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DISTRIBUTION, MORPHOLOGY, AND CLIMATE-BASED HABITAT MODELING OF ROSA SUMNEVICZII KOROTKOVA”

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Abstract: Rosa sumneviczii Korotkova is a rare and understudied wild rose species endemic to the Western Pamir-Alay region of Uzbekistan. Initially described in 1948, it is taxonomically distinct from closely related taxa such as Rosa kokanica, based on morphological characteristics including spine shape, stem bark color, and sepal orientation. The species has an extremely limited known distribution, restricted to its type locality near Ak-Kishlak in the Kashkadarya Region. This study integrates morphological evaluation, spatial conservation metrics, and climate-based species distribution modeling (SDM) to assess its current and future conservation status. Six georeferenced records from iNaturalist in 2024 were used to calculate an extent of occurrence (EOO) of 0.073 km² and an area of occupancy (AOO) of 722 km², qualifying the species as Critically Endangered under IUCN Criterion B1 and Vulnerable under Criterion B2, respectively. No known populations fall within protected areas. Using MaxEnt and climate projections for 2070 under RCP 8.5, suitable future habitats were identified not only at the current locality but also in adjacent parts of Tajikistan and Afghanistan. These findings highlight both the conservation urgency and potential transboundary conservation value of this narrowly endemic species. Immediate conservation actions, including in situ habitat protection and targeted field surveys in climatically suitable areas, are essential for the survival of R. sumneviczii.
Key words: Rosa sumneviczii, Rosa kokanica, Pamir-Alay, morphological.

Introduction. *Rosa sumneviczii* Korotkova is a poorly known wild rose species, originally described in 1948 based on collections from the Western Pamir-Alay region of Uzbekistan (Korotkova, 1948). It is morphologically allied to *Rosa kokanica* Rgl., a species widely recognized in floristic treatments such as the *Flora of Pakistan* [2], yet it can be clearly differentiated by several key traits, including the shape and color of its spines, stem bark, and sepal orientation. Despite its taxonomic distinction, *R. sumneviczii* remains under-documented and poorly represented in herbarium collections and biodiversity databases. The species has an extremely narrow known distribution, restricted to its type locality in the upper reaches of the Katta-Uru-Darya River near Ak-Kishlak, Kashkadarya Region, Uzbekistan. It is recognized in the Plants Cadastre of the Kashkadarya Region [3] under its original name, suggesting regional botanical support for its taxonomic validity. Given its limited range and the potential threats posed by climate change and habitat degradation, an assessment of its conservation status and distribution potential is urgently needed. This study aims to (1) assess its extent of occurrence (EOO) and area of occupancy (AOO) following IUCN criteria, (2) evaluate overlap with protected areas, and (3) model its future habitat suitability under climate change projections using species distribution modeling (SDM) under the RCP 8.5 scenario for 2070.

Materials and Methods. Original species description and morphological differentiation were sourced from the protologue [1] and relevant literature. Field-based occurrence records were augmented by six georeferenced observations of *R. sumneviczii* uploaded to iNaturalist in 2024

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by observer Oybek, all located near the type locality in the Ak-Kishlak area of the Zeravshan Range, Uzbekistan. Spatial conservation metrics were calculated using GeoCAT [4, 8] (Geospatial Conservation Assessment Tool), which follows IUCN Red List guidelines. Extent of occurrence (EOO) was computed. Area of occupancy (AOO) was estimated using a 19 × 19 km grid cell size to reflect coarse-scale modeling constraints, especially relevant for data-deficient taxa. The species' current known distribution was overlaid with the World Database on Protected Areas (WDPA) [5] to assess conservation coverage. MaxEnt [6] modeling was conducted to project potential habitat suitability under future climate conditions. Climatic variables were derived from WorldClim projections for the year 2070 under the RCP 8.5 scenario [7]. Predicted habitat suitability was classified into three categories: low, moderate, and high. Total areas for each category were computed using ArcGIS.

Taxanomy *Rosa sumneviczii* Korotkova

Protologue: *Bot. Mater. Gerb. Inst. Bot. Zool. Akad. Nauk Uzbeksk. S.S.R.* **10**: 15 (1948).

