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Ecomorphic structure of the dendroflora of a park plantation

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Abstract. The study revealed the species composition of trees and the ecomorphic structure of the stand in the city park of a large industrial metropolis of the Steppe zone of Ukraine and their ecological features. The study was conducted in the recreational area of the Botanical Garden of the Oles Honchar Dnipro National University (Students' Park). The total of 230 survey points were placed in a quasi-regular grid to determine the structure of the dendroflora. The survey of the park yielded a total of 380 specimens of tree plants, representing 30 species from 15 families. The Salicaceae family was the most abundant with eight species. The families Aceraceae and Malvaceae were represented by three species each. Four families—Oleaceae, Fabaceae, Rosaceae and Ulmaceae—were represented by two species each. The families Adoxaceae, Betulaceae, Cannabaceae, Juglandaceae, Fagaceae, Moraceae, Sapindaceae and Simarubaceae were represented by one species each. The ecomorphic analysis allowed us to determine the ecological characteristics of the ecosystems. In the tree stand, mesotrophs (59.3%) were the most prevalent trophomorphs, with a slightly lower number of megatrophes (33.3%) and oligorophes (7.4%). This finding indicated the high soil fertility in the park and that species that are quite demanding to the level of soil fertility can be used to form the assortment of trees in the park. Among the gigromorphes, the conditions were more favourable for more drought-resistant tree species than for mesophytes. It should be noted that mesophytes are the most typical representatives of the forest formation. The steppe forests and their derivative planted forests and park plantings are characterised by moisture deficit. The results of the ecomorphic analysis confirm this statement. The resistance of trees to moisture deficit is obviously an important criterion for the formation of the range of tree species in a park within the steppe zone. The light-loving species demonstrate a predominance over shade-tolerant species within the studied park. This result draws attention to the shortcomings in the formation of the tree assortment and the further trajectory of the park planting. The lighted structure of the park is appropriate in some locations, but should be combined with locations with shady and heavily shaded light structure. Obviously, the issue of the optimal light structure of a park plantating requires further study to design the most effective practical recommendations. The problem of the light regime is certainly closely related to the phenomenon of the increased share of ruderal species in the structure of the park stand. The ruderal plants demonstrate the ability to grow rapidly. The potential for growth of ruderal species is very well revealed under the conditions of high soil fertility. The trophomorphic analysis found that the soils in the park are able to meet the needs of megatrophic tree species. The rapid growth of ruderal species may be beneficial at early stages of park's existence, as they can quickly create a favourable forest environment. However, in the future, ruderal trees should be preferably replaced with representatives of the native flora, which are more aesthetically pleasing and capable of providing a longer-lasting and more significant effect on the park's microclimatic conditions.

Keywords: tree stand; urban park; ecosystems services; green areas; urboecosystem.

Introduction

Urban green spaces confer a number of significant ecological, environmental and cultural benefits, including the conservation of biodiversity and the enhancement of human wellbeing (Knapp et al., 2017). Vegetation is a multifunctional and integral component of the urban environment, which can significantly reduce the anthropogenic load (Fanelli & De Lillis, 2004). Tree plantations in cities can store a significant amount of carbon in their biomass, which is a significant contribution to combating the global climate change (Nowak & Crane, 2002). The urban dendroflora provides health and hygiene benefits (Shupranova et al., 2022). Tree plantations operate as a biological filter that optimises the air composition, protects the city's atmosphere from dust, and saturates the air with phytoncides, which in turn have bactericidal, antifungal, and antistatic effects. The functional properties of tree stands are significantly influenced by the species composition of the planted species, with the effects being species-specific (Chen et al., 2024). The existence of urban green spaces provides a habitat for a variety of plants and animals, thereby contributing to the conservation of biodiversity in urban areas (Paudel & States, 2023). It has been demonstrated that walking in parks and other green spaces has a beneficial effect on mental health, reducing stress and improving mood and overall mental wellbeing. The contact of a person with nature in a city park promotes relaxation and recuperation (Cheesbrough et al., 2019). The gradual rise in industrial and vehicular emissions, coupled with the increasing recreational pressure on green spaces and the natural ageing process of plants, has resulted in a notable decline in the quality of urban green areas, including parks and public squares (Gireesh Kumar et al., 2021). The deterioration of park plantations has an adverse effect on their sanitary and hygienic function, manifesting in reduction of their capacity to transform and neutralise noxious substances. One of the principal mechanisms through which urban green spaces contribute to enhanced air quality is the capacity of vegetation to capture and filter fine particulate matter (PM2.5 and PM10). These particles represent the primary constituent of airborne pollutants linked to adverse health outcomes, particularly those affecting the respiratory and cardiovascular systems (Pope & Dockery, 2006). The presence of trees and other vegetation in urban parks serves to capture and retain particulate matter on their surfaces, including leaves, bark, and branches. This process effectively reduces the concentration of these particles in the surrounding atmosphere. It is estimated that trees in urban areas in the United States remove approximately 711,000 metric tonnes of particulate matter from the atmosphere on an annual basis. This effect is particularly pronounced in areas with high levels of traffic, where air pollution levels are elevated (Escobedo & Nowak, 2009).

