



Review Article

RABBIT ZACATUCHE (ROMEROLAGUS DIAZI): AN ENDEMIC SPECIES OF THE VALLEY OF MEXICO

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ABSTRACT

The Volcano rabbit (*Romerolagus diazi*) is an endemic species of Mexico, in danger of extinction, restricted to the central part of the Mexican transvolcanic belt. Considered like primitive species by its morphological characteristics, one faces a diminution in its free populations by destruction of its habitat mainly. It is one of the smallest rabbits of the world, it is of mainly diurnal activity, it lives in small groups, it does not present a defined reproductive stage but that remains in constant state of sexual acceptance once in puberty. The reproductive period includes all the year, although it is more intensive during the slighter summer and decrease during the winter. Its feeding consist mainly of grass. The present work is a description of the main biological aspects of the species, as morphology, behavior, feeding, distribution, habitat and with greater emphasis in the reproductive aspects and of conservation of the same one.

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INTRODUCTION

The zacatuche (*Romerolagus diazi*), also known as teporingo, tepolito or volcano rabbit, is a Mexican endemic species restricted to a small area of the central mountains Neovolcanic Transversal. It is a species assigned to a monotypic genus and is considered primitive by bone characteristics, because this has been seen as close to the pikas (*Ochotona*). His physical appearance is identified with any other rabbit, however, chromosomal and reproductive factors as more related to hares (*Lepus*) than the rabbits (Cervantes y Gonzalez, 1996). Belongs to the order Lagomorpha (Lagus = rabbit, morph = form, a rabbit), along with the other species of rabbits, hares and pikas. Mexico is the richest country in the Americas in terms of diversity of lagomorphs as it has 14 different species of rabbits and hares. It has nine different species of rabbits, eight known scientifically as *Sylvilagus* and more like *Romerolagus* plus five

species of hares in the genus *Lepus* (Romero and Velázquez, 1994). Of all the species of our country, five rabbits and three rabbits are endemic, or 57%.

Morphology

Has a relatively small size compared with the other members of the family Leporidae, its members are short, the ears are small and round the tail is so small that it is almost invisible. The coat is rather short and dense yellow mixed with black on the back and side areas. Apical and basal parts of the hairs are black and yellow middle. The distal upper legs does a brilliant ocher, the ventral surface pale brown. The sides of the nose and orbital region are beige, the base of the ears of metallic beige, below the throat color is ocher mixed with dark gray-silver in a short coat. Have a picture of yellow hair on the neck, between the base of the ears. The chest is covered with long hair, smooth: there is no contrast to the ventral coat color.

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The average values and ranges of body measurements for adults are: total length 270-315mm, head length 18-31 mm, hind foot length of 42-55 mm, ear length 40-45 mm and weight 380 - 600 g (Cervantes and Martinez, 1996).

Habits

Zacatuche activity is primarily diurnal and crepuscular, most active at dawn and dusk, and all day on cloudy days. While the asset is moved along specific roads or tunnels between the sacaton (bunch grass). Remain in these tunnels, but also live in underground tunnels abandoned by other mammals, useful to protect themselves from predators in exposed areas (Matsuzaki *et al.*, 1996). Stand still with his ears raised as a conduct warning. Another behavior that we see, is that it is at no great distance when they flee, but are only a few meters and stopped several times before reaching its burrow. Establishing and live in groups of two to five individuals as a form of social well-defined features aggressive behaviors like biting and drive to other individuals in defense of territory or mates. The frequently used vocalizations zacatuche sharp and strong, which most likely are intended to inform other individuals about the presence of predators. Of all the rabbits and hares of the world, none other than the zacatuche vocalizes and pikas. Furthermore, although not alert situations, vocalized as a normal part of their social interactions (Romero and Velázquez, 1994).

They are gregarious, living in groups of between 2 and 5 individuals. They have a home range no greater than 2500 m² (DGZCM, 2006).

Food

They feed mainly on bunch grass (grass) known locally as tillers or Sacaton. They are consumed throughout the year, selected young leaves of Sacaton, which are soft and green. Habitually consuming parts close to the base of the leaves or the lower parts of sacaton. In addition to the pasture, eat grass, young leaves of thorny herbs, seeds and bark of alder (*Alnus* sp.), Also feed in fields without causing damage and often consume the foliage of young plants of maize (*Zea mays*) and oats (*Avena sativa*) (Romero and Velázquez, 1994). In this regard, Cervantes and Martinez (1992), indicated that the zacatuche consume 22 different plant species, mainly Poaceae sp, Betulaceae sp, Loganiaceae sp, sp and Geramiaceae Lamiaceae sp. The most used are *Muhlenbergia* sp, *Stipa* sp and *Festuca* sp.

