Handbook of “Adriatic good practices” for ecological behaviours for the practice of fisheries

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1 Introduction

The ARGOS Handbook of "Adriatic Good Practices" for Ecological Behaviours in Fisheries: A Comprehensive Guide for Sustainable Practices.

Ecological behaviour means “actions which contribute towards environmental preservation and/or conservation” (Axelrod & Lehman, 1993).

Pro-environmental behaviour is a form of environmental action that “consciously seeks to minimize the negative impact of one’s actions on the natural and built world” (Kollmuss and Agyeman, 2002)

Environmental knowledge and environmental values explained 40 per cent of the variance of ecological behaviour intension (Kaiser et al 1999), therefore promoting knowledge and education can significantly improve practice in fisheries.

In an effort to protect the delicate ecological balance of the Adriatic Sea, the Handbook of "Adriatic Good Practices" for Ecological Behaviours in Fisheries provides fishermen with practical insights and strategies for sustainable fishing.

The Handbook of "Adriatic Good Practices" for Ecological Behaviours in Fisheries serves as a beacon of hope for the future of fishing in the Adriatic region, offering a compilation of best practices and innovative approaches towards ecological sustainability. Some of those are general, and some of those recommendation comes directly from numerous studies provided by Argos project.

Embark on a journey of ecological stewardship with the Handbook of "Adriatic Good Practices" for Ecological Behaviours in Fisheries, empowering fishermen to embrace sustainable fishing methods and safeguard the Adriatic's marine resources.

As the demand for seafood continues to rise, the Handbook of "Adriatic Good Practices" for Ecological Behaviours in Fisheries becomes an invaluable tool, equipping fishermen with the knowledge and tools necessary to ensure the long-term viability of their industry.

The Handbook of "Adriatic Good Practices" for Ecological Behaviours in Fisheries represents a collaborative effort by experts, policymakers, and fishermen alike, coming together to promote responsible fishing practices and preserve the Adriatic's fragile ecosystem.

Delve into the pages of the Handbook of "Adriatic Good Practices" for Ecological Behaviours in Fisheries, where you will find a wealth of information on sustainable fishing techniques, gear selection, and resource management, all tailored to the unique characteristics of the Adriatic Sea.

By embracing the principles outlined in the Handbook of "Adriatic Good Practices" for Ecological Behaviours in Fisheries, fishermen can play a vital role in conserving the Adriatic's biodiversity, ensuring a prosperous and sustainable future for generations to come.

The project ARGOS, funded by the Interreg Italy – Croatia Programme, pursues both regional, national and supranational strategic objectives. The project involves 16 Partners:

LP - Regione Autonoma Friuli Venezia Giulia (IT) which has been entrusted with the role of

Lead Partner of the project;

PP1 - Veneto Region (IT);

PP2 - Emilia Romagna Region (IT);

PP3 - Marche Region (IT);

PP4 - Molise Region (IT);

PP5 - Puglia Region (IT);

PP6 - Istrian County (HR);

PP7 - Coastal Montana County (HR);

PP8 - Zadar County (HR);

PP9 - Development Agency of Šibenik County – Knin;

PP10 - Development Agency of Split County – RERA;

PP11 - Dubrovnik-Neretva County (HR);

PP12 - National Research Council CNR -IRBIM(IT);

PP13 - Institute for Oceanography and Fisheries IOF (HR);

And associated partners:

PP14 - Ministry of Agricultural, Food, Forestry and Tourism Policies (IT);

PP15 - Ministry of Agriculture of Croatia (HR).

The manual was designed in such a way as to preliminarily arrange the important and other basic premises and guidelines that arise from professional works through the implementation of the Argos project itself. Of course, there is no room in the handbook to cover everything, however, the focus will be on the essential imperatives, especially the ecological practices that emerged from the program. The practical extrapolated work will be presented in each part of the chapter after the set of relevant pictures.

2 Handbook of “Adriatic good practices” for ecological behaviours for the practice of fisheries:

2.1 Lessons learned from the project that contribute to fishermen and farmers when applying the Bottom-up approach in management and co-management

Project extracted instructions: The Handbook of "Adriatic Good Practices" for Ecological Behaviours in Fisheries offers valuable lessons learned from projects that promote the bottom-up approach in management and co-management. These lessons provide practical insights and guidance for fishermen in their efforts to apply this approach. Some key lessons include:

1. Stakeholder involvement: The handbook emphasizes the significance of involving fishermen, along with other relevant stakeholders, in decision-making processes. By actively engaging these stakeholders, their knowledge, perspectives, and needs can be incorporated into management and co-management strategies effectively.

2. Local knowledge integration: The bottom-up approach recognizes the value of local knowledge and traditional practices. The handbook highlights the importance of integrating this knowledge into management and co-management initiatives. By combining scientific knowledge with traditional ecological knowledge, more holistic and context-specific approaches can be developed.

3. Collaborative governance: Successful implementation of the bottom-up approach relies on collaborative governance structures. The handbook provides examples of successful collaborations between fishermen, local communities, researchers, and policymakers. It emphasizes the need for inclusive and participatory decision-making processes to ensure the interests and concerns of all stakeholders are addressed.

4. Adaptive management: The bottom-up approach encourages adaptive management, which involves continuously learning and adjusting strategies based on feedback and new information. The handbook offers examples of adaptive management practices that have proven effective in promoting sustainable fisheries and farming practices. It highlights the importance of monitoring, evaluation, and feedback loops to inform decision-making and enable timely adjustments.

5. Capacity building and training: The handbook recognizes the importance of capacity building and training programs to support the application of the bottom-up approach. It provides guidance on developing and implementing training initiatives that equip fishermen with the necessary skills and knowledge to actively participate in management and co-management processes.

6. Knowledge sharing and networking: The handbook emphasizes the value of knowledge sharing and networking among stakeholders. It provides recommendations for establishing platforms, such as workshops, forums, and online communities, where fishermen, and other stakeholders can exchange experiences, best practices, and lessons learned.

By incorporating these lessons into their practices, fishermen can effectively apply the bottom-up approach in management and co-management, contributing to more sustainable and resilient fisheries systems in the Adriatic region.

Figure 1 and 2 Photos from the Round Table on the topic of designating new protected areas, held in Komiža on July 21, 2022.

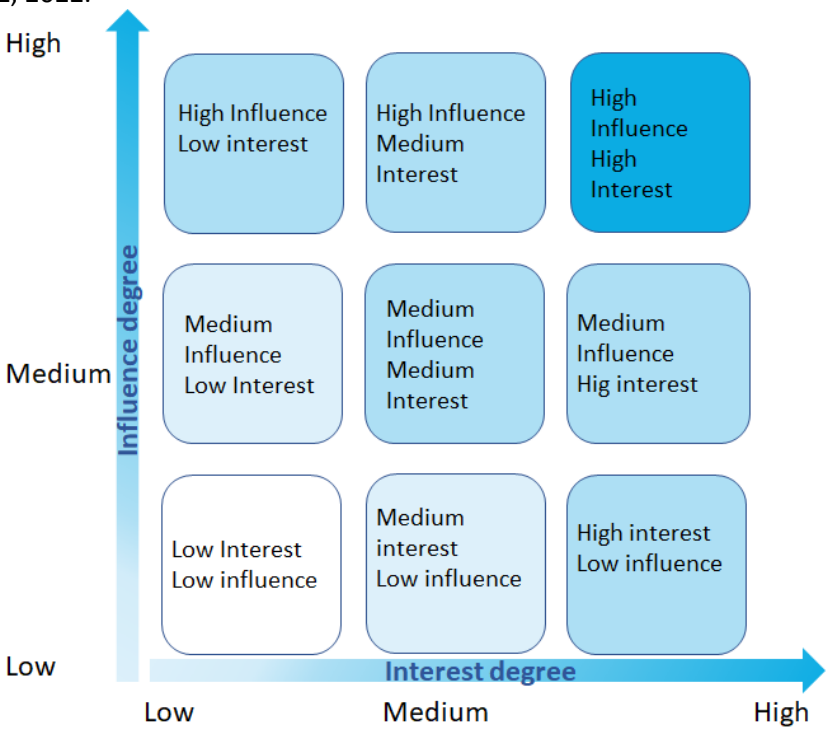


Figure 3. Stakeholder mapping matrix

Notes from deliverables:

Improvement of fishermen behaviours, bottom-up approach was used for establishing the Management protocol for NATURA 2000 sites. Also, while proposing guidelines by P2 for the most effective procedures to safeguard the sustainability of fishery in the framework of marine protected areas it has been stressed that compliance with regulations often depends on effective monitoring and enforcement mechanisms, as well as the availability of financial compensation where necessary. In this context, participatory approaches and the ecosystem based approach to fisheries management can play crucial roles in protecting, monitoring, and managing fisheries and marine protected areas while ensuring the resilience of both.

Network for the training and education of operators towards environmental sustainability held several workshops and individual consultations with fishermen. All participants in the consultation agreed that it is necessary to improve overall environmental sustainability, especially the protection of fish stocks and biodiversity. The fishermen said that they consider the following types of education to be the most important:

- Fishermen's meetings, where they exchange experiences with each other, but at the same time have direct contact with representatives of the ministry and scientific-educational and advisory institutions
- Study visits in which they will be in direct contact with fishermen and fishing activities
- Educational workshops when dealing with new regulations and proposing technological solutions.

Stakeholders can be mapped in a matrix (Picture. 3) which offers a view of the level of interest as well as of influence of each stakeholder. The matrix is a classification of the degree of interest plotted on x axis on an increasing scale from low to high interest, and the degree of influence plotted on y axis again from low to high influence, all the intermediate levels can be used.

In general term, the stakeholders positioned at the lower extreme level, such as low interest and low influence, probably, do not want even being involved. At the opposite stakeholders with high influence and high interest are probably the main driver of the decision-making process.

In the case of professional fishery, the level of influence depends on local conditions, and - in addition to participation - professional fishermen have a specific role in monitoring actions that needs to be capitalized; as fishers can provide valuable data on changes occurring at the site.

Management Protocols (MP) stem from the necessity to regulate human activities that may influence the conservation status of habitats and species in a Nature 2000 site.

A key role is assigned to the direct involvement of fishery stakeholders according to the bottom-up principle, as conservation and enhancement of the resource is primarily for the benefit of these stakeholders.

Apart from the need to strengthen the image of the artisanal fisherman, distinguishing him from other professional figures precisely due to the specificity of his profession and the characteristics of the activity he carries out (peculiarity, seasonality, sustainability), it would be advisable to concentrate efforts by intervening on the motivation and on active involvement, making the fishermen themselves active protagonists of the change process in which they are involved. Intervening on the motivation to contribute to a participatory and collective development can help trigger solidarity mechanisms among fishing operators by strengthening the development of collective activities.

