

## CAPE MIDIA - CORBU SEACOAST AREA, A POTENTIAL NEW NATURAL RESERVE

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**Abstract:** The paper's aim is to present the floristical inventory and the main habitats types of this less-known coastal area, situated in the southern proximity of Danube Delta's Biosphere Reserve. Some considerations about the high phytodiversity and rare and threatened plant species within researched area, about biological forms, phytogeographical elements and ecological categories, are also presented. We are trying in the paper to bring solid reasons in order to propose this coastal area as Natural Reserve.

**Key words:** Black Sea coast, flora, habitats, rare and threatened flora, conservation, natural reserve.

### Introduction

The explored area, known as Corbu Beach, is located southeast of Corbu village, opposite the Corbu Lake, bounded on the north side by Cape Midia and on the south side by the Midia Military Shooting Range. A former sea bay silted up successively with sand by the waves and wind actions, it belongs geomorphological to the littoral area. It's bounded on its east side by a sea-wall having a height oscillating within the 2 - 15 m range.

Located at the southern proximity of Chituc sandbank (Fig. 1), it is part of the Danube Delta's Biosphere Reserve as a buffer area, it is not under any strict protection rules. Because of this, its natural habitats and extraordinary biodiversity can be in danger as there is the intent of some people to build houses directly on the beach. We are trying to draw attention through our research on this less known coastal area which meets the attributes for being declared Natural Reserve.

The floristic studies on this area are very old and brief ones. The latest efforts in getting to know the flora and vegetation of this area belong to POPESCU V. [11], who based on some field work in summer of 1950 inventoried 53 species of the coastal and sea-wall areas and described three plant associations. The number of species he established is however much bigger in this area. The floristic data of this coastal area have been completed subsequent by Făgăraș M. [5, 6].

### Material and Methods

Our research has been developed only on the seacoast area, the sea-wall and its neighbouring areas being the object of another study. Field research has been done during the entire vegetation season in order to capture all the

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phenology stages. The length of the researched area is of about 1500 m and its width is within 10 – 500 m range.

The plant taxa nomenclature follows the *Flora Europaea* [14, 15] or *Flora ilustrată a României (Pteridophyta et Spermatophyta)* [1].

For the representative coastal habitat types identified in the studied area, we mentioned the NATURA 2000 code and the Palearctic Habitats classification code [3, 4, 16].

**Fig. 1 – The geographic position of Corbu beach, between Cape Midia and Chituc sandbank**

### Results and discussions

Floristic research in Midia-Corbu Cape has led to identification of 173 vascular taxa, from which 159 species and 14 subspecies. This means an addition of 120 taxa to the ones Popescu V. [11] mentioned 50 years ago.