Furthermore, green vegetation in parks has the potential to trap other pollutants, including ozone (O_3), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), and other gaseous substances that contribute to atmospheric pollution. Such substances are not only detrimental to human health but also contribute to the formation of smog and exacerbate the climate change. Urban parks play an instrumental role in the reduction of air pollution through the absorption of carbon dioxide, the filtration of particulate matter and other noxious substances. Such green spaces not only contribute to an improvement in the quality of the environment, but also exert a beneficial influence on the health of urban residents (Kunakh et al., 2022). The implementation of effective urban park planning and maintenance strategies has proved its effectiveness in mitigation of the adverse effects of urbanisation on the atmosphere, thereby fostering the creation of a healthier environment.

The ecomorph reveals the relationship between organisms and the environment and reflects the adaptations of individual plant species to the most important elements of biogeocenosis: to the phytocoenosis as a whole and to each of the structural elements of the ecotope (thermotope, heliotope, trophotope, hygrotope, thermotope) separately (Belgard, 1950). The system of life forms (biomorph, ecomorph) is based on a broad philosophical foundation. Plants exhibit a range of ecological amplitudes, indicating varying degrees of tolerance to environmental conditions. A correlation is often observed between morphology and adaptation. A plant's ability to thrive in its environment is an example of automatic physiological integration, whereby the plant adapts and interacts with its surrounding factors in a way that is largely automatic and innate (Cain, 1950). The term 'ecomorph' is preferred because it is more precise than 'life form' in that it refers specifically to adaptations that are expressed in the appearance of a plant. Furthermore, not all structural elements of a biogeocenosis have physiognomic manifestations, which is another reason for preferring 'ecomorph' over 'life form'. Ecotope is defined as a combination of climatope and edaphotope. The climatopes are subdivided into thermotopes and heliotopes (space factors), while the edaphotopes are further classified as trophotopes and hygrotopes (terrestrial factors). The plant coenomorph is defined as the adaptation of a living organism to the biogeocenosis as a whole (Belgard, 1950). Ecomorphic analysis is an effective tool for analysing the ecological structure of natural ecosystems. Ecomorphic analysis can also be applied to the ecological characterisation of parkland in a city.

The ecological situation in the city of Dnipro is tense due to the increase in the technogenic load. Therefore, it is crucial to intensify efforts to address the scientific and practical challenges associated with enhancing the quality of green spaces. The objective of the study was to identify the species composition of tree species and ecomorphic structure of the tree stand in the city park of a large industrial metropolis of the Steppe Zone of Ukraine and to determine their ecological features.

Materials and methods

The recreational section of the Botanical Garden of the Oles Honchar Dnipro National University is situated within the boundaries of the university campus. The park was established in 1964 and subsequently incorporated into the Botanical Garden of the Dnipro National University in 1996 (Kunakh et al., 2021). The area designated for green spaces is approximately 13 hectares. The park is currently included on the list of objects of national importance within the nature reserve fund.

The study was conducted in the recreational area of the Botanical Garden of the Oles Honchar Dnipro National University (Students' Park). To determine the structure of the dendroflora, 230 recording points were laid out in a quasi-regular grid (Fig. 1). The distance between the registration points was 14.0 ± 0.28 m and ranged 7.1 to 31.0 m. The coordinates of the points were recorded using a mobile GPS device. All tree species located within a 5 m radius of the survey point were recorded. Taxonomic names of plants are given according to the Euro+Med Plantbase resource (ww2.bgbm.org/EuroPlusMed).