Challenges arise when multiple stakeholders, some overlapping with fisheries and others competing with them, are involved in the interactions between marine protected areas and human activities. Furthermore, compliance with regulations often depends on effective monitoring and enforcement mechanisms, as well as the availability of financial compensation where necessary. In this context, participatory approaches and the ecosystem based approach to fisheries management can play crucial roles in protecting, monitoring, and managing fisheries and marine protected areas while ensuring the resilience of both.

After holding four workshops and a series of individual consultations with fishermen whose goal was to determine the real problems and needs of the sector, all participants in the consultation agreed that it is necessary to improve overall sustainability.

When asked about the method of organizing education, all fishermen prefer "live" education, with as much direct contact as possible with other fishermen, and education that is simple and with the application of practical examples. They consider the following types of education to be the most important:

- Fishermen's meetings, where they exchange experiences with each other, but at the same time have direct contact with representatives of the ministry and scientific-educational and advisory institutions
- Study visits in which they will be in direct contact with fishermen and fishing activities
- Educational workshops when dealing with new regulations and proposing technological solutions.

Partners of the ARGOS project, propose the following topics for further education:

- Bycatch of sensitive species (turtles, birds, mammals, crustaceans) - which would include the importance of bycatch of these species, the importance of reporting and mitigation measures
- Marine litter and microplastics - to emphasize the importance of trawling in the elimination of marine litter ("fishing for litter"), in addition to the need to solve the problem that trawlers have with the disposal of microplastics
- The importance of establishing marine protected areas (MPA - Marine protected areas)
- Diversification of fishing activities - diversification within fishing (replacing destructive fishing gears with more selective ones), diversification outside fishing (tourist fishing, tourism)
- Education on fishing skills, considering that today it is almost impossible to find a fisherman who knows how to mend nets, make longlines, drill and other gears
- Education on withdrawing funds from EU fisheries funds
- Education on the legal regulation of fishing in the EU
- The importance of forming fishing associations or other forms of association
- The importance of harmonizing the curriculum for fishing professions in schools
- Diversification of production (introduction of new species into cultivation)
- The need for sustainable fish food (insect meal, microalgae)
- Finding new materials that would reduce the harmful impact of plastic.

a proposal to form an Education Platform instead of the Network of Regional Education Centres, where potential partners for entering the platform will be all stakeholders of the sector in accordance with individual competencies.

It is proposed to establish a Network of regional centres for education, or a Platform in which individual experts will be involved in education according to their individual competencies in order to establish the most efficient cooperation with fishermen and breeders. Regardless of the way of organization (Network or platform), education should primarily cover the following broader topics of common interest:

- Marketing (especially education in the use of IT technology and social media)
- Sustainable fishing tools
- Administration (bureaucracy)
- Diversification of fishing activities
- Diversification of production in aquaculture
- Application of new technologies.

In the sphere of marketing, education, training and cooperation of all stakeholders would make it possible to solve some clearly identified relevant factors of the success of the fishing industry:

- Support the development of new market opportunities in high-value product segments
- Redirect marketing that is overly focused on lower value products
- Pay adequate attention to innovative marketing solutions using own solutions as well as those that have proven to be effective in other countries and environments
- Facilitate access to domestic (especially including tourism as an important branch of coastal industries in both in both countries) and higher value export markets including markets "niche" where higher prices can be achieved
- Expand product differentiation, including additional recognized certificates
- Encourage the development of new promotional methods to increase the consumption of aquaculture products.

Fishermen are also aware that the sustainability of the sector is affected by illegal fishing (fishing without privileges) and insufficient control of sport and recreational fishing. Although they emphasize that these controls have been increased in the last two or three years, they believe that this increase is still insufficient. Namely, illegal fishing encourages the reduction of fish prices and reduces their competitiveness on the market, they emphasize.

2.2 Ecological behaviours – fishery

Project extracted instructions: Good practices in ecological behaviours in fisheries are crucial for ensuring the sustainability and long-term viability of fishery resources. Here are some key good practices that can be adopted:

1. Sustainable fishing methods: Adopting sustainable fishing methods, such as selective fishing gear and techniques, can help minimize the capture of non-target species and reduce the impact on the marine ecosystem. Practices like using size-selective nets, employing escape panels in fishing gear, and implementing catch-and-release measures can promote sustainable fishing practices.

2. Responsible fishing practices: Implementing responsible fishing practices, such as adhering to catch limits, respecting fishing seasons and closures, and avoiding overfished areas, are essential for maintaining healthy fish populations. By following these practices, fishermen can ensure the replenishment and recovery of fish stocks.

3. Resource conservation: Practicing responsible resource conservation involves minimizing waste and discards. This can be achieved by utilizing bycatch reduction devices, practicing proper handling and storage techniques to prevent spoilage, and maximizing the use of captured fish by promoting responsible fish processing and marketing practices.

4. Habitat protection: Protecting critical habitats, such as coral reefs, seagrass beds, and spawning grounds, is essential for maintaining the overall health of the ecosystem. Avoiding destructive fishing practices like bottom trawling in sensitive areas and promoting the use of fishing gear that has minimal impact on habitats are important steps towards habitat protection.

5. Collaboration and co-management: Engaging in collaborative approaches and co-management initiatives that involve fishermen, scientists, policymakers, and local communities can lead to

more effective fisheries management. By working together, stakeholders can develop and implement regulations, monitoring systems, and conservation measures that are tailored to local contexts and promote the sustainable use of fishery resources.

6. Research and innovation: Embracing research and innovation can contribute to ecological behaviours in fisheries. This includes conducting scientific studies on fish populations, ecosystem dynamics, and the impacts of fishing practices, as well as exploring and adopting new technologies and practices that minimize environmental impact, such as eco-friendly fishing gear and alternative fishing methods.

7. Education and awareness: Promoting education and awareness about sustainable fishing practices among fishermen, local communities, and consumers is crucial. By providing training programs, workshops, and outreach initiatives, stakeholders can enhance understanding of the importance of ecological behaviours in fisheries and encourage responsible choices in fish consumption.

By implementing these good practices, fishermen can play a vital role in preserving fishery resources, protecting the marine ecosystem, and ensuring the long-term sustainability of fisheries for future generations.

Figure 4. Jellyfish caught in fishing nets A – the fried-egg jellyfish; B – the compass jellyfish; C – Salpa fusiformis; D – the walnut jellyfish; and E – the barrel jellyfish; A, B, D & E from the east coast while C was taken on the west coast of the northern Adriatic Sea; photo kindly shared the affected fishermen.

Notes from deliverables:

Good ecological behaviours in fisheries include the following:

- Fisheries should set harvest levels that allow fish populations to reproduce and replenish themselves naturally. This involves determining the maximum sustainable yield (MSY) of a particular fish stock and setting catch limits accordingly.

- Selective fishing: Selective fishing methods target specific species and sizes while minimizing bycatch (the unintentional catch of non-target species). By reducing bycatch, fisheries can minimize the ecological impact on non-target species and maintain the overall balance of the ecosystem.

- Gear modifications: Using fishing gears that minimize habitat damage and reduce impacts on sensitive habitats is crucial. For example, using traps or nets with escape panels allows smaller or non-targeted fish to escape, reducing the potential for overfishing and promoting population sustainability.

- Protection of spawning and nursery areas: Identifying and protecting critical habitats such as spawning and nursery areas is essential for the successful reproduction and survival of fish populations. Implementing fishing closures or restrictions in these areas during vulnerable times helps ensure the replenishment of fish stocks.

- Monitoring and research: Regular monitoring of fish populations, their habitats, and fishing practices is vital to assess the health of fish stocks and identify potential issues. Scientific research plays a significant role in understanding ecosystem dynamics, fish behaviour, and the impact of fishing practices, which informs effective management strategies.

- Collaboration and regulation: International cooperation and effective regulation are crucial for sustainable fisheries. Collaborative efforts among governments, stakeholders, scientists, and fishing communities help establish policies, regulations, and conservation measures that promote sustainable fishing practices and ensure compliance.

- Ecosystem-based management: Recognizing the interconnectedness of species and habitats within an ecosystem is essential. Managing fisheries in an ecosystem-based manner involves considering the broader ecological context, such as predator-prey relationships, habitat health, and the overall resilience of the ecosystem.

2.3 Compliance with protection measures in NATURA 2000 areas

Project extracted instructions: Compliance with protection measures in NATURA 2000 areas is crucial for safeguarding the biodiversity and ecological integrity of these protected sites. Here are some key aspects related to compliance with protection measures in NATURA 2000 areas:

1. Legal framework: NATURA 2000 is a network of protected areas established under the European Union's Habitats Directives. This directive aims to conserve and protect important habitats and species of European significance. Compliance with the legal framework provided by these directives is essential for ensuring the effective protection of NATURA 2000 areas.

2. Site-specific regulations: Each NATURA 2000 site has specific conservation objectives and if needed be management plan. Compliance with site-specific regulations is vital to ensure the

preservation of the unique ecological features and species within these areas. These regulations may include restrictions on certain activities, habitat restoration guidelines, and species protection measures.

3. Stakeholder engagement: Engaging with stakeholders, including local communities, landowners, conservation organizations, and relevant authorities, is essential for compliance with protection measures. Collaboration and dialogue among stakeholders can help raise awareness about the importance of NATURA 2000 areas, promote understanding of the regulations, and foster a sense of ownership and responsibility towards their conservation.

4. Monitoring and enforcement: Regular monitoring and enforcement of protection measures are essential for ensuring compliance within NATURA 2000 areas. Monitoring can involve species and habitat surveys, tracking human activities, and assessing the effectiveness of conservation measures. Enforcement actions, such as penalties for non-compliance and inspections to ensure adherence to regulations, are important to deter illegal activities and maintain the integrity of these protected areas.

5. Education and awareness: Promoting education and awareness among local communities, visitors, and stakeholders about the ecological significance of NATURA 2000 areas is vital for compliance. Providing information about the protected species, habitats, and the benefits of conserving these areas can foster a sense of responsibility and encourage compliance with protection measures.

6. Sustainable sea and resource management: Adopting sustainable sea and resource management practices within and around NATURA 2000 areas is essential for ensuring long-term compliance with protection measures. This can include sustainable fishery practices, responsible tourism management, and habitat restoration initiatives. Integrated land-use planning that considers the ecological sensitivities of these areas is also crucial.

7. Capacity building and support: Providing training programs, technical support, and financial incentives to fisherman and other stakeholders can help enhance compliance with protection measures. Capacity building initiatives can promote understanding of the regulations, provide guidance on best practices, and facilitate the implementation of conservation measures.

By ensuring compliance with protection measures in NATURA 2000 areas, we can effectively conserve and protect Europe's valuable natural heritage, maintain biodiversity, and promote sustainable sea and land use for the benefit of present and future generations.

