprolites of *Myotragus balearicus* have also been reported previously in the Abric de Son Matge (at least two levels of coprolites, possible indicators of confined animals; Waldren, 1982) and in a cave in s'Arenal (materials possibly from the Würm; see Cuerda, 1975). Nevertheless, the coprolites from the Abric de Son Matge were too oxidized, whereas those from s'Arenal were totally mineralized, and neither therefore contain determinable organic material.

The study of the Cova Estreta coprolites of *Myotragus balearicus* provides relevant information on the diet of an extinct species (Alcover *et al.*, 1999). At the same time it provides first-hand information on the vegetation with which *Myotragus* interacted. The most pertinent finding of the analyses was the high proportion of pollen from *Buxus balearica*, a poisonous species for other bovids, which comprises 98% of the total amount of pollen.

The abundance within the coprolites of *Myotragus* of a taxon which has both a relatively low pollen production and dispersion capacity (Pérez-Obiol & Roure, 1985) allows us to reasonably consider that the coprolites' pollen content originates from ingestion and that probably, *Buxus balearica* was a very important part of the diet of *Myotragus balearicus*, at least in the Cova Estreta area.

Buxus balearica is known to be a species with a very high toxicity. Its leaves and trunk contain different steroidal alkaloids (buxines, cyclobuxines, parabuxines and others; see, for example, Khuong-Huu *et al.*, 1966). The ingestion of large amount by sheep, goats or calves of leaves or bark of *Buxus sempervirens*, a species very close *Buxus balearica*, can lead to death (Bastein *et al.*, 1973; Fowler, 1983; Camy *et al.*, 1986). Probably the effects of the ingestion of leaves or bark of *Buxus balearica* are identical. In fact, according to the literature no population of extant artiodactyl has been found to feed on *Buxus*.

Due to the toxicity of box it might be suggested as an alternative explanation that the *Myotragus* population from the Cova Estreta were forced to consume box owing to the non-existence or scarcity of other species of plants, and that box consumption was the cause for the death of the individuals. However, for us this explanation can be totally dismissed. It cannot be accepted if the morphology of the coprolites is considered. They are unlikely to belong to sick animals (coprolites revealing either diarrheas or abnormal forms are not present). On the other hand, if box consumption represented the last ingestion, a greater diversity of plant microfossils within the coprolites would be expected if the remains of former meals were present. Finally, the analysed coprolites have had to be produced by different individuals. It is not likely that a whole population, comprised of individuals which did not have bone pathologies indicating either rachitism or any other symptomatic condition related to food scarcity, would consume a plant which was not part of its habitual diet.

We therefore believe that the pollen analyses suggest that *Buxus balearica* was part of the habitual diet of *Myotragus balearicus*, being a source of great importance, at least in the Cova Estreta area. The analysis of the coprolites of *Myotragus balearicus* shows that the diet was extremely uniform. Consequently, it can be inferred that, at least in the Cova Estreta deposit, *Buxus balearica* was probably the only or almost the only food consumed. The relatively high percentages of other plants

found in three coprolites have to be interpreted as pollen depositions on the *Buxus balearica* material consumed by *Myotragus*.

We are not aware if *Myotragus balearicus* depended on box for survival. How *Myotragus* avoided its toxic effects is a question which we are currently working on.

The fine texture of the *Myotragus* coprolites, which do not contain macroscopic fibers, differs substantially from those of goat and sheep dung pellets which we have compared. The latter contain many fibers of more than 1 mm diameter, visible with the naked eye. The coprolites of *Myotragus* do not contain apparent fibers, but are composed of fine dust. More than 95% of the dry weight of the coprolites consists of particles less than 500 μm , and almost 50% is less than 125 μm .

The internal texture of the *Myotragus* coprolites cannot be explained as a result of a postdepositional degradation. The small particle size inside the *Myotragus* coprolites suggests more efficient digestive processes than that of other bovid species, in which numerous particles of larger size can be observed. From a comparative point of view, several recent dung pellets of *Capra hircus* belonging to the surroundings of Cova Estreta have been analysed. Twenty five percent of dry weight of the goat dung pellets consists of particles of more than 0.5 mm, whereas only 14.2% are particles of more than 0.125 mm.