The following plants taxa have been identified in the researched area (the rare and threatened taxa are highlighted): *Achillea setacea* Waldst. et Kit., ***Aeluropus littoralis* (Gouan) Parl.**, ***Agrostis gigantea* Roth ssp. *maeotica* (Klokov) Tzvelev** [*Agrostis pontica* (Grec.) Dihoru], *Agrostis stolonifera* L., *Althaea officinalis* L., *Alyssum desertorum* Stapf., ***Alyssum hirsutum* Bieb.**, *Amaranthus albus* L., *Amaranthus retroflexus* L., *Anagallis arvensis* L., *Anthemis ruthenica* Bieb., *Apera spica-venti* (L.) Beauv. ssp. *maritima* (Klokov) Tzvelev, ***Argusia sibirica* (L.) Dandy**, *Artemisia austriaca* Jacq., *Artemisia pontica* L., *Artemisia santonica* L. ssp. *santonica* K.Persson, ***Artemisia tschernieviana* Besser** (*A. arenaria* DC.), *Asperula cynanchica* L., ***Asperula setulosa* Boiss.**, *Aster tripolium* L. ssp. *pannonicus* (Jacq.) Soó, ***Astragalus varius* Gmel.** (*A. virgatus* Pallas), ***Astrodaucus littoralis* (Bieb.) Drude**, *Atriplex oblongifolia* Waldst. et Kit., *Atriplex prostrata* Boucher ex DC. (*A. hastata* auct.), *Avena fatua* L., ***Bassia hirsuta* (L.) Ascherson**, ***Bassia laniflora* (Gmel.) Scott** [*Kochia laniflora* (Gmel.) Borbas], *Bassia prostrata* (L.) Beck [*Kochia prostrata* (L.) Schrad.], *Bolboschoenus maritimus* (L.) Palla (*Scirpus maritimus* L.), *Bromus hordeaceus* L. (*Bromus mollis* L.), *Bromus squarrosus* L., *Bromus sterilis* L., *Bromus tectorum* L., ***Cakile maritima* Scop. ssp. *euxina* (Pobed.) Nyar.** (Foto 1), *Calamagrostis epigeios* (L.) Roth., *Calystegia sepium* (L.) R.Br., *Carduus acanthoides* L., *Carduus thoermeri* Weinm. (*C. leiophyllus* Petrovic), *Carex colchica* Gay, *Carex distans* L., ***Carex extensa* Good.**, ***Centaurea arenaria* Bieb. ssp. *borysthena* (Gruner) Dostal**, *Centaurea diffusa* Lam., *Centaurea solstitialis* L., ***Centaurium erythraea* Rafin ssp. *turcicum* (Velen) Melderis**, *Centaurium pulchellum* (Swartz) Druce, ***Centaurium spicatum* (L.) Fritsch**, *Cerastium glomeratum* Thuill., *Cerastium semidecandrum* L., ***Chamaesyce peplis* (L.) Prokh.** (*Euphorbia peplis* L.), *Chenopodium album* L., *Chenopodium rubrum* L., *Chondrilla juncea* L., *Cichorium intybus* L., *Consolida regalis* S.F. Gray, *Convolvulus arvensis* L., *Conyza canadensis* (L.) Cronq. (*Erigeron canadensis* L.), ***Corispermum nitidum* Kit. in Schultes**, ***Crambe maritima* L.**, *Crepis foetida* L. ssp. *rhoeadifolia* (Bieb.) Celak., *Cuscuta planifolia* Ten., *Cynanchum acutum* L., *Cynodon dactylon* (L.) Pers., *Daucus carota* L. ssp. *carota*, ***Dianthus bessarabicus* (Kleopow) Klokov** [*D. polymorphus* Bieb., *D. diutinus* Prod. non. Kit.], *Dichanthium ischaemum* (L.) Roberty [*Botriochloa ischaemum* (L.) Keng.], *Diplotaxis muralis* (L.) DC., *Echinochloa crus-galli* (L.) Beauv., *Elaeagnus angustifolia* L., *Elymus elongatus* (Host) Runemark [*Agropyron elongatum* (Host) Beauv.], ***Elymus farctus* (Viv.) Runem. ex Meld. ssp. *bessarabicus* (Săvul. et Rayss.) Meld.** [*Elytrigia bessarabica* (Săvul et Rayss.) Prokud.], *Elymus hispidus* (Opiz) Melderis ssp. *hispidus* [*Agropyron intermedium* (Host) Beauv.], *Elymus repens* (L.) Gould [*Agropyron repens* (L.)