Reproduction

In lagomorphs adult sexual dimorphism, females are generally larger than males. In zacatuche is obvious at a glance this phenomenon. The average female measured 285.1 mm and weighing 535.9 g on average, in contrast to males with a length of 268.3 mm and weighs 417.4g. Although statistically, Cervantes found no significant difference between the sexes in this regard (Cervantes, 1982). The age of puberty has not been determined clearly. In this regard, Matsuzaki *et al.* (1996) found that the weight of both females and males is stabilized between 400-450 g at five months old, which was considered as a criterion to start playing, the first delivery was made seven months age, the first mating success was observed at the age of five to six months.

It was noted that the links can be made at any time, as it apparently is induced ovulation. The zacatuche sexually active males are characterized by the location of the testicles inside the scrotum, as in other rabbits, and the extrusive nature of the glans penis. It was found that on average, the right testicle is 17.6 mm long by 9.7 mm wide, while the left is 17.4 mm in length and 9.7 mm wide. In most adult lagomorphs, the testicles descend from the abdominal cavity into the scrotum during the breeding season only relevant, but in the zacatuche found that scrotal remain throughout the year. No relationship was found between the size of the testicles and the individual with the time of year. However, the number of sexually active adults in the middle of the year was higher (Cervantes, 1982). As in other Leporidae, the ovaries with the naked eye can see, the presence of translucent areas representing follicles Graff and dark depressions that correspond to the corpus luteum. The oviducts and uterus are cylindrical in shape (Cervantes, 1992). Lagomorphs characteristically present in the early postpartum estrus, ie, within hours of birth, during which they are fertile (Ambriz *et al.*, 2002). No defined reproductive stage but remains constant state of sexual acceptance once puberty. It was noted that the links can be made at any time, as it apparently is induced ovulation. The reproductive period covers the entire year, but is more intense during the warm and humid summer and milder in the winter cold and dry (Cervantes and Martinez, 1996). It has been observed in laboratory and reproduced every month of the year, except in May, but the kits born in June are the result of links made in May, so the zacatuche like the domestic rabbit (*Oryctolagus cuniculus*) can be played all year. The same has been seen in wild populations. Zacatuche reproductive pattern is determined by food availability (Matsuzaki *et al.*, 1996). With regard to courtship and mating behavior of very different zacatuche the pikas and rabbits. When found, the male approaches the female, to smell it approaches the female, which moves several steps in the opposite direction, which is repeated several times. Half of these approaches, the female to the male becomes suddenly and pretends to attack, jumping on the male's head, which goes to the female and approaches. Finally, the female stops, stretches stretching the forelimbs and adopts a submissive posture called lordosis, which is the arching of the spine and exhibition of the genitals. While mating the male makes the female the peritoneum moves upward. Copulation takes place in seconds and is characterized by the fall of the male to the female's back. It is commonly observed the fight or escape, where the female may attack the male to cause serious or even fatal injuries (Matsuzaki *et al.*, 1996).

The gestation period ranges between 38 and 41 days. Fetuses at term without hair, except for isolated whiskers and hair on the face. Fingers have already developed fingernails and incisors that just stick out of gum. The small, visible tail and is well formed. The kits open their eyes between 10 and 12 days old, but remain in the nest for two weeks. Lactation is from 21-28 days (Matsuzaki *et al.*, 1996). The average litter size is 2.4 ± 0.7 kits. The body is developing rapidly after 21 days and weigh between 83-130g for females and 95-128g for males. Growth is rapid the first four months, after which female growth slows slightly, while males continue to develop up to five months (Matsuzaki *et al.*, 1996). Zacatuche nests are digging on the soil surface, located near the base of bunch grass, which hides its dense coverage of the hearing. Some nests have been found also on the central part of these grasses.

The construction material is made from dried bits and pieces of plants such as pine (*Pinus* sp), alder (*Alnus* sp), herbs (*Penstemon* sp, *Eryngium* sp and *Gnaphalium* sp), fragments of finely chopped bunch grass and a long mass of hair the mother, which occupies most of the volume. The nest entrance is usually covered almost entirely by plant debris, except for a small gap of about 3cm in diameter. However, nests have also been found between the cavities of volcanic rocks and in burrows abandoned by other mammals (Cervantes and Martinez, 1996).