Typus: *Uzbekistan*, Western Pamir-Alay, spurs of the Zeravshan Range, upper reaches of the Katta-Uru-Darya River, 12 km southeast of the village of Ak-Kishlak, fine-earth slopes of the gorge with variegated rock outcrops, 1900 m a.s.l., 14 August 1937, fr., A.I. Granitov & G.D. Dolgikh, **№ 508** (holotype, Figure 1). Cotypes: **№ 506, 507**.

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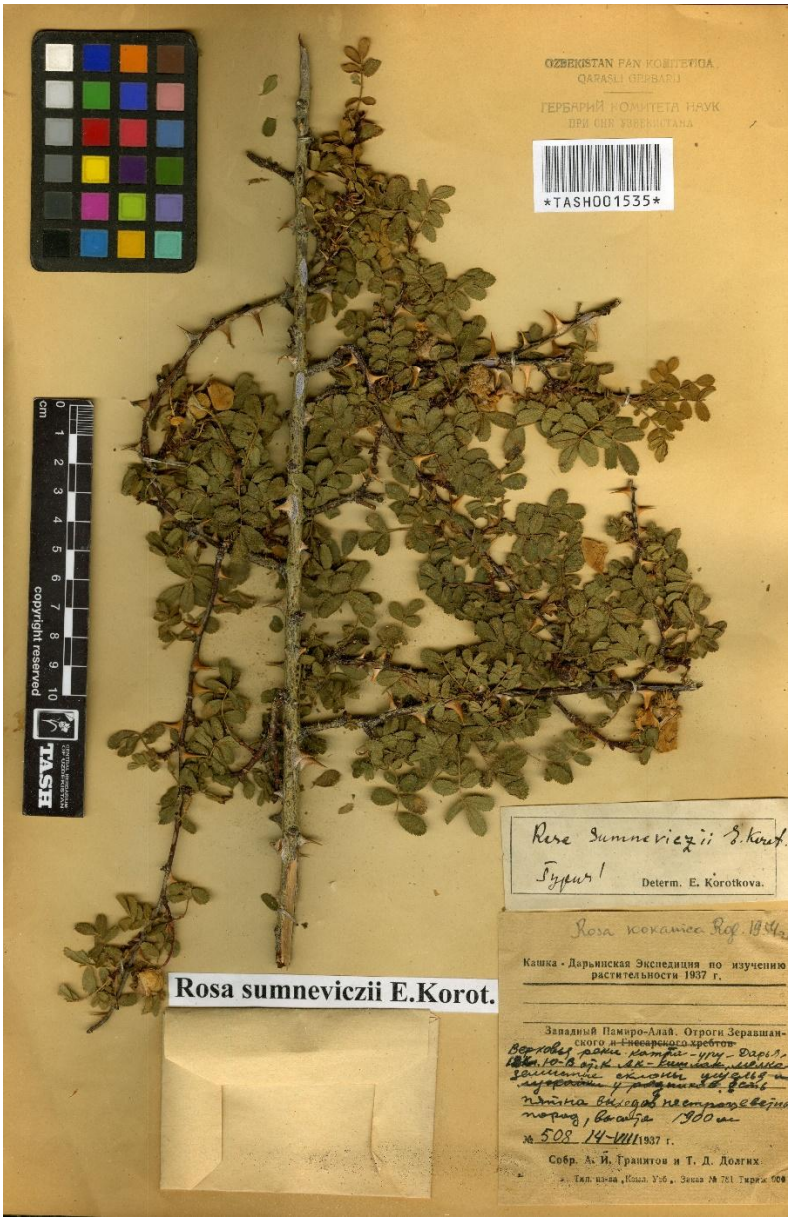

Figure 1. Holotype of *Rosa sumneviczii* Korotkova

The species under discussion is most closely allied to *Rosa kokanica* Rgl., yet it can be readily distinguished by a suite of morphological traits. These include robust, ash-gray spines that gradually broaden basally into a triangular shape and curve distinctly downward—unlike the violet-brown, abruptly widened, and horizontally oriented spines of *R. kokanica*. Additionally, the stem is enveloped in ash-gray bark, in contrast to the brown-violet coloration seen in the latter species. The sepals of *R. sumneviczii* are reflexed and closely appressed to the fruit, differing from the straight, erect, or horizontally spreading sepals of *R. kokanica*. Furthermore, the pedicels are densely covered with short spines.