Figure 5 Species recorded in the area of the proposed Cape Stupišće - Island of Vis Special Reserve (source: Public institution RERA SD).

Notes from deliverables:

Using fishing gears that minimize habitat damage and reduce impacts on sensitive habitats is crucial.

Fishery that is not wisely managed can deplete fishery resources, whenever overfishing occurs, inducing a progressive reduction in the catch, and also bycatch, which can deplete the coastal marine ecosystem and reduce its capacity to produce ecosystem services (including food supply, feeding a downward spiral).

On the contrary, the sensitive management of timing, mode and area of fishery allows not only continuous and sustained use of fish resources, but also increases them by improving the coastal marine system, in a positive synergy with the fishery sector. For example, but not limited to, by protecting and improving nursery areas that host the juvenile stages of species - the most delicate stage of the life cycle - which is essential for maintaining a thriving population for any species.

Professional marine fishery is not only about the use of shared common resources, but also about socio-economic aspects and ecology; when practiced within the Natura 2000 Network it also adds a layer of complexity, as well as offering some governance opportunities. Indeed, the Natura 2000 Network does not a priori prohibit human activities, as long as these do not hinder the conservation of the habitats and species to which the network sites are dedicated.

The definition of Ecosystem Services is taken from the IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services at https://ipbes.net/) and is: the benefits that people derive from ecosystems. Fisheries are based on a specific ecosystem service: the provision of food from wild organisms, a service that is produced by the common good represented by the marine and coastal environment whose preservation is of public interest because said environment is a provider of a plurality of services such as: tourism, leisure enjoyment and recreation activities, and fruition of landscape assets.

The governance of professional fishery imposes complex challenges; fish resources migrate, move and cross administrative limits and borders, therefore, it is necessary to call for compliance with existing EU, national and Regulatory Bodies legislation, which have already provided specific regulations.

The EU Biodiversity Strategy for 2030 calls for the protection of 30% of the European sea surface by 2030, including putting a third of this surface under strict protection (10%) and effective management of all protected marine areas, focusing special attention on the regulation of fishing activities. It also plans to adopt binding marine biodiversity targets, focusing on ecosystems that store carbon efficiently and areas of exceptional biodiversity.

From Natura 2000: Sites - Habitats Directive we can find that each Site of Community Importance (SCI) is identified by the information supplied by the Member States in the standard data format. The list for each Member State gives the following information:

- SCI code comprising nine characters, the first two being the ISO code for the Member State;
- name of SCI;
- surface area of SCI in hectares or length in km;
- geographical coordinates of SCI centroid (latitude and longitude);

Two documents issued by the Veneto and ER regions contain the first significant measures for SCI management.

Measure for conservation of *Caretta caretta* and *Tursiops truncatus*

- Avoid deliberately approaching the species in question, unless they are approach the boats.

- Report the discovery of dead and/or stranded specimens to the Harbour Offices territorially competent.

- Maintain a straight course when trawls and trawl nets are in operation.

- Mark gillnets and other gillnetting equipment with TAGs.

- Apply any mitigation measures to fishing equipment currently in use that will be provided, if effective, in order to reduce bycatch for turtles within the of the application of good practices.

Prohibitions

- Prohibition of the use of longlines and single and multiple hooked lines.

- Prohibition of new wind power plants, according to Art. 5 paragraph l) of the Decree of 17 October 2007.

- Prohibition of windsurfing, kitesurfing, water skiing, jet skiing, motorised towing of flying equipment (kites, ascending parachutes and similar devices), events motorboats.

- Prohibition of close interaction with animals including voluntary approach, capture, feeding, swimming in the presence of animals

Some points that might be added to the measures for SCI area management:

- Access to the area is only allowed after a training course explaining the procedures to be adopted, which are proposed in the sheets

- Access to the protected area is only allowed to boats (professional or sports) equipped with an AIS tracking device

- Sports boats must notify the local Port Authority of their intention to enter the area

- Use of biodegradable hooks for those entering the SCI area

2.4 Contribution to Data collection

Project extracted instructions: Fishermen and other stakeholders can make valuable contributions to data collection efforts, which are crucial for effective fisheries management and conservation. Here are some ways in which they can contribute:

1. Catch data reporting: Fishermen can provide essential data on their catches, including species composition, size distribution, and catch locations. By accurately reporting their catch data, fishermen contribute to the understanding of fish stocks, population dynamics, and trends over time. This information is vital for assessing the health of fish populations and determining sustainable fishing limits.

2. Observer programs: Participating in observer programs allows trained observers to accompany fishing vessels and collect data on fishing activities, bycatch, discards, and compliance with regulations. Fishermen can support these programs by cooperating with observers, providing them with access to their fishing operations, and sharing accurate and complete information.

3. Logbooks and fishing diaries: Maintaining logbooks or fishing diaries is another way fishermen can contribute to data collection. These records can include information such as fishing effort, gear used, fishing locations, and environmental conditions. Such data can provide valuable insights into fishing patterns, changes in fish abundance, and the impact of environmental factors on fishing success.

4. Participatory surveys and research: Engaging fishermen in participatory surveys and research projects allows them to directly contribute their knowledge and experiences. Their insights on fish behavior, local ecological changes, and the effectiveness of management measures can enhance scientific understanding and inform decision-making processes.

5. Reporting of illegal activities and incidents: Fishermen and other stakeholders play a crucial role in reporting illegal fishing activities, such as illegal gear use, overfishing, or non-compliance with regulations. By promptly reporting such incidents, they assist enforcement agencies in taking appropriate actions to address illegal practices and protect fishery resources.

6. Collaboration with scientists and researchers: Collaboration between fishermen, scientists, and researchers can greatly enhance data collection efforts. By sharing their local knowledge, observations, and experiences, fishermen can contribute to the design and implementation of research projects, improving the accuracy and relevance of collected data.

7. Technology and data-sharing platforms: Embracing technology, such as electronic monitoring systems and smartphone apps, can facilitate data collection by fishermen. These tools can automate data recording, capture important information, and simplify reporting processes.

Additionally, participating in data-sharing platforms and initiatives allows fishermen to contribute their data to larger databases, improving the overall understanding of fisheries dynamics.

By actively participating in data collection efforts, fishermen and other stakeholders can provide critical information that supports evidence-based fisheries management, enhances scientific understanding, and contributes to the sustainable use and conservation of fishery resources.

Figure 6. An image taken by interviewer Storelli during an inspection at the port of Monopoli - 13.03.2022

Notes from deliverables:

Case studies which - depending on the peculiarities of the fleet or fish stocks or local/regional needs - could increase the level detail of the local knowledge of the individual Partners and complete the existing data collected

Nowadays, the necessity of producing standardised protocols to securely gather and share data across the inshore fleet, identify fishing trips and infer fishing activities in SSF is no longer negligible. Indeed, standardisation of collected data is necessary in order to achieve comparable results between different case studies.

The availability and the analysis of SSF positional data will help:

- improve fishing effort estimation;
- better assess impacts on ecosystems;
- enhance seafood products traceability;
- assess compliance monitoring in MPAs;
- outline spatial conflicts and competitive exploitation of marine resources (e.g., identifying the main fishing grounds), especially as happen with other fishing fleets (LSFs, Large Scale Fisheries).

At present, fishing units operating above 15 meters have two monitoring systems: VMS and AIS. Data relating to the movement of naval units, in this case trawl fishing vessels, are monitored by the VMS system, including fishing actions. However, as this system aims at detecting fraud, a public license is not released.

On the other hand, the AIS system has the required features with fishing functionality, but even though the option for the vessel commander to report the start and end of fishing operations is available, this mode is often forgotten, generating unreliable data.

Instead, data should be collected from all units and then interpreted by software that, based on an evaluation of the number of hauls/time (dates), extracts areas where fishing has been practiced less recently and/or frequently, changing the colour of a grid covering the permitted fishing zones. This tool would allow boats to steer towards areas where they have not fished for a longer time and, statistically, where they can make more catches.

The state of the art in this case is represented by the DISPLACE program, which has already been applied in Northern Europe and provides a screen of marine areas with one-kilometre squares. The model provides information for the spatial management of fishing effort and evaluates how fishing revenues and environmental benefits are influenced. However, it is not yet available.

In a simplified form of this system, the vessel would be informed (cell by cell of a square kilometre) of which cells have received fewer fishing actions inside them, therefore potentially more profitable. With, for example, a variation of the cell colour, the ratio of fishing interventions in the area compared to time will be indicated. The areas will thus gradually acquire a colour that quantitatively indicates the exploitation status.

It is likely that in the future, the same data related to the Displace/AIS system will indicate the benefits generated by the initiatives proposed through this report (e.g., an increase in fishable biomass).

If scientific and control organizations manage to extract a maximum capacity for the grid cells to avoid overexploitation, some cells will even be uncoloured for a time as resting areas where fishing is not recommended.

DATA COLLECTION PROTOCOLS

Below are the specific protocols for data collection at the local level defined in collaboration with the entrepreneurial associations and cooperatives of fishing, aquaculture and the trade of fish products and in close collaboration with the Adriatic Advisory Council - AAC;

Section 4 – Changes in the world of fishing

In this section, operators are asked for opinions, information, observations, etc. in relation to climate change, the presence of invasive or alien species and the presence of plastic in the marine environment.

Section 1 – vessel and fishing data

This section must be presented to operators and/or fishing cooperatives and completed as follows:

Section 1.1 - Vessel

Enter the data of the vessel used for fishing. If the owner has several boats, repeat the section for each of them.

For this section you can start from the Fleet Register and update it and/or from the lists held by the local Port Authorities and validate them in the field or at the local fishing cooperatives.

Section 1.2 – gear and catch

For each tool used, indicate on a monthly basis:

- Fishing days completed

- The type of catch (species)

- The quantities expressed in kg

Section 2 – data relating to economic aspects

This section must be presented to operators and/or fishing cooperatives and completed by completing the items relating to:

- gross annual income derived from fishing activity, possibly indicating other income always linked to the fishing profession (fishing closure, covid19 contributions, de-minims contributions, fishing tourism, ittitourism, etc.).

- Expenses incurred for the crew (on an annual basis)

- Expenses incurred for fuel (on an annual basis)

- Expenses incurred for the maintenance of the boat and tools (on an annual basis)

Section 3 – social data

The data in this section must be requested from trade associations and chambers of commerce and refer to the various sectors of marine fishing.

Section 3.1 – Type of business

Select the activity one at a time and for each of them indicate:

- The number of total employees

- The number of male operators

- The average age of male operators

- The number of female operators

- The average age of female operators

Section 3.2 – Level of education and origin of fishing operators

Indicate at regional level the percentages of education level of fishing operators and the percentage of Italian operators, coming from EU and non-EU countries.

