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MODERN SYNOPSIS AND CONSERVATION OF THE SPECIES *COUSINIA KRAUSEANA* DISTRIBUTED IN THE FERGANA VALLEY

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ABSTRACT
Cousinia krauseana is a fascinating endemic species of mountainous Central Asia, found primarily in the southern Chotkal region. Its small population and restricted distribution make it of significant conservation concern. Field research in the South Chotkal region revealed anthropogenic threats to its habitats. Evaluated under the IUCN Red List criteria, it was categorized as Vulnerable+Endangered (VU+EN). Urgent conservation measures are needed to safeguard its future in this captivating landscape.
KEYWORDS: ***Cousinia, Asteraceae, Fergana Valley, modern synopsis, conservation, IUCN.***

INTRODUCTION

The genus Cousinia Cassini was initially published in 1827 by Cassini, within G.-F. Cuvier's "Dict. Sci. Nat., ed. 2. 47: 503 (1827)," relying on the species Carduus orientalis Adams. A more comprehensive investigation of the genus was conducted by A. Bunge in 1865, utilizing morphological data and encompassing 126 species across 23 sections. Building upon Bunge's studies, Boissier (1875) and Tscherneva (1962) subsequently made taxonomic revisions as well.

This group stands as one of the largest within the Asteraceae family, comprising approximately 700 species (Ulukuş and Tugay, 2020). Its primary centers of species diversity lie in Turkey, Iran, Afghanistan, and Central Asia, exhibiting a significant level of endemism (Rechinger, 1986; Knapp, 1987; Djamali et al., 2012). Notably, out of the 400 Cusinia species found across South-West Asia, a remarkable 379 species are classified as endemic, thriving in the mountainous regions of Iran, Afghanistan, and Turkmenistan (Knapp, 1987).

Furthermore, this genus is distinctive for housing a vast number of species within a relatively confined geographical area. These species are distributed in various regions, such as the Western Tien Shan (60 species), Pamir-Aloy (170 species), North-Eastern Afghanistan (Eastern Hindu Kush; 80 species), North-Western Afghanistan (Western Hindu Kush; 45 species), Kopetdag (Iran; 70 species, Turkmenistan; 30 species), Elburz (Northern Iran; 70 species), Northern Zagros (Western Iran; 45 species), and the Eastern Anatolia mountains in Azerbaijan (West Turkey, North-West Iran; 40 species) (López-Vinyallonga & al. 2009).

The genus Cusinia boasts a rich diversity, with 260 recorded species in Central Asia (Tscherneva 1993). Within the flora of Uzbekistan, 133 species of Cusinia have been identified (Tscherneva 1962), contributing to 22% of the total species diversity within the Asteraceae family (Tojibaev et al. 2014). Recent years have witnessed the discovery of 8 additional species in the Uzbekistani flora (Sennikov 2010, Tojiboev et al. 2017, Usmanov 2017a, Usmanov 2017b), raising the local species count to 141.

Various studies encompassing palynology, phytochemistry, anatomy, and molecular analysis have been carried out by foreign scientists (Ahmad et al., 2011; Amiri et al., 2014; Ulukush and Tugay, 2019a, 2019b; Tugay et al., 2019; Ulukush and Tugay, 2020). However, these investigations are not conclusive, and there is a pressing need to continue targeted and contemporary research on the taxonomy, geography, ecology, and conservation of these species.

In the forthcoming period of 2023-2024, researchers from Namangan State University (Namangan, Uzbekistan) have embarked on a study focused on the Cousinia genus found in the administrative region of the Fergana Valley (Uzbekistan). Specifically, they will explore Jurineopsis (Juz.) Tschern, a species distributed within the Ferghana Valley, with a particular focus on Cousinia krauseana Regel & Schmalh.

MATERIALS AND METHODS

The picturesque Fergana Valley finds itself encircled by various mountain ranges, with Kurama bordering it from the northwest, Chotkal from the north, Fergana and Otoynaq from the northeast and east, while Aloy and Turkestan flank it from the south. To the west, the valley is bordered by Mongolia. Its dimensions stretch approximately 300 km in length and are, on average, 60-120 km wide.

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From a political and administrative perspective, the valley shares its borders with the Jalalabad, Osh, and Batken regions of the Kyrgyz Republic to the north, east, and south, respectively. Towards the southwest, it borders the Sogd region of the Republic of Tajikistan, and to the west, it meets the Tashkent region (Fig. 1).

