

VEGETATION OF THE PANTANA AREA AT KAŠTELA BAY AND ITS PROTECTIONS PROBLEMS

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Izveček

Območje Pantane je v zahodnem delu Kaštelanskega zaliva in obsega nekaj km². Pod vplivom rahlo slane izvirske vode ter plime in oseke se je razvila specifična močvirska in halofitska vegetacija. Na podlagi fitocenoloških in sintaksonomskih analiz je bilo ugotovljenih 6 rastlinskih združb: *Limonio-Artemisietum coerulescentis* H-ić 1934 *Salsoletum sodae* Pignatti 1953, *Juncetum maritimo-acuti* H-ić 1934, *Ruppietum maritimae* Br.-Bl. 1931 *Phragmitetum australis* (W. Koch 1926) Schmale 1939 in *Bolboschoenetum maritimi* Br.-Bl. 1931. Združbe so mozaično razporejene v skladu z mozaično razporeditvijo ekoloških dejavnikov (globina in slanost vode, menjava plime in oseke kakor tudi tekstura tal). Skupaj je bilo zabeleženih 42 rastlinskih vrst. Področje Pantane je pod močnim antropogenim vplivom, ki je zadnje čase vse močnejši. Raziskava kaže na veliko biotsko raznovrstnost območja in potrebo po konkretnih zaščitnih ukrepih.

Abstract

The Pantana area is situated in the western part of the Kaštela Bay occupying an area of several square kilometers. Here, under the influence of slightly saline spring water and tidal movements, a specific marsh and halophytic vegetation has developed. Based on the phytosociological and syntaxonomic research for the Pantana area 6 plant associations have been determined: *Limonio-Artemisietum coerulescentis* H-ić 1934 *Salsoletum sodae* Pignatti 1953, *Juncetum maritimo-acuti* H-ić 1934, *Ruppietum maritimae* Br.-Bl. 1931 *Phragmitetum australis* (W. Koch 1926) Schmale 1939 and *Bolboschoenetum maritimi* Br.-Bl. 1931. These plant associations are distributed in a mosaic manner, in conformity with the equally mosaic distribution of major ecological factors (water depth and salinity, high and low tide, soil texture). A total of 42 plant species has been registered. The Pantana area is under a strong anthropogenetic impact which has lately become even stronger. Therefore, this research has to show both the great biodiversity of this area and the necessity to take certain protective measures to preserve it.

Ključne besede: Kaštelanski zaliv, Pantana, močvirna vegetacija, halofitska vegetacija

Key words: the Kaštela Bay, the Pantana, marsh vegetation, halophytic vegetation

1. INTRODUCTION AND DESCRIPTION OF THE RESEARCHED AREA

The Pantana (Pantan) marshland is situated in the western part of the Kaštela Bay near Trogir,

extending over an area of several square kilometers. The spring with slightly saline water is in the close vicinity of the road leading from Trogir to Split. Additional water brackishness results from a slightly higher position of the spring in relation to the sea

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level, so depending on whether the tide is high or low the brackishness increases or decreases. Near the spring there is a water-mill from the 13th century, and on the mouth the remnants of the tower from the same period. The water-mill is presently under reconstruction because of the intention to include it in the tourist and catering offer. Between the spring and the mouth there are old fish-ponds, which have not been used for several years now. In its eastern part, the marsh has become a refuse and construction waste dump. A slaughterhouse is there, too. From the eastern and northwestern sides filling of the marsh is done for the purpose of extending farmland. The earlier urban development plans of Trogir even anticipated a part of the marsh to be filled for housing construction.

As far back as in the 15th century the laws forbidding fishing with fishing nets in this area were in force. Wading on muddy land, as well as cutting of reed and grass were forbidden, too (Fisković 1981; Babić 1984; Cvitanić 1996, 1998; Sučević & Dujmov 1998).

