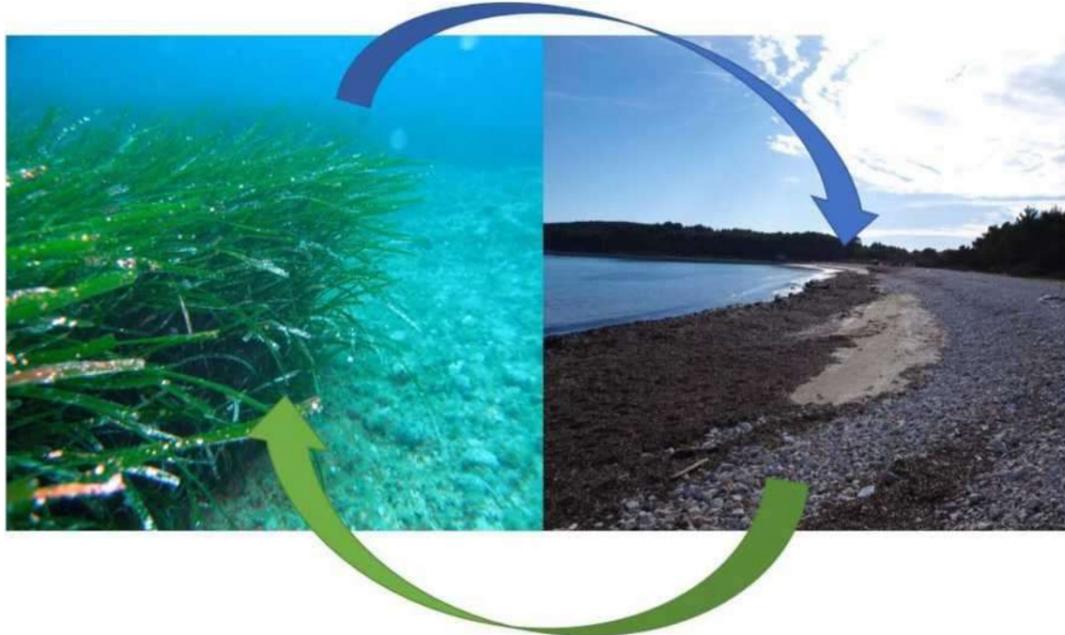


RECOMMENDATIONS

for the preservation of the Posidonia ecosystem through
 regulations and management
 plans for protected areas and the Natura 2000
 sites



Zadar, April 2022



Project co-financed by the European Regional Development Fund

* General Directorate of Protected Areas and Biodiversity of the Regional Government of the Balearic Islands is not funded by ERDF funds

LIST OF ABBREVIATIONS:

BE1	The species is listed in Appendix I to the Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention)
BA2	The species is listed in Annex II to the Protocol concerning specially protected areas and biological diversity in the Mediterranean of the Convention for the Protection of the Mediterranean Sea Against Pollution (the Barcelona Convention)
DD	Data deficient
EN	Ecological network
EU	European Union
IUCN	International Union for Conservation of Nature
ICZM	Integrated Coastal Zone Management
PI	Public Institution
MINESD	The Ministry of Economy and Sustainable Development (competent authority for nature protection)
NHC	National Habitat Classification
PCA	Protected coastal zone

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1. INTRODUCTION

This document was created as a part of the POSBEMED2 project and consists of recommendations and tools for the integrated management and preservation of the Posidonia ecosystem in protected areas and the Natura network 2000 sites in Croatia, with particular regard to the pilot area of the project – Sakarun beach.

1.1. POSBEMED 2

The project “POSBEMED2 – Governance and management of Posidonia beach-dune systems across the Mediterranean” is co-financed by the European Regional Development Fund. The project commenced on 1 November 2019 and will finish on 30 June 2022. The project is led by the Autonomous Region of Sardinia - Department of the Environment - Nature conservation and forestry policies Office from Italy, in partnership with Natura-Jadera public institution for management of protected areas in the County of Zadar (Croatia), the Institute for the Study of Anthropogenic Impact and Sustainability in the Marine Environment of the National Research Council (Italy), the IUCN MED (Spain), the Enalia Physis Environmental Research Centre (Cyprus), the Region of Provence-Alpes-Côte d’Azur (France), the Region of Central Macedonia and the Hellenic Society for the Protection of Nature (Greece). The Municipality of Sali, the Tourist Board of the Municipality of Sali, and the Tourist Board of Božava participate in the project as associate partners from Croatia. The total value of the project is EUR 2,767,717.04, out of which the European Union provided a total of EUR 2,352,559.49 from the European Regional Development Fund.

1.2. The aim of the document

The aim of this document is to analyse the Croatian legislation and management practices in order to propose recommendations focused on the preservation and sustainable use of the Posidonia ecosystems, and thus contribute to the integrated/integral management of the coastal zone in the protected areas and the Natura 2000 sites in Croatia, as well as to create a framework for the preservation of the entire Posidonia ecosystem (littoral zone).

1.3. The area of interest

The Adriatic Sea and its coast is an area full of valuable but extremely sensitive natural resources of the Republic of Croatia, and it is necessary to establish an adequate system of governance, use, and protection. The processes that depend on the interaction of the sea and the land take place in this area where the developmental pressure and negative impact on natural ecosystems are the most prominent. At the same time, the Adriatic Sea represents a unique and very sensitive marine system which differs from the rest of the Mediterranean by its key hydrographic, oceanological, biological and other characteristics, though it is its constituent part. The Adriatic Sea, its coast and islands are unique in character due to the rich biodiversity, the still preserved high-quality environmental factors, and their unparalleled authentic landscape.¹

Sakarun beach on the island of Dugi Otok was chosen as the pilot area of the POSBEMED II project in Croatia. The beach itself is located in the significant landscape of the North-

¹ Strategic framework for the management of the marine environment and the coastal zone of Croatia

western part of Dugi Otok, while its marine part is included in the Natura 2000 ecological network under the name HR3000069 Sakarun Bay (image 1).



Image 1 Significant landscape North-western part of Dugi Otok with Sakarun beach and bay (Source: www.natura-jadera.com)

2. POSIDONIA ECOSYSTEM

2.1. Posidonia beds (*Posidonia oceanica*) (Natura code: 1120)

Seagrass meadows of *Posidonia oceanica* are ecologically very important areas which play a major role in the littoral zone ecosystems in more ways than one:

1. they provide a habitat for different fauna and flora
2. they significantly reduce coastal erosion
3. many young specimens of fish and invertebrates live there
4. they alleviate climate change.

The significance of these meadows is also realised through the absorption of the CO₂ from the atmosphere, the production of oxygen, an increase in seawater transparency, a decrease in wave intensity and consequently the reduction of coastal erosion, the solidifying of sediment and a reduction of its movement, their significant role in the nutrient salt cycling (nitrates and phosphates) in the sea, as well as a bioindicator of the state of the sea and the accumulation of heavy metals. The *Posidonia* meadows are areas of the greatest / very high biodiversity due to rich primary production, and because many organisms feed on them, breed and find shelter in them. Besides, the dead parts of the *Posidonia* help create marine deposits on the shore and settle the gravel berm. Since they absorb the CO₂ from the atmosphere, they help alleviate climate change, and they also have a significant potential for carbon sequestration using their own biomass but also by filtering small organic particles from the surrounding seawater. Globally, seagrass meadows are responsible for over 10 % of the sequestered carbon in the ocean, even though they cover only 0.2 % of the world sea floor.

Moreover, the Posidonia meadows have an important 'defence' function when it comes to beach erosion because their rhizome and roots strengthen the sediment, which stabilises the sea floor and prevents coastal erosion. Besides, by keeping the sediment in meadows, the sea floor becomes shallower so waves occur further from the shore, which additionally alleviates coastal erosion during storms. Seagrass also slows down the sea currents between the sea floor and its leaves. Recent studies have shown that the height of waves in areas covered in dense seagrass meadows is 10 to 20 % lower in comparison to a bare sea floor.

The distribution of Posidonia beds in Croatia has shown that Posidonia meadows are more common and developed in the central and eastern Adriatic than in its northern part.

Keeping in mind that Posidonia beds are found in infralittoral zones, the anthropogenic impact on them is unavoidable and often detrimental. In shallower areas, the most common negative impact on these seagrass beds is linked to physical damage (due to construction, anchoring, waves), while at greater depths negative impacts are caused by the changes in the characteristics/quality of the water and the sediment. In previous years, the reduction in Posidonia populations due to mechanical damage caused by trawls, anchoring, urbanisation (such as the construction of marinas and harbours, coast levelling etc.), as well as eutrophication connected to it (such as submarine outfalls of wastewater, backfilling, and fish and shellfish farms) were recorded in the western and the northern Mediterranean. After the network of Posidonia stems (rhizome) is damaged by anchoring, it becomes susceptible to erosion by waves.²

Although the process of re-growth after the cessation of the anthropogenic impact is very slow, recovery was recorded in the areas where this species is protected, which indicated that these exceptionally valuable habitats must be protected in due time.

2.2. Banquettes

The deposits of dead leaves of the Posidonia seagrass left on the coast by waves form structures called *banquettes*. Although the main condition for their formation on land is the presence of submarine Posidonia meadows, this cause-and-effect relationship is not limited to a narrow geographical area. In other words, the Posidonia leaves deposited on the shore come from beds which can be several kilometres away from the shore at which the leaves are deposited, which is especially true for more exposed shores. Except for the presence of the Posidonia beds in the sea, important factors are also the coast orientation and its exposure to the winds which can develop great strength and duration, which create deposits. Whether the deposits will remain on the shore or not, and for how long, once again depends mostly on winds, i.e. on the exposure of the shore to the strongest waves, which lead to deposit erosion.³ Banquettes are thick Posidonia rhizome and leaf deposits, which provide an important habitat to some species of amphipod and isopod crustaceans and small polychaetes, and are classified as endangered habitats. There are not many bays with such habitats in Croatia.⁴ Dried parts of such deposits are carried

² Study of the anchorages of Split-Dalmatia County (2019)

³ Action plan of the management of coasts with Posidonia deposits in the north-western part of Dugi Otok focusing on Sakarun beach

⁴ Bakran-Petricioli T. (2007)

away by the wind to other coastal habitats (such as the prostrate spurge and the *Glaucium flavum* habitats), enriching the soil with nutrients. Besides being the habitat of many amphipod and isopod species, the network of *Posidonia* rhizomes and leaves also protects the sediment from erosion. *Posidonia* deposits also contribute to beach geomorphology due to the participation of organisms in the construction of landforms, and they are no less important than the well-known habitats such as coral reefs. They form a flexible and effective marine energy absorption system, which is one of the best forms of coastal protection and natural erosion protection (image 2).

