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Deliverable 6.1 Solutions arising from the bottom-up approach

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Solutions arising from the bottom-up approach

1. Introduction

Promoting positive change by directly working with fishermen and scientists is the main goal of the MINOUW project.

For this change to be meaningful, long-lasting and self-sustaining in the long run, the MINOUW project envisaged placing stakeholders at the core of the action by promoting multi-stakeholders engagement.

Multi-stakeholder participative work is the delivery mechanism to bring positive change – i.e. increased selectivity - to European fisheries, and this is in agreement with the strengthened focus on stakeholders participation in the EU Common Fishery Policy (hereinafter CFP).

The "social work" applied in MINOUW has elements in common with participatory research but also with broader fisheries co-management. Usually, the former appeared in the initial phases of the planned stakeholders field work, when researchers and fishers worked together on the available data (which include traditional environmental knowledge) and agreed on solutions, raised from this bottom up approach, to be tested in the field. The social work further developed in the implementation phase (according to the implementation plan; i.e. deliverable D2.1) through field testing.

It is often considered that this type of participatory research can pave the way to true co-management, being a natural way to rationalize fisheries management.

The project performed field actions in a total of 12 case studies (CSs), mostly related to fisheries based on trawlers, purse seines and static nets.

WWF had the role as coordinator of the social solutions in WP2. In particular, WWF provided overall guidance on multi-stakeholder participatory work to the teams involved in the case studies.

Notwithstanding the high heterogeneity among fishing realities in the European seas and the logical need to avoid a "one size fits all" approach, as well as the need to anchor any field work on an adaptive management approach, the work was done according to an "ideal" common methodological approach.

This social work, developed according to a step by step methodology, produced a series of "bottom up" solutions to possibly solve the discard problem at case study level.

In the field, each CS leader adapted this methodology to the specific local conditions.

By using this methodology (hereafter described), WWF collated the implementation plan presented in Deliverable 2.1 and completed this document as deliverable 6.1.

2. Description of the social intervention methodology

Where field work with stakeholders has been planned (Algarve, Catalan Sea, Sicilian Channel, North Aegean Sea, Aegean Sea, Adriatic Sea, Tuscany, Balearic Islands), the work, done in the first year, was structured in 4 steps to jointly characterize the problem and to identify the needed field actions.

During the second year of the project the fishers involved in the experimental field tests will be routinely visited. At these "on-the-dock meetings" fishers reported to the Project field technicians on the implementation of the new measures and, eventually, submitted relevant data pertaining to the data-collection and monitoring scheme. The field technicians acted as an interface between the scientific team and the fisheries collective, and assisted in fine-tuning the field work following an adaptive approach. Adaptive management based on continuous feedback is in fact an essential element of a successful participatory research program. Some stakeholder round table per year were conducted to follow-up in detail on the on-going field experiences.

2.1. Year 1

2.1.1. Step 0 - Stakeholders analysis and action plan

The project partners responsible for a field case study listed the concerned actors (hereinafter stakeholders). Roles and links among these identified stakeholders were understood and established. It was important to make a broad and inclusive analysis, also taking into account any relevant external stakeholders highly trusted by fishers (who might have eventually helped the Project getting their buy - in). Based on this, the precise timing of the meetings included in Step 1 and 2 below were planned.

2.1.2. Step 1 and 2 – Seeking Institutional support from administration and engaging the fishing sector at institutional level

Even if the nature of our social work was based on a bottom-up, multi-stakeholder participatory approach, it has been very important to secure the institutional support from the administration/s competent in the fishery. Further, from a fisheries co-management perspective, the competent administration is always a key stakeholder in the process. Such support is of a two-way nature: on one hand it helps to provide for the necessary enabling conditions for the field interventions and it can also establish synergies to maximize dissemination and outreach of best practices, including replication. On the other hand, counting on the support from the administration helped convincing initially reluctant fishers, who might decide to engage lured by prospects to increase their profile vis-à-vis the competent local authorities.

