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THE BOTANICAL-GEOGRAPHICAL POSITION OF THE ZIADIN-ZIRABULAK REGION AND NEWLY RECORDED SPECIES

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Abstract: The Ziadin-Zirabulak botanical-geographical region belongs to the Kuhistan district and the Mountainous Central Asia province, located within the Samarkand and Navoi regions. This area is characterized by diverse climatic conditions, with temperatures ranging from +12°C to +16°C and annual precipitation from 172 mm to 395 mm. The floristic checklist of the region has not been fully developed, and discrepancies exist between recorded and observed species. This study, conducted through fieldwork from March to end of May 2025, resulted in more than 2500 observations uploaded to the iNaturalist platform. The findings made it possible to identify 13 species previously unrecorded for the Ziadin-Zirabulak region. These results offer new insights into the flora of the area and contribute to a deeper understanding of its biodiversity and ecological significance.

Keywords: Field research, iNaturalist, Ziadin and Zirabulak mountains

Introduction. The Ziadin–Zirabulak botanical-geographical region (ZZBGR) belongs to the Kuhistan district within the Mountainous Central Asia province. ZZBGR is bordered to the south, west, and north by the Bukhara district of the Turan province, adjoining the Karshi–Karnabchul, Lower Zeravshan, and Middle Zeravshan botanical-geographical regions, respectively. To the east, it shares a boundary with the Urgut botanical-geographical region of the Kuhistan district. The territory is located at the junction of two major provinces—Mountainous Central Asia and Turan [1]. From the perspective of Uzbekistan's administrative divisions, the region lies within the Samarkand and Navoi provinces (Figure 1A).

The elevation of the area ranges from a minimum of 290 meters to a maximum of 1,089 meters above sea level. The average annual temperature in the ZZBGR ranges from +12°C to +16°C, depending on elevation (Figure 1B). Annual precipitation varies from 172 to 395 mm, increasing gradually from the western part (Navoi region) to the eastern part (Samarkand region) (Figure 1C) [2].

According to the phytogeographic scheme proposed by E.P. Korovin (1962), the Ziadin–Zirabulak mountains are included within the Bukhara district of the Turan desert province [3]. However, R.V. Kamelin (1973a) classified these mountain ranges as part of the Western Hissar district of the Mountainous Central Asia province [4]. In the botanical-geographical regionalization scheme of Uzbekistan, it is emphasized that morphostructural factors and their closely associated landscape characteristics (such as arid climate, altitudinal zonation, moisture conditions, soil types, etc.) have played a more significant role than tectonic factors in the formation of the flora across Central Asia—particularly in the Ziadin–Zirabulak Mountains. For this reason, the area has been included within the Kuhistan district of the Mountainous Central Asia province [5].

The flora of the ZZBGR remains insufficiently studied, and the primary reference for this region continues to be the monographs by K.Z. Zakirov (1955, 1962), which still retain their relevance [6,7]. The plant cadastre of Samarkand region lists 472 species for the ZZBGR, while the cadastre of Navoi region records 384 species [8,9]. However, there is a discrepancy between the officially documented species and those actually present in the field. Moreover, data on the geographical distribution of species in the area remain insufficient.

Materials and Methods

This study employed several methodological approaches to investigate the geographical context of the ZZBGR. To accurately illustrate the spatial characteristics of the area, maps were

generated using ArcGIS software, taking into account factors such as topography, climatic conditions, and elevation zones. Data on climate and elevation were obtained from the WorldClim global database and subsequently analyzed [2]. For the floristic analysis, fieldwork was conducted between March and May 2025. Each plant specimen was photographed in situ, and to ensure data accuracy, GPS coordinates were recorded and uploaded to the iNaturalist platform [10].