Today, the Pantana marshland has been proclaimed a special ichthyologic and ornithological natural reserve in order to prevent catching of those birds which rest here during their migration, as well as fishing using fishing tackle and explosives. Despite the protection given by law and due to lack of control, the destruction caused by farmland extending and by filling with construction waste continues. Unfortunately, the vegetation is not included in the protection, although some vegetation researches were made (Bedalov & Šegulja 1990). However, as these researches have never been fully published, the need is felt for a new vegetation research which aim would be to protect the flora and vegetation.

2. METHODS

The vegetation researches carried out in the Pantana area in the spring, summer and autumn of 2001 are based on the combined estimation according to the Zürich-Montpellier school (Braun-Blanquet 1964), while the syntaxonomic nomenclature is presented according to Horvatić (1963) and Poldini & al. (1999).

In the researched area, individual plant associations are distributed in a mosaic-like manner and are not separated sharply. The reason is in the analogue, namely mosaic distribution of the most important ecological factors (water depth and

salinity, high and low tide, soil texture). Therefore, in the preparation of relevés relatively small areas had to be taken for analysis. Thus, the vegetation is in fact developed as one mosaic complex. However, some plant associations in the researched area are developed fragmentarily only, and were therefore analysed accordingly.

3. RESULTS

On the basis of phytosociological research, the marsh and halophilic vegetation in the Pantana area could be shown in terms of syntaxonomy in the following way:

- I. Cl. *Salicornietea* Br.-Bl. et Tx. 1943
 - O. *Salicornietalia* Br.-Bl. 1931
 - All. *Thero-Suaedion* Br.-Bl. 1931
 1. Ass. *Salsolietum sodae* Pignatti 1953
 - All. *Salicornion fruticosae* Br.-Bl. 1931
 2. Ass. *Limonio-Artemisietum coerulescentis* H-ia 1934
- II. Cl. *Juncetea maritimi* Tx. 1951
 - O. *Juncetalia maritimi* Br.-Bl. 1931
 - All. *Juncion maritimi* Br.-Bl. 1931
 3. Ass. *Juncetum maritimo-acuti* H-ia 1934
- III. Cl. *Ruppietea* Tx. et Preising 1960
 - O. *Ruppietalia* J. Tüxen 1960
 - All. *Ruppion maritimae* Br.-Bl. 1931
 4. Ass. *Ruppium maritimae* Br.-Bl. 1931
- IV. Cl. *Phragmitetea* Tx. et Preising 1942
 - O. *Phragmitetalia* W. Koch 1926
 - All. *Phragmition* (W. Koch 1926) Br.-Bl. 1931
 5. Ass. *Phragmitetum australis* (W. Koch 1926) Schmale 1939
 6. Ass. *Bolboschoenetum maritimi* Br.-Bl. 1931

1. Ass. *Salsolietum sodae* Pignatti 1953

The ass. *Salsolietum sodae* is developed in the area of the low gravelly seashore and on the small islands at the mouth. It builds the first, outer vegetation zone, characterized by the humid and markedly saline soil. Its floristic composition is shown in Table 1, made on the basis of 9 relevés. A total of 26 species has been registered. The association, although fragmentarily developed, occupies relatively large areas, and inside it the elements of ass. *Euphorbio-Glaucietum* H-ic 1950 and ass. *Salicornietum fruticosae* Br.-Bl 1931 grow fragmentarily.

