

Species Composition and Bioecological Characteristics of Mammals in The Lower Amudarya State Biosphere Reserve

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Abstract: This article analyzes the species composition, ecological distribution, and major bioecological characteristics of mammals inhabiting the Lower Amudarya State Biosphere Reserve. The analysis demonstrates that mammalian distribution and population dynamics are determined primarily by vegetation structure, water availability, food resources, seasonal climatic conditions, habitat connectivity, and anthropogenic pressure. Special consideration is given to the rapid recovery of the Bukhara deer population and the ecological consequences of increasing population density. It is concluded that effective mammal conservation in the Lower Amudarya requires an ecosystem-based approach integrating population monitoring, protection and restoration of tugai vegetation, maintenance of suitable hydrological conditions, preservation of ecological corridors, and scientifically based management of anthropogenic impacts.

Keywords: Lower Amudarya State Biosphere Reserve, mammals, species composition, bioecology, biodiversity, tugai forest, habitat, population dynamics, ecological adaptation, conservation.

Introduction: The Lower Amudarya State Biosphere Reserve is one of the most important protected natural territories for the conservation of mammalian biodiversity in the arid zone of Central Asia. Located in the lower reaches of the Amudarya River in the Republic of Karakalpakstan, the reserve protects a large complex of tugai forests, riverine habitats, reed beds, shrub communities, semi-desert areas, and adjacent anthropogenic landscapes. It covers approximately 68,718 hectares and contains one of the largest remaining areas of natural tugai vegetation in Central Asia [3, 44-50]. UNESCO emphasizes that tugai represents a unique and threatened riparian ecosystem and that the Lower Amudarya area supports exceptionally high biodiversity compared with the surrounding desert landscapes. The ecological importance of the territory is particularly evident in its mammalian fauna because mammals occupy different trophic levels and respond sensitively to changes in vegetation, water availability, habitat connectivity, and

human pressure [1].

Current official information records 36 mammal species within the Lower Amudarya State Biosphere Reserve. Their taxonomic and ecological diversity reflects the transitional position of the reserve between riverine tugai ecosystems and the surrounding arid landscapes. The mammalian community includes ungulates, carnivores, lagomorphs, insectivores, bats, and numerous rodents. Representative species include the Bukhara deer, wild boar, golden jackal, jungle cat, fox, badger, hare, long-eared hedgehog, bats, gerbils, ground squirrels, and other small mammals. These species do not use the reserve uniformly. Their spatial distribution is determined by the availability of water, vegetation structure, food resources, shelter, soil characteristics, seasonal flooding patterns, and the degree of anthropogenic disturbance [5, 245-247].

The most important mammal from the conservation perspective is the Bukhara deer, currently classified as *Cervus hanglu bactrianus* in UNESCO materials. It is

closely associated with the tugai ecosystems of Central Asian river valleys and is therefore an important biological indicator of the ecological condition of riparian forests. The species depends on a mosaic of dense woodland, shrub vegetation, open feeding areas, and reliable water sources. Its diet is predominantly herbivorous and includes leaves, shoots, branches, reeds, grasses, and other components of floodplain vegetation. Earlier ecological observations from the reserve identify reed, cane, liquorice, willow and related plants among important food resources. The dense tugai vegetation simultaneously provides feeding sites, shade during extremely hot summer conditions, and protective cover during reproduction.

The history of the Bukhara deer population demonstrates the effectiveness of long-term conservation in the reserve, but it also illustrates an important ecological problem. Following reintroduction and protection, the population increased dramatically. A scientific assessment reported that the reintroduced population had exceeded 2,000 individuals, concentrated mainly within approximately 88 km², producing an estimated density of about 24 individuals per square kilometre. Such a high density can create strong browsing pressure on tugai vegetation. Therefore, population growth cannot automatically be interpreted as complete ecological success. When herbivore abundance exceeds the carrying capacity of the habitat, intensive consumption of shoots, leaves, and young plants can reduce natural regeneration, alter vegetation structure, and eventually decrease the quality of the habitat on which the deer itself depends. Recent conservation work has consequently focused not only on increasing deer numbers but also on improving habitat and considering redistribution of animals to other suitable sections of the reserve. This demonstrates the transition from simple species protection toward ecosystem-based population management [2].