However, this apparent high digestive efficiency complicates the analyses on the diet of *Myotragus*, since it involves a greater destruction of the materials consumed. At present it is difficult to determine which parts of box were consumed by *Myotragus balearicus*. A very few microhistological remains of flowers of *Buxus* have been found together with several remains of vessels. Probably, *Myotragus* basically consumed leaves, perhaps only tender leaves. There is no doubt that it consumed flowers. However it cannot be determined if it was an accidental or selective consumption. More information on the parts consumed by *Myotragus* would require further research. In what way *Myotragus* was dependent on box forests and the degree of euryphagy it had is unknown.

Data presented in this work are constrained to a mountain population of *Myotragus balearicus* from Mallorca. The diet of *Myotragus balearicus* in other habitats and on the remaining islands will remain unknown until there are further paleontological discoveries. Nevertheless, recent research (Pérez-Obiol., pers. com.) evidence that *B. balearica* played an important role as a component of the vegetation previous to human settlement on Mallorca and Menorca, living in areas where now the species is absent or even where current environmental conditions seem inadequate for it. It is not unlikely that *M. balearicus* interacted with the Balearic vegetation in a way such that favoured the development of *B. balearica* woods.

DENTITION OF *MYOTRAGUS BALEARICUS*

Until now there has been a general consensus on the interpretation of the dentition of *Myotragus balearicus*, but new materials from different Mallorcan caves have provided spectacular new information concerning the dentition of *Myotragus balearicus* (Bover & Alcover, 1999a).

The original description (Bate, 1909, enlarged by Andrews, 1915), established that its dental formula was 0/1, 0/0, 2/1 and 3/3 and that the dentition was secondary or successional (*sensu* Lockett, 1993a, b). Thus, the dentition was considered to result from the replacement of a primary or deciduous dentition.

Fig. 3. Dentary of juvenile *M. balearicus* with an erupted dI₁ and an still unerupted dI₂.

The incisor of *Myotragus balearicus* --very wide and evergrowing-- was considered from the beginning to be a I₁ (Andrews, 1915), which presumably had a deciduous predecessor. This interpretation has continued up to the present (e.g., Adrover & Angel, 1968; Alcover *et al.*, 1981; Waldren, 1982). Its origin is more controversial. Different authors have assumed that the presence of a sole incisor in the adult dentaries of *Myotragus balearicus* was due to the disappearance of I₂ present in its ancestor, *Myotragus batei* (Adrover & Cuerda, 1968; Moyà-Solà, 1979; Alcover *et al.*, 1981). However, other authors (Adrover & Cuerda, 1968) suggest that the incisor of *M. balearicus* could have originated from the fusion of I₂ and I₁ of *M. batei*.

Andrews (1915) described an alveolus, present in the dentary from young specimens, which presumably housed a second incisiform tooth, which subsequently fell out. The presence of either this tooth or its alveolus in young dentaries of *Myotragus balearicus* has been documented repeatedly. This tooth (as well as its alveolus) is absent in adults and has been identified in different ways: as I₂ or dI₂ (Pons-Moyà & Moyà-Solà, 1976; Waldren, 1982: page 634), as I₃ (Moyà-Solà, 1979; Alcover *et al.*, 1981; Waldren, 1982) or as C (Villalta & Kurtén, *vide* Adrover & Cuerda, 1968). All the above mentioned authors consider this tooth as a primary tooth which has no successor.

A young jaw specimen available has two incisiform teeth, the first being wide and hypsodont, almost non emerged, and the second is smaller and is located at the back and above the former. This specimen is considered to represent either the end of the fetal stage or is a neonate.

One of the juvenile dentaries available (MNIB 48059; Fig. 3) had two very hypsodont incisors together with an alveolus above the incisiform series are observed. No such dentary has been described before. There is a small functional erupted incisor, which has the base of its root just beneath the mental foramen in the area beneath the diastema (Sisson & Grossman, 1982) and oriented

almost horizontally and beneath the diastema. It has a different morphology from that of adult incisors.

Once this tooth is removed from its alveolus, we have observed, just above and behind this tooth (in anatomical position) a second incisor, still not erupted, which has the base of its root in the region just below the cheek teeth series, between dP₄ and M₁. The location of its root base is indicated externally by the visible prominence located on the lingual surface of the dentary. This situation has been confirmed by radiographs. This second incisor is wide and its distal part is at 5.5 mm from the most anterior margin of the dentary symphysis. Since it has not emerged it shows no wear. This same tooth has been found inside other young dentaries (MNIB 46501, 49203 and 49205), although the first incisor above described was not present in these specimens. Its alveolus was, however, present.