Table 1. Ass. *Salsolietum sodae* Pignatti 1953

No. of veget. record	1	2	3	4	5	6	7	8	9
Size of veget. record (m ²)	15	10	10	20	10	20	20	15	20
Ass.:									
<i>Salsola soda</i>	1.2	2.2	1.2	.	2.3	2.3	2.3	+2	+2
All., O., Cl.:									
<i>Inula chritmoides</i>	1.3	1.2	2.3	2.2	+2	1.2	.	.	+2
<i>Artemisia coerulescens</i>	1.2	+2	1.2	1.2	+2	.	.	.	.
<i>Aster tripolium</i>	.	+2	+2	.	.	+2	.	1.3	+2
<i>Atriplex latifolia</i>	.	+2	+2	.	+2	+2	.	.	1.2
<i>Halimione portulacoides</i>	3.3	1.2	+2	.	.	.	+2	.	.
<i>Beta maritima</i>	.	+2	.	.	+2	+2	+2	.	.
<i>Sonchus maritimus</i>	.	.	+	+2	+	.	.	.	.
<i>Suaeda maritima</i>	.	.	.	.	.	+2	.	.	1.3
<i>Salicornia fruticosa</i>	.	.	.	.	.	.	.	2.3	.
<i>Puccinellia palustris</i>	.	.	1.2	.	.	.	.	.	.
Comp.:									
<i>Elymus pycnanthus</i>	.	.	+2	+	.	+2	+	.	1.2
<i>Glaucium flavum</i>	.	.	.	.	+2	+2	2.2	.	.
<i>Chritimum maritimum</i>	3.3	.	.	2.3	.	.	.	.	.
<i>Juncus acutus</i>	.	+2	.	.	.	.	.	+3	.
<i>Datura stramonium</i>	.	.	.	.	+2	+2	.	.	.
<i>Oenanthe silaeifolia</i>	.	.	+2	.	.	+2	.	.	.
<i>Ecbalium elaterium</i>	.	.	.	.	+	.	+2	.	.
<i>Lactuca scariola</i>	.	.	.	+	.	+2	.	.	.
<i>Lotus alionii</i>	.	.	.	1.3	.	.	.	.	.
<i>Juncus maritimus</i>	.	.	+2	.	.	.	.	.	.
<i>Lophochloa cristata</i>	.	.	.	.	.	+2	.	.	.
<i>Pulicaria disenterica</i>	.	+2	.	.	.	.	.	.	.
<i>Tamarix dalmatica</i>	.	.	.	.	.	.	.	+2	.
<i>Daucus carota</i>	.	.	.	.	+	.	.	.	.
<i>Vitex agnus-castus</i>	.	.	.	.	.	+	.	.	.

2. Ass. *Limonio-Artemisietum coerulescentis* H-ić 1934

The ass. *Limonio-Artemisietum coerulescentis* continues to the ass. *Salsolietum sodae* toward the land, or it is developed on a somewhat higher gravelly soil, inside the wave spraying zone. Its floristic composition is shown in Table 2, made on the basis of 4 relevés. A total of 17 species has been registered, among which the dominant are *Artemisia coerulescens* and *Inula chritmoides*. This association covers relatively large areas with the coverage of practically 100%, and inside it the elements of the fragmentarily developed ass. *Salicornietum fruticosae* Br.-Bl. 1931 occur.

3. Ass. *Juncetum maritimo-acuti* H-ić 1934

The ass. *Juncetum maritimo-acuti* grows on both the seashore and the inner side of the small islands,

on more or less saline, muddy and muddy-gravelly soils, where fresh and salt water mix. Its floristic composition is presented in Table 3, made on the basis of 8 relevés. A total of 18 species has been registered. The association is developed on a relatively small space and inside it the elements of the class *Ammophiletea* Br.-Bl. ex Tx. 1943 and *Salicornietea* Br.-Bl ex Tx. 1952 occur.