A similar approach was adopted with the fishing sector. Even though the fishing sector's internal institutional architecture differs in the different countries, it was important to avoid internal frictions by respecting the sector formal structures engaging them in the project. Even if the work was developed in a preselected fishing port and it was expected to involve only a part of the fleet, it was important to seek the institutional engagement/endorsement of the formal fishermen representative structures (regional or national fisheries associations, Cofradias, or the like). After

achieving the endorsement and participation from the sector, in certain case studies a small workshop or working meetings including fishermen and representatives from the concerned administrations were organized.

2.1.3. Step 3 Introductory Meeting

After the institutional support of both the administration and the fishing sector was obtained and a specific fishing fleet/fishing port was selected for the field work, it was important to get the buy in from the local fishing community. During the first year of work was vital to be able to regularly engage the maximum number of local fishers from the selected fishing segment (e. g. bottom trawlers, purse seiners, small-scale netters, etc.). Fishers were engaged in technical discussions so it was important anyone with expertise participates (this included skippers and crew or boat owners, as appropriate and possible). An introductory meeting needs to be conducted to engage the community, with support from institutional fisher's leaders and staff from the fishing administration (or other actors identified in Step 0 –such as social scientists, local NGOs, gear manufacturers, buyers, technologists, etc.) if deemed appropriate.

It was important that local fishers understood they were at the core of the intervention, and that any decisions on specific measures to be tested was ultimately taken by them. Also, it was important they understood that the project was an opportunity: they were given a unique privilege to propose and have a say on innovative ways to minimize the potential impacts of the landing obligation on their activities. Work with the fishing sector gave equal weight to the "how" and the "what": fishers were proactive seeking for solutions, participating in their design and taking responsibility over the implementation. In some of the case studies the solution proposed by the researchers were accepted as were presented, in other ones potential solutions and adaptations were suggested by fishermen.

2.1.4. Step 4 . Regular multi-stakeholders workshop with fishermen

During the first year of the project regular working workshops were held with participation of fishers and scientists (and in same case studies facilitated by WWF) to 1) jointly gather qualitative and quantitative information on discards and 2) jointly agree on potential solutions to be tested in the field.

To ensure maximum fishers' participation meetings took place very close to or in the fishing ports. Working meetings took place throughout the year. Generally, discussions were structured as follows:

1. **Characterization of the problem**:

- Qualitative/quantitative assessment of fisher's perceptions and data, including temporal and spatial components (e.g. participatory mapping exercises), to gather an initial set of elements for the discussion. In certain case studies, questionnaires were used.
- Joint discussion of data available to scientists.

- Joint diagnostic and characterization of the problem (incl. prior cross-validation and consolidation of all the available information).

2. **Identification of field actions**:

- Shortlist of proposals by fishers of potential solutions to be tested/implemented in the field (any solutions, including time/area closures, etc.). In certain case studies, conceptual model were prepared.
- Introduction by scientists of the technical solutions included in MINOUW (e.g. grids or deep vision), with technology experts attending in case of interest from fishers
- Joint discussion of pros and cons and final decision on the interventions to be tested. Support from relevant administrations might be needed for certain type of interventions (e.g. a time/area closure)

3. Design of fishers-based data-collection & monitoring schemes:

- Joint design of a data-collection scheme based on the fishers to monitor the effects of the selected field action/s (incl. potentially an electronic support like mobile phone or tablet)

4. Agreement on formative actions required:

- Training and capacity building of end users in the new technologies and data collection schemes
- Field visits of some fishers to learn from other fisheries (exchange program).

2.2. Year 2: Agreed Interventions

At the end of the first year, after having followed the multi-stakeholders participatory approach (from step 0 to step 4), and by having adapted and tailored it to the context of each case study, an agreed interventions plan was defined in each case study by the CS leaders.

WWF collated all the planned interventions per case study in a single GANTT- style table, which was presented in Deliverable 2.1.

These planned field test interventions were performed in Year 2 and, in some cases, will continue in Year 3.

These field test interventions involved a very limited number of fishermen out of the constituencies participating to the work done in Year 1.