Beauv.], *Equisetum ramosissimum* Desf., *Erodium ciconium* (L.) L'Herit., *Erodium cicutarium* (L.) L'Herit., *Erophyla verna* (L.) Chevall. (*Draba verna* L.), *Eryngium campestre* L., ***Eryngium maritimum* L.**, *Erysimum diffusum* Ehrh., *Euphorbia agraria* Bieb., *Euphorbia helioscopia* L., *Euphorbia seguieriana* Necker (*E. gerardiana* Jacq.), *Festuca arundinacea* Schreber, *Festuca valesiaca* Schleicher ex Gaudin, *Galium humifusum* Bieb. [*Asperula humifusa* (Bieb.) Besser], ***Glaucium flavum* Crantz** (Foto 2), *Gypsophila muralis* L., ***Gypsophyla perfoliata* L.** (*G. trichotoma* Wend.), *Helianthus annuus* L., *Heliotropium europeum* L., *Holosteum umbellatum* L., *Hordeum geniculatum* All. [*H. histrix* Roth; *H. maritimum* Stokes ssp. *gussoneanum* (Parl.) Asch. et Graeb.], *Inula germanica* L., *Juncus gerardi* Loisel., *Juncus littoralis* C.A. Meyer (*J. tommasinii* Parl.), *Juncus maritimus* Lam., *Kohlruschia prolifera* (L.) Kunth [*Tunica prolifera* (L.) Scop.], *Lactuca tatarica* (L.) C.A. Meyer, *Lamium amplexicaule* L., *Lappula squarrosa* (Retz.) Dumort (*L. echinata* Gilib.), ***Leymus sabulosus* (Bieb.) Tzvelev.** [*Elymus sabulosus* Bieb., *E. arenarius* Lam.], ***Limonium meyeri* (Boiss)**, *Linaria genistifolia* (L.) Miller, *Linum austriacum* L., *Lotus corniculatus* L., *Lycopus europaeus* L., *Lythrum virgatum* L., *Marrubium peregrinum* L., *Matricaria perforata* Mérat (*M. inodora* L. nom. illegit.), *Matricaria recutita* L., *Medicago falcata* L., *Medicago lupulina* L., *Medicago minima* L., *Melilotus albus* Medik., ***Melilotus arenarius* Grec.**, *Melilotus officinalis* Lam., ***Merendera sobolifera* C.A Meyer**, *Odontites vernus* (Bellardi) Dumort. ssp. *serotinus* (Dumort.) Corb., *Onopordum acanthium* L., ***Onosma arenaria* Waldst. et Kit.**, ***Orchis laxiflora* Lam. ssp. elegans (Heuffel) Soó**, *Papaver rhoeas* L., *Phragmites australis* (Cav.) Steudel, *Picris hieracioides* L., ***Plantago cornuti* Gouan**, *Plantago major* L., *Plantago maritima* L., *Plantago media* L., *Plantago scabra* Moench (*P. indica* L.; *P. arenaria* Waldst. et Kit.), *Polygonum arenarium* Waldst. et Kit., ***Polygonum maritimum* L.**, ***Polygonum mesembrium* Chrték (*P. rayi* auct.)**, *Puccinellia distans* (L.) Parl., *Pulicaria dysenterica* (L.) Bernh., *Reseda lutea* L., *Salsola kali* ssp. *tragus* (L.) Nyman., ***Samolus valerandi* L.**, *Scabiosa argentea* L. (*S. ucranica* L.), *Schoenoplectus lacustris* (L.) Palla [*Scirpus lacustris* L.], *Schoenoplectus tabernaemontani* (Gmel.) Palla, *Schoenus nigricans* L., *Scirpoides holoschoenus* (L.) Sojak (*Scirpus holoschoenus* L., *Holoschoenus vulgaris* Link.), *Sclerochloa dura* (L.) Beauv., ***Secale sylvestre* Host**, ***Senecio borystenicus* (DC.) Stankov**, *Senecio vernalis* Waldst. et Kit., *Setaria pumila* (Poiret) Schultes [*S. glauca* (L.) Beauv.], ***Silene borysthenica* (Gruner) Walters**, *Silene conica* L., ***Silene exaltata* Friv.**, *Sisymbrium orientale* L., *Solanum nigrum* L., *Sonchus arvensis* L., ***Stachys maritima* Gouan**, ***Syrenia cana* (Pill. et Mitterp.) Neilr.**, ***Syrenia montana* (Pallas) Klokov**, *Tamarix tetrandra* Pallas ex Bieb., *Teucrium polium* L., *Teucrium scordium* L. ssp. *scordioides* (Schreber) Arcangeli, *Torilis arvensis* (Hudson) Link, *Tragopogon pratensis* L. ssp. *orientalis* (L.) Celak. (*Tragopogon orientalis* L.), *Trifolium campestre* Schreber, *Trifolium fragiferum* L., *Trifolium repens* L., *Valerianella locusta* (L.) Laterrade, *Verbascum banaticum* Rochel,

*Verbascum blattaria* L., *Vicia angustifolia* L., *Xanthium italicum* Moretti, *Xanthium spinosum* L., *Xanthium strumarium* L., *Xeranthemum annuum* L.

