original scientific article
received: 2005-05-30

UDC 574.4/.5:581.9(497.4 Strunjan)

VEGETATION OF THE STJUŽA COASTAL LAGOON IN STRUNJAN LANDSCAPE PARK (SLOVENIA): A DRAFT HISTORY, MAPPING AND NATURE-CONSERVANCY EVALUATION

Nina ŠAJNA
University of Maribor, Pedagogical Faculty, Department of Biology, SI-2000 Maribor, Koroška 160
E-mail: nina.sajna@uni-mb.si

Mitja KALIGARIČ
Department of Biology, Pedagogical Faculty, University of Maribor, SI-2000 Maribor, Koroška 160
University of Primorska, Science and Research Centre of Koper, Institute for biodiversity studies, SI-6000 Koper, Garibaldijeva 1

ABSTRACT

A draft history of the artificial Stjuža coastal lagoon was reconstructed on the basis of old maps (1804 and 1873) and compared with the present-day situation using GIS. The current data were simplified to obtain comparable categories (landscape units) with old maps. The following major landscape units were distinguished: lagoon, salt marshes, mainland, brackish rivers and estuaries, ditches and canals, salt-pans, embankment, villages and roads. On current map, a total of 47 habitat types according to PHYSIS typology occurring in 206 polygons, which cover an area of 41.6 ha, were identified and described. Habitats with greater nature-conservancy value cover 26.7 ha of the total research area and constitute 40% of the polygons described. 55.6% of these belong to halophilous scrubs – Sarcocornetea fruticosi *(=* Arthrocnemetea fruticosi*) – and 25.9% to annual salt pioneer sward communities, dominated by* Salicornia europaea*. Mediterranean salt swamps (*Juncion maritimi*) are present to a small extent only. It could be concluded that the artificial Stjuža lagoon, constructed for fish farming purposes, developed in habitat diverse coastal wetland area after partial abandonment.*

Key words: coastal lagoon, vegetation, habitat types, PHYSIS, mapping GIS

VEGETAZIONE DELLA LAGUNA COSTIERA STJUŽA NEL PARCO NATURALE DI STRUGNANO (SLOVENIA): BOZZA STORICA, RILEVAMENTO E VALUTAZIONE DEL GRADO DI CONSERVAZIONE DELLA NATURA

SINTESI

Sulla base di vecchie mappe (datate 1804 e 1873) gli autori hanno ricostruito una bozza storica della laguna costiera artificiale Stjuža e, con l'ausilio del GIS, l'hanno confrontata con la situazione attuale. I dati recenti sono stati semplificati per ottenere categorie comparabili (unità di terreno) con le vecchie mappe. Le nove maggiori unità distinte comprendono: laguna, maremme, terraferma, fiumi ed estuari salmastri, fossi e canali, saline, argini, villaggi e strade. Sulla mappa contemporanea vengono identificati e descritti 47 tipi di habitat conformi alla tipologia PHYSIS, ritrovabili in 206 poligoni, ricoprenti un'area di 41,6 ettari. Gli habitat con il più alto grado di conservazione della natura ricoprono 26,7 ettari dell'area studiata, ovvero il 40 % dei poligoni descritti. Il 55,6 % di essi appartiene ad arbusti alofili – Sarcocornetea fruticosi *(=* Arthrocnemetea fruticosi*) – mentre il 25,9 % alle comunità annuali pioniere alofile, dominate da* Salicornia europaea*. Le caratteristiche maremme mediterranee (*Juncion maritimi*) sono presenti solo in minor misura in quest'area. Gli autori concludono che la laguna artificiale Stjuža ha sviluppato, dopo un parziale abbandono dell'attività di pescicoltura, diversi habitat tipici delle zone umide costiere.*

Parole chiave: laguna costiera, vegetazione, tipi di habitat, PHYSIS, rilevamento, GIS

INTRODUCTION

The area under consideration was declared Strunjan Nature Park in 1990 (Firbas, 2001), primarily due to its floristic and faunistic diversity, geological phenomena and landscape value. The attractive seacoast cliffs are built of flysch (Eocene calcareous sandstone), which enables development of deciduous thermophilous vegetation. Due to flysch properties (impermeable to water), there are several springs and most of them remain active also during the summer. The most prominent among them is the Strunjan stream, even though it is only 5.6 km long but, except that in its lower course the permanent water input is provided with underground springs (Radinja, 1979). In its mouth in Strunjan bay there probably was, in pre-human history, a seacoast marsh, developed on alluvial deposits. We could assume that *Phragmites* and *Juncus maritimus*–dominated vegetation developed in permanently flooded stands. Halophyte vegetation probably developed on shallow mudflats of the estuary in different forms, mostly due to the salinity level, water availability, soil type and microtopography. The area, however, must have been subjected to strong human pressures in distant past. As early as in Roman times (Darovec, 1992), the sedimentary coast of the mouth of the Strunjan stream was probably transformed into salt-pans, which still exist nowadays. Another part of the bay was later separated from the sea by a shallow dyke, but remained connected with a canal. It was used for fish farming, but abandoned at the beginning of the 20th century (Avčin *et al.*, 1974). As the lagoon originated due to the fact that the bay was artificially closed and separated from the open sea, it was given the name Stjuža, deriving from the Italian term "chiusa" (closed).

