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Research article

Balancing ecology, economy and culture in fisheries policy: Participatory research in the Western Mediterranean demersal fisheries management plan

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ABSTRACT

Fishing communities in the Mediterranean Sea face challenges in dealing with Common Fisheries Policy (CFP) ecosystem-based management measures aimed at reducing fishing effort and implementing partial closures of fisheries. The Participatory Action Research method is used here as a "pilot experience" to gather reactions from fishers, scientists and fisheries managers to the Western Mediterranean Multi-Annual Demersal Fisheries Plan (WM MAP) by identifying needs and concerns, but also alternatives to maintain the viability of the fishery. The data gathering process consisted on a structured questionnaire administered during a workshop to 40 stakeholders involved in Spanish fisheries in the Mediterranean, followed by an open discussion session. The results show that fishers disagree with the new regulations, which they perceive as yet another layer of restrictive regulations for an industry that faces major challenges and currently has low profitability, whereas scientists tended to agree more with the WM MAP than the administration or the fishers. Nevertheless, all stakeholders agree that the values of the cultural heritage of fisheries and the exploration of alternative marketing systems should balance the productivity-based approach to fisheries policies followed so far, that have shown signs of failure. According to stakeholder perceptions, this would improve the economic and social viability of fisheries, as well as highlight the value of fishing activity and its social prestige. Integrating the value of cultural heritage and post-production processes into the CFP would improve stakeholder involvement in fisheries policies. Through participatory research methods the ecosystem-based management approach could be embedded in a community-based approach, integrating its social actors in a proactive attitude and considering fisheries as a human activity socially and culturally rooted in the environment, which would enhance the effective implementation of fisheries policies.

1. Introduction

The global trend of fisheries overexploitation has resulted in the need to reduce fishing effort in all European seas, which has been a central management strategy in the European Common Fisheries Policy (CFP) in recent decades (EU Reg. 1380/2013) (Penas Lado, 2016). For the Mediterranean Sea fisheries, the CFP has implemented, from its inception, a set of specific technical measures that have not been reviewed along time (Sánchez-Lizaso et al., 2020), primarily based on limiting fishing effort and gear characteristics; but notably, no catch limits are applied, in contrast with European Atlantic fisheries (EU Reg. 1967/2006) (Smith and Garcia, 2014; Vasilakopoulos et al., 2014). The measures have not helped redress the chronic overexploitation of fish stocks and have resulted in undesirable socioeconomic consequences for the fishing industry, notably a strong reduction of the fleet (30% for EU Mediterranean member states, from ca. 51 000 in 1995 to 36 000 in 2016, Maynou, 2020) and the destruction of jobs in the fisheries sector. The CFP measures to mitigate this structural adaptation have been limited to promoting the diversification of fishers' activities and subsidizing the lack of employment opportunities (EC 2369/2002, European Fisheries Fund (EFF) 2007–2013, European Maritime Fisheries Fund (EMFF) 2014–2021, Council Regulation (EC) No 1198/2006), or simply to compensate exit from the sector (Pita et al., 2010a). Meanwhile, fisheries resources have not recovered (Vasilakopoulous et al., 2014)

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confirming the failure of fisheries management (Cardinale et al., 2017; Hogg et al., 2013; Smith, 2013; Vielmini et al., 2017), while ignoring the problem of fleet overcapacity (Gómez and Maynou, 2020).

The new multi-annual plan for demersal fisheries in the western Mediterranean (Regulation (EU) 2019/1022 of the European Parliament and of the Council of June 20, 2019, OJEU L172/1) introduces the concept of maximum allowable fishing effort, which consists in a reduction of fishing time available to demersal fleets adjusted to the available stocks (Sánchez-Lizaso et al., 2020). Despite the shortcomings of effort control to avoid overexploitation (Cardinale et al., 2017; Vielmini et al., 2017), the WM MAP continues to make emphasis on the effort control regime for demersal trawlers, which now will be based on the total annual number of allowable fishing days per vessel (Bellido et al., 2020; Sánchez-Lizaso et al., 2020). The capping of fishing days is complemented by local seasonal closures or other measures approved during the implementation phase, such as establishing fisheries restricted areas for European hake nurseries (EU Reg. 2019/1022). The specific implementation details of the WM MAP are left to individual member states (for Spain the definite version was published in the Official Journal on May 2020: APA/423/2020, https://www.boe.es/eli/es/o/2020/05/18/apa423). The WM MAP is implemented by the fisheries management authorities of the member states, by listing the number of days per year when the vessels of different segments of demersal fisheries can operate. For operative purposes, the plan divides the demersal trawl fleet in two broad segments: vessels operating on coastal mixed fisheries and vessels operating on deep-water crustacean fisheries. Each fleet segment is in turn divided into four sub-fleets, according to vessel length (6–12 m, 12–18 m, 18–24 m and larger than 24 m length overall). The objectives of the plan are to align fishing opportunities with biological productivity, based on the biological reference point "fishing mortality at maximum sustainable yield" (Fmsy), which should be achieved by 1st Jan. 2025 with a progressive reduction (up to 40%) of the fishing effort from historical levels (art. 7 of APA/423/2020). The actual effort reduction will be set each year, based on the status of the demersal stocks, according to annual assessments (art. 13 of APA/423/2020). The objectives aiming to ensure environmental sustainability should be consistent with achieving economic, social and employment benefits, but they are expected to exacerbate socioeconomic consequences (reduction of the fleet, incomes and work salary conditions) endangering the continuity of the fishing industry, eroding cultural well-being of communities dependent on fishing (Gómez and Maynou, 2020) and accelerating the loss of potential ecosystem services for local development. Financial incentives have not been sufficient to boost fishers towards labour mobility, at least in southern Europe, where there are evidences of the weight of family cultural ties and attachment to the community (Pita et al., 2010a).

The new policy measures aligned with the technical measures have so far focused on the recovery of fish stocks. They are expected to produce new socio-economic challenges that fishers perceive as new tensions they will have to face, in addition to depleted aquatic marine living resources, global change, pollution, market competition, changing consumption patterns, limited institutional capabilities, and inconsistence of EU fisheries policies at local scale despite the efforts in the regionalizing process of decision-making (CFP, EU Reg. 1983/2013) (Raicevich et al., 2018). Alternatives to biologically centered conventional management proposals (Berkes, 2003; Gómez and Maynou, 2020) point out to a more comprehensive and interdisciplinary ecosystem-based approach (Garcia et al., 2003), and encompassing human dimensions as a tool to improve the effectivity of management. Whereas the primary focus has been ecological outcomes and biological recovery, sociocultural dimensions underlying human-environmental interactions (from production to consumption) that impact on ecosystems have been little considered in policy making. Scientists stress the need of understanding the contents of management plans by all stakeholders and, conversely, that fisheries managers have a correct understanding of stakeholders' perceptions involved, which is important for the successful implementation of specific policies (Garza-Gil et al., 2015; Tafon, 2019; de Vos et al., 2016). However, little attention has been paid to the concerns, needs, constraints and new opportunities that policy implementation can produce in everyday fisheries activity, which relate to socio-cultural, economic and biological issues. By considering social and cultural drivers underlying the economic ones, together with the ecological goals, management systems could adjust to the requirements (economic performance, cultural welfare, job creation, ecosystem conservation) that different dimensions' demand, so as to make the implementation of management measures more effective.