The bioforms' spectrum (Fig. 2) indicates the large presence of terophytes (51,44%), followed by hemicryptophytes (34,68%) and some less present categories (geophytes, camephytes, hydro-helophytes, fanerophytes). The large number of terophytes shows that there is a discontinuous vegetable carpet, especially in the area of dune habitats, with lots of empty spots covered by annual and biannual plants. Hemicryptophytes, which hold about 1/3 of the total bioforms, are those that establish perennial vegetable groupings and give the vegetable carpet a certain continuity and stability. Geophytes and hydrophytes (cryptophytes) are also perennial species, limited especially to the fixed dunes and to the lower areas among dunes, which are often swampy.

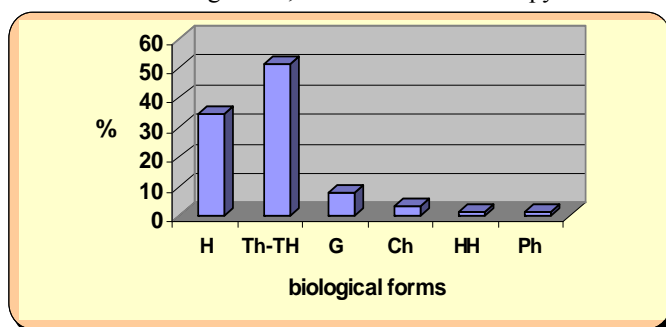


Fig. 2 – The bioform's spectrum of studied area

Among floristic elements (Fig. 3) the Euro-Asian species are predominant (43,34%), followed by the Pontic ones (21,96%), the European and Central European ones (6,35%), the cosmopolitan ones (10,40%), the Mediterranean and Atlantic-Mediterranean ones (7,51%), other phyto-geographic elements (circumpolar ones, adventive ones, Balkan ones, Asian ones) being less represented. The large number of Pontic species spotlights the specific Pontic nature of the coastal flora from the studied area, which is rich in steppe species.

The ecological spectrum (Fig. 4) of the explored area indicates there is a preponderance of the xero-mesophilic (41,76%) and xerophilous (20,00%) species which are spread especially on the sand hill areas and at the foot of the sea-wall. Mesophilous species (17,64%) and meso-hygrophilous ones (10,58%) also hold an important percentage, mostly covering the low moist places or the boggy ones behind the dunes' string. The limited number of hygrophilous (2,94%) and hydrophilic (1,76%) species indicates the absence of any permanent puddles.

Taking into consideration the factor related to temperature, the moderate-thermophilous (42,94%) and the micro-mesothermal (41,76%) species are predominant and taking into consideration the soil reaction, the predominant are the low neutro-acidophilous (43,52%) and neutro-basophilic (14,11%) species.

