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THE USE OF THE EUNIS CLASSIFICATION APPROACHES TO EVALUATION OF A PORT OLVIA (MYKOLAIV CITY) TECHNOTOPE

Alokhina T.M.

c.b.s., Senior Researcher,

ORCID: <https://orcid.org/0000-0001-8501-7212>

Kryvyi Rih State Pedagogical University,

Kryvyi Rih, Gagarin Ave. 54, 50086

Abstract. *The article arrange for the pre-war characteristics of microphytocenoses in the Southern outskirts of the Mykolaiv city. In assessing the territory adjacent to the Olvia port, classification approaches of the EUNIS were used. The EUNIS habitat classification (European Nature Information System) has designed to create a standardized pan-European reference set of natural and semi-natural habitat, with a shared description of all those units through a common hierarchical classification. The study results revealed the presence of 10 distinct habitat types. A significant percentage of the surveyed area is under the influence of strong anthropogenic factors, thus these areas are classified as modified habitats.*

In general, the plants found in the studied area belong to four Phyla: Magnoliophyta, Pinophyta, Polypodiophyta, and Equisetophyta. These plants encompass 76 genera from 24 families. The most abundant genera and species are represented by the family Compositae (18 genera) and Poaceae (11 genera). Notably, among the identified species endemics and species listed in the Red List were.

Key words: *EUNIS habitat classification, port Olvia technotope, plant biodiversity.*

Introduction.

As a strategic direction of development, Ukraine has chosen integration into the European economic and political-legal space. A key foreign policy priority and strategic goal of Ukraine at the highest state level is accession to the European Union. Such aspiration determines the implementations of European norms in various sectors of the Ukrainian economy.

The project «Q Terminals Olvia Port (Ukraine) – Environmental and Social impact assessment» was carried out in 2021 accordance with the requirements of the EBRD and Ukrainian legislation. The project has been aimed at the renewal and modernization of existing port facilities and development of a new grain terminal. As part of the project preparation, the environmental and social conditions have been assessed to indicate the order of remediation magnitude.

Considering the huge importance of rivers in the economy and life of population, the analysis of projects [1] that can impact to development of river ecosystems are important for the prognosis of their condition and recommendations design for the rational use of water and coastal resources. The classification of ecosystems allows to assess the degree of natural groups transformation, it is important during environmental monitoring, expertise, environmental planning.

The EUNIS classifies terrestrial habitats on phytosociological vegetation types, based on species composition and vegetation structure. Moreover, the EUNIS emphasizes the abiotic environment and geographic location as classification criteria and includes habitats in which plants are nearly or entirely absent. The EUNIS typology extends to the entire European continent and adjacent seas [2, 3], although still some



gaps are especially in Eastern Europe.

The key **goal** of the presented research was to characterize the pre-war state of the habitats surrounding the port Olvia territory with using the EUNIS classification approaches.

In order to achieve the over goal, expeditionary research of the surrounding the port Olvia territory, laboratory and desktop processing of the results were carried out. The obtained indicators features have characterized in the context of anthropogenic activity and possible ways of mitigating environmental problems are considered. The resumption of active economic activity in the ports of the Mykolaiv city there is no doubt after the finishing of martial law conditions. Therefore, the data presented in this article can serve as a valuable resource for making comparative assessments of the state of the researched territory both before and after the period of the armed aggression.

Materials and methods.

The research plots was the Southern outskirts of Mykolaiv city in the Southern Bug River mouth area, which is part of the Dnieper-Bug estuary (Figure 1).



Figure 1. Location of researched area (the territory of the undeveloped part of the Northern Spit and the territory surrounding of the port Olvia)

(Authoring Alokina T.)

The study of habitats had conducted on the territory of the undeveloped part of the Northern Spit and the territory surrounding of the port Olvia in order to assess its condition, included several stages. The first stage was familiarizing with the natural conditions of the area of work and all available published materials. The field stage included route investigation with a description of plant communities and landscapes in general, characteristic of the state of terrestrial ecosystems, sources and signs of anthropogenic impact.

Results.

Identification of the species composition of biocenoses is the basis of an information block inventory, which is a part of a comprehensive system environmental monitoring and is the starting point for assessing of the anthropogenic influences to the given territory.



The results of field research, as well as a preliminary analysis of the literature showed that the flora of vascular plants very various. The dominant communities of vascular plants are represented by next families: *Compositae*; *Poaceae*; *Brassicaceae*; *Fabaceae*; *Cyperaceae*; *Salicaceae*. The largest number of species are represented by the genera: *Artemisia*, *Salix*, *Poa*, *Populus*.