Marine environments, like estuaries and lagoons, constitute highly productive ecosystems with special ecological role owing to their location between marine and terrestrial interface area, where nutrients are supplied from fresh water inputs, tides, the atmosphere and bottom sediments (Forman & Godron, 1986). Still, they remain among the most threatened ecosystems worldwide according to IUCN classification, especially due to various anthropogenic impacts, such as tourism activities, aquaculture and agriculture (Salman, 1994).

Today, the Stjuža coastal lagoon is an important wetland site also due to the rare and endangered halophyte vegetation types and its halophyte flora. Ample data on the halophyte flora of Strunjan were available already in some historical floras, such as Marchesetti (1896-97) and Pospichal (1897-98). A very comprehensive list was produced by Wraber (1974) and later completed by Kaligarič (1996). The vegetation cover, threat status and phytocoenosis distribution of halophytes have been discussed by Kaligarič (1985, 1996, 1999a, 1999b), with phytosociological Strunjan releves also included in Poldini *et al.* (1999).

The objective of this study was (1) to make a draft historical reconstruction of the area's vegetation assemblage, (2) to quantify and spatially characterise the present vegetation throughout habitat types, (3) to identify valuable habitats for conservation, and (4) to develop a GIS system that can be used for future observations.

MATERIAL AND METHODS

Cartography

The early available vegetation covers of the area were interpreted from Austro-Hungarian military maps, made in 1804 exclusively for military purposes within the "Emperor Joseph II Land Survey" (Rajšp & Ficko, 1996). The maps were drawn at a scale of ca. 1 : 28,000. They are not sufficiently accurate to be processed directly by GIS (Čarni *et al.*, 1998), but by comparing the positions and distances between still existing single houses from old and new maps, it was possible to transfer categories, clearly visible from the old maps, into GIS and allowed us to resize the maps to fit the scale of the present ones.

Next temporal window is represented by Italian cadastre ("Regolazione dell´imposta fondiaria") at a scale of ca. 1 : 20,000, drawn in 1873 by Giuseppe Coreggi (Coreggi, 1873). The lagoon is marked "Peschiera di Strugnano Basso" and "Pesca", with both names referring to fish farming.

The current data were simplified to obtain comparable categories (landscape units) with old maps. We distinguished the following major habitat categories: lagoon, salt marshes, mainland, brackish rivers and estuaries, ditches and canals, salt-pans, embankment, villages and roads.

Habitat mapping

To represent the diversity of various biological features, different approaches are used. Diversity can be measured either at the species or community levels (Boteva *et al.*, 2004). A survey at the species level could be very complex and time-consuming, like a detailed floristic and faunistic inventory. Remote-sensing data, like airborne methods, require field evaluation to prevent different kinds of errors associated with digitising and subjective photo interpretation (Green & Hartley, 2000). Sometimes the scale is not sufficiently accurate, especially if the vegetation occurs in a small-structured mosaic, like the Stjuža coastal lagoon. Smith & Theberge (1986) emphasize that vegetation communities are the most commonly used spatial unit for diversity assessment. As suggested by Kati *et al.* (2004), standard typologies of habitats, predominantly based on vegetation types, according to Devillers & Devillers- Terschuren (1996), Pienkowski *et al.* (1996) or Stoms *et al.* (1998),

