SJIF Impact Factor (2023): 8.574| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 8 | Issue: 5 | May 2023 - Peer Reviewed Journal

UDC 591.5

# ECOLOGICAL FEATURES OF THE COMB GERBIL (*MERIONES TAMARISCINUS*) IN THE SOUTHERN ARAL SEA REGION

**Bekmuratov Baxtiyar Mirzabaevich[1], Khabibullaev Amet Zhandullaevich[2]**
*[1]Degree-Seeking Student, Karakalpak Research Institute of Natural Sciences, Uzbekistan, Nukus*
*[2]Doctor of Philosophy in Engineering (PhD), Karakalpak State University named after Berdakh Uzbekistan, Nukus*

**ABSTRACT**
*The problem of anthropogenic transformation of landscapes in various modifications has become one of the most priority and leading areas of population ecology. In the South Aral Sea Meriones tamariscinus is widely distributed, but unevenly. Significant changes in the size of the gerbil population over the years were revealed. The population dynamics of Meriones tamariscinus and reproductive processes are influenced by various environmental factors.*
**KEYWORDS:** *the lower reaches of the Amudarya, population dynamics, ecology, environmental factors.*

At present, in all regions there is an intensive impact of anthropogenic pressure on the Earth's ecosystems, where, as a result, the transformation of natural landscapes occurs. The problem of anthropogenic transformation of landscapes in various modifications and the adaptation of biota to such transformations has become one of the most basic trends in the field of population ecology. In order to bioindicate ecosystems, it is possible to successfully apply indicators of ongoing processes in the functional components of biota [1, 6].

As is known, the responses of populations and communities to exogenous environmental impacts determine the stability of ecosystems. Numerous works show the ecological vector of transformation of the main parameters of biosystems under the influence of anthropogenic impact [6, 7, 14, 16]. In terms of ecological and morphophysiological features, small mammals are the most dynamic component of biocenoses and play a significant role in the functioning of the ecosystems of the South Aral Sea region.

According to scientists, small mammals have a wide dynamism, high fecundity, rapid restructuring of the sex and age structure; they are an ecological bioindicator of the state of the natural environment as a whole [1, 7].

The combed gerbil (*Meriones tamariscinus*) is a mesophilic background species in the lower reaches of the Amu Darya in the Aral Sea region and, regardless of biotopic conditions, is found everywhere. *Meriones tamariscinus* is sufficiently adapted to living in deserts and semi-deserts from the Lower Volga region to Uzbekistan, Tajikistan, and Southeast Kazakhstan [5, 10, 13]. Outside the CIS, it occurs in Northwestern China [14, 15].

In the lower reaches of the Amu Darya, *Meriones tamariscinus* very often inhabits tugai and reed beds and irrigated areas. Also, the gerbil prefers to settle in the thickets of licorice, comb, as well as along canals and ditches, in gardens and on sown lands of farms in the Republic of Karakalpakstan [11, 13].

Experts noted that the subspecies taxonomy is still not fully understood. According to scientists, 6-7 subspecies have been described so far, and in the region of the South Aral Sea - 1 species (M. *t. Tamariscinus Pallas (1773*) [5, 12]. significantly higher than in the desert zones of the North-Western Kyzylkum.On the Ustyurt plateau, the population of *Meriones tamariscinus* is quite low (no more than 5 holes per 1 km, or 0.5% of falling into traps) [5, 12]. in the lower reaches of the Amu Darya, the population of *Meriones tamariscinus* is quite high, sometimes reaching up to 23-27 holes per 1 km, or 8-10% of the hit.

SJIF Impact Factor (2023): 8.574| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 8 | Issue: 5 | May 2023 - Peer Reviewed Journal

The main habitat of *Meriones tamariscinus* is a hole where the animals hide in case of danger from natural situations. According to experts, *Meriones tamariscinus* very often digs single burrows under combing bushes, which are relatively simple. According to our observations, the depth of the burrow is about 1.5 m, and the average diameter of the inlet is up to 5-6 cm. The burrows are vertical. Burrows are the birthplace of cubs and the place of their winter hibernation. In permanent burrows, *Meriones tamariscinus* arranges nesting chambers (up to two on average) located at different depths, which is consistent with the literature data [5, 10, 12]. Individuals of *Meriones tamariscinus* are most active at twilight and at night (including in winter) [15].