Section 4 – Changes in the world of fishing

This section can be completed by bringing together a significant sample of sea fishing operators, best employed in different trades, and directly requesting opinions, information, observations, and opinions on the following topics:

- Climate change

- Presence of invasive or alien species

2.5 Reduction of carbon footprint (engine replacement)

Project extracted instructions: Reducing the carbon footprint in fishery operations, specifically through engine replacement, can be achieved through several approaches. Here are some strategies to consider:

1. Transition to more fuel-efficient engines: Upgrading to newer, more fuel-efficient engines can significantly reduce carbon emissions in fishery operations. Look for engines that meet environmental standards and are designed for optimal fuel consumption. The use of modern technologies such as electronic fuel injection and direct injection can improve engine efficiency and reduce carbon emissions.

2. Shift towards alternative propulsion systems: Consider exploring alternative propulsion systems that have lower carbon footprints compared to traditional diesel engines. For example, electric propulsion systems powered by batteries or hybrid systems that combine electric and combustion engines can be more environmentally friendly. These alternatives can reduce carbon emissions and improve fuel efficiency.

3. Embrace renewable energy solutions: In some cases, integrating renewable energy sources can help reduce carbon emissions. Installing solar panels on fishing vessels to generate electricity for on-board systems, or using wind turbines to assist propulsion, can contribute to carbon footprint reduction. These solutions may require modifications to vessel infrastructure and careful consideration of energy storage capabilities.

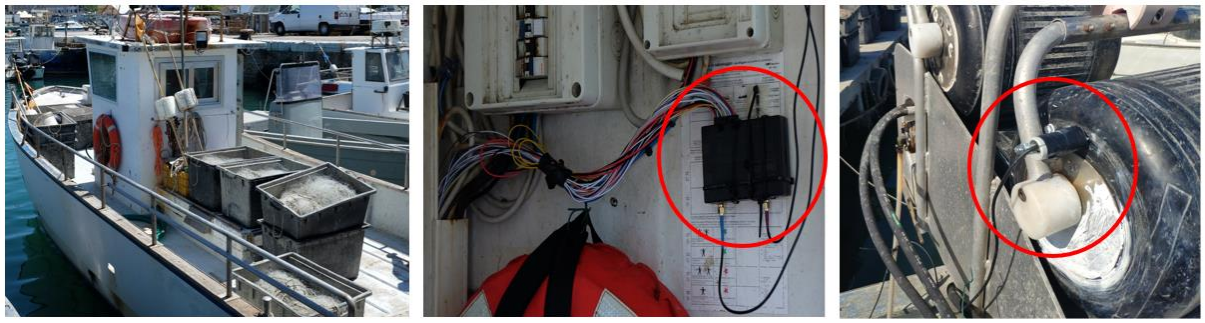
4. Optimize vessel operations: Implementing operational practices that maximize fuel efficiency can help reduce carbon emissions. This includes optimizing vessel speed, reducing idling time, and proper maintenance of engines and equipment to ensure optimal performance. Additionally, optimizing fishing routes and schedules to minimize fuel consumption can further contribute to carbon footprint reduction.

5. Promote sustainable fishing practices: Sustainable fishing practices, such as using selective fishing gear, avoiding overfishing, and reducing bycatch, can indirectly contribute to carbon footprint reduction. By maintaining healthy fish populations and ecosystems, fishermen can help preserve the natural carbon sink capacity of marine environments.

6. Education and awareness: Promote education and awareness among fishermen about the importance of reducing carbon emissions and the benefits of adopting more environmentally friendly practices. Providing training on fuel-efficient operation techniques and sharing success stories of other fishermen who have reduced their carbon footprints can inspire and motivate change.

7. Financial incentives and support: Governments and organizations may offer financial incentives, grants, or subsidies to encourage fishermen to replace engines with more energy-efficient alternatives. Explore available programs and funding opportunities that can help offset the cost of engine replacement and make the transition more economically viable.

It's important to assess the specific needs and characteristics of each fishery operation to determine the most suitable engine replacement strategy for reducing the carbon footprint. Consultation with experts in marine engineering and sustainable fisheries can provide valuable guidance in making informed decisions.



(a) (b) (c)

Figure 7. The first small-scale fishing vessel (a) on board of which the Teltonika FMM640 is installed (b) and the hall-effect speed sensor attached to hauler (c).

Notes from deliverables:

Reducing the carbon footprint in fisheries is crucial for promoting sustainable practices and mitigating the impacts of climate change. Strategies that can help achieve a reduction in the carbon footprint of fisheries include:

- Optimizing vessel efficiency: Encourage the use of more fuel-efficient vessels and engines, including regular maintenance to keep engines in good condition. Promote practices like vessel load optimization, hull cleaning, and propeller maintenance to reduce fuel consumption and emissions.
- Improving fishing gear and techniques: Use selective fishing gear and practices that minimize bycatch, such as using fishery-specific gear modifications, reducing tow times, or implementing escape panels in nets. This reduces fuel consumption and associated greenhouse gas (GHG) emissions.
- Enhance fishing vessel design: Consider designing and constructing fishing vessels with energy-efficient features, such as hybrid or electric propulsion systems, advanced hull designs, and lightweight materials. These improvements can lead to substantial reductions in fuel consumption and emissions.
- Promote sustainable fishing practices: Encourage the adoption of sustainable fishing practices, such as implementing fishing quotas, seasonal closures, and size limits to allow fish stocks to replenish. Sustainable practices help maintain healthy ecosystems, leading to increased resilience against climate change impacts.
- Develop and adopt low-carbon alternatives: Explore and promote the use of low-carbon alternatives in fishing operations, such as electric or solar-powered fishing gear, energy-efficient refrigeration and storage systems, and renewable energy sources for on-board activities.

- Improve supply chain efficiency: Reduce post-harvest losses and waste by improving transportation and storage systems. Implement measures to minimize the energy requirements for processing, packaging, and distribution.
- Enhance fisheries management: Strengthen fisheries management and governance systems, including monitoring and control measures, to prevent illegal, unreported, and unregulated (IUU) fishing. IUU fishing often involves inefficient practices with higher carbon footprints.
- Encourage responsible consumption: Educate consumers about sustainable seafood choices and encourage responsible consumption patterns. Promote certification programs, such as the Marine Stewardship Council (MSC) and Aquaculture Stewardship Council (ASC), to support sustainable fisheries and aquaculture practices.

2.6 Recover waste at sea and from the sea with facilitation of disposal

Project extracted instructions: Recovering waste at sea and from the sea is essential for minimizing marine pollution and maintaining the health of marine ecosystems. Here are some measures that can be implemented in fisheries to facilitate the recovery and proper disposal of waste:

1. Fishing gear retrieval programs: Establishing programs that incentivize or require fishermen to retrieve lost or abandoned fishing gear can help reduce ghost fishing and entanglement hazards. These programs can include initiatives for gear collection, financial incentives for returning gear, and education on responsible gear handling and disposal.

2. On-board waste management: Implementing effective waste management practices on-board fishing vessels is crucial. This includes providing designated storage areas for different types of waste, such as plastics, metals, and hazardous materials. Vessels should be equipped with proper waste collection systems, including bins, containers, and recycling facilities, to facilitate waste separation and storage.

3. Port-based waste reception facilities: Ensuring that appropriate waste reception facilities are available in ports and harbours can encourage fishermen to properly dispose of their waste. These facilities should have designated areas for different types of waste, such as general waste, recyclables, and hazardous waste, allowing fishermen to easily and responsibly dispose of their waste upon returning to the port.

4. Awareness and education: Raising awareness among fishermen about the environmental impacts of marine waste and the importance of waste recovery and proper disposal is crucial. Providing educational materials, workshops, and training sessions on waste management practices can promote responsible behaviour and encourage active participation in waste recovery efforts.

5. Collaboration with recycling and waste management industries: Establishing partnerships and collaborations with recycling and waste management industries can facilitate the proper disposal and recycling of fishing-related waste. This can involve working together to develop specialized recycling programs for fishing gear, establishing collection points for recycling fishing nets, and exploring innovative methods for repurposing or upcycling fishing-related waste materials.

6. International cooperation and regulations: Cooperation at the international level is essential for addressing marine waste issues. Governments, organizations, and stakeholders should work

together to develop and enforce regulations that promote responsible waste management in fisheries. This can include regulations on waste disposal at sea, restrictions on certain types of fishing gear, and the development of international guidelines for waste recovery and disposal.

7. Research and innovation: Continued research and innovation in waste recovery technologies can contribute to more effective and efficient waste management in fisheries. This can include the development of innovative methods for waste retrieval at sea, the use of advanced recycling technologies, and the exploration of sustainable materials for fishing gear construction that are biodegradable or easily recyclable.

By implementing these measures, fisheries can play a significant role in recovering waste at sea and from the sea, contributing to the reduction of marine pollution and the protection of marine ecosystems.

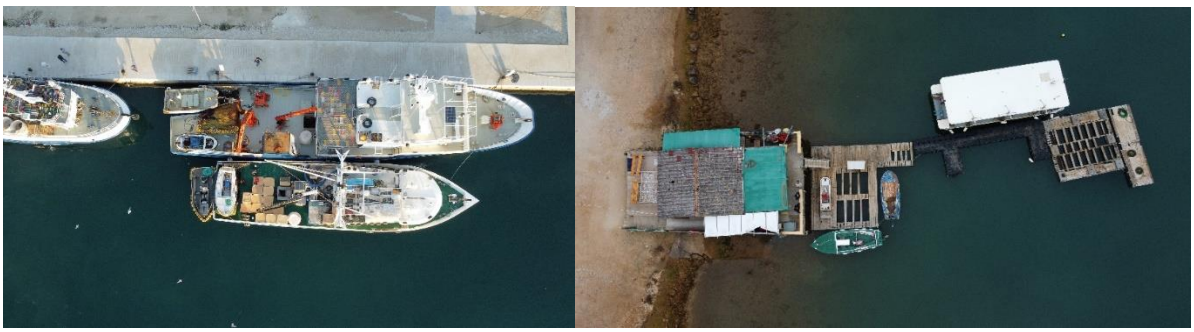


Figure 8 and 9 staying on the dock D. Mioković 2022)

Notes from deliverables:

Regarding to the issue of marine litter and plastic at sea, the fishermen of the region are involved in various initiatives and campaigns for the collection of marine litter and thanks to their participation, collaborative networks have been strengthened between the productive world, the research and waste collection and disposal companies on land. As part of the programming of the EMFF (European Fund for Maritime Activities and Fisheries) 2014/2020, the Emilia-Romagna Coast FLAG financed five important project initiatives aimed at activating, along the entire regional coast (from Goro - FE - up to Catholica RN) virtuous paths capable of countering the phenomenon of the presence of waste in the sea and ghost nets. A brief description of the initiatives is provided below.

