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Floristic diversity and conservation in peri-urban landscapes: The Case of Sarıyer, Istanbul

Kent çeperinde floristik çeşitlilik ve koruma: Sarıyer, İstanbul Örneği

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Abstract
This study investigates the temporal changes in floristic composition within Sarıyer, a peri-urban district in northern Istanbul that serves as a critical conservation zone due to its ecological richness. By synthesizing data from 11 studies, a comprehensive flora database was developed, encompassing 1,194 plant taxa distributed across 125 families and 525 genera. Sarıyer accounts for approximately 47.76% of Istanbul's total plant species and 69.7% of its endemic taxa, underscoring its pivotal role in regional biodiversity. Key findings include the identification of 23 endemic taxa and 21 taxa categorized under IUCN threat levels, emphasizing the area's ecological significance and the urgent need for conservation measures. The study highlights the impacts of urbanization, including habitat fragmentation, the introduction of invasive species, and large-scale infrastructure projects, on the region's biodiversity. Floristic records were analyzed alongside contemporary data, revealing that 267 taxa documented in earlier surveys were absent in recent studies, many due to urban transformation. This research underscores the importance of aligning urban development with ecological principles and proposes conservation strategies to prioritize threatened habitats. The integration of floristic records and contemporary data provides a robust framework for sustainable biodiversity management, offering a model for urban conservation globally.

Özet
Bu çalışma, ekolojik zenginliği nedeniyle önemli bir koruma alanı olarak öne çıkan İstanbul'un kuzeyindeki Sarıyer ilçesinin floristik kompozisyonunu incelemektedir. Daha önce yapılmış 11 çalışmanın verilerinin sentezlenmesiyle, 125 familya ve 525 cinse ait toplam 1.194 bitki taksonunu kapsayan kapsamlı bir flora veritabanı oluşturulmuştur. Sarıyer, İstanbul'daki toplam bitki türlerinin yaklaşık %47.76'sına ve endemik taksonlarının %69.7'sine ev sahipliği yaparak bölgesel biyolojik çeşitlilikteki hayati rolü ile öne çıkmaktadır. Çalışmada, 23 endemik taksonun ve IUCN tehdit kategorilerine göre sınıflandırılmış 21 taksonun tespit edilmesi, alanın ekolojik önemini ve koruma önlemlerinin aciliyetini ortaya koymaktadır. Araştırma, kentsel gelişimin biyolojik çeşitlilik üzerindeki etkilerini; habitat parçalanması, istilacı türlerin yayılması ve büyük ölçekli altyapı projeleri gibi faktörler üzerinden ele almaktadır. Floristik kayıtlar, güncel verilerle birlikte analiz edilerek tür kayıpları izlenmiş, erken dönem çalışmalarda belgelenen 267 taksonun, çoğu kentsel dönüşüm nedeniyle, güncel çalışmalarda artık mevcut olmadığı tespit edilmiştir. Bu araştırma, kentsel gelişimin ekolojik ilkelerle uyumlu hale getirilmesinin önemini vurgulamakta ve tehdit altındaki habitatlara öncelik veren koruma stratejileri önermektedir. Floristik kayıtların ve güncel verilerin entegrasyonu, sürdürülebilir biyolojik çeşitlilik yönetimi için sağlam bir çerçeve sunmakta ve küresel düzeyde kentsel koruma için bir model teşkil etmektedir.

INTRODUCTION

Peri-urban landscapes, situated at the interface of urban and rural environments, are pivotal for floristic diversity conservation, particularly in metropolitan areas like Istanbul. These transitional zones offer crucial habitats that support a wide array of species and maintain ecological functions. Recent studies highlight the importance of green infrastructure in enhancing ecological connectivity within urban peripheries (Capotorti et al. 2019) and the role of innovative land-use policies in mitigating habitat loss (Barral and Guillet 2023). Furthermore, urban and peri-urban forests provide essential ecosystem services, such as carbon sequestration and biodiversity conservation (Livesley et al. 2016). Research consistently shows that urban green spaces sustain regional biodiversity by supporting native species despite the overall decline in species densities due to urbanization (Aronson et al. 2014). Peri-urban forests, in particular, serve as critical refuges that enhance species richness and mitigate the impacts of habitat fragmentation caused by urban expansion (Hedblom and Söderström 2010, Canedoli et al. 2017). However, these landscapes face increasing pressures from urban sprawl, leading to significant land-cover

transformations and habitat loss. Comparative studies in Central and Eastern European cities reveal that while traditional conservation tools remain effective, they require adaptation to address the specific challenges posed by urban expansion (Kovács et al. 2024). Furthermore, analyses of functional urban areas across Europe highlight varying scales and dynamics of urban sprawl, underlining the need for tailored policy responses to mitigate its ecological impacts (Grabowska et al. 2024). In Istanbul, districts like Sarıyer exemplify this dynamic interplay, showcasing both the challenges and opportunities inherent in conserving biodiversity within peri-urban landscapes.