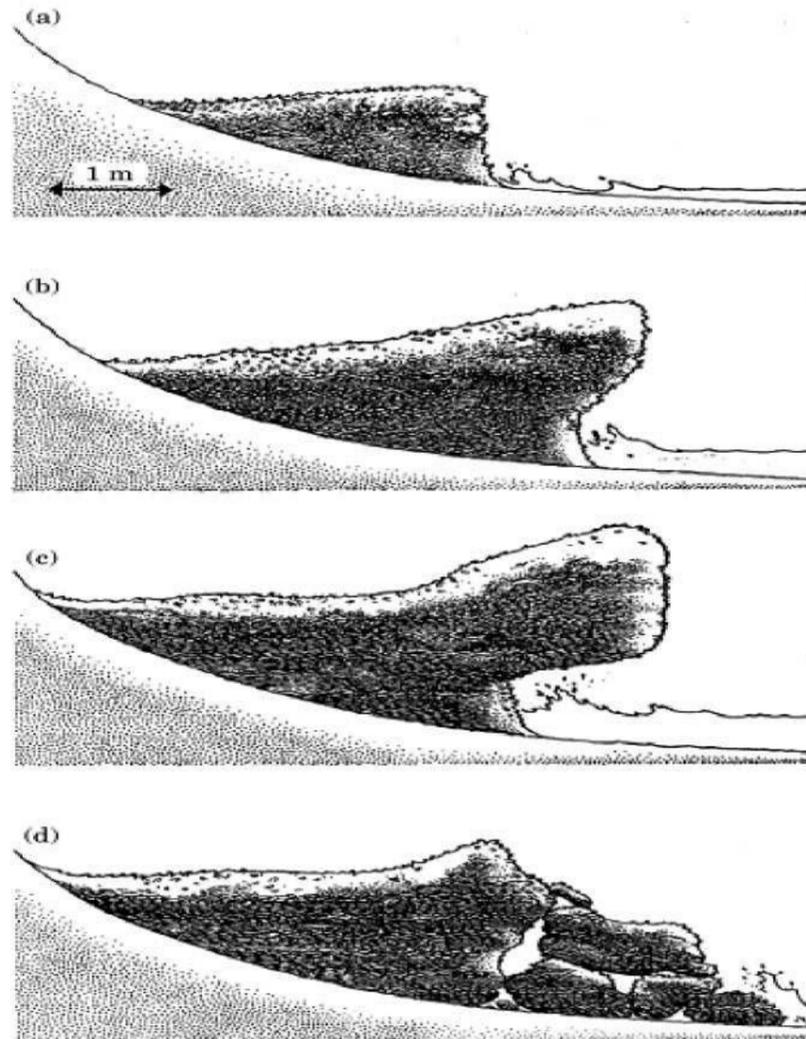


Image 2 Formation and destruction of *Posidonia* deposits (Source: Mateo et al., 2003), with marine energy absorption and prevention of beach erosion

When they are removed from the beach, the sediment within and under the deposits is also removed, which results in premature beach erosion, the destruction of nutritional soil occupied by land plants, and the disruption of the sea-land relationship in the ecosystem.

3. LEGISLATION

3.1. Legislation recognising Posidonia

The importance of the Posidonia seagrass and its protection in the Republic of Croatia is recognised in the following laws and regulations:

3.1.1. Nature Protection Act⁵

This law states that nature is preserved by conserving biodiversity, landscape diversity and geological diversity, as well as through the protection of parts of nature, and every physical and legal person is under the obligation to do so. Article 153 of the Nature Protection Act prohibits the picking, cutting, felling, excavating, collecting or destroying the individuals of strictly protected plants, fungi, lichens and algae from nature in their natural distribution range.

Additional prohibitions, such as the prohibition of mooring vessels, apply in protected areas and are regulated by Article 139 of the Nature Protection Act, which prohibits the anchoring and/or mooring of vessels outside of the areas determined by the spatial plan and the legislation of the state authority competent for inland navigation in the protected areas if said protected area is located within an inland waterway, as well as the mooring of vessels outside of the areas defined as harbours in the spatial plan if the protected area is located within the maritime domain. The Nature Protection Act also prohibits anchoring with boat anchors within protected areas.

3.1.2. Ordinance on strictly protected species⁶

Local wildlife species which are endangered, or are endemic to a narrow geographical area, or wildlife species for which such protection is determined by the European Union regulations defining the preservation of wildlife plant and animal species, or by international contracts signed by the Republic of Croatia are classified as strictly protected species.

Posidonia oceanica is listed in Annex I of the Ordinance on strictly protected species, which transposed Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora into the laws of the Republic of Croatia.⁷

FAMILY	SPECIES - scientific name	SPECIES - English name	LISTING CRITERIA	
			ENDANGERED STATUS	INTERNATIONAL CONTRACTS / EU LEGISLATION
Posidoniaceae	<i>Posidonia oceanica</i> (L.) Delile	Neptune grass	DD	BE1, BA2

This ordinance lists strictly protected species, provides detailed contents of the request for a permit for an exemption from strict conservation measures, regulates procedures regarding dead or injured individuals belonging to strictly protected species, contents, creation method and procedure of adopting a strictly protected species management plan with an action plan, additional rules for marking strictly protected animals, exemptions

⁵ Official Gazette, No 80/13, 15/18, 14/19, 127/19

⁶ Official Gazette No 144/13, 73/16

⁷ SL L 206, 22.07.1992

from the prescribed marking methods, and procedures in the case of damage or loss of the strictly protected animal's original marking.

According to Article 4, paragraph 3 of the Ordinance, all provisions apply to both dead and alive individuals of strictly protected species in all of their developmental stages (in this case – dead and discarded leaves).

3.1.3. Ordinance on the list of habitat types and habitat maps⁸

Annex I to the Ordinance lists habitat types in the Republic of Croatia where *Posidonia* leaves deposits are recognised as a separate habitat:

NHC code and name (Level I)	NHC code and name (Level II)	NHC code and name (Level III)	NHC code and name (Level IV)	NHC code and name (Level V)
F. Seashore	F.2 Sand seashore	F.2.2 Supralittoral sands	F.2.2.1 Biocenosis of supralittoral sands	F.2.2.1.5 Seagrass-meadow sedimentary facies
	F.3 Gravel seashore	F.3.2 Supralittoral gravel and stones	F.3.2.1 Biocenosis of slow-drying accumulations of marine vegetation remains on gravel	F.3.2.1.1 Biocenosis of slow-drying accumulations of marine vegetation remains
G. Sea	G.2 Mediolittoral	G.2.3 Mediolittoral gravel and stones	G.2.3.1 Biocenosis of mediolittoral coarse detritic bottoms	G.2.3.1.1 Facies with banks of dead leaves of <i>Posidonia oceanica</i> and other phanerogams
	G.3 Infralittoral	G.3.5 <i>Posidonia</i> meadows	G.3.5.1 Biocenosis of <i>Posidonia oceanica</i> meadows	G.3.5.1.3 Facies of dead 'mattes' of <i>Posidonia oceanica</i> without much epiflora

Annex II of the Ordinance in question identifies endangered and/or rare habitat types of national and European importance found in the Republic of Croatia. Those habitats include *Posidonia* meadows:

Endangered and/or rare habitats (NHC code and habitat name); each of the listed habitat types includes all habitat types of lower classification level	Listing criteria		
	NATURA	BERN - Res.4.	CROATIA
G.3.5 <i>Posidonia</i> meadows	*1120	A5.53	

Annex III of the Ordinance lists natural habitat types of importance for the European Union found in the Republic of Croatia.

Habitat type significant to the EU code	Habitat type significant to the EU name	National habitat classification (NHC) habitat type code and name
*1120	<i>Posidonia</i> meadows (<i>Posidonion oceanicae</i>)	G.3.5 <i>Posidonia</i> meadows

*priority habitat type

⁸ Official Gazette No 27/21

All of the aforementioned information leads to the conclusion that the Croatian legislative framework recognises the importance of the Posidonia seagrass in its natural habitat – seagrass meadows, but insufficiently so on land, which means that its entire ecosystem is not protected to a sufficient extent (meadows/banquettes).

3.2. Coastal zone legislation

Croatian legislation recognising the coastal zone belonging to the Posidonia ecosystem (littoral zone) is as follows:

3.2. 1. Physical Planning Act⁹

The basis of Croatian zoning legislation is the Physical Planning Act. The amendments to this Act in 2017 ensured the complete transposition of the EU Directive on maritime spatial planning into Croatian legislation. Parts of the Physical Planning Act regarding maritime spatial planning, particularly those referring to protected coastal zones, are also relevant to the subject in question, as well as the parts regulating the development and application of spatial planning documents, especially in the maritime domain areas:

Physical Planning Act
<i>»Maritime spatial planning</i> Article 49(a)
(1) Maritime area plans shall be developed as follows: <ol style="list-style-type: none">1. By the national spatial development plans2. By the spatial plan of the Ecological and Fisheries Protection Zone (hereinafter: ZERP spatial plan)3. By the spatial plan of the continental shelf of the Republic of Croatia4. By the spatial plans of national parks and nature parks which include maritime areas5. By the spatial plans of counties which include maritime areas and the spatial plans of cities and municipalities within their borders defined in accordance with special regulations and listed in the Register of Territorial Units based on special regulations governing state surveying and the real estate cadastre6. By the master plan and town-planning developments which include maritime areas.
(2) Interventions in the areas of national and local (regional) importance and on surfaces which may be planned in maritime areas shall be regulated by the provisions referred to in Article 56, paragraph 2 of this Act, and interventions and surfaces which may be planned in maritime areas by spatial plans on the local level shall be regulated by the ordinance referred to in Article 56, paragraph 3 of this Act.

