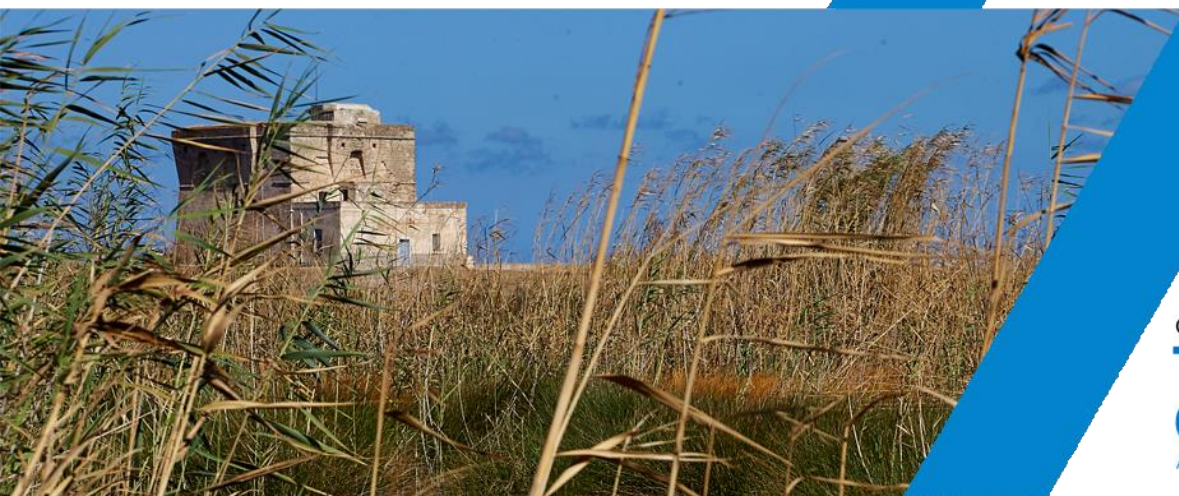




Consorzio di Gestione di

**Torre
Guaceto**

Area Marina Protetta • Riserva Naturale dello Stato



AKZM
AGJENCIA KOMBËTARE
E ZONAVE TË MBROJTURA



UNEP



RAC / SPA



MINISTERO DELL'AMBIENTE
E DELLA TUTELA DEL TERRITORIO E DEL MARE

SPAMI

Twinning Programme



Authors

Francesco de Franco – Rigers Bakiu

Consorzio di Gestione di Torre Guaceto

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1. INTRODUCTION

This report is written in the framework of the “Specially Protected Areas of Mediterranean Importance (SPAMI) Twinning Programme” implemented by SPA/RAC in the framework of the Cooperation Agreement between the Italian Ministry of Environment, Land and Sea and the UN Environment/Mediterranean Action Plan (UNEP/MAP).

The SPAMI Twinning Programme aims to contribute to the achievement of the objectives of the Barcelona Convention and its Protocols concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol), as well as, the Aichi Target 11, and SDG 14.5 in the Mediterranean, by developing and strengthening an effective management of marine protected areas (MPAs) and particularly SPAMIs.

The main objectives of the activities envisaged in the framework of the SPAMI Twinning Programmes among Italian SPAMIs/MPAs and SPAMIs/MPAs of the Mediterranean sub-regions of which Italy is part are:

- -promoting networking ;
- -strengthening exchange of experience ;
- -supporting sharing of best practices between the twin SPAMIs/MPAs ;
- -standardizing management ;
- -building capacities; and,
- -involving civil society organizations.

The purpose of this report is to:

1. define the scientific background from the available studies;
2. evaluate of the existing outputs on fishing efforts monitoring and proposed recommendations;
3. define of a common monitoring programme on governance, socioeconomic, biological, citizen science indicators that must be carrying out in 2020 and later

2. LEGAL FRAMEWORK AND MANAGEMENT INFORMATION

2.1. TORRE GUACETO MPA

The Torre Guaceto MPA extends for 2,227 hectares, with a coastline of 8.405 km, was formally established in 1991 (see Interministerial Decree of 4 December 1991. Establishment of the marine natural reserve called "Torre Guaceto" http://win.riservaditorreguaceto.it/page.aspx?ID=9601694&LVL_II=68&view=top&mp=1), and was entrusted to a Management Consortium formed by the municipalities of Brindisi and Carovigno and by the WWF Italy with the Ministry of Environment Decree 4 February 2000 (http://win.riservaditorreguaceto.it/page.aspx?ID=3498572&LVL_II=68&view=top&mp=1).

The "Torre Guaceto" MPA as defined by the D.M. of 12/4/91 instituting the reserve pursues the following 5 objectives:

1. the conservation and enhancement of the national marine and coastal natural heritage present in the area, with particular reference to the quality of the water, the geomorphological characteristics of the flora and fauna and, in particular, the aquatic birdlife in relation to the designation of part of the area as wetland of international importance based on the provisions of the decree of the President of the Republic n. 448/1976;

2. the realization of study and research programs aimed at systematic knowledge of the area, also for the purpose of possible modifications or additions to the perimeter and planning of the protected area established by the institutional decree, as well as to define an optimal integrated management model of the same area in function of the primary purposes of conservation and enhancement of the natural heritage;
3. dissemination of knowledge on ecology and biology in relation to the marine coastal environments of the reserve;
4. the study and planning of a rational management of fishery resources in order to achieve the compatibility of fishing activities with the primary need for nature conservation, thus providing, in this framework of systematic knowledge, also interventions aimed at restocking fish area and surrounding areas;
5. the promotion of a socio-economic development compatible with the naturalistic-landscape importance of the area, also favouring traditional local activities already present; as part of the promotion of a development compatible with the aforementioned purposes, for activities related to the channelling of tourist flows and guided tours, the

determination of the relative discipline must provide specific facilities for collective transports preferably managed by citizens residents in the municipalities of Brindisi and Carovigno

The Torre Guaceto MPA, as per institutional decree, in the context of the project proposal, has two fundamental objectives, as already mentioned:

1. conservation and enhancement of the natural heritage
2. the study and planning of a rational management of fishery resources

The prohibitions and the regulation of the permitted activities are regulated by the institutive decree, already mentioned, and by the regulation of execution and organization of the marine protected area "Torre Guaceto", approved with D.M. Environment 26 January 2009 (cfr. http://win.riservaditorreguaceto.it/page.aspx?ID=6484448&LVL_IL=68&view=top&mp=1).

The MPA is affected by the presence of two areas included in the Natura 2000 Network (vd. Figure 1):

1. ZSC Torre Guaceto and Macchia San Giovanni (IT9140005) extended for 250 ha on the ground and 7,658 ha at sea,
2. SPA Torre Guaceto (IT9140008) extended to 547.97 ha

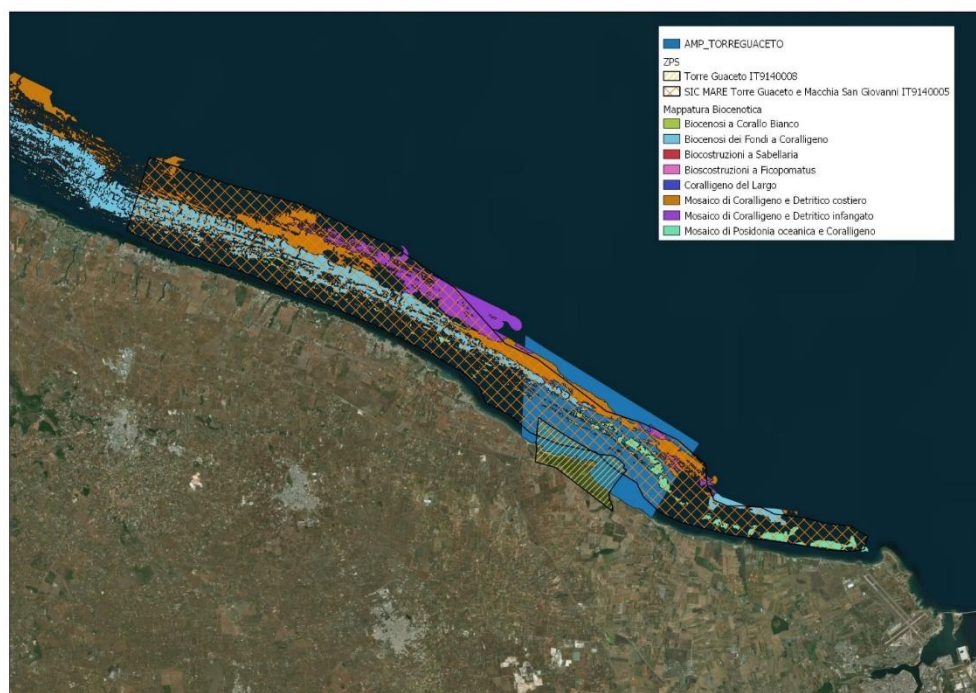


Figure 1

2.2. KARABURUN SAZAN MPA

The efforts of Albania's government towards the marine habitats and ecosystem conservation have led to the proclamation of 11 marine and coastal protected areas. Until now, Karaburun-Sazan Marine Protected Area (MPA), which includes the area around Karaburun Peninsula and Sazan Island, is the first marine protected area (Marine National Park) declared in Albania. The National Agency of Protected Areas (NAPA), established in 2015, represents the management authority of the Albanian Protected Area Network. NAPA is directly responsible for the management, protection, development and expansion of the protected areas. In Vlora region, its authority is represented by Administration of Protected Areas in Vlora Region (RAPA Vlore or RAPAV), which has always been supportive towards collaborations between local and experienced NGOs in the field of environmental conservation. Marine Protected Areas (MPAs) are an essential tool for protecting overexploited populations and threatened species and their habitats as well as to implement sound management actions to tackle the socioeconomic challenges and sustain the local livelihoods. The known benefits of MPAs for coastal resources include an increase in abundance (net emigration of adults and juveniles across borders, termed "spill over"), biomass and fecundity (the increased production and exportation of pelagic eggs and

larvae), and average size of commercial species, as well as a potential benefit for biodiversity, which finally affect positively small scale fisheries. Contribution to the sustainability of adjacent and 'in-house' fisheries is often an explicit management goal for MPAs.

Recently, it was approved by the parliament the Law about Protected Areas n. 81/2017, with reference to Law No. 8906 for protected areas (2002) and the Law No. 9868 amending and supplementing Law No. 8906 of 2002 on protected areas (2008).

The Law 81/2017 aims at the designation, conservation, administration, management, and sustainable use of protected areas and biological and natural resources based on the principle of sustainable development in order to guarantee their environmental, economic, social and cultural benefits to all the society. Further, the law lays down the institutional framework including both public and private entities and their tasks and responsibilities for the conservation and sustainable management of these resources.

As stated in the Article 1, the objectives and applications are shown below:

1. This law objectives are represented by proclamation, protection, management, sustainable use of environmentally

protected area and their natural and biological resources, based on the principle of sustainable development, for a guaranteed fulfilment of environmental, economic, social and cultural interesting functions, in the interest of the whole society, as well as the determination of the responsibilities of public institutions and natural / legal persons, private companies, for protection and sustainable administration through:

- a. Identifying, designating and adding protected areas or expanding the existing protected areas;
 - b. Preservation, rehabilitation and renewal of ecosystems of natural habitats, of species, of reserves and natural landscapes inside environmentally protected areas;
 - c. the sustainable use of environmentally protected areas, integrating elements of it on strategies, plans, programs and decision making of all levels.
2. The provisions of this Law shall apply to the surfaces contained within the boundaries of protected areas in the Republic of Albania.

The aim of this law (Article 2) is to provide protection of the environmentally protected areas and important components of biodiversity and its nature in them through:

- a) The proclamation of protected areas, of importance to their natural values, economic or social, as part of the inheritance natural and cultural environment;
- b) Development and protection of protected areas, national assets with importance related to the rare values of its natural equilibrium and biodiversity, as an obligation in the interests of generations, for today and tomorrow;

- c) Facilitating the conditions for a sustainable development and promoting the assessment of ecosystem services (environmental);
- d) Informing and educating the public about the condition and usefulness of protected areas.

In the Article 22, it is stated that the "Marine Protected Area" is declared each sea area, coastal and underwater area, seabed and islands, together with flora, fauna, landscape habitats and historical characteristics, cultural and archaeological heritage, destined for:

- a) protection of biodiversity, ecosystems, habitats and endangered species and especially critically threatened species, endemic species and migratory ones of marine fauna, characterized by a genetic diversity;
- b) preservation of water quality, prevention and protection from destroying pollutants;
- c) landscape and underwater heritages protection, on the coast and seabed;
- d) preservation of the biological diversity;
- e) conservation of nature and survival of species during the development of seaside, coastal and underwater tourism, while preserving habitats and species;
- f) restoration of species and degraded ecosystems, especially by fishing, and other living organisms threatened by other activities with negative impact, including the climate change;
- g) sustainable use of natural marine and coastal resources natural, by applying long term preservation and traditional sustainable fishing practices;
- h) development of activities for the purpose of preservation and integrated management of the areas;
- i) research and monitoring for scientific purposes

3. CONSERVATION OBJECTIVES

3.1. TORRE GUACETO MPA

The management strategy of the MPA in Torre Guaceto is based on the application of a conceptual model derived from what has been elaborated by the Conservation Measures Partnership. This standard was chosen by the IMELS to define a standardized approach to management, because the geographical and political heterogeneity of the Italian MPA system has determined the existence of management plans peculiar to each area, which are difficult to compare and fundamentally different.