In the South Prearalie, the population of *Meriones tamariscinus* breeds from March to September, most intensively from April to June. An active lifestyle of *Meriones tamariscinus* begins in the middle of March [11, 13, 17]. The seasonal life of gerbils is in direct connection with the natural and climatic conditions of the environment. Under favorable natural conditions, gerbils are very active throughout the year, as well as in the presence of a sufficient food supply. Seeds and vegetative parts of plants are the main food resource in the diet of gerbils. In spring and summer, rhizomes and green parts of plants are recorded in the diet of *Meriones tamariscinus*. In other seasons of the year, it makes good use of fruits, seeds, and branches of various plants in its diet [10].

Among the wide variety of adaptive ecological mechanisms of animals to changing environmental conditions, a special place belongs to structural and population adaptations, including the very labile age structure of populations [7, 8].

One of the priority directions of the adaptive evolution of small mammals is the complication of the age structure of populations. The complex age structure of the population increases the adaptive capabilities of populations and increases the resistance of animals to the impact of adverse environmental factors [5, 7, 15]. For small mammals, this aspect is of particular importance, since individuals are characterized by relatively low individual stability and the ability of group adaptation to very changing habitat conditions [8, 12, 15].

The study of the age structure of rodent populations makes it possible to assess the biological originality and the significant role of individual generations in the reproduction of species [12, 13].

Based on the materials of long-term surveys (2015–2022) of the comb gerbil in the lower reaches of the Amu Darya, we set the task of parametrizing the dependence of body length and weight on age for two variants of ontogeny: “rapid growth, puberty in the current year” and “slow growth and puberty next year".

As is known, growth in mammals is traditionally classified as asymptotic, i.e. with the onset of puberty, growth inhibition is observed. For many species of small mammals adapted to the specific conditions of an arid climate, including the combed gerbil (*Meriones tamariscinus*), a seasonal feature of the reproduction process is typical, i.e. one breeding period (from March to September), where females bring several litters during this period (from 1 to 2, rarely up to 3 generations) [15].

n the course of the studies, it was found that *Meriones tamariscinus* is characterized by two variants of ontogeny: monophasic growth for underyearlings that mature in the year of birth, and biphasic growth for overwintered individuals, whose puberty occurs only the next year after their birth. The second peak of biphasic growth occurs in the spring and also depends on the time of puberty of newly arrived individuals [5, 9, 17].

For a comparative analysis of the nature of the growth of non-maturing (0) and maturing (1) underyearlings, a parametric equation of the Michaelis-Menten type was used [4]:

$$y = a*x/(b + x),$$

where **a** is an estimate of the population mean of the upper asymptote, **b** is a “constant”, numerically equal to the value of the abscissa (age), at which the ordinate reaches half of its maximum value. The following parameter estimates were obtained with a 95% confidence interval: for body length (mm):

SJIF Impact Factor (2023): 8.574| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 8 | Issue: 5 | May 2023 - Peer Reviewed Journal

$$Y(0) = 93{,}2[94{,}5–96{,}2] * x / (0{,}7[0{,}6–0{,}9] + x);$$
$$Y(1) = 101{,}2[96{,}1–101{,}6] * x / (0{,}2[0{,}02–0{,}4] + x)$$

Since the confidence intervals do not intersect, it can be noted that maturing underyearlings are not only characterized by higher asymptotes, but also reach their half value approximately 0.5–1 week earlier.

The results obtained are consistent with the concept of the signaling role of photoperiodicity in the growth and development of small mammals in an arid climate [1, 9].

Thus, in the South Prearalie, the population of *Meriones tamariscinus* is widely distributed, but unevenly. Significant changes in the size of the gerbil population over the years have been revealed, and along with the intensity of reproduction, various environmental factors (drought, enemies, competitors, diseases, etc.) influence the population dynamics.