⁹ Official Gazette No 153/13

Article 49(b)

(1) **When drafting and adopting spatial plans which include maritime areas, appropriate attention shall be paid to the special characteristics of the maritime area in question, significant existing and future activities, the intended use and the manner of use of the maritime areas and its impacts on the environment, as well as the safety of navigation and natural resources, taking into consideration the interaction of land and the maritime area and long-term alterations caused by climate change.**

(2) When drafting and adopting spatial plans which include maritime areas, economic, social and environmental factors shall be taken into consideration in order to support sustainable development and growth of the maritime sector, applying the approach based on ecosystems, and in order to promote mutual accommodation of significant activities, intended use and manner of use of the maritime area.

(3) When drafting and adopting spatial plans which include maritime areas, efforts should be made to contribute to the sustainable development of tourism, maritime transport, the fisheries and mariculture sectors, and the energy sector in the maritime area, unless otherwise provided by this Act, as well as the conservation, protection and improvement of the environment and nature, including its resilience to the effects of climate change, and also the protection and conservation of cultural goods.

Article 49(c)

In order to achieve the objectives referred to in Article 49(b) of this Act, spatial plans which include the maritime area shall be used to analyse the spatial and temporal distribution of existing and future significant activities, the intended use and the manner of use of the maritime area, **taking into consideration their interaction.**

GOOD PRACTICE EXAMPLES:

As the expert background for the amendments and the adoption of the new Split-Dalmatia County spatial plan, a STUDY OF ANCHORAGES has been conducted¹⁰ based on navigation and meteorological characteristics, as well as technical, technological, transportation and maritime transportation characteristics, maritime safety measures, **the habitat map of the Natura 2000 ecological network**, the list of recorded strictly protected species, technical and technological anchoring methods and anchorage organisation. The study determines the spatial extent of the concession field of special function ports – anchorages, and the conditions that must be met by the investor in order to get the necessary permits and authorisations.

Considering that more than 73% of the locations included in the study are located within the Natura 2000 ecological network area, special emphasis should be put on the use of the technical and technological solutions of ecologically sustainable anchorages adapted to different habitats within the Natura 2000 ecological network when creating type solutions for the anchorages in the Spatial Plan, i.e. during the creation of conceptual designs by investors. Repeated anchoring in nautical destinations damages the submarine landscape more than the durable ecologically acceptable anchoring systems recommended by this Study to be used when creating type solutions for anchorages.

Also, having in mind the reality of climate change and its consequences on the coastal zone, such as the sea level rise and common flooding in coastal areas endangering the low waterfront, which represents the land part of the maritime domain, when creating/improving the maritime domain management mechanisms, it is especially important to take into consideration climate change accommodation measures.

¹⁰ Study of the anchorages of Split-Dalmatia County (2019)

 **RECOMMENDATIONS:**

Locations in which anchoring is permitted in the spatial plan must be determined based on the study defining the spatial extent of the concession field of the special function port – anchorage and investor conditions, which will be a condition for adopting/amending the new spatial plan.

Improving the methodology of spatial planning by taking into consideration climate change accommodation and its integration into spatial plans.

3.2.1.2. Spatial planning of areas with special features (protected areas)

Spatial plans of areas with special features must be created for national parks and nature parks according to the legislation on physical planning and nature conservation, as well as for the areas determined by the Spatial Development Strategy of the Republic of Croatia, or the County Spatial Plan. In Croatia, those spatial plans were adopted for all national parks and nature parks, as well as two significant landscapes.

Physical Planning Act

Spatial planning of areas with special features: contents

Article 69

(1) The spatial plan of an area with special features, depending on common natural, cultural-historical and landscape values or other features, shall include the following:

- Basic organisation and demarcation of the space by intended use,
- The distribution of functions of importance for area management,
- Public and other infrastructure systems,
- The measures for use, development and protection of that area with priority activities,
- Measures of improvement and conservation of nature, landscape values and the environment, cultural goods and other values in the area,
- The conditions of construction for interventions in the area for areas for which a more detailed spatial plan is not required,
- The obligation and the scope of the draft and the guidelines and indicators for the elements of more detailed spatial plans for smaller areas.

(2) The spatial plan from paragraph 1 of this Article shall be adopted for national parks and nature parks, as well as the areas defined by the Strategy or the county spatial plan.

GOOD PRACTICE EXAMPLES:

Spatial plan of the special features area of the significant landscape Lower Kamenjak and the Medulin Archipelago

Spatial plan of the special features area of the significant landscape Žut-Sit Archipelago



RECOMMENDATIONS:

Adopt spatial plans for areas with special features for all protected maritime areas in order to protect the entire Posidonia ecosystem more thoroughly and in accordance with professional standards through measures of use, development and protection of these areas with priority activities.

When planning anchorage locations in protected maritime areas and Natura 2000 sites, one of the conditions should be to conduct a study which will define the spatial extent of the concession field of the special function port – anchorage and investor conditions.

Promoting the construction of eco-friendly permanent anchorages.

The approach to maritime spatial planning must include planning with the ecosystem in mind and managing human activity which impacts the marine environment in an integral way, promoting conservation and sustainable use.

3.2. 2. Maritime Domain (maritime common good) and Seaports Act¹¹

The maritime domain management system is of great importance for the conservation and sustainable use of the marine environment and coastal area, which includes the Posidonia ecosystem. This Act defines the maritime domain as a common good of particular interest for the Republic of Croatia which is under its special protection. Neither ownership nor any other rights in rem over the maritime domain can be acquired. The maritime common good falls outside of the domain of the legal transactions and the state has no ownership authority over it. The maritime common good comprises the internal waters and the territorial sea, its floor and underground areas, as well as the part of the land intended for general purpose by its nature, or having been declared as such, and everything permanently connected to this part of the land on its surface or under it. For this purpose, the term “part of land” can denote the **seashore**, harbours, embankments, sandbanks, islets, reefs, **beaches**, river mouths of the rivers flowing into the sea, channels connected to the sea, and all animate and inanimate **natural resources** in the sea and under the sea floor.¹²

Beaches, as one of the key maritime domain elements, albeit mentioned, are neglected and marginalised, which affects decision-making and conduct in management, protection and beach planning practices. A new draft of the Act is in the making and should eliminate this shortcoming to a substantial extent.

According to the Act, the land area of the maritime domain stretches to the “line reached by the biggest waves during a storm, as well as the part of the land which is by its nature and purpose intended for the use of the sea, and which is at least 6 metres wide measuring

¹¹ Official Gazette No 158/03, 38/09, 141/06, 56/16, 98/19

¹² Article 3 of the Act, Official Gazette No 158/03, 100/04, 123/11, 141/06, 38/09

horizontally from the line of the mean high water level.

Because of this definition, as well as the institutional and administrative framework of the Republic of Croatia, determining the borders of the maritime common good is a very complicated, slow and expensive process, so a border is yet to be determined for a significant part of the seashore. Moreover, the number of entities having a certain amount of authority over the maritime domain is substantial, and their relationships are unclear. This significantly aggravates the management of the maritime domain and it is necessary to adopt a clearer and simpler division of competence in this area.

To establish an optimal maritime domain management system, the focus should be on reaching full integration of the maritime domain management systems into one coastal zone management system. With regard to the given subject, this can be achieved by allocating the authority over the maritime domain in protected maritime areas to public institutions managing the protected area in question, since this Act, as well as the associated institutional framework, is highly important for the definition of obligations and responsibilities related to the conservation of the posidonia ecosystem (littoral zone).



RECOMMENDATIONS:

Define a clearer and simpler division of competence in the maritime domain area.

Allocate authority over the maritime domain in protected maritime areas and the Natura 2000 sites to public institutions responsible for the given protected area.

3.2.2.1. Concessions and concessionary approval

The *Maritime Domain Act* makes a clear distinction between the terms “concession” and “concessionary approval” in its introductory part, in Article 2, when providing definitions of certain expressions used in the legal text. In item 5 of the aforementioned Article, **concession** is defined as a right which partially or completely exempts a part of the maritime domain from general use, and the right to its special or economic use is given to physical or legal persons, in accordance with spatial plans. In the same Article, in item 6, the Act defines **concessionary approval** as an act on the basis of which physical and legal persons are given the right to use the maritime domain in order to perform activities which do not preclude nor limit the use of the maritime domain for general purposes. Both institutions enable the maritime domain to be used for certain activities. Concession partly or completely excludes the general use of the maritime domain, while concessionary approval does not exclude it, nor limit it. Furthermore, a concession is given for special and economic purposes, while concessionary approval is given for maritime domain utilisation. The final difference between these terms is that a concession is given in accordance with the spatial planning documentation, whereas this

documentation is not necessary in order to obtain a concessionary approval. This is understandable when taking into consideration the type and the nature of activities for which a concessionary approval is given; further articles of the Act prescribe the grantor of the concession in protected areas:

Maritime Domain and Seaports Act
Article 7
A concession may be given to physical and legal persons for special or economic utilisation of a part of the maritime domain in accordance with the procedure laid down in the Act. A concessional approval may be given to physical and legal persons for the conduct of activities which do not preclude or limit the general use of the maritime domain. Special or economic use of the maritime domain may be permitted in accordance with the regulation on environmental and nature protection.
Article 19
Special utilisation of the maritime domain: Only the Republic of Croatia shall grant concessions for economic use of the maritime domain in national parks, and in other protected natural areas, concession is granted by the competent authority referred to in Article 20 of this Act¹³, after obtaining the consent of the ministry responsible for nature protection. Legal persons managing national parks, strict nature reserves, or special reserves may be given the right to special use of the maritime domain by a special decision of the government of the Republic of Croatia.