The starting point of the management plan are the key conservation targets (KT or key target) which represent the values to be protected; these can be animal or plant species, habitats, ecosystem services, communities, geomorphological singularities, landscape units, but also social and cultural elements. Due to their importance, these targets are chosen by the manager through a multicriteria analysis, based both on objective and scientific elements, and on a qualitative or perception evaluation of their importance. For each target, a conservation target is identified which represents the desired status for the target at the end of medium / long-term planning. This objective must be expressed in quantitative terms (eg. Increase of n% of the area) to better verify the achievement of what is expected.

3.1.a. Marine vertebrate community

State of vitality of the target: Good

Description: A few years after the start of the real protection regime (i.e. after the institution of the manager), the coastal fish population present in the MPA of Torre Guaceto showed a considerable recovery in terms of abundance, size and overall biomass, reaching values much higher than those recorded in the surrounding unprotected areas. More specific and effective actions began in 2001 and 2003: the result is that an abundance of sea bream (which are ecologically and commercially relevant fish species) has been observed in MPA 2 to 10 times greater than in areas open to fishing outside the MPA. Considering the entire fish population, recent research carried out in low

depth rocky habitats (i.e. 5-8 meters deep) with the visual census technique have shown that the abundance and biomass are respectively 3 and 15 times greater within the Zone A of the MPA with respect to the outside. Data recorded by the catches of artisanal fishermen have shown that the level of total catches is approximately two times higher inside Zone C (where artisanal fishing is allowed to a limited number of boats) compared to outside. The area is affected by the presence of sea turtles and marine mammals, detected by the interaction with the fishing sector. This aspect needs further study and specific monitoring programs must be implemented to determine the interactions of these species with the coastal fish community and their ecological role on the site.

Conservation objectives: Maintain the biomass of coastal fish stocks 3 to 5 times greater inside Zone A than outside (data obtained from underwater visual census) and a catch level (CPUE) per boat 2 times greater than inside of Zone C compared to outside (data obtained from the analysis of catches of artisanal fishing boats). Increase knowledge on the populations of turtles and marine mammals.

3.1.b. Coastal benthic population

State of vitality of the target: Good

Description: The potential of conservation and management actions to protect *Posidonia oceanica* grasslands is assessed making a comparison between the populations at inside and outside the AMP. Significant differences in macroalgal coverage were observed between protected and unprotected locations. In the shallow infralittoral, protection can increase the stability of the community: within the MPA the macrobenthos, consisting of long-lived and low growth rate invertebrates and structurally complex algal formations, is distributed homogeneously in space and shows small fluctuations over time. On the contrary, a patchwork is present in the unprotected locations, with the rotation from positions with macroalgae to barren and drastic temporal variations between the two states. The populations of the macroalgae of the mid-coast are apparently little affected by

the protection effect of the Reserve. This habitat has suffered the loss of the precursor *Cystoseira* spp., A brown algae which locally increases the biodiversity of sessile and mobile invertebrate species. However, many species of molluscs (*Patella* spp., *Phorcus turbinatus*, *Stramonita haemastoma*) show larger sizes and densities inside the MPA than outside

Conservation objectives: Maintenance of the current number of species, coverage, biomass and stability of the populations characterizing the protected marine habitats, through the exclusion and / or management of human activities within the MPA.

3.1.c. Posidonia oceanica meadows and their community

State of vitality of the target: Good

Description: The potential of conservation and management actions to protect *Posidonia oceanica* meadows is assessed making direct observations of the densities of the leaf phases in the meadows inside and outside AMP. Although there is a general tendency for subsea grassland regression observed over time, protected grasslands have shown a significant greater leaf density than outdoors. suggesting greater resistance to local human activities. This trend was confirmed in the last observation period. Recent mappings made during 2013 show a general reduction in the extent of *P. oceanica* meadows compared to previous mappings

Conservation objectives: The ban and / or management of human activities within the MPA should halt the decline of *Posidonia oceanica* grasslands, a priority habitat for the European Union. The goal by 2020 is to maintain the density of leaf bundles inside the MPA higher than outside.

3.1.d. Coralligenous formations

State of vitality of the target: Good

Description: The structure of the sessile populations of the Coralligenous formations are similar inside and outside the AMP. Significant differences potentially attributable to the protection effect, however, were highlighted in the heterogeneity of the populations, indicating greater discontinuity in unprotected locations. The abundance of the target species analyzed, that is, *Eunicella* spp., Seems to be comparable

between protected and unprotected areas. Still, no significant differences emerged by analyzing the size of the colonies. A greater frequency of large colonies seems to characterize the populations of *Eunicella* spp. in control locations, although colonies appear to be less affected by signs of disturbance within the MPA.

Conservation objectives: By 2020, direct threats to the biodiversity target will be eliminated, ensuring the maintenance of the complexity of the habitats already detected in 2013

3.1.e. Ornithic migratory community

State of vitality of the target: Good

Description: The Reserve is located on important migratory routes that connect the African wintering areas with the reproductive ones of Central and Northern Europe. For this reason, very significant avifauna's quotas pass through and populate vast areas. From this derives the importance of the conservation and enhancement of the mosaic of the Reserve habitat, whose role is mainly the trophic one for species in transit, to which is added that of wintering and / or nesting for part of the ornithic community. Out of a total of 218 vertebrate species identified in the Reserve, 188 are represented by birds. Of these 168 (89% of the total birds) are migratory. This bird community is very heterogeneous, because it includes marine, marsh, scrub / forest, steppe and agricultural environment species. Many of these species are included in the annexes of Directives 92/43 / EEC and 79/409 / EEC.

Conservation objectives: Guarantee the maintenance of the current load-bearing capacity of the habitat system for the individual species and to increase the availability of habitats through enhancement actions and transformative improvements.

3.1.f. Wetlands

State of vitality of the target: Good

Description: The wetland has an area of 108 ha, of which only 16 ha (15%) are represented by water bodies and flooded meadows (pertaining to various types of habitat), while 92 ha (85%) are represented by the Marsh Straw Community (*Phragmites australis*), or reed bed. This therefore constitutes the main habitat of the wetland. The habitats of the wetland are mostly of secondary

origin, occupying the areas subjected to reclamation at the beginning of the 20th century.

Conservation objectives: By 2020 diversify the mosaic of habitats by favouring those of greater conservation value. Increase the permanence of fresh water by counteracting the intrusion of the saline wedge.

3.1.g. Coastal habitats

State of vitality of the target: Good

Description: Depending on the intense ecological gradients, a series of natural habitats are distributed along the coast which form bands parallel to the coastline. Most of these habitats are included in the annexes of Directive 92/43 / EEC. Given their location, they are subject to both natural and anthropogenic pressures.

Conservation objectives: by 2020 restoration of 6,000 m2 of coastal dunes through nourishment and planting of pioneer plants. Maintaining the current level of pressure intensity.

3.2. KARABURUN SAZAN MPA

Management Plan (November 2015) of the MPA is divided into several themes, each of which has a goal that the Plan aims to achieve. The goals have a series of objectives with indicators that can be monitored to determine whether objectives and goals are being achieved. Each objective has a list of prioritized activities that are to be implemented and these activities also have their indicators, monitoring of which shows if the Plan is being implemented.

3.2.a. THEME: Biodiversity conservation

GOAL: Maintain and protect valuable marine species and habitats by regulating activities at the sea and improving knowledge on importance of biodiversity.

OBJECTIVES:

- Reduce degradation and maintain the size and status of Posidonia meadows in front of beaches (western part) during management plan timeframe (10 years)
- Stop degradation and maintain the status of coralligenous communities and other vulnerable marine habitats during management plan timeframe (10 years)
- Preserve favourable status of endangered and protected marine species and ensure safe passage of charismatic species (marine turtles, monk seals, dolphins and whales) through corridor during management plan timeframe (10 years)

3.2.b. THEME: Cultural heritage and landscape

GOAL: Maintain and preserve well-known cultural and historical features and outstanding geological formations by improving regulations and promoting good practices.

OBJECTIVES:

- Preserve aesthetic value of the landscape during management plan timeframe (10 years)
- Preserve geological formations by stopping degradation on cliffs and in caves (Haxhi Ali, Grama Bay, etc.) in the next 5 years
- Preserve actual state of underwater archaeological remains at archaeological sites during management plan timeframe (10 years)

3.2.c. THEME: Supporting local communities and sustainable use of natural resources

GOAL: Support local community development by promoting viable fishing and sustainable tourism practices that ensure wise use of natural resources.

OBJECTIVES:

- Improve fish stocks through maintaining number of species and increasing fish population abundance in the next 5 years
- Diversified and quality tourist offer & achieved sustainable level of tourism on

beaches, caves and diving sites during management plan timeframe (10 years)

- Quality tourist experience, including clean, not overcrowded and quiet natural beaches during management plan timeframe (10 years)

3.2.d. THEME: Awareness and education

GOAL: Raise awareness and improve knowledge on the importance of biodiversity conservation and sustainable use of natural resources and promote values and benefits of MPA.

OBJECTIVES:

- Raise awareness about MPA values among visitors and general public
- Educate stakeholders on issues related to their contribution to improved MPA management

3.2.e. THEME: Management, administration and sustainability

GOAL: Ensure effective management of MPA by building capacities, providing necessary human and financial resources, and improving communication and cooperation with relevant stakeholders.

OBJECTIVES:

- Establish a Management Administration, hire staff, raise their level of knowledge and skills and adequately equip them in relation to the existing state in 2014.
- Improve communication and cooperation of the Management Administration with the residents and authorities.

The Management Plan has been developed through participatory approach, including four stakeholder workshops, meetings, questionnaires, etc. It is intended for the Management Plan to be a strategic planning document of the Management Administration for 10 years. As stated in the Management Plan, the changes occurring over those ten years should be included in the review of management actions. The possibility to change existing actions enables the Park to be flexible and, at the same time, to continue following the guidelines defined by the vision and the goals of the Management Plan.

As the Management Plan vision is a long-term goal of the protected area, its lifespan is longer than

the duration of the Plan. If there is no change in the protected area status, the vision remains the same thus ensuring continuity in management. Similarly, if there are no significant changes, the objectives of the Plan should remain unchanged at least for the next ten-year period.

After five years, Management Plan implementation and the results achieved are analysed, and the Plan is revised accordingly. If necessary, management actions are partially changed or completely revised. As for monitoring, an analysis should be made of previous actions to explain what has been done or not, the reasons why a specific action was not implemented, and the knowledge and experience used during the revision process.

In the last three years, the management of the Karaburun Sazan MPA is improving significantly, mostly related with the establishment of the patrolling system, by rangers of RAPAV and the MPA Project and the introduction of management activities. Actually, RAPA Vlore is controlling the territory supported by infrastructure investment and trained staff aiming to better perform their duties. Last year the establishment of the visitor centre of the MPA, gave a new impulse to the education activities and promotion of the marine park, carried out by RAPA Vlore staff. The number of visitors in the MPA increased up to 29000 in 5 months, 40% of which were foreigners. The presence of tour boats operating in the area was increased up to 5 medium tour boats and around 15 small vessels operating in the summer season, which is now slightly extended for the MPA.

Significant progress has been done in these main directions:

- The MPA Sazan – Karaburuni is a management subject to prioritized activities, which performance is monitored through METT assessment tool;
- Enforcement and control mechanisms, such as surveillance/patrolling in the target area of Sazan-Karaburuni area are ensuring mitigation and prevention of all kind of damages and environment pressures.

Just recently, five buoys and relative signals were installed in the MPA in order to show the borders

of the MPA and facilitate the management, patrolling and monitoring effectively the MPA. Furthermore, it was evaluated and tested the anti-trawling and its use inside the MPA of Karaburun-Sazani.

Several Memorandums of Understandings (MoU) have been implemented involving stakeholders in

the process of surveillance, monitoring, law enforcements in protected areas and data collection. In the framework of the 2017 MedPAN small project, it was drafted another MoU by ACEPSD in collaboration with the other partners and soon it will be signed by all the involved partners, including RAPAV and Directorate of Fisheries and Aquaculture Services.

4. ZONING AND USED REGULATIONS

4.1. TORRE GUACETO MPA

The MPA is divided into three zones with different levels of protection: *Zone A* (full protection), *Zone B* (general oriented reserve) and *Zone C* (partial reserve).