The ecological analysis of the dendroflora was carried out according to Belgard (1950). The following climamorphes were considered as ecomorphs: cenomorphes, climamorphes, trophomorphes, hygromorphes, heliomorphes, termomorphes, polenochores, and diasporochores. The plant cenomorphism characterises the adaptation of a plant to the biogeocenosis as a whole. The ecological groups of plants that are similar in terms of their adaptation to certain cosmic factors are represented by the following: climamorphs, which characterise adaptations to climate conditions in general; heliomorphs, which indicate plant adaptations to lighting conditions; thermomorphs, which are markers of adaptations to the thermal climate regime. Ecological groups of plants exhibit similarities in their adaptations to specific terrestrial factors. These include trophomorphs, which indicate adaptations to soil fertility conditions, and hygromorphs, which indicate adaptations to humidity conditions. These ecomorphs primarily reflect adaptations to growth conditions, and thus may be designated as vegetative ecomorphs. In addition to vegetative ecomorphs, there are also generative ecomorphs that define the behaviour of species with regard to pollination and the dispersal of diaspores. Pollenochores are defined as groups of plants distinguished by their type of pollination. Diasporochoras (ecobiochoras) are groups of plants that are distinguished by the types of plant diaspora dispersal (Belgard, 1950).

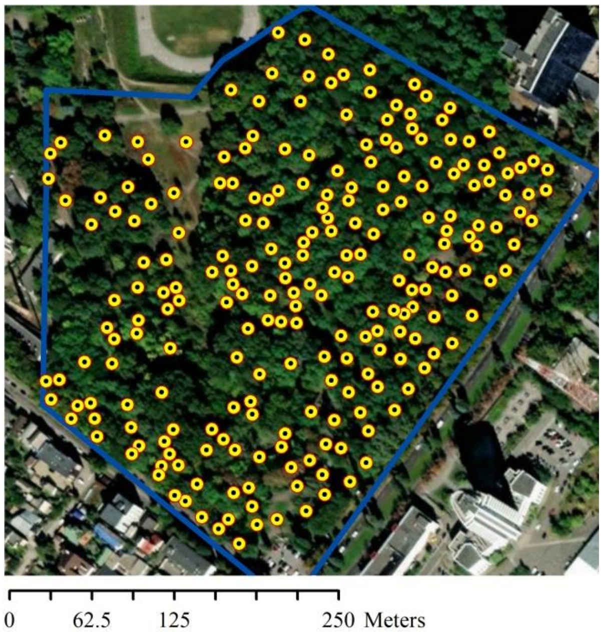

Fig. 1. The location of the registration points within the Students' Park: the black dots indicate the registration points; the yellow circles around the points have a radius of 5 metres within which the tree plant counts were made; the blue line indicates the boundaries of the park

Results

The study of the park yielded a total of 380 specimens of tree plants, representing 30 species from 15 families (Table 1). The Salicaceae family was the most numerous, with eight species represented. The Aceraceae and Malvaceae families were represented by three species each. Four families, namely Oleaceae, Fabaceae, Rosaceae and Ulmaceae, were represented by two species each. The families Adoxaceae, Betulaceae, Cannabaceae, Juglandaceae, Fagaceae, Moraceae, Sapindaceae, and Simarubaceae were represented by a single species each. The dominant species of the park were *Robinia pseudoacacia* (93 specimens, 24.5%), *Acer platanoides* (59 specimens, 15.5%) and *Acer negundo* (47 specimens, 12.4%), *Gleditsia triacanthos* (23 specimens, 6.1%), *Aesculus hippocastanum* (20 specimens, 5.3%), *Ulmus laevis* (18 specimens, 4.7%), *Fraxinus pennsylvanica* (16 specimens, 4.2%), *Populus deltoides* (14 specimens, 3.7%), *Morus alba* (11 specimens, 2.9%) were quite numerous. Six species were represented by 6–10 plant specimens, 9 species had between 2 to 5 individuals, and 6 species were represented by only one plant (*Fraxinus excelsior*, *Populus nigra*, *Populus* x *sanadensis*, *Salix alba*, *Tilia* x *europaea*, *Tilia amurensis*). With regard to these species, it can be concluded that they are at risk of extinction in the near future.

It is to be expected that the stand is represented mainly by phanerophytes (Fig. 2). In the tree stand, mesotrophs (59.3%) were the most prevalent trophomorphs, with a slightly lower number of megatrophes (33.3%) and oligorophes (7.4%).