Project "PESCAMI: PESCAtori aManti dei marI "4

Beneficiary institution: Flaminia Foundation (RA) Through close collaboration with the selected fishermen (for the three types of mussel underwater fishing, small-scale artisanal fishing, trawlers) actions have been carried out to collect sea waste, assignment and disposal at the ports of the cities of Cervia, Porto Garibaldi and Marina di Ravenna.

Project "Raccolta e gestione innovativa dei rifiuti in mare con interventi dei pescatori del Porto"5

Beneficiary body: University of Ferrara

The experimental initiative has set itself a dual objective: to free vast stretches of sea and SCI from ghost nets and other waste but also to set up for the first time, in the fishing port of Goro, a differentiated

collection of such waste on the quay. The waste collected and stored in special bags by the fishermen and placed in special equipped areas, was subsequently catalogued and divided by type and quantification. Material samples were also analysed in FTIR spectrophotometry to determine the polymer composition and identify the recoverable part.

Project “Raccolta, caratterizzazione e smaltimento dei rifiuti Marini dal Porto di Cattolica”6

Beneficiary body: Alma Mater Studiorum - University of Bologna

The project carried out waste collection actions in the sea, their characterization and their disposal at the Port of Cattolica. The fishing vessels involved provided data on the quantities and different types of waste collected during normal fishing activities, as well as providing the material collected to the operators trained for the characterization of the waste according to qualitative and quantitative criteria. Fishermen were provided with adequate tools for describing the waste and recording the areas of origin of the waste, which made it possible to carry out an initial mapping.

Project “Raccolta da parte dei pescatori MARINE LITTER compresa la rimozione degli attrezzi da pesca smarriti”7

Beneficiary body: Marine Research Canter Foundation

The project focused on the methodological aspect, adopting and disseminating an integrated approach to the issue of sea waste in the Cesenatico navy, capable of combining environmental aspects with economic and social ones. Specifically, an operational protocol has been prepared for the collection and management of marine waste, training of fish operators on the methods of collection, storage and disposal of marine waste and fishermen's work waste, marine waste collection actions and port in a dedicated and equipped area, subdivision, weighing and quantification of the collected material and management and transfer, waste disposal and evaluation of the recycling and/or recovery possibilities, verification and validation of the operating protocol.

Project “Sperimentazione di un modello di rete da pesca a strascico che separa originariamente i rifiuti dall’attività di pesca” – Rete Salvapesca8

Beneficiary: Cetacea Onlus Foundation

The project aimed to test the use of a trawl net model with the aim of effectively separating waste from caught fish, thus reducing working times at sea and obtaining cleaner and higher quality fish. The experimental activity was, therefore, aimed at verifying whether the conformation of the experimental net affected and in what way the quantities of commercial fish. Net characteristics: 4-sided trawl net, in high tenacity polyethylene reinforced with two bags (the first bag for debris mounted in the final part of the net, while the second for the fish mounted on top of the first) and complete with chains and floats.

Fishermen have shown themselves to be very sensitive to the issue, attentive also to the issue of plastic management, in terms of protecting the environment and in particular the sea, which constitutes for them not only a source of income, but is the environment in which they live and which they intend to protect. One aspect that concerns them closely is the use of Styrofoam boxes. There is widespread concern among fishermen that plastic causes serious harm to the seas, and they positively see a transition to environmentally friendly and sustainable materials.

The issue of waste management from the sea has also recently been the focus of the "Fishing for future project", a project funded by the Veneto Region's 2014-2020 FEAMP funds, with the aim of highlighting the role that fishermen play in the management of resources and the marine and lagoon environment. The focus of the project was, in fact, to protect and restore biodiversity and the marine ecosystem through the collection of sea litter by two cooperatives of fishermen from Veneto during their usual fishing activities. Participation in the activities by the professionals led to the collection of useful data for future planning on environmental waste management and at the same time allowed the fishermen to bring ashore and properly dispose of the waste without consequences such as fines or additional costs.

2.7 Diversification of production towards alien species to be exploited (blue crab, jellyfish, etc.)

Project extracted instructions: Diversification of production towards alien species, such as blue crab or jellyfish, can present both opportunities and challenges in the context of fisheries. Here are some considerations related to the diversification of production towards alien species:

1. Market demand and economic viability: Before considering the diversification of production towards alien species, it is important to assess the market demand and economic viability of these species. Conduct market research to understand the potential demand, pricing, and market trends for these species. Evaluate the economic feasibility of harvesting, processing, and marketing these species to ensure that the venture is economically sustainable.

2. Environmental impact assessment: When considering the introduction or expansion of production of alien species, it is crucial to conduct a thorough environmental impact assessment. Assess the potential ecological impacts on native species and habitats, including competition, predation, habitat alteration, and potential spread of invasive species. Consult with local experts and regulatory authorities to ensure that the introduction of alien species aligns with conservation goals and does not harm native biodiversity.

3. Regulation and permits: Check the regulatory framework and obtain the necessary permits and licenses for harvesting, processing, and marketing alien species. Different countries and regions may have specific regulations and guidelines governing the production and trade of alien species. Compliance with these regulations is essential to ensure legal and sustainable operations.

4. Knowledge and expertise: Ensure that there is sufficient knowledge and expertise available for the responsible production of alien species. Conduct research or collaborate with scientific institutions to understand the biology, reproduction, feeding habits, and potential impacts of the species being considered. Acquire the necessary technical knowledge and skills for the sustainable cultivation, harvesting, and handling of these species to maximize productivity and minimize environmental risks.

5. Risk management: Implement robust risk management strategies to address any potential negative impacts associated with the diversification of production towards alien species. This includes monitoring and surveillance programs to detect and mitigate any unintended ecological consequences, as well as contingency plans to manage potential risks and prevent the escape or establishment of invasive alien species in natural ecosystems.

6. Public perception and consumer acceptance: Consider public perception and consumer acceptance of alien species in the market. Some alien species may be considered invasive or have negative connotations, which can affect consumer preferences. Engage in effective communication and outreach to raise awareness about the ecological benefits, nutritional value, and sustainable production practices associated with the targeted alien species.

7. Collaboration and knowledge sharing: Collaborate with relevant stakeholders, including scientists, fisheries managers, industry associations, and local communities. Sharing knowledge, experiences, and best practices can help overcome challenges and ensure responsible production of alien species. Collaborative efforts can also contribute to research and development, innovation, and the establishment of guidelines and standards for the sustainable production of these species.

It is important to approach the diversification of production towards alien species with caution, considering the potential ecological, economic, and social implications. By carefully evaluating the factors mentioned above and implementing appropriate management practices, the diversification towards alien species can offer new opportunities for fisheries while minimizing negative environmental impacts.

Figure 10 Jellyfish D. Mioković 2022 and Figure 11. Contribution to chef menu- Argos source)

Notes from deliverables:

Despite the harmful effects of IAS on the ecosystem, there is also the possibility of their commercial use. We cite an example of an invasive species of blue crab, *Callinectes sapidus*, which recently appeared in the Adriatic, and which, due to its availability, some restaurateurs today offer as a delicacy on the menus of their catering establishments (https://more.slobodnadalmacija.hr/om/ribolov/plavi-rak- threat-to-our-biological-diversity-or-delicacy-1095695). Of course, the hunting and harvesting of IAS species (e.g. jellyfish) requires adaptation of fishing tools and appropriate legal regulations.

The benefits of medusae as a marine resource are traditionally recognised in Asian cultures. For example, medusae has been traditionally consumed by Chinese for more than thousand years and are considered as delicacy. In recent decades, consumption of jellyfish has increased and with increasing demand, mostly from Far East countries (China, Japan, and Korea), fisheries and aquaculture of edible jellyfish have increased (FAO database accessed in 2021). Several fishing operations that were hampered by recurring

jellyfish blooms worldwide, have adopted for, exclusively or additionally in seasons with jellyfish occurrence, fishing medusae (Brotz et al., 2017). In addition to the commodity as a human food, medusae are a valuable source of different compounds. Jellyfish gelatine polypeptides are used as antioxidants, collagens from jellyfish may replace bovine collagens in biomedical and nutraceutical applications, the scyphomedusae venoms possess different pharmacological properties including antitumor activity, jellyfish qniumucin may have disease-modifying effects on osteoarthritis (Malej et al., 2014 and the references therein). Some pilot studies tested jellyfish biomass as potential fertilizer (Fukushi et al., 2004; Seo et al., 2014), nano- and micro- particles adhering filters (Patwa et al., 2015) and even a jellyfish-based plastic material was constructed (Steinberger et al., 2019). Unfortunately, global trends of medusae blooms and causes of population fluctuations still require further rigorous research to clarify trends and enable estimating/predicting jellyfish "stock" material that is essential when implementing a new commercial species.

To date, about 40 species of jellyfish are commercially fished for food purposes (Edelist et al., 2021). However, until 2020 when FAO categories of commercial species were updated to include two items referring to jellyfish, the catch of gelatinous species was mainly listed under "other marine invertebrates". According to the national reports (summarized in Edelist et al., 2021), there is an increasing trend in world jellyfish catch, particularly from 2016 on, when it reached 900 000t/y. It is important to note, that, according to our investigation, there is a strong interest among local fishermen to adjust their fishing strategies to fish jellyfish if any become targeted species. Yet less intention to change dietary habits was expressed.

The fishermen highlight the impact of predatory species but also of two alien species: the blue crab and the sea nut. The swimming crab or blue crab (*Callinectes sapidus*) is a naturalized allochthonous species, introduced into the Mediterranean from the northern Atlantic through ballast water. Along the Atlantic coast it is the object of professional fishing, while in the upper Adriatic it was reported at the end of the 1940s. In recent years it has become very frequent in coastal waters and especially in lagoon waters. The situation of the Sacca di Goro is exemplary, where in the last five years there has been a real explosion. In addition to numerous newspaper articles and some scientific articles, the observations of the fishermen are evidence of this. The marketing data of the Goro Fish Market are unequivocal, where it went from 7 kg sold in 2017 to 5,451 kg in 2019 and 89,876 kg. In 2022. Another species that has recently aroused concern from fishermen, especially small scale artisanal fishermen who operate with post gear, is the massive presence of the murex along the coast. There are two species: the spiny murex (*Bolinus brandaris*) and the truncated murex (*Hexaplex trunculus*). The latter has greatly compromised the fishing season for sea snails (*nassarius mutabilis*) creating various problems for fishermen as predators. To favour the commercial development of the aforementioned predatory species and alien species, which are poorly known and consumed, various studies and initiatives are underway aimed at spreading their consumption. An example is the start-up "mariscadoras" benefit society which, through the "Blueat"3 brand and with the support and collaboration of professional organizations and fishing cooperatives, is marketing blue crabmeat distributed through large-scale distribution.