As required by the ministerial Decree of 1991, the following activities are prohibited within "Torre Guaceto" marine protected area, except as explicitly provided for in the protection regimes within the various reserve areas:

- the removal, even partial, and damage of the mineral formations;
- motorized navigation for all boats with the exception of those used for service or surveillance and those used by professional fishermen in the

manner that will be specified in the implementing regulation;

- spearfishing, even without respirator, fishing with longline lines, with seine-type shore nets, as well as hunting, catching, collecting, damaging and in general any activity that may constitute danger or disturbance for animal species or plants, including the introduction of foreign species, and in particular the collection of benthic organisms, as well as the alteration, damage and collection of vegetation and specimens of spontaneous flora;
- the alteration, by any means, direct or indirect, of the geophysical environment and the chemical and biological characteristics of the water,

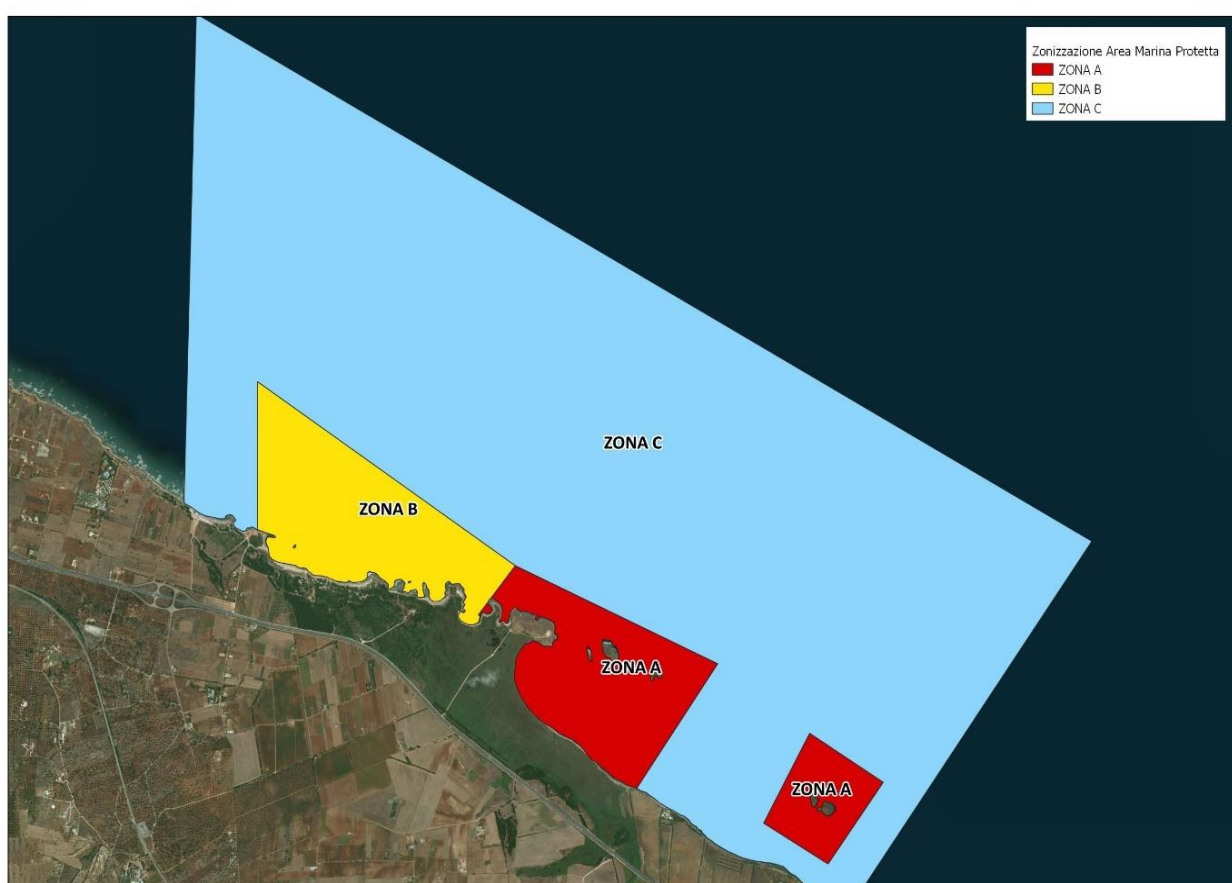


Figure 2

as well as the landfill of solid or liquid waste and in general the introduction of any substance that can modify, even temporarily, the characteristics of the marine environment, as well as the excavation and collection of inert materials;

- the introduction of weapons, explosives and any destructive or captive means, as well as toxic or polluting substances, with the exception of the gear relating to the fishing activities allowed and according to the procedures of the regulation;
- the activities that can in any case cause damage, hindrance or disturbance to the realization of the study and scientific research programs to be implemented in the area;
- navigation, access, stop and landing with ships and boats of any kind and type, except as provided in paragraph 3 of this article.
- In any case, any further restrictions already provided for by current legislation remain in force throughout the reserve area.

ZONE A, of INTEGRAL RESERVE, in which the navigation, access, landing and anchoring of ships and boats of any kind and type is prohibited, with the exception of those duly authorized by the managing body for reasons of service and for any scientific research and guided tours, previously authorized by the management body itself. In the MPA of Torre Guaceto there are two zones A where, therefore, any human activity is prohibited, which can cause damage or disturbance to the marine environment because this area represents the "core area" of the MPA.

ZONE B, of GENERAL RESERVE, where, in addition to the activities envisaged for Zone A, a series of activities that allow the sustainable use and use of the environment are permitted, often regulated and authorized by the managing body.

In zone B bathing is permitted bathing from sunrise to sunset.

ZONE C, of PARTIAL RESERVE, represents the buffer zone (buffer) between the areas of greatest naturalistic value and the sectors outside the AMP; in this area most of the MPA extension falls. In this area it is possible to carry out, in addition to the possible activities in zone A and B, also fishing activities and navigation. The activities listed above are governed by the institutional decree and the provisional implementing regulation.

The following activities are prohibited within the coastal territorial areas of the maritime domain:

- the opening and cultivation of quarries, as well as any excavation and removal of materials;
- access and movement of motor vehicles except for those necessary for management and surveillance activities;
- the practice of hunting and bird catching carried out by any means, as well as any form of disturbance of wild fauna including the training of dogs, as well as the collection and destruction of eggs and nests and the introduction of foreign species;
- damage and collection of spontaneous plant species with reference to old tree specimens, rows of trees, hedges or residual tree and shrub vegetation;
- the abandonment of waste of any kind;
- fishing, except for that carried out in areas C, of partial reserve and according to the methods permitted in these same areas;
- modification of the water regime, except for interventions intended for the reconstitution of humid environments.
- tamper with and alter or damage in any way the natural and semi-natural biotopes and open new tracks of penetration;

- carry out any further urbanization work, without prejudice to ordinary and extraordinary maintenance interventions and renovations aimed at reusing existing buildings, for activities compatible with the purposes of establishing the marine natural reserve;
- lighting fires;
- install and carry out camping activities;
- introduce dogs;
- affix advertising signs;
- introduce plant species not belonging to the spontaneous flora or to the flora inserted as a landscape component in remote times and which has become characteristic for the landscape;
- damage the tree or shrub cover present.

The Puglia Region, with D.G.R. n.262 dated 08.03.2016, approved the Regional Regulation n. 6 of 10 May 2016: Regulation on Conservation Measures pursuant to European Community Directives 2009/147 and 92/43 and Presidential Decree 357/97 for Sites of Community Importance (SIC), subsequently amended and integrated with D.G.R. 646 dated 02.05.2017. This regulation has identified the following rules for FISHING IN LAGOAR WATERS / SEA:

1. Prohibition of fishing at sea in contrast with the provisions of art. 4 of Regulation

(EC) n.1967 / 06 and subsequent amendments and additions.

2. In the area of sport fishing, it is forbidden to use towed nets, purse seines, dredges, gill nets pulled by boats, mechanized dredgers, trammel nets, longlines and combined bottom nets.
3. Prohibition of fishing for juveniles, except for fishing for restocking purposes

Furthermore, it introduced the ban on fishing for the following species:

- 1120 *Alburnus albidus*
- 1136 *Rutilus rubilio*
- 1137 *Barbus plebejus*
- 1152 *Aphanius fasciatus*
- 1155 *Knipowitschia panizzae*
- 1154 *Pomatoschistus canestrinii*

With the presence of the habitats 1120 * (Posidonia meadows) and 1170 (Cliffs), it is forbidden to fish with trawl nets, dredges, traps, purse seines, boat seines, beach seines and similar nets within the areas characterized by the presence of habitats.

With the presence of the habitat 1170 (Cliffs) the prohibition to carry out trawling inside the areas characterized by the presence of the habitat is made, even if falling at depths greater than 50 meters.

These conservation measures are also valid for the portion of the SCI Torre Guaceto Macchia San Giovanni, outside the MPA of Torre Guaceto.

4.2. KARABURUN SAZAN MPA

The zoning plan for the territory of the National Marine Park Karaburun-Sazan followed these steps:

- a) Collection of complete necessary information on nature, biodiversity, use of the area, community needs and livelihood, etc.

- b) Development of the draft zoning plan together with interested stakeholders and local communities.
- c) Review of the draft zoning plan, including description of zones and more detailed regulation of activities.
- d) Finalizing the draft zoning plan.

This system is in line with the Guideline on the approach and criteria for zoning of the territory

within a protected area (GIZ/GOPA 2013), which was developed by GIZ for the Ministry of Environment. Table 1 shows zone coverage (area

and percentage) and marking of different zones in the map of Figure 3.

Table 1 Characteristics of the zoning system applied to the MPA of Karaburun-Sazani MPA

No.	Zone name	Acronym	Area (ha)	Percentage (%)	RGB code	Colour
1	Core Zone	CZ	781.2	6.29	Red 0 Green 200 Blue 0	
2	Effective Management Zone	EMZ	8579.1	69.03	Red 135 Green 225 Blue 135	
3	Recreational Zone	RZ	1926.8	15.50	Red 255 Green 255 Blue 100	
4	Sustainable Development Zone	SDZ	1140.9	9.18	Red 200 Green 200 Blue 200	

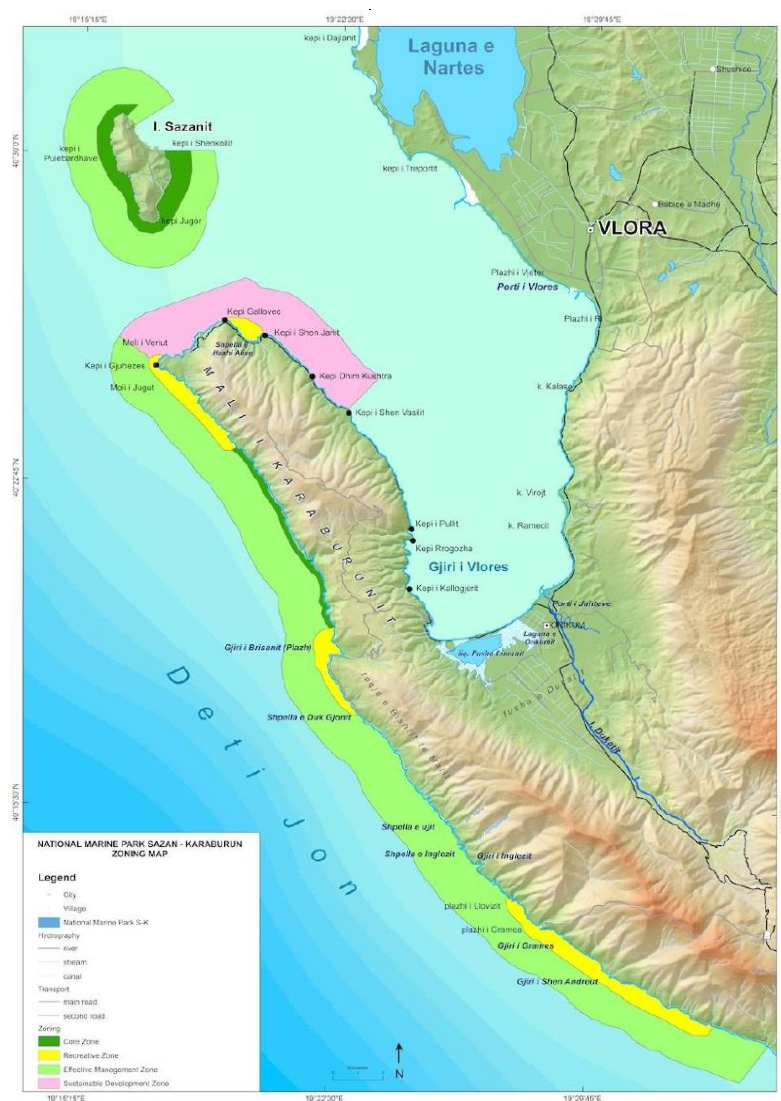


Figure 3 Extension of each Zones in the MPA of Karaburun-Sazani MPA, with the different colors, as represented in Table 1

4.2.a. Core Zone (CZ)

This includes areas with very high nature performance, with little or no disturbance from human activities as: 1) the area around Sazani island not more than 1 km off shore; 2) western part of Karaburuni up to 200 m offshore.

In the Northern, Western and Southern part (till Kepi Jugor) of Sazani island there are important reefs and coralligenous formations. There are also interesting reefs in the eastern part of the island next to Kepi i Shenkolit. The southern coast of the island is cover with *Posidonia* meadows. The western side of Karaburuni is also rich in coralligenous formations and interesting underwater geomorphological features, reefs and cliffs.

The priority here is the conservation of nature, biodiversity (*Posidonia meadows*, coralligenous formations), nature monuments (Falezat e Sazani), endangered species (red coral, date mussel, dusky grouper, starfish, common dolphin, loggerhead turtle, etc.), unique land and seascape (reefs and cliffs), extraordinary natural geomorphologic and paleontological features without any permanent support intervention. These areas are managed in a way that preserves their natural status, maintains dynamic evolution of genetic resources and they are used for scientific purposes only. This zone benefits from strict protection character. The area supports scientific studies and research; low level monitoring is allowed by special permit; and

visitation, if any, is very strictly regulated. Normally, public contacts are limited and socio-economic and recreational activities are totally forbidden. Natural processes with minimal management interventions are allowed and there is no infrastructure development. The area should be free of disturbances from any socio-economic activity, military trainings, pollution and discharges from ships, or dumping of any type of material (metals, glass, etc.) and waste that remains at the sea bottom.