Table 1
The species and quantitative composition of the dendroflora of the Students' Park

Family	Species	Primary geographic range	The number of individuals	Proportion of the total number of tree plants, %
Aceraceae	*Acer negundo* L.	North America	47	12.4
	Acer platanoides L.	Europe	59	15.5
	Acer pseudoplatanus L.	Europe	10	2.6
Sapindaceae	*Aesculus hippocastanum* L.	Greece	20	5.3
Simarubaceae	*Ailanthus altissima* (Mill.) Swingle	China	8	2.1
Betulaceae	*Betula pendula* Roth	Europe. Western Siberia	7	1.8
Cannabaceae	*Celtis occidentalis* L.	North America	4	1.1
Oleaceae	*Fraxinus excelsior* L.	Europe. Caucasus	1	0.3
	Fraxinus pennsylvanica Marshall	North America	16	4.2
Fabaceae	*Gleditsia triacanthos* L.	North America	23	6.1
	Robinia pseudoacacia L.	North America	93	24.5
Juglandaceae	*Juglans regia* L.	Central and South Asia	4	1.1
Rosaceae	*Malus baccata* (L.) Borkh.	Caucasus	2	0.5
	Pyrus communis L.	Europe. Middle East	2	0.5
Moraceae	*Morus alba* L.	Central Europe. The Mediterranean	11	2.9
Salicaceae	*Populus alba* L.	Europe. Central Asia	3	0.8
	Populus deltoids Marshall	North America	14	3.7
	Populus nigra L.	Europe. Central Asia	1	0.3
	Populus nigra var. italica Du Roi	The Himalayas. Western Asia	2	0.5
	Populus simonii Carrière	North America	6	1.6
	Populus x *canadensis* Moench	North America	1	0.3
	Salix alba L.	Europe	1	0.3
	Salix cinerea L.	Europe. Central Asia	2	0.5
Fagaceae	*Quercus robur* L.	Central and Eastern Europe	9	2.4
Adoxaceae	*Sambucus nigra* L.	Europe. The Mediterranean	4	1.1
Malvaceae	*Tilia amurensis* Rupr.	Asia	1	0.3
	Tilia platyphyllos Scop.	Europe	6	1.6
	Tilia x europaea L.	Europe. Western Siberia	1	0.3
Ulmaceae	*Ulmus laevis* Pall.	Europe. Western Siberia	18	4.7
	Ulmus minor Mill.	Europe. The Mediterranean	4	1.1

The ecomorphic structure, based on the number of individuals, indicated a notable prevalence of megatrophes (55.2%), a relatively high proportion of megatrophes (41.9%), and a notable decline in the proportion of oligotrophes (3.0%, Fig. 3). Among the hygromorphes, the mesophytes were the most prevalent in the stand (48.1%), with a slightly lower proportion of mesoxerophytes (33.3%) and xeromesophytes (18.5%). The hygromorphic structure, when considered in relation to the number of individuals, indicated that mesoxerophytes are the most prevalent (45.3%), with a notable proportion of mesophytes (38.6%) and a notable decrease in the proportion of xeromesophytes. Among the heliomorphes, the scioheliophytes (shade-tolerant species) were the most prevalent (59.3%), with slightly fewer heliosciophytes (22.2%), and heliophytes (18.5%). The heliomorphic structure, when considered in relation to the number of individuals, indicates a notable prevalence of scioheliophytes (53.4%) and heliophytes (38.6%), accompanied by a decline in the proportion of heliosciophytes (8%). Among the coenomorphs, the sylvanites were the most prevalent (81.5%). The number of ruderals was significantly lower (14.8%), as was that of pratants, meadow species (3.7%). With regard to the number of individuals, there was a notable increase in the proportion of ruderals in the community, representing 46.3% of the total. Among the thermomorphs, megatherms were the most prevalent (63.0%). When the number of individuals is taken into account, there is an indication of an increase in the proportion of mesotherms (72.9%). In the case of pollenophores, entomophiles were the most prevalent (63.0%). When the number of individuals is taken into account, the proportion of this ecomorph is even higher (84.1%). Among the diasporochores, the anemochorous plants were the most prevalent (63.0%). When the number of individuals is taken into account, a significant increase in the proportion of ballistae is indicated.