4. Ass. *Ruppietum maritimae* Br.-Bl. 1931

The ass. *Ruppietum maritimae* grows at the mouth, in the lagoon closed from the sea by the low shore and the small islands. The vegetation grows on the muddy bottom at a depth of 5-40 cm, depending upon whether the tide is low or high. The water salinity also varies considerably according to the tidal movements. The floristic composition is given

Table 2. Ass. *Limonio-Artemisietum coerulescentis* H-ić 1934

No. of veget. record	1	2	3	4
Size of veget. record (m ²)	40	40	30	20
Ass.:				
<i>Artemisia coerulescens</i>	3.4	2.3	+3	3.3
All.:				
<i>Inula chritmoides</i>	2.3	2.3	2.3	3.3
<i>Limonium serotinum</i>	1.2	1.3	+3	1.2
O., Cl.:				
<i>Halimione portulacoides</i>	1.2	1.2	+2	1.2
<i>Aster tripolium</i>	2.3	1.2	+2	.
<i>Salsola soda</i>	+2	+2	.	+2
<i>Puccinellia palustris</i>	1.2	.	1.3	.
<i>Carex extensa</i>	.	1.2	.	.
<i>Salicornia fruticosa</i>	.	.	.	+2
<i>Soncus maritimus</i>	.	.	+	.
Comp.:				
<i>Chritimum maritimum</i>	+2	3.3	.	.
<i>Juncus maritimus</i>	+3	+2	.	.
<i>Elymus pycnanthus</i>	+2	+2	.	.
<i>Atriplex latifolia</i>	.	.	+2	+2
<i>Galium maritimum</i>	.	.	+2	.
<i>Parietaria judaica</i>	.	.	+2	.
<i>Polygonum maritimum</i>	.	+2	.	.

Table 3. Ass. *Juncetum maritimo-acuti* H-ić 1934

No. of veget. record	1	2	3	4	5	6	7	8
Size of veget. record (m ²)	20	20	15	20	15	20	20	20
Ass.:								
<i>Juncus acutus</i>	1.3	3.3	3.3	1.3	.	3.3	2.2	1.3
<i>Aster tripolium</i>	+2	.	+2	1.2	+2	+2	1.2	+2
All.:								
<i>Juncus maritimus</i>	2.3	2.3	+2	1.3	+2	+2	2.2	2.3
<i>Sonchus maritimus</i>	.	.	.	.	+2	+2	.	.
<i>Carex extensa</i>	.	.	.	.	1.2	.	.	.
O., Cl.:								
<i>Elymus pycnanthus</i>	.	.	+2	+2	.	1.2	.	+2
Comp.:								
<i>Puccinellia palustris</i>	1.2	+2	+2	.	.	.	.	1.3
<i>Inula chritmoides</i>	1.2	.	1.2	+2	.	1.2	.	.
<i>Artemisia coerulescens</i>	+2	.	+2	.	.	+2	.	+2
<i>Bolboschoenus maritimus</i>	+2	.	.	+2	+2	.	.	+2
<i>Limonium serotinum</i>	+3	.	.	.	+2	+2	.	.
<i>Phragmites australis</i>	.	.	.	.	+	.	1.2	.
<i>Atriplex latifolia</i>	.	+2	.	.	.	.	.	.
<i>Chritimum maritimum</i>	.	.	+2	.	.	.	.	.
<i>Lotus alionii</i>	.	.	+2	.	.	.	.	.
<i>Halimione portulacoides</i>	.	.	.	.	.	+	.	.
<i>Lactuca scariola</i>	.	.	.	.	.	.	+	.
<i>Rumex crispus</i>	.	.	.	.	.	+	.	.

in Table 4, made on the basis of 5 relevés. A total of 6 species has been registered.

Table 4. Ass. *Ruppia maritima* Br.-Bl. 1931

No. of veget. record	1	2	3	4	5
Size of veget. record (m ²)	25	25	25	25	25
Ass., All., O., Cl.:					
<i>Ruppia maritima</i>	4.5	3.3	2.3	2.3	3.3
Comp.:					
<i>Enteromorpha linza</i>	1.2	+2	+	2.3	+2
<i>Ulva rigida</i>	+	1.1	.	+	+2
<i>Ceramium rubrum</i>	.	.	+2	.	+2
<i>Chaetomorpha sp.</i>	+	+2	+	+2	+
<i>Cladophora sp.</i>	1.3	2.2	.	1.2	.