Daily visits are strictly limited in number and sites. Special permits by PA administration are needed. Guided tours are allowed only on specified routes with very low impact on a small part of the area covering a maximum 10% of it, under guidance of PA administration at a level that serves physical and spiritual wellbeing and preserves wild nature qualities of the area for present and future generations.

The first level of protection is applied to this zone. Enforcement is ensured by PA administration patrolling and implementing strictly defined rules and approaches.

Allowed activities: No activity should occur within the Core Zone except regulated activities listed below.

Not allowed activities: It is strictly not allowed to perform the following activities within the Core Zone: diving, swimming and snorkelling (beaches and sun bathing), fishing, boating (excursions), anchoring, mooring, sailing, kayaking, any kind of water sports, maritime traffic, any kind of infrastructure development, mineral extraction, collection of plants, minerals, stones, paleontological findings, development of aquaculture and any military activities.

Regulated activities: The following activities can be performed after a special permit is issued by the PA administration: scientific research (special permit and limited numbers of scientists allowed), monitoring (special permit is needed), waste removal, visitation only by guided tours at specified routes under guidance of PA administration (strictly limited in numbers and sites), diving is allowed only for scientific research and monitoring purposes.

4.2.b. Effective Management Zone (EMZ)

This includes areas with high nature performance with very important natural habitats or biotopes of rare and endangered species. The priority is preservation of biodiversity, natural and scenic areas of national and international importance for spiritual, scientific, educational purpose and integrating protected area management with the sustainable and balanced use.

The zone includes 1) the area around Sazani island that is not included in the Core Zone; 2) the area around Karaburuni peninsula from Shen Vasili Cape to the south end of the park that is not included in other zones.

This zone is used for areas featuring ecosystems, landscape values and other natural values where activities that are not against the protection purpose and management objectives can occur. Only educational environmental ecotourism is allowed according to clear rules and there should be limitations for permitted areas and trails. Natural processes with minimal management interventions are allowed and there is no infrastructure development. The area should be free of disturbances from any socio-economic activity, military trainings, pollution and discharges from ships, or dumping of any type of material (metals, glass, etc.) and waste that remains at the sea bottom. The area supports scientific studies and research and monitoring of biodiversity status and sustainable use of natural marine resources.

In this area some recreational activities are allowed, such as sailing, kayaking and other no motor water sports, but no massive sports are allowed. Diving is allowed within designated diving sites at Pulebardha Cape and South Cape, where several shipwrecks are located. Wildlife watching of whales, dolphins, marine turtles and other charismatic species is also allowed along designated routes and sites, but with certain restrictions (code of conduct: swimming with animals and feeding them is not allowed; animals should not be approach from front, but from behind; boat should approach them slowly and sail in parallel to them, engine should be turned off; they should not be approached more than 50 m – enough space has to be left for them; maximum time to stay with them is 30 minutes).

The second level of protection is applied to this zone. Enforcement is ensured by PA administration patrolling and implementing strictly defined rules and approaches.

Allowed activities: No activity should occur within the Effective Management Zone except regulated activities listed below.

Not allowed activities: It is strictly not allowed to perform the following activities within the Effective Management Zone: swimming and snorkelling (beaches and sun bathing), fishing, anchoring, maritime traffic, any kind of infrastructure development, mineral extraction, collection of plants, minerals, stones, paleontological findings, development of aquaculture and any military activities.

Regulated activities: The following activities can be performed after a special permit is issued by the PA administration: scientific research (special permit and limited numbers of scientists allowed) and monitoring (special permit is needed), waste removal, diving (diving sites should be specified and diving is allowed only at those specific sites, only guided tours, limited number of divers, monitoring by PA administration), boating excursions (limited and guided boat excursions, special permit for boats, time and access to the area should be defined by PA administration), sailing and mooring (some areas should be off limits – such as diving sites and areas designated for water sports; signs for boats should be put), kayaking, water sports (no use of jet skis and other motor water sports; clear division of water sport zones and swimming areas), visitation (guided tours, limited in numbers), wildlife watching (respecting code of conduct).

4.2.c. Recreational zone (RZ)

This zone has a good nature performance. It is defined as a zone containing suitable terrestrial, aquatic and marine areas where the combination of activities, traditional products of the community, businesses and tourism is in line with the nature and biodiversity conservation standards. It includes 1) the area from Shen Janit cape to Galloveci cape; 2) from Kepi i Gjuhezes to Moli i Jugut and south to Gjiri i Bristanit; 3) from Bristani bay to Duk Gjoni cave, and 4) from Llovizi beach to Grama bay and south to San Andrea bay.

This zone should enable public enjoyment through tourism and recreational activities in line with the

character and size of the essential features of the area, promoting scientific and educational activities that will help the long-term development and wellbeing of local people and provide wide public support for nature conservation. The zone has wide potentials for education, wilderness recreation, sports and facilities that respect the protected area functions and ecological values.

Within the park there are 4 caves (Haxhi Ali next to Moli i Veriut; Duk Gjoni 2 km from Bristani bay; Water cave and Inglizi cave about 1 km north from Inglizi bay). In the underwater area between Galloveci cape and Gjuheza cape (especially close to Moli i Veriut) there are at least 5 shipwrecks. Another shipwreck is next to Bristani bay. The area has many historical and cultural values. There are several diving sites identified in this area: 1) diving site at Moli i Veriut next to Haxhi Ali cave; 2) diving site between Gjuheza cape and Moli i Jugut; 3) diving site at Bristani bay next to Water cave; 4) diving site at Inglizi bay; and 5) diving site at San Andrea bay at the southern end of the park. This area includes an observation point for whales, dolphins and marine turtles about 4 km south of Gjuheza cape. Wildlife watching of these animals is allowed with certain restrictions (code of conduct: swimming with animals and feeding them is not allowed; animals should not be approached from front, but from behind; boat should approach them slowly and sail in parallel to them, engine should be turned off; they should not be approached more than 50 m – enough space has to be left for them; maximum time to stay with them is 30 minutes).

Also this zone includes several small beaches, such as: Shën Vasili cape, Shën Jani cape, Bristani bay (3 km north of the bay), Llovizi bay and Grama bay. Next to Shen Vasili Cape and Shen Jani cape there are several small docks and tourism business services that can be used for anchoring and servicing of small visitor boats. Within this area there are several caves (Grama Bay) and other cultural and historical sites with great interest for visitors. At Grama bay there are some interesting archaeological remains. Other possible anchoring sites are defined at Shen Vasili cape, Moli i Veriut, Gjuheza Cape and Bristani bay as well as at some of the small beaches.

As for the water sports, there should be a clear division of water sport zones and swimming areas.

Also, no jet skis are allowed in any part of the MPA. Other motor water sports and other water sports are allowed in the Recreational Zone. The third level of protection is applied to this zone. The enforcement is enabled in cooperation with local authorities and PA administration patrolling and implementing strictly defined rules and approaches.

Allowed activities: The following activities can be performed freely within this zone without any prior authorisation: sailing (some areas should be off limits, such as diving sites; signs for boats should be put, no waste discharges, carrying capacity for the number of boats must be defined by the PA administration), swimming and snorkelling, anchoring, mooring, kayaking, water sports (but without jet skis, as these are not allowed in any zone), and visitation.

Not allowed activities: It is strictly not allowed to perform the following activities within the Recreational Zone: maritime traffic, mineral extraction, and collection of plants, minerals, stones, paleontological findings, development of aquaculture and any military activities.

Regulated activities: the following activities can be performed after a special permit is issued by the PA administration: scientific research and monitoring, diving (diving sites should be specified and diving is allowed only at those specific sites, only guided tours, limited number of divers, monitoring by PA administration), fishing (only sport (hooks) and traditional fishing is allowed, special permit for fishing must be approved by the PA administration, no commercial fishing), boating excursions (limited and guided boat excursions, special permit for boats, time and access to the area should be defined by PA administration), wildlife watching (respecting code of conduct), infrastructure development (infrastructure development should be in accordance with Development Plans and Management Plan, no permanent buildings, only "light" infrastructure is allowed, such as moorings and/or small docks (for 2-3 boats), platforms (use environmental friendly construction material), no massive sports and no massive tourism infrastructure).

4.2.d. Sustainable Development Zone (SDZ)

The area has a satisfactory nature performance. It includes the park area from Kepi i Shen Vasilit till Kepi i Gjuhezes. The priority is harmonizing

biodiversity, nature and landscape protection by coordinating protected area management with sustainable socio-economic development.

This zone should enable a harmonic interaction of nature and culture through preservation of landscape quality, continuous traditional use of resources, social and cultural and traditional customs manifestation, and avoiding and preventing, where necessary occurrence of activities that are inappropriate in size and/or content.

Among the main goals of this zone is also to provide economic benefits and contribute to the improved livelihood of local people by using natural goods and services or benefits coming from appropriate forms of tourism. Through sustainable balanced long-term use the zone will give an opportunity to local people within the protected area to gain economic benefits that are not against other management objectives. So, the zone supports the livelihood and economic activities that are in harmony with nature and preservation of spiritual and cultural constituency of the local people. This zone should contribute to regional and national development, promote management practices aiming at sustainable production and protect basic natural resources from other types of land uses that can be harmful to the biological diversity of the area. Urban development of different objects or infrastructure for the needs of local people and businesses is done in accordance with the Management Plan and Development Plans approved by National Territorial Council. Along with socio-economic development, the zone should maintain and preserve necessary habitat condition for the protection of species, groups of species, biotic communities or physical features of the environment that require special human intervention for an effective management. The area should support facilitation of scientific research and environmental monitoring of sustainable use of natural resources. Similarly, it should eliminate where necessary and avoid use or seizure of territory with activities that are against the purpose the area is being protected for. Apart from this, the zone should enable public enjoyment through tourism and recreational activities in line with the character and size of the essential features of the area promoting scientific and educational activities, that will help the long-

term development and wellbeing of local people and provide wide public support to nature conservation. The third level of protection is applied to this zone. The enforcement is enabled in cooperation with local authorities and PA administration patrolling and implementing strictly defined rules and approaches.

Allowed activities: The following activities can be performed freely within this zone without any prior authorisation: sailing (some areas should be off limits, such as areas designated for water sports; signs for boats should be put, no waste discharges, carrying capacity for the number of boats must be defined by the PA administration), swimming and snorkelling, kayaking, anchoring, mooring and visitation.

Not allowed activities: It is strictly not allowed to perform the following activities within the Sustainable Use Zone: maritime traffic, mineral extraction, and collection of plants, minerals, stones, paleontological findings, development of aquaculture and any military activities.

Regulated activities: the following activities can be performed after a special permit is issued by the

management PA administration: scientific research and monitoring, diving (diving sites should be specified and diving is allowed only at those specific sites, only guided tours, limited number of divers, monitoring by PA administration), fishing (only sport (hooks) and traditional fishing is allowed, special permit for fishing must be approved by the PA administration, no commercial fishing), boating excursions (limited and guided boat excursions, special permit for boats, time and access to the area should be defined by protected areas administration), water sports (no use of jet skis and other water motor sports; clear division of water sport zones and swimming areas), wildlife watching (respecting code of conduct), infrastructure development (infrastructure development should be in accordance with Development Plans and Management Plan, no permanent buildings, only "light" infrastructure is allowed as moorings and/or small docks (for 2-3 boats), platforms (use environmental friendly construction material), no massive sports and no massive tourism infrastructures).

5. FISHERY REGULATION

5.1. TORRE GUACETO MPA

The management of the Marine Protected Area is entrusted to the Consortium of Torre Guaceto formed by the municipalities of Brindisi and Carovigno and WWF Italy, which is responsible for applying the provisions in the founding decrees of the protected area, in addition to drafting the executive regulations and related implementation regulations.

According to the provisions of the founding decree, trawling, purse seine, purse seine and lampara nets are not allowed in the protected marine area, as well as aquaculture and active restocking are not allowed. In zones A and B, any professional fishing activity is prohibited.

Professional fishing in zone C is permitted, with authorization by the management body and according to the provisions of the decree implementation regulation, exclusively with gillnets.

The regulation of execution and organization of the marine protected area "Torre Guaceto", approved with D.M. Environment January 26, 2009, art. 18, only provides for small-scale artisanal fishing, with authorization by the managing body, reserved for professional fishermen residing in the municipalities within the protected marine area and registered with companies and fishing cooperatives having their registered office in the province of Brindisi on the date of approval of the regulation, in the following ways:

- a) exclusively by naval units with a maximum tonnage of 2 GT and a maximum power of 35 KW;
- b) with the use of gill net, with maximum length and minimum mesh size established annually by the managing body, based on the results of the monitoring of the fishing effort, with subsequent autonomous decision;
- c) at a minimum distance of 0.5 nm from the coast and in any case at a bathymetry of not less than 10 meters;
- d) throughout the year, with the exception of seasonal downtimes established by the managing body and by the competent authorities.