2.8 Support towards fishermen/farmers in case of loss due to invasive alien species

Project extracted instructions: When fishermen experience losses due to invasive alien species, it is important to provide them with support to mitigate the economic impact and help them adapt to the changing circumstances. Here are some potential measures that can be considered:

1. Financial assistance: Establishing financial assistance programs specifically designed to support fishermen affected by losses caused by invasive alien species. This can include direct compensation for lost catches or income, subsidies for gear replacement or modifications to adapt to the new circumstances, or low-interest loans to help fishermen transition to alternative fishing practices.

2. Training and capacity building: Offer training programs to affected fishermen to enhance their skills and knowledge in alternative fishing practices. This can involve workshops, seminars, or vocational training to equip them with the necessary expertise to diversify their catch or adapt to new fishing grounds. Providing education on the biology and ecology of invasive alien species can also help fishermen better understand and respond to the challenges they pose.

3. Market diversification: Support fishermen in exploring new market opportunities for alternative species or products that are less impacted by invasive alien species. This can involve conducting market research to identify potential demand for alternative catches, assisting with product development and marketing strategies, and facilitating access to new markets or value chains.

4. Collaboration and information sharing: Foster collaboration among fishermen, researchers, and relevant stakeholders to share knowledge and experiences related to invasive alien species. Establish platforms for information exchange and encourage the dissemination of best practices and success stories. Collaborative efforts can help develop innovative strategies for mitigating the impacts of invasive species and improve the resilience of affected fishing communities.

5. Resource management and monitoring: Strengthen monitoring and management efforts to control the spread and impact of invasive alien species. This can involve implementing early detection and rapid response programs, enhancing surveillance and monitoring systems, and promoting effective biosecurity measures. By actively managing invasive species, the long-term impact on fishermen can be minimized.

6. Social support and counselling: Recognize the psychological and social impact that losses due to invasive alien species can have on fishermen. Provide access to counselling services or support groups to help fishermen cope with the emotional stress and uncertainty associated with changes in their fishing livelihoods. Social support programs can offer assistance in navigating the challenges and exploring new opportunities.

7. Policy advocacy: Advocate for policy measures that address the issues of invasive alien species and their impact on fishermen. This can involve engaging with policymakers to raise awareness, promote regulations to prevent the introduction and spread of invasive species, and ensure that the concerns of affected fishermen are considered in policy decision-making processes.

Supporting fishermen affected by losses due to invasive alien species requires a multi-faceted approach that combines financial assistance, training, market diversification, collaboration, and policy advocacy. By providing comprehensive support, fishing communities can better adapt to the challenges posed by invasive species and maintain their livelihoods in a changing environment.

Table 1. Invasive alien species recorded in the Region of Istria.

GROUP	SCIENTIFIC NAME	CROATIAN NAME
Seaweed	*Caulerpa cylindracea* *Caulerpa racemosa*	Grozdasta kaulerpa Zelena kaulerpa
Diatoms	*Pseudonitzschia* spp	
Bryozoa	*Bugula fulva*	
Ctenophora	*Mnemiopsis leidyi*	Morski orah
Appendicularia	*Appendicularia sicula*	
Tunicates	*Clavelina oblonga*	Mješićnica
Molluscs	*Dreissena polymorpha* *Crassostrea gigas*	Raznolika trokutnjača Pacifička kamenica
Crabs	*Hemigrapsus sanguineus* *Pacifastacus leniusculus* *Parvocalanus crassirostris*	Signalni rak
Insects	*Aedes albopictus* *Aedes koreicus* *Cinara cedri* *Harmonia axyridis*	Azijski tigrasti komarac Korejski komarac Lisna uš Harlekinska božja ovčica
Fishes	*Gambusia holbrooki* *Oplegnathus fasciatus* *Pomatomus saltatrix* *Pseudodiaptomus marinus*	Gambuzija Prugasti kljunaš Strijelka

Notes from deliverables:

Invasive species are non-native species that can have an extremely negative effect on ecosystem biodiversity. In the area of introduction, invasive species can suppress native species, change the structure of communities and food webs, and can also change nutrient cycling and sedimentation (Molnar et al., 2008). In European seas, including the Mediterranean and thus the Adriatic Sea, a large number of invasive species have been recorded, considering the world level, who's most frequent routes of entry are ballast water and mariculture (Molnar et al., 2008).

Among the rising nuisance for fisheries in some coastal areas worldwide, are jellyfish blooms that are increasing in frequency, intensity and duration (e.g. Brotz, et al., 2012). In the northern Adriatic, such trend has been confirmed for several species over the last decades (Kogovšek et al., 2010; Kogovšek et al., 2018) and were synchronous with drastic changes in the marine pelagic ecosystem recorded in the beginning of 2000s (Mozetič et al., 2012). The devastating effects of the intense jellyfish blooming events over the last decades on the region's economy have been previously evaluated. Palmieri and colleagues (Palmieri et al., 2014) estimated that jellyfish blooms cause an economic loss of up to 8.2 million € per year due to reduction in fish catches for northern Adriatic trawling fleet only, in addition to 460 000€ per year of fuel costs due to displacement of fishing operations and over 89 000 man-hours per year spent by fishermen repairing the damaged equipment.

Gelatinous macro plankton aggregations may have severe impact on pelagic food web structure and functioning and by interaction with fishing activities, tourism and human health present nuisance for coastal-based operations or even cause significant economic loss in some coastal sectors (in fisheries e.g. Palmieri et al., 2014; tourism e.g. Germandi et al., 2015; power plant operations e.g. Chae et al., 2008). Nevertheless, recently it has becoming increasingly clear that jellyfish may also be a valuable resource to humans (Malej et al., 2014).

The aggregations of jellyfish are reported to: reduce the fish catch, damage or destroy the fishing gear; the bycatch prolong the sorting of the catch, reduce the time of fishing, reduce the quality of caught fish, cause the replacement of the operations to avoid catching the jellyfish and increases the work effort. The estimated impact, in terms of reducing the cost, was between <5% and 25%, most commonly reported (4 out of 7) that jellyfish are responsible of 25% reduction of the seasonal/yearly income. In addition, we identified that jellyfish impacted fishermen health by stinging (4 out of 7 respondents).

2.9 Contribution to native stock recovery

Project extracted instructions: Contributing to the recovery of native fish stocks is essential for the long-term sustainability of fisheries. Here are some key contributions that fishermen and other stakeholders can make towards native stock recovery:

1. Compliance with regulations and conservation measures: Adhering to fishing regulations, such as catch limits, size restrictions, and closed seasons, is crucial for allowing fish stocks to recover. Compliance with these measures helps protect spawning populations, allows juvenile fish to grow and reproduce, and ensures sustainable fishing practices.

2. Adoption of selective fishing gear: Using selective fishing gear can minimize the capture of non-target species, especially juveniles and vulnerable species. Selective gear, such as size-selective meshes, can help reduce bycatch and increase the survival rate of undersized or non-targeted fish, allowing them to contribute to the recovery of native stocks.

3. Support for habitat restoration and protection: Participating in efforts to restore and protect critical habitats, such as spawning grounds, nursery areas, and feeding grounds, can greatly contribute to the recovery of native fish stocks. This can involve initiatives like habitat restoration projects, reseeding of marine vegetation, or the establishment of protected areas.

4. Participatory monitoring and data collection: Engaging fishermen in participatory monitoring programs and data collection efforts can provide valuable insights into the status and behaviour of native fish stocks. Fishermen can contribute their knowledge of local fishing grounds, spawning seasons, and abundance trends, which can supplement scientific data and inform stock recovery strategies.

5. Collaboration with scientists and researchers: Collaboration between fishermen, scientists, and researchers is crucial for effective native stock recovery. By sharing their experiences, observations, and traditional knowledge, fishermen can contribute to research projects, stock assessments, and the development of management plans. Collaborative efforts can enhance scientific understanding and improve the accuracy of stock recovery initiatives.

6. Support for restocking and hatchery programs: Participating in or supporting restocking and hatchery programs can assist in the recovery of native fish stocks. This involves releasing hatchery-reared fish into suitable habitats to supplement natural populations or reintroduce species in areas where they have declined. Fishermen can contribute by providing input on suitable release sites, assisting with monitoring efforts, or volunteering for restocking activities.

7. Advocacy for sustainable fishing practices: Fishermen can play an important role in advocating for sustainable fishing practices within their communities and among industry stakeholders. By promoting responsible fishing methods, reducing waste and discards, and raising awareness about the importance of stock recovery, fishermen can inspire others to adopt sustainable practices and contribute to the long-term health of native fish stocks.

Native stock recovery requires a collaborative and multi-dimensional approach that involves fishermen, scientists, policymakers, and other stakeholders. By actively engaging in sustainable fishing practices, supporting habitat restoration, sharing knowledge, and participating in conservation initiatives, fishermen can contribute significantly to the recovery of native fish stocks and the overall health of marine ecosystems.

Figure 12 Komiža by night

Notes from deliverables:

Specific Fish Aggregating Devices (Tecnoreef pyramids) have been settled to implement the ADRIBLU marine area in the Gulf of Trieste. Thanks to ARGOS project the area is now achieving a role of a reef habitat for demersal fauna and bentho-pelagic fish stocks. This role has been characterised by biological monitoring and experimental fishing sessions. Now the area is managed as a no-take zone. In an optic of a possible management by the local fishery cooperative, guidelines and a protocol are defined.

In an optic of a possible management of the ADRIBLU area by the local fishery cooperative it is recommended to strongly regulate possible fishing pressure, focusing on selective fishing techniques (e.g. 36 mm mesh or larger), targeting large animals. It will be necessary an evaluation of the catches and monitoring of the populations of the area over time, with a continuous dialogue with the operators of artisanal fishing. In addition to maintaining constant attention to the reproductive periods of the different species.

This activity could be done in advance by planning the fishing periods and the type of gear to be used; not only tools such as bottom nets, but also pots dedicated to crustaceans or cephalopods. For example, lobster fishing could be concentrated/allowed only for a limited period, between the end of winter and the beginning of spring, always with dedicated and very selective tools.

Therefore, the following topics must be foreseen:

- catch restrictions (size);
- gear restrictions (mesh size);
- restriction on the number of weekly and annual fishing days;
- restrictions on the fishing period.

An initial operational hypothesis can be elaborated by considering the size of the area and the fishing effort that can be applied to it without risking the loss of equipment on the barriers and without heavily affecting the fish population. The possible exploitation of the area could allow 2 gillnets 300 m long on each side for a maximum of 1,200 m of net. This by lowering the nets between the Fixed and FAD structures perpendicular to the coast. This fishing effort by a small fishing vessel every 15 days (twice a month).

Fishing can be done with gillnets (trammel nets only for cuttlefish in season) with a suggested mesh size of at least 30 mm. The target are the larger individuals, who are of greater interest in the market while maintaining the presence of juveniles in the area.