Discussion

The tree cover of the park planting is represented by a high diversity of plant species, characterised by different ecological adaptations to the habitat conditions. Ecological diversity is the basis for the development of community resilience to changing habitat conditions, both in the local context and in the context of global climate change (Cochrane & Cafer, 2018). *Robinia pseudoacacia* is the most typical representative of the park stand. There were 93 records of this species, which is 24.5% of the total number of records. This species is a phanerophyte, oligotrophic-megatrophic plant capable of inhabiting saline soils and tolerating prolonged drought or excessive humidity (Burda & Koniakin, 2019). The tree requires moderate ambient temperatures and is light-demanding (Faly & Brygadyrenko, 2018). The species is entomophilous. It is an adventive species, originally from North America (Kunakh et al., 2024). *Gleditsia triacanthos* is also a member of the Fabaceae family. The species is native to North America. This tree is moderately selective for soil nutrients, tolerates prolonged drought and excessive moisture, requires moderate ambient temperatures, and is light loving, entomophilous and anemochorous. There were 23 records, representing 6.1% of the total number of records.

Trees of the genus *Acer* accounted for 30.5% of the total number of individuals recorded. Two species of this genus - *A. platanoides* and *A. pseudoplatanus* - are native, and *A. negundo* is invasive. *Acer platanoides* is a pheromophyte, a megatroph. This species can tolerate excessive humidity, requires moderate ambient temperatures; it is shade-loving, entomophilous, anemochorous and immoral. A total of 59 trees were recorded, representing 15.5% of the total number of trees recorded. *Acer pseudoplatanus* is also a megatrophic species that can tolerate excessive humidity and high ambient temperatures. This species is shade-tolerant. There were 10 trees of this species recorded, which is 2.6% of the total number of records. *Acer negundo* is an adventitious species originating from North America, introduced to Ukraine in 1809 in the Karazin's Osnoviansk Acclimatisation Garden (Ishchuk et al., 2021). The tree is moderately selective for soil nutrients, tolerates prolonged drought, requires moderate ambient temperatures, is shade-tolerant and is an entomophile. A total of 47 trees were recorded, representing 12.4% of the total number of records.

There were few records of *B. pendula*. This species is an oligotroph that can tolerate excessive humidity and high ambient temperatures. It is quite light-requiring. The species is native to Europe and Western Siberia. The genus *Fraxinus* was represented by two species. The species *F. excelsior* is a representative of the natural flora of the region, and *F. pennsylvanica* is an adventitious species originating from North America. The adventitious species *F. pennsylvanica* is much more resistant to urban conditions, so it was found much more often than the native species *F. excelsior*. The latter species is most likely a remnant of the natural oak forest that used to exist on the site of the park. *Pyrus communis*, *U. laevis*, *U. minor* and *Q. robur* are also associated with the pockets of natural vegetation that remain in the park. These are typical representatives of steppe forests. Notably, some individuals of these species predate the park's establishment. This finding confirms the hypothesis that there are remnants of natural oak forests within the park.