The regulation provides that for particular environmental protection needs, on the basis of

the results of the scientific monitoring, the managing body can further regulate the procedures for the exploitation of fish resources, in particular by establishing the maximum number of weekly fishings and the maximum number of units authorized to fish.

The disciplinary implementing the regulation (approved by resolution of the Board of Directors n. 25 on 20/06/2018) provides for art. 9 that the allowed gill net is of the "trammel" type, with a maximum length of 1000 m, a maximum height of 1.5 meters and mesh size, each side, from knot to knot, equal to or greater than 30 mm; the check of the mesh is carried out considering that 10 stitches must measure at least 30 cm (+/- 2 cm as tolerance). This mesh size should be understood as a 'minimum' mesh.

5.2. KARABURUN SAZAN MPA

Albania legislation has done some good steps in the last years to improve the national legislation aiming to be in accordance to the international and regional legislation. Albania is committed to be in line with the sustainable policy to reach the objective of sustainable fisheries in the Mediterranean.

Regarding the management of the fisheries inside the Protected Areas, the approval of the new law of protected areas in Albania, Law nr 81/2017, dt.04.05.2017 "On protected areas", was an important step forward for the regulations of fishing activities inside PA-s in Albania, since it was not any reference about this activity and the institution responsible for the implementation in the previous law.

The article 34 of the law predicted that the commercial fishing is not allowed inside National Marine Parks in Albania, that means that inside the Marine National Park of Karaburun Sazan, is

not allowed to be realized any form of commercial fishing since the entrance in power of the new Law on Protected Areas. It will continue to exist supported even by the law and regulations of fisheries.

Furthermore, Albania is member of the General Fisheries Commission for the Mediterranean (GFCM) since April 10th 1991. The country is party to the UN Law of the Sea Convention (23 June 2003) and also to the FAO Compliance Agreement of 1993. Albania has not ratified the FAO Port State Measures Agreement of 2009 and the UN Fish Stock Agreement of 1995.

In order to create and promote the sustainable fishing activities in Karaburuni- Sazani MPA, it is essential that professional fishers and future generation's fishers have sufficient knowledges regarding regulations and the law on fisheries. (

Table 2)

Table 2 List of national legislation about sustainable fisheries relevant for the NMP Karaburun-Sazan

National legislation	Year	Objectives and implication relevant to the PA management
Law No. 64/2012, dated 31.05.2012, "On Fisheries"	2012	Regulates fisheries, its management, provides protection for marine life and internal waters, and regulates "fishing protected areas"
Regulation No 1, dated 29.03.2005, "For application of the legislation on fishery and aquaculture"	2005	Prohibits fishing around river mouths, fishing and aquaculture in the outer part of Karaburuni (up to 1 nm or up to 50 m depth), trawl and pelagic trail nets in Vlora bay, fishing in the lagoon channels
Regulation No. 8, dated 11.11.2009, "Concerning management measures for the sustainable exploitation of fishery resources in the Sea"	2009	Prohibits use of bottom gears within 3 nm from the coast or up to 50 m depth, towed gears within 1.5 nm from the coast, hydraulic dredges 0.3 nm from the coast, and gillnets/purse seine 300 m from the coast

Furthermore, in Table 3 are shown some of the characteristics of the areas protected from the Law on Fisheries.

On the other hand, fishing inside the other categories of protected areas could be allowed only after the approval of the General Director of NAPA of the conditions of fishing activities in these areas. Actually, in each of the areas of Karaburun-Sazani MPA is not permitted any type of fishing activities due to the fact that it has been very difficult to patrol all these areas and a coordination between the responsible institutions

need to be established for an effective management (including the monitoring) of the fishing areas located inside the MPA of Karaburun-Sazani.

Furthermore, it is imperative to mention that though the MPA of Karaburun-Sazani represents one of the few cases in Albania, where a single protected area has a Management Plan, a Business Plan and a Sustainable Tourism Management Plan, it still lacks a plan for the management of fisheries in the area.

Table 3 Summary of areas protected from fishing Articles of the Law

National Legislation	Areas protected from fishing	Map legend	Area (km2)	% of territorial waters
Reg. No. 1, 2005: Art. 43/2	Buffer zone with 2 km radius from mouth of Buna River and 1 km radius from the mouth of other Albanian rivers where the fishing is prohibited	River mouths	18,40	0,31%
Reg. No. 1, 2005: Art. 43/3/j	Buffer zone in the distance of 1 NM shoreline or 50 m isobaths, outer part of Karaburuni shore from Kepi i Gjuhezes until Rruget e Bardha	Total fishing ban	6,50	0,11%
Reg. No. 1, 2005: Art. 44/1	Vlora Bay – limited on the north from the basic line of the Bay of Karaburun up to Treport	No use of trail nets (trawl or pelagic)		
Reg. No. 1, 2005: Art. 45/1	buffer zone with 2 km radius from the mouth of sea lagoon communication channels	Lagoon channels	45,00	0,76%

Reg. No. 8, 2009: Art. 12/1	3 nautical miles or till the 50 m isobaths buffer zone of the coast where the use of bottom gears is prohibited	No use of bottom gears	1599,60	26,87%
Reg. No. 8, 2009: Art. 12/2	buffer zone 1.5 miles from shoreline where there use of towed gears is prohibited	No use of towed gears	1077,00	18,09%
Reg. No. 8, 2009: Art. 12/2	buffer zone of 0,3 nautical miles from shoreline where the use of hydraulic dredges is prohibited	No use of hydraulic dredges	220,00	3,69%
Reg. No. 8, 2009: Art. 12/3	300 m buffer zone from shore line where fishing of every kind gillnets and purse seine is prohibited	No use of gillnets/purse seine	143,00	2,40%

6. MONITORING METHODOLOGY

Marine protected areas (MPAs) have been proposed as tools aiming at protecting natural populations and ecosystems, enhancing small scale fisheries, and promoting local socio-economies through sustainable development. MPAs could therefore lead to a win-win scenario where the challenges of conservation and small scale fisheries management can be resolved in parallel (Di Franco et al. 2016). However MPAs can deliver benefits only under a certain set of conditions. In order to identify these conditions it is crucial to consider small scale fisheries and fishing resources as a complex socio-ecological system (SES) that integrates both natural and human components.

In this perspective, an integrated approach covering ecological, economic and social dimensions is required. Small scale fisheries (SSFs) are in fact complex activities encompassing multiple dimensions of management of natural resources.

Specifically the management of SSFs can affect the environment through the extraction of fishing resources and therefore potentially having an impact on marine ecosystems, and also the human dimensions of SSFs and fishermen through

modification in fishermen incomes and a large set of social variables.

Due to this multifaceted nature, successful management practices of SSFs should properly address all these aspects, and therefore it clearly emerges the need to collect relevant data concerning multiple aspects of SSFs management in order to develop and adapt sound management plans and strategies.

However until now very few studies investigated both the environmental and the human dimension of SSF management, and therefore it clearly emerges the need to fill this gap.

In order to collect information about catches, a number of different methodologies can be applied. In order to minimize sampling time in field and fish manipulation we chose to collect data using a photo-sampling methodology. Practically the operator places the catch over a flat surface (e.g. a table or the fish box to minimize manipulation) and takes one/multiple pictures where a ruler (as length reference) has to be visible and on the same plane as fishes. All the individuals have to be clearly identifiable and seen entirely (from the tip of the snout to the tail). The pictures have to contain an unique identifier of

the fishing operation (i.e. a small piece of paper with a unique code). This will allow, a posteriori, to assess length and wet weight of each specimen in laboratory by using a image-analysis software (e.g. ImageJ) and to evaluate, therefore, the composition and weight of the catch obtained in each individual fishing operation. The calculation of the wet weight starting from the estimated size with the image analysis tool is based on the use of available size / weight relationships.

The collection of data carried out in this way allows to calculate, in more detail:

1. the total catch for each fishing operation;
2. The CPUE (catch per unit effort) for each fishing operation;
3. catches and CPUE for individual species, especially for the most relevant target species;
4. The size distributions for the main species;
5. The catch percentages of undersized specimens (relative to the species for which the minimum catch sizes have been set).

7. RESULTS

7.1. TORRE GUACETO MPA

As far as the present study is concerned, the commercial landed with trammel nets was evaluated for a total of 76 fishing operations evaluated, of which 25 carried out in MPA (in zone C) and 51 outside MPA. The composition of the catches in percentage terms was represented by pie charts. The possible differences between "inside" and "outside" MPA in terms of catches and average CPUE have been tested by t-test.

In addition to the timely analysis of the data relating to this project, the data have been aggregated, year by year, from when the monitoring started in 2005 to the latest data collected in 2019, in order to represent the trend over time (on a scale multiannual) of total catches and the ratio between CPUE IN vs OUT MPA (with and without mullet and blue-fish). Mullet and blue-fish include gregarious species which, when captured (moreover with gear and targeted strategies), can represent almost all of the catch, heavily influencing the average figure, even if these catches have no direct link with the effect linked to the fisheries management system (e.g. mullets aggregate for breeding purposes).

The percentage composition of the catches made during this study within the AMP and beyond its boundaries are represented in the below pie charts (Figure 4).

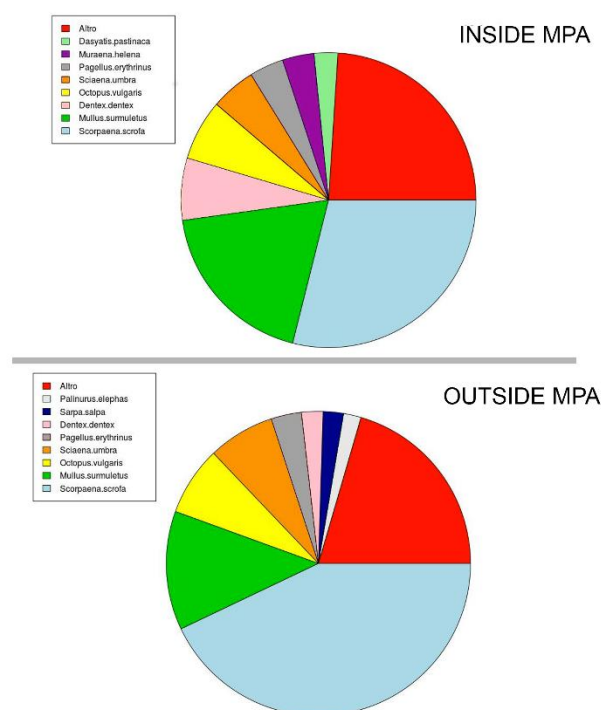


Figure 4 Percentage composition of the catches made in the Zone C of the MPA Torre Guaceto and outside its borders during this study.

Both inside the MPA (more precisely in Zone C) and outside, the two main target species, the red mullet and the red scorpionfish, represent roughly half of the catch. Following species such as the octopus (*Octopus vulgaris*), the Brown meagre (*Sciaena umbra*), the Common pandora (*Pagellus erythrinus*) and the Common dentex (*Dentex dentex*) which together represent approximately

20-25% of the catch both inside and outside the MPA.

As regards the average values of the total catches and of the CPUE made in zone C and outside the MPA, it can be seen in Fig. 3.4.2 how the average values for both variables were higher in MPA than in external.

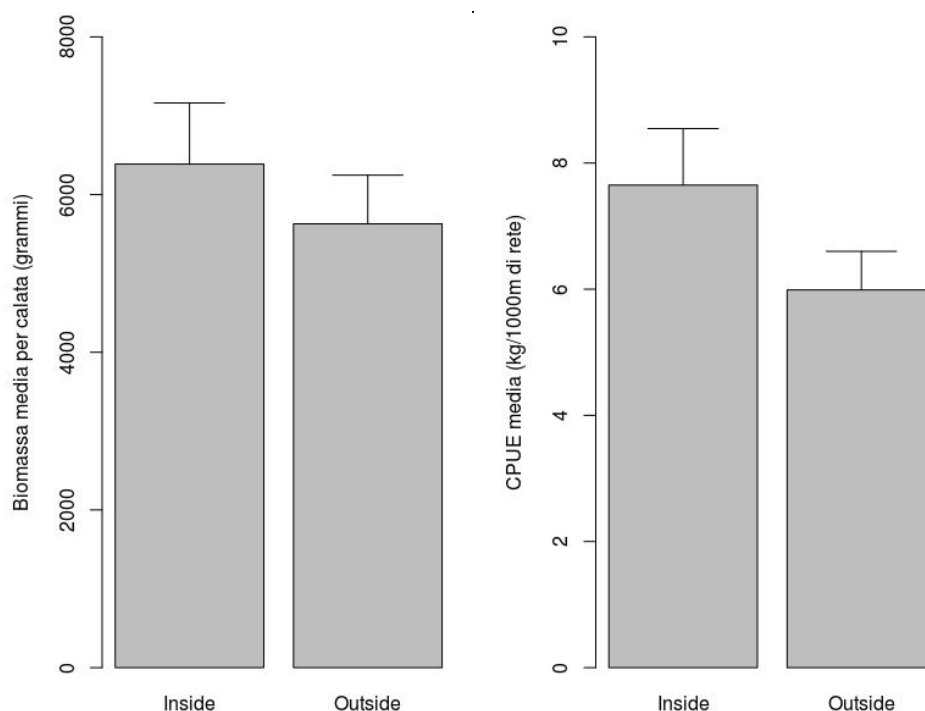


Figure 5 Total and CPUE catches made in zone C and outside the MPA Torre Guaceto during the present study

The total catch and CPUE data collected under this project enrich a historical series of gill nets data that began in 2005 and which represents a unique case worldwide. Since 2005, in fact, a series of monitoring have been carried out on an annual basis (with multiple campaigns carried out every year) in the C area of the MPA and in areas outside the MPA, in order to be able to compare the catches and the yields of the fishing under participatory management conditions compared to what normally takes place outside the MPA.