In some of the young specimens at the upper and lingual part of this tooth which has not erupted, a bony septum separates the alveolus of this tooth from a small cavity containing no teeth. Occasionally this septum is not present and only a small opening is present which connects the cavity to the alveolus of the second incisor.

The interpretation of the presence of two hypsodont incisors in young dentaries of *Myotragus balearicus* is complex. A first hypothesis considers that the first incisor described is a dI₁ which would then be replaced by another incisor that would be the I₁. In fact, the existence of a dI₁ has been postulated by different authors (Andrews, 1915; Waldren, 1982). In the remaining Bovidae (e.g., Sisson & Grossman, 1982; Pérez-Barbería & Mutuberria, 1996, and personal observations in 3 *Ovis aries* and 13 *Rupicapra pyrenaica* dentaries) the primary incisor teeth are replaced by other secondary teeth which always emerge from the same alveolus of the corresponding primary tooth. This substitution occurs by vertical replacement. As the secondary tooth emerges a resorption of the root of the corresponding primary tooth takes place. The former root of the primary tooth was being re-absorbed, especially at the lingual face, due to the fact that the secondary tooth emerges at a slightly more lingual position than that of the primary tooth (e.g., Berkowitz & Moxham, 1981).

However, this first hypothesis is incorrect for *M. balearicus*. Three facts allow us to dismiss it. In the first place, both teeth are found in different alveoli, which are separated by a very thin septum. If, in the case of specimen MNIB 48059, the observed incisors were the primary and secondary teeth corresponding to the same tooth (first incisor), the secondary tooth should emerge through the same alveolus as that of the primary tooth (Berkowitz & Moxham, 1981). In the second place, a re-absorption of the root base of the primary tooth should take place (Berkowitz & Moxham, 1981), which was not observed in the first incisor of MNIB 48059 or in the different homologous incisors studied. In the third place, the location of the root base of both teeth is very different for the two incisors of specimen MNIB 48059. If they were the same tooth, the base of the roots should be located in the same place or very close to one another.

An alternative hypothesis is that both teeth correspond to different numbered positions and what is really observed is not the replacement of a primary tooth by the corresponding secondary tooth, but a horizontal displacement of a tooth by its contiguous tooth (as in the cheek teeth of living elephants). In this case their homologies can be drawn by establishing which teeth they represent (first, second or third incisor or canine) and which dentition they correspond to (primary or secondary).

Since according to our interpretation there is no evidence of the replacement of incisiform teeth by other teeth, all the incisiforms of *Myotragus balearicus* would belong to a unique dentition, either the

primary or secondary. According to this interpretation, *Myotragus balearicus* would then have a monophyodont incisiform dentition, being unique among ruminants (Grassé, 1955). Yet to be determined is whether it is a primary dentition, several elements of which would have remained until an adult age, or a secondary dentition, without a primary dentition having erupted, at least postnatally, as, for example, the second premolar of the genus *Tarsius* does (Lockett, 1993a).

The fact that the only incisiform present in the adult stage of *Myotragus balearicus* is an evergrowing tooth does not provide information on which dentition (primary or secondary) it belongs to. In different orders of mammals, there are species with evergrowing incisors which can be interpreted either as belonging to the primary dentition (e.g., Glires: Adloff, 1898) or to the secondary dentition (e.g., *Daubentonia madagascarensis*, *Hippopotamus amphibius*; Hiiemae, 1981; Lockett, pers. com.).

According to our opinion, all the incisiform teeth of *Myotragus balearicus* belong to the primary dentition. According to Adloff (1898) the embryological study of evergrowing incisors in rodents and in lagomorphs shows that these teeth are dI_2 , as in *Myotragus balearicus*. The identification of an evergrowing incisor in rodents or lagomorphs as the same tooth (dI_2) has been considered as one of the most important characters grouping these two orders of mammals as Glires (Lockett & Hartenberger, 1985). Another independent case of acquisition of an evergrowing incisor interpreted as a dI_2 questions the usefulness of this character for supporting the monophyly of Glires. The analysis of the acquisition of an evergrowing incisor in *Myotragus*, a process which took place over the last 2.3 million years, can provide relevant data to understand the acquisition of evergrowing incisors in rodents and lagomorphs, a process which took place approximately 55-60 million years ago. Bate (1909) named the genus *Myotragus* since it possesses an evergrowing incisor similar to that of rodents. The similarities of this incisor with that of rodents is considerable due to the fact that in both cases it involves the same primary tooth.