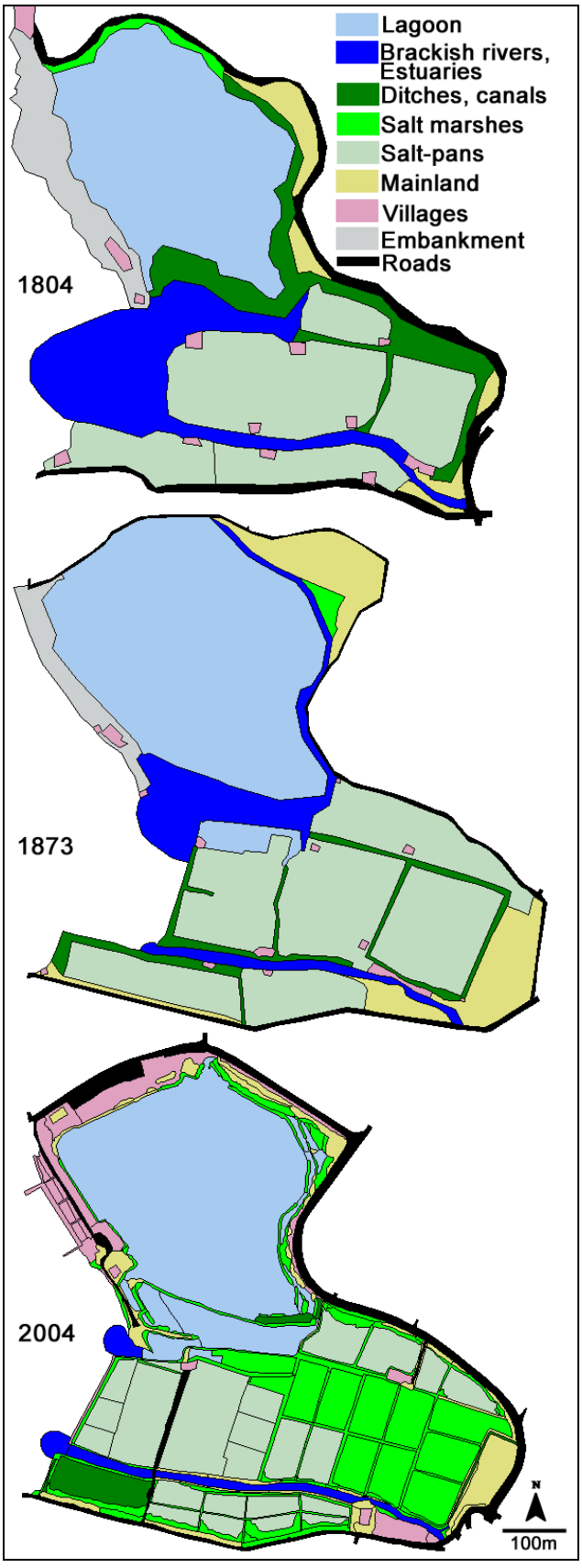

Fig. 1: Historical review of the Stjuža lagoon and adjoining areas on the basis of 10 landscape units.
Sl. 1: Zgodovinski pregled lagune Stjuža in sosednjih območij na podlagi 10 krajinskih enot.

could be used effectively. Among them PHYSIS is very practical, due to its physiognomically based criteria of determining single polygons, but its units are phytosociologically grounded. PHYSIS Data Base (Devilliers & Devilliers-Terschuren, 1996) was adapted and improved in order to fit local conditions (Jogan *et al.*, 2004).

Therefore, we evaluated the current situation by field observations combined with aerial photographs (digitalized ortho-photographs, provided by GURS, Republic of Slovenia). For elaboration in GIS, the computer package ArcView 3.1 (ESRI) was used. Field data included habitat types classified according to Palaearctic habitat typology from PHYSIS Data Base, adjusted to Slovenian habitat characteristics.

To obtain more precise description of habitats occurring in the field, we used intermediates (marked with "x") between two habitat types in case of transition between two habitat types. For the same purpose we used a combination of two habitat types marked with "/", when trying to explain one type with the help of another (for instance forest fragment explained with the type of the forest).

For the identification of habitat units with greater nature-conservancy value (App. 1), we used the list of priority habitats ("FFH" code that corresponds to the NATURA 2000 code) from the Annex I of the "Habitats Directive" (Directive 92/43/EEC, 1992)

To reduce the level of details that cannot be show on 1 : 6,000 maps, we aggregated related habitat types into 15 categories (App. 1) and named them adequately (Tab. 1).

Each map produced was processed via detailed quality control check with CLU Quality Control extension in ArcView, to clear the multipart polygons, overlapping polygons, sliver polygons, void polygons and adjacency. Obtained spatial data is geolocated and can now be stored and visualized using geographic information systems (GIS).

Tab. 1: Codes and names for different aggregate types derived from PHYSIS typology.
Tab. 1: Kode in imena zbirnih habitatnih tipov na podlagi tipologije PHYSIS.