Wild boar (*Sus scrofa*) represents another important ungulate component of the mammalian community. In contrast to the more specialized ecological association of the Bukhara deer with tugai vegetation, wild boar has considerable ecological plasticity. Dense reed beds, wet depressions, riverbanks, shrublands, and forested areas provide shelter and feeding opportunities. Its omnivorous diet allows it to consume roots,

underground plant organs, fruits, seeds, invertebrates, and other available organic material. Such dietary flexibility is particularly advantageous in the Lower Amudarya environment, where the quantity and distribution of food resources vary substantially between seasons. Through rooting and soil disturbance, wild boars may also influence soil aeration, seed germination, decomposition, and small-scale vegetation dynamics.

Carnivorous mammals form an ecologically significant group within the reserve. The golden jackal (*Canis aureus*) is among the characteristic predators of Central Asian tugai landscapes. Jungle cats, foxes, badgers, weasels and several other carnivorous mammals have also been documented in the reserve, while wolves have occasionally been observed. The jackal is particularly well adapted to heterogeneous environments because of its opportunistic feeding strategy. It may consume rodents, small vertebrates, carrion, insects, fruits, and other available food. Such flexibility enables it to survive in natural tugai forests as well as in areas influenced by agriculture and human settlement. Jackals may prey upon young Bukhara deer, but available research indicates that their predation pressure is insufficient to regulate the exceptionally dense deer population effectively. This is an important example of how changes in trophic structure can affect ecosystem regulation.

The jungle cat (*Felis chaus*) is another characteristic predator of the reserve and is particularly associated with dense reeds, shrubs, wetlands, and riparian vegetation. Official observations identify it, together with Bukhara deer, jackals and tolai hares, among commonly encountered mammals of the reserve. Its ecological specialization differs from that of the jackal because it depends more strongly on dense vegetation that provides concealment during hunting. Small mammals and other small vertebrates constitute important components of its prey base. Consequently, the persistence of the jungle cat is closely connected with the maintenance of structurally complex tugai and reed habitats. Reduction or fragmentation of these habitats can affect the predator both directly, through loss of shelter, and indirectly, through changes in prey abundance.

Small mammals constitute a less conspicuous but functionally essential component of the reserve's

mammalian diversity. The tolai hare, long-eared hedgehog, gerbils, ground squirrels, and other rodents occupy different ecological niches ranging from dense floodplain vegetation to open semi-desert habitats. Their importance extends beyond species richness. Rodents consume seeds and vegetation, redistribute plant material, modify soils through burrowing, and provide a major prey resource for carnivorous mammals and birds of prey. Burrowing species also influence soil structure by mixing soil horizons and increasing local aeration and water penetration.

The yellow ground squirrel provides a particularly clear example of adaptation to the arid component of the biosphere reserve. Recent observations confirm its presence in the Lower Amudarya State Biosphere Reserve. It inhabits desert and semi-desert areas and feeds primarily on plant material, including stems, leaves, buds, bulbs, and young shoots. Tamarisk, saxaul, camelthorn and salt-tolerant vegetation may form part of its diet. Its presence demonstrates that mammalian biodiversity in the reserve cannot be understood solely as tugai fauna. The reserve functions as an ecological mosaic in which riverine, wetland, shrub, and desert mammal assemblages occur within a relatively limited geographical area.

Insectivorous mammals such as the long-eared hedgehog occupy another functional niche. Their diets include insects and other small invertebrates, connecting mammalian communities with lower trophic levels. Bats similarly contribute to ecosystem functioning through nocturnal insect consumption. Their ecological activity becomes especially important during warm seasons when insect abundance increases. The presence of bats and insectivorous terrestrial mammals therefore contributes to natural regulation of invertebrate populations and increases the functional diversity of the mammalian assemblage [4, 31-33].

A defining bioecological characteristic of mammals in the Lower Amudarya region is adaptation to strong seasonal and spatial environmental contrasts. The landscape lies within an arid climatic region, yet the Amudarya creates comparatively humid riverine habitats. Mammals living there must therefore respond simultaneously to high summer temperatures, cold winter periods, irregular moisture availability, changes in river hydrology, and fluctuations in vegetation productivity. Species solve these ecological challenges

through different strategies. Large herbivores move between feeding, resting and watering sites; carnivores exploit changing prey resources; rodents use underground burrows to avoid extreme surface temperatures; nocturnal species reduce exposure to daytime heat; and habitat generalists move between natural and human-modified landscapes.

Water availability is one of the principal factors determining mammalian distribution. The Amudarya River and associated floodplain habitats historically maintained the hydrological processes necessary for tugai formation. Changes in river flow, groundwater depth, flooding frequency, and soil moisture consequently affect mammals indirectly by transforming their food and shelter resources. This relationship is especially important for the Bukhara deer because the quality of its habitat depends on productive riparian vegetation. The current ecological situation shows that conservation of a mammal population cannot be separated from conservation of hydrological processes and vegetation communities.