The re-interpretation of the dentition of *Myotragus* has allowed us to clarify the dental homologies and the evolution of the dentition of this taxon. It has been documented that *Myotragus* acquired an incisiform dentition, through a neotenic process a little more than 2.3 million years ago. *M. antiquus* (Pliocene) had a diphyodont incisiform dentition, whereas its successors *M. kopperi* (Pliocene-Pleistocene boundary), *M. batei* (Lower Pleistocene) and *M. balearicus* (Middle Pleistocene to Holocene) had a monophyodont dentition. From the acquisition of monophyodonty, different teeth belonging to the primary incisiform dentition are preserved throughout the animal's life. In the evolutionary sequence, these teeth alter their position, in such a way that they change from being located next to one another, to being located one above the other. In parallel, a change in the dental replacement patterns has taken place. The replacement of a tooth by its secondary successor has evolved into the replacement of one tooth (dI_1) by its contiguous (dI_2) by means of a process of horizontal displacement.

From an evolutionary point of view, a reduction in the number of incisiform teeth has taken place in the adults. Four incisiform teeth were probably present in *M. antiquus*. *M. kopperi* had three, *M. batei* two and *M. balearicus* only one. The reduction is carried out phylogenetically and ontogenetically in a slightly different way.

Ontogenetically, in the succession of incisiform teeth in *M. kopperi*, *M. batei* and *M. balearicus* the loss of dI_1 first takes place. Phylogenetically, the loss of dI_3 in *M. balearicus* represents the only

Table 2. Measurements of *Myotragus balearicus* mounted skeletons, after Quetglas & Bover (1998). Skeleton 1, Museu de la Naturalesa de les Illes Balears, now in Societat d'Història Natural de les Balears (Palma de Mallorca, Balearic Islands); Skeleton 2: Smithsonian Institution (Washington, USA); Skeleton 3: Museu de Paleontologia "Miquel Crusafont", (Sabadell, Catalonia) All the measurements are in cm.

Measurement	Skeleton 1	Skeleton 2	Skeleton 3
Greatest length	83	88	87
Shoulder Height	47,5	49	50
Height to top of horns	49,9	63	59
Height to top of scapula	42	44,5	47
Height to top of pelvis	37,2	43	49

complete disappearance of an incisiform tooth within the evolution of *Myotragus*.

BODY SIZE AND WEIGHT

Our weight estimates based on the width of the diaphyses of the larger skeletal elements (Scott, 1983) assigns a weight to adult specimens of *Myotragus balearicus* (for different ages) between 13 and 20 kg for the smallest adult specimens and between 50 and 70 kg for the larger specimens (Alcover *et al.*, 1999).

At present we know that the adult specimens coming from the most recent Holocene level were at least 20% smaller in long bone length than specimens coming from the upper Pleistocene (e.g., Hamilton, 1984, Marcus, 1998). Some adult physical parameters of *Myotragus balearicus* skeletons are given in Table 2.

As a first step in the study of the *M. balearicus* growth, a research on the physical characteristics of neonate specimens is published (Bover & Alcover, 1999b). The results of estimation on the body mass and height of neonate *M. balearicus* are interesting.

This size reduction probably affected the neonates in the same proportion as in the adult specimens, although we have not enough material to confirm this point. Assuming that the temporal difference in size among neonates was of the same order as among adults, we can calculate from the length of long bones that the upper Pleistocene *Myotragus balearicus* had a shoulder height at the birth near 180 mm, while the neonate Holocene specimens reached only 150 mm. This shoulder height represents less than a half of the mother's shoulder height, an unusual feature for bovids (but usual for other artiodactyles like suids).

In our opinion, considering that the jaw of the upper Pleistocene neonate *Myotragus balearicus* is roughly similar in size to a rabbit (*Oryctolagus cuniculus*) and the long bones are also of a roughly similar length to those from a rabbit, an estimated weight of 700-900 g can be approached from our materials for the upper Pleistocene specimens, while for Holocene specimens the weight must have been less than 500- 600 g. Of course, the long bones of *Myotragus balearicus* are more robust than the corresponding rabbit bones, but the body weight of a rabbit always includes the viscer contents, while the estimated weight of the neonate *Myotragus balearicus* had empty viscera. This estimated weight represents probably about 2 % of the mother's weight. In this point, *Myotragus balearicus* was also unusual.