Aggregate code used in Fig. 2	Name of the aggregate
1	**Marine communities** Open-water and bottom communities and vascular vegetation beds; marine communities of the littoral zone and coastal lagoons.
2	**River mouths, estuaries and mudflats** River mouths, estuaries, sand or mud sea banks under influence of tide.
3	**Glasswort swards** Annual salt pioneer swards, in particular *Salicornia herbacea*, colonizing periodically inundated mud of the Mediterranean coastal saltmarshes.
4	**Tall rush saltmarshes** Beds of *Juncus maritimus* or *J.acutus* of periodically inundated depressions of the Mediterranean. In Slovenia, only *J. maritimus* occurs.
5	**Saltmarsh scrubs and rocky shore communities** Low shrubby expanses of woody halophytes, characteristic of inundated saltmarshes and rocky shores with several annual plants.
6	**Coastal lagoons** Saline or hypersaline waters cut off from the sea completely or still connected to the sea by narrow passages. The presence of marine invertebrate communities or vegetation can be indicated by addition of other habitat codes.
7	**Ligneous formations** Ligneous formations of natural thermophilous shrub communities or cultivated tree formations composed of native, exotic or native species out of their natural range and habitat.
8	**Reed beds** Communities of the margins of lakes, sea inlets, rivers and brooks, eutrophic marshes, swamps, ditches dominated by tall Poaceae-like *Phragmites*.
9	**Ruderal communities** Communities of pioneering, introduced or nitrophilous plants colonising waste places, disturbed natural or seminatural areas, roadsides and other interstitial spaces or disturbed ground.
10	**High-stem orchards** Tree crops of standards, cultivated for fruit production.
11	**Urban green spaces** Usually varied formations, created for recreational use. The vegetation usually composed mainly of introduced species or cultivars.
12	**Towns, villages, industrial sites** Areas used for human occupation and industrial activities.
13	**Salt-pans** Active or recently abandoned salt-extraction basins. When vegetation is established, detailed habitats can be specified by means of the subdivisions of 15.
14	**Ditches and small canals** Narrow linear artificial freshwater bodies, mostly used for irrigation or partition, in this case for the purpose of salt-extraction basins.
15	**Roads**

RESULTS AND DISCUSSION

A draft historical reconstruction

Slovenia has a very short coastline of 47 km (Kos, 1996), whose greater part is composed of a fairly steep coast (including an 80 m high cliff formation). Despite its artificial origin, the Stjuža lagoon developed into diversity-rich habitats of great ecological importance.

There were no maps, transferable to GIS, available before the beginning of the19th century. Therefore, there are no cartographic records of the earlier mentioned open bay. On the Austro-Hungarian military map, however, the embankment seems to be of relatively recent origin if we look at the shape of the dyke and the green

coloration on the original map. The halophyte and brackish swamp vegetation began to develop when the lagoon was closed, and due to hydrologic dynamics, sediment deposition and anthropogenic impact, the vegetation cover continuously followed these dynamics. The cartographic aspect of the vegetation cover, simplified in order to be comparable, is shown in three temporal windows in figure 1. A review of the historical data shows that the area of brackish rivers, estuaries and salt marshes became shrank during the centuries, whereas the salt-pans expanded towards the sea. Nowadays, the increasingly occurring saltmarshes favours salt-pans abandonment. Also, the size and shape of the lagoon has varied through history. In 1873, the lagoon was the largest, almost twice the present size with its total surface area of 10.55 ha. In general, it is well known that species diversity correlates with habitat size, but in habitats that include shoreline, the shape is significant as well. To describe the changes occurring in the shape of the lagoon, we calculated an index according to Forman & Godron (1986). It is the ratio between shore length and the circumference of a circle with same surface area as the water body that can describe the degree of development of the shoreline (D). In 1804, the shoreline development values were higher (D = 1.317), the dyke and the lagoon had a more natural appearance. The smallest values were calculated for the year 1873 (D = 1.130), despite the large surface area. This leads back to an intense fish farming activity at the time. Nowadays, the degree of the lagoon shoreline development increased (D = 1.283) due to abandonment of fish farming and assemblage of marginal vegetation (saltmarsh scrub, reed beds and ruderal communities).