There are two more bylaws which regulate the granting of concessions and concessionary approvals in the maritime domain in more detail:

1. Regulation on granting concessions in the maritime domain¹⁴
2. Regulation on granting concessionary approval in the maritime domain¹⁵

Regulation on granting concessions in the maritime domain
III. PROCEDURE OF GRANTING A SPECIAL-PURPOSE CONCESSION IN THE MARITIME DOMAIN
Article 24
The government of the Republic of Croatia shall grant special-purpose concessions in the maritime domain for a maximum period of up to 99 years for structures of national importance, and preliminary procedures shall be conducted by the Ministry of the Sea, Tourism, Transport and Development. The county authority shall grant special-purpose concessions in the maritime domain for the maximum period of up to 20 years for structures of county importance, and the preliminary procedure shall be conducted by the competent county authority. The municipality or the city council shall grant special-purpose concessions in the maritime domain for the maximum period of up to 20 years for structures of local importance, and the preliminary procedure shall be conducted by the competent municipality or city authority.
Article 25
A special-purpose concession shall be granted on the basis of a written application submitted to the competent authority for the concession procedure referred to in Article 24 of this Regulation.

The regulation defines granting concessions in the maritime part of the Posidonia ecosystem, i.e. where nautical **anchorages** are most commonly located. The anchorages are often located within the seagrass distribution range because boaters and seagrass

¹³ The County Assembly, the City Council, and the Municipal Council

¹⁴ Official Gazette No 23/04, 101/04, 39/06, 63/08, 125/10, 102/11 and 83/12

¹⁵ Official Gazette No 36/04, 63/08, 133/13 and 63/14.

favour similar habitats – shallower areas with more moderate water movement and wave impact.¹⁶ Croatia has a great number of potential anchorages and refuges due to its indented coastline. Uncontrolled planning and granting concessions for nautical anchorages in particular can have a negative impact not only on the natural environment but also on nautical tourism as a whole. Those special function ports – anchorages refer to the construction (installation) and economic utilisation of the permanent anchoring system based on a concession granted by the County Assembly. This part of the maritime domain is partly or completely exempt from general use, and the right to its special or economic utilisation is granted to physical and legal persons at their request. The development of those anchorages can either protect, or destroy target Natura 2000 network habitats, depending on whether they are directly connected to and necessary for area management with the purpose of nature conservation, or their main goal is profit. When it comes to permanent anchorages, countless examples in practice show that such interventions in nautical destinations can serve as a maritime habitat protection measure against repeated anchoring, especially regarding priority Posidonia meadows, with the application of certain technical-technological anchoring systems.¹⁷

GOOD PRACTICE EXAMPLES:

On 24 January 2018, the government of the Republic of Croatia granted the “Kornati National Park” Public Institution the special-purpose concession of the maritime domain for the period of 20 years for the purpose of installing and utilising an anchoring system at Kornati National Park.

The total area of the maritime domain in concession is 415,358.79 m² and includes 223 anchorages with the annual concession fee of HRK 1.00 per square metre of the occupied maritime domain area, i.e. HRK 415,358.79 per year.



RECOMMENDATIONS:

Enable granting special-purpose concessions of the maritime domain (anchorages), if possible free of charge, to public institutions governing protected maritime areas and/or Natura 2000 sites with target Posidonia habitats.

If the public institution itself lacks the capacity for the implementation of the special-purpose concession of the maritime domain, another (simpler) way in which Posidonia ecosystem conservation could be supported is to earmark a portion of the proceeds from concessions and concessionary approvals in the protected areas / Natura 2000 sites within the maritime domain for the public institution, because at the moment the proceeds are not allocated to the authorities which are, according to the *Nature Protection*

¹⁶ Demers, M.A., Davis, A.R. & Knott, N.A. (2013)

¹⁷ Study of the anchorages of Split-Dalmatia County (2019)

Act, competent for managing such areas. The act prescribes that such revenues be divided between the local government units, the county, and the country in the following way:

Maritime Domain and Seaports Act
Article 12
Maritime domain management resources shall be as follows:
1. Proceeds from concession and concessionary approval fees.
2.
Article 13
The contracted concession fee shall be paid in the following way:
- One third to the state budget,
- One third to the county budget,
- And one third to the city or the municipality budget.
The resources referred to in Article 12, paragraph 1, item 2 of this Act shall be the proceeds of the county budget, and resources from paragraph 1, item 3 shall be the proceeds of the state budget.
The proceeds from concessionary approval fees shall go towards the city/municipal budget.

Public institutions managing maritime protected areas, and especially county public institutions which manage a great number of Natura 2000 sites as well, lack financial and human resources so they are not able to fulfil their basic obligations in a professional manner. It is necessary to find a way to finance the conservation of the ecological network areas. One possible way would be to grant a portion of the proceeds from concession and concessionary approval fees to the public institution managing the protected area or the ecological network area in question.

 **RECOMMENDATIONS:**

Amend the Maritime Domain and Seaports Act so that a portion of the proceeds from the concession and concessionary approval fees, if said concessions and concessionary approvals are granted in protected areas or Natura 2000 sites, is given in a certain amount to public institutions managing those areas.

Granting concessionary approvals in protected areas is also regulated by the *Ordinance on concessionary approvals in protected areas*,¹⁸ but it will not be discussed in this document, since, according to Article 1, paragraph 4 of the ordinance, concessionary approval may not be granted within the maritime domain because it is covered by the aforementioned acts and regulations.

According to the *Regulation on granting concessionary approval in the maritime domain*, regular maritime domain management includes the following: care for the protection and maintenance of the maritime domain in general use, which is done in accordance with the *Maritime domain management plan* which this falls under the responsibility of local government units (cities/municipalities). This plan also defines the list of activities which may be performed and the exact location where concessionary approval can be given. If a concessionary approval request is submitted for a location within the maritime domain of great natural value and under special protection, the Council must first obtain a

¹⁸ Official Gazette 9/2021

Preliminary consent of the ministry responsible for nature conservation in order to grant the approval according to Article 8, paragraph 6 of the Regulation.

Regulation on granting concessionary approval in the maritime domain

Article 8

When dealing with requests, the Council shall determine if the request is in compliance with the annual maritime domain management plan referred to in Article 5, paragraph 1 of this Regulation.

The Council shall request, ex officio, the consent of the competent Harbour Master's Office regarding the safety of navigation for activities using resources specified in the Single List of Activities on the Maritime Domain.

If the Council determines that the request does not comply with the annual maritime domain management plan referred to in Article 5, paragraph 1 of this Regulation, or if the Harbour Master's Office does not provide consent referred to in paragraph 2 of this Article, the Council shall reject the request for concessionary approval.

By way of derogation, if the approval is granted for a period longer than 1 (one) calendar year, and the activity in question requires a microlocation within the maritime domain, the Council shall first obtain a special certificate of the competent county authority which confirms that the concession procedure will not be initiated during the concessionary approval period.

The applicant shall be required by the Council to pay a determined amount as a concessionary approval fee, if the Council deems their request to be in compliance with the annual maritime domain management plan, according to paragraph 1 of this Article, and if the competent Harbour Master's Office issues the consent referred to in paragraph 2 of this Article, and, in the case defined in paragraph 4 of this Article, after receiving special authorisation from the competent county authority.

If the concessionary approval request refers to specially protected locations of natural value in the maritime domain, the Council may grant the approval having obtained the consent of the ministry responsible for nature conservation.

According to the aforementioned article, the Ministry may, but is not required to, seek an opinion from the public institution managing the protected area where concessionary approval is requested. It is hereby clear that public institutions for nature conservation managing the areas in question are not parties in the concessionary approval granting procedure. The competent bodies consult them only if needed.



RECOMMENDATIONS:

Prescribe by law that the opinion of the institution managing the maritime protected area or the Natura 2000 sites is obligatory during the concessionary approval granting procedures in the areas the institution manages.

The Maritime Code is also an important law with regard to the Posidonia ecosystem.

3.2.3. Maritime Code¹⁹

The Maritime Code, among else, prescribes measures for pollution prevention, as well as procedures in the case that pollution occurs.

Article 24

(1) The Minister may within the internal waters and in the territorial sea of the Republic of Croatia determine and prescribe compulsory navigable waterways or traffic separation schemes, vessel communication systems as well as the procedure for managing maritime traffic for reasons of safety of navigation for all or for certain kinds of waterborne craft.

(2) For the purposes of safety of navigation, protection of the sea from pollution, **preventing the endangerment of biological and landscape diversity**, as well as to decrease the danger of more serious maritime accidents, the Minister may ban navigation in certain parts of the internal waters or the territorial sea, either for vessels of certain type or size or for vessels transporting certain types of cargo

(3) The navigable waterways and traffic separation schemes referred to in paragraph 1 of this Article **shall be established in the specially protected nature areas with the consent of the ministry in charge of environmental protection.**

(4) Waterways, traffic separation schemes and ship reporting systems referred to in paragraph 1 of this Article shall be indicated in the official navigational charts published by the Hydrographic Institute of the Republic of Croatia and published in the "Notice to Mariners".



RECOMMENDATIONS:

Determine traffic separation schemes in bigger areas where Posidonia meadows have already been recognised as endangered, or there is a real risk of this happening.

Article 49(b)

(5) It is prohibited to release or discard solid or liquid waste, oily water, faeces, or cargo residue from crafts, as well as all other substances which pollute the sea, air or the coast into the sea or onto the seashore.

Article 56(a)

(6) **Seaport authorities and concession holders of special-purpose ports shall ensure the provision of adequate reception facilities and equipment in ports and devices for handling and receiving solid and liquid waste**, cargo residues from crafts, oily waters and faeces as defined by the MARPOL Convention provisions 73/78, as amended.

(7) Seaport authorities and concession holders of special-purpose ports shall adopt and implement a Plan for Receiving and Handling Waste and Cargo Residues **and ensure the reception and collecting of waste from crafts** for each type of waste, cargo residue and rubbish category separately in compliance with the provisions of the MARPOL Convention 73/78, as amended.

Article 1013

Legal persons acting contrary to Articles 56 and 56(a) shall be fined with a HRK 5,000.00 to 100,000.00 fine for a maritime offence.

In order to prevent waste and faeces from being discarded anywhere into the sea, the Maritime Code determines that all ports must be appropriately equipped for their reception and prescribes penalties for failure to do so. Although the Maritime Code resolves this problem well and prescribes fines in case of non-compliance, in practice it

¹⁹ Official Gazette No 181/04, 76/07, 146/08, 61/11, 56/13

is not always implemented due to insufficient control.