1.1. The integration of social and cultural aspects in fishery management

In the framework of the new European ecologically-oriented policy for the next years, economic development (understood as "Blue Economy"), the restoration and preservation of marine ecosystem services go together (EU, 2020). The human dimension is recognized as a component of ecosystems that integrates economic, social and cultural factors, which are interdependent with biodiversity (CBD, 1993; Khakzad et al., 2015). The elucidation of this complex socio-ecological interplay has been conceptualized through the ecosystem services (ES) approach. As an integral tool that emerged for socio-ecological assessments in political agendas, the concept of ecosystem services relies on ecological functions supporting life and lifestyles for human wellbeing by providing products, regulating the benefits of ecosystem processes, and supporting the production of all other ecosystem services (Hirons et al., 2016; Martin et al., 2016). Unlike provisioning, regulating and supporting services, intangible and subjective cultural services are non-measurable (e.g. sense of place, heritage, bequest) flowing from the human intellectual and spiritual interaction with ecosystems, and it proves difficult to specify their contribution to meet needs and well-being, and consequently, to integrate them into management (Cabana et al., 2020; Cooper et al., 2016; Martin et al., 2016).

Despite recent advances in developing conceptual frameworks and new methods to integrate cultural ecosystem services (CES) into policy decision-making (Cabana et al., 2020; Gould et al., 2019), the CES valuation and assessment still remain complex. The complexity is partly due to its contextual and place meaning (Fish et al., 2016; Maund et al., 2020) bonded to social actors' experiences, background and characteristics (Hirons et al., 2016; Maund et al., 2020) that perform activities that interact with the environment. In an effort to uncover the socio-cultural perspectives from ecosystem services (ES) some approaches propose to distinguish conceptually CES from social and cultural values (Scholte et al., 2015). Hence, whereas cultural ecosystem services reflect the non-material well-being, sociocultural values reflect both material (e.g. food) and non-material values (e.g. sense of place and cultural heritage) (Scholte et al., 2015). Therefore, market values and non-market-values are interconnected in activities such as fishing that we understand as a livelihood that performs an economy rooted in social institutions and cultural values, interacting in ecological cycles (Gómez and Maynou, 2020). Therefore, social and cultural aspects resulting from this complex socio-ecological relationship are product of this human-nature interaction defined throughout historical processes that produce identity and define heritage. Heritage, also refers to material culture (e.g. fishing gears) that embody the knowledge produced through this locally-established relationship with the environment in deploying fishing decisions (Gómez, 2018). Accordingly, we understand heritage as that cultural legacy that may make sense in contemporary society to cope with transformation processes (Gómez and Lloret, 2017), but also as "that part of the past that is selected at present for economic, cultural, political or social purposes" (Graham, 2002: 1006). Heritage valuations have been pointed out as opportunities for use, recreation, and education at the same time that supporting economic coastal development and fostering community engagement in management (Claesson, 2011). Its integration in management have been suggested under *integrative complexity theory* that considers the multiple links of

heritage values with economic, social, natural and political dimensions as drivers for the protection of nature and culture (Khakzad, 2015). Likewise, multifunctionality theoretical framework points out towards the unfolding of the diverse functions of fisheries, encompassing the environmental, economic, social, and cultural goods and services. This relatively new concept in fisheries, introduced in agricultural EU's Common Agricultural Policy (CAP) in the 2000s (Knickel et al., 2004) is tentatively introduced in fisheries and as Urquhart points out (2013) rarely seen in policy. Multifunctionality is characterized by the jointly production of multiple commodity and non-commodity outputs (NCO) when some of these NCOs are "externalities" or "public goods", the markets for these goods are poor or lacking and not balanced by harvesting level, therefore jeopardizing social welfare linked to joint production of NCOs (e.g. non-provisioning ecosystem services, cultural heritage) (Mulazzani, 2019). Ensuring the sustainable and environmentally sound production of public (externalities, NCOs) and private goods involves an ecological, economic and sociocultural balanced cycle as a whole at the interface of production-distribution-consumption; and taking into account that fishers may provide other goods beyond food provisioning (e.g cultural heritage, identity, recreation, employment, environmental stewardship) (Mulazzani, 2019).

Nevertheless, the weakness of bottom-up participatory process limits sociocultural resource valuations and assessments (Claesson, 2011). Fisheries management, at the intersection of ecology, economy, and social and cultural principles, need to be approached with methods capable to integrate this complex fishing cross-sectorial system. Within this framework, stakeholder engagement has to be deployed into every stage of policy design and decision-making.

1.2. Participatory Action Research within the framework of new perspectives and approaches to fishery management

Since promoting sustainable use of resource through community participation is a declared goal of the EU 2013 reform of the CFP, new approaches aiming at facilitating the integration of socioeconomic and environmental dimensions in decision making have initiated a trend towards more involvement of stakeholders (Leite and Pita, 2016). Nevertheless, up to now, participatory approaches ranging from "functional participation" to "co-management schemes" and "decision support frameworks" are driven by the administration (national or regional) to enhance the governance of specific fisheries and/or adhering to a predetermined "management model" (Leite and Pita, 2016). Although advances have been made by assembling stakeholders (scientific, managers, fishers) to create knowledge in providing bio-socioeconomic advice for decision-making; the integration of sociocultural aspects is still lacking. In short, as Mikalsen and Jentoft highlight (2008: 174) "management decision-making is rather a consultative decision-making" (Mikalsen and Jentoft, 2008) that is limited by the CFP existing structures (Leite and Pita, 2016) and it would require to be institutionalized to produce binding decisions (Macher et al., 2018). The consultative and advice processes providing these participatory schemas for decision-making following pre-settled directives (Leite and Pita, 2016), do not enable to capture properly the stakeholders needs and concerns -more sensitive to sociocultural aspects- that beyond advising, collecting stakeholder knowledge and perceptions, should be integrated in the implementation of fisheries policies.

The involvement of rural communities in development and management policies was the main driver of Participatory Action Research (PAR) from the 1970s onwards, in Latin America and some countries from Asia (Fals Borda, 1987). As Trimble and Berkes (2012) assert, the method aims at combining theory, action and participation committed to further the interests of disadvantaged groups. By the end of the 1990s and the 2000s some studies and social intervention programmes started to use this methodology in fishing communities and for fisheries management (Conway and Pomeroy, 2006; Hartley and Robertson, 2006; Wiber et al., 2009; Nurick and Apgar, 2014; Tolentino et al., 2015). PAR is a methodology based on "phenomenology, ethnography and case-study method" (Khan and Chovanec, 2010:36) and implies a process of participatory research aiming to provide solutions to real-life problems (Tolentino et al., 2015). Designed to follow a community-based approach, the method relies on the co-production of knowledge with an action-oriented component to address certain problems or improve specific situations based on local interests and concerns (Trimble and Berkes, 2012) in order to enhance stakeholders' well-being. Unlike Participatory Rural Appraisal (PRA) and Rural Rapid Appraisal (RRA), PAR is not limited to transfer knowledge from experts to communities in shared learning between locals and experts in the exchange process of scientific knowledge and experience knowledge (Chambers, 1994). Participatory Action Research (PAR) requires that all participants take part in the whole process of research development as co-researchers from the beginning. In the design of the research, identifying social problems to define the research problems, in data collection (e.g. self-sampling), in the evaluation and consequent actions to be taken.