5. Ass. *Phragmitetum australis* (W.Koch 1926) Schmale 1939

The ass. *Phragmitetum australis* occupies the largest areas in the researched locality. It grows from the spring to the inner edge of the lagoon on the muddy bottom. Absolutely dominant is *Phragmites australis*. The floristic composition is given in Table 5, made on the basis of 8 relevés. A total of 13 species has been registered, with *Phragmites australis* being absolutely dominant in this association. Such marked domination of reed proves this to be its optimal habitat, regardless of the presence of halophytic species among the accompanying species.

6. Ass. *Bolboschoenetum maritimi* Br.-Bl. 1931

The ass. *Bolboschoenetum maritimi* grows from the spring to the inner edge of the lagoon, on the muddy shore, following the ass. *Phragmitetum australis*. Absolutely dominant is *Bolboschoenus maritimus*. Its floristic composition is given in Table 6, made on the basis of 10 relevés. A total of 12 species has been registered, with *Bolboschoenus maritimus* being absolutely dominant in the association.

List of plant species:

A list of plants, arranged in an alphabetical order, has been set forth. The plants have been recorded in the studied area and give a basis for further studying.

<i>Artemisia coerulescens</i>	<i>Juncus acutus</i>
<i>Aster tripolium</i>	<i>Juncus maritimus</i>
<i>Atriplex latifolia</i>	<i>Lactuca scariola</i>
<i>Beta maritima</i>	<i>Limonium serotinum</i>
<i>Bolboschoenus maritimus</i>	<i>Lophochloa cristata</i>
<i>Calystegia sepium</i>	<i>Lotus alionii</i>
<i>Carex extensa</i>	<i>Oenanthe silaeifolia</i>
<i>Ceramium rubrum</i>	<i>Parietaria judaica</i>
<i>Chaetomorpha sp.</i>	<i>Phragmites australis</i>
<i>Chritimum maritimum</i>	<i>Polygonum maritimum</i>
<i>Cladophora sp.</i>	<i>Puccinellia palustris</i>
<i>Datura stramonium</i>	<i>Pulicaria disenterica</i>
<i>Daucus carota</i>	<i>Rumex crispus</i>
<i>Ecbalium elaterium</i>	<i>Ruppia maritima</i>

Table 5. Ass. *Phragmitetum australis* (W.Koch 1926) Schmale 1939

No. of veget. record	1	2	3	4	5	6	7	8
Size of veget. record (m ²)	50	50	50	50	40	50	50	30
Ass.								
<i>Phragmites australis</i>	4.5	3.4	4.5	4.5	4.5	4.5	3.4	5.5
All., O., Cl.:								
<i>Bolboschoenus maritimus</i>	+2	.	1.2	.	1.2	+2	.	.
Comp.:								
<i>Aster tripolium</i>	+2	+2	+2	+3	+2	1.2	.	.
<i>Calistegia sepium</i>	+2	.	.	.	+2	+2	.	+2
<i>Carex extensa</i>	.	.	.	+2	+2	+2	.	.
<i>Inula chritmoides</i>	.	.	+2	.	.	.	+2	.
<i>Juncus acutus</i>	.	+2	.	.	.	+2	.	.
<i>Juncus maritimus</i>	.	+2	+2	.	.	.	.	.
<i>Atriplex latifolia</i>	+2	.	.	.	.	.	.	.
<i>Halimione portulacoides</i>	.	.	.	.	.	.	+2	.
<i>Inula viscosa</i>	.	.	.	+2	.	.	.	.
<i>Salsola soda</i>	.	.	.	.	.	.	+2	.
<i>Lactuca scariola</i>	.	.	.	+	.	.	.	.