 **RECOMMENDATIONS:**

Develop the capacities of competent authorities (governing authorities, maritime administration, inspectorate, maritime police force) for the purpose of efficient supervision and control of maritime activities.

Increase supervision and inspections in order to control the pollution caused by the discharge of waste from ships over Posidonia meadows.

3.2.4. Marine Fisheries Act²⁰

This Act prescribes fines if seines are towed over Posidonia meadows.

Article 85

(1) Legal persons shall be fined with a HRK 5000.00 to 30,000.00 fine for an offence in the following cases:

1. If they **perform fishing activities** with trawls, dredges, purse seines, seines, shore seines or similar nets **over the sea floor covered in seagrass, in particular *Posidonia oceanica*** or other marine spermatophytes contrary to Article 4, paragraph 1 of the Council Regulation (EC) No 1967/2006.

Even though the law prescribes fines for trawling nets over Posidonia meadows, this is difficult to control due to the insufficient financial and human resources of the competent authorities.

 **RECOMMENDATIONS:**

Develop the capacities of competent authorities (governing authorities, fisheries inspectorate, maritime police force) for the purpose of efficient supervision and control of fishing activities.

Except for the aforementioned acts and regulations, there are two more acts concerning the littoral zone important for the conservation of the posidonia ecosystem:

3.2. 5. Regulation on the development and protection of the protected coastal marine area

The protected coastal zone is the area which encompasses all islands, the land area up until 1000 m from the coastline, and the marine area up until 300 m from the coastline²¹

Article 3 of the Regulation prescribes that the planning and development of the protected coastal zones are based on the following planning guidelines, of which we single out the following:

²⁰ Official Gazette No 81/13, 14/14 and 152/14

²¹ Official Gazette No 128/2004

- **conserving the natural**, cultural, historical and traditional **values of the coastal** landscape,
- **ensuring the implementation of environmental protection measures on land and the sea**,
- planning the integral development and **protection based on criteria of conservation of natural values and integrity of individual morphological units**,
- **recovery** of valuable and endangered areas of natural, cultural and historical heritage,
- **conservation of natural beaches** and forests, as well as promoting natural forest recovery and other indigenous vegetation.

Article 3

Planning and development of protected coastal zones shall be based on the following planning guidelines: - conserving the natural, cultural, historical and traditional values of the coastal landscape, - **ensuring the implementation of environmental protection measures on land and the sea**, and especially drinking water resources, **planning the integral development and protection based on criteria of conservation of natural values and integrity of individual morphological units**,

- **recovery of valuable and endangered areas of natural**, cultural and historical heritage,
- ensuring free access to the coast and passage along the coastline, as well as public interest in utilisation, especially with regard to the maritime domain,
- conservation on uninhabited islands and islets with natural and cultivated landscapes, primarily those used for agricultural activities, recreational use, organised visits and exploration, without construction area planning,
- **conservation of natural beaches** and forests, as well as promoting natural forest recovery and other indigenous vegetation,
- not planning new construction areas in towns and cities, or connecting existing ones,
- limiting construction in the areas without buildings of existing construction areas of towns and cities and separate construction areas (outside of towns and cities) by the seashore or watercourse mouths, except for the purposes directly related to the sea, seashore and watercourses,
- limiting the construction of industrial and energy buildings in order to protect and conserve valuable spatial features, - defining conditions for the development of transport and municipal infrastructure in order to protect and conserve valuable landscape features, - planning the construction of residential, business and other buildings in a way which respects the existing valuable objects and features of the landscape by the means of their intended use, position, size and shape,
- recovery of existing exploitation fields of mineral resources and industrial areas, primarily by the means of landscape reclamation, or by planning tourist or recreational use objects.

3.2.6. Integrated Coastal Zone Management (ICZM)

The coastal zone is shaped by the mutual action of land, sea and atmosphere, which makes it dynamic and susceptible to change. Integrated Coastal Zone Management is a dynamic process of sustainable management and use of coastal zones, which at the same time takes into consideration the fragility of coastal ecosystems and landscapes, the diversity of activities and utilisation possibilities, their mutual action, the maritime focus of certain activities and utilisation possibilities, and their impact on sea and land parts of the area.

The document which recognises the need for integrated coastal zone management is the *Protocol on Integrated Coastal Zone Management in the Mediterranean*. Within the framework of the Mediterranean action plan of the United Nations Environment Programme (UNEP/MAP), the contracting parties of the Barcelona convention signed the

Protocol in Madrid in 2008, which came into force in March 2011. The aim of the Protocol was to establish a common framework of integrated coastal zone management in the Mediterranean and to undertake necessary measures in order to strengthen international cooperation. The Republic of Croatia ratified the Protocol in 2012 by adopting the **Act on the Ratification of the Protocol on Integrated Coastal Zone Management in the Mediterranean**.²² One of the countries' obligations is to draft national ICZM strategies. With this in mind, Croatia started the drafting of this strategy, which will, along with the "marine strategy", which is drafted pursuant to the Environmental Protection Act, be integrated into the Strategy for the Management of the Marine Environment and the coastal zone.

The Protocol sets the legal framework for integrated coastal zone management as well. By adopting the Act on the Ratification of the Protocol, the Republic of Croatia also defined the land scope of the coastal zone, as well as all local administrative areas that border the sea. On the sea, the scope is defined by the territorial sea border.

Even though ICZM is a good tool for the conservation of coastal ecosystems, the existing Croatian legislation does not provide for the drafting of coastal management plans which would in our case include the entire Posidonia ecosystem. The Republic of Croatia signed and ratified the aforementioned Protocol which provides for the drafting of such plans, but their implementation is not legislative. ICZM provides plans which provide guidelines and recommendations which can be integrated into other plans, such as, for example, county spatial plans, municipal plans, etc.

²² Official Gazette No 8/12

4. PROTECTED AREAS AND NATURA 2000 SITES IN THE REPUBLIC OF CROATIA

A protected area is a geographically clearly defined area with the intended purpose of nature protection, which is managed for the purpose of long-term conservation of nature and other accompanying ecological services. It is defined by the Nature Protection Act,²³ which is at the same time the basic legal act used to prescribe regulations on the protection of natural values in the Republic of Croatia. Activities of nature protection in Croatia include preserving biodiversity, geodiversity and landscape diversity, and by protecting parts of nature, which include the following:

1. protected areas,
2. protected species,
3. protected minerals and fossils.

4.1 Protected areas in the Republic of Croatia

The Croatian law on nature protection recognises nine different protection categories depending on basic values intended to be preserved. They include the following:

- | | | |
|----------------------------------|---|-----------------------------|
| 1. strict nature reserve | } | area of national importance |
| 2. national park | | |
| 3. special reserve | | |
| 4. nature park | | |
| 5. regional park | } | area of local importance |
| 6. natural monument | | |
| 7. significant landscape | | |
| 8. forest park | | |
| 9. monument of park architecture | | |

National parks and nature parks are managed by public institutions within the competence of the ministry responsible for nature protection (currently The Ministry of Economy and Sustainable Development), and other areas are managed by county public institutions in the county territory.

There is a total of 410 protected areas in Croatia²⁴ (image 3), with 17 including the coastal zone and the sea. They include three national parks: Brijuni, Kornati, and Mljet, and two nature parks: Telašćica and Lastovo Islands, two marine special reserves: Mali Ston Bay and Malo More as well as Lim Bay; four special reserves: botanical – Prvić island with coastal waters and Grgur Channel, ornithological – the south-eastern part of the Neretva River Delta, Pantan by Trogir, palaeontological – Datule and Barbariga; three significant landscapes: Luka Channel (by Šibenik), Žut-Sit Archipelago, Zavrtnica; two geomorphological natural monuments: the Blue Grotto and the Medvidina Špilja cave on Biševo. These areas encompass a total of 604 km²²⁵

²³ Official Gazette No 80/13, 15/18, 14/19, 127/19

²⁴ www.bioportal.hr

²⁵ Priručnik za zaštitu mora i prepoznavanje živog svijeta Jadrana (*Handbook for Marine protection and identification of Adriatic Marine Species*) PRVAN, M., JAKL, Z.

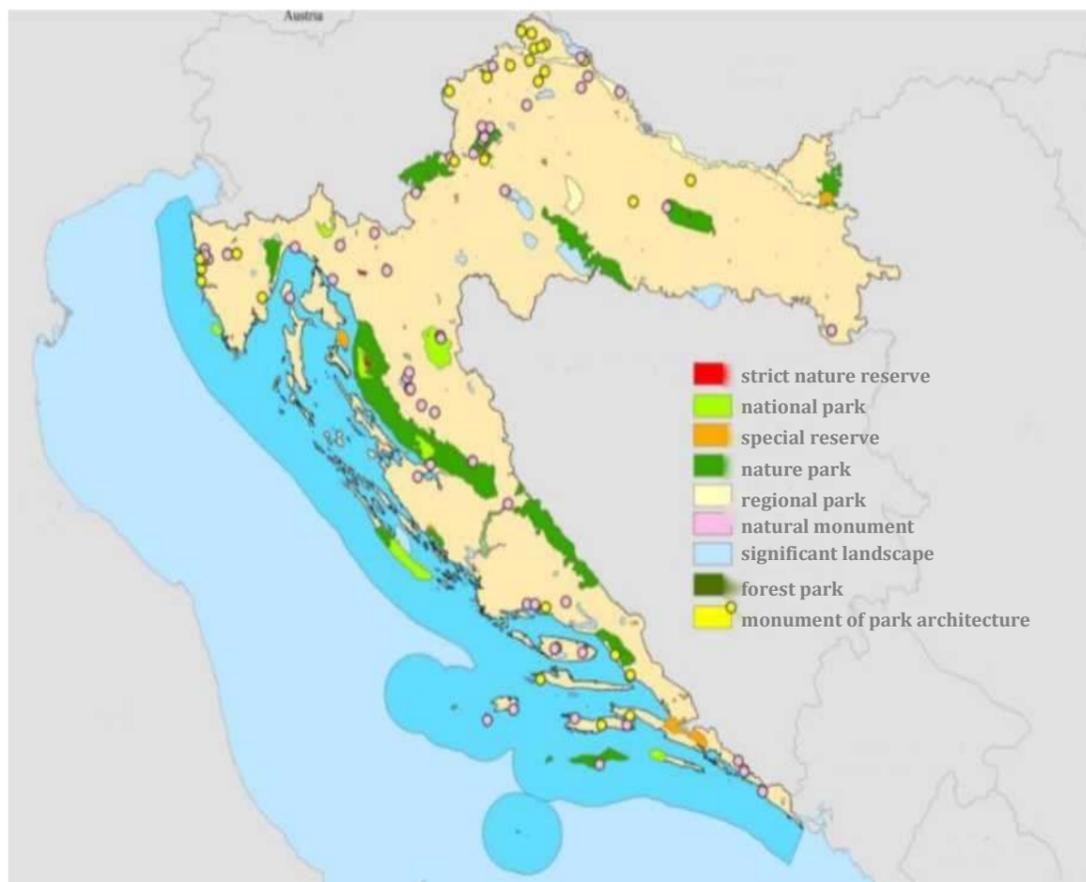


Image 2 Representation of protected areas in the Republic of Croatia (Source: Database, MINESED, 2022)

