

Assessing stakeholder perceptions to guide social-ecological fit of marine protected areas

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Abstract:	To halt the degradation of ecosystems and subsequent negative impacts on human wellbeing, effective social and ecological interventions that can benefit both nature and people are needed. Marine protected areas (MPAs) are commonly used to foster the sustainability of coastal social-ecological systems. However, because MPAs are often proposed and implemented by external actors, ensuring they are fit to the local social-ecological context remains a challenge. Here, we introduce a framework to identify the place-based social and ecological objectives for an MPA. We use as case study a marine conservation project in the Philippines. We assess the perceptions of local communities and decision-makers across four domains: i) ecosystem services, ii) environmental stressors, iii) proposed management options, and iv) MPA goals and needs. Assessing these is a way to locally refine the objectives of marine conservation, adapt the implementation of planned interventions, and monitor their future outcomes.
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Question	Response
Standardized datasets A list of datatypes considered standardized under Cell Press policy is available here . Does this manuscript report new standardized datasets?	No
Original code Does this manuscript report original code?	No

December 13 2023

Dear editor,

We are happy to submit our manuscript entitled “Assessing stakeholder perceptions to guide marine social fit of marine protected areas” for consideration as an original research article for the special issue on Sustainable Oceans in a Changing Climate in *iScience*. This submission follows an initial invitation from Dina Li and Jans Sheba Agarwal and subsequent discussions.

Marine protected areas (MPAs), usually proposed as a “win-win” for people and nature, often lack clearly defined, measurable and locally relevant ecological and social objectives. This is especially true when they are pushed by external actors paying little attention to local contexts, which poses a problem of social-ecological fit. In our study, we develop a framework designed to assess the place-based objectives of MPAs based on the perceptions of local stakeholders and use this framework to study a marine conservation project undertaken in Palawan, Philippines. We show that locally, improving livelihoods and food security are the main concerns for stakeholders who widely agree on the need for more effective management of coastal ecosystems. We believe that this work will provide a timely and valuable contribution to the current discussions on MPA planning and evaluation, and more generally on ocean sustainability.

The United Nations Convention on Biological Diversity’s Kunming-Montreal Global Biodiversity Framework recently set the target of conserving 30% of land and ocean by 2030. This should further accelerate an already active momentum of MPA creation throughout the global ocean. The Philippines is located within the coral triangle, one of the richest and most threatened marine ecosystems on the planet. As the country shows a vital dependence on these ecosystems for the food and livelihoods of already marginalized fishing communities and a high commitment towards MPA creation, the conditions in which marine conservation is undertaken will affect millions. It is therefore more than ever urgent to propose ways to guide the creation of more relevant, efficient and just MPAs, in the Philippines and globally.

Finally, this work has a high importance locally as Shark Fin Bay and Palawan are subject to an increasing attention from local governments and international NGOs. Palawan was declared as a UNESCO Man & Biosphere reserve, but is still a data-deficient province. While the main results from this study have translated in concrete propositions and applied to improve local management, our framework could also be used as a blueprint for future conservation work conducted in the province.

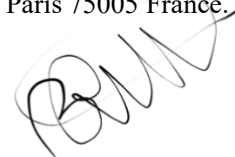
We confirm that this work is original and is not under consideration for publication in any other journal. All co-authors agree with the contents of the manuscript and its submission.

On behalf of all the other co-authors, I thank you for your consideration of our manuscript,

Sincerely,

Victor Brun

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Assessing stakeholder perceptions to guide social-ecological fit of marine protected areas

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Summary

To halt the degradation of ecosystems and subsequent negative impacts on human wellbeing, effective social and ecological interventions that can benefit both nature and people are needed. Marine protected areas (MPAs) are commonly used to foster the sustainability of coastal social-ecological systems. However, because MPAs are often proposed and implemented by external actors, ensuring they are fit to the local social-ecological context remains a challenge. Here, we introduce a framework to identify the place-based social and ecological objectives for an MPA. We use as case study a marine conservation project in the Philippines. We assess the perceptions of local communities and decision-makers across four domains: i) ecosystem services, ii) environmental stressors, iii) proposed management options, and iv) MPA goals and needs. Assessing these is a way to locally refine the objectives of marine conservation, adapt the implementation of planned interventions, and monitor their future outcomes.