Table 6. Ass. *Bolboschoenetum maritimi* Br.-Bl. 1931

No. of veget. record	1	2	3	4	5	6	7	8	9	10
Size of veget. record (m ²)	40	40	30	40	25	30	30	25	30	40
Ass.										
<i>Bolboschoenus maritimus</i>	4.4	3.4	4.5	4.5	3.3	3.3	3.3	4.5	2.3	4.5
All., O., Cl.:										
<i>Phragmites australis</i>	.	.	+2	+2	+	.	.	.	.	.
Comp.:										
<i>Aster tripolium</i>	+2	+2	+	+2	1.2	+2	1.2	.	+2	+2
<i>Juncus maritimus</i>	+2	1.2	+2	+2	.	.	.	1.2	+2	+2
<i>Limonium serotinum</i>	.	+2	+2	+2	.	.	.	.	+2	.
<i>Carex extensa</i>	.	.	.	.	.	+2	.	.	1.2	+2
<i>Elymus pycnanthus</i>	.	.	.	.	.	.	.	+2	1.2	+2
<i>Puccinellia palustris</i>	+2	.	+3	.	.	.	.	.	.	.
<i>Halimione portulacoides</i>	.	+2	.	.	.	.	.	.	.	.
<i>Inula chritmoides</i>	+2	.	.	.	.	.	.	.	.	.
<i>Juncus acutus</i>	.	.	.	.	.	+2	.	.	.	.
<i>Salicornia fruticosa</i>	.	+	.	.	.	.	.	.	.	.

- | | |
|--------------------------------|-----------------------------|
| <i>Elymus pycnanthus</i> | <i>Salicornia fruticosa</i> |
| <i>Enteromorpha linza</i> | <i>Salsola soda</i> |
| <i>Galium maritimum</i> | <i>Sonchus maritimus</i> |
| <i>Glaucium flavum</i> | <i>Suaeda maritima</i> |
| <i>Halimione portulacoides</i> | <i>Tamarix dalmatica</i> |
| <i>Inula chritmoides</i> | <i>Ulva rigida</i> |
| <i>Inula viscosa</i> | <i>Vitex agnus-castus</i> |

4. DISCUSSION AND CONCLUSION

According to the phytosociological and syntaxonomical research 6 plant associations have been registered for the Pantana area: the ass. *Salsolietum sodae*, where in 9 relevés 26 species have been registered, the ass. *Limonio-Artemisietum coerulescentis*, where in 4 relevés 17 species have been registered, the ass. *Juncetum maritimo-acuti*, where in 8 relevés 18 species have been registered, the ass. *Rupprietum maritimae*, where in 5 relevés 6 species have been registered, the ass. *Phragmitetum australis*, where in 8 relevés 13 species have been registered, and the ass. *Bolboschoenetum maritimi*, where in 10 relevés 12 species have been registered. A total of 42 species has been registered. Because of the mosaic distribution of the most important factors (water depth and salinity, tidal movements, soil texture), the plant associations are not sharply separated from each other, but occur like a mosaic complex. A certain number of plant associations occur fragmentarily only, such as *Euphorbio-Glaucietum* and *Salicornietum fruticosae*.

All these data indicate the vegetation biodiversity in the researched area, which results in the biodiversity of fauna. To ensure the preservation of such biodiversity in the future, it would be necessary to put the Pantana area under a more severe protection regime and take certain measures.

Keeping in view that the marshland is filled with construction and other waste, it is absolutely necessary to prevent any further filling with waste and cart off the existing waste to a refuse_dump.

Filling with earth and with farming waste, presently done to increase farming land, should also be prevented.

Fertilizers and stable manure affect the fertility not only of farmland but of marshland, too, which enables the development of various weeds between the marsh and halophytic species. There is also an uncontrolled use of pesticides in farming, which has negative effects on the natural vegetation, too. It would be ideal to direct the agriculture to the biocultivation or, at least, to introduce strict control in the use of fertilizers and pesticides.

The reed stalks (*Phragmites australis*) are often used as poles in vegetable gardens and to provide shadow around houses, so their cutting should be forbidden.