Since those areas are protected, any interventions on the land or in the sea require permission under nature protection conditions from the competent authority. The competent authority in protected areas of national importance (strict and special reserve, national park and nature park) is not the institution which manages the protected area in question, instead, the permission is issued by MINESED, and for protected areas of local importance, the competent authority is the competent county department.

Beaches are specific because they are protected as significant parts of nature due to their extraordinary valuable natural characteristics. For example, such beaches are Sakarun (Dugi Otok island), Saprunara (Mljet island), and Prapratna (Pelješac island – significant landscapes), Stiniva and Zlatni Rat – natural monuments, the Neretva River Delta – ichthyological and ornithological reserve, etc. The county PIs manage those beaches (except for Saprunara, which is managed by Mljet National Park as of 2018). However, those institutions most commonly lack financial and human resources and they cannot implement the measures necessary for the management of such nature parts in their entirety. There is also the aforementioned problem of competence overlapping when it comes to the management of beach areas which are a part of the maritime domain. This results in a situation where public institutions are responsible for such areas, but they are not the competent authority.

One of the ways to protect and preserve nature would certainly be to implement surveillance carried out by the **wildlife officers** of the public institution managing the protected area. Without them the nature protection system would not be complete, because they carry out direct surveillance as authorised by the *Nature Protection Act* and the *Ordinance on the manner of work and conduct of wildlife officers*.²⁶ The challenges often encountered by the public institutions managing the areas include insufficient legislative framework regarding the procedure, and lack of clear instructions and authority necessary for efficient wildlife officers' conduct, especially in the Natura 2000 sites. Although the Act and the Ordinance in question prescribe certain competence and conduct of wildlife officers, they are not wide nor restrictive enough to ensure efficient protection. One of the ways would be to create institutional and material conditions for wildlife officers within the framework of the police, but such systemic changes are quite challenging.



RECOMMENDATIONS:

Include provisions for cases of non-compliance with the management plans as infringement in the Nature Protection Act.

Develop the capacities and the authority of wildlife officers for the purposes of efficient supervision and control of activities in protected areas and Natura 2000 sites.

²⁶ Official Gazette No 35/2021

4.2 Ecological network of the Republic of Croatia

The ecological network (Natura 2000 sites) of the Republic of Croatia was defined by the *Regulation on the ecological network and the competence of public institutions for the management of ecological network areas*²⁷; it encompasses 36.67 % of the land territory and 16,26 % of the coastal sea (image 4).²⁸

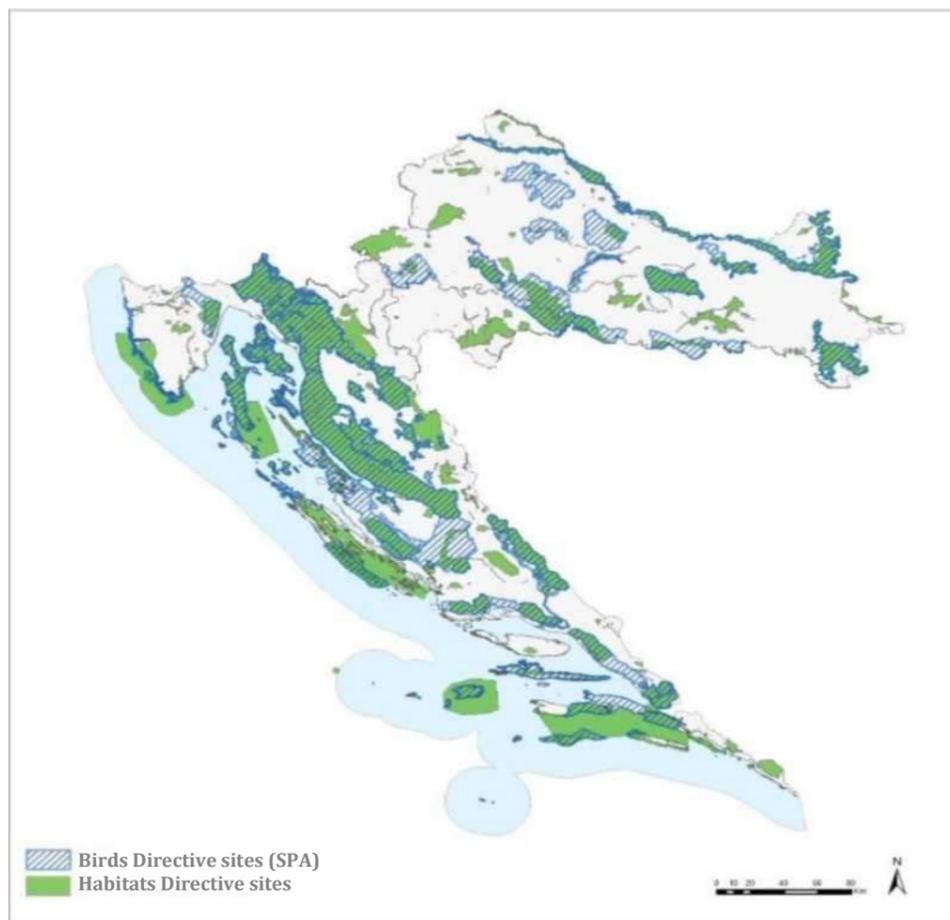


Image 4 Natura 2000 sites in Croatia (Source: Database, MINESED, 2022)

Even though social and economic activities are not prohibited in the Natura 2000 sites, EU member states must guarantee that the condition of the area will not worsen and that they will undertake all conservation measures necessary to conserve the protected species and habitats in good condition, or to return them to such condition.

According to the Nature Protection Act and the Regulation, the competent authorities for the management of the Natura 2000 sites are the public institutions responsible for the management of national parks and natural parks, as well as institutions managing other protected areas and/or other protected parts of nature founded by counties / local government units.

Management includes the adoption of a **management plan** which defines the

²⁷ Official Gazette No 80/19

²⁸ <http://www.haop.hr/hr/tematska-podrucja/odrzivo-koristenje-prirodnih-dobara-i-ekoloska-mreza/ekoloska-mreza>

conservation goals, activities implemented to achieve management goals and efficient management indicators. The basic method of Natura 2000 sites management is implementing conservation measures for target species and habitat types, which are integrated into the management plan, as well as sector plans of natural resources management. In accordance with the provisions of Directive 92/43/EEC on habitats, the European Union members must adopt conservation goals and measures for such areas within six years in order to ensure the favourable conservation status of target species and habitat types in the Natura 2000 sites, as well as to preserve its integrity. This important six-year deadline for Croatia ended on December 4 2020. Croatia adopted conservation goals and measures in conservation areas important for birds, but for species and habitat types which include Posidonia meadows, ordinances are yet to be adopted.

The EU project “Development of management framework for the Natura 2000 sites” is currently being implemented in Croatia, with the aim of drafting management plans for 40 % of the Natura 2000 sites. The project beneficiary is MINESED, Department for Nature Conservation, the project partner is the State Institute for Nature Protection, while public institutions are collaborators on the project.



RECOMMENDATIONS:

Include conservation measures for the entire Posidonia ecosystem (littoral zone) in the conservation measures related to 1120 Posidonia beds, which form a constituent part of the Ordinance on conservation goals and measures.

Another bylaw resulting from the Regulation is the **Regulation on assessment of the acceptability for the ecological network**, according to which all interventions (as well as plans and programmes) conducted on the Natura 2000 sites, and thus in the sea as well, which by themselves or in combination with other interventions may have a negative impact on the conservation goal and the Natura 2000 ecological network integrity, must undergo an acceptability assessment procedure for the ecological network. In this procedure, a competent authority assesses if the negative impact on the Natura 2000 ecological network can be prevented. If it can, the intervention may continue with the regular permission obtaining procedure. If it is not possible, the investor must conduct a Study on the assessment of the acceptability of the intervention for the ecological network (a constituent part of the Main Assessment Application) in which the possible adverse effects will be analysed more thoroughly and the investor will try to find alternative solutions and protection measures which may alleviate the effects. The Study on the assessment of the acceptability of the intervention for the Natura 2000 ecological network will be assessed by the Department for Nature Conservation at the State Institute for Nature Protection, however, the competent authority alone makes the decision if such an intervention is acceptable for the ecological network, i.e. a positive opinion of the Institute is non-binding for the competent authority when making a decision. It is

important to highlight that during the acceptability assessment procedure for the Natura 2000 ecological network not only the impact of a single intervention of anchorage installation is assessed, but the cumulative impact of all operations which can affect an ecological network site. The possibility of a significant adverse effect can only be determined by implementing the acceptability assessment procedure for the ecological network.

The intervention within the Natura 2000 sites which must be most thoroughly discussed in this document is the construction of anchorages (special-purpose ports) because it has the greatest impact on Posidonia meadows.