As "pilot experience", and together with the evaluation of fishers' perceptions, a commonly used method (Maynou et al., 2018; Pita et al., 2010b; Villasante et al., 2016), this paper aims to identify the main contentious issues of fisheries management in the Spanish Mediterranean by gathering stakeholders' concerns as a first stage of PAR. This bottom up procedure seeks to bring together stakeholders and researchers in the co-creation of knowledge as it offers an alternative analysis of reality in an inter-related process where different viewpoints and understandings are represented. PAR involves a cyclic rather than a linear process of research that implies the continued contrast between the progress of researches and stakeholders' viewpoints, moving from the theory to the practice and vice versa. Researchers and stakeholders remain partners throughout the research process, ensuring the "true participation" of stakeholders as participants (Khan and Chovanec, 2010). In this way, social concerns and needs can become research problems for, in a step forward, assess the actions undertaken (working together to design research and collect data) in order to address the management gaps in providing solutions. Therefore, the method is based on reflection, data collection, and action aiming to tackle concerns and to identify new opportunities through the involvement of stakeholders who, in turn, may take actions to address them together with scientists.

Here we explore the potential of Participatory Action Research, which consists in identifying the concerns of fishers (and other stakeholders) and collecting perceptions on management measures in order to provide knowledge on problematic points as well as overall concerns and needs to facilitate the implementation of effective fisheries management in the Mediterranean Sea, using as motivating example the contentious implementation of the recently adopted Western Mediterranean Multi-Annual Plan for demersal fisheries.

2. Materials and methods

A multi-stakeholder workshop was organized in the frame of the XII annual meeting of the Scientific Forum for Spanish Mediterranean Fisheries (http://www.pescaforo.net), convened in Almería (Spain) on 17–18 September 2019. Two researchers acted as facilitators in the two phases of the session.

Unlike Participatory modelling (PM) systems, PAR does not involve a modelling component (using software) and is a bottom-up driven investigation. Despite the PM can reduce unexpected scenarios difficult to avoid through PAR, they tend to produce simplifications of reality (Voinov and Bousquet, 2010). Nevertheless, one of the PAR goals aims to produce sharing experiences and mutual understanding of stakeholders' problems. Also, to identify potential opportunities to, finally, jointly commit to take actions. Hence, the influence that social interaction may produce on opinions accounting for the different social roles and positions stakeholders occupy in social system, is constitutive of this participatory process (Tolentino et al., 2015), sensitive to conflicts of

interest and divergent values. As an adaptive method that is flexible to contextual requirements there is not a unique way to develop it. Workshops are the usual format, with variable attendance of stakeholders (from tens to hundreds) (Graef et al., 2019; Nurick et al., 2014; Tolentino et al., 2015) that in some phase of the workshops may be grouped (e.g. in discussion groups) by social profile, knowledge and priorities as control groups to reduce possible contextual bias and/or to ensure that all voices can express themselves. In some cases, face-to-face interviews are also collected in addition of workshop discussion sessions (Trimble and Berkes, 2013).

In this study, a mix-method approach has been adopted combining data gathered through a questionnaire with data obtained from a discussion session during the multi-stakeholder workshop, organized in two phases. In the first phase, the questionnaire, elaborated specifically for the workshop, was administered to participants. This consisted of 43 close-ended and open questions, with the purpose of obtaining a wide overview of the main fisheries opinions and perceptions while other questions focused on management measures more recently adopted (WM MAP). To elicit the perceptions of stakeholders we followed the methodological approach of survey research used in applied social research (Hilton et al., 2019). The second part of the workshop consisted in a discussion moderated by the facilitators in charge of guiding the deliberation of the arguments and ensuring the participation of everyone (110 attendants). Grouping the attendants by smaller discussion groups was dismissed, as the purpose was to stimulate the discussion and to establish a space of dialogue between different stakeholders from all fishing communities of Spanish Mediterranean coast, and respective managers affected by CFP policies. Furthermore, one of the goals of PAR consists in encouraging the group "to establish relationships with other groups, making up networks and associations that facilitate change at different levels, and establish solid foundations for sustainable development" (Guzman et al., 2013: 4). Facilitators may act as "social bridges" to overcome differences between social actors (Léopold et al., 2019). For this purpose, the facilitators start by launching one or two general open questions (e.g. How do you see the future of the fisheries? How do you see the state of resources? How do you think fisheries may improve its economic performance?) to boost the discussion. The main goal was to produce a reflection on fisheries development challenges and opportunities. The discussion was open and did not follow a structured script but, like an informal conversation, let the information flow according to the course of dynamic participation processes and insights exchange. It enabled to bring up a storytelling of divergent interests, concerns, and needs which are revealed expressing feelings, complaints, disappointments, opinions and viewpoints undermining economic, political but also social and cultural aspects wrapping up values of fishing. The deliberations and exchange of viewpoints were noted in situ and audio-recorded. Interviewees' data were confidentially treated. The questionnaires and discussion session analysed in this paper provide the first findings on fishers' concerns, obstacles and new opportunities.

2.1. Data collection

The questionnaire was organized in three blocks: block A, with questions related to the current situation of fisheries in the Mediterranean Sea, block B, with general questions on fisheries management, and block C, with specific questions on the implementation of the Western Mediterranean demersal fisheries multiannual management plan (WM MAP) (EU Reg. 2019/1022). In this section, questions about socioeconomic and social and cultural aspects of fishing were introduced. The questionnaire was anonymous but contained a header asking about the job and position of the person, age and gender. Job and position helped classify the respondents in three categories of stakeholders: fishers, fisheries administration and fisheries scientists. An English translation of the questionnaire is provided in Supplementary Material 1 (Annex 1).

We identified the types of stakeholders relevant for the discussion of the implementation of the WM MAP. Following Hein et al. (2006) and Hauck et al. (2016), stakeholders are defined as "any group or individual who can affect or is affected by ecosystem services", in our case the services concerned are primarily food provisioning in the form of seafood products and non-market values such as cultural services. Stakeholders of type fisher were represented by owner-operators and crew members of bottom trawlers from the Fishers' Organizations of Andalusia, Valencia and Catalonia. Scientists included fisheries biologists from the Spanish Oceanographic Institute, the University of Alicante and biologists employed at WWF or performing consultancy work. Finally, the fisheries administration in our questionnaires were represented by fisheries managers from Andalusia, Murcia, Valencia and the Balearic Islands. All the attendants are representative actors involved in EU fisheries policies implementation at local level whether as regional administration, scientists providing data for evaluating the more suitable way, or fishers conducting fisheries practices in compliance with the measures.

The basic aspects of the regulation were recalled in the first part of the workshop during a ½ h presentation by the authors and staff of the Spanish General Secretariat for Fisheries to the conference participants. Afterwards, another ½ h was allocated to participants to individually complete the questionnaire, which was collected by the authors on the spot. From the 110 persons present in the conference room, 40 returned valid questionnaires, which can be considered a high response rate since after 20 answered questionnaires new concepts and results tend to diminish (Villasante et al., 2016). Finally, the exercise, in a second part, was followed of 1 h open discussion session.

The questionnaire consists of questions suitable for quantitative and qualitative analysis. All questions that were statistically analysed (Suppl. Mat. Annex 1, Tables 1–3) were closed questions, and the level of agreement of the respondent with the proposition was determined on a 5-point Likert scale (strong disagreement, disagreement, neutral, agreement, strong agreement). For three qualitative questions, the respondents were asked to rank their preferences and treated statistically. There were three additional open-ended questions that were examined qualitatively.