The most powerful anthropogenic pressure, the development of land for irrigated agriculture in the lower reaches of the Amu Darya in the Aral Sea region, leads to a reduction in suitable habitats and a decrease in the population of combed gerbils. The obtained estimates of ontogeny parameters allow us to conclude that the increase in body length outstrips weight gain by about two weeks, and the average terms with a 95% confidence interval correspond to 50% of the increase in body length and weight. These results are in good agreement with the concept of the signal role of photoperiodism in synchronizing the growth and maturation of small mammals in the lower reaches of the Amu Darya.

**LITERATURE**

1. *Bashenina N.V. Ways of adaptation of mouse-like rodents. M.: Nauka, 1977.-355 p.*
2. *Bakhiev A.B., Treshkin S.E., Mamutov N.K. The study of plant resources of the Southern Urals and their rational use in the conditions of Anthropogenic desertification. // On Sat. IV International scientific-practical conference "Problems of rational use and protection of biological resources of the Southern Aral Sea". - Nukus: Ilim. - 2012. - P.35.*
3. *Bigon M., Harper J., Townsend K. Ecology. Individuals, populations, communities. M.: Mir, 1989. - V.2. - 278 p.*
4. *Biochemistry: textbook / Edited by Severin E. S. - M.: Geotar-Med, 2004. - 784 p.*
5. *Isaev S.I., Shilova S.A. Biotopic distribution of midday (Meriones meridianus) and tamarisk (M.tamariscinus) gerbils (Rodentia, Gerbillinae) in the south of Kalmykia // Izvestiya RAN. Ser. Biol. (1). 2000. C. 94-99.*
6. *Gashev N. Mammals in the system of ecological monitoring (on the example of the Tyumen region). Tyumen: Tyumen State University, 2000. - 202 p.*
7. *Demidovich A.P. The community of rodents as an indicator of the degree of disturbance of the indigenous natural complexes of the Baikal region // Teriofauna of Russia and adjacent territories (VII congress Teriol. ob-va). Mat. intl. owls. - 2003. - M. - 2003.- p. 108.*
8. *Ivanter E.V. Population ecology of small mammals in the Taiga North-West of the USSR. - L.: Nauka, 1975.- 243 p.*
9. *Lukyanova L.E. Changes in the population parameters of small mammals under the conditions of technogenic impact // V congress Vses. teriol. Society of the Academy of Sciences of the SSR. - T.2. - M. - 1990. - S. 242-243.*
10. *Magomedov Yu., Akhtaev M-Kh.R. Dependence of nutrition and the state of the population of the comb gerbil on the dynamics of food resources // Zool: Zh. - 1993. - v. 72, v.2. - S. 101111.*
11. *Mambetullaeva S.M. Characterization of the spatial structure of populations of small mammals in the lower reaches of the Amu Darya // Journal "Postgraduate student and competitor", Moscow, Russia, 2012, No. 2, pp. 47-48.*
12. *Ramazanov Kh.M. Materials for the biology of combed gerbil. // Vestnik DSU. Natural Sciences. Issue. 1. - Makhachkala, 2005. - S. 59-61.*
13. *Reimov R. Rodents of the Southern Aral Sea. - Tashkent, FAN. - 1987.- 125 p.*
14. *Sludsky A.A., Borisenko V.A., Kapitonov V.I., Makhmudov S., Mokrousov N.Ya. and other Mammals of Kazakhstan, V.1, Part 3. Rodents (gerbils, voles, Altai zokor). - Alma-Ata, Nauka. - 1978. - 491 p.*
15. *Surkova E.N., Savinetskaya L.E., Ovchinnikova N.L., Chabovsky A.V. Long-term population dynamics of the tamarisk gerbil under conditions of anthropogenic transformation of the landscape // Scientific electronic journal "Principles of Ecology" - V. 5. No. 3 (19). September, 2016: http://ecopri/ru*
16. *Shilov A., Chabovsky A.V., Isaev S.I., Neronov V.V. The dynamics of the community and population of rodents in the semi-deserts of Kalmykia under conditions of reduced pressure on pastures and humid climate // Izvestiya AN: Ser. Biol. - 2000.- No. 3. - p. 332-344.*
17. *Shubin I.G., Bekenov A. Ecological features of the comb gerbil in the Zaisan basin // Ecology (4). 1971. C. 97-98.*