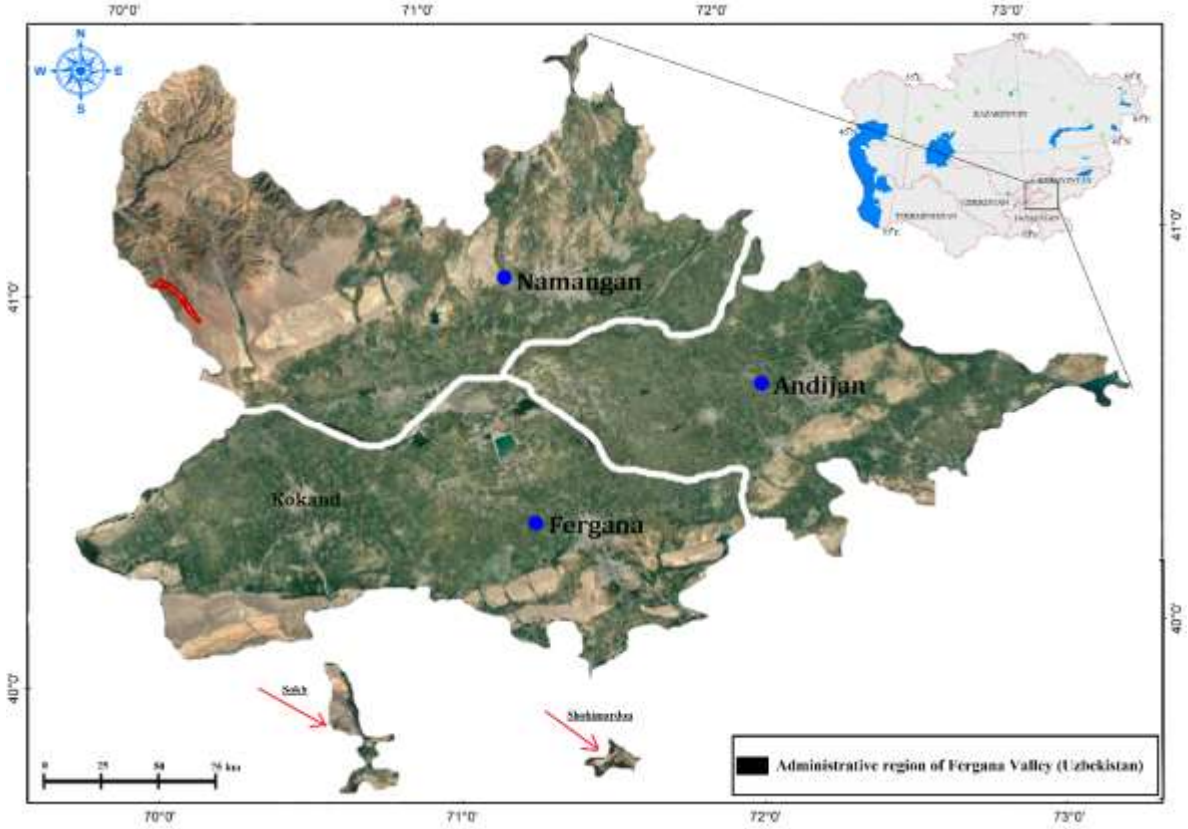

Figure 1. Administrative region of Fergana Valley (part of Uzbekistan)

In this study, a comprehensive analysis of the species was conducted using herbarium specimens, totaling 20 specimens stored in the National Herbarium of Uzbekistan (TASH) and various other herbaria, including MW (8), B (3), P (2), E (2), S (1), W (1), BR (1), K (1), and RB (1). Additionally, the Global Biodiversity Information Facility (https://www.gbif.org/ru, accessed on 30 April 2023) served as an additional source of information through international databases.

Taxon nomenclature was cross-referenced using Plants of the World Online (http://www.plantsoftheworldonline.org, accessed on 5 May 2023) and the International Plant Name Index (https://www.ipni.org, accessed on 6 May 2023) from international databases. Geographical coordinates depicting the extinction points in the herbarium specimens were determined using Google Earth Pro 7.1 software, and visual documentation of the species was captured with a digital camera (Sanon EOS 400D).

The research area map was prepared using ArcGIS 10.6.1 software, and natural illustrator Photoshop CS6x64 software was utilized (Fig. 3). To assess the threat status of the species, IUCN Red List categories and criteria from 2012 were employed. Geospatial analysis was performed using the GeoCAT GeoSpatial Conservation Assessment Web Tool (Bachman et al. 2011), with a recommended cell width of 2 km2 for the Area of Occupancy (AOO).