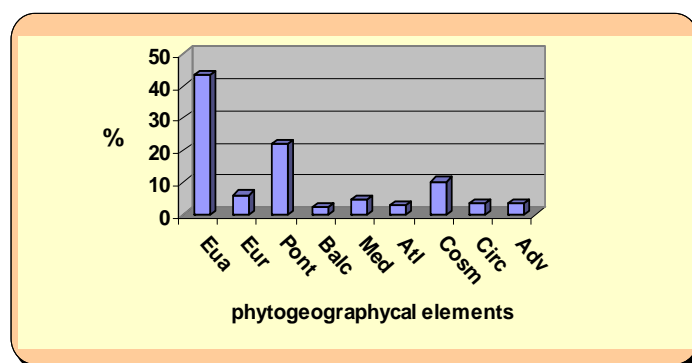


Fig. 3 – The phytogeographical elements spectrum

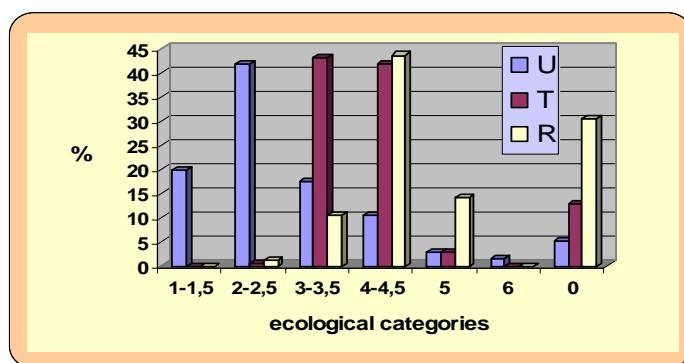


Fig. 4 – The ecological spectrum of studied area

What is noteworthy though is the large number of rare and endangered species in this area (Fig. 5).

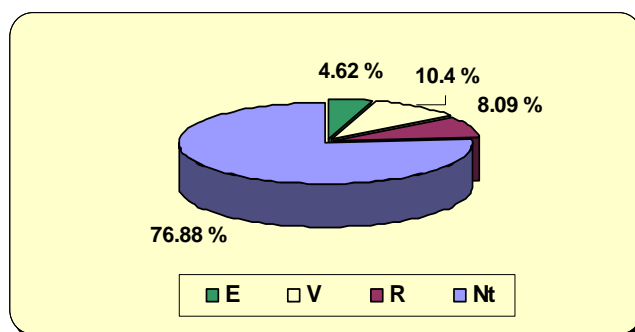


Fig. 5 – The rate of rare and threatened taxa within studied area

Among the identified taxa, 40 species and subspecies (23.12%) can be framed within one of the categories of sozology accepted by IUCN. The distribution of these taxa, according to the Romanian Red List [2, 8, 9] goes like this: *endangered* species (E) – 4,62%, *vulnerable* ones (V) – 10,40%, *rare* ones (R) – 8,09%. The rest of taxa (76,88%) are not threatened (Nt).



Foto 1 – *Cakile maritima* ssp. *euxina*

Foto 2 – *Glaucium flavum* ssp. *flavum*

The percentage representing the endangered and rare species from Cape Midia-Corbu (23.12%) is higher than the one representing the entire coastal area between Vama Veche and Periboina (20.22%) [5] and it is close enough to the one representing the Romanian Flora (27.11%) [2, 8] (Tab. 1). This emphasizes the floristic importance of the area and the necessity of preserving the coastal habitats and their specific phytodiversity.

Table 1 – The percentage of threatened taxa within researched area, compared with that from Vama Veche-Periboina seacost area and Romanian Flora

Comparative values	Cape Midia-Corbu (the present paper)	Vama Veche-Periboina sea shore area (Făgăraș, 2002)	Romanian Flora (Negrean, 2001)	Romanian Flora (Dihoru et al., 1994)
Total taxa	173	702	3795	3795
No. of rare and endangered taxa	40	142	1029	1189
Percentage of rare and endangered taxa (%)	23,12%	20,22%	27,11%	31,33%

The rich fitodiversity and heterogeneity of the vegetation are mainly determined by the variety of the habitats [6]: mobile and semi fixed dunes, mesohalophilous meadows, damp depressions, damp or swampy interdunal corridors during the rainy seasons and, last but not least, the habitats along the sea-wall.

There have been identified 14 major types of coastal habitats (Tab. 2), from which five of them are of European Community interest [16]; to preserve them they need to designate the Special Preserved Areas (SPA) [13]; among them, the salt marsh meadows with *Juncus gerardi* represent a priority type of habitat (code 1340\*), according to the Habitats Directive, Annex 1 [16]. This is another argument that supports our efforts in getting the area to be declared Natural Reserve.