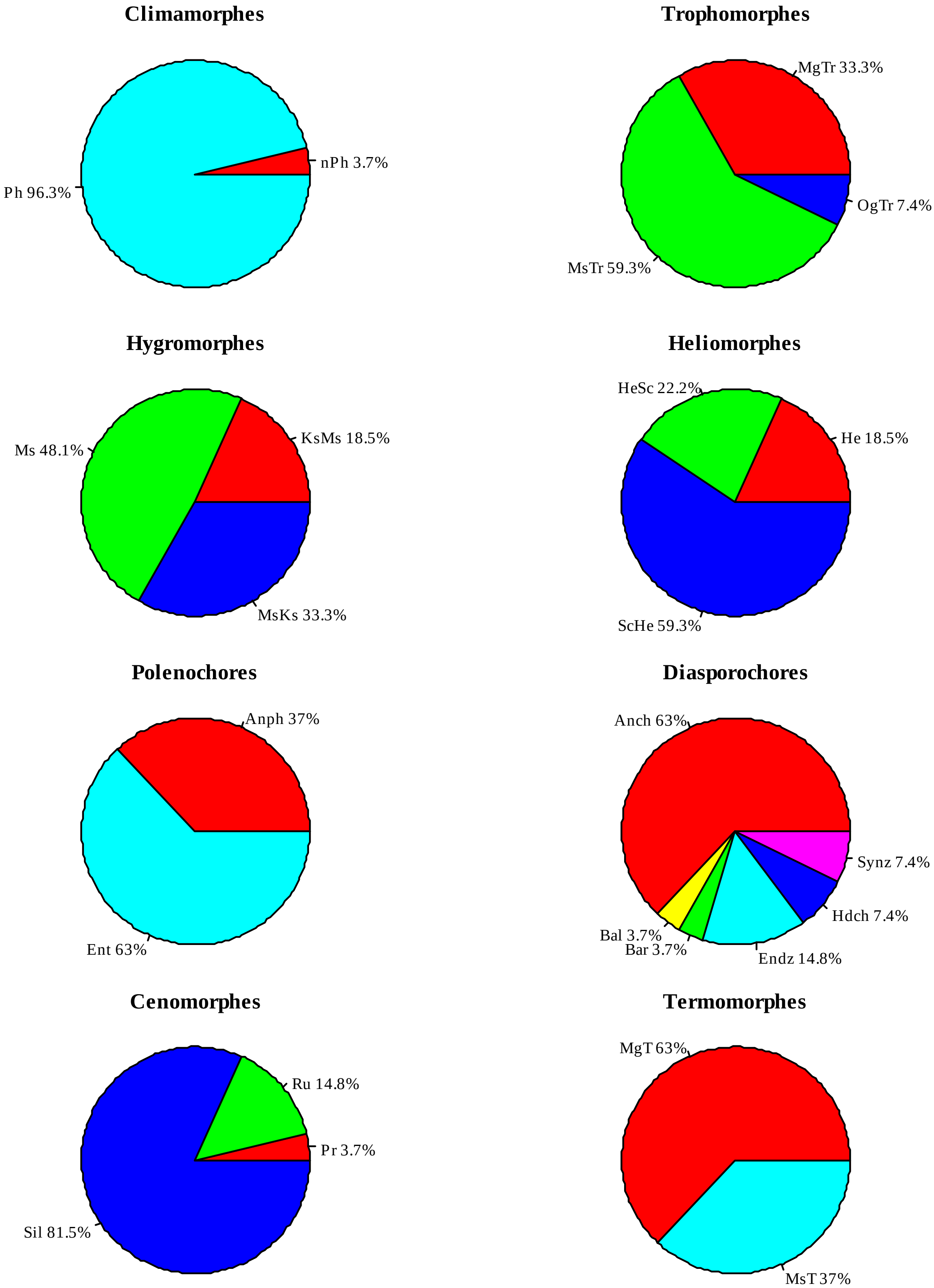

Fig. 2. Ecomorphic structure of the tree stands by the number of species: climamorphes: Ph is phanerophyte, nPh is nanophanerophyte; trophomorphes: OgTr is oligotrophe, MsTr is mesotrophe, MgTr is megatrophe; hygromorphes: MsKs is mesoxerophyte, KsMs is xeromesophyte, Ms is mesophyte; heliomorphes: He is heliophyte, ScHe is scioheliophyte, HeSc is heliosciophyte; polenochores: Anch is anemochorus (the spread of seeds, fruits and plant spores by air), Bar is barochory (shedding of fruits and seeds only under the influence of gravity), Bal is ballistae (diaspores are scattered by elastic stalks when exposed to shocks), EpZ is epizoochor (transport on the skin or fur of animals, diaspores are tenacious), EndZ is endozoic (transfer of seeds by animals after eating and defecation), SynZ is synzoohor (dispersal of plant fruits by animals as they consume them); Polenochores: Ent is entomophilous plant (pollination by insects), Anph is anemophilous plants (wind pollination)