2.2. Analysis

2.2.1. Statistical analyses of the questionnaire

The ordered multinomial responses to the quantitative questions (from strong disagreement to strong agreement) were subjected to a chi-square test to examine whether the percentage of responses on the 5-point scale were significantly different from the expected 20 percent in each category. In addition, the ordered multinomial responses were analysed with ordered logit regression (Adkins and Hill, 2011) to examine the effect of the predictors –stakeholder type or age– on the level of agreement to a given question. For each question, a set of four candidate models (m) were considered: **m0**: null model (i.e., no predictors), **m1**: single predictor stakeholder type, **m2**: single predictor age, and **m3**: predictor stakeholder and age. Models with interaction of the two terms in m3 were not attempted, due to the limited amount of data ($n = 40$). The four models were estimated for each quantitative question using routine *polr* of the MASS R library (Venables and Ripley, 2013). The model selection process followed information-based inference and the model with lowest AICc (Akaike Information Criterion with bias correction) was chosen for interpretation (Burnham and Anderson, 2017).

Additional to the quantitatively analysed questions, the questionnaire contained three multiple-choice questions (A04, A08, C02) (Table 4), allowing the respondent to rank their preferences, and three open-ended questions (C07, A4.12, A4.14, A14) were the opinion of the respondent could optionally be written.

2.2.2. Analysis of the open discussion

Deliberations were transcribed and classified by categories in a

Table 1
Summary results of Bloc A (see also Fig. 1). We combine "Strongly Agree" and "Agree" as agreement with the question and "Strongly Disagree" and "Disagree" with disagreement. The questions have been shortened (see Appendix 1 for full text). The full model results are in Appendix 2. OLRM: Ordered Logistic Regression Model.

Question	Prevalent opinion	Model Results	Interpretation
A01. The real state of exploitation is in agreement with the scientific diagnostics	45% of respondents agreed	OLRM results showed that stakeholder type was important in explaining agreement	Fishers were much less likely to agree with the question than scientists or administrators, with ratio of agreement scientists to fishers 14.97
A02. Small scale fishing is viable	The majority (70%) agreed	OLRM results showed that stakeholder type was important in explaining agreement	Fishers were much less likely to agree with the question than scientists or administrators, with ratio of agreement scientists to fishers 5.20
A03. Large scale fishing is viable	37.5% of respondents agreed	OLRM results did not show any effect of stakeholder type or age	–
A05. The fishing sector needs to apply proactive changes	The majority (82.5%) agreed	OLRM results showed that stakeholder type was important in explaining agreement	Fishers and administration were practically neutral in this question (odds ratio 1.09), but scientists tended to strongly agree, with ratio of agreement scientists to administration of 5.19 and to fishers of 4.78
A07. Technical and scientific research can help improve profitability	The majority (82.5%) agreed	OLRM results showed that both stakeholder type and age was important in explaining agreement	The odds ratio of fishers to administration was 0 while that of scientists to administration was 0.33, i.e. basically mostly administrators agree. Interestingly, the odds ratio of age was 0.94, suggesting that younger respondents tended to agree
A09. The viability of the fishing sector is threatened by internal factors	The majority (75%) agreed	OLRM results did not show any effect of stakeholder type or age	–
A10. The viability of the fishing sector is threatened by external factors	The majority (77.5%) agreed	OLRM results did not show any effect of stakeholder type or age	–
A11. Need for valorization of local seafood products	The majority (95%) agreed	OLRM results showed that stakeholder type was important in explaining agreement	Differences between stakeholders were not large, with the odds ratio of scientists to fishers equal to 1.22
A12. Need for valorization of fishing heritage	The majority (87.5%) agreed	OLRM results did not show any effect of stakeholder type or age	–
A13. Favour innovation in the commercialization of seafood products	The majority (87.5%) agreed	OLRM results did not show any effect of stakeholder type or age	–
A15. Fishers are correctly informed of the management plans	22.5% of respondents agreed	OLRM results showed that age was important in explaining agreement	The odds ratio for age was 1.10, suggesting that older respondents tended to agree with the question
A16. Fisheries administration have adequate resources for control and monitoring	32.5% of respondents agreed	OLRM results showed that stakeholder type was important in explaining agreement	Fishers were 4.83 times more likely to agree with that question than administrators, while scientists were much more sceptical than administrators (odds ratio 0.13)

matrix according to the content of issues raised along the open discussion. These categories coded are: *Management, within management subcategories have been identified as **Regional management, **Community/Local management (referring to fisheries associations), **Self-management (referring to individual fishers' entrepreneurship). *Alternative marketing systems; *Social innovation and entrepreneurship; *Responsible consumption; *Divulgation of fish consumption; *Sustainability, with subcategories **social sustainability, **economic sustainability, **Ecologic sustainability; *Work relationships, with subcategories **Fair work conditions; **Labor risks and security, **Mental and physical welfare; *Intergenerational replacement; *Social image of fishers.

This information extracted from the statements have been incorporated in an excel database file to facilitate data comparisons and interrelationships among the information, in order to interpret suitably the meaning and the sense of each assertion pronounced.

2.2.3. Mix-method analysis

Drawing on mix type of data (closed-ended, multiple-choice and open-ended questions, and qualitative data from a discussion session) the analysis combined quantitative and qualitative data. The data from the questionnaire and data of the open discussion have been contrasted to produce accurate data to avoid omissions and shortcomings for example in statements socially and culturally informed. The open-discussion enabled to identify variables and relations necessary to understand motives and attitudes of the valorizations and perceptions revealed through questionnaires. At the same time, it captured conflicts of interest between stakeholders. Also, those stressors (such us market challenges), and specificities that shape fishers' decisions, viewpoints and reactions according to each distinct local context and by the pace of daily political, ecological and socioeconomic unpredictable scenarios.

3. Results

3.1. Quantitative questions

Forty valid questionnaires were processed, 16 each from fishers and scientists and 8 from fisheries managers. In all cases, the ordered multinomial responses to the questions were significantly different from

Table 2
Summary results of Bloc B (see also Fig. 2). We combine "Strongly Agree" and "Agree" as agreement with the question and "Strongly Disagree" and "Disagree" with disagreement. The questions have been shortened (see Appendix 1 for full text). The full model results are in Appendix 2. OLRM: Ordered Logistic Regression Model.

Question	Prevalent opinion	Model Results	Interpretation
B01. Trawls with 40-mm cod-end meshes have good selectivity	40% of respondents agreed	OLRM results showed that stakeholder type was important in explaining agreement	Fishers tended to agree more with this question (4.83 times more than administrators and 1/0.31 = 3.32 times more than scientists)
B02. Trawling threatens small scale fishing	35% of respondents agreed	OLRM results showed that age was important in explaining agreement	Younger respondents tended to agree with this question, with an odds ratio of 0.95
B03. Small scale fishing threatens trawling	Only 10% of respondents agreed	OLRM results did not show any effect of stakeholder type or age	–
B04. Both types of commercial fishing are threatened by recreational fishing	32.5% of respondents agreed	OLRM results did not show any effect of stakeholder type or age	–
B05. Time limits are effective against overexploitation	60% of respondents agreed	OLRM results showed that stakeholder type was important in explaining agreement	Scientists agreed more with this question than fishers (odds ratio 6.18) or administration (4.07)
B06. Close seasons are effective against overexploitation	72.5% of respondents agreed	OLRM results showed that stakeholder type was important in explaining agreement	Scientists agreed more with this question than fishers (odds ratio 5.45) or administration (1.17)
B07. The Landings Obligation is effective against overexploitation	15% of respondents agreed	OLRM results showed that stakeholder type was important in explaining agreement	Although disagreement was more prevalent, scientists tended to agree more with this question than fishers (odds ratio 5.45) or administration (1.17)
B08. Fisheries management should be adaptive	85% of respondents agreed	OLRM results showed that age was important in explaining agreement	Older respondents tended to agree with thus questions (odds ratio 1.04)
B09. Adaptive management should take into account social and economic aspects, not only biological aspects	87.5% of respondents agreed	OLRM results did not show any effect of stakeholder type or age	–
B10. Fisheries management should not be limited to productivity, but also distribution, commercialization and consumer needs	95% of respondents agreed	OLRM results did not show any effect of stakeholder type or age	–
B11. Fishers should be integral participants in management plans	97.5% of respondents agreed	OLRM results showed that stakeholder type was important in explaining agreement	Although agreement was practically unanimous, fishers and scientists had higher levels of agreement with the question than administration (odds ratio 13.37 and 5.80, respectively)

the 20 percent in each category that could be expected if the pool of respondents did not have clear preferences about the questions. The scores obtained are shown in Figs. 1–3 for blocks A to C. Tables 1–3 report summarily the information in the figures as well as the multinomial model results (Suppl. Mat. Annex 2).