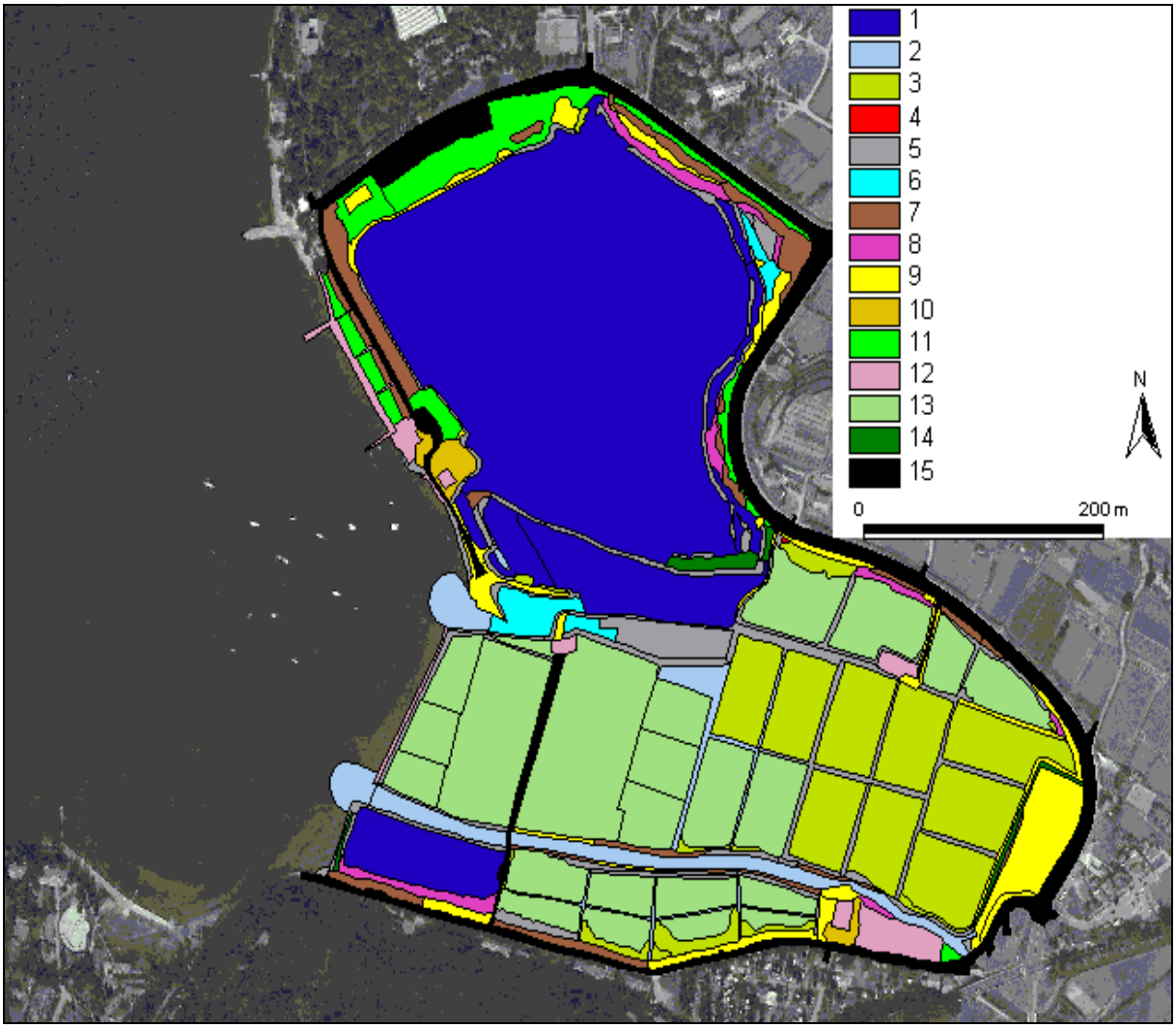

Fig. 2: 15 aggregated habitat types (see Table 1) of the Stjuža lagoon and adjoining areas.
Sl. 2: 15 zbirnih habitatnih tipov (glej Tabelo 1) lagune Stjuža in sosednjih območij.