The study involved the examination of the species' syntype, which is preserved in the herbarium of the Royal Botanical Garden (K000786364). Field research was carried out in 2023 in the administrative regions of the Ferghana Valley, specifically in the Chortaq district, Arbagish village, where herbarium samples were prepared (Fig. 2).

RESULTS AND DISCUSSION

A Modern Synopsis of the Species

This exquisite plant is characterized as a two-year species, and its life cycle reveals delightful phenology, with blooming occurring from May to June, and fruiting during the months of June to July.

Inhabiting a variety of red and brown-gray soils, Cousinia krauseana thrives in the foothills up to the lower mountain regions, flourishing at elevations between 1050-1200 m above sea level.

Despite its significance, the species faces a concerning conservation status, as no in-situ protective measures are currently in place. To safeguard this lesser-known plant and

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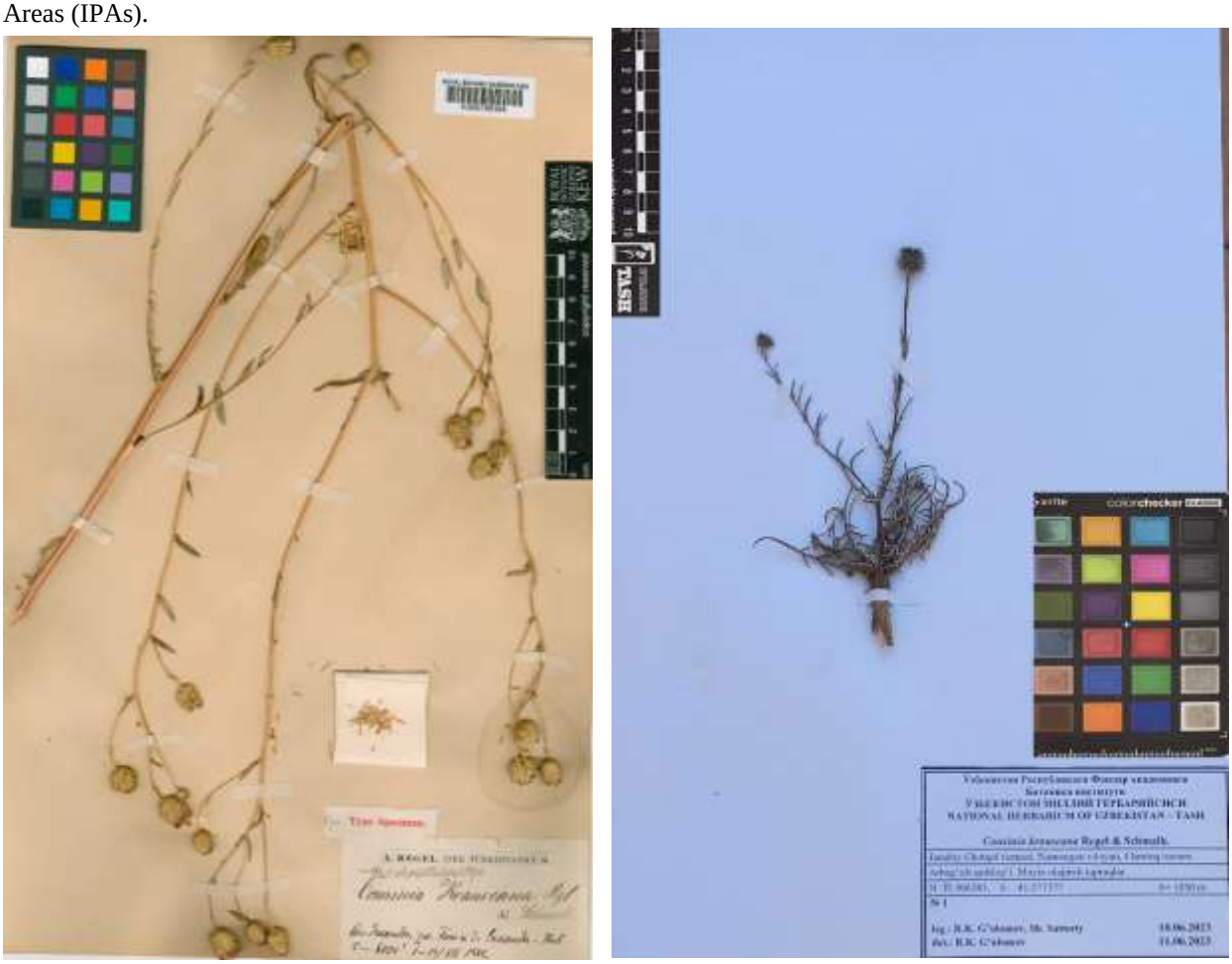
assess its distribution and population size, it is essential to conduct specialized field surveys.