In Block A, respondents tended to agree or strongly agree with the majority of questions, with only 4 questions (A01, A03, A15, A16) showing agreement lower than 50% (Fig. 1). Questions A15 and A16 were questions with a high percentage of neutral responses (Fig. 1). Table 1 shows that in those questions where stakeholder type was important in explaining the level of agreement, fishers tended to give contrasting opinions to administrators and even more markedly, were at variance with scientists' perceptions. For instance, in A01 (reliability of scientific results) and A02 (viability of small-scale fishing) the fishers' perception was less optimistic than administration and scientists. In question A16, fishers felt that the fisheries administration has adequate resources for control and monitoring, contrary to the prevalent opinion among the administration itself or to that of scientists. For some questions, the agreement of the respondents with the question was very high (75% or more) and did not vary across stakeholder type or age (e.g. A09, A10, A12, A13): these are questions related to internal and external threats or the need of valorization and innovation. In question A03 there was low level of agreement (37.5%) and no difference among stakeholder types, suggesting that the viability of large-scale fishing (e.g. bottom trawling and purse seining) is universally perceived to be low. Age was an important explanatory predictor in very few cases, but it is revealing to remark that younger respondents tended to agree with A07 (importance of technical and scientific research for the profitability of fishing units) and disagree with A15 (fishers are correctly informed of management plans), suggesting that younger generations have higher information needs.

In Block B (Fig. 2 and Table 2), five questions had low levels of agreement (B01 to B04 and B07). In the case of B03 and B07, disagreement was higher than 50%. Regarding the questions related to management of trawl fishing, fishers tended to agree more than the other stakeholders than the current 40-mm cod ends have appropriate selectivity (B01). Interestingly, fishers tended to have perceptions at variance with scientists and fisheries administrations on effort control management measures (B05, time restrictions, and B06 close seasons). In these last two questions, although the predominant opinion was of agreement, fishers had higher disagreement. The perception on the effectiveness of the Landings Obligation (B07) was predominantly negative, although scientists showed marginally more agreement. Regarding questions on alternative fisheries management (B08–B10) all respondents tended to agree that fisheries management should be adaptive and take into account integrally socio-economic aspects. In question B11 agreement was practically unanimous, but administrators showed relatively less agreement than the other two stakeholder types with the issue of including fishers in the elaboration and implementation of management plans. The answers to three questions related to perceived conflicts between fisheries actors (trawlers, small scale fishing units, recreational fishing) produced low scores for agreement (35% or

Table 3
Summary results of Bloc C (see also Fig. 3). We combine "Strongly Agree" and "Agree" as agreement with the question and "Strongly Disagree" and "Disagree" with disagreement. The questions have been shortened (see Appendix 1 for full text). The full model results are in Appendix 2. OLRM: Ordered Logistic Regression Model.

Question	Prevalent opinion	Model Results	Interpretation
C01. CFP should prioritize technical measures to improve trawl selectivity	40% of respondents agreed	OLRM results showed that stakeholder type was important in explaining agreement	Scientist tended to agree more with this question than fishers (odds ratio 36.89) or administrators (odds ratio 3.449)
C03. Valorization of discards would enhance profitability	32.5% of respondents agreed	OLRM results did not show any effect of stakeholder type or age	–
C04. Three month close season between 50 and 100 m depth will be beneficial to demersal resources	45% of respondents agreed	OLRM results showed that stakeholder type and age were important in explaining agreement	Fishers and scientists tended to agree more with this question than fisheries administrators (odds ratio 1.81 and 7.20, respectively) and scientists showed higher agreement than fishers (3.98). Younger respondents tended to have a more favourable opinion (odds ratio 0.95)
C05. The WM MAP limits the activity of bottom trawlers but not of small scale demersal fishing units	37.5% of respondents agreed	OLRM results did not show any effect of stakeholder type or age	–
C06. Focusing the management of demersal resources on 5 target species is insufficient	45% of respondents agreed	OLRM results showed that stakeholder type was important in explaining agreement	The opinion of fishers and administrators was similar and predominantly neutral (odds ratio 1.03), while fisheries scientists tended to agree (odds ratio 7.90)
C08. MSY as main fisheries management objective is appropriate	32.5% of respondents agreed	OLRM results did not show any effect of stakeholder type or age	–
C09. Fisheries management should be complemented with socio economic objectives	95% of respondents agreed	OLRM results did not show any effect of stakeholder type or age	–
C10. The conservation of the marine environment should be given more importance	75% of respondents agreed	OLRM results showed that stakeholder type was important in explaining agreement	The opinion of fishers and administrators was similar (odds ratio 1.19), while fisheries scientists tended to agree (odds ratio 3.28)
C11. The fishing industry should contribute to the creation of non-fishing zones, against compensation	52.5% of respondents agreed	OLRM results showed that age was important in explaining agreement	Younger respondents tended to have a more favourable opinion (odds ratio 0.94)
C12. Employment should have priority	65% of respondents agreed	OLRM results did not show any effect of stakeholder type or age	–
C13. Commercialization and valorization of seafood should be prioritized	90% of respondents agreed	OLRM results did not show any effect of stakeholder type or age	–
C14. Valorization of fishing culture and knowledge transfer	82.5% of respondents agreed	OLRM results did not show any effect of stakeholder type or age	–
C15. Integrate maritime culture in fisheries policy	87.5% of respondents agreed	OLRM results did not show any effect of stakeholder type or age	–
C16. Valorization and dissemination of knowledge, maritime culture and natural heritage by means of touristic activities	70% of respondents agreed	OLRM results did not show any effect of stakeholder type or age	–

Table 4
Ranking of multiple-choice questions. For each option, we show the times it was ranked first or second, and the average ranking across respondents.