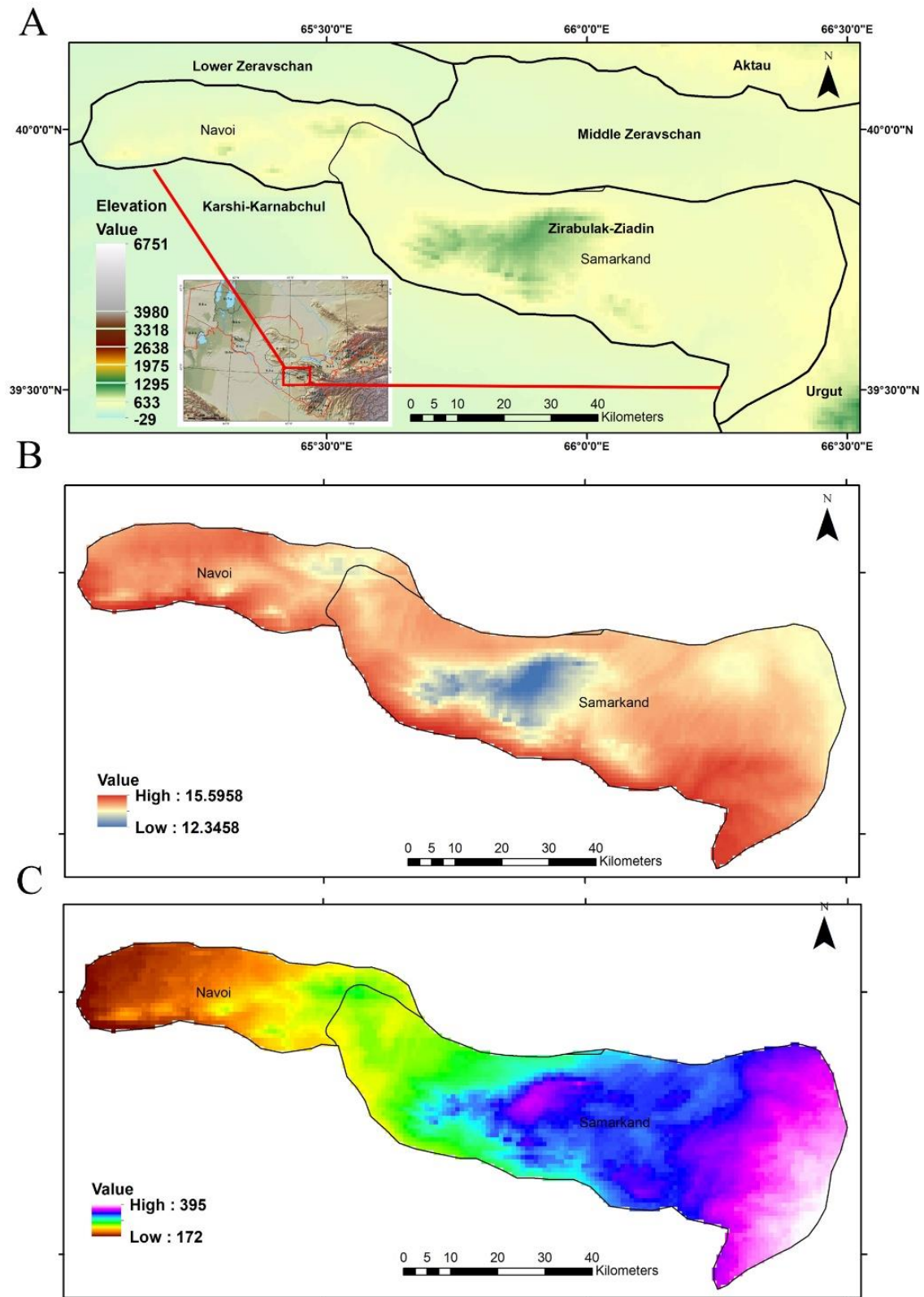


Figure 1. Ziadin–Zirabulak botanical-geographical region: A. Phytogeographical location. B. Annual average temperature. C. Annual average precipitation.

Observations on the platform were verified by both international and local experts, and a checklist of confirmed species was compiled. The scientific names of the identified plant species were cross-checked using the Plants of the World Online (POWO) database [11] to ensure nomenclatural accuracy. Selected specimen photographs were processed using Adobe Photoshop for illustrative purposes, with key morphological characteristics clearly highlighted.

Results and Discussion

To address the gaps outlined above, field research within the study area commenced on March 8, 2025, and continued until May. During this period, over 2,500 observations were recorded and uploaded to the iNaturalist platform: <https://www.inaturalist.org/projects/ziaddin-zirabulak-mountains>. As a result of the field studies, 13 plant species previously unrecorded in the Navoi and Samarkand cadastres for the ZZBGR were identified (Figure 2).