Another important feature is the ecological interaction between natural and anthropogenic habitats. The reserve includes protected, buffer, and transition zones, reflecting the biosphere-reserve principle of combining strict biodiversity conservation with sustainable resource use. Mammals may move between tugai forests, semi-desert habitats, agricultural fields, riverbanks, and transitional landscapes. This increases access to seasonal food but also exposes animals to disturbance, habitat fragmentation, livestock competition, roads, and other human-related pressures. The maintenance of ecological corridors between suitable habitats is therefore particularly important for large and medium-sized mammals.

From a functional perspective, the mammalian community can be regarded as an interconnected ecological system rather than a simple list of species. Large herbivores influence vegetation structure and regeneration; rodents participate in seed consumption and soil modification; insectivores regulate invertebrate populations; carnivores affect prey behaviour and abundance; and omnivorous mammals connect several trophic pathways. Alteration of one component may consequently produce indirect effects elsewhere in the ecosystem. The exceptionally high abundance of Bukhara deer provides a clear illustration: successful

protection of one threatened mammal can eventually create new ecological management challenges if vegetation recovery, habitat area, predator abundance, and population dispersal do not develop at comparable rates.

The conservation significance of the Lower Amudarya State Biosphere Reserve therefore lies not only in the number of mammal species recorded there but in its ability to maintain a representative mammalian community of the lower Amudarya landscape. Its 36 recorded mammal species occupy ecological niches extending from aquatic and riparian environments to tugai forests and surrounding semi-desert habitats. Among them, the Bukhara deer has exceptional conservation importance, while wild boar, jackal, jungle cat, hare, hedgehogs, bats, ground squirrels, gerbils, and other small mammals maintain important trophic and ecosystem functions. Long-term conservation should therefore integrate systematic population monitoring, protection of tugai vegetation, maintenance of natural and semi-natural water regimes, preservation of habitat connectivity, assessment of carrying capacity, and regulation of excessive anthropogenic disturbance. Official management already includes regular spring and autumn fauna monitoring, while conservation measures for Bukhara deer include habitat management and supplemental feeding where necessary.

CONCLUSION

In conclusion, the mammalian fauna of the Lower Amudarya State Biosphere Reserve represents a biologically diverse and functionally complex assemblage shaped by the interaction of riverine tugai forests, wetlands, reeds, shrubs, semi-desert ecosystems, and human-modified landscapes. The ecological adaptations of its mammals reflect the severe continental climate, dependence on the Amudarya hydrological system, seasonal variation in food resources, and heterogeneous vegetation structure. The recovery of the Bukhara deer is one of the most important conservation achievements of the reserve, but its present high density also confirms that successful biodiversity conservation requires continuous scientific management rather than protection of individual species alone. Maintaining mammalian diversity in the Lower Amudarya ultimately depends on preserving the

ecological integrity of the entire tugai landscape, because the survival, reproduction, spatial distribution, and trophic relationships of its mammals are inseparably connected with the condition of this unique Central Asian riverine ecosystem.

REFERENCES

1. Dosnazarova, U., Kidirbaeva, A., Davletmuratova, V., & Niyazymbetova, T. (2025). Bioecological features of the bukhara deer (*Cervus elaphus bactrianus* Lyd) in the lower Amu Darya State biosphere reserve. In BIO Web of Conferences (Vol. 190, p. 01012). EDP Sciences.
2. Normuminovich, T. A., & Botirovich, K. K. (2020). ANALYSIS OF BIOECOLOGICAL RESOURCES OF THE REGION AND THEIR CURRENT STATE. Asian Journal of Multidimensional Research (AJMR).
3. Paluanova, G., & Kurbaniyazov, A. (2026). ECOLOGICAL AND BIOLOGICAL FEATURES OF MICROTUS TRANSCASPICUS IN THE LOWER AMU DARYA BIOSPHERE RESERVE. Journal of Experimental Studies, 4(1), 44-50.
4. Авезов А.К. (2022). ФАУНА НИЖНЕ-АМУДАРЬИНСКОГО ГОСУДАРСТВЕННОГО БИОСФЕРНОГО РЕЗЕРВАТА. Мировая наука, (6 (63)), 31-33.
5. Хожанова А. (2021). СОВРЕМЕННОЕ ЭКОЛОГИЧЕСКОЕ СОСТОЯНИЕ НИЖНЕ-АМУДАРЬИНСКОГО ГОСУДАРСТВЕННОГО БИОСФЕРНОГО РЕЗЕРВАТА. Мировая наука, (4 (49)), 245-247.