The results of the field testing lead to the definition of the bottom-up solutions, which are described in the following paragraphs.

3. Solutions arising from the bottom-up approach

3.1. Solutions per case study

1. CS 1.4 Catalan Bottom Trawling

Possible solutions identified during the multiactor approach

Several multiactor sessions were carried out in CS1.4 in the period May 2015 – March 2016 (as described in deliverable D2.1) which led to the identification of possible solutions to mitigate the impact of the landings obligation on bottom trawl fisheries by reducing the amount of discards of Annex III (Mediterranean Regulation) species. The topic of utilization of former discards was not identified as possible solution by the stakeholders and all efforts were directed to technological measures aiming at enhancing the species or size selectivity of existing bottom trawls. The solutions identified were:

- test the DeepVision system to determine areas of high concentration of unwanted catches, as a diagnostic tool for a future fisheries management plan based on spatial restrictions to fishing,
- test T90 extension before codend to reduce by catch of undersize individuals,
- test artificial light stimuli as device for species selection (avoidance of fishes) in fishing operations directed to crustaceans (*Nephrops* upper slope fishery)
- to analyse the *Nephrops* survival of individuals returned at sea to obtain data for possible exemption.

Solutions tested in pilot case studies by researchers and fishers

In the period May 2016 – April 2017 field tests onboard trawlers of the port of Blanes were carried out testing the T90 extension piece against the standard, regulatory bottom trawl with 40 mm square mesh codend. The results show a significant shift of L50 towards larger sizes in the two species (hake, red mullet) for which the landing obligation entered into force in Jan. 2017 and a significant reduction of unwanted bycatch. Limited tested with artificial light stimuli have been carried out so far (as of this writing, Feb. 2017), but preliminary results suggest that the catches of the target species (*Nephrops*) are not adversely affected by the modified trawl fitted with lights, while unwanted catches of the catshark (*Scyliorhinus canicula*) are significantly lower. In April 2016 the DeepVision system was tested on fishing grounds operated by the Blanes fleet onboard a research vessel but the results were not completely satisfactory due to bad performance of the experiment. From March 2016 to February 2017 experiments onboard trawlers of the port of Blanes and at the laboratory of the ICM were carried out to analyse the survival of *Nephrops*. The results show a significant survival of immature individuals.

2. CS 1.5 Sicilian Bottom Trawling

Possible solutions identified during the multiactor approach

Multiactor sessions were carried out in Mazara del Vallo in 2015/2016 (as described in deliverable D2.1) which, through the adoption of a conceptual model technique, led to

the identification of possible solutions to mitigate the impact of the landings obligation on deep water rose shrimps/red shrimps/hake trawl fisheries. The utilization of discards, as suggested by the landings obbligation (art. 15 of the CFP) was not excluded as possible solution by the stakeholders, but according to them a huge investement in modernization of the vessels is needed to transform the former discards in fish meals on board. These vessels stay, infact, out at sea even for 40 continuos days before going back to the initial harbour of Mazara, and at the moment there are not structured to even store the discard that must be landed.

Acccording to the stakeholders all efforts must be directed to (1) support the implementation of a transnational management plan with Tunisia (which includes spatial/temporal measures, catch limits, and above all *de minimis* exemptions); and to the (2) utilization of selective grids to improve selectivity and reduce discards at sea.

Solutions tested in pilot case studies by researchers and fishers

Field tests were carried out on board of a local trawler in the harbor of Mazara del Vallo in 2016 and further field tests will be done in March 2017. The results produced by using the selective grids were satisfying. A fishermen exchange in Norway, where selective grids are built and used by shrimp fisherman since decades, were organized within the framework of the Minouw project. A fishermen and a researcher from Mazara del Vallo attended the exchange. A Norway grid was bought and will be adapted to the Mazara trawl net and tested in 2017.