1. Introduction

Coastal fishing communities can be highly dependent on marine ecosystem services, making them particularly vulnerable to marine environmental degradation or change in access to resources^{1–4}. Improving the way coastal and marine resources are used is a great challenge as ocean-based activities are developing at an increasing pace⁵. A variety of approaches exist to identify sustainability interventions in coastal social-ecological systems (SESs) according to their expected outcomes (e.g., Reimer et al., 2021) or local conditions (e.g., Thiault et al., 2020). However, the identification and the implementation of sustainability interventions are often driven externally⁸, which can increase the likelihood that interventions are not fit to local contexts and fail to deliver expected positive social and ecological outcomes or even lead to negative outcomes including increased environmental degradation, social inequities, and conflicts^{4,9–18}. The concept of social-ecological fit represents the idea that some governance arrangements and interventions are more adequately and specifically suited to the social and ecological characteristics of the environmental problem at hand^{19–21}. It has been applied to study the relevance of sustainability interventions in the context of marine social-ecological systems and their ability to efficiently curb ecological threats and improve human well-being^{20,22}.

Marine protected areas (MPAs), among other area-based management tools, are commonly used to improve the sustainability of coastal social-ecological systems²³. MPAs can deliver benefits to people across diverse wellbeing dimensions (Ban et al. 2019), and thus, can be appealing to local communities²⁴. However, MPAs are also often proposed, implemented and managed by external actors, in particular non-governmental organizations (NGOs). While these actors can support the participation of local actors in resource governance²⁵ and enhance the financial and legal capacity of MPAs^{26,27}, externally driven area-based conservation can create or exacerbate local vulnerabilities, for instance when preventing fishers from accessing their fishing grounds^{4,14,28}. Indeed, opposition to MPAs can arise when they do not meet local needs, or their benefits are oversold^{29,30}. Social-ecological fit should therefore be a top-priority for all conservation initiatives^{20–22,31,32}, if not a moral obligation³³. As global coverage of MPAs is likely to increase dramatically to comply with Target 3 of the Kunming-Montréal Global Biodiversity Framework, improving the inclusivity and fit of MPAs constitutes a pillar of ocean justice and equity^{12,33}.

59 Social assessments focusing on stakeholders' perceptions have widely been used for MPA
60 planning and evaluation. These can help evaluate local dependencies on marine ecosystem
61 services³⁴, assess threats to ecosystems³⁵, help design the MPA³⁶, understand barriers and
62 levers to a specific MPA feature like the level of protection³⁷, or assess local support for
63 conservation³⁸. However, a framework designed to jointly study the perceptions of local
64 actors on these different domains relevant to the social-ecological fit of MPAs is still lacking.

65 Here, we develop a framework designed to understand and guide the fit of MPAs to the local
66 social-ecological context by assessing stakeholders' perception across these four domains: i)
67 marine importance, ii) environmental stressors, iii) proposed management options, and iv)
68 MPA goals and needs. Assessing the perception of marine and coastal ecosystems is a way to
69 identify what benefits MPAs aim to improve or sustain. Similarly, the perception these
70 communities have of environmental stressors is informative of what threats are expected to
71 be curbed by MPAs. Proposed management options represent a portfolio of different
72 interventions that can include but are not limited to MPAs. Finally, asking stakeholders about
73 the goals they have for MPAs and what they need to function properly, elucidates their
74 objectives in relation to the three first domains.

75 We trialed our framework to study a conservation project undertaken in Palawan, Philippines,
76 where an NGO is promoting the creation of several community-based MPAs. We surveyed
77 the perceptions of local resource users, researchers and decision-makers across the four
78 perception domains and synthesized their perceptions to assess the challenges and
79 opportunities for a local social-ecological fit of that area-based conservation project.

2. Methods

2.1. A framework to assess the social-ecological fit of marine protected areas

We aimed to develop a framework designed to determine the expectations of local stakeholders and the objectives of a project of new community-based MPAs to guide their social-ecological fit. The survey was designed to collect perceptions in the following four domains: i) marine importance, ii) environmental stressors, iii) proposed management options, and iv) MPA goals and needs (Figure 1). It helps ensure management is more likely to be aligned with local values, needs, cultural and governance systems, meaning a greater likelihood of local leadership, support, compliance, and therefore social and ecological outcomes. The following sections detail each domain using existing literature and provide examples of their use in the context of area-based marine conservation social-ecological fit.