	Times ranked 1st	Times ranked 2nd	average score
A04: Which are the main problem affecting Spanish Mediterranean fisheries?			
4.1 Overexploitation of resources	18	4	3.00
4.3 Pollution	4	9	4.47
4.6 Concurrence among seafood products	5	9	4.74
4.11 Normative, regulations and management	3	7	4.84
4.5 Limited interest of younger generations in fishing/lack of family support	4	4	5.03
4.2 Climatic change	2	6	5.38
4.9 Production costs	5	7	5.41
4.12 Lack of political representativeness	8	2	5.60
4. 10 Low commercial viability	3	6	5.81
4. 13 Organizational constraints of the fishing industry	3	2	6.44
4.4 Lack of qualified workers	2	1	6.61
4.7 Concurrence with other extractive activities, such as recreational fishing	4	2	7.14
4. 8 Inequality in the remuneration system (share system)	4	0	7.67
A08: Which type of research requires further effort?			
8.4 Biological and ecological research	23	8	1.70
8.3 Economic research	13	11	2.18
8.2 Cultural and social research	10	7	2.60
8.1 Technological research	9	9	2.70
C02: What should be done with unwanted catches brought to land under the Landing Obligation?			
2.4 Distribute to charity	21	6	1.77
2.1 Sell to reduction industry for fishmeal or fish oil	11	12	2.31
2.2 Sell to pharmacoceutical industry	5	8	2.69
2.5 Nothing, continue discarding	12	8	2.97
2.3 Sell to cosmetic industry	5	7	3.17

less in question B02–B04), with no effect of stakeholder type.

The questions of Block C (Fig. 3 and Table 3) were related to the Management Plan for Western Mediterranean demersal fisheries and possible improvements. The basic tenets of the Common Fisheries Policy

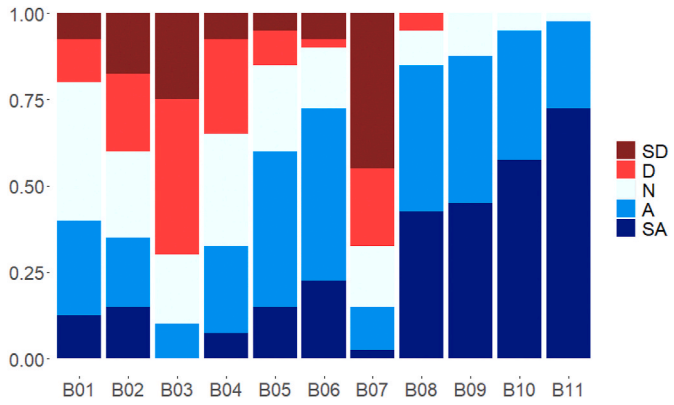

Fig. 1. Frequency of responses by n = 40 respondents to questions in Bloc A. SD: Strongly disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree.

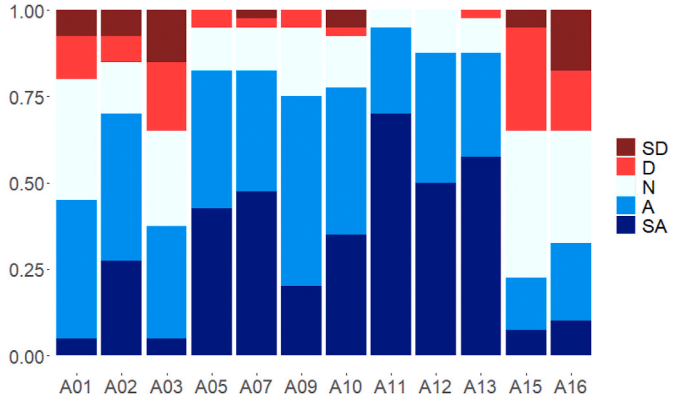

Fig. 2. Frequency of responses by n = 40 respondents to questions in Bloc B. SD: Strongly disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree.

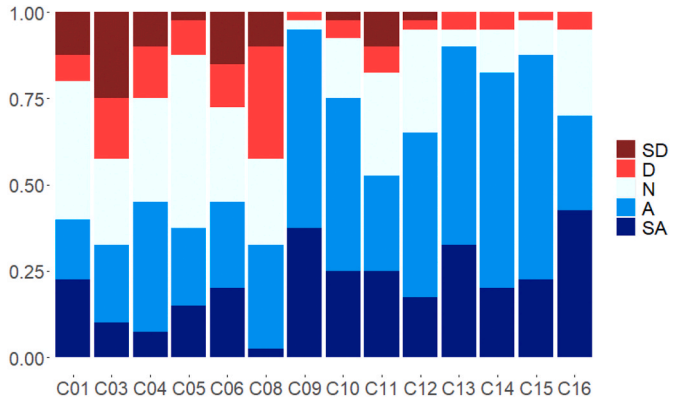

Fig. 3. Frequency of responses by n = 40 respondents to questions in Bloc C. SD: Strongly disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree.

and the WM MAP (questions C01–C08) showed levels of agreement below 50%. Fisheries scientists tended to reach higher agreement on these questions. In particular, the perception of fishers of the need to improve trawl selectivity (C01) was rather negative (odds ratio scientists to fishers of 36.89). Fisheries scientists tended to agree more on the benefits of a seasonal three-month closure between 50 and 100 m (C04) and on the interest of focusing the management of fisheries demersal resources on the 5 target species (C06). The valorization of discards (C03) and the objective of MSY (C06) had 32.5% agreement with no difference across stakeholder types. Only 37.5% of respondents perceived that bottom trawling was excessively penalized compared with small scale fishing (C05), which is remarkable when considering that practically all regulations in the WM MAP affect only trawlers. Regarding questions C09 to C15, concerning measures complementing the current implementation of the WM MAP, respondents showed high levels of agreement, with little differences among stakeholder types. Respondents showed very low levels of disagreement with the importance of taking into account socio economic objectives (C09), employment (C12), commercialization and valorization (C13), and cultural aspects (C14, C15). The need for environmental conservation, in addition to fisheries conservation, reached also high levels of agreement, although here the opinion of scientists was clearly more favourable (C10). The creation of non-fishing zones at the initiative of the fishing industry even with economic compensation (C11) received moderate support (52.5%), although it is remarkable that younger respondents tended to have a more favourable opinion.

3.2. *Multiple-choice, open-ended questions and open discussion*

The rankings observed in three multiple-choice questions (Block A A04 and A08; Block C C02) are shown in Table 4. The results show that overexploitation was perceived to rank first as the main problem affecting the commercial exploitation of fisheries resources and 18 of the 40 respondents ranked it first. Second in importance, with similar rankings, are pollution, market concurrence from aquaculture-based products or imports, and excessive regulation of the fishing sector. In the open discussion fishers manifested their feeling of being seen by other stakeholders (and society) as the only responsible for the state of fisheries resources and being "punished" for this with ever growing legislation, while other concurrent factors (such as pollution) are rarely considered in policies. It was pointed out that trawl fisheries have an important role in food provisioning, employment and the livelihood of fishers' organizations, fish auctions and related services and the new regulation threatens the viability of trawl fisheries.

Family support connected to generational replacement was also perceived as an important problem, ranked in the fifth position, although generational replacement is not homogeneously perceived in all the fishing locations. The qualitative analysis of the statements showed that Southern Mediterranean Spanish autonomies (e.g. Murcia, Andalusia) had a more optimistic view, contrasting with the pessimist sensation in northern autonomies of absolute lack of generational replacement that can jeopardize the continuation of the activity in the near future (particularly in Catalonia). During the 1-h open debate, fishers' organizations representatives and scientists from southern Spain explained different initiatives developed over the past 5 years with the main goal to give value and social prestige to the profession of fisher (e.g. video documentaries), specially for the case of small-scale fisheries. The inequality in the remuneration system was ranked the last problem affecting Spanish Mediterranean fisheries and only 4 respondents of the 40 considered it as the major problem. The traditional share remuneration system helps cushion fisheries economic risks (Guillen et al., 2017) but is not necessarily the fairest system in distributional terms. The lack of qualified workers was not considered very important, ranking in third-to-last position in importance over the 8 possible options in the questionnaire.