3. CS 1.6 Tuscany Bottom Trawling

Possible solutions identified during the multiactor approach

During the different phases of the multi-participatory approach, fishermen addressed some issues to the end-users in order to explore solutions to the discards problem, and to outline possible management solutions under the framework of multiannual management plan. Since from the beginning, fishermen showed a strong opposition to an increase of mesh size due to the loss of commercial species with no Minimum Conservation Reference Size (i.e., cephalopods). On the contrary, fishermen were in favour of an implementation of management measured based on fishery restricted areas (also on a temporal basis). Also temporal fishing closures were suggested as a possible solution, but in a different way from the actual fishing closure. In this context, Deep-Vision was considered as a valid tool to help in real time monitoring of temporal fishing closures.

Solutions tested in pilot case studies by researchers and fishers

After having verified the impossibility of local trawlers to deploy the Deep Vision system due to the weight of the equipment, it was decided to carry out a joint experimental cruise in the Catalan Sea using the RV “Garcia del Cid” operated by CSIC. The deployment was conducted at 120-130 m depth, and the cod-end was left open so that a long duration haul could be conducted. During heaving, the trawl torn in half, and Deep Vision system remained at the seabed. The Deep Vision was ultimately retrieved with only minor damage and without loss of the data collected.

Visibility was sufficient during the first 30 minutes of trawling to easily identify all of the passing organisms, including cephalopods, echinoderms, crustaceans and fish. This included both commercially important and commonly discarded species. After 30 minutes of trawling, visibility was too severely reduced by suspended sediments to confidently count or identify the species passing.

4. CS 1.8 Tuscany Bottom Trawling

Possible solutions identified during the multiactor approach

During the different phases of the multi-participatory approach, fishermen addressed some issues to the end-users in order to explore solutions to the discards problem, and to outline possible management solutions under the framework of multiannual management plan. Since from the beginning, fishermen showed a strong opposition to an increase of mesh size due to the loss of commercial species with no Minimum Conservation Reference Size (i.e., cephalopods). In order to improve the efficiency of the trawl net, some fishermen explained that the use of artificial lights attached to the trawl net can increase the catches of target species (shrimps), while reducing the by catch.

Solutions tested in pilot case studies by researchers and fishers

The field activities related to the case study 1.8 "Use of lights in trawl fishery for shrimps in Ligurian and northern Tyrrhenian Sea" started in summer 2016. The main objective of this case study is evaluating the effects of the use of lights in trawl fishery for shrimps, and assessing the impact of using artificial lights on crustaceans catch efficiency and unwanted catches, mainly juvenile European hake.

The preliminary results obtained a GAM model fitted on the data from the first survey (summer 2016) did not show any significant effect of lights in reducing discards. At the same time, no effect of lights was highlighted on the efficiency of catching target species (deep-water rose shrimp and Norway lobster).

5. CS 2.1 Adriatic Pelagic Trawling

Possible solutions identified during the multiactor approach

Multiactor sessions were carried out along the Adriatic coastline in 2015/2016 (as described in deliverable D2.1) which, through the adoption of a conceptual model technique, led to the identification of possible solutions to mitigate the impact of the landings obligation on pelagic trawl fisheries. The utilization of discards, as suggested by the landings obbligation (art. 15 of the CFP) was excluded as possible solution by the stakeholders (since in the past it lead to the collapse of the anchovy) and so all efforts were directed to (1) support the implementation of a transnational management plan with Croatia (which include spatial/temporal measures, catch limits, and above all *de minimis* exemptions); (2) stakeholders partecipation in political fora, where decision are taken (MEDAC, FAO-AdriaMED); and (3) market incentives (like MSC certification). It has to be underlined that the main outcome of the process was the political partecipation the the decision making processes. This partecipation was defined by the stakeholders of paramount importance.

Solutions tested in pilot case studies by researchers and fishers

Since 2015, fishermen from the Adriatic Italian coast organized themselves in order to actively participate as "Federazione degli Operatori " (FederOP) to the MEDAC (EC-Mediterranean Advisory Council) Working Group on the Small Pelagic Fishery in the Adriatic, where they contributed by commenting the proposals to manage this fishery in the Adriatic sea. They participated also in the stakeholders discussions within the framework of the FAO-AdriaMED project. In 2017, they will participate to the official roundtables, named "Tavolo dei piccolo pelagici", which will be organized by the Italian administration, the Ministero delle Politiche Agricole.