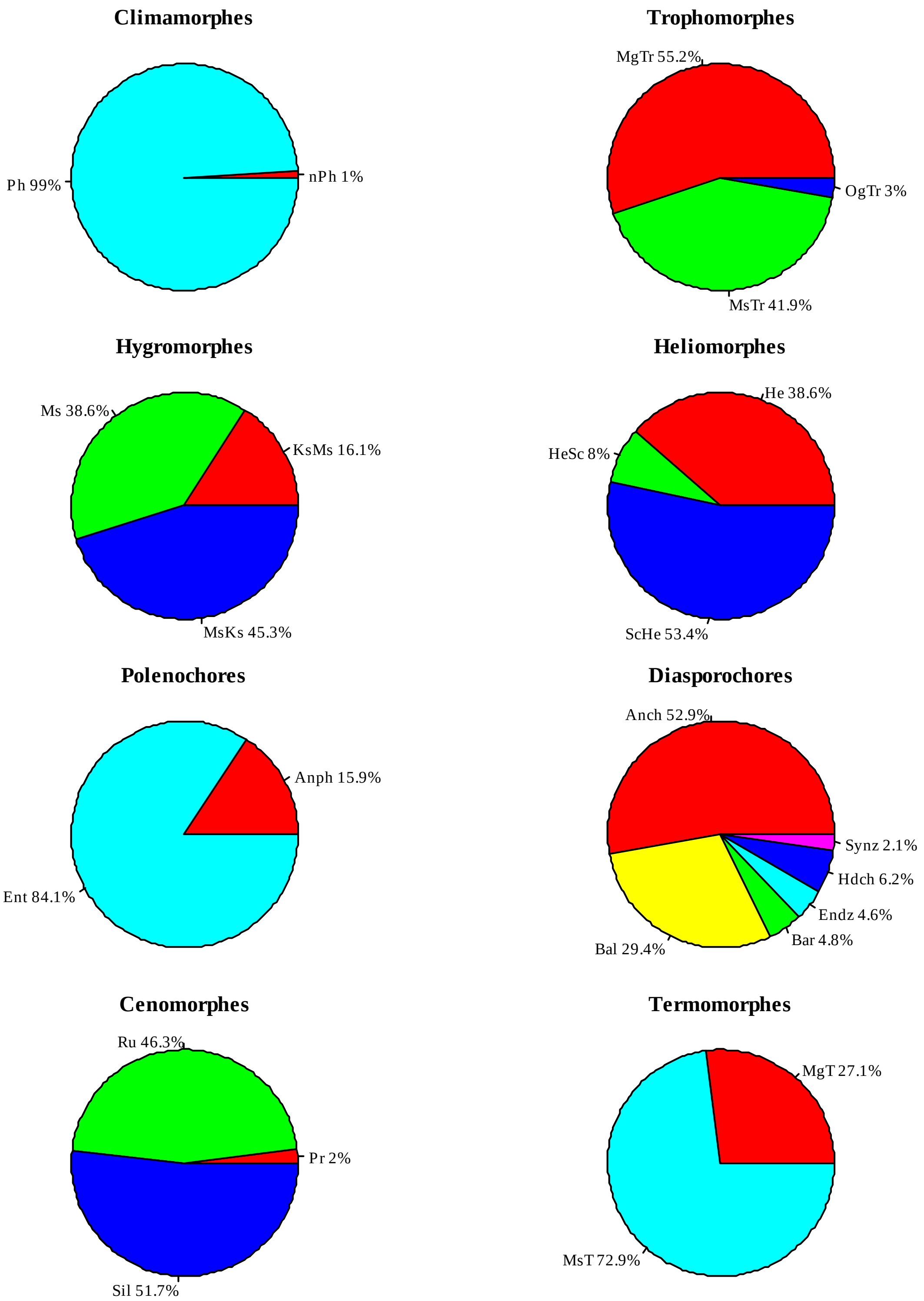

Fig. 3. Ecomorphic structure of tree stands by the number of individuals: climamorphes: Ph is phanerophyte, nPh is nanophanerophyte; trophomorphes: OgTr is oligotrophe, MsTr is mesotrophe, MgTr is megatrophe; hygromorphes: MsKs is mesoxerophyte, KsMs is xeromesophyte, Ms is mesophyte; heliomorphes: He is heliophyte, ScHe is scioheliophyte, HeSc is heliosciophyte; Polenochores: Anch is anemochorus (the spread of seeds, fruits and plant spores by air), Bar is barochory (shedding of fruits and seeds only under the influence of gravity), Bal is ballistae (diaspores are scattered by elastic stalks when exposed to shocks), EpZ is epizoochor (transport on the skin or fur of animals, diaspores are tenacious), EndZ is endozoic (transfer of seeds by animals after eating and defecation), SynZ is synzoohor (dispersal of plant fruits by animals as they consume them); Polenochores: Ent is entomophilous plant (pollination by insects), Anph is anemophilous plants (wind pollination)