Allium kysylkumi Kamelin (Amaryllidaceae)

This perennial species grows on clayey and gravelly lower mountain slopes at elevations of 400–700 meters. It is an endemic species of Uzbekistan. Previously recorded in the Kyzylkum outlier mountains and Aktau area [12].

Distribution within the ZZBGR: Navoi region, Karmana district, near the raw material excavation site of the Cement Plant (40.01822638, 65.33794169), 10 April 2025, observed by Karimov Bobur (iNaturalist); Navoi region, Karmana district, Blue mountain (39.93819339, 65.17442855), 12 April 2025, observed by Karimov Bobur (iNaturalist). This species was identified by Ziyoviddin Yusupov. The plant's growth sites are located approximately 40 km from the Aktau region, indicating proximity to previously known populations of this species.

Fritillaria karelinii (Fisch. ex D. Don) Baker (Liliaceae)

This perennial species is considered a Turan floristic element. It grows in sandy, clayey, and gravelly deserts, plains at mountain foothills, and low residual mountains. In the Navoi region cadastre, it has been recorded only for the Kyzylkum and Kyzylkum outlier mountains.

Distribution within the ZZBGR: Navoi region, Karmana district, near the raw material excavation site of the Cement Plant (40.01823684, 65.33799071), 10 April 2025, observed by Karimov Bobur (iNaturalist). This species was identified by Giyos Bukhorov.

Iris falcifolia Bunge (Iridaceae)

This perennial species belongs to the Kopetdag–Pamir–Alay floristic area type. It occurs in sandy, clayey, and gravelly desert regions, low residual mountains, plains, and foothill zones. In the floristic cadastre of Navoi region, this species is recorded in the Kyzylkum, Kyzylkum outlier mountains, and Karshi–Karnabchul floristic regions.

Distribution within the ZZBGR: Navoi region, Karmana district, near the raw material excavation site of the Cement Plant (40.01872125, 65.33943207), 10 March 2025, observed by Karimov Bobur (iNaturalist). This species was identified by Yuri Pirogov.

Linaria micrantha (Cav.) Hoffmanns. & Link (Plantaginaceae)

This annual species is considered an Eastern ancient Mediterranean floristic element. It occurs on fine soil and gravelly slopes, foothills, low mountains, and mid-elevation mountain regions. The presence of this species in the Ziadin Mountains is noted in the reference “Opredelitel rasteniy Sredney Azii” [13], but it is not included in the floristic cadastre of Navoi region.

Distribution within the ZZBGR: Navoi region, Karmana district, Ziadin Mountains (40.00178831, 65.63059399), 14 March 2025, observed by Karimov Bobur (iNaturalist); Navoi region, Karmana district, Blue mountain (39.94568812, 65.28694605), 14 April 2025, observed by Karimov Bobur (iNaturalist). The identification of this species was confirmed by Vladimir Epiktetov.

Saponaria sewerzowii Regel & Schmalh. (Caryophyllaceae)

This perennial species is considered a West Tianshan – West Pamir–Alay floristic element. It grows on rocky slopes, cliffs, variegated soils, red clays, foothills, and low mountains. It is regarded as an endemic species characteristic of Mountainous Central Asia. This species is not included in the floristic cadastre of Navoi region.

Distribution within the ZZBGR: Navoi region, Karmana district, Blue mountain (39.94249173, 65.16955503), 12 April 2025, observed by Karimov Bobur (iNaturalist). This species was identified by Georgii Lazkov.

Minuartia meyeri (Boiss.) Bornm. (Caryophyllaceae)

This annual species is considered an Eastern ancient Mediterranean floristic element. It mainly grows on foothills, low and mid-mountain areas, on fine soil, gravelly, and rocky slopes. In the Navoi region cadastre, it has been recorded only for the Nurata, Aktau, and Kyzylkum outlier mountains.

Distribution within the ZZBGR: Navoi region, Karmana district, Blue mountain (39.9458756, 65.28701812), 14 April 2025, observed by Karimov Bobur (iNaturalist).

Matthiola integrifolia Kom. (Brassicaceae)

This perennial species is considered a Pamir-Alay floristic element. It grows on fine soil, small gravel, and rocky slopes of mid and high mountain regions. In the Navoi region plant cadastre, it has been recorded only for the Nurata and Aktau mountain ranges.