Rapid urban expansion has significant implications for floristic diversity, particularly through habitat fragmentation and alterations in species composition, as observed in peri-urban areas like Sarıyer, Istanbul. Urbanization transforms natural landscapes into built environments, leading to the loss of native plant species and significant shifts in floristic diversity (Lopez et al. 2018, Dylewski et al. 2023). Native plant species have often been displaced, while invasive and exotic species thrive in these modified environments, reshaping the ecological balance and landscape character (Knapp et al. 2010). This transformation underscores the need to document and analyze the dynamics of urban biodiversity, with historical records offering critical insights into the long-term changes in species composition and habitat conditions (Bagella and Bagella 2023).

Despite being perceived as biodiversity-poor, urban ecosystems can support significant floristic diversity. Studies conducted in Southeastern Europe reveal that urban flora exhibits high species richness, including both unique taxa and neophytes adapted to urban conditions (Rat et al. 2017, Jovanović and Glišić 2021). However, these ecosystems are increasingly threatened by accelerated urban development (Laurance et al. 2015) which disproportionately affects endemic and rare species (Cui et al. 2019), particularly in rapidly urbanizing regions such as Istanbul. Istanbul, a transcontinental city, is home to approximately 2.500 plant species, with ten taxa being exclusive to the region (Tuncay and Akalin 2019). The city's biodiversity, shaped by its unique geographical and climatic conditions, faces significant pressures from large-scale infrastructure projects and urban sprawl, including the construction of the third Bosphorus bridge and Istanbul's third airport (Bayraktar et al. 2024).

Sarıyer, a district located in the northern part of Istanbul, exemplifies the ecological and floristic richness of the region. The area encompasses diverse habitats that support numerous endemic and rare species, making it an essential conservation zone. Historical studies conducted in Sarıyer, including in subregions like Belgrad Ormanı and Balabandere Vadisi, have documented a wide range of taxa, highlighting the ecological significance of the district (Kayacık 1955, Yaltırık 1963, Erol 2005, Özhatay and Yüzbaşıoğlu 2013). However, like much of Istanbul, Sarıyer has been subject to urban transformation, which has fragmented its natural habitats and intensified ecological pressures (Yalçıntan et al. 2014, Bayraktar et al. 2024). Understanding the impact of these changes on the region's biodiversity is critical for developing effective conservation strategies (Gros et al. 2023).

This study focuses on Sarıyer, a district that stands out as a prominent example of peri-urban landscapes, showcasing the complex interactions between urbanization and biodiversity conservation within a rapidly expanding metropolitan context like Istanbul. By identifying species and evaluating their conservation status, the research seeks to provide insights into the potential impacts of urbanization on local flora. Additionally, the study aspires to contribute to urban biodiversity management by suggesting conservation strategies that prioritize habitats facing the most immediate threats.

MATERIAL AND METHODS

The study area, Sarıyer, is located in the northern part of Istanbul, covering a diverse range of landscapes from coastal zones to forested areas (Figure 1). It represents one of the most extensively researched regions in Istanbul for floristic studies, offering a rich foundation for

comprehensive analysis. Sarıyer's strategic location, bordered by the Bosphorus and encompassing ecological hotspots like Belgrad Ormanı and Balabandere Vadisi, makes it an essential conservation zone. The area is characterized by a mosaic of natural and urban habitats, providing a unique opportunity to assess the interplay between biodiversity and urbanization.