Distribution

The zacatuche is one of the mammals with restricted ranges of all mammals in Mexico. Their populations are in the mountains of the southern part of Valle de Mexico (Cervantes *et al.*, 1990). Historically had been reported in the volcano Iztaccihuatl Popocatepelt volcano at elevations within the adjacent states of Mexico, Puebla and Mexico City. Although the collections made, in the late 80's, it was not known with precision the total area of distribution. Hoth *et al.* (1878) found the zacatuche in three isolated areas in the central area Neovolcanic Cross: The Sierra Nevada, the volcano Tlaloc and Pelado volcano, however, not found in the Nevado de Toluca, which previously reported (Velazquez *et al.*, 1996). At the beginning of the 90's, was found in the Sierras and Ajusco Chichinuatzin and the Sierra Nevada, in the Sierras and Ajusco Chichinuatzin, was restricted to Tlaloc and Pelado volcanoes. Within the Sierra Nevada was found in volcanoes Popocatepelt, Papaya and Iztaccihuatl (Velázquez *et al.*, 1996). Currently, it is considered that an area is fragmented into 16 zones in the states of Puebla, Mexico, Federal District: Sierra Chichinuatzin, Ajusco and Sierra Nevada. Within the Federal District, the area of distribution is approximately 140 thousand hectares (DGZCM, 2006).

Habitat

We defined nine vegetation communities considered as synonyms of habitats

- Supra-Alpine Mosses: zacatonal open above the 4230 m altitude.
- Zacatonales supra-alpine bit heavier than before, between 4100 and 4220 m, grasses form clumps.
- Zacatonales alpine zacatonal homogeneous and very dense, between 3900 and 4130 m altitude.
- Pine tall, widely distributed open pine forest with a dense and homogeneous herbaceous, between 3120 and 3840 m.
- Zacatonales induced in pine forest, between 3090 and 3620 m altitude, tree layer is homogeneous and dense.
- Mixed forest, pine-aile, located between 3000 and 3500 m altitude.
- Zacatonales in fir forest, open forest of firs, between 3150 and 3480 m altitude.
- Fir forest: dense forest, between 280 and 3340 m altitude.
- Fir and cedar forest, mixed forest, between 2840 and 3070 m.

To define zacatuche habitats, we must consider two aspects: the floristic and structural. The first aspect defines the composition and community structure, the second provides shelter their relationship as well as being a food source with a high level of nutrients.

Conservation

The zacatuche, is listed in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and Red List of the International Union for Conservation of Nature (IUCN) as a species endangered. In our country, is in the same category protected by the Mexican Official Standard NOM-059-ECOL-2001. Rabbits and hares from Mexico, have a great ecological importance, since along with rodents represent the food of other animals like coyotes, weasels, ring-tailed cats, bobcats, hawks, eagles, owls and some snakes. Feeding rabbits and hares include grasses, herbs, shrubs and tree parts, which cause major changes in the plants allowing the control and development of these populations. They contribute to the dispersal of several species of plants because they can eat their seeds in one place and defecate elsewhere (Romero and Velázquez, 1994). There is no recent census, an estimated current population is 5000 people distributed over an area of 386.5 km². Within the range, there are five areas considered protected areas, which mostly lack a management and infrastructure needed for its conservation (DGZCM, 2006). The main problem it faces is the fragmentation and habitat reduction. Velázquez *et al.* (1996) determined that the most used habitat type is formed by *Pinus* sp.y *tolucensis* *Festuca*, which is in a difficult situation, because on one side wins and suffered major alterations by human activities and on the other, no important features to be considered within the priority areas for conservation, the current national environment plans. The main activities are habitat disturbance (Lopez-Paniagua, 1996):

- Urban development.
- grazing of cattle and sheep extensive and intensive.
- Deforestation, uncontrolled and illegal.
- Fires and natural.
- Extraction of Zacaton and land.
- Use of fertilizers, herbicides and pesticides (potential problem are as yet unknown effects on zacatuche).
- Poaching.

The conservation of biodiversity implies the maintenance of genetic variability of species and ecosystems. When a species is defined as a priority to be preserved are actually talking about maintaining their populations in the wild. Zacatuche utilization is of great importance for the conservation of habitat and a large number of species that depend on it for survival. These areas are also a significant area for ecological conservation of natural systems that surround the city of Mexico. In addition, other important situations for the preservation of zacatuche are: lack of a management plan and conservation of the species and natural areas protected nationally and internationally, lack of education and awareness of local and regional population and little variety and effectiveness development alternatives for local people (DGZCM, 2006).

Conclusion

Due to the risk posed by zacatuche (*Romerolagus diazi*) and considering that there is little data to support program management and conservation of the species, consistent with the peculiarities of its biology is of utmost importance to establish in the first instance outreach programs to protect it, and then generating basic knowledge to develop conservation programs in situ and / or ex situ.

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