Some of them, from Chioggia harbor (where a Minouw meeting took place), entered a process to certified their fishery (with Marine Stewardship Council; MSC), but with no successes because the stock is still fished at unsustainable level.

6. CS 2.2 Algarve Purse seine

Possible solutions identified during the multiactor approach

There were two multi-stakeholders meetings during 2015-2016 aiming to minimise unwanted catches by incentivising the adoption of fishing practices and technologies to purse seining that reduce pre-harvest mortality and post-harvest discards ,as described in deliverable D.2.1. The main solutions pointed out were the following, according to the fishing tecnique.

Before fishing, to avoid unwanted catches is necessary to:

- use the on-board technology (like the trawl sampler);
- count on skipper experience;
- select accurately the fishing areas;
- increase the percentage (20%) of by-catch allowed;
- create specific non-fishing areas
- temporal manage the operating fishing fleets;

During the fishing activity, to reduce unwanted catches is in need:

- allowing the fish to escape by lowering the net (slipping) using different methods (standard, modified with weights or the Mestre Abilio's Technique) or by using a selectivity procedure called "cuba da vante" (BRD).
- Improving survival by using of less abrasive material and no knots in the bag ("pejada");

Solutions tested in pilot case studies by researchers and fishers

Experimental campaigns were carried out in April and September 2016 where the trawl sampler and two slipping procedures for the sardines (*Sardina pilchardus*) were evaluated. The trawl sampler was deployed as previously planned, but it did not gave positive results, mainly because the device tested was not adapted to this particular purse seine fishery. The first slipping method tested is based on the fastest, easiest and most used technique in the purse seine fleet in the Algarve and basically the net is hauled in and any unwanted fish are slipped out over the floatline (standard slipping) and the second is based on a more complex technique that uses weights to sink the

floatline creating an opening where the fish escape (modified slipping). Preliminary results indicated that the modified slipping was the most efficient method to let the sardine escape alive. A new and promising method (Mestre Abilio's Technique) to promote the sardines escape is going to be tested in 2017.

7. CS 2.3 North Aegean Purse seine

Possible solutions identified during the multiactor approach

Since the very beginning of the Project and the initial discussions with the local purse seine (PS) fishermen of Kavala, fishermen were insisting that the discards rate in the area where the fleet operates is surprisingly low. An analysis of the available data was conducted by the Hellenic Centre for Marine Research (HCMR) and together with MINOUW field work and the questionnaires filled out by local fishermen in order to collect data on the catch and effort activities, the discards ratio, the fishing practices and the implementation of the landing obligation confirmed fishermen's claims. Actually, the estimated discard's percentage for North Aegean was found to be approximately 1.8% of the total catch in terms of weight. The underlying causes of such exemplary performance with a focus on environmental factors, ecosystem factors and fishing techniques used by the local fishermen were further explored.

Solutions tested in pilot case studies by researchers and fishers

The HCMR prepared a report including a comparison of purse seine fisheries discards in the North and the Central Aegean Sea fleets for the period 2003-2008, which revealed great differences in discard ratios at the fishery level (independent of species). These differences are mainly attributed to the species composition of the catch in the two areas. In the North Aegean PS fishery sardine and anchovy dominate the landings summing up to ~90% cumulative contribution, while the Central Aegean PS fishery is more multi-species with several additional species constituting an important part of the landings. The overall higher discards ratio of the Central Aegean PS fishery results because (i) some of the species (e.g. bogue, horse mackerels) are of relatively low commercial value and are characterised by higher discard ratios, and (ii) a substantial number of species are caught in very low quantities (not high enough to be sold). The species composition of the catch is mainly affected by the differences in the relative abundance of the species in the two ecosystems; the North Aegean Sea is a much more productive area due to the extended continental shelf, the Black Sea water input and the river run-offs, and can support important populations of anchovy and sardine. Therefore, the abundance of these two species is progressively reduced southwards and in parallel, the relative abundance of species like bogue and horse mackerels increases. Finally, some differences in PS fishing techniques between the two study areas were identified. In the North Aegean, the lamp rafts are deployed close to each other and an operator from a rowing boat brings them even closer together. This process simultaneously aggregates the fish attracted by each lamp raft and a larger fish aggregation is formed. During this process, the operator is in visual contact with the fish aggregations and can decide whether the fish composition and the size of the individual fish are worth catching. At this point, the operator can inform the captain in the event of undersized fish and therefore avoid a catch that would be discarded. Then, the "mother vessel" encircles all lamp rafts together. In contrast, in