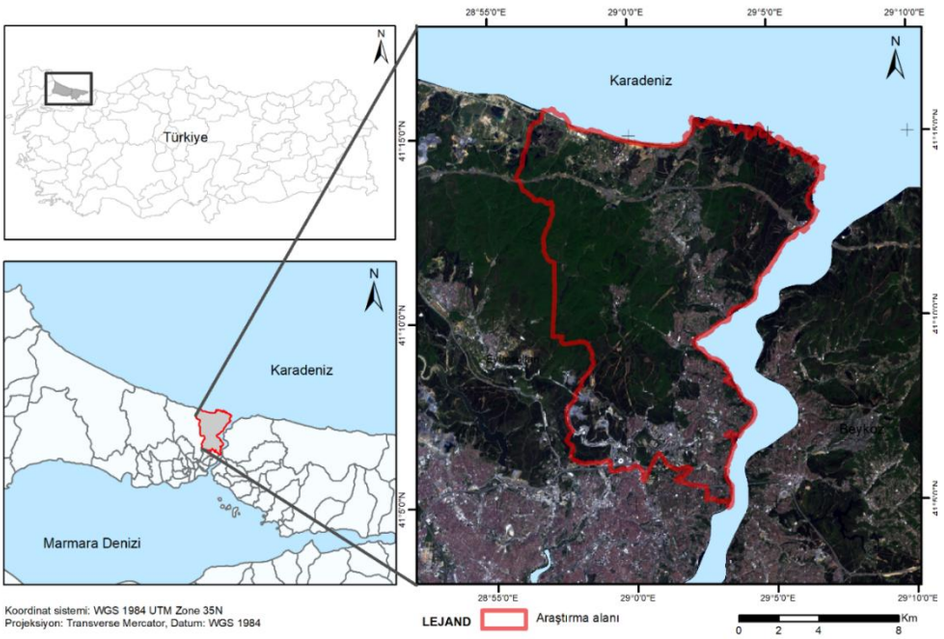

Figure 1.Location of the study area

Building on the rich history of floristic research conducted in Sarıyer, this study leverages the extensive body of knowledge accumulated over decades to develop a comprehensive understanding of the region's biodiversity. By systematically consolidating existing studies into a single database (Table 1), this study employed a structured methodology to ensure the accurate integration of diverse data sources, as detailed in the following sections.

Table 1. Overview of floristic studies conducted in Sarıyer, including the number of taxa recorded and corresponding references

Study area	Number of Taxa	Reference
Belgrad Ormanı	151	(Kayacık 1955)
Belgrad Ormanı	408	(Yaltırık 1963)
Belgrad Ormanı	49	(Karamanoğlu 1976 from Çolak et al. 2013)
Belgrad Ormanı	143	(Yönelli 1986)
Sarıyer	649	(Davis 1965-85, Davis et al. 1988)
İUC Araştırma Ormanı	355	(Kavgacı 2002)
Balabandere Vadisi	424	(Erol 2005)
Zekeriyaköy Vadisi	332	(Bayraktar 2013)
Belgrad Ormanı	388	(Özhatay and Yüzbaşıoğlu 2013, Çolak et al. 2013)
İÜC Orman Fakültesi Kampüsü	284	(Tanfer 2019)
Zekeriyaköy- Uskumruköy	211	(Emecen 2015)

To compile the flora database, species lists from individual studies were digitized manually using Microsoft Excel. Following this, all datasets were meticulously reviewed to account for potential synonymy, ensuring that duplicate entries were merged and species names were updated to their most current

taxonomic nomenclature (a standardized system for naming and classifying organisms based on universally accepted scientific principles). Renowned taxonomic resources, including the Catalogue of Life (Anon. 2021a), TNRS (Anon. 2021b), The Plant List (Anon. 2021c), and Bizim Bitkiler (Anon. 2021d), were utilized for this purpose. Additionally, to ensure consistency and reliability, records categorized only at the genus level in the source studies were excluded from the database**.**

The consolidated database incorporated floristic studies from diverse subregions of Sarıyer, including Belgrad Ormanı, Balabandere Vadisi, and Zekeriyaköy Vadisi. For example, studies conducted in Belgrad Ormanı have recorded a wide range of taxa, with numbers varying from 49 taxa (Karamanoğlu 1976) to 408 taxa (Yaltırık 1963), reflecting both the temporal depth and variability of research efforts in this area. The study by Davis (1965-1985), covering the entire Sarıyer region, documented the highest number of taxa (649), underscoring the ecological richness of the study area.

The finalized species list was then analyzed in comparison to data from the Ministry of Forestry and Water Affairs (2017), focusing on endemic and at-risk taxa. This approach enabled the integration of historical and contemporary insights, facilitating a comparative evaluation of Sarıyer's flora within the broader context of Istanbul's biodiversity.

