

PAPER

# STRUCTURE AND PASTURE VALUE OF REED-TAMARIX VEGETATION ON SOLONCHAK WETLAND HABITATS OF THE DRIED BED OF THE ARAL SEA

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## Abstract

This article examines the reed-Tamarix pasture variety formed in the coastal part of wetland vegetation on the dried bed of the Aral Sea. This pasture variety belongs to the group of reed-Tamarix and saltwort-Tamarix year-round pastures developed on meadow, meadow-takyr and takyr-like solonchak soils. The vegetation cover is associated with moderately saline meadow-bog soils and is represented by shrub, reed, grass and halophytic species adapted to wetland and saline habitats. The dominant species include *Tamarix hispida*, *T. ramosissima*, *Phragmites australis*, *Aeluropus littoralis*, *Karelinia caspia*, *Typha angustifolia*, *Lycium ruthenicum*, *Halostachys belangeriana* and *Kalidium caspicum*. The total projective cover reaches 30%, the average productivity is 3.3 c/ha, and the occupied area is 10126.20 ha. The studied pasture variety has important forage value for sheep and camels and also performs an ecological function by stabilizing coastal wetland habitats under conditions of salinity and periodic soil moisture.

**Key words:** dried bed of the Aral Sea, pasture variety, reed-Tamarix vegetation, solonchak soils, wetland vegetation, halophytes, pasture productivity, *Phragmites australis*, *Tamarix hispida*.

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## Introduction

Natural pastures of arid and semi-arid regions of Central Asia represent an important forage base for traditional livestock breeding. Their productivity and stability depend on soil properties, salinity, moisture availability, vegetation composition and grazing pressure. Earlier studies on desert pastures of the Ustyurt Plateau and the Aral Sea region emphasized that pasture productivity is closely linked with the ecological and biological characteristics of dominant forage plants, as well as with the degree of land degradation and the potential for pasture improvement [1, 2].

The dried bed of the Aral Sea is one of the most dynamically developing arid landscapes in Central Asia. After the retreat of the sea, large areas with contrasting soil, hydrological and salinity conditions were exposed. Recent studies show that the vegetation of the exposed seabed is still in the process of formation and is strongly controlled by substrate type, salinity gradients and local moisture conditions [13, 17]. Soil formation and restoration potential on the dried seabed are also closely related to the accumulation of salts, organic matter development and the establishment of pioneer plant communities [14].

Among the pasture types of the dried Aral Sea bed, reed-Tamarix and saltwort-Tamarix communities occupy a specific ecological position. They are associated with meadow, meadow-takyr and takyr-like solonchak soils, where salinity, periodic moisture accumulation and groundwater influence determine the structure of plant communities. Similar regional studies of desert and semi-desert pastures indicate that shrub and halophytic vegetation plays an important role in maintaining the stability of natural forage lands under arid conditions [3, 8, 16].

The study of individual pasture varieties is necessary for assessing forage resources, mapping pasture types and developing sustainable management approaches. Classical studies on forage plants and desert pastures provide the basis for evaluating their feeding value, seasonal use and suitability for sheep and camels [4-6, 8]. In addition, the rational use of pastures requires consideration of permissible grazing loads, pasture rotation and state monitoring regulations [10, 11]. Anthropogenic pressure, especially overgrazing, remains one of the

main factors affecting the structure and productivity of pasture vegetation in Uzbekistan [12].

The aim of this article is to characterize the floristic composition, ecological conditions, forage productivity and pasture significance of the reed-Tamarix pasture variety formed on solonchak wetland habitats of the dried bed of the Aral Sea.