The slaughterhouse waste is deposited into pits and backfilled, but it is often left uncovered. For this reason, the slaughterhouse should be moved to another, more suitable location.

As lately most structures are built of concrete, it is necessary to forbid any further construction of

either business or residential structures which require the construction of access roads and septic pits.

The fish-farm ponds have been neglected. However, they should not be renewed and their concrete linings should be removed or at least broken, which would enable the ponds to become overgrown.

Some 50 m away from the Pantana spring there is a concrete plant which produces a large amount of concrete dust, which has negative effects on the entire Pantana ecosystem. It would, therefore, be necessary to stop the operation of this plant.

The reconstruction of the water mill at the spring will be completed soon and the mill will be used in tourism. Its owner is willing to grant one room for scientific research and for teaching students and pupils. He also wishes to present all the biodiversity of the Pantana. The modalities of cooperation should be agreed with the owner.

The dilapidated beach structure in the western part, on the very shore, has recently been given in concession. Its reconstruction beyond its present dimensions should be prevented in order to protect the beautiful stands of the ass. *Limonio-Artemisietum coerulescentis* and the ass. *Juncetum maritimo-acuti*, growing to the west and to the north from this structure respectively.

Near the spring there is the extremely busy two-lane Split-Trogir road. Trees (such as cypress - *Cupressus sempervirens*) could be planted between the road and the spring in order to reduce the impact of exhaust gases.

As the small islands and the coast at the mouth, which are very nice beaches, form the outer edge of the shallow lagoon filled with quagmire, it would be absolutely necessary to warn swimmers of the presence of this quicksand.

5. POVZETEK

Vegetacija območja Pantana ob Kaštelskem zalivu in problemi njegovega varovanja

Močvirno območje Pantana leži na zahodnem delu Kaštelskega zaliva, blizu Trogira, in se razteza na površini nekaj kvadratnih kilometrov. Izvir rahlo slane vode je v neposredni bližini ceste, ki pelje iz Trogira v Split. Voda je še bolj slana, ker leži izvir le malo nad morsko gladino in se zato slanost povečuje oz. znižuje v odvisnosti od plime in oseke.

Na podlagi fitocenološko-sintaksonomskih raziskav je bilo na tem območju zabeleženih 6

rastlinskih združb: as. *Salsoletum sodae*, kjer se v 9 popisih pojavlja 26 vrst, as. *Limonio-Artemisietum coerulescentis*, kjer se v 4 popisih pojavlja 17 vrst, as. *Juncetum maritimo-acuti*, kjer se v 8 popisih pojavlja 18 vrst, as. *Ruppium maritima*, kjer se v 5 popisih pojavlja 6 vrst, as. *Phragmitetum australis*, kjer se v 8 popisih pojavlja 13 vrst, in as. *Bolboschoenetum maritimi*, kjer se v 10 popisih pojavlja 12 vrst. Skupaj je bilo ugotovljenih 42 vrst. Zaradi mozaično razporejene vegetacije glavnih ekoloških dejavnikov (globina in slanost vode, plima in oseka, tekstura tal), rastlinske združbe niso jasno ločene druga od druge, ampak se pojavljajo v obliki kompleksnega mozaika. Določen del rastlinskih združb se pojavlja le fragmentarno, npr. *Euphorbio-Glaucietum* ter *Salicornietum fruticosae*.

Prav navedeni podatki govore o veliki biotski raznovrstnosti vegetacije na raziskovanem območju, na podlagi tega lahko sklepamo tudi na veliko raznovrstnost favne. Da bi to zaščitili, bi bilo potrebno v Pantani uvesti strožji režim zaščite in uvesti določene ukrepe.

6. APPENDIX

To save space, in tables the following abbreviations are used:

Ass.	= characteristic species of association
All.	= characteristic species of alliance
O.	= characteristic species of order
Cl.	= characteristic species of class
Comp.	= accompanying species

7. LITERATURE

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