This systematic approach to data collection, standardization, and consolidation not only ensured the reliability of the database but also provided a robust foundation for evaluating Sarıyer's floristic diversity and its conservation priorities within a broader ecological and historical context.

RESULTS

A comprehensive flora database was developed in this study, incorporating data from 11 previous studies and comprising records of 1.438 taxa. After resolving synonymy issues and merging duplicate entries, a total of 1.194 plant taxa were identified in Sarıyer, Istanbul. These taxa are distributed across 125 families and 525 genera. The floristic analysis revealed that the study area contains a rich diversity of plant families. Asteraceae (140 genera), Fabaceae (129 genera), and Poaceae (115 genera) were identified as the families with the highest taxonomic richness, collectively representing a significant proportion of the flora (Figure 2). In contrast, 44 families were found to be represented by a single genus.

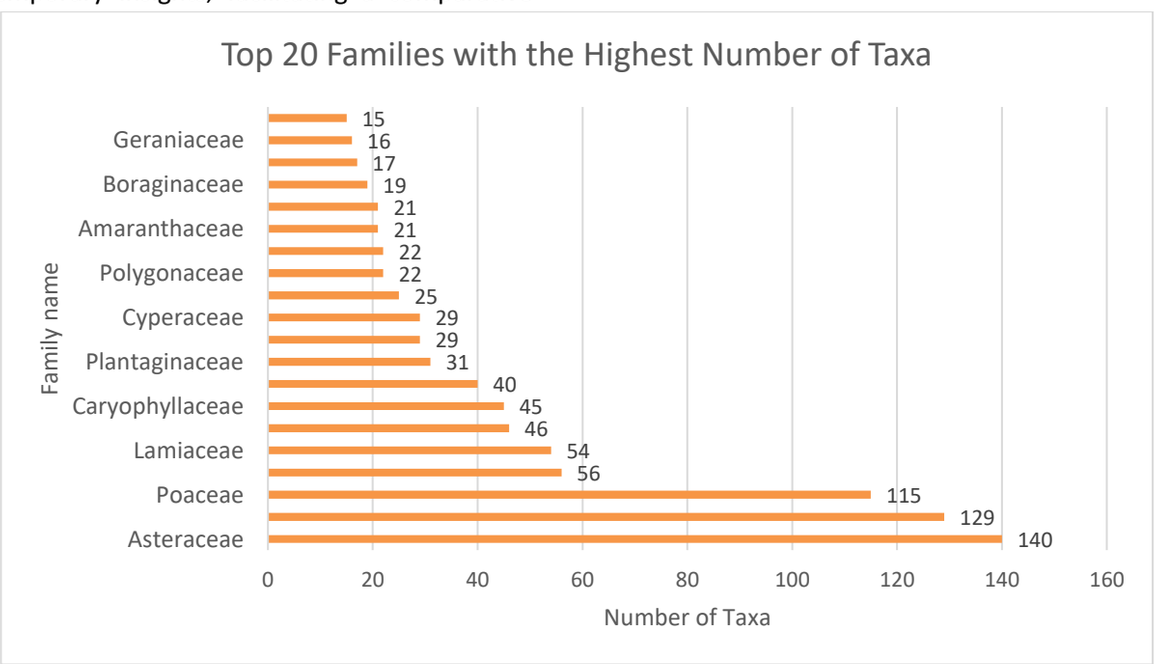

Figure 2. Distribution of the Top 20 Plant Families in Sarıyer (Istanbul) by Number of Taxa

At the genus level, *Trifolium* (29 taxa), *Vicia* (20 taxa), and *Euphorbia* (18 taxa) were identified as the genera with the highest number of species and subspecies, as presented in Figure 3.