While *R. kokanica* is recognized in the *Flora of Pakistan* [2], botanists in Uzbekistan regard *Rosa sumneviczii* as a distinct taxon. This perspective is reflected in the Plants Cadastre of the Kashkadarya Region [3], where the species is cited under its original name. It is important to

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note that *R. sumneviczii* possesses an extremely narrow geographic distribution, underscoring its potential conservation significance.

Results. In 2024, six georeferenced observations of *Rosa sumneviczii* were uploaded to the iNaturalist platform by user Oybek from the region surrounding Ak-Kishlak, Kashkadarya Region, Uzbekistan—the species' type locality. Using GeoCAT (Geospatial Conservation Assessment Tool), the extent of occurrence (EOO) was calculated as 0.073 km², which qualifies the species as Critically Endangered (CR) under IUCN Criterion B1 (Figure 2). When applying a 19 × 19 km grid cell size for area of occupancy (AOO) estimation—selected due to the extremely limited number of observation points and broad-scale habitat mapping constraints—the resulting AOO is 722 km², corresponding to the threshold for Vulnerable (VU) under Criterion B2. These findings suggest a highly restricted distribution and emphasize the importance of continued monitoring and habitat protection efforts.

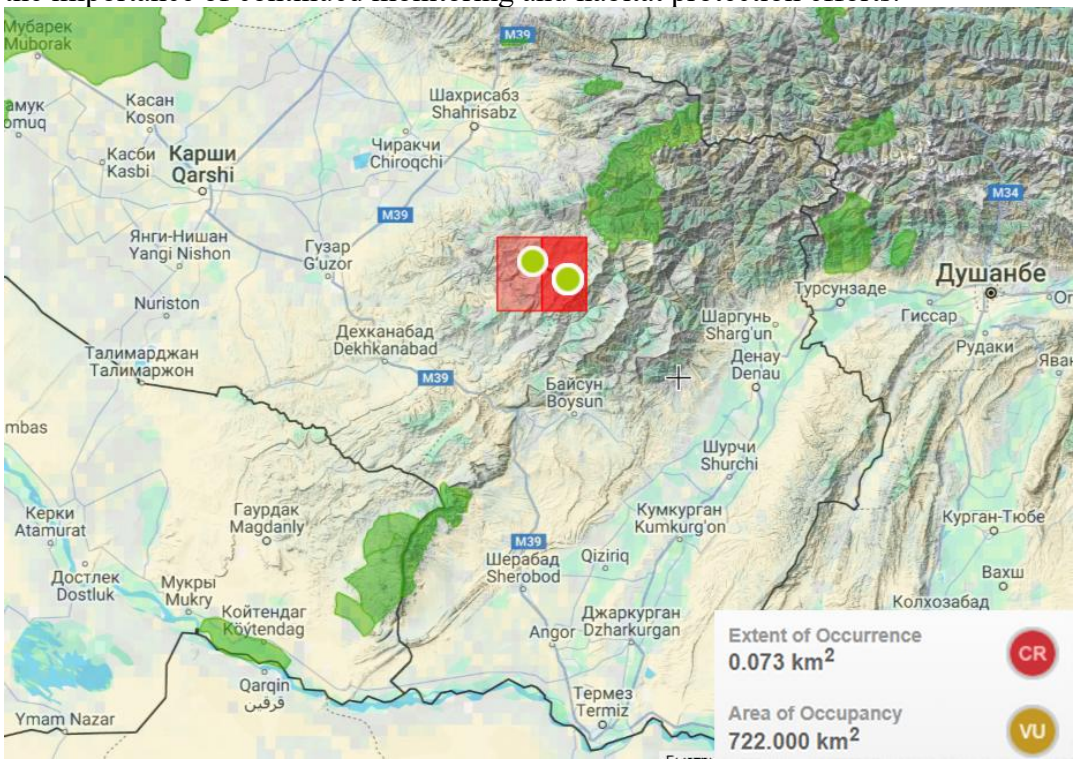

Figure 2. Evaluation map of occupied area and range extent (green colors indicate protected areas)

The known distribution of *Rosa sumneviczii* does not currently overlap with any officially designated protected areas, indicating a lack of in situ conservation coverage (Figure 2). To evaluate the potential future range of this narrowly distributed species under climate change, we performed a species distribution modeling (SDM) analysis projected to the year 2070 using the RCP 8.5 climate scenario. The model predicts suitable habitat not only at the species' type locality in Uzbekistan but also in adjacent areas of Afghanistan and Tajikistan. Habitat suitability was classified into three categories (Figure 3): low, moderate, and high. The projected extent of suitable habitat in each category is as follows: low suitability – 3,803,428

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km², moderate suitability – 1,716,974 km², and high suitability – 2,240,980 km². These results suggest the existence of potentially suitable yet currently unoccupied habitats, emphasizing the importance of transboundary conservation planning and the identification of potential refugia under future climate conditions.