An internal regulation among professional operators may consider not fishing or rather releasing individuals close to reproduction (females and males with eggs) or species that result in catches of little interest such as selachians.

All these provisional guidelines have been discussed with the local fishing cooperative, defining the role of the ADRIBLU area as a no-take zone

Development of a “collection, recovery and releasing” protocol for the reduction of embryos loss due to the inappropriate fishing gears activities.

Fishermen from Ancona e Numana sites have been involved in the collection of cuttlefish embryos during the cleaning operations of the fishing equipment.

Concluding, this pilot action aimed to define a protocol for sustainable management and protection of a shared stock such as that of cuttlefish, starting from the collaboration of local fishermen.

⇒ The activities and measures proposed here are absolutely replicable and transferable to other Italian and Croatian sites.

⇒ The protocol proposed for the assessment and monitoring of the eggs quality represents an important element for monitoring the cuttlefish stock in the Adriatic. The results of this extended monitoring on all the Adriatic coasts (Italian and Croatian) will allow a complete picture of the whole cuttlefish stock and will help its management.

⇒ -The in-land system can be replicated in any other part of both the Italian and Croatian coasts and if used fully it can represent an excellent support for the restocking of cuttlefish in the Adriatic

⇒ -The involvement of fishermen, their availability and support led to realise a documentary which could be used to reach several targets (consumer, school, fishermen…) both Italian and Croatian.

Predicting the effects of the protected area on fish species

Excluding small trawlers and fast boats from within 3 nautical miles would protect not only sole, but also all those species for which the coastal strip represents a primary growth area, especially cuttlefish. In fact, in spring, adult cuttlefish migrate from offshore waters to coastal waters to reproduce. Juveniles stay near the coast until the end of summer (Reid et al., 2005), then migrate in autumn to deeper waters, where they will remain until the following spring. With this management measure, part of the cycle could be preserved while ensuring better recruitment.

Currently, there is no minimum landing size for this species. In addition, to increase the reproductive success of cuttlefish, a good amount of hard substrate would allow the hatching of deposited eggs. Ad hoc artificial structures for cuttlefish egg deposition have been experimented with for some time and the results have been published in the work of Grati et al. (2018). Such structures could be provided alongside the natural area.

Opportunities for exploitation of areas in the surrounding areas

If requested, the study of new spaces for mollusc farming activities alongside the area is possible. The following are the characteristics that mussel long-line systems have on the environment:

Anchors and other fixed structures provide a substrate for the settlement of sessile forms, increasing the biodiversity of the seabed (muddy or sandy).

The effect of mussel farms, which are traversed by waves, reduces the same wave motion and consequently tends to reduce beach erosion.

The filtering action of mussels contributes to water clarification.

The structures have an aggregating effect for many species of fish that are attracted for both food and shelter.

The more the area in concession is interdicted to fishing, the more it acts as a growth zone for important coastal species.

2.10 Definition of marine areas to be co-managed by fishermen

Involving fishermen in the co-management of marine areas can lead to more effective and sustainable fisheries practices. Here are some actions that can be taken in the sense of defining marine areas to be co-managed by fishermen:

1. Participatory mapping and delineation: Engage fishermen in the process of mapping and delineating marine areas that are important for their livelihoods and fishing activities. This can involve conducting participatory workshops or meetings where fishermen provide input on the boundaries, features, and ecological significance of specific areas.

2. Identification of key fishing grounds and habitats: Collaborate with fishermen to identify and prioritize key fishing grounds and habitats that are crucial for sustaining fish populations. This can

be based on their knowledge of seasonal fish migrations, spawning areas, feeding grounds, and other ecological factors. Consider including areas that are essential for the life cycle of target species.

3. Assessing ecological and socio-economic values: Work together with fishermen to assess the ecological and socio-economic values of different marine areas. This can include evaluating the abundance and diversity of fish species, the presence of critical habitats, the potential for sustainable yields, and the economic importance of specific areas to fishing communities. This information can inform decision-making processes and help determine which areas should be co-managed.

4. Establishing co-management agreements: Develop formal co-management agreements that outline the roles, responsibilities, and decision-making processes for fishermen and other stakeholders involved. These agreements should clearly define the boundaries and objectives of the co-managed areas and specify the rights and obligations of all parties involved.

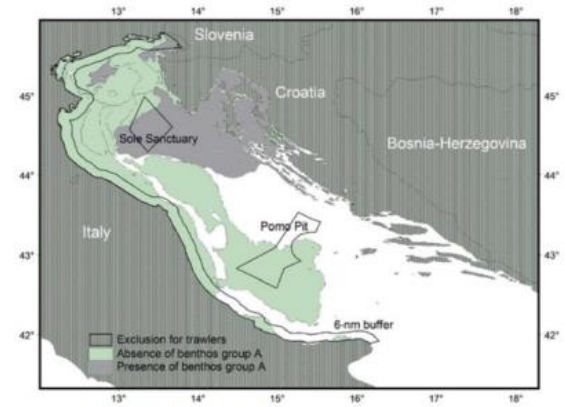
5. Designing and implementing management plans: Collaboratively develop and implement management plans for the co-managed areas. This can involve setting sustainable fishing quotas, establishing gear restrictions, implementing seasonal closures or fishing bans, and implementing monitoring and enforcement measures. The management plans should reflect the collective knowledge and input of fishermen and incorporate adaptive management approaches to address changing conditions and new information.

6. Capacity building and training: Provide capacity building and training programs to enhance the skills and knowledge of fishermen in co-management practices. This can include workshops on fisheries management, data collection methods, sustainable fishing techniques, and conflict resolution. Building the capacity of fishermen to actively participate in co-management processes can lead to more effective decision-making and improved outcomes.

7. Regular communication and stakeholder engagement: Foster ongoing communication and engagement with fishermen and other stakeholders involved in the co-management process. Establish platforms for regular dialogue, such as advisory committees or community meetings, to discuss progress, address concerns, and exchange information. Effective communication and engagement help build trust, strengthen collaboration, and ensure that the co-management approach remains responsive to the needs and perspectives of fishermen.

Notes from deliverables:

By involving fishermen in the definition and co-management of marine areas, their knowledge and expertise can be harnessed to inform sustainable fisheries practices. This approach promotes stewardship, empowers fishing communities, and enhances the long-term viability of marine resources.



Source: Bastardie et All.

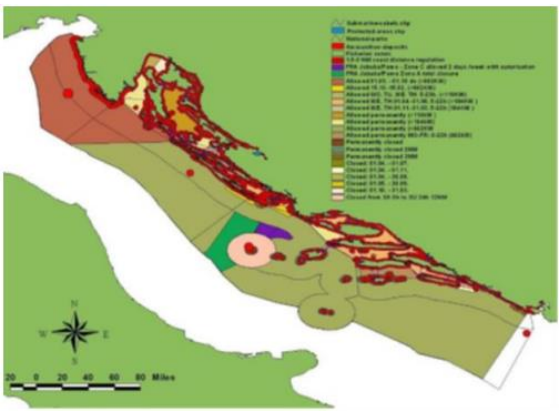


Figure 13 and 14: Map of permanent spatio-temporal fisheries regulation scheme including FRA Jabuka/Pomo Pit)

The positive impacts of marine protected areas on biodiversity conservation and ecosystem health have been unequivocally demonstrated in numerous studies (FAO, 2017). These benefits extend beyond conservation by also enhancing commercially important fish stocks. Notably, the effectiveness of marine protected areas in protecting fish populations can also benefit fishermen and their long-term economic activities. One significant mechanism through which this occurs is the "spill-over" effect, whereby protected areas serve as sources of repopulation, replenishing fish stocks in adjacent areas where fishing, aquaculture, and other activities are permitted (Medoff et al., 2022).

The establishment of Sites of Community Interest (SCI) in the maritime waters of Emilia-Romagna and Veneto was acknowledged by the Italian Ministry for the Environment and for the Protection of Land and Sea (MATTM). The targeted species for protection are the bottlenose dolphin (*Tursiops truncatus*) and sea turtle (*Caretta caretta*). The conservation measures implemented in the two sites, are completely similar.

Best practices that involve fishermen and management of the protected areas are:

A. Involve representatives of the professional fishing community and aquaculture in the management body of the SCI area and in the possible modification and redefinition of mitigation measures.
B. Financially support fishing enterprises that use selection tools and possible deterrents.
C. Continue and implement training through theoretical-practical information and refresher courses for fishermen and other stakeholders on the monitoring of animals at sea, interaction with other institutional and non-institutional actors, animal management and the use of mitigation tools to reduce possible mortality. These activities should be extended to other actors such as boaters, sport fishermen, and transport operators. The training activities will also include a return of data compiled by research and monitoring bodies that will enable informed participation in the critical review of conservation and management measures for these species. These will be manifested through public meetings with direct stakeholders and the various fishing sectors. Implement training and public information activities by integrating fishing tourism activities with dolphin-

watching activities through adequate training and compliance with the international rules governing these activities.

D. Support and promote sustainable fishing, including through objective sustainability certifications, according to accredited standards such as MSC or 'Friends of the Sea'. It is possible to further implement this effort by trying to extend it also to other gears and expanding it with certification systems with specific references to respect and protection of bottlenose dolphins and sea turtles. This is also thanks to EMFF funding, which allows for an adequate economic return thanks to direct contact with the consumer and adequate product valorisation.
E. Promote active participation through public meetings with stakeholders, particularly various fishing sectors, during the revision of conservation and management measures for these species.

2.11 Reduction of microplastic emissions

Reducing microplastic emissions in the fishery sector is crucial for safeguarding marine ecosystems and the health of aquatic organisms. Here are some measures that can be implemented to address this issue:

1. Education and awareness: Raise awareness among fishermen about the impacts of microplastics on marine life and the importance of reducing their emissions. Provide educational materials and training sessions on best practices for minimizing microplastic pollution in fishery operations.

2. Proper waste management: Implement effective waste management practices on fishing vessels and in fishing ports to prevent the release of plastic waste into the marine environment. This includes providing adequate storage facilities for waste, promoting recycling and proper disposal of plastics, and ensuring that no waste is deliberately discharged overboard.

3. Use of alternative materials: Explore and adopt alternative materials for fishing gear and equipment that have lower or no plastic content. For example, consider using biodegradable or compostable materials for packaging, ropes, and nets, thereby reducing the potential for microplastic shedding during fishing activities.

4. Fishing gear maintenance and repair: Encourage fishermen to properly maintain and repair their fishing gear to prevent the generation of microplastics. Regularly inspect gear, replace worn-out components, and ensure that repairs are done using appropriate materials and techniques to minimize microplastic shedding.