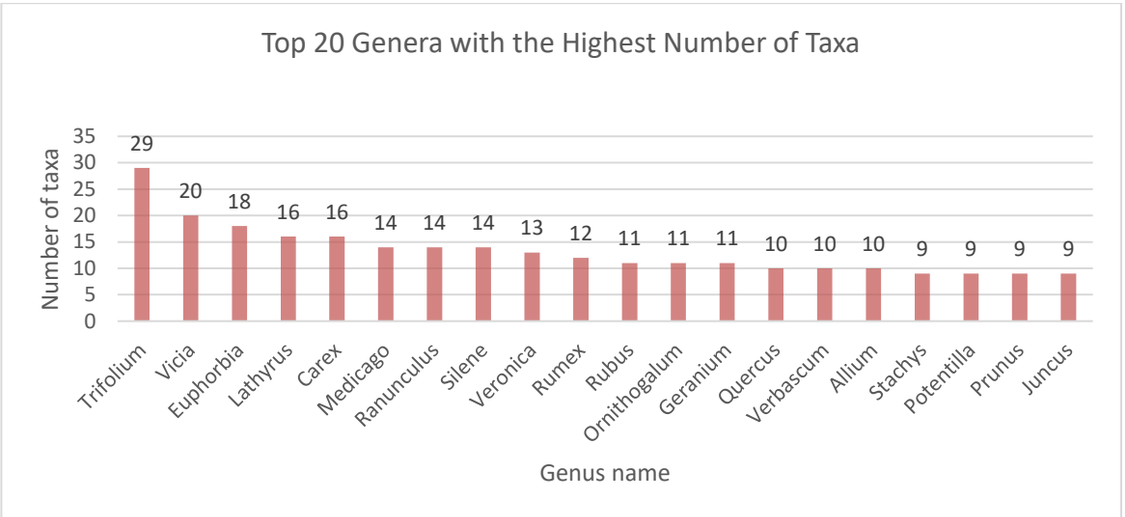

Figure 3. Distribution of the Top 20 Genera with the Highest Number of Taxa in Sarıyer (Istanbul)

Common species were identified based on their occurrence in at least 9 of the 11 studies analyzed. These species, distributed across diverse families, represent the dominant taxa of the Sarıyer flora, highlighting their ecological importance and widespread presence in the region (Table 2).

From a conservation perspective, the analysis revealed that 23 taxa identified within the study area are endemic (Table 3). Additionally, 8 taxa are listed in the BERN Appendix-I (Table 4), which includes species that are strictly protected under the Bern Convention to ensure their survival in natural habitats.

Furthermore, 6 taxa are included in the CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) Appendix-I (Table 5), signifying that they are among the most endangered species globally. CITES is an international agreement aimed at ensuring that the trade of wild animal and plant species does not threaten their survival, with Appendix-I covering species that are at the highest risk of extinction and for which trade is only permitted in exceptional circumstances.

Finally, 21 taxa are classified under various threat categories based on the IUCN (International Union for Conservation of Nature) Red List criteria (Table 6). The IUCN Red List is an internationally recognized system for assessing species' risk of extinction, providing critical insights into their conservation status and prioritization for protective measures.

These findings underscore the ecological significance of the area and highlight the need for targeted conservation measures to protect its unique and vulnerable biodiversity

Table 2. Common species identified in at least 9 studies within the Sarıyer district, along with their corresponding family names

Taxa name	**Familya name**
Rabelera holostea (L.) M. T. Sharples & E. A. Tripp	Caryophyllaceae
Quercus frainetto Ten.	Fagaceae
Hedera helix L.	Araliaceae
Epimedium pubigerum (DC.) Morren & Decne.	Berberidaceae
Carpinus betulus L.	Betulaceae
Cistus salviifolius L.	Cistaceae
Pteridium aquilinum (L.) Kuhn	Dennstaedtiaceae
Trifolium pratense L.	Fabaceae
Trifolium repens var. *repens*	Fabaceae
Castanea sativa Mill.	Fagaceae
Hypericum calycinum L.	Hypericaceae
Tilia tomentosa Moench	Malvaceae
Ligustrum vulgare L.	Oleaceae
Plantago lanceolata L.	Plantaginaceae
Veronica chamaedrys L.	Plantaginaceae
Fragaria vesca L.	Rosaceae
Geum urbanum L.	Rosaceae
Acer campestre subsp. *campestre*	Sapindaceae
Daphne pontica L.	Thymelaeaceae
Sambucus ebulus L.	Adoxaceae
Daucus carota L.	Apiaceae
Oenanthe pimpinelloides L.	Apiaceae
Ruscus aculeatus L.	Asparagaceae
Ruscus hypoglossum L.	Asparagaceae
Asplenium adiantum-nigrum L.	Aspleniaceae
Corylus avellana L.	Betulaceae
Dioscorea communis (L.) Caddick & Wilkin	Dioscoreaceae
Genista tinctoria L.	Fabaceae
Quercus petraea subsp. *polycarpa* (Schur) Soó	Fagaceae
Geranium asphodeloides Burm. f.	Geraniaceae
Luzula forsteri (Sm.) DC.	Juncaceae
Brachypodium sylvaticum (Huds.) P.Beauv.	Poaceae
Lysimachia arvensis subsp. *arvensis*	Primulaceae
Clematis vitalba L.	Ranunculaceae
Crataegus monogyna var. *monogyna*	Rosaceae
Mespilus germanica L.	Rosaceae
Potentilla reptans L.	Rosaceae
Pyracantha coccinea M. Roem.	Rosaceae
Rosa canina L.	Rosaceae
Galium verum subsp. *verum*	Rubiaceae
Rubia peregrina L.	Rubiaceae
Viola odorata subsp. *odorata*	Violaceae