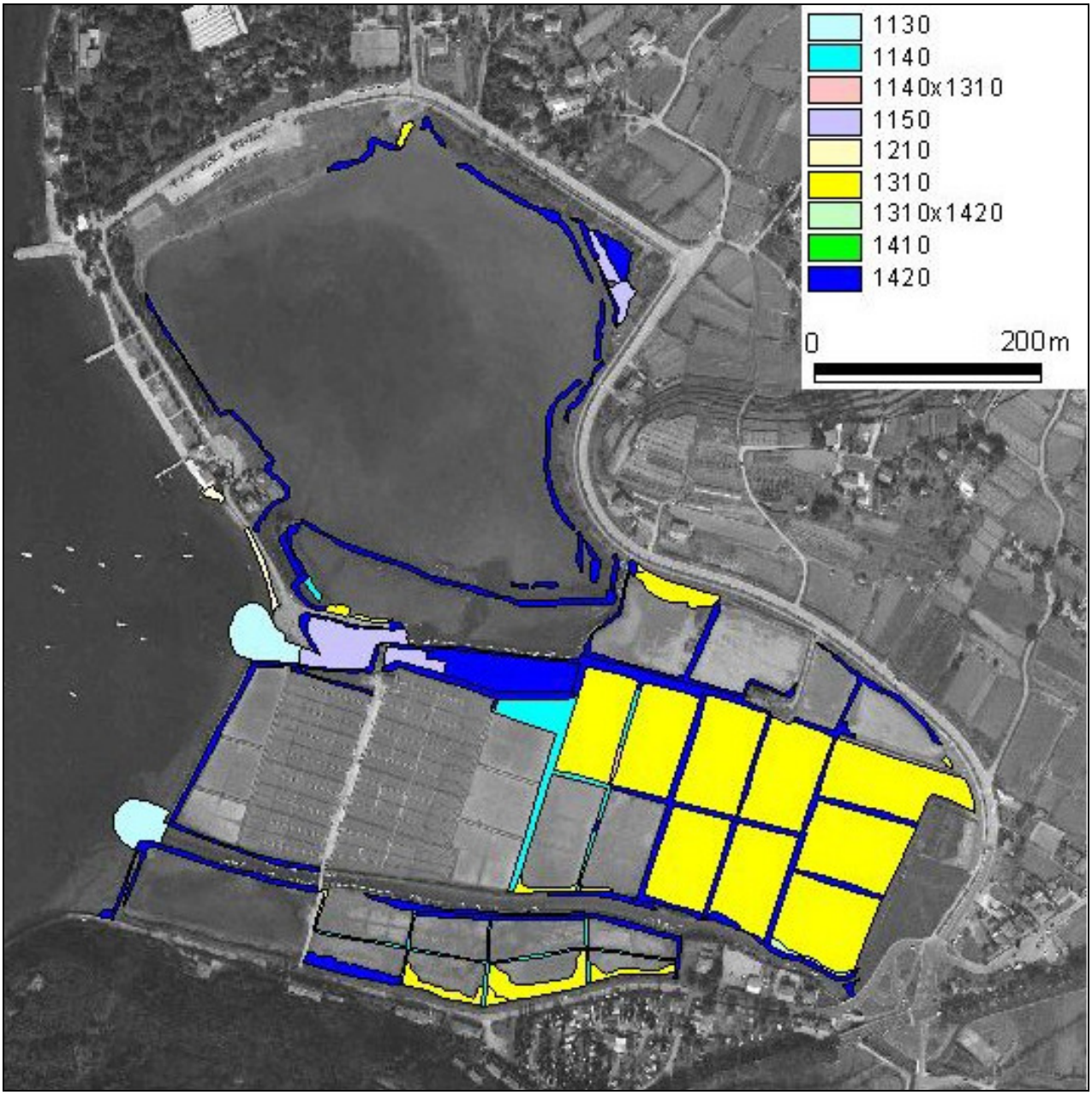

Fig. 3: Habitat types of greater nature-conservancy value ("Natura 2000 habitats") of the Stjuža lagoon and adjoining areas. For names of the habitats see App. 1.
Sl. 3: Naravovarstveno pomembnejši habitatni tipi ("habitati Natura 2000") lagune Stjuža in sosednjih območij. Za imena habitatnih tipov glej App. 1.

Habitat mapping

We identified and described a total of 47 habitat units according to PHYSIS typology occurring in 206 polygons that cover an area of 41.6 ha. The current situation of aggregated habitat types is shown in figure 2. It is a remarkable complex of coastal and halophytic habitats present in a small area, although some polygons show considerable size. Most of the area is occupied by seagrass meadows with *Cymodocea* and *Zostera* (13.6 ha), although we found *Ruppia cyrrhosa* in a single small polygon (0.8 ha) as well. Areas with extensive salt-extraction activities occupy 10 ha. The cover area is followed by ruderal communities (3.8 ha) and glasswort swards with annual *Salicornia, Suaeda* or *Salsola* on 2.35 ha.

We introduced a new habitat type category for Slo-

vene PHYSIS classification – Tamarisk stands, due to the subspontaneous abundant formations in areas that cannot be avoided at this mapping scale. Large part of the mapped habitat is covered by ruderal communities or their intermediates. This is a sign of unstable and disturbed habitats, though very floristically rich due to warm climatic conditions at Strunjan.

Habitats with greater nature value (Fig. 3) cover 26.7 ha of the total research area, constituting 40 % of the polygons described. Almost all halophytic habitat types known for Slovenia and classified as priority habitats by the Habitats directive are present there. Among these habitat types, 55.6 % are represented by habitats suitable for halophilous scrubs – *Sarcocornetea fruticosi* (FFH code number 1420), occurring mainly in the abandoned salt-pan basins, and 25.9 % habitats by annual salt pioneer swards communities, in particular with dominating *Salicornia europae*, often the only species in the community, colonising periodically inundated sand and silt banks (code 1310). This communities require soil with high ion concentration and low oxygen availability, as well as gently sloping sea banks protected from direct impact of the sea for their establishment (Kaligarič, 1996) that can be found in the abandoned salt-pans and at the edges of some still active salt-extraction basins. Mediterranean salt meadows (*Juncion maritimi*) are present to a minor extent, likewise the annual halophytes colonising the rocky shores.

It could be concluded that this is the only lagoon on the Slovenian flysch and flysch-derivated sedimentary coast, despite being artificial developed in habitat-diverse and halophyte communities-rich coastal wetland area. Historical reconstruction of the past 200 years indicates that the assemblage of valuable habitats increased, probably due to partial abandonment of salt-pans and fish farming activities.