The extremely restricted EOO of *Rosa sumneviczii*, based solely on recent iNaturalist records and the type collection, strongly supports its designation as Critically Endangered under IUCN Criterion B1. Although its AOO is somewhat larger due to the use of coarse grid sizes, the lack of any occurrence within protected areas heightens its vulnerability.

The morphological distinctiveness from *R. kokanica*, combined with its recognition in regional floras such as the Plants Cadastre of the Kashkadarya Region, supports its taxonomic validity and conservation prioritization. The discrepancy between modeled habitat suitability and known occurrences likely reflects both under-sampling and the species' true ecological narrowness.

The SDM results suggest that areas in Tajikistan and northern Afghanistan may offer climatically suitable conditions for *R. sumneviczii* by 2070. However, the species' dispersal capacity and habitat specificity remain unknown, necessitating targeted field surveys in these regions.

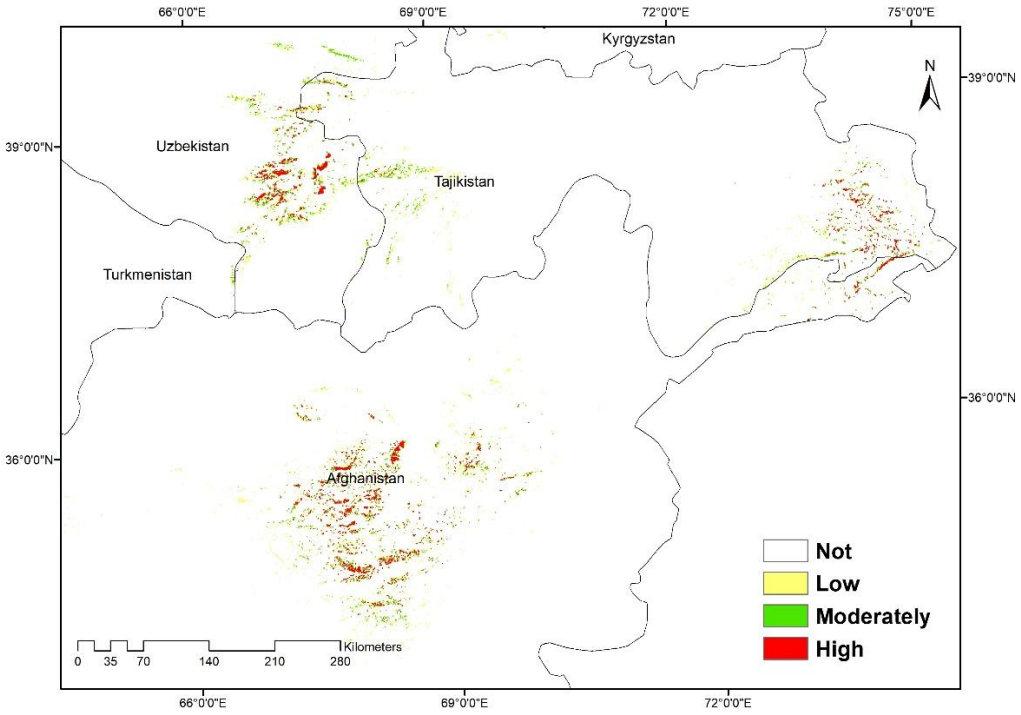

Figure 3. Projected species distribution model for rosa sumneviczii in 2070 under rcp 8.5 scenario

Conclusion

Rosa sumneviczii represents a narrowly endemic and poorly studied rose species of high conservation concern. Its currently known distribution is extremely limited, and it does not occur within any protected areas. While SDM projections indicate the possibility of broader suitable habitats under future climate scenarios, field validation is needed. Immediate

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conservation actions—including habitat monitoring, population assessments, and the integration of known sites into protected area networks—are critical to ensuring the survival of this taxon.

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