The data relating to this monitoring and the historical series are shown in Figure 6 as regards the total catches (a, b) and the average CPUE (c, d).

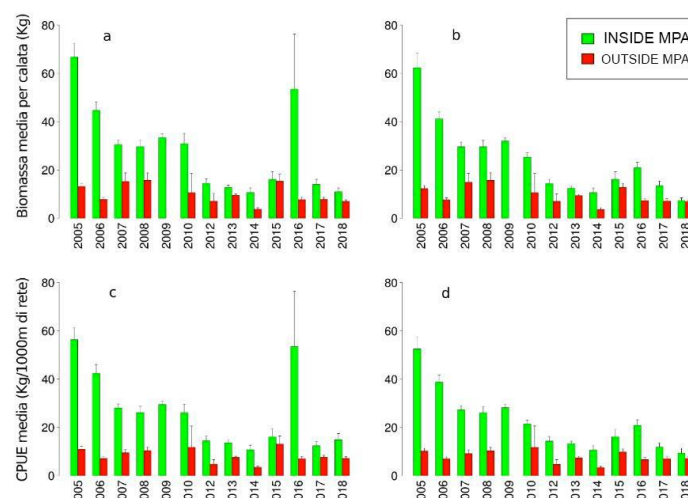


Figure 6 total catches (a, b: with and without "mullet + bluefish") and CPUE (c, d: with and without "mullet + bluefish") made with standard instrument (trammel) in zone C of the AMPAMP of Torre Guaceto (IN: green bars) and outside (OUT: red bars).

As regards the quantities relating to catches taken with gillnets, the data show average catches (expressed in terms of CPUE, kg of fish caught per 1000 m of net) higher in the C area of the MPA compared to the external sites to the north and south of the WAP. More in detail the average CPUE were higher in the C area of the MPA (around 10 kg of fish caught per 1000 m of net), slightly lower in the external area to the south (around 9 kg of fish per 1000 m of net) and about 20-25% lower in the external area to the north (around 7.5 kg of fish caught per 1000 m of net). It should, however, be considered that a not inconsiderable part of the catch made in external areas was carried out on specific catches made (for other with different nets) in order to specifically catch mullet and "blue fish". If these specific catches are not considered, the CPUE carried out in the sites outside the MPA zone C is significantly less than that obtained in MPA (in zone C).

The data collection method used in this study has also allowed us to collect precise data on the size of the specimens fished and, therefore, to build size-frequency distributions for some of the most fished species using the two techniques being monitored in this study (gillnets and longlines) and for which, at the same time, the minimum catch sizes have been formally established (according to EC Regulation 1967/2006).

The red mullet (*Mullus surmuletus*), for example, is caught only by the gillnets and its minimum allowed size is 11 cm. The data collected highlighted how the mail nets used, relative to the size of the smallest mesh, never capture under-sized mullet (Figure 7).

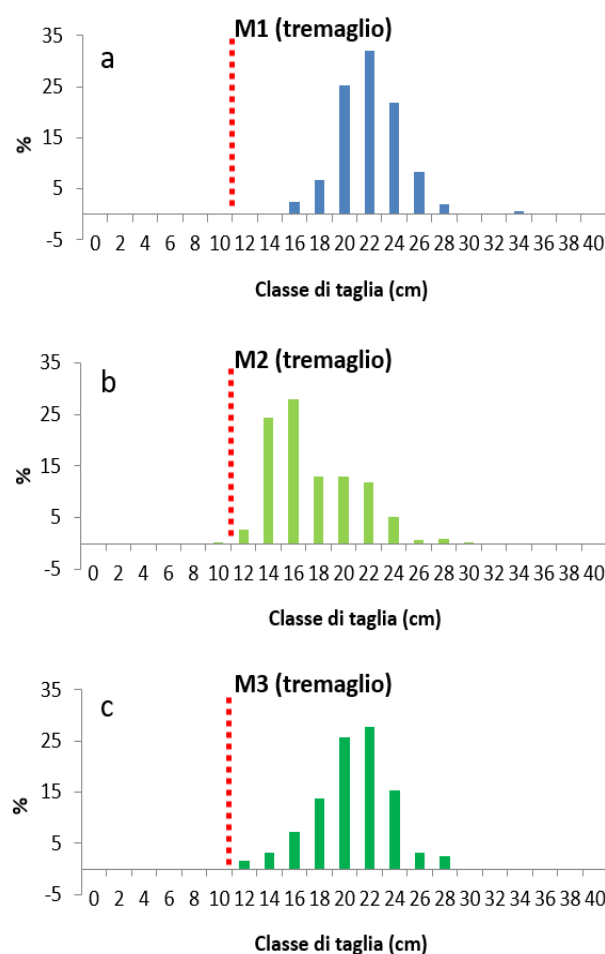


Figure 7 Size-frequency distributions of red mullet in relation to catches made with gillnets in zone C of the AMP (a) and in the two external areas north and south of the AMP (b, c) in the context of this study. The dotted red line indicates the minimum

The "Common Pandora" (*Pagellus erythrinus*) is one of the most fished sparids, with nets, and its minimum size is set at 15 cm. The data collected allow to highlight how the undersized catches are completely marginal in all three study areas (Figure 8).

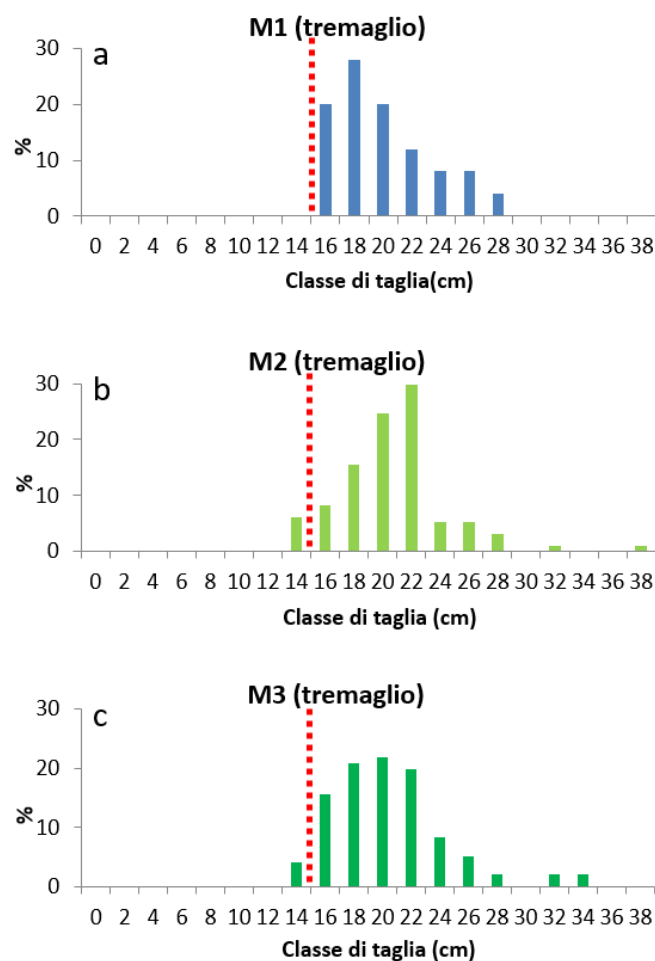


Figure 8 Size-frequency distributions of the Common Pandora in relation to catches made with gillnets in zone C of the MPA (a) and in the two external areas north and south of the MPA (b, c) in the context of this study. The dotted red line indicates the minimum size allowed

The "Common two-banded seabream" (*Diplodus vulgaris*) is effectively fished both by using nets and by using longlines. Its minimum catch size is 18 cm. The observation of size distributions demonstrates a non-negligible impact of nets on this species with, at times, more than half of the individuals that appear to be undersized. (Figure 9).

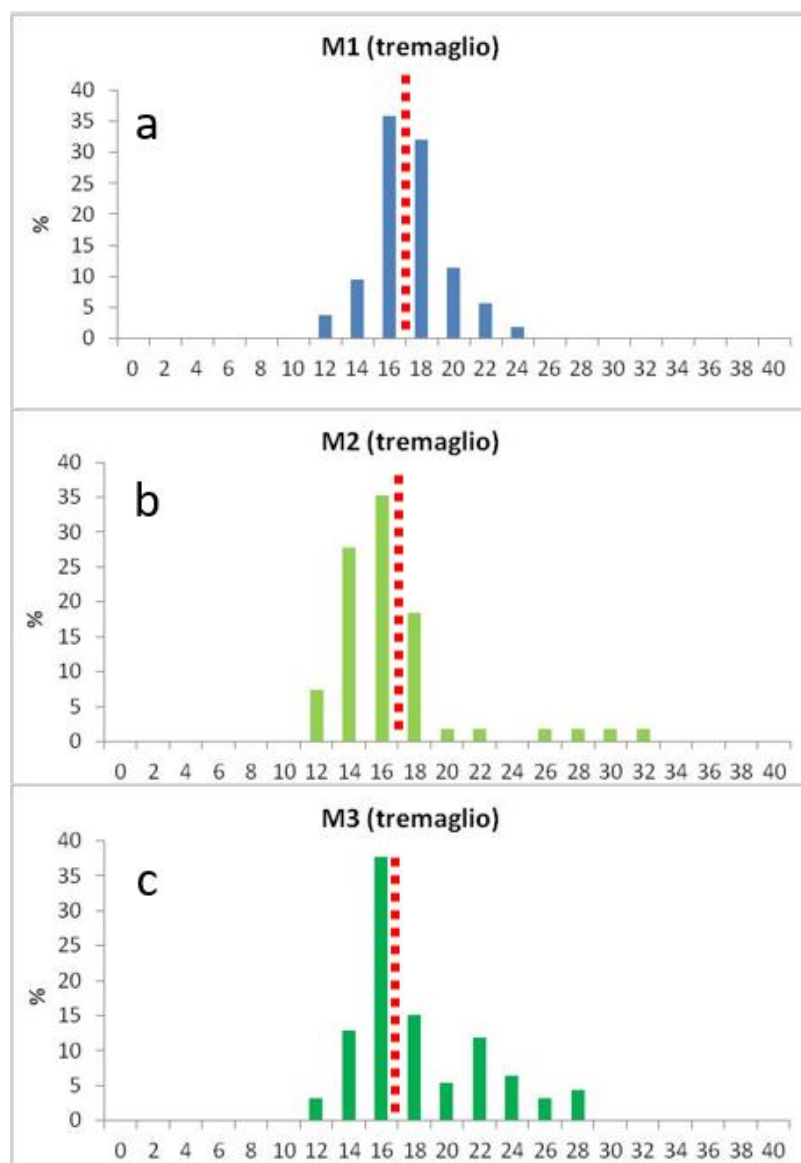


Figure 9 Size-frequency distributions of the black-headed bream related to catches made with gillnets (a: area C of the MPA; b, c: two external areas north and south of the MPA) The red dotted line indicates the minimum size allowed

Finally, as regards the " Couch's sea bream " (*Pagrus pagrus*), its minimum size is set at 18 cm. The analysis of the cut-frequency distributions clearly showed that a significant percentage of specimens caught with gill nets fall into the sub-size category. (Figure 10)

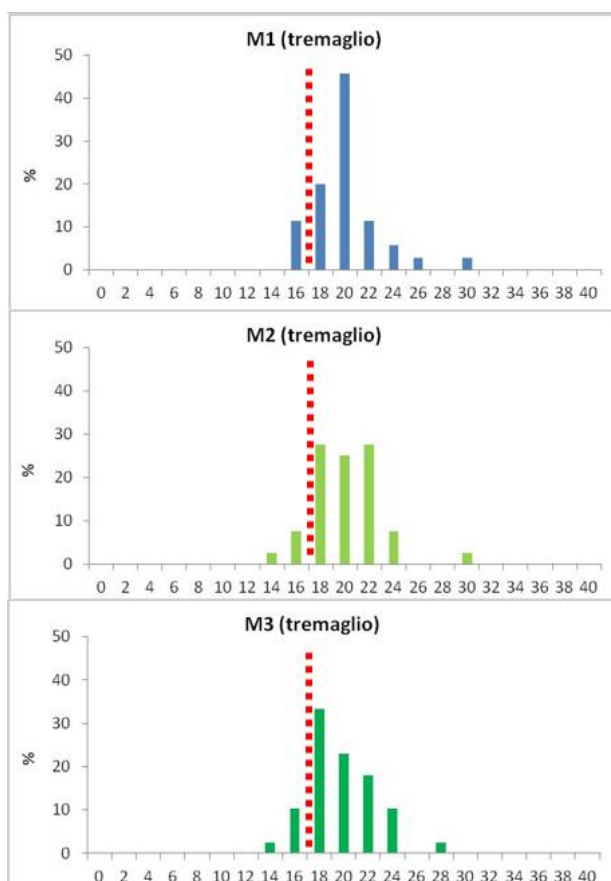


Figure 10 Size-frequency distributions of the Couch's sea bream in relation to catches with gillnets (a: area C of the MPA; b, c: two external areas north and south of the AMP). The dotted red line indicates the minimum size allowed

7.2. KARABURUN SAZAN

The catch composition of the fisheries landings in the Fishing Center Orikú (in Orikum) is reported for considered months during several projects implementation with the financial support of MedPAN and SPA/RAC, which are represented by April, May, August, September and October. As it is shown, during the monitoring performed in April, from the total landed catch coming from the small scale fishing activities inside the MPA (Karaburun and Sazani Island areas), the most representative species (in terms of abundance) are represented by European hake (*Merluccius merluccius*) with 82% of total catch.