Major types of habitats identified in the studied zone are the following (Tab. 2) (the habitats of European Community interest are highlighted):

**Table 2 – The main habitats types identified in the researched area**

No	Coastal habitats types	Natura 2000 code	Palaearctic habitats code	Specific plant communities
1.	<b>Western Pontic sand beach annual plant communities</b>	1210	16.1232	<i>Atripliceto hastatae-Cakiletum euxinae</i> Popescu & Sanda 1999
2.	<b>Western Pontic embryonic shifting dunes</b>	2110	16.2124	<i>Agropyretum juncei</i> (Br.-Bl. & De L. 1936) Tx. 1937 <i>Artemisietum arenariae</i> Popescu & Sanda 1977 <i>Elymetum gigantei</i> Morariu 1957
3.	Western Pontic sand beach annual communities	-	16. 1232	<i>Secali sylvestris-Brometum tectorum</i> Hargitai 1940 <i>Aperetum maritimae</i> Popescu & al., 1978
4.	Western Pontic fixed dunes	-	16.22 B1	<i>Scabioso argenteae-Caricetum colchicae</i> (Simon 1960) Krausch 1965
5.	North-western Pontic fixed dunes	-	16.22B123	<i>Holoschoeno-Calamagrostetum epigeios</i> Popescu & Sanda 1978
6.	Pontic white dunes plant communities	-	16.2124	<i>Plantaginetum arenariae</i> (Buia & al. 1960) Popescu, Sanda, 1987
7.	<b>Western Pontic humid fixed dunes</b>	6420	16.22B1	<i>Schoenetum nigricantis</i> Oberd. 1957 (Syn. <i>Schoenetum nigricantis</i> Pop et al. 1962)
8.	<b>Western Pontic salt marsh grass swards (<i>Juncetalia maritimi</i>)</b>	1410	15.55	<i>Juncetum littoralis</i> Popescu & al.1992 <i>Juncetum littorali-maritimi</i> Popescu & Sanda 1972
9.	Euro-Siberian perennial amphibious communities	-	53.113	<i>Schoenoplectetum lacustris</i> Egger 1933

10.	<b>Sarmatic <i>Juncus gerardi</i> saline meadows</b>	<b>1340*</b>	15.A2224	<i>Juncetum gerardi</i> (Warming 1906) Nordh. 1923
11.	Western Pontic <i>Hordeum histrix</i> swards	-	15.1463	<i>Hordeetum hystricis</i> (Soó 33) Wendelbg. 1943 (syn. <i>Hordeetum maritimi</i> Șerbănescu 1965)
12.	Western Pontic <i>Agropyron elongatum</i> saline beds	-	15.A21273	<i>Agropyretum elongati</i> I.Șerbănescu 1965
13.	Sarmatic <i>Carex distans</i> saline meadows	-	15.A2225	<i>Carici distantis-Festucetum arundinaceae</i> Rapaics 1927
14.	Western Pontic <i>Cynodon dactylon</i> saline beds	-	15.A21275	<i>Trifolio fragifero-Cynodontetum</i> Br.-Bl. et Bolos 1958

### Conclusions

Through our floristic research we have managed to make an inventory of 166 vascular taxa, from which 152 species and 14 subspecies, 113 more than Popescu V. identified more than 50 years ago.

Of the total sum of taxa there is a high percentage of rare and endangered species (23.48%) that certifies once more the importance of this less known coastal area's flora and plant communities.

In the studied area there have been identified 14 major types of coastal habitats, five of them of European Community interest, for which preservation they need to designate Special Preserved Areas (SPA), one of these types having priority according to the Habitats Directive, Annex 1.

The variety of habitats, of plant associations, the rich fitodiversity and the large number of rare and endangered species are solid reasons to suggest (in cooperation with Environmental Protection Agency Constanța) that this coastal area should be declared Natural Reserve.

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