The Eastern and Southeastern parts of the territory adjacent to the port's area are located on the terraces of the Southern Bug, where historically grassy groups of sandy steppes with characteristic endemic species of cornflowers (*Centaurea margaritacea* Ten., *Centaurea protomargaritacea* Ten. subsp.(Klokov) Dostal) were. Now in these territories plantations of Scots pine (*Pinus sylvestris* L.) and Crimean pine (*Pinus nigra* ssp. *pallasiana*), belonging to the forest reserve of local value "Balabanovka", are created. In some places on meadows a natural flora remains, namely the habitat of cornflower (*Centaurea margaritacea* Ten.) (Figure. 2).



Figure 2. Endemic specie of cornflower *Centaurea margaritacea* near the fence rounding of port Olvia territory. (Authoring Alokhhina T.)

Northern Spit – is a land area of 34 hectares in the northern part of the port. The plot is irregularly shaped; part of the plot borders with water. The territory of the site is partly a natural area, partly artificial backfilling area. The backfilling process of the territory had begun in the second half of the 60s and was taking place periodically until the 80s of the 20th century.

In the most of the surveyed territory, vegetation is represented by anthropoceneses and synanthropic florocomplexes. Based on above detailed research of the territory we offered the following EUNIS habitats [4] categories. The results of our study could identified 10 types of habitats. Performed at the community and species level study made it possible to distinguish the following five areas as likely natural or transitional with residual of natural vegetation. The specified habitats include: C 3.2 – Water-fringing reedbeds and tall helophytes other than canes; G 1.2 – Mixed riparian floodplain and gallery woodland; F 9.1 – Riverine shrub; G 1.111.2 – Eastern European poplar-willow forests; F 9.1282 – Ponto-Sarmatic riverine willow shrub.

C3.2 – Water-fringing reedbeds and tall helophytes other than canes. Presented phytocenosis, on the territory of the undeveloped part of the Northern Spit and the territory surrounding of the port Olvia, is typical for all coastal areas. This habitat characterizes a border of water and land by dominance of a reed (*Phragmites australis*



(Cav.) Trin. ex Steud.). In some places, reeds form monodominant thickets up to 30-40 m wide. A frequent satellite of reed *Phragmites australis* is *Calystegia sepium* (L.) R. Br., *Aristolochia clematitis* L. and *Galium aparine* L.

The difference in floristic diversity depends on the moisture of the site. A poorer plant community is represented on the spit. In some places, thickets of shrubs begin near the water, adjacent to the reeds. Among the shrubs, we can distinguish next: *Robinia pseudoacacia* L., *Sambucus nigra* L., *Ulmus campestris* L., *Elaeagnus angustifolia* L., *Rubus caesius* L. Such plant as *Crambe maritima* Bieb., non L. was identified only on the territory of the Northern Spit, it is the Red List of Ukraine specie.

G1.2 – Mixed riparian floodplain and gallery woodland. Shrubby and low woody vegetation grow on the mossy-covered soil of the central part of spit. The site has micro hilly relief with traces of anthropogenic impacts (predominantly household and industrial rubbish). The dominant shrub on this site is *Elaeagnus angustifolia* L. Preval among herbs next species: *Artemisia vulgaris* L.; *A. absinthium* L.; *A. marschalliana* Spreng.; *Helichrysum arenarium* (L.) Moench; *Centaurea arenaria* auct. p.p.; *Convolvulus arvensis* L.; *Leymus arenarius* (L.) Hochst.; *L. racemosus* (Lam.) Tzvel.; *Hordeum jubatum* (L.); *Alyssum borzaeanum* E. I. Nyarady; *Barbarea vulgaris* R.Br.; *Viola arvensis* Murr.

F 9.1 – Riverine scrub. A territory of habitat identified as Riverine shrub is characterized alternation of shrubs thickets with areas covered with grass. Several sites were assigned to this phytocenosis, the most characteristic of which is the site in the central part of the Northern Spit. The central part of the Northern Spit is a slight rise of sandy soil above the water surface. The vegetation communities of the spit are adapted to constant winds. The vegetation on the north side of the spit is poorer than on the south side. Among the shrubs, in this plant community, *Elaeagnus angustifolia* L. and *Amorpha fruticosa* L. dominate.

G 1.111.2 – Eastern European poplar-willow forests. In two places, on the Northern Spit, floodplain areas of a poplar forest with shrubs in the second storey were identified. The poplars (*Populus tremula* L., *Populus nigra* L.) grow in the first storey of this site. The shrub *Amorpha fruticosa* L. forms the second storey. On the lower storey, the grasses close tightly and form a uniform sod. Among the herbs dominates *Agropyron dasyanthum* Ledeb. and *Koeleria cristata* (L.) Pers.; different species of *Carex* and *Galium aparine* L. often meet.