Regarding A08, 23 respondents ranked first the proposition that biological research is needed, while economic research ranked second. Research on fishing technology was perceived as less important. Notwithstanding this result, the integration of fishing and maritime culture in management plans, as well as knowledge transfer into fisheries policy, was considered very important, regardless of stakeholder type, by >80% of respondents. Also, the dissemination of maritime culture by means of touristic activities was considered important (70%) (Block C C14, 15 and 16). Fishers tended to be reluctant to accept measures constraining the fishing activity (Block C C11) and expressed a clear desire to keep fishing as livelihood. However, respondents are

aware that there should be a change of focus to redress the situation that technical control measures have failed to achieve. Finally, regarding the question of former discards under the remit of the Landing Obligation, the option of distributing these catches to charity was ranked first by 21 respondents, despite the explicit prohibition in the regulation of destining this product to human consumption.

Among the opinions expressed in relation to fisheries policy, many respondents expressed their disconformity with the Common Fisheries Policy in terms of being far from reality or being insufficiently flexible with local problematics. Specifically, in relation to the seasonal three-month closure between 50 and 100 m (C04), specific zoning was seen as more beneficial, rather than closing the entire bathymetric range 50–100 m.

Deficiencies in the application of the European/national/local regulations and excess of (sometimes contradictory) regulations were also mentioned. Some respondents claimed that the fishing sector should be directly involved in fisheries management or at least co-management schemes be more generalized (compare with the high level of agreement with proposition B11 above).

On the other hand, many opinions coincided that the way forward to ensure the viability of the fishing industry should give more importance to post-productive processes: diversification of commercialization/distribution channels, improve marketing strategies, create innovative products and other solutions to add value to the fisheries landings. The focus of the discussions was largely on alternative marketing systems, highlighting that "sustainability" implies not only fishing in accordance with MSY, but also seeking appropriate marketing channels to ensure "social sustainability". While the fishers stressed that they were making efforts to comply with measures to ensure environmental sustainability, economic sustainability was not ensured, but rather put at risk. The idea of sustainability was often suggested throughout the discussions without it being clearly defined what it was or if all the participants understood the concept in the same way. Social sustainability was sometimes referred to when it was clear from the context that it was more a question of the economic sustainability of fishing vessels. Working conditions and wages were not perceived as an issue of sustainability.

The discussions opened a rich debate about the different distribution channels and the possibilities of self-managed fish commercialization initiatives, independent from the traditional model of auction centralized control, to enhance the marketing of seafood. Different emerging innovative initiatives, from online sale to direct provisioning from producers to retailers, were also discussed (e.g. online direct seafood sale organized by a fishers producers organization from Almeria: https://delbarcoalamesa.com/). Bottom up participatory management was also explicitly encouraged by representatives from the local administration, who are self-perceived as facilitating agents, whose tasks consist of providing the necessary logistic and administrative structure to support fishers' initiatives. That is, devolving to fishers the responsibility for the development of measures and initiatives to improve the sector. Several initiatives conducted in Catalonia were explained, specially focused on the culinary knowledge of fishers and fish gastronomic values in promoting the seafood products (Alegret, 2013). Divulgating responsible consumption was also another issue that was tackled in the discussion session but specially the need to divulgate the beneficial values of consuming fresh fish of proximity educating consumers by, for instance, diversifying the distribution channels to the school canteens, hospitals, geriatrics and other public bodies. A measure that could be supported by administrations and that it was pointed out as another possible marketing option.

4. Discussion

Our results show that stakeholders in Mediterranean Spanish fisheries are aware of the difficulties facing the viability of the fishing industry and the challenges posed by the Common Fisheries Policy and, more specifically, the implementation of the recently approved WM MAP. Similarly, as it happens elsewhere in Europe (van Ginkel, 2001), fishers clearly expressed the will to continue fishing despite difficulties impinging the economic viability of fisheries and to be aware of the low levels of commercial stocks because of overexploitation. Nevertheless, most respondents tended to agree with propositions related to the need of giving more value to the high-quality product of local fisheries as a way to improve fisheries viability. Adding value to local heritage, complementing commercial fishing with cultural activities or innovating in commercialization of seafood products were also aspects with high level of agreement. The respondents felt the necessity of better integrating socio-economic, cultural and heritage aspects into management plans. Exploiting the potential of fishing cultural heritage has already been pointed out as a key tool to readapt small-scale fishing to face market challenges and give added value to sustainably fished seafood products (Gómez, 2018; Gómez and Lloret, 2017). Also, the values of cultural heritage have been highlighted in artisanal small-scale fisheries as guarantor of marine custody. Artisanal small-scale fishing is identified by fishers themselves as an "attitude to fishing" imprinting fishers' decisions on "how to fish" according to cultural values which have been transmitted throughout generations (Gómez and Lloret, 2017). Conversely, cultural heritage and values as vehicle towards sustainable fishing have not been too much developed in large-scale fishing (particularly trawl and purse seine fisheries). In this sense, respondents also highlighted that the transfer of fishers' knowledge has to be taken into consideration in fisheries policies.

It is important to note that all these aspects, that were strongly supported in the responses to the questionnaires, are usually not taken into account, or only in vague and general terms, in the Common Fisheries Policy. Basic tenets of the CFP, such as MSY as the main guiding principle in fisheries management (Penas Lado, 2016), did not receive a strong support. Neither did, other important pillars of this policy, such as improving selectivity or the Landing Obligation, the specific aspects of the WM MAP, such as prohibiting trawling between 50 and 100 m or basing the management objectives onto 5 target species. Obviously, fisheries scientists tended to agree with the proposition more often than the other two stakeholder types in questions on fisheries management.

Overall fishers tended to disagree with all questions related to fisheries management, particularly limitations to fishing effort, but showed much higher levels of agreement than the other types of stakeholder with the proposition that the 40-mm square mesh is sufficient. The latter, combined with the negative perception of the need to incorporate more technical management measures in fisheries policy, reflects a conservative approach to seafood production, that is, an attitude to avoid having to change the way bottom trawl fishing is carried out. The expressed need to integrate post-production initiatives together with cultural heritage and tourist activities into management plans could be an opportunity for institutionalizing fishing sustainability by linking the fishers' commitment to resource protection with livelihoods at the interface of production, distribution and consumption under sustainable criteria (ecological, sociocultural and economic) (Gómez and Lloret, 2017). Several initiatives have pointed out the need to progress towards "multifunctionality" in small-scale fisheries in Europe (Urquhart and Acott, 2013; Salmi, 2015; Malorgio et al., 2017; Prosperi et al., 2019), as a model of multidimensional (economic, sociocultural, environmental) integrated development. The main functions supported by these systems go through interrelated employment, food security and environmental functions with social and territorial ones (that refer to cultural heritage and tourism). Environmental conservation is ensured through sustainable ways of production, new ways of marketing and value chains. Under a "non-productivism" paradigm (Prosperi et al., 2019), defined by less productivity tied to a diversified and multifunctional form of fisheries (Mulazzani et al., 2019), non-market values of fishing (cultural heritage) are convertible into added values for seafood marketing together with the development of touristic activities. Fishers cultural wellbeing is ensured at the same time that fishing activity as livelihood,

which beyond food provision may provide other goods and services (e.g. recreational activities, wellbeing, employment, preservation of cultural heritage and environment). Whereas fishers demonstrated to be willing to stay in fishing despite its low economic viability, their answers point out that they would be willing to reduce fishing in exchange of improving the economic performance of the activity through marketing and recreational activities. Commercial and non-commercial values would be complementary. The multifunctional paradigm, although very little developed in fisheries, is nevertheless taking shape as fishers' initiatives and practices, regardless of EU policies and institutions (Gómez and Maynou, 2021). Notwithstanding of potentialities these systems may provide, the pioneer experiences developed in agricultural settings received criticism in the academic literature that noted the limits of the system rooted on localism that could reproduce corporatist privileges (Dupuis and Goodman, 2005).