VEGETACIJA OBALNE LAGUNE STJUŽA V KRAJINSKEM PARKU STRUNJAN (SLOVENIJA): ZGODOVINSKI ORIS, KARTIRANJE IN NARAVOVARSTVENO OVREDNOTENJE

Nina ŠAJNA
Univerza v Mariboru, Pedagoška fakulteta, Oddelek za biologijo, SI-2000 Maribor, Koroška 160
E-mail: nina.sajna@uni-mb.si

Mitja KALIGARIČ
Univerza v Mariboru, Pedagoška fakulteta, Oddelek za biologijo, SI-2000 Maribor, Koroška 160
Univerza na Primorskem, Znanstveno-raziskovalno središče Koper, Inštitut za biodiverzitetne študije, SI-6000 Koper, Garibaldijeva 1

POVZETEK

Avtorja sta na osnovi starih zemljevidov (1804 in 1873) napravila rekonstrukcijo lagune Stjuža v Strunjanu in jo ob pomoči GIS (geografskega informacijskega sistema) primerjala z današnjo. Z namenom, da bi dobila s starimi zemljevidi primerljive kategorije (krajinske enote), sta poenostavila današnje podatke in določila naslednje poglavitne krajinske enote: laguno, slanišča, kopno, brakične reke in ustja, jarke in kanale, soline, nasip, vasi in ceste. Na današnjem zemljevidu sta identificirala in opisala skupaj 47 habitatnih tipov glede na tipologijo PHYSIS, ki se pojavljajo na 206 poligonih na površini 41,6 ha. Naravovarstveno pomembnejši habitati se raztezajo na 26,7 ha celotne raziskane površine in sestavljajo 40 % opisanih poligonov. 55,6 % od teh pripadajo slanoljubemu grmišču – Sarcocornetea fruticosi *(=* Arthrocnemetea fruticosi*) – 25,9 % pa enoletnim slanim pionirskim združbam, v katerih prevladuje navadni osočnik* Salicornia europaea*. Značilnih sredozemskih slanih močvirij (*Juncion maritimi*) je tu malo. Avtorja zaključujeta, da se je laguna Stjuža po delni opustitvi rabe razvila v pestre habitate obmorskih mokrišč.*

Ključne besede: obalna laguna, vegetacija, habitatni tipi, PHYSIS, kartiranje, GIS

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App. 1: Complete list of habitat types, including names, PHYSIS and FFH codes and syntaxonomic units (where appropriate).
App. 1: Popoln seznam habitatnih tipov, ki vključuje njihova imena, kode PHYSIS in FFH ter sintaksonomske enote, kjer obstajajo.

PHYSIS Habitat code	**Name of the habitat**	**Syntaxonomic unit**	**Aggregate code used in Fig. 2**	**FFH Code**
11.33	**Mediterraneo – Pontic *Cymodocea* and *Zostera* beds** Mediterranean beds of *Cymodocea nodosa, Zostera noltii* and *Zostera marina*.	*Cymodoceion nodosae* Den Hartog 1976, *Zosterion* Christiansen 1934	**1**	
11.33x21	**Intermediate type**		**1**	
11.412	**Brackish waterbodies with *Ruppia cirrhosa*** Stands of *Ruppia cirrhosa*, colonising brackish waterbodies, shoals, abandoned salt-pans and river mouths.	*Ruppion maritimae* Br.-Bl. 1931	**1**	
13.11	**Brackish rivers** Brackish lower stream of rivers caused by tide.		**2**	
13.2	**River mouths, estuaries** Usually broad river mouths, deltas into the sea. Detailed habitats can be specified by means of the subdivisions of 11.		**2**	**1130**
14	**Sand or mud banks without vascular vegetation beds** Sand or mud sea banks, usually without vascular plants, can be overgrown by algae or cyanobacteria. Similar permanently flooded habitats belong to subdivisions of 21.		**2**	**1140**
14x15.113	**Intermediate type**		**2**	**1140x 1310**
15.113	**Mediterranean glasswort swards** Annual salt pioneer swards, in particular *Salicornia herbacea*, colonising periodically inundated muds of Mediterranean coastal saltmarshes.	*Salicornion patulae* Gehu et Gehu-Franck 1984	**3**	**1310**
15.113x15.61	**Intermediate type**		**3**	**1310x 1420**
15.113x53.6	**Intermediate type**		**3**	**1310**
15.113x87.2	**Intermediate type**		**3**	**1310**
15.11xTamarisk stands	**Intermediate type**		**3**	**1310**
15.51	**Mediterranean tall rush saltmarshes – *Juncion maritimi*** Beds of *Juncus maritimus* or *J. acutus* of periodically inundated depressions of the Mediterranean. In Slovenia, only *J. maritimus* is known to occur.	*Juncion maritimi* Br.-Bl. 1931 (*Juncetum maritime-acuti* Horvatić 1934)	**4**	**1410**
15.51x53.6	**Intermediate type**		**4**	**1410**