4.2.1. Anchorages in protected areas and Natura 2000 sites

Marine (and land) protected areas attract tourists, and especially boaters, due to their natural, aesthetic and cultural attractions. The Posidonia ecosystem (the littoral zone) is the most endangered in the locations directly susceptible to human activities, such as:

- anchoring
- excessive and unsustainable tourism
- congestion and increased opacity due to construction material for backfilling and construction of structures on the coast
- eutrophication and other pollution types
- illegal fishing activities using bottom-trawling equipment
- invasive species distribution
- presence of rubbish and large waste, sea pollution (plastic bags, styrofoam)
- temperature changes (e.g. temperature increase and extreme events) ²⁹

This document does not address the solution to all of the threats to the Posidonia ecosystem, rather, it focuses on the priority threats which can be alleviated by these recommendations – anchoring and beach activities which include alluvium. From the position of the regulatory framework, for the purposes of sustainable tourism, it is necessary to consider the issuing of nautical permits with a daily maximum according to the load capacity of the area and the prohibition of free anchoring with provided alternatives, i.e. eco-friendly anchorages.

In the context of sea conservation, we can distinguish two anchorage categories: temporary and permanent. Permanent anchorages refer to special-purpose ports – anchorages which cannot be moved simply and quickly. Temporary anchorages mostly refer to boat anchors, which have a significant impact on Posidonia meadows; therefore, they are often emphasised as the cause of meadow condition deterioration. Experiments on anchor impacts on seagrass meadows have shown that during one anchoring manoeuvre 34 shoots are destroyed, especially if population density is low and if rhizomes are greatly denuded.³⁰ There are many examples in practice which prove that permanent eco-friendly anchorage systems protect the sea floor from devastation resulting from repeated boat anchoring, and it is, therefore, necessary to install permanent, eco-friendly anchorages where possible. Total prohibition of anchoring is

²⁹ Study of the anchorages of Split-Dalmatia County (2019)

³⁰ Francour, P., Ganteaume, A., Poulain, M. (1999) Effects of boat anchoring in Posidonia oceanica seagrass beds in the Port-Cros National Park (north-west Mediterranean Sea). Aquatic Conservation 9, 391-400.

difficult to implement in practice. This is why permanent anchoring must be done according to the rules of the profession, keeping the space and the capacity of the concession area in mind. It is certainly vital to adopt management plans as soon as possible, as well as to prescribe conservation measures in order to reach a consensus on the impact of anchorage development for the purposes of long-term conservation of target marine habitats. This would also shorten and simplify the acceptability assessment procedure for the Natura 2000 ecological network sites. The basic intended use of the anchoring systems should be to realise a simple and safe way to anchor vessels, even for less experienced boaters. Additionally, installing anchoring systems reduces the need to use one's own anchor for anchoring, which ensures greater protection and conservation of the sea floor, but also introduces an anchorage surveillance method.

By applying modern electronic and information technologies (for example smart buoys) it is possible to further increase all of the advantages of the installation of organised anchorages from the standpoint of safety and simplicity of use, as well as simplified surveillance and protection. The utilisation of additional possibilities of modern electronic and information technology enables these systems to be used for collecting data, which can be used for different analyses, such as anchorage load capacity, boaters' patterns of behaviour, planning and optimisation of anchoring systems, and other scientific and other purposes. It is important to notice that concessions of the maritime domain for anchorages within protected marine areas and ecological network areas are granted by the county assembly. Public nature conservation institutions cannot submit a concession application for economic purposes granted for anchorages if they are not registered as economic operators, instead, they can only apply for the **special-purpose concession** which is rarely granted in practice. Also, the proceeds from the maritime domain area under concession within the Natura 2000 sites are not allocated to the bodies which manage these areas but are divided among local self-government units, the county and the state, according to the *Nature Protection Act and the Regulation on the ecological network* (see page 16). Public institutions for nature conservation are not the parties in the maritime domain concession procedure or the acceptability assessment procedure for the Natura 2000 sites. The competent bodies consult them only if needed, depending on interest and personal relationships, even though the public institutions know the area in question best and are legally designated to manage those areas. The habitat and species conservation objectives of the Natura 2000 network cannot be fulfilled if the legislative framework does not provide for the mechanisms which will enable public institutions to actively contribute to the conservation of the Natura 2000 site and to obtain sufficient financial resources for the conduct of their activities, which primarily include the supervision of anchorage development projects and the monitoring of target habitats during anchorage operation with the possibility to act in the case of non-compliance with the conditions prescribed by the competent authorities.

In order to ensure temporary mooring, recreational crafts prefer to anchor in seagrass meadows rather than on other sea floors. Anchoring, in addition to trawling, is emphasised as one of the mechanical impacts which damage *Posidonia*, which is one of the reasons why all of the complainants of the anchorage installation initiative within the Natura 2000 network must undergo the aforementioned acceptability assessment procedure for the ecological network. Also, as already mentioned, Article 139 of the

Nature Protection Act prohibits the anchoring and/or mooring of vessels outside of the places determined by the spatial plan, as well as the mooring of vessels outside of the areas defined as harbours in the spatial plan if the protected area is located within the maritime domain.

 **RECOMMENDATIONS:**

Allocate anchorages in ports which are located within marine protected areas and Natura 2000 sites to public institutions under the special-purpose concession model.

 **RECOMMENDATIONS:**

Anchoring:

- **instead of dropping anchor, when possible other mooring methods should be used, which include permanent permitted anchorages designed based on expert studies.**
- **define zones where anchoring is prohibited in sensitive Posidonia meadow habitats**
- **regulate anchoring in a way that it is permitted only on soft (sand) sea floor with a limited number of vessels and anchoring duration**
- **determine areas which allow vessels to anchor safely without the need for port construction, and where only eco-friendly anchoring systems are permitted which do not impact Posidonia meadows**
- **use *smart buoy* systems where possible.**

Allow entrance into marine protected areas and Natura 2000 sites only to vessels equipped with tanks which do not discard wastewater into the sea.

Limit the number of vessels which may enter the protected marine area by issuing a limited number of day tickets according to the assessed load-bearing capacity of the area.

Promote the use of eco-friendly anti-fouling products and cleaning products.

4.3 Management plans

Protected areas of national importance and Natura 2000 sites in these areas are managed by national park and nature park public institutions. Other protected areas of local importance and Natura 2000 sites in county areas are governed by county public institutions for management of protected areas. The management of protected areas includes the adoption of a **management plan** which defines the conservation goals, activities implemented to achieve management goals and efficient management indicators. Unfortunately, these plans fall into the category of *indicative* plans, i.e. non-legislative plans which provide guidelines on how to manage a certain problem. The only article in the Nature Protection Act that to an extent helps to strengthen management plans is Article 139, which states that legal and physical persons who operate in a protected area are required to follow the management plan, but there are no penalties if they fail to do so.

Nature Protection Act Management plan
Article 138
(1) Protected areas shall be managed according to the management plan. (2) The management plan shall be adopted for a period of ten years, with the possibility of amendment after five years. (3) The management plan shall determine the following: - management objectives, - activities implemented in order to fulfil management objectives, - management efficiency indicators. (4) The contents of the management plan, the procedure of its adoption and/or amendment shall be further regulated by the minister with an ordinance. (5) Legal and physical persons operating in a protected area are obliged to adhere to the management plan. (6) Public institutions are obliged to make available the draft of the management plan to the public in accordance with the special regulation on environmental protection. (7) The management plan of cross-border protected areas shall be determined in agreement with the competent authority of the cross-border part of the protected area. (8) The management plan may include more protected areas within the competence of one public institution. (9) The management plan of the protected area proclaimed by the Government and the representing body of the local (regional) self-government unit, and extending over more than one unit of local (regional) self-government, shall be jointly adopted by the governing councils of public institutions that manage it.
Prohibited actions
Article 139 (1) In protected areas, the following activities are prohibited in particular: - anchoring and/or mooring vessels outside of the places determined by the spatial plan and the legislation of the state authority competent for inland navigation in the protected areas, if said protected area is located within an inland waterway, - mooring vessels outside of the areas defined as harbours in the spatial plan if the protected area is located within the maritime domain.

The way to strengthen the management plan and the authority of wildlife officers is to include provisions in case of non-compliance with the management plans in the Nature Protection Act, since without it, the plan is non-legislative, which brings into question the legal implementation of the ecological network at sea.

 **RECOMMENDATIONS:**

Include provisions for cases of non-compliance with the management plans in the Nature Protection Act

Through the implementation of the aforementioned project “Development of management framework for the Natura 2000 sites”³¹ the management plans for 40 % of the Natura 2000 sites in Croatia are currently being drafted since management plans are yet to be adopted for almost all Natura 2000 sites including the Ordinance on the measures on target species and habitats conservation.

A management plan for an Natura 2000 site includes conservation measures of target habitats, which every EU member must adopt within six years after the area is proclaimed a part of the Natura 2000 network; this deadline for Croatia has passed, and the Ordinance has not yet been adopted. This represents a significant problem in the context of the conservation of marine habitats and the adoption of management plans.

4.4. Significant landscape North-western part of Dugi Otok and the Sakarun Bay Natura 2000 site

In Zadar County, the protected areas of local importance, as well as Natura 2000 sites are managed by “Natura-Jadera”, the county public institution for management of protected areas in Zadar County, in compliance with the *Nature Protection Act and the Regulation on the ecological network*. The protected area which includes Sakarun beach (image 5) belongs to the category of significant landscape, and by the beach is the Natura 2000 site Sakarun Bay (HR 3000069) spreading over 438.55 hectares. The target priority habitats in this area are 1120 Posidonia meadows, 1110 sand sea floors permanently covered by the sea and 1170 reefs.