Biologically-based fisheries management measures are perceived by the fishing industry as restrictions on the fishing activity and are seen as inefficient in helping to reverse ever-decreasing catches or improving vessels' profitability. New layers of restrictive regulations are not well received by traditional fishing communities that have to face, additionally, new challenges such us the globalization of the market, changes in consumer habits and marine pollution. Similarly, the results of Tafon (2019) point out that Polish small-scale fishers show signs of "fatigue" because of continual socio-political transformation and reorganization of the institutional framework in which they carry their activity, and, consequently new policies can only expect to receive very low support. On the positive side, if the fishing industry could transform heritage culture into an economic asset (Jiménez de Madariaga and García del Hoyo, 2019), the product of this traditional activity would procure an added value to partially offset the overall negative picture. Moreover, it would give social value to a profession that at times feels discredited by fisheries managers and the public in general as a threat to marine resources, boosting self-confidence in the profession and making it perhaps more attractive to younger generations.

Although the factor age had a relatively low power of explanation, perhaps due to insufficient contrast of age among participants (25–60 years old, average 44), it is interesting to note that in those questions where age was statistically significant, younger respondents tended to have a more progressive attitude towards the propositions that the fishing industry should be more proactive in steering changes or the need for more technical and scientific research in fisheries.

In summary, propositions regarding fisheries management, as laid out in the Common Fisheries Policy in general and the WM MAP in particular, were not universally perceived as good solutions to the problem of the viability of demersal fisheries in the Spanish Mediterranean. Although the existence of internal and external critical factors was recognized by all three stakeholder types, fishers tended to perceive negatively limitations to their activity or the introduction of new, ever more restrictive, management measures. In general, all respondents tended to agree on the need of more proactive and adaptive fisheries management, rather than prescriptive management based on complex regulations that are sometimes difficult to implement and enforce. To facilitate the successful implementation of the WM MAP it is important to make fishers integral to the decision-making process. As with any other policy, fishers' views and knowledge are vital to its successful implementation (de Vos et al., 2016; Garza-Gil et al., 2017). Fisheries governance should progress from top-down prescriptions led by fisheries agencies with the technical assistance of fisheries scientists towards co-management schemes where all relevant stakeholders can contribute to formulate solutions in conditions of mutual trust and transparency (de Vos et al., 2011; Lleonart et al., 2014). Despite the objective of regionalizing the process of decision-making laid out in the CFP (EU Reg. 1983/2013) it has been shown that this has not helped to substantially increase local fisher communities' participation in the decision-making process (Raicevich et al., 2018). According to our results, this is not only a question of lack of political representation, but also a problem of incomplete integration of fishers' viewpoints, needs and requests what could enhance the management plans enforcement.

Participatory Action Research has proved to be an appropriate research method that should be considered from the outset of policy development, as it is a realistic method for testing and informing EU and national management plans against local concerns, needs and alternatives that fishermen can develop to meet the challenges of fisheries. Adaptive management requires context-specific research methods to understand complex socio-ecological systems subjected to uncertainties (Léopold et al., 2019). Hence, "PAR is particularly appropriate for addressing complex human and ecosystem relationships" (Parkes and Panelli, 2001: 86). Although participatory frameworks cannot be formally institutionalized, governance issues emerging from stakeholders' engagement can influence the fisheries policies implementation by Member States.

Participatory Action Research involves stakeholders who, on the basis of the reflections, express needs and concerns from their own experience which researchers can use as reference points to be taken into account in research, whose results can be continuously monitored and contrasted with stakeholders, and if appropriate take remedial action to improve the circumstances. Equity, by ensuring that different points of view are taken into consideration in participatory research, is ensured while not only addressing ecological objectives but also the economic, social and cultural aspects inherent in fishing activity.

Fishers estimate that large scale measures (top to bottom) lag behind the initiatives of fishers' organizations and certain communities are already currently testing local co-management or self-management rules to redress the overexploitation problem. As discussed by Boccardi and Duvelle (2013) community management of natural resources, grounded on cultural heritage and local ecological knowledge can often be seen as "green" by default. Fisheries sector in the Spanish Mediterranean has been historically regulated through their own institutions (known as "Cofradías": fishers' organizations or guilds, of medieval origin that were constituted as public law corporations in 1943 and are now in charge of organizing schedules, access to resources per fishing community and the first sale) that socially legitimate regulations and engage fishers' communities' in fisheries management (Franquesa, 2005; Hogg et al., 2013; Raicevich et al., 2018). To reach mutual trust and transparency, the role of the own fishers' organizations should be taken into account, which, along the time, have been crucial to engage fishers in scientists and managers' projects and through which the implementation of regulations should pivot in co-management. Nevertheless, note that co-management implies good representation systems giving voice to all participant in the decision-making (Hogg et al., 2013; Jentoft et al., 1998). Therefore, it is a question of the own fishers' organizations to ensure the equitable representation of all members from fishing communities. On the other hand, co-management grounded on local communities as bottom-up participatory system, while pledging the devolution of power to individuals by empowering communities, is also stressing the entrepreneurial ethos which could reproduce some of the axioms and values of neoliberalism discourses and practices. For example, by strengthening inequalities between larger and smaller communities, or semi-industrial fleets against small scale fleets, with different business development potential, which can intensify competition between them.

5. Conclusions

The imbalance between biologically based management measures that are applied independently of the socio-economic sphere and the cultural assumptions that shape fishing activity as a whole do not allow for effective implementation of fisheries policies. Instead, incorporating the point of view of the direct social actors so that they appropriate the policies and take their own actions, will ensure the incorporation of the human dimension into the rigidity of a set of rules for an activity that has an important socio-cultural component, and which has traditionally

been "self-managed" by the communities for many years throughout history under different institutional models.

The results of this first stage of a Participatory Action Research confirm that there is a displacement factor between rules/legislation and social practice that does not take into account local ecological and socio-cultural specificities (Gómez and Lloret, 2017) in order to implement effective measures and involve stakeholders in fisheries policies. Stakeholders pointed out that market systems are the primary channel for achieving the viability (sustainability) of fisheries to compensate for declining productivity, and would help align policies with the objective of environmental sustainability by reducing pressure on stocks. Highlighting the value of the cultural heritage of fisheries can add value to its products but also to the profession, that lacks generational replacement. At the same time the social image of fishers would be improved, they would feel better considered and, consequently, the cultural well-being of those who depend on fishing would be ensured. Ecosystem-based management approach can thus be encompassed in a community-based approach that integrates its social actors in a proactive attitude and fisheries as a human activity that is socially and culturally rooted in the environment. The next step in the agenda would be a second round of engagement activities consisting in defining the research questions to proceed in a third phase in taking actions (to conduct research) to improve fisheries management implementation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvman.2021.112728.

Credit author statement

S.G.: Collection of data, Formal analysis, Writing-original draft, Review and editing. F.M.: Collection of data, Formal analysis, Writing-original draft, Review and editing, Funding acquisition, Project administration. All authors have read and agreed to the published version of the manuscript.

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