## Materials and Methods

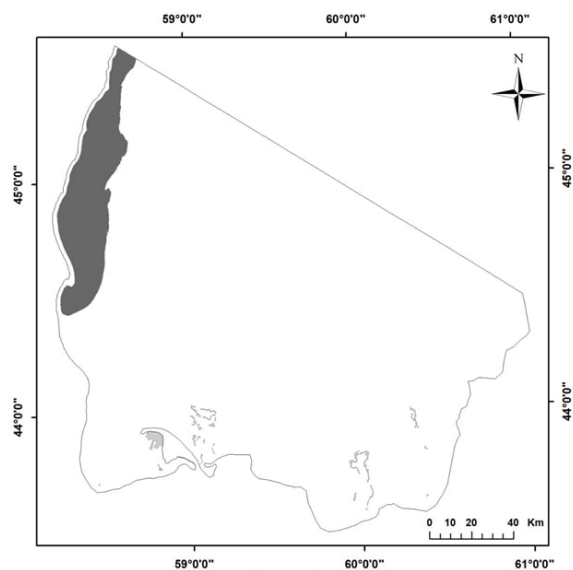
The object of this study is the reed-Tamarix pasture variety belonging to the group of reed-Tamarix and saltwort-Tamarix year-round pastures for sheep and camels. This vegetation type develops on meadow, meadow-takyr and takyr-like solonchak soils, mainly in the coastal wetland habitats of the dried bed of the Aral Sea.

The description of the pasture variety was based on the following indicators: dominant species composition, total projective cover, soil characteristics, salinity level, average productivity and occupied area. The geobotanical assessment followed generally accepted principles of field geobotany and methodological approaches used for the survey of natural forage lands of Uzbekistan [7, 9]. The interpretation of forage value was also based on classical approaches to the assessment of hayfield and pasture plants, including their seasonal use and feeding significance for livestock [4-6].

The spatial distribution and occupied area of the pasture variety were determined through cartographic analysis of the mapped contour using GIS approaches and remote monitoring materials. Remote sensing and GIS-based vegetation monitoring have become important tools for studying vegetation dynamics and spatial differentiation in the South Aral Sea region [15]. The forage value was assessed based on the average productivity, expressed in centners per hectare, and the suitability of the pasture for year-round grazing by sheep and camels. The distribution map of the studied pasture variety is presented in Figure 1. It shows the spatial position of the reed-Tamarix vegetation associated with solonchak wetland habitats on the dried bed of the Aral Sea (Fig. 1).

## Results and Discussion

The studied pasture variety is confined to coastal wetland habitats and saline depressions where



**Figure 1.** Distribution of the reed-Tamarix pasture variety on solonchak wetland habitats of the dried bed of the Aral Sea. Grey areas indicate the territory occupied by this pasture variety.

meadow-bog soils are formed. These sites are characterized by moderate salinity, periodic soil moisture and the presence of plant species adapted to both wet and saline conditions. The salinity level of the studied areas ranges from 0.8 to 1.8%, which corresponds to moderately saline soil complexes. Such conditions are typical of parts of the exposed Aral Sea bed, where soil development and vegetation colonization are shaped by the interaction of salinity, moisture and substrate stability [13, 14].

The floristic structure of this pasture variety is determined by the joint participation of shrub, reed, grass and halophytic species. The dominant species are *Tamarix hispida*, *T. ramosissima*, *Phragmites australis*, *Aeluropus littoralis*, *Karelinia caspia*, *Typha angustifolia*, *Lycium ruthenicum*, *Halostachys belangeriana* and *Kalidium caspicum*. This combination indicates the transitional character of the community, where wetland elements coexist with typical halophytes of solonchak habitats. The role of such halophytic and wetland-associated vegetation is consistent with earlier descriptions of pasture plants in Central Asian arid regions [3, 4].

Species of the genus *Tamarix* play a major structural role in the community. *Tamarix hispida* and *T. ramosissima* form the shrub layer and contribute to the stabilization of saline substrates. Their root systems help bind the soil surface,

reduce the mobility of fine particles and create microhabitats suitable for the development of accompanying herbaceous and halophytic species. In desert pasture systems, shrub components are often regarded as important stabilizing elements that maintain the structure and ecological resilience of plant communities [8, 12].

The presence of *Phragmites australis* and *Typha angustifolia* reflects the influence of wetland conditions and periodic moisture accumulation. These species are characteristic of more humid microsites and indicate that the studied pasture variety is connected not only with salinity but also with local hydrological conditions. *Aeluropus littoralis* and *Karelinia caspia* further emphasize the meadow-halophytic character of the vegetation. Similar ecological differentiation of plant communities has been reported for the dried Aral Sea bed, where vegetation composition varies depending on moisture, salinity and geomorphological position [17].