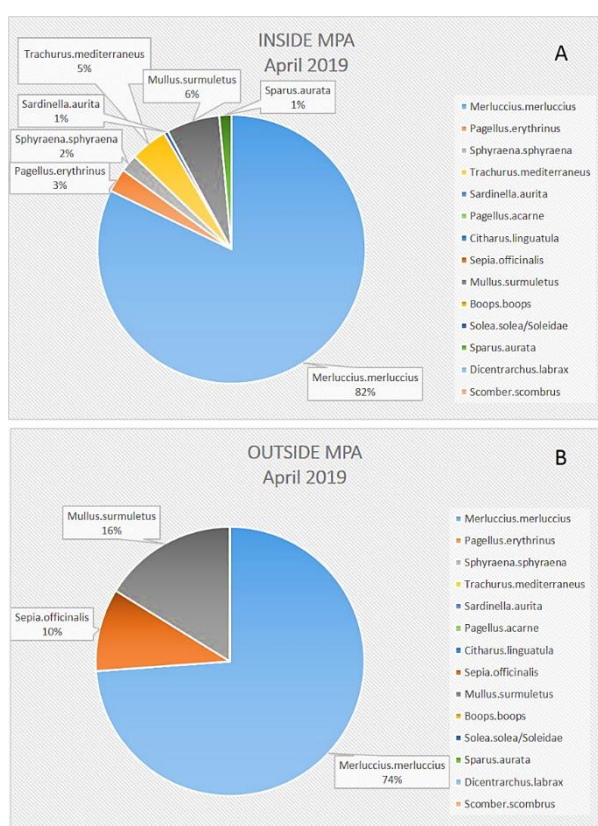


Figure 12 Catch composition of the fisheries landings from the small-scale vessels, which have been operating inside (A) and outside (B) the MPA during the month of April

The same species resulted to be the most abundant even in the catch composition coming from fishing outside the MPA (European hake 74%), though there were included other species in the list of the consistently fished species during April month, which are represented by the striped red mullet (*Mullus surmuletus*) and European common cuttlefish (*Sepia officinalis*) with 16% and 10% of the total catch, respectively.

During the monitoring of the fisheries landing composition in May, the most representative

species of the fishing activities inside the MPA resulted to be represented by European hake (75%), striped red mullet (8%) and bogue (*Boops boops*, 6%).

The fisheries catch composition corresponding to

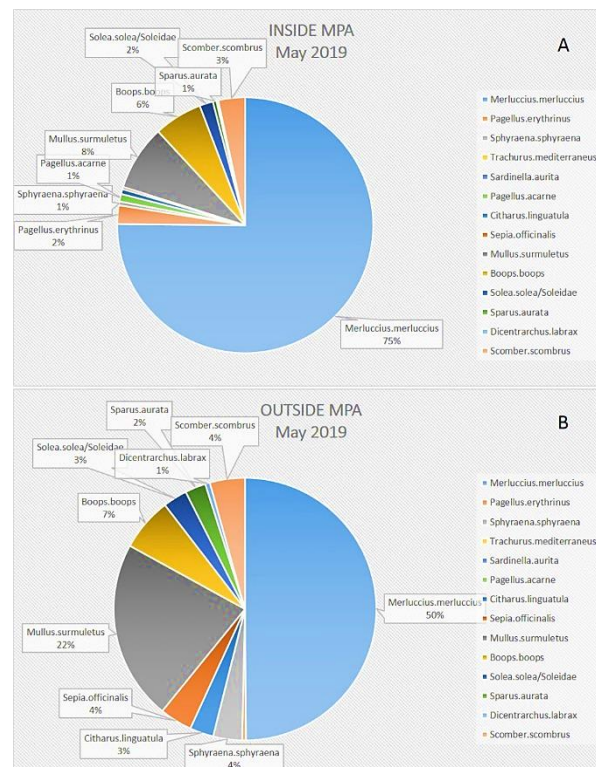


Figure 11 Catch composition of the fisheries landings from the small-scale vessels, which have been operating inside (A) and outside (B) the MPA during the month of May

the area outside the MPA was mostly characterized by European hake (50%), striped red mullet (22%) and bogue (7%).

The diversity of the fished species observed during the fisheries monitoring in August was almost on the same level regarding the landed catch coming from inside the MPA in comparison to the fishing outside the MPA. In the catch composition of the small-scale fishing inside the MPA, it was observed almost a homogeneous abundance distribution among European hake, striped red mullet and bogue. From the fishing activities outside Karaburun and Sazani island areas, it resulted that the most representative species were represented by the European hake (40%), bogue (15%), red striped mullet (16%) and the Atlantic spotted flounder (*Citharus linguatula*) (9%).

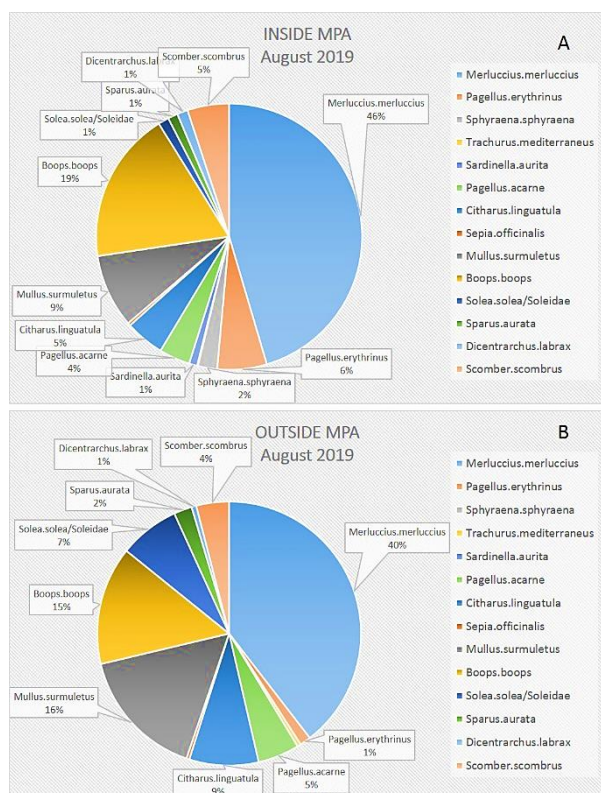


Figure 13 Catch composition of the fisheries landings from the small-scale vessels, which have been operating inside (A) and outside (B) the MPA during the month of August

Differently from the previous months, in September the most fished species were not only the European hake (29%) and the striped red mullet (11%), but also the European seabass (*Dicentrarchus labrax*, 26%) inside the MPA, while outside these areas (Karaburun and Sazani Island) the most fished species were represented by the European hake (42%), red striped mullet (20%) and the common pandora (*Pagellus erythrinus*, 14%).

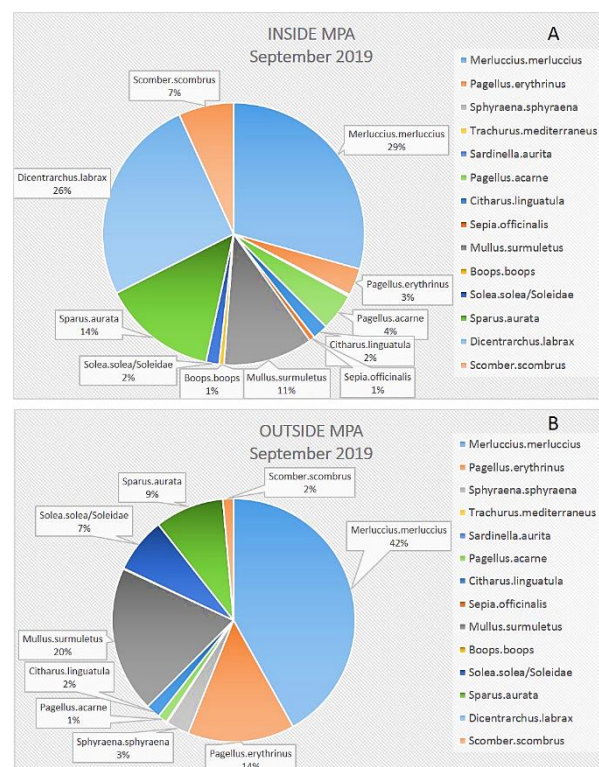


Figure 14 Catch composition of the fisheries landings from the small-scale vessels, which have been operating inside (A) and outside (B) the MPA during the month of September

The diversity of the fished species observed during the fisheries monitoring in October was higher on the landed catch coming from inside the MPA in comparison to the fishing outside the MPA. In the catch composition of the small-scale fishing inside the MPA, it was observed almost a homogeneous abundance distribution among European hake, Atlantic mackerel (*Scomber scomber*), gilthead seabream, Soleidea and striped red mullet. From the fishing activities outside Karaburun and Sazani island areas, it resulted that the most representative species were represented by the European hake (42%), bogue (21%), red striped mullet (14%) and the Atlantick mackerel (10%).

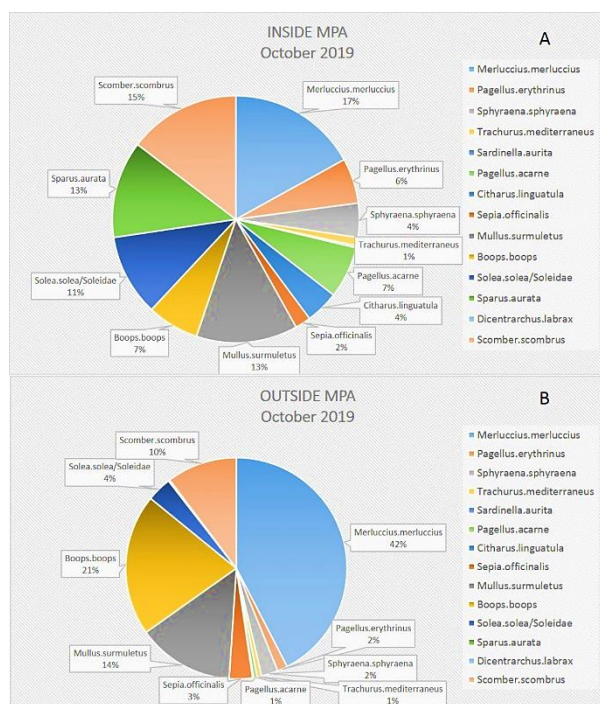


Figure 15 Catch composition of the fisheries landings from the small-scale vessels, which have been operating inside (A) and outside (B) the MPA during the month of October

In Figure below is shown the total landed catch inside and outside the MPA for each of the most fished species during the integrated fisheries monitoring, which was implemented in the frame of this project on April, May and from August to October 2019. The fished biomass of *C. linguatula*, *S. officinalis*, *M. surmuletus*, *B. boops* and *S. Solea/Soleidae* was higher outside the MPA than inside it, while the fished biomass of *S. sphyræna* was the same inside and outside the MPA. In the case of *M. merluccius*, *P. erythrinus*, *T. mediterraneus*, *P. acarne*, *S. Aurata*, *D. labrax* and *S. scombrus*, the fished biomass resulted to be higher inside the MPA than outside it.