In the Fergana Valley, this lovely species holds an important presence, classified under Category Aiii of the Important Plant Areas (IPAs).

With a broader distribution spanning across Middle Asia, including Uzbekistan, Kyrgyzstan, and Tajikistan, Cousinia krauseana primarily thrives in the foothills and low-mountain belts of the Fergana Valley.



A **B**

Figure 2. A) Syntype: Royal Botanic Gardens, Kew - Herbarium Specimens (K000786364); B) A herbarium specimen collected from the village of Arbagish, Fergana Valley

Belonging to the Cousinia sect. Jurineopsis (Juz.) Tscherneva, endemic to the Central Asian Mountains, this species finds itself amongst 11 others, most of which boast relatively small distribution areas. Tscherneva's earlier work identified C. krauseana in the flora of Uzbekistan and Kyrgyz SSR, with a limited distribution confined to the northern foothills of the Fergana Valley. However, more recent field surveys revealed a small population of the species on the border of Uzbekistan and Kyrgyzstan, reaffirming its narrow distribution range, aligning with Tscherneva's latest data from 1993. Yet, the species remains underrepresented in herbarium records, urging for further attention and documentation by experts (Komiljon Sh. Tojibaev et al., 2023).

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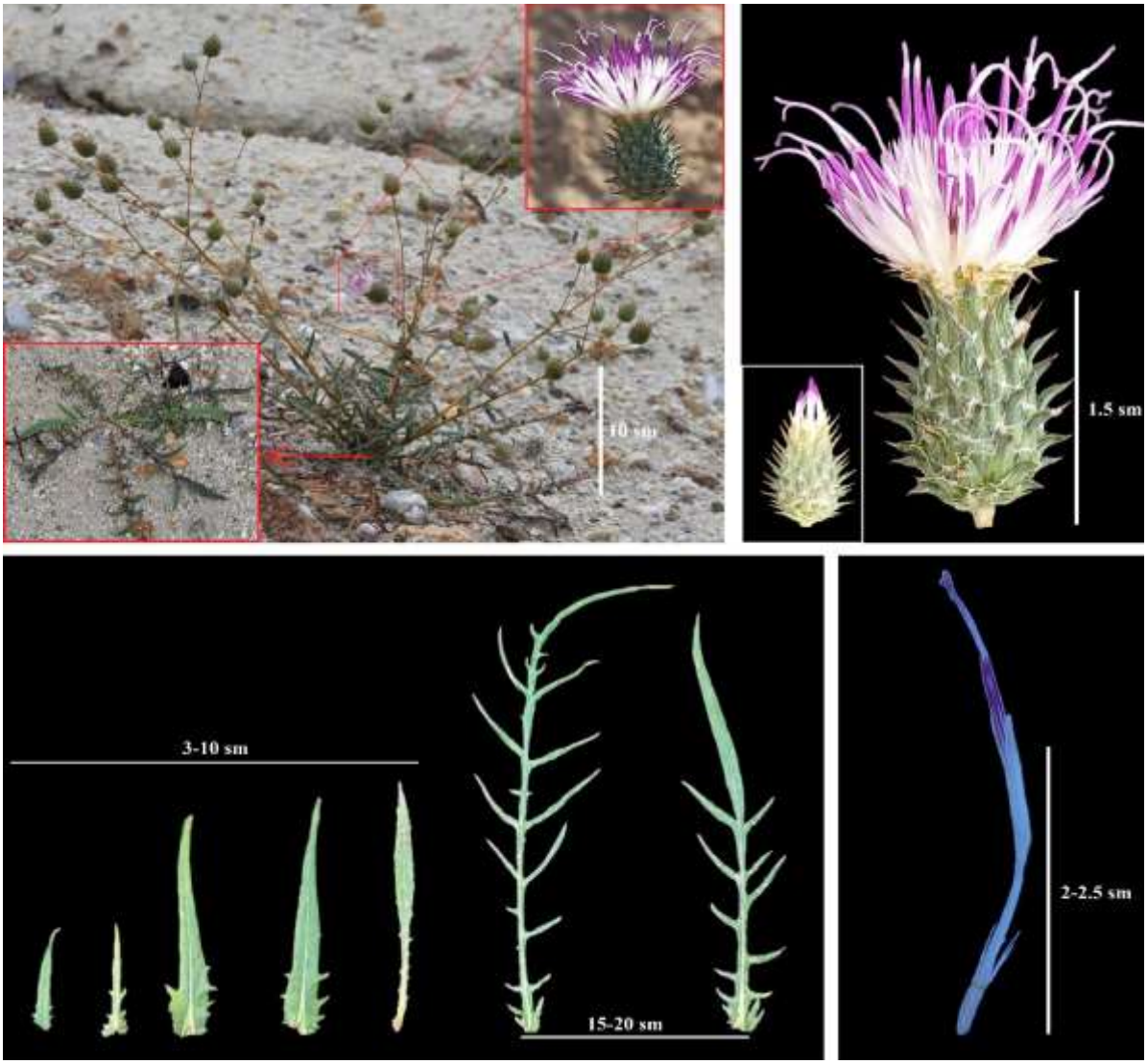