The genus *Populus* is represented in the park by considerable diversity, including both native species and ornamental plants. Two species represent the natural fraction of the flora (*P. alba*, *P. nigra*). These species, as well as species of the *Salix* genus, are concentrated in the thalweg of the gully located within the park. The communities comprising these species should be attributed to the remnants of hydrophilic communities of the natural vegetation cover. Other adventitious species and ornamental plants were planted in the park, making them most commonly found in areas with heavy recreational use. The trees of the genus *Tilia* (*T. europaea*, *T. amurensis*, *T. platyphyllos*) were found in the park only once. The representatives of this genus have a significant decorative and habitat-transforming potential, and therefore, the park management should review the strategy in the field of tree species and consider the possibilities to increase the representation of *Tilia* trees in the park. *Aesculus hippocastanum* was relatively common in the park. The species is native to Greece. We recorded 20 trees, which is 5.3% of the total number of records. *Celtis occidentalis* was a single occurrence. This species is moderately demanding on soil nutrient content and is able to tolerate excessive humidity and high ambient temperatures. *Celtis occidentalis* is a shade-tolerant species native to North America. An aggressive invasive species is *A. altissima*, which originates from China. This species is very ecologically plastic and shows a significant potential for spontaneous spread.

The ecomorphic analysis reveals the ecological characteristics of ecosystems. Ecomorphic spectra by number of species and number of individuals have their own specific interpretation. A comparison of the two ways of presenting the ecomorphic structure reveals a dynamic aspect in the formation of a stand. The ecomorphic spectrum by the number of species indicates the characteristics of a potential ecological niche, while the ecomorphic spectrum by the number of individuals indicates the characteristics of a realised ecological niche. Thus, a comparative analysis of the two methods of presenting the ecomorphic structure indicated that megatrophes have much better living conditions in the park than representatives of other tree trophic groups. This finding indicates the high soil fertility in the park and that species that are quite demanding on the level of soil fertility can be used to form the assortment of trees in the park. Among the gigromorphes, conditions are more favourable for more drought-resistant tree species than for mesophytes. It should be noted that mesophytes are the most typical representatives of the forest formation. The steppe forests and their derivative planted forest and park plantings are characterised by moisture deficit. The results of the ecomorphic analysis confirm this statement. It is obvious that the resistance of tree species to moisture deficit is an important criterion for the formation of the range of tree species in a park within the steppe zone.

The light-loving species demonstrate a predominance over shade-tolerant species within the studied park. This result draws attention to the shortcomings in the formation of the tree assortment and the further trajectory of the park cultivation. The lighted structure of the park is appropriate in some locations, but should be combined with areas that are shaded and heavily shaded. Obviously, the issue of the optimal light structure of a park planting requires further study to create the most effective practical recommendations. The problem of the light regime is certainly closely related to the phenomenon of increasing the proportion of ruderal species in the structure of the park stand. The ruderal plants demonstrate the ability to grow rapidly. The potential for growth of ruderal species is very well revealed under conditions of high soil fertility. The trophomorphic analysis showed that the soils in the park are able to meet the needs of megatrophic tree species. The rapid growth of ruderal species may have some benefits in the early stages of the park's existence, as they can quickly create a favourable forest environment. However, in the future management of the park landscape, attention should be paid to the need to replace ruderal trees with representatives of the native flora, which are more aesthetically pleasing and capable of having a longer and more powerful impact on the microclimatic conditions in the park.

It should be noted that the implemented niche is primarily filled with entomophilous tree species. This aspect underlines the importance of park planting as a centre of biodiversity. Urban parks should also be considered as refugia for the dissemination of various faunal complexes to other areas of the city. In the context of the park as a space for recreation, insects should also be considered as an aesthetic factor.

Conclusion

The dendroflora of the recreational area of the Botanical Garden of the Oles Honchar Dnipro National University is represented by 30 species of trees belonging to 15 families. The highest number of species was observed for the family Salicaceae (8 species). The families Adoxaceae, Fagaceae, Moraceae, Juglandaceae, Betulaceae, Simaroubaceae, and Sapindaceae are each represented by one species. The dominant species in the park are *Robinia pseudoacacia*, *Acer platanoides* and *Acer negundo*. The ecomorphic analysis allows us to determine the ecological characteristics of the park's tree stand. It indicated a high level of soil fertility, which creates favourable conditions for megatrophs. The moisture regime in the park is more favourable for more drought-resistant tree species than for mesophytes. The light-loving species demonstrated a predominance over shade-tolerant species within the studied park. The predominance of ruderal species in the park's stand is an alarming signal that suggests the need to optimise the park's management system. The park planting performs an important function in maintaining the biological diversity of animal communities, as evidenced by the high proportion of entomophilous species in the stand. The resistance of tree species to moisture deficit is an important criterion for the formation of the range of tree species in a park within the steppe zone.

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