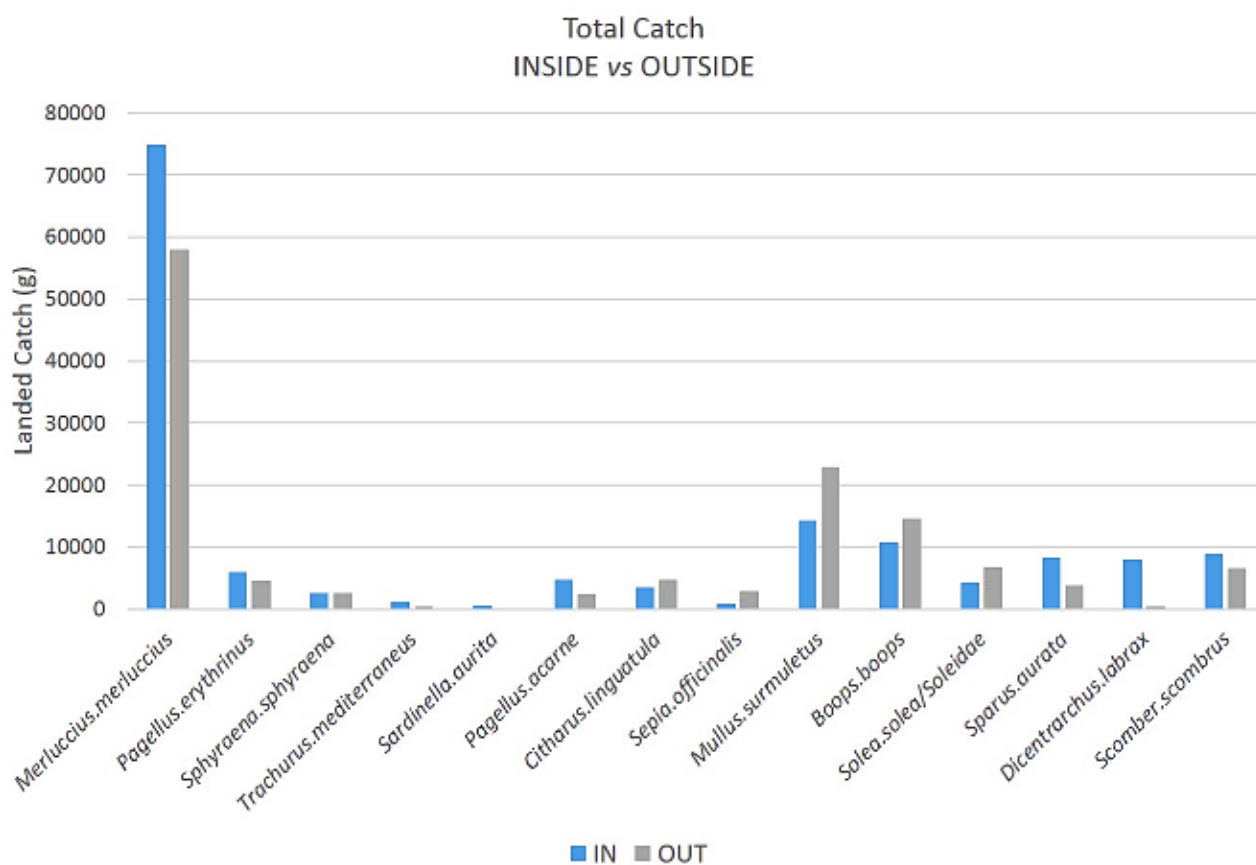


Figure 16 The total catch registered for each of the most representative species along the monitoring of fisheries landings

In Figure below are graphically shown the monthly average landed catches inside and outside the MPA on April, May and from August to October 2019. The variance is generally high as shown by the barrel corresponding to the standard

deviation. Furthermore, the application of the t-test ($p < 0.05$) showed that no statistically significant difference exists between the monthly average catch inside and outside the MPA for each of the most fished species.

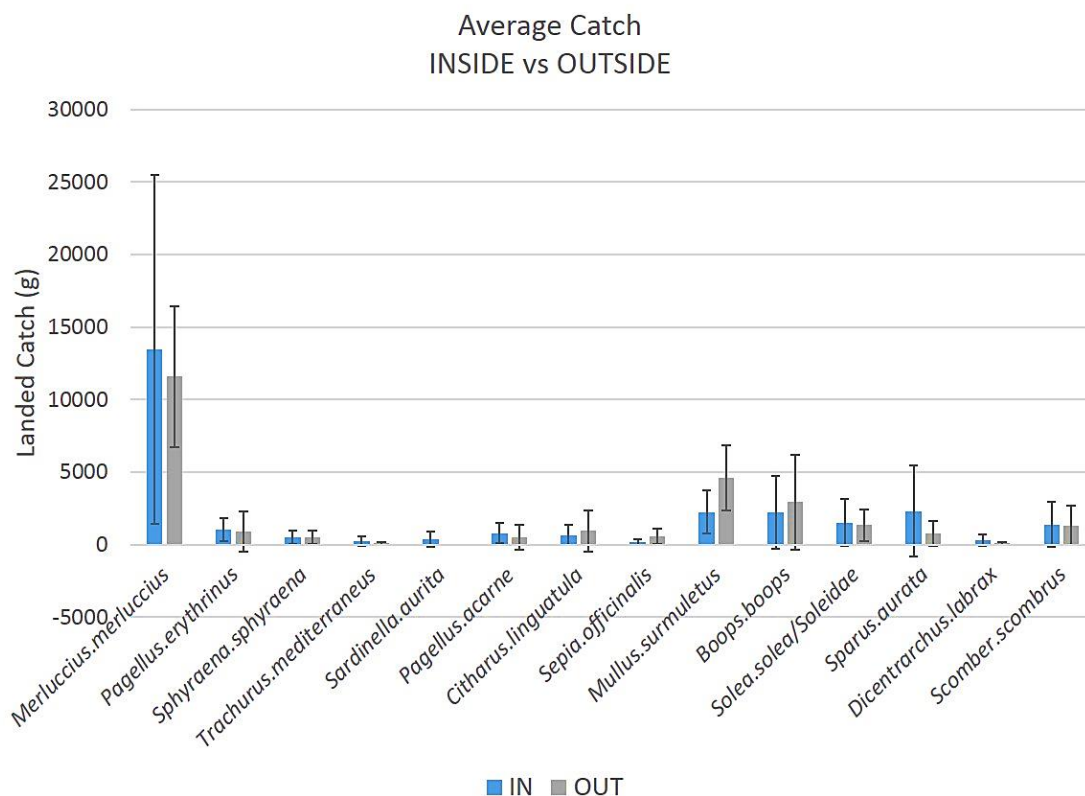


Figure 17 The average catch registered for each of the most representative species along the monitoring of fisheries landings (barrels represent the standard deviation values)

For the three most fished species (European hake, striped red mullet and bogue), inside and outside the MPA of Karaburun-Sazani are shown the monthly total landed catch of April, May, August, September and October. In the case of European hake (*M. merluccius*), the landed catch coming from the small-scale vessels (which were fishing) in the area outside the MPA was higher than the fished biomass corresponding to the small-scale fishing activities inside the MPA during September and October, while during the August month the landed catch was the same in the two analyzed fishing areas. In April and May, the landed catch from the fishing vessels coming from the MPA areas were higher than the landed catch from outside the MPA.

Regarding the striped red mullet (*M. surmuletus*), the landed catch coming from the small-scale vessels in the area outside the MPA was higher than the fished biomass corresponding to the small-scale fishing activities inside the MPA during all the considered months (from August to October and May) except the month of April, when it was registered the opposite. In the case of the bogue (*B. boops*), no one individual of European hake was registered during the monitoring activities. On August and November no apparent differences were observed between the two fishing areas, while on October the fished biomass resulted to be higher outside than inside the MPA. On September just some individuals of bogue were registered exclusively during the monitoring of the fishing activities inside the MPA of Karaburun-Sazani.

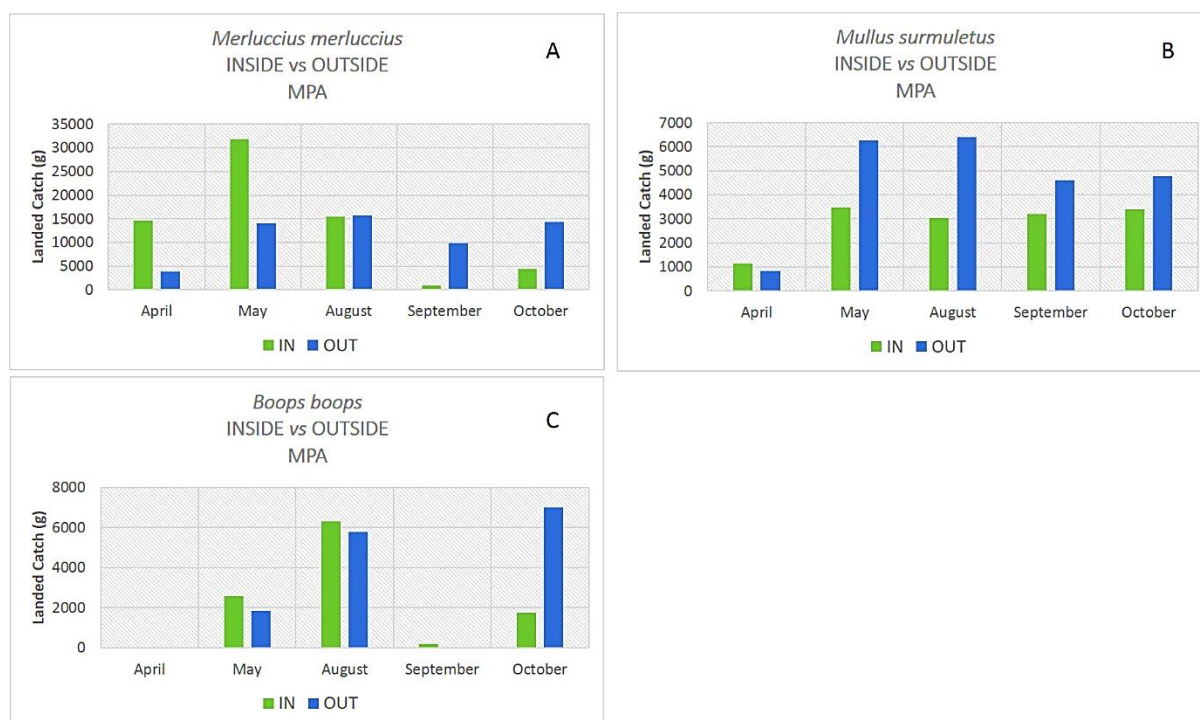


Figure 18 The monthly total catch registered for European hake (*M. merluccius*) (A), striped red mullet (*M. surmuletus*) (B) and bogue (*B. boops*) (C) inside and outside the MPA (fishing areas close to Karaburun peninsula and Sazani island)

Furthermore, it was calculated the Catch per Unit of Effort (CPUE) based on the landed catch corresponding to the small-scale fishing activities inside and outside the MPA. The CPUE is expressed as kg of fish per 1000 m of deployed fixed net (trammel net). In Figure below are shown the graphics corresponding to the average CPUEs inside and outside Karaburun area, the average CPUEs inside and outside Sazani Island area and the comparison between all fishing areas average CPUEs. From the t-test ($p < 0.05$), it resulted that no statistically significant differences exist between fishing inside Karaburuni area and outside it, or fishing inside/around the Sazani

island, though there are some slight differences, as shown in the respective graphics. Furthermore, as it is shown in the graphic of, the fishing area corresponding to the Sustainable Development Zone (in the Zoning System of Karaburun-Sazani MPA) resulted to be less productive than the area around Sazani island; even the fishing areas located close to the Core Zone and the Effective Management Zone of Sazani Island (in the Zoning System of Karaburun-Sazani MPA), based on the average CPUE values comparisons, resulted to be more productive than the fishing areas close to the Sustainable Development Zone of Karaburun peninsula.

8. DISCUSSION

It very important to elucidate the fact that the common indicators have been used even previously by the two MPAs. It means that it is almost obligatory to continue with implementing a monitoring approach on local fisheries data

collection in the MPA of Karaburun-Sazni, based on previously used methodology and a complementary methodology previously used in Torre Guaceto to get fishery data in the framework of the FISHMPABBLUE2 project. In the

case of the MPA of Karaburun-Sazani MPA, this methodology was developed together with the International Expert (Professor Paolo Guidetti) in the project entitled “Creating Bridges of Collaborations over the Adriatic Sea, while Adapting the Successful Experiences from Torre Guaceto MPA in Karaburun-Sazani MPA for Sustainable Fisheries Development”. It takes into account several biological, social and economic factors in order to have affordable indicators by the socio-economic point of view on the interest of the small-scale fishers and the biological point of view on the interest of all the humanity and the coming generations (biodiversity conservation).

8.1. BIOLOGICAL INDICATORS

Based on the catch composition and fished biomass as biological indicators, it was indicated that there is a high biodiversity of the fished species, characterised by pelagic and demersal fish species and molluscs (common cuttlefish), where the abundance was nearly the same in the comparison between the fishing areas (inside vs outside the MPA). Thus, it means that a better management of the small-scale fisheries is needed in these areas, Bay of Vlorë and Karaburun-Sazani MPA. This could be done by adapting the working strategy of the Torre Guaceto MPA.

8.2. SOCIO-ECONOMIC INDICATOR

The CPUE, RPUE and IPUE are economic indicators which take into account the social aspects of the involved people in the fishing sectors. The results of the CPUEs indicated that there is higher production and revenues inside the MPA, but the

corresponding differences are not statistically significant or better expressed can be defined as slight differences, which suggest a better management of the MPA in terms of biodiversity conservation and a better management of the fisheries sector close to the MPA. It is taken into account the IPUE analyses, it would be highly suggested not to go for fishing in the areas inside and close to the EMZ and CZ of Sazani, because there is no considerable net profit from the fishing activities in these areas, especially for the areas close to Sazani island (when taking into account only the fishers of the Fishing Center Oriku).

8.3. CITIZENS SCIENCE

Citizenscience is an approach where researchers collaborate with people to conduct studies and it is a positive human influence that is growing rapidly in support of many disciplines, particularly in conservation and environmental research.

Citizenscience empowers any individual, including both professionally trained scientists and amateur citizens, to make a direct contribution to conservation and research. For example, actually in Albania there are two Facebook groups (one for the sharks observations and the other for the Invasive Alien Species - IAS). These groups aim at recording observations of sharks and rays in Albania and also the IAS, respectively. Based on the fact that an existing initiative just exists at national level, it would be urged to extend it at international level by promoting the cooperation between the two MPAs (Karaburun-Sazani MPA in Albania and Torre Guaceto MPA in Italy).