Distribution within the ZZBGR: Navoi region, Karmana district, Blue mountain (39.94076116, 65.17500201), 13 April 2025, observed by Karimov Bobur (iNaturalist). This species was identified by Georgii Lazkov.

Draba nuda (Bél.) Al-Shehbaz & M.Koch (Brassicaceae)

This annual species belongs to the Eastern ancient Mediterranean floristic area. It is mainly found on plains, foothills, and low mountain regions, growing on fine soil, gravelly, and rocky slopes. In the Navoi region cadastre, it has been recorded only for the Nurata and Aktau mountains.

Distribution within the ZZBGR: Navoi region, Karmana district, Blue mountain (39.95714479, 65.3506384), 11 March 2025, observed by Karimov Bobur (iNaturalist). This species was identified by Quyoshbek Ziyadullayev.

Eremostachys eriolarynx Pazij & Vved. (Lamiaceae)

This perennial species grows in clayey and gravelly mixed desert areas and is an endemic species specific to Uzbekistan, distributed in the Kyzylkum region.

Distribution within the ZZBGR: Navoi region, Karmana district, near the village of Uzumzor (40.0777042, 65.11670152), observed by Karimov Bobur (iNaturalist). This species was identified by Rustam Gulomov. The location we recorded is approximately 60 km from the previously known distribution area in Kyzylkum, indicating its proximity to known populations of this species.

Amberboa turanica Iljin (Asteraceae)

This annual species is considered an Eastern ancient Mediterranean floristic element. It grows in sandy, clayey, and gravelly soils of lowlands and foothill areas. In the Navoi region floristic cadastre, it has been recorded only for the Kyzylkum, Kyzylkum residual mountains, Lower Zarafshan, and Karshi–Karnabchul botanical-geographical regions.

Distribution within the ZZBGR: Navoi region, Karmana district, Blue mountain (39.94550347, 65.29923254), 14 April 2025, observed by Karimov Bobur (iNaturalist).

Pseudopodospermum ovatum (Trautv.) Zaika, Sukhor. & N.Kilian (Asteraceae)

This perennial species belongs to the Iran-Central Asia floristic area. It is found in plains, foothills, and low to mid-mountain zones, growing on fine soils, gravelly, rocky, open rocky substrates, and salty-sandy habitats. In the Navoi regional flora cadastre, it has been recorded only for the Nurata and Aktau' areas.

Distribution within the ZZBGR: Navoi region, Karmana district, Ziadin mountains (40.02621837, 65.46143758), 13 March 2025, Karimov Bobur (iNaturalist); Navoi region, Karmana district, Blue mountain, 13 April 2025, Karimov Bobur (iNaturalist). This species was identified by Orzimat Turginov.

Stizolophus balsamita (Lam.) K.Koch (Asteraceae)

An annual plant belonging to the Iran–Central Asia floristic area. It grows in cultivated fields, wastelands, roadsides, river valleys, and stony and gravelly slopes. It is distributed across plains, foothills, and lower mountain zones. In the Samarkand regional flora cadastre, it has been recorded in the Urgut, Nurota, Aktau, and Middle Zarafshan floristic regions.

Distribution within the ZZBGR: Samarkand region, Nurobod district (39.58783485, 66.31767857), 29 May 2025, Karimov Bobur (iNaturalist).