F 9.1282 – Ponto-Sarmatic riverine willow scrub. A willow-dominated microphytocenosis has formed in one of the sites of the study area. Such thickets of willow are characteristic of floodplain areas Southern steppe subzone of the Black Sea-Southern steppe province. In this site, willows form dense impassable thickets with an average height of 3-4 meters. In some places, hops and grapes entwine tightly closed crowns of willow. The dominant plants of habitat are *Salix caprea* L., *Salix cinerea* L. and *Vitis vulpine* L. Along the perimeter, this microphytocenosis is surrounded by *Populus nigra* L., *Acer negundo* L., *Fraxinus excelsior* L. Herbs are represented in the lower storey: *Phragmites australis* (Cav.) Trin. ex, *Agropyron dasyanthum* Ledeb., *Bromus tectorum* L., *Carex spicata* Trev. and *C.colchica* J. Gay, *Artemisia vulgaris* L., *Barbarea vulgaris* R.Br.



E 2.7 – Unmanaged mesic grassland. Artificially altered territories of above-floodplain terraces and floodplain, which now are either not used or abandoned, are meadows with predominantly ruderal vegetation or with natural-ruderal vegetation (section on the eastern side of the port). Vegetation elements here are extremely diverse due to various microclimatic conditions, various edaphic factors with their characteristic ecological types of plants – psammophytes, halophytes, different in relation to the moisture regime – xerophytes, mesophytes, hydrophytes. In addition to the characteristic Euxinian species, there are also many steppe elements.

G3.F – Highly artificial coniferous plantations. The areas of highly artificial coniferous plantations occur in two places around the territory of port Olvia: in the depths of the Northern Spit and on the Eastern side of the port. Vegetation of this area is represented by artificial (with high probability) plantings *Pinus sylvestris* L. with inclusions *Pinus nigra ssp.pallasiana*. Trees and tall shrubs such as *Robinia pseudoacacia* L. with inclusions of a maple *Acer tataricum*, an alder *Alnus glutinosa* L. at the border of microphytocenoses from C.3.2 to G.3.F, form the second storey.

Discussion and conclusions.

The researched region, by physical-geographical zoning, belongs to the Southern steppe subzone of the Black Sea-Southern steppe province and by floristic zoning – to the South-eastern part of the Right-Bank Cereal Meadow sagebrush steppe. Weakly formed soil cover of the surveyed territory characterizes by sandy, sandy-shell and sandy-clay contain. The territory surrounding of the port Olvia and the undeveloped part of the Northern Spit is a partly natural alluvial area covered sand with shell rock. There is a high probability that the material of backfill and adding soil was the material of previous dredging works (in the Soviet times).

A natural vegetation in the researched area is almost not preserved. Single fragments of the natural vegetation has been identified outside the port area. The most common among the existing plant communities are sub-pontic herbaceous and sandy steppes, also bushes. Intrazonal vegetation is diverse: swamp-meadow, psammophytic (including coastal sands), coastal and aquatic vegetation. Meadows are widespread along the banks and floodplains of rivers, in reedbeds – floodplain willow-poplar forests and occasionally – eutrophic swamps.

A significant percentage of the surveyed area is subject to strong anthropogenic influence, so the habitat in such places can be classified as modified habitats, namely: E 2.7 – Unmanaged mesic grassland, G 3.F – Highly artificial coniferous plantations, J 6.5 – Industrial waste, J 4.5 – Hard-surfaced areas of ports and X 01 – Estuaries Modified habitats. For the three latter of habitats we do not give a vegetation description, because they absolutely technogenic transformed territories.

The area of the territory occupied by different habitats varies significantly, and smooth transitions from one habitat to another are common. The exceptions are modified habitats, where vegetation borders with extensive territories of technotope.

In total, the plants found in the studied area belong to four Phyla: *Magnoliophyta*, *Pinophyta*, *Polypodiophyta*, and *Equisetophyta*. These plants encompass 76 genera from 24 families. The most diverse families in terms of genera and species are *Compositae* (18 genera) and *Poaceae* (11 genera). It's worth noting that even in such diverse conditions, endemic and Red List species have been identified. Experts from



the Ukrainian Nature Conservation Group [5] have compiled a list of rare plant species threatened by the ongoing conflict in Ukraine, including *Centaurea margaritacea* and *Centaurea protomargaritacea*.

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