the Central Aegean, each lamp raft is usually deployed alone and encircled separately and no operator is involved in the process.

8. CS 3.2 Balearic set net fisheries

Possible solutions identified during the multiactor approach

In general, fishermen propose to use nets with bigger mesh sizes for lobster and cuttlefish trammel nets. In addition, some of them propose to avoid fishing on days with adverse sea conditions, as it produces a greater movement of the nets and therefore the capture of more quantity of discards. In the specific case of lobster trammel net, fishermen attending the WWF-organized MINOUW meeting in Italy (July 2015) thought that the incorporation of the “greca” into the base of their nets could reduce the capture of maërl and other benthic discards.

A feature of the lobster fishery is the capture of younger specimens of less than authorized size, which according to the new European regulations should be landed as discards. It was proposed by the researchers to carry out a study of the post-capture survival of these young specimens in order to determine if they can be considered "releasable capture" due to their probable high survival.

Solutions tested in pilot case studies by researchers and fishers

Some fishermen routinely use nets with mesh sizes greater than those authorized by current legislation to reduce unwanted catches. However, this method might not be profitable in the most exploited areas. During the 2016 cuttlefish fishing season, a comparative study was carried out to test the effectiveness of two mesh sizes (5 pass versus the traditional 6 pass) in cuttlefish nets and the influence of the level of exploitation of the area.

Also during the lobster fishing seasons of 2015 and 2016, two comparative studies have been developed between different types of nets. Firstly, the effectiveness of traditional multi-filament polyamide (PMF) nets with respect to others made with a new, lighter, multi-monofilament material (MMF) has been tested and apparently reduces the capture of discards. In the second place, the effect of the capture of discards between nets with ”greca” (selvedge) against nets without “greca” has been tested. All these data are being analyzed.

The regional government has already begun to regulate the activity of the professional fishing in the marine reserves in this direction, increasing the mesh size allowed in gill nets to 5 passes (80 mm of light) and in the case of The mullet fishery allowing only the net of a single cloth (gillnets) and light of mesh of 8 passes (50 mm of light).

During the 2016 lobster fishing season, the regional government authorized fishery investigators to transfer to the LIMIA facilities all caught lobster specimens that were below the minimum authorized size to being studied at the LIMIA facility. The survival of these specimens is assessed following the methodology for estimating the survival of discards proposed by the ICES (WKMEDS) in January 2014.

9. CS 3.3 Balearic Islands boat seine fisheries

Possible solutions identified during the multiactor approach

The "jonquillo" fishery has a co-management system in which the fishermen themselves, the administration, researchers and NGOs participate, and hold periodic meetings. During one of these meetings, fishermen proposed a system to prevent catches exceeding quota from being discarded. This system would be to establish an agreement and allow fishermen who catch an excess quota to pass it to other fishermen who have not reached that limit, avoiding that said surplus quota be returned to the sea, even by using the technique of "slipping".

Solutions tested in pilot case studies by researchers and fishers

The administration of the regional government is studying the possibility of incorporating this measure in the legislation so that it can be applied by fishermen.