Table 3. List of endemic taxa ıdentified in the study area

Taxa name	Family name
Ballota nigra subsp. *anatolica* P.H.Davis	Lamiaceae
Asperula littoralis Sm.	Rubiaceae
Campanula lyrata subsp. *lyrata*	Campanulaceae
Centaurea consanguinea DC.	Asteraceae
Centaurea hermannii F. Herm.	Asteraceae
Centaurea kilaea Boiss.	Asteraceae
Cirsium byzantinum Steud.	Asteraceae
Colchicum micranthum Boiss.	Colchicaceae
Euphorbia amygdaloides subsp. *robbiae* (Turrill) Stace	Euphorbiaceae
Ferulago thirkeana (Boiss.) Boiss.	Apiaceae
Galanthus plicatus subsp. *byzantinus* (Baker) D.A.Webb	Amaryllidaceae
Geropogon hybridus (L.) Sch. Bip.	Asteraceae
Knautia degenii Borbás	Caprifoliaceae
Lathyrus undulatus Boiss.	Fabaceae
Sideritis romana L.	Lamiaceae
Torilis triradiata Boiss. & Heldr	Apiaceae
Taraxacum turcicum Soest	Asteraceae
Trifolium apertum Bobrov	Fabaceae
Verbascum bithynicum Boiss.	Scrophulariaceae
Taraxacum pseudobrachyglossum Soest	Asteraceae
Lathyrus undulatus Boiss.	Fabaceae
Taraxacum aznavourii Soest	Asteraceae

The analysis revealed 8 taxa from the study area listed in BERN Appendix-I, indicating their conservation importance at the international level (Table 3).

Six taxa identified in the study area are included in CITES Appendix-I, reflecting their vulnerability to international trade and habitat pressures.

Table 4. Taxa in the study area listed in BERN Appendix-I

Taxa name	Family name
Eleocharis carniolica W.D.J.Koch	Cyperaceae
Centaurea hermannii F. Herm.	Asteraceae
Cyclamen coum var. *coum* Mill.	Primulaceae

Table 5. taxa in the study area listed in CITES Appendix-I

Taxa name	Family name
Cephalanthera longifolia (L.) Fritsch	Orchidaceae
Dactylorhiza romana (Sebast.) Soó	Orchidaceae
Epipactis helleborine (L.) Crantz	Orchidaceae
Neotinea maculata (Desf.) Stearn	Orchidaceae
Neottia nidus-avis (L.) Rich.	Orchidaceae
*Anacamptis morio subsp. morio (*syn. *Orchis morio* subsp. *morio)*	Orchidaceae

The flora of the study area includes several species that fall within different categories of the IUCN Red List. These taxa, which are critical indicators of biodiversity health, are categorized based on their risk of extinction, ranging from Critically Endangered (CR) to Vulnerable (VU) and Lower Risk (LR). The identification and classification of these taxa not only reflect the ecological significance of the area but also emphasize the pressing need for conservation efforts. Table 5 provides a detailed overview of the species within these IUCN categories, showcasing their taxonomic affiliations and conservation status.