Halophytic components, including *Halostachys belangeriana* and *Kalidium caspicum*, indicate the solonchak nature of the substrate. These species are well adapted to high salt concentrations and physiological drought. Their participation shows that soil salinity remains one of the leading ecological factors controlling the composition and structure of the vegetation cover. The development of such communities is closely linked with the broader process of vegetation colonization on the exposed seabed [13].

The total projective cover is 30%, which is relatively higher than in many sparse desert pasture communities formed on sandy or strongly deflated substrates. This can be explained by periodic soil moisture and the presence of reed and shrub components. However, salinity limits overall floristic diversity and favors specialized halophytic and wetland-tolerant species. The observed structure confirms that reed-Tamarix vegetation represents a specific pasture type within the mosaic of arid, saline and wetland habitats of the dried Aral Sea bed.

The average productivity of this pasture variety is 3.3 c/ha. This value indicates moderate forage productivity under the conditions of meadow-bog solonchak soils. The pasture is suitable for year-round grazing by sheep and camels. Camels can

utilize shrub and coarse halophytic components, whereas sheep mainly use young shoots, grasses and softer herbaceous parts during favorable seasons. Forage assessment principles developed for desert pastures and Central Asian rangelands support the evaluation of such communities as seasonal and year-round forage resources [5, 6, 8].

The occupied area is 10126.20 ha. Although this pasture variety is not among the most extensive types of the dried Aral Sea bed, it represents an important component of the pasture fund due to its relatively higher projective cover and productivity. Its distribution is closely linked to coastal wetland zones and saline depressions, where reed-Tamarix and halophytic communities are able to develop. Spatial assessment of such pasture contours is important for pasture cadastre, monitoring and management planning [10, 15].

From an economic point of view, the reed-Tamarix pasture variety is valuable as a year-round grazing area for sheep and camels. Its forage importance is determined not only by productivity, but also by the ecological stability of dominant species under saline and periodically wet conditions. At the same time, the use of such pastures should be regulated in accordance with permissible grazing loads and pasture rotation requirements [11].

Ecologically, this community contributes to the stabilization of wetland-solonchak habitats. Tamarix shrubs, reed stands and halophytic components reduce surface instability, support organic matter accumulation and participate in the gradual formation of stable vegetation cover. Such processes are important for the ecological restoration and stabilization of the exposed Aral Sea bed, where vegetation plays a key role in reducing degradation risks and improving landscape resilience [14, 17].

Excessive grazing may damage young shoots, reduce the proportion of forage species and disturb the natural structure of the community. Therefore, the use of this pasture should be organized according to the seasonal condition of vegetation, the stability of wetland-solonchak soils and the need to preserve shrub, reed and halophytic components. The impact of anthropogenic pressure on pasture vegetation has been emphasized in studies of Uzbekistan's rangelands, where overgrazing is considered one of the main causes of degradation [12].

## Conclusion

The reed-Tamarix pasture variety is a characteristic vegetation type of coastal wetland and solonchak habitats on the dried bed of the Aral Sea. It develops on meadow-bog soils under moderately saline conditions, with salt content ranging from 0.8 to 1.8

The dominant species are *Tamarix hispida*, *T. ramosissima*, *Phragmites australis*, *Aeluropus littoralis*, *Karelinia caspia*, *Typha angustifolia*, *Lycium ruthenicum*, *Halostachys belangeriana* and *Kalidium caspicum*. The total projective cover is 30%, the average productivity is 3.3 c/ha, and the distribution area is 10126.20 ha.

The studied pasture variety has significant forage and ecological value. It is suitable for year-round use by sheep and camels and contributes to the stabilization of saline wetland habitats. To maintain its productivity, grazing pressure should be regulated, soil salinity and moisture conditions should be considered, and degradation of shrub, reed and halophytic components should be prevented.

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