15.61	**Mediterranean saltmarsh scrubs** Low shrubby expanses of woody glasswort, seablites, sea purslanes or *Halocnemum*, characteristic of inundated saltmarshes of the Mediterranean coasts. Characterised by dominant species belonging to *Arthrocnemum*, *Halimione* and *Limonium* genus.	*Arthrocnemion fruticosi* Br.-Bl.1931 corr. O. Bolos 1967	**5**	**1420**
15.61x53.6	**Intermediate type**		**5**	**1420**
15.61x87.2	**Intermediate type**		**5**	**1420**
17.2	**Rocky shore communities of annuals** Rocky shores with several plants like *Atriplex spp., Salsola soda, Cakile maritime* ...	*Cakiletea maritimae* Tüxen et Preising, Tüxen 1950	**5**	**1210**
21	**Coastal lagoons** Saline or hypersaline waters cut off from the sea completely or still connected to the sea by narrow passages. The presence of marine invertebrate communities or vegetation can be indicated by addition of other habitat codes.		**6**	**1150**
31.8122	**Sub-Mediterranean blackthorn-privet scrub** Thermophilous shrub communities of the Sub-Mediterranean part of Slovenia, occupying a large range of the mentioned area. Occurring in hedges dividing karst grasslands (Istria, flysch area), forest edges, woodland recolonisation communities or on sites exposed to sun. On steep rocky edges it can occur as a pioneer forest. Formed by *Prunus mahaleb, Frangula rupestris, Cotinus coggygria, Fraxinus ornus, Rubus ulmifolius, Ligustrum vulgare, Carpinus orientalis, Cornus mas, Berberis vulgaris.*	*Ligustro-Prunetum* Tx. 1952	**7**	
31.8122x53.6	**Intermediate type**		**7**	
31.8122x87.2	**Intermediate type**		**7**	
53.6	**Reed beds** Communities of the margins of lakes, sea inlets, rivers and brooks, eutrophic marshes, swamps, ditches dominated by tall Poaceae- like *Phragmites*.	*Phragmitetum communis* Koch 1926 subass. *halophylum* Pignatti 1953	8	
53.62	**Giant reed stands** Secondary formations of *Arundo donax*.		**10**	
53.62xTamarisk stands	**Intermediate type**		**9**	
53.6x53.62	**Intermediate type**		**9**	
53.6x87.2	**Intermediate type**		**9**	
83.11	**Olive groves** Mediterranean intensively farmed and traditional plantations of *Olea europaea*.		**10**	

83.151	**Extensively farmed high-stem fruit orchards** High-stem orchard of apple, pear, cherry, often extensively farmed. Low density of trees allows mowing of herb undergrowth.		**10**	
83.152	**Intensively farmed high-stem fruit orchards** High-stem orchard in Sub-Mediterranean, often intensively farmed. High density of trees planted in rows.		**10**	
83.152x85.31	**Intermediate type**		**10**	
83.3	**Plantations** Cultivated ligneous formations planted most often for the production of wood, composed of exotic species or native species out of their natural range and habitat.		**7**	
83.3x87.2	**Intermediate type**		**7**	
83.324	**Locust tree plantation** Plantations and spontaneous formations of *Robinia pseudacacia*.		**7**	
83.324xTamarisk stands	**Intermediate type**		**7**	
84.2	**Hedgerows** Small tree and shrub formations arranged in a linear or reticulated manner, closely with grassy or cultivated habitats, usually serving as partitions and shelter.		**7**	
85.11	**Park woodlots** Copses, groves of woods of native or introduced trees, with or without accompanying shrubbery and herbaceous undergrowth, constituting elements of urban parks.		**7**	
85.12	**Park lawns** Frequently mown grassland (more than 3 times per year), composed of native or sometimes exotic grasses, constituting elements of urban parks.		**11**	
85.12x87.2	**Intermediate type**		**11**	
85.31	**Ornamental gardens** Areas of land adjoining a house, planted with ornamental grass, shrubs, trees, flower beds.		**11**	
86.2	**Villages** Small groups of houses in rural areas, susceptible to strong interconnection between usages by the fauna of the built-up and countryside habitats. Includes bordering areas of town suburbs and isolated buildings.		**12**	

87.2	**Ruderal communities** Communities of pioneering, introduced or nitrophilous plants colonising waste places, disturbed natural or seminatural areas, roadsides and other interstitial spaces or disturbed ground.	*Sysimbrion officinalis* Tx- et al., Tx. 1950, *Dauco-Melilotion* Goers 1966, *Artemisio-Egropyrion intermedii* Mueller et Goers 1969.	**9**	
87.2xTamarisk stands	**Intermediate type**		**9**	
89.11	**Sea harbours** Seaside complexes of artificial basins and inlets constructed for the purposes of navigation.		**12**	
89.12	**Salt-pans** Active or recently abandoned salt-extraction basins. When vegetation is established, detailed habitats can be specified by means of the subdivisions of 15.		**13**	
89.22	**Ditches and small canals** Narrow linear artificial freshwater bodies, mostly used for irrigation or as partitions, in this case for the purpose of salt-extraction basins.		**14**	
-	**Tamarisk stands**		**9**	
-	**Asphalted road**		**15**	
-	**Macadamised road**		**15**	
-	**Path**		**15**	