Table 6. Taxa ıdentified in the study area categorized by IUCN Threat levels

Taxa name	Family name	Threat level
Atriplex tatarica L.	Amaranthaceae	CR
Cirsium byzantinum Steud.	Asteraceae	CR
Cirsium hypoleucum DC	Asteraceae	CR
Lamium purpureum L.	Lamiaceae	CR
Centaurea hermannii F. Herm.	Asteraceae	EN
Centaurea kilaea Boiss.	Asteraceae	EN
Ballota nigra subsp. *anatolica* P.H.Davis	Lamiaceae	LR
Carduus nutans subsp. *leiophyllus* (Petrovic) Arènes	Asteraceae	LR
Campanula lyrata subsp. *lyrata*	Campanulaceae	LR
Euphorbia amygdaloides L.	Euphorbiaceae	LR
Euphorbia amygdaloides subsp. *robbiae* (Turrill) Stace	Euphorbiaceae	LR
Ferulago thirkeana (Boiss.) Boiss.	Apiaceae	LR
Knautia degenii Borbás	Caprifoliaceae	LR
Arum byzantinum Blume	Araceae	VU
Asperula littoralis Sm.	Rubiaceae	VU
Ferulago sylvatica subsp. *confusa* (Velen.) Hartvig	Apiaceae	VU
Galanthus plicatus subsp. *byzantinus* (Baker) D.A.Webb	Amaryllidaceae	VU
Galanthus × valentinei nothosubsp. *subplicatus* (N.Zeybek) A.P.Davis	Amaryllidaceae	VU
Jurinea kilaea Azn.	Asteraceae	VU
Lathyrus undulatus Boiss.	Fabaceae	VU
Lilium martagon L.	Liliaceae	VU

DISCUSSION

This study provides a comprehensive analysis of the floristic composition and taxonomic diversity in Sarıyer, Istanbul, based on a synthesis of 11 prior studies. A total of 1.194 plant taxa were identified, distributed across 125 families and 525 genera, after resolving synonymy issues and merging duplicate entries. The floristic analysis highlights the richness of plant families within the region, with Asteraceae (140 taxa), Fabaceae (129 taxa), and Poaceae (115 taxa) emerging as the most taxonomically diverse. These findings underscore Sarıyer's significant contribution to Istanbul's overall floral diversity and ecological importance.

Historical records (1857-1968) provided by the Flora of Türkiye add depth to our understanding of Sarıyer's biodiversity (Davis 1965-85, Davis et al. 1988). Among the taxa identified in this study, 267 were exclusively documented in earlier botanical surveys conducted in the late 19th and early 20th centuries. Analysis of *Flora of Türkiye* records revealed that the collection sites of these species correspond to areas such as Rumelihisarı, Tarabya, Zekeriyaköy, and Büyükdere, which were historically semi-natural habitats but have undergone significant urbanization over the past decades. Many of these taxa were originally found in areas that are now heavily urbanized, such as the villages around the Bosphorus (Bayraktar 2013, Tekeli et al. 2015, Coban et al. 2020). These historical records illustrate the transformative impact of urbanization on biodiversity, highlighting the potential loss or underrepresentation of certain taxa in recent studies.

Aronson et al. (2014) further emphasize that urbanization leads to significantly lower densities of native species compared to non-urban areas, underscoring the urgent need for conservation efforts to restore native vegetation in urban environments. Revisiting historical datasets alongside modern surveys can identify taxa that have been lost, survived, or

adapted, serving as a critical tool for conservation and restoration efforts in urban and peri-urban landscapes.

Historical floristic records have proven critical in tracing biodiversity changes over time, providing a robust framework for assessing the impacts of urbanization on species composition (Bagella and Bagella 2023). The region's floristic richness is further exemplified by its role as a hotspot for endemic species. Of Istanbul's 33 endemic taxa, 23 were recorded in the study area, positioning Sarıyer as a vital conservation zone. Rare taxa such as *Convolvulus persicus*, *Verbascum bugulifolium*, *Ranunculus thracicus*, *Rosa sempervirens*, and *Spiranthes spiralis* add to the ecological value of the area, serving as indicators of its biodiversity. Additionally, 21 taxa in the study area fall under various IUCN threat categories, underscoring the urgent need for targeted conservation and habitat management strategies.
The significance of the study area is further emphasized by its inclusion within Belgrad Ormanı, which has been identified as one of Europe's top 100 biodiversity hotspots by the World Wide Fund for Nature (WWF) and one of Türkiye's nine ecological priority zones. Additionally, two of Istanbul's seven most significant plant areas, as identified by a scientific report prepared for the Doğa Derneği, are located within the study area. These findings highlight the ecological importance of the study area as a critical conservation zone.

The timeline of conservation and forest management efforts in Belgrad Ormanı, as documented by Çoban et al. (2016), further illustrates the critical role of historical management interventions in shaping the current ecological dynamics of the area. These efforts, ranging from early attempts at forest classification to the establishment of protected status and ecological research initiatives, underscore the resilience and vulnerability of the region's ecosystems in response to anthropogenic pressures. This historical framework enriches our understanding of Sarıyer's biodiversity, highlighting its potential as a model for urban biodiversity conservation.