Figure 3. Natural illustration of C. Krauseana species

This remarkable species holds a special place in the heart of mountainous Central Asia, showcasing its unique endemism, with a narrow distribution primarily confined to the southern Chotkal region. Given its limited population and restricted range, the species raises conservation concerns and calls for dedicated efforts to ensure its survival.

During a tour of the South Chotkal region, this area emerged as a hotspot, drawing significant interest. Subsequently, a detailed field research expedition was conducted in May 2023, unveiling the species' habitats under imminent anthropogenic threats. Specifically, the research pinpointed the presence of the species in Arbagish, Chortoq district (coordinates: 41.277377°N, 71.906383°E). Unfortunately, this area displayed signs of moderate anthropogenic transformation, with approximately 25-50% degradation of vegetation cover, as reported by G. Ibrokhimova in 2020.

In order to assess its conservation status, a revision of the International (IUCN) Red List categories was undertaken. The evaluation revealed that the Extent of Occurrence (EOO) for C. krauseana spans an area of 13,077,769 km2, while the Area of Occupancy (AOO) covers 20,000 km². The species is found in 6 separate hunting areas, each approximately 2 km2 in size, but these areas are scattered at distances ranging from 10 to 50 km within the South Chotkal region. Based on these significant factors, the species was categorized as Vulnerable+Endangered (VU+EN) according to the criteria established by the International Union for Conservation of Nature (IUCN) (Fig. 4).

With this evaluation in mind, it is evident that protective measures and conservation efforts are crucial to safeguard the future of this remarkable species, ensuring it thrives in its natural habitat amidst the beauty of mountainous Central Asia.

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Figure 4. Distribution GeoCAT map of C. Krauseana species

CONCLUSION

In conclusion, Cousinia krauseana emerges as a fascinating and precious species endemic to the captivating landscapes of mountainous Central Asia, specifically confined to the southern Chotkal range. Its limited distribution and small population make it a species of significant conservation interest, warranting immediate attention to ensure its preservation and long-term survival.

Through detailed field research conducted in May 2023, the species' habitats were carefully examined, revealing areas under the distress of anthropogenic threats, particularly in the Arbagish region of the Chortoq district. It is disheartening to observe that this region has experienced moderate anthropogenic transformation, resulting in a noticeable 25-50% degradation of vegetation cover.

Assessing the species' conservation status using the International (IUCN) Red List categories, it was found that Cousinia krauseana has a relatively extensive Extent of Occurrence (EOO) spanning 13,077,769 km2, yet its Area of Occupancy (AOO) is confined to a mere 20,000 km². The species is scattered across six hunting areas, each approximately 2 km2 in size, with distances between these areas ranging from 10 to 50 km within the South Chotkal region. Taking into account these vital parameters, the species was designated under the Vulnerable+Endangered (VU+EN) categories established by the International Union for Conservation of Nature (IUCN).

Given the concerning conservation status and the anthropogenic threats faced by Cousinia krauseana, it is imperative to implement immediate and targeted conservation efforts. Preserving its unique habitats, mitigating anthropogenic impacts, and ensuring the sustainable management of its surroundings are essential steps to safeguarding the future of this remarkable species. Collaborative initiatives, informed by scientific research and supported by conservation organizations, will play a crucial role in securing the survival and continued flourishing of Cousinia krauseana in the awe-inspiring landscapes of mountainous Central Asia.

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