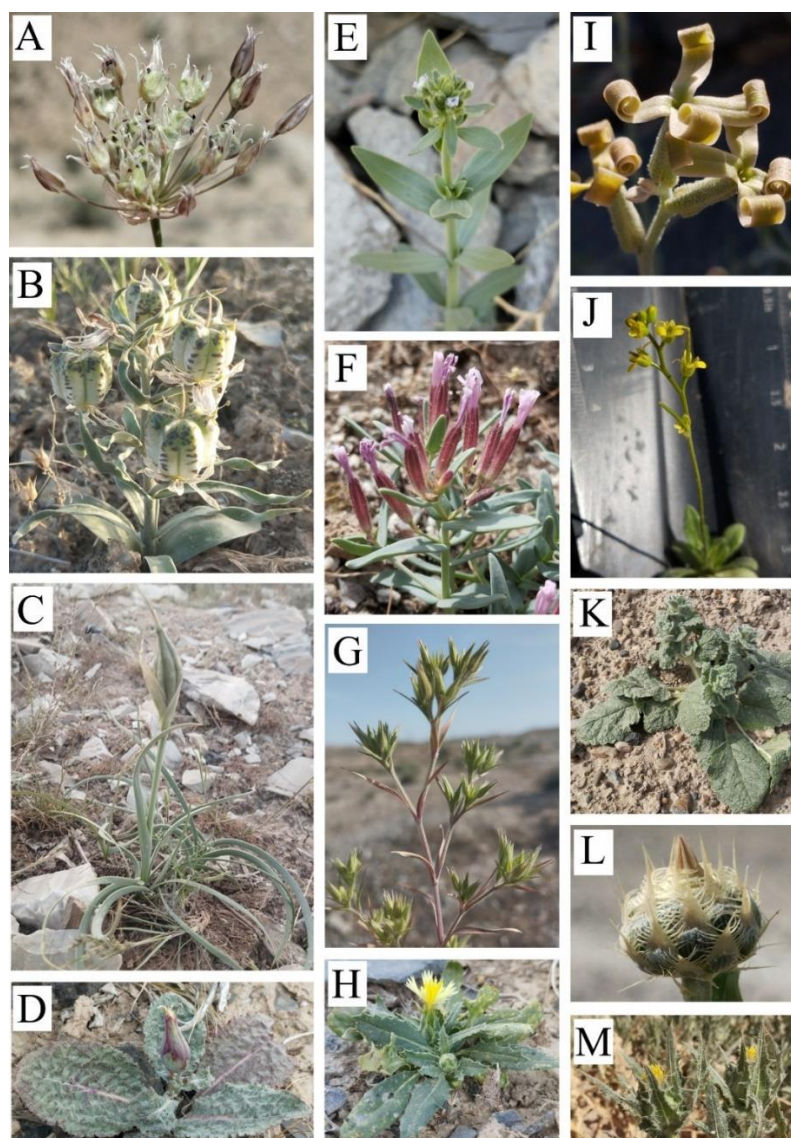


Figure 2. Newly recorded species for the Ziadin-Zirabulak. A. *Allium kysylkumi*, B. *Fritillaria karelinii*, C. *Iris falcifolia*, D. *Pseudopodospermum ovatum*, E. *Linaria micrantha*, F. *Saponaria sewerzowii*, G. *Minuartia meyeri*, H. *Amberboa turanica*, I. *Matthiola integrifolia*, J. *Draba nuda*, K. *Eremostachys eriolarynx*, L. *Stizolophus balsamita*, M. *Centaurea benedicta*

***Centaurea benedicta* (L.) L. (Asteraceae)**

An annual plant classified as pluriregional in distribution. It typically grows in clayey and gravelly deserts, foothill plains, moist areas, river valleys, wastelands, fields, fallow lands, and weedy habitats across plains and foothills. According to the flora cadastre of the Samarkand region, this species has been recorded in the Urgut, Nurota, Aktau, and Middle Zarafshan floristic regions.

Distribution within the ZZBGR: Samarkand region, Nurobod district (39.58763912, 66.3175213), 29 May 2025, Karimov Bobur (iNaturalist); Samarkand region, Nurobod district, near the village Dzharkuduk, 8 May 2025, Ibrokhimjon Ergashov (iNaturalist)

The conducted studies indicate that although ZZBGR is rich in floristic diversity, its scientific documentation remains very limited. Previous sources, including the monographs by K.Z. Zokirov [6,7], only partially reflect the flora of the region. The newly recorded species during this research clearly demonstrate the need for further extensive floristic studies in this area.

Conclusion. The research carried out on the ZZBGR provided important information about the floristic composition and ecosystem diversity of the area. Fieldwork conducted from March to May 2025 resulted in over 2,500 observations uploaded to the iNaturalist platform. As a result, 13 plant species previously unrecorded in the region were identified. These findings help to deepen the understanding of the biological diversity of ZZBGR and its ecosystem significance within the context of the mountainous regions of Central Asia.

Moreover, this study highlighted the importance of using platforms like iNaturalist for biodiversity monitoring, as they enable rapid data collection and verification by local and international experts. The integration of remote sensing and GIS technologies in mapping the ecosystem zones of the region significantly improved the accuracy and efficiency of the floristic research.

Acknowledgments

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