While the study highlights the region's biodiversity, it also brings attention to the challenges posed by urbanization and invasive species. Urbanized areas like Zekeriyaköy are particularly vulnerable to the spread of invasive and exotic species, which threaten native biodiversity. Coban et al. (2020) noted that exotic species dominate residential green spaces in Istanbul, comprising 71% of shrub and evergreen species, while parks contain a higher proportion of invasive plants. Similarly, Bayraktar (2013) identified 334 exotic species in the residential gardens of Zekeriyaköy, highlighting the high exotic diversity in the area and the need for ecological approaches to control their usage. Barral and Guillet, (2023) further underscores that mitigating the spread of invasive species requires innovative land-use policies that ensure ecological integrity in urban and peri-urban landscapes. In line with this, Tokuş (2012) emphasized that integrating green spaces such as parks, cemeteries, and school gardens into an urban green network can significantly enhance ecological resilience, provided that the proliferation of exotic species is effectively managed and native species are prioritized in restoration and landscaping efforts.

Large-scale infrastructural projects, such as the construction of the third Bosphorus bridge and Istanbul's third airport, have further intensified land degradation. According to Bayraktar et al. (2024), anthropogenic land degradation in Istanbul has increased by approximately 40% per district over the past four decades, significantly impacting natural and semi-natural habitats. Supporting this, Güneralp et al. (2021) highlights that transportation infrastructure developments in Istanbul's northern regions have led to a 10% loss of forest cover and significant fragmentation of core forest habitats, further exacerbating biodiversity loss and reducing ecological connectivity. While the northern forests exhibit relative resilience, they remain under significant pressure from urban expansion and land-use changes.

Sarıyer's significant contribution to Istanbul's overall floristic richness is evident not only in its diverse taxa but also in its role as a refuge for threatened and endemic species. Of Istanbul's 33 endemic taxa, 23 (approximately 69.7%) are found in Sarıyer, highlighting its importance as a conservation hotspot. Similarly, Sarıyer hosts 1.194 of Istanbul's approximately 2.500

plant species, representing 47.76% of the city's floristic diversity. These figures underscore Sarıyer's critical ecological value and its potential as a model for urban biodiversity conservation. By integrating historical records and contemporary data, this study emphasizes the necessity of aligning urban development with ecological principles to safeguard biodiversity.

The integration of historical floristic records and contemporary conservation practices emerges as an indispensable approach to biodiversity conservation. These records provide essential insights into past ecological conditions, inform targeted restoration strategies, and highlight the need for long-term monitoring. By addressing the challenges posed by urbanization with evidence-based conservation actions, stakeholders can contribute to preserving the ecological heritage of both Sarıyer and Istanbul. This integrated approach holds promise for sustaining biodiversity in the face of accelerating environmental change, offering a model for urban conservation efforts globally.

CONCLUSION

This study provides a comprehensive analysis of the floristic records of Sarıyer (Istanbul), emphasizing the taxonomic diversity, historical trends, and conservation priorities of the region. By synthesizing data from 11 studies spanning over a century, a robust flora database was established, encompassing 1.438 taxa across 125 families, 525 genera, and 1.194 species. The analysis highlights the dominance of families such as Asteraceae, Fabaceae, and Poaceae, while revealing the rarity and localized nature of specific taxa, including several endemic species.

The findings underscore Sarıyer's critical role as a peri-urban landscape in preserving floristic diversity amidst rapid urbanization. The integration of historical and contemporary records demonstrates how floristic data can document biodiversity changes and inform conservation strategies. Notably, 267 species documented solely in historical records are now absent due to urban transformation, emphasizing the need for targeted conservation efforts to protect remnant populations of endemic and threatened species, such as *Centaurea kilaea* and *Ballota nigra* subsp. *anatolica*.

Sarıyer's biodiversity, representing 47.76% of Istanbul's plant species and 69.7% of its endemic taxa, highlights the ecological importance of peri-urban areas as biodiversity hotspots. This research establishes a foundation for conservation strategies that prioritize native species, control invasive plants, and enhance habitat connectivity. By integrating historical floristic records into landscape analysis, the study provides a broader perspective on ecological changes, facilitating targeted restoration efforts and informed conservation planning. This dual focus on historical insights and contemporary needs offers a replicable model for aligning urban development with ecological sustainability, ensuring the long-term preservation of floristic diversity in urban and peri-urban landscapes globally.

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