The neonate weight for ungulates is closely correlated with the mother's weight (Robbins & Robbins, 1979; Saether & Gordon, 1994). Usually, the neonate weight for bovids is > 4 % of its mother's weight. This seems not to be the case for *Myotragus balearicus*. In contrast with ruminants, the Suina in general produce relatively small offspring (Frädrich, 1967). For some suids the weight of the neonate is lesser than 2% of the mother's weight. For example, in *Sus scrofa*, *Potamochoerus porcus* and *Phacochoerus ethiopicus* the ratio between the weight of the neonate and that of its mother is 1.6%, 2.0% and 1.3% respectively (see Saether & Gordon, 1994). The weight of neonate *Myotragus balearicus* relative to the mother's weight was similar to these figures. Whether this small size of neonates was related to larger litter size, as is the case in suids, it is currently unknown. Although litter size in ungulates is inversely related to the relative neonate weight, *Myotragus balearicus* may have been also an exception to this rule.

ACKNOWLEDGMENTS This paper was presented as a poster in "The Ryukyu Islands" International Conference, organized by Dr H. Otsuka (Kagoshima). We want to acknowledge him for his invitation and hospitality. One of the authors (P.B.) received a fellowship from the Conselleria d'Educació i Cultura del Govern Balear (Direcció General d'Educació).

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P. BOVER & J. A. ALCOVER *Myotragus balearicus* Bate 1909 (偶蹄類ウシカモシカ亜科)
の極端な島嶼的進化

Myotragus balearicus Bate 1909 は地中海 Balears 諸島（スペイン領）の矮小化した偶蹄類ウシカモシカの一種で、4500 年前に絶滅してしまった。その先祖は、約 570 万年前の、地中海の乾燥気候時に、Balears 諸島を取り囲んだ塩性砂漠を横切って Mallorca 島に移入・定着した。その島嶼型進化に沿って、*Myotragus* は大変に特殊で、派生した特徴を獲得した。この *Myotragus* は、比較的小型（成獣でも肩高約 50 cm）で、大変にたくましい四肢—短い掌骨と指骨、ステレオスコープのように、見えることを容易にした前方に位置する眼窩、さらにその成獣では大変長冠歯で、常に成長を続ける犬歯を具えていた。

Myotragus の移動運動は、本土のウシ類のそれとは根本的に異なっていた。それは、ある限定された関節の形状にある。これらの解剖学的形状のために、それぞれ異なった骨と骨（大腿骨と脛骨、上腕骨と橈骨、掌骨と指骨）の関節面での動きはかなり制限されていた。つまり、現在の本土の牛科の、食肉類の攻撃に対しての、逃げるためのジグザグの動きは *balearicus* では限られていたか、全く出来なかった。足根骨と中足骨との融合は、ジグザグの動きには不適である。更新世の Balearic 諸島における食肉類の不在は、*Myotragus* の運動システムの島嶼的進化を明らかにする鍵となる。

この成獣の個々の歯の中で、常に成長をつづける 1 本の犬歯の存在は、この種の最も特徴的なところである。この犬歯は最近まで第 2 乳門歯 (dI₂) であると解釈されてきた。しかし、その成獣における存在は、ネオテニの過程で起こった。未成熟のこの動物は、他の初生的犬歯を有する。第 2 乳門歯 (dI₂) は、恐らくは、最初第 1 乳門歯 (dI₁) の脱落后に萌出し、誕生後の数週間、未成熟の歯列中に存在する。また未成獣においては、脱落する犬歯 (dC)、下顎第 3 前臼歯 (dP₃)、上顎第 2 乳臼歯 (dP₂) を具えている。これら 3 つの歯は、二次的永久歯の生え変わりもなく、脱落する。*Myotragus* におけるこのように高度に改変された歯の獲得は、鮮新世に始まり、それは気候変化と植生変化に関係してきた。

M. balearicus は大変有効な草食者で、硬い植物を食べることが出来た。糞石の花粉研究から、この動物は約 98% はツゲ属の一種 *Buxus balearicus* を食べていた。今日、この植物は Balears 諸島における遺存種的な分布をしている。しかし、後期更新世には、Mallorca 島と Menorca 島では普通であった。この植物は葉に大量の *buxine alkaloid* を含むために、今日のウシ類にとっては大変有毒な種である。

M. balearicus の絶滅は、Balears 諸島への人類の到達後とみなされる。確固たる原因はわからないが、それは人類到達と関係があるに違いない。