10. CS 3.4 Catalan Trammel Nets

Possible solutions identified during the multiactor approach

Several multiactor sessions were carried out in CS3.4 in the period May 2015 – Jan. 2016 (as described in del. D2.1) which led to the identification of possible solutions to mitigate the impact of the landings obligation on small scale fisheries using static nets. Other small scale fisheries in the area were considered by the group unproblematic due to the low amount of discards of Annex III (Mediterranean Regulation) species. Utilization of former discards was not identified as possible solution by the stakeholders and all efforts were directed to technological measures aiming at enhancing the species or size selectivity of existing bottom trawls. The solutions identified were:

- test artificial light stimuli as device for species selection (avoidance of fishes) in métiers directed to invertebrates (cuttlefish trammelnet and caramote prawn trammelnet),
- test a selvedge strip on the lower part of a trammelnet on fishing operations directed to the caramote prawn.

Solutions tested in pilot case studies by researchers and fishers

Field tests were carried out on board of a local trammelnetter in the harbour of Sant Carles de la Ràpita in the period March 2016 – April 2017, although due to bad weather and logistic limitations the planned regular monthly sampling could not be followed up. In particular, the selvedge strip on the caramote prawn summer fishery planned for summer 2016 was cancelled. Experimental use of lights on the trammelnet was successfully tested in several deployments, but the preliminary results do not show significant differences between control and test designs.

11. CS 3.5. Tuscan Trammel Nets

Possible solutions identified during the multiactor approach

The caramote prawn fishery is very important for small-scale fishing fleets in Tuscany (FAO-GFCM GSA 9). Unfortunately, catch of target species is often associated with important quantities of unwanted catches (crabs and other benthic invertebrates); this often generates high discards and damages to gears, with consequent environmental impacts and associated costs for fishermen. Some fishermen are already using a particular device to reduce discards and associated damages to the net. This device is locally known with the term of "greca" (selvedge net), and consist of a gill net panel installed at the base of the trammel net used in the fishery of caramote prawn.

Solutions tested in pilot case studies by researchers and fishers

Preliminary observations and information collected from fishermen provided encouraging results in the efficiency of this device to reduce discards.

Case Study 3.5 is aimed at carrying out an experimental study to test the effects of a "selvedge" device placed in a trammel net to reduce the unwanted catches in the caramote prawn fishery. Experimental fishing trials were carried out in summer 2016 during the fishing season of the caramote prawn fishery along Tuscany coasts. Fifteen trials were performed using a hired professional fishing vessel. In each experimental trial, a common trammel net and two trammel nets with 20 and 30 cm height selvedge device, respectively, were used. The sheet position was changed randomly at each trial, to achieve similar catch probability of each sampling gear. The analysis performed on the collected data, though showing a slight decrease of commercial catches, showed a significant reduction in terms of discards by using nets equipped with the selvedge device. The selvedge represents also an efficient device in reducing operational costs for the fishermen. Its benefits on reducing the environmental impact and increasing the economic efficiency could be explored also in other set net fisheries exploiting coastal resources.

12. CS 3.6 Aegean Longline Swordfish (SWO)

Possible solutions identified during the multiactor approach

During the meetings with fishers, the by-catch problems of the fishery were analyzed together with potential solutions. The replacement of the typical J-hooks with circle ones in order to mitigate sea-turtle captures was discussed as a potential solution to the problem but several fishers were reluctant to accept such a gear modification given that the consequences on the catch rates of the target species are unknown. In addition, they expressed doubts regarding the ability of circle hooks to avoid sea-turtle catches. It was agreed, however, that such a gear modification would be tested on field and the results should be openly evaluated and discussed.

Solutions tested in pilot case studies by researchers and fishers

Experimental fishing trials on board commercial vessels equipped with longlines having different hook types (both, J and circle hooks) started in April 2016 and will be concluded by the end of February 2017. Fishing trials are accomplished on a seasonal basis and monitoring includes: (a) Catch rates of target species (both commercial and

undersized fractions), (b) Catch rates of other commercial by-catch species, (c) Incidental catches of sensitive species such as sea-turtles and pelagic sharks, and (d) economic performance of the fisheries. Given that the field work has not accomplished yet, only preliminary indications regarding the catch rates of the target species (swordfish) are available. According to them, it seems that circle hooks do not adversely affect the catch rates of the target species.

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