5. Responsible disposal of old fishing gear: Establish programs or partnerships for the proper disposal of old or damaged fishing gear. Encourage fishermen to bring their worn-out gear to designated collection points or recycling facilities instead of discarding them in the marine environment, where they can break down into microplastics.

6. Innovative gear designs: Support research and development efforts to design fishing gear that reduces the release of microplastics. Innovations could include modifications to gear structures or materials to minimize abrasion and shedding, as well as the development of gear recycling programs.

7. Collaboration with stakeholders: Foster collaboration among fishermen, fishing gear manufacturers, researchers, and policymakers to collectively address the issue of microplastic

emissions in fishery. Collaborative efforts can lead to the development of guidelines, standards, and incentives for reducing microplastic pollution throughout the supply chain.

8. Monitoring and research: Conduct monitoring programs and research studies to assess the extent of microplastic pollution in fishery activities. This can help identify hotspots, sources, and potential mitigation measures. The findings can inform targeted interventions and support evidence-based decision-making.

9. Policy and regulation: Advocate for policies and regulations that address microplastic pollution in the fishery sector. Encourage the development of guidelines or legal requirements for responsible waste management, gear maintenance, and gear material choices. Support initiatives to incorporate microplastic reduction strategies into fisheries management plans and environmental regulations.

By implementing these measures, the fishery sector can contribute to the reduction of microplastic emissions and protect the marine environment. It requires a combination of education, improved waste management practices, collaboration, innovation, and policy support to effectively address this environmental challenge.

Figure 15 Plastic pollution-Hakai magazine-Coastal science and communities (web source)

Notes from deliverables:

Some of the main sources of microplastic emissions in fisheries are:

- Fragmentation of larger plastic debris: Large plastic items such as buoys and fishing gear can break down over time due to weathering and physical processes like wave action, UV radiation, and mechanical stress. This fragmentation results in the release of smaller microplastic particles that can contaminate the marine environment.
- Lost, abandoned, or discarded fishing gear, commonly known as "ghost nets," is a significant source of microplastic pollution. These nets, along with other types of fishing equipment like lines, ropes, and buoys, can release microplastic particles as they degrade in the marine environment.

Some measures that can help reduce microplastic emissions in fishing activities include:

- Alternative Fishing Gear: Explore and promote the use of fishing gear made from non-plastic or biodegradable materials. For example, replacing plastic-based nets and lines with natural fibre alternatives like hemp or cotton can reduce microplastic shedding.
- Improved Gear Handling: Train fishermen in proper gear handling techniques to minimize wear and tear. Avoiding rough handling and ensuring regular maintenance of fishing gear can help reduce microplastic release.
- Recycling and Proper Disposal: Encourage the proper disposal of fishing gear by establishing recycling programs and providing designated disposal sites. Recycling fishing nets and other plastic-based gear can prevent them from breaking down and releasing microplastics into the environment.
- Recovering lost and abandoned fishing gear
- Collecting marine litter and bringing it to shore for proper disposal

Extracting lost and abandoned fishing gear starts with identification of areas where ghost gear is known to accumulate or where it poses a significant threat to marine ecosystems. It is important to establish collaborations and partnerships with local communities, fishermen, environmental organizations, and government agencies to gather support, resources, and expertise for ghost gear removal efforts. Trained divers and remotely operated vehicles (ROVs) are used to locate and recover ghost gear underwater. Divers can physically detach the gear from reefs or other structures, while ROVs equipped with cameras and manipulator arms can perform similar tasks remotely. Nets and other gear may also be collected with trawling nets or dredges.

Surface collection: Ghost gear that is floating on the surface can be collected using boats equipped with nets, grappling hooks, or long-handled tools. This method is particularly useful for smaller debris or fragments.

Once the ghost gear is retrieved, it is essential to handle and dispose of it properly. Recycling programs or specialized facilities can process the collected gear to minimize waste and maximize resource recovery.

Education and raising awareness are very important, because fishermen who are aware of the impacts of ghost gear will be ready to report lost gear, implement gear marking systems, and use equipment that minimizes ghost gear entanglement.

3 List of deliverable as a source for hand book

D3.1.4 Num.1 MSP programme final document

Italian Maritime Spatial Plans Adriatic Maritime Area - Summary

Ministry of Sustainable Infrastructure and Mobility

Expert study for the declaration of a marine protected area “Cape Stupišće, island of Vis”

WP3 Governance framework

Activity 3.2. Maritime Spatial Planning assessments

PP10 – RERA S.D.

D3.2.6. Analysis of nutrient levels and food web in the upper Adriatic Sea (Marano and Grado lagoons): current dynamics and interactions with the small-scale fishery

WP3 Governance framework

Activity 3.2. Maritime Spatial Planning assessments

LP - Regione Autonoma Friuli Venezia Giulia with the scientific support of the National Institute of Oceanography and Applied Geophysics - OGS

D.3.2.1 - Analysis for the harmonisation of legal framework between the regulation on fisheries and aquaculture between Italy and Croatia, within the general EU regulatory framework

WP3 Governance framework

Activity 3.2. Maritime Spatial Planning assessments

PP3 – Marche Region

D.3.2.2 Study for the protection of marine resources and fisheries and aquaculture activities of the Molise region

WP3 Governance framework

Activity 3.2. Maritime Spatial Planning assessments

PP4 – Molise Region

D.3.2.3 Study on maritime intra-sectorial interactions analysis as a deepening of the spill over effects of the establishment of Natura 2000 areas in the upper Adriatic Sea

WP3 Governance framework

Activity 3.2. Maritime Spatial Planning assessments

PP1 - Veneto Region, partners involved - LP, PP1, PP2, PP3, PP6, PP7, PP8, PP12

D.3.2.7 How different fishery methods and linked management measures interfere each other both at biological and socio-economic level

WP3 Governance framework

Activity 3.2. Maritime Spatial Planning assessments

PP12 - National Research Council with the scientific support of VRAI - UNIVPM

D.3.3.1 Socio-economic effects deriving from actual management measures of the fish-related activities (Small pelagic species report)

WP3 Governance framework

Activity 3.2. Maritime Spatial Planning assessments

PP12 - National Research Council with the scientific support of VRAI - UNIVPM

PP13 - IOF

D.3.3.1 Socio-economic effects deriving from actual management measures of the fish-related activities (Demersal species report)

WP3 Governance framework

Activity 3.2. Maritime Spatial Planning assessments

PP12 - National Research Council with the scientific support of VRAI - UNIVPM

PP13 - IOF

Assessments of the possibility of using data collected in fisheries at the county level - case study PP8 – Zadar County

WP4 Knowledge-based decision-making process

Activity 4.1. Survey and comparison of existing data and databases

PP8 - Zadar County

D.4.1. and D.4.2. Research and comparison of existing data and databases and design of protocols for

monitoring invasive species in fisheries and aquaculture

WP4 Knowledge-based decision-making process

Activity 4.1. Survey and comparison of existing data and databases

Activity 4.2. Common scheme for the management of fishery activities at local level

PP2 – Emilia-Romagna Region

PP6 – Istrian Region

D.4.1.1 Num. 1 report illustrating and comparing the existing biological and socio-economic databases concerning fish-related matters provided at institutional level in Italy and Croatia, outlining main statistical information

Survey and comparison of existing data and database - WP4 Knowledge-based decision-making process

Activity 4.1. Survey and comparison of existing data and databases

PP13 - IOF

D.4.1.2 Agenda for the standardization of data as a basis for a shared approach in the management of Adriatic biological resources and economic activities

WP4 Knowledge-based decision-making process

Activity 4.1. Survey and comparison of existing data and databases

PP13 - IOF

D.4.2.1 Protocol to collect data at local level PGK

WP4 Knowledge-based decision-making process

Activity 4.2. Common scheme for the management of fishery activities at local level

PP7 - Primorje Gorski kotar County

D.4.2.1 Num. 1 technical-scientific common scheme for local data collection on fish and fish related data at very local level

WP4 Knowledge-based decision-making process

Activity 4.2. Common scheme for the management of fishery activities at local level

PP13 - IOF

D.4.2.2 Common scheme for the management of fishery activities at the local level

WP4 Knowledge-based decision-making process

Activity 4.2. Common scheme for the management of fishery activities at local level

PP2 – Emilia-Romagna Region

D.4.2.2 Protocol on fishery and fish related data collection at local level

WP4 Knowledge-based decision-making process

Activity 4.2. Common scheme for the management of fishery activities at local level

PP – Lead partner - Autonomous Region of Friuli Venezia Giulia

D.4.2.2 Collection of Apulian fishery and aquaculture data at local level

WP4 Knowledge-based decision-making process

Activity 4.2. Common scheme for the management of fishery activities at local level

PP – Lead partner - Autonomous Region of Friuli Venezia Giulia

D.4.2.2 Fisheries-biological and socio-economic aspects of bottom longline fishing in the open central Adriatic and protocol for local data collection and management of this type of fisheries

WP4 Knowledge-based decision-making process

Activity 4.2. Common scheme for the management of fishery activities at local level

PP10 – RERA S.D.

Establishment of a local and cross-border network for training and education of all stakeholders of the fisheries sector for the purpose of environmental protection and sustainability

WP5 Sectorial know-how development and pilot project implementation

Activity 5.1 Network for the training and education of operators towards environmental sustainability

PP11 - Dubrovnik-Neretva County

D.5.2.1 Set of guidelines by P1 and P2 for the most effective procedures to safeguard the sustainability of fishery in the framework of marine protected area

WP5 Sectorial know-how development and pilot project implementation

Activity 5.2 Improvement of fishermen behaviours

PP1 – Veneto Region, PP2 – Emilia-Romagna Region

D.5.2.2 Guidelines and protocols for the sustainable exploitation and management of marine areas

WP5 Sectorial know-how development and pilot project implementation

Activity 5.2 Improvement of fishermen behaviours

LP – Autonomous Region of Friuli Venezia Giulia

D.5.2.3 Fisheries co-management plan in a Natura 2000 site

WP5 Sectorial know-how development and pilot project implementation

Activity 5.2 Improvement of fishermen behaviours

PP5 – Apulia Region

D.5.2.4 Protocol for small-scale fishery data collection and proposal for management

WP5 Sectorial know-how development and pilot project implementation

Activity 5.2 Improvement of fishermen behaviours

PP12 - National Research Council with the scientific support of VRAI – UNIVPM

D.5.2.6 Protocol for the sustainable management and protection of a shared fish stock

WP5 Sectorial know-how development and pilot project implementation

Activity 5.2 Improvement of fishermen behaviours

PP3 - Marche Region

D.5.3.1 Guidelines proposal by P2 for the most effective procedures to safeguard the sustainability of fishery in the framework of marine protected areas

WP5 Sectorial know-how development and pilot project implementation

Activity 5.2 Improvement of fishermen behaviours

PP8 – Zadar County – responsible partner, author PP2 - Emilia-Romagna Region