³¹ <https://mingor.gov.hr/o-ministarstvu-1065/djelokrug/uprava-za-zastitu-prirode-1180/ekoloska-mreza-natura-2000/projekt-razvoj-okvira-za-upravljanje-ekoloskom-mrezom-natura-2000/5990>

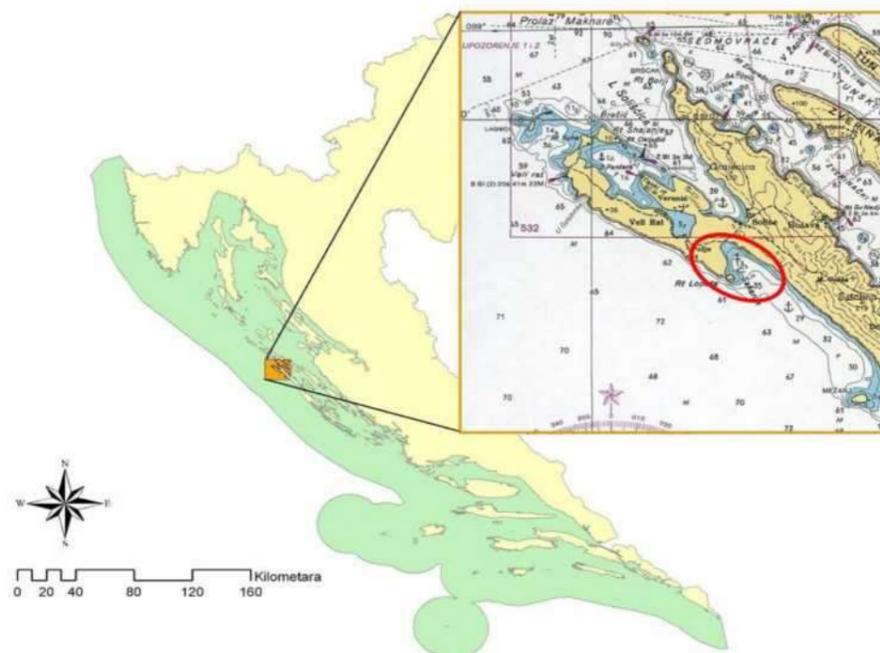


Image 5: Croatian map indicating the location of the North-western part of Dugi Otok and the Sakarun beach protected area

According to the Nature Protection Act, the category of a significant landscape refers to a natural or a cultivated area of a significant landscape value and biodiversity and/or geodiversity, or a landscape with preserved unique features typical for a certain area. The category of significant landscape permits interventions and activities which do not damage those features which characterise it as a significant landscape.

Nature Protection Act

Article 118

- (1) A significant landscape is a natural or a cultivated area of a significant landscape value and biodiversity and/or geodiversity, or a landscape with preserved unique features typical for a certain area.
- (2) The category of significant landscape permits interventions and activities which do not damage those features which characterise it as a significant landscape.

What makes Sakarun beach even more special is the origin of its sand. Namely, on most Croatian sand beaches, sand is created as a result of coastal rock wear, while at Sakarun beach, the sand mostly consists of marine biogenic carbonate. Since Sakarun beach is precisely one of the characteristics because of which the area is protected, it means that all interventions threatening its existence are prohibited there, which, according to the latest scientific studies, includes removing the Posidonia deposits.

Sakarun beach is a favourable location for the occurrence of Posidonia deposits because of its orientation, configuration and the position of the coast and the sea floor, as well as the large surfaces of Posidonia beds nearby.



Image 6 Map of Posidonia seagrass meadows near Sakarun beach Source: Exploration of Posidonia oceanica in Sakarun Bay, Zadar County, 2017, Expert Report, Society of Marine Researchers – 20,000 Miles, Zadar

According to Pikelj (2021), the thickest Posidonia deposits occur in the beach face area. In the autumn, the beach relatively quickly loses its volume, and this negative trend continues during the winter. The type and the size of waves have the largest impact on the banquette size. The waves mix the sand and the pebbles with the banquettes, creating a berm where plant communities grow and strengthen the beach with their roots. The stabilisation and an increase in volume start to occur immediately before the tourist season, mostly in May. This is when the Posidonia banquette is most often removed as part of the preparations for the tourist season, which removes a significant amount of sediment as well. Research has shown that by removing 1560 m³ of Posidonia, 99,840 kg, i.e. 37 m³ of sediment is removed as well (if the average weight of sediment per 1 m³ of Posidonia is 64 kg), which can amount to 37 m³ annually, while at the same time only 14 m³ of sediment is deposited.

Since Posidonia banquettes are the most stable in the furthestmost parts of the beach, while the middle part of the beach is the most dynamic, it is recommended to remove Posidonia only from the middle (most dynamic) part of the beach. Furthermore, those deposits should not be disposed of at landfills, but they should be stored in appropriate places nearby so they can easily be restored. After the end of the tourist season (the end of September), it is recommended that the deposits should be returned to the impact of waves in the intertidal and the shallow subtidal area because in this way the remaining sediment is restored as well.

! MP RECOMMENDATIONS / land

Allow the removal of Posidonia deposits only in the middle section of the Sakarun beach, in a length which should amount to no more than half of the total beach length.

Removing parts of Posidonia deposits should not be permitted before 15 May.

Removing parts of Posidonia deposits using heavy machinery (excavators) should not be permitted.

Define that Posidonia alluvium should be cleaned from anthropogenic waste by hand.

Monitor illegal operations of sand and pebble removal from Sakarun beach.

Advocate for Sakarun beach to gain the status of a natural beach according to the Regulation on the development and protection of protected coastal zones.

Advocate for the inclusion of measures which preserve the whole Posidonia ecosystem in the Regional programme of development and management of marine beaches.

Determine the reception capacity of Sakarun beach taking into consideration the necessity that the Posidonia deposits remain at the beach.

Sakarun Bay is a spacious bay (approx. 80 hectares) mostly up to 10 m deep. The sea floor is rich in *Posidonia oceanica* meadows. The sea at the beach is of the highest quality, but because it is exposed to winds and currents (especially during winter), high deposits of different rubbish can be found there. Thanks to the efforts of the Natura Jadera PI the beach is cleaned regularly. The beach is also an attractive destination for boaters and in 2009, the PI was granted a concession for the period of five years to install an anchorage on 7,200 square metres in order to reduce the adverse effects of boaters (anchoring) on the environment, and especially Posidonia meadows.³² Unfortunately, after the concession period, the County carried out a public tendering procedure, and the PI was not chosen.

³² Sustainable management of the beaches in the Republic of Croatia – guidelines and priority actions



Advocate for the public institution to be granted a special-purpose concession for anchoring in Sakarun Bay.

Prohibit boat anchor dropping in Sakarun Bay.

Advocate for the implementation of eco-friendly anchors and mooring methods which have minimal impact on marine habitats.

Recommend the removal of concrete blocks from Sakarun Bay before installing new, eco-friendly anchorages.

6. CONCLUSIONS

The Posidonia ecosystem (the littoral zone) is the most endangered in the locations directly susceptible to human activities, such as: anchoring, illegal fishing activities using bottom-trawling equipment, excessive tourism – the most common cause of *banquette* deterioration, sea pollution, and the presence of rubbish and large waste on the coast. All of those threats to the ecosystem can be alleviated by prescribing conservation measures formulated and controlled by competent authorities which should be followed by all of the beneficiaries of this area, and, above all, by raising awareness of the sea and beach conservation efforts (and nature in general) in the local community, but with visitors as well. Considering the extremely high pressure of tourism, the land and the sea should be viewed as a whole.

The recommendations for the efficient coastal zone management which encompasses the entire Posidonia ecosystem are primarily concerned with amendments to the legislation which would result in the development of capacities and authority of the public institutions managing those areas (national, regional and local), which operate in those areas and are responsible for it, within their jurisdiction.

Keeping in mind the significance of protected marine and coastal zone management, it is important to clearly determine authority over maritime domain (maritime common good) of protected areas, alongside capacity building. Namely, public institutions managing protected areas and Natura 2000 sites in practice have almost no jurisdiction over the marine part of these areas. This applies especially to public institutions managing the areas of county and local importance. As the first step in this integration, public institutions could be granted the right to manage the maritime domain within the boundaries of the protected area they manage. This would enable them to view the area and the entire Posidonia ecosystem as a whole (littoral zone).

The main obstacle when it comes to integration and coordination of institutions is most commonly the fragmented division of responsibilities, as well as fragmented sources and allocation of resources. Institutions and their resources are limited to narrow objectives, different deadlines and limited human resources, which results in the implementation of conservation measures in only one aspect of their scope of action. Although this may seem small, this often represents an insurmountable obstacle to public institutions managing protected areas and Natura 2000 network sites. Therefore, the cooperation and the holistic approach to future developments, as well as the analysis of scenarios and plans which help make more quality decisions, represent an incredibly important objective.

Except for the cooperation of different sectors operating in the same area, in order to alleviate the barrier of institutional jurisdiction, one of the solutions would be to enable integrated management of the land and the sea parts of the coastal zone. This functional connection between the land and the sea part should most importantly be recognised on a national, county and local level in order to prevent the partial implementation of measures, as well as to ensure making decisions which lead to the sustainable development of the entire coastal and marine area.

In addition, since the largest adverse effects of climate change are expected in the narrow

coastal zone and at the very coastline, where the problem of institutional jurisdiction is most prominent, integrated management of land and sea will be of great importance. We are aware that climate change is happening, and we know that there is an increase in variability and the mean sea level. Science will help to get increasingly precise values of the changes before us, but decisions should be made today. Except for the cooperation of institutions, the cooperation of science and politics, and business and civil sectors is no less important and requires additional efforts. Adjustment to climate change and its integration in development and other plans is a subject which should be included into management plans of protected areas and the practices of other sectors, especially spatial and development planning. Measures to alleviate climate change should be included in such plans. The measures should concern the quality of the constructed environment, the conservation of natural values, the measures of rational use of the coastal zone and the strengthening of the spatial planning systems and nature conservation systems.

Nature conservation is no longer concerned only with the preservation of areas, species, habitats or geodiversity, but the survival of humans as a species as well. Nature and ecosystems in good condition are the basis for ensuring ecosystem services necessary for a better quality of human life and economic growth.

Posidonia ecosystem conservation offers many known benefits, but its protection is mostly motivated by its importance for the marine biodiversity, and not its entire role, which also includes the preservation of the coast (primarily from erosion).

The improvement of knowledge on the role of Posidonia in the protection of the coast and the role of the entire ecosystem, and not only its marine part, presents a new challenge for local, regional and national governments responsible for the conservation of nature, sea and coast.

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