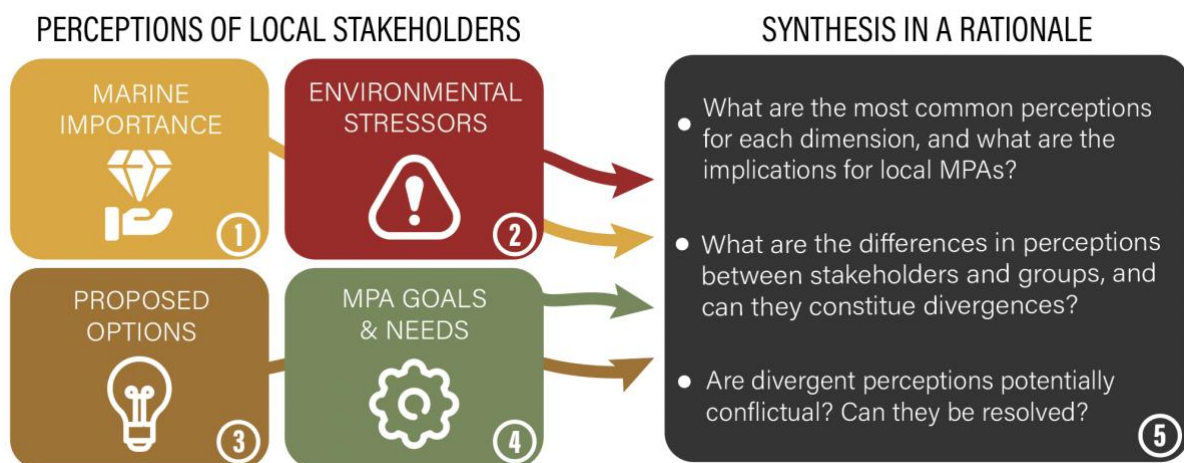


Figure 1. Conceptual diagram representing the four perception domains guiding the assessment of the social-ecological fit of an area-based marine conservation project.

2.1.1. Marine importance

The first domain we propose to explore is the perceived importance of the marine and coastal environment. The diversity of ways in which communities depend on environmental features constitutes an important part of their well-being, in particular in the context of coastal communities depending on fishing³⁹. The framing of this dependence as ecosystem services or nature's contributions to people has caused some debate^{39–42}; yet these definitions hold in common the idea that disrupting ecological processes, or managing ecosystems will in turn affect either negatively or positively human well-being. Depending on contexts, MPAs can have positive or negative economic, governance and health outcomes^{10,43}. Assessing marine

importance can help for ecological, social, and SES fit¹⁹, as it is informative on how, where and how people use and perceive they benefit from ecosystems. In other words, it highlights the core values and relationships between ecosystems and human wellbeing^{14,44}. That reliance indeed varies between contexts, within groups, and is susceptible to radically change in time^{45–49}. Finally, it is important to note that many of the impacts of MPAs on people are direct, not mediated by changes in ecosystem services¹⁵ for example, loss of agency. These impacts can be critical motivators whether or not people support management and are important to consider when designing options to fit the social-ecological context.

2.1.2. Environmental stressors

Assessing environmental stressors can help guide the ecological fit of MPAs, defined as an “alignment between the spatial, temporal and functional characteristics of biophysical problems and institutions”¹⁹. After documenting how marine ecosystem services contribute to the well-being of local communities, we propose to assess what stressors are thought to potentially affect that contribution. The perception of environmental stressors to marine ecosystems varies between actors, cultures and knowledge systems^{50–53}. These stressors encompass drivers linked to climate change, or various pollution sources, but also the root-causes of these threats: more distal drivers such as urbanization or poverty. Using the traditional ecological knowledge of local stakeholders is a way to ensure MPAs can effectively tackle the threats at play in that particular ecosystem. It is also a step forward in assessing their expected future outcomes. For instance, if stakeholders are considering the main threat is a decrease in population of a specific group of species, subsequent monitoring could focus on that group of species.

2.1.3. Proposed options

We refer to “proposed options” to reflect what different stakeholders bring up in the discussion as a potential solution to curb the stressors previously identified. Those who do not identify specific stressors in the area should not be asked to propose options. When an MPA is planned or already exists, asking stakeholders to discuss all potential management options is a way to verify if and how they bring this MPA to the discussion. It also allows describing stakeholders’ understanding of MPAs, refine their objectives and improve their management^{54,55}. Leaving space for different stakeholders to make management

propositions can be vital to increasing their support and legitimacy^{56,57}. Also, other effective area-based conservation measures (OECMs) can complement MPAs and offer synergies⁵⁸.

2.1.4. MPA goals

The objectives of MPAs can be geared towards ecological outcomes, biodiversity outcomes, or both²³. Values and objectives can be quite opposed between community members and with external actors^{59,60}, it is therefore vital to make them explicit when seeking for better outcomes of area-based management. Gurney et al. (2017) set the boundaries of a community based on people's use and valuation of marine resources. Diving deeper into how community members perceive the objectives of MPAs based on their use of marine ecosystems, allows to directly question potential oppositions and conflicts. It can also help refine what external actors initially considered as objectives. We propose to disaggregate this domain in three linked themes: i) what are the objectives of MPAs, ii) who are they made for, and iii) what do they need to be efficient.

2.1.5. Synthesis in a rationale

Building on the four prior domains, the last step is to integrate these results and build what we call a rationale for MPAs. This rationale, or narrative, can include present objectives, future ones, resources, actors, consider potential trade-offs and conflicts, and constitute a summarized statement on how this MPA should be fit to the social-ecological context. The framework we propose is exploratory and should guide subsequent decision and conflict resolution stages. The way we propose to synthesize these results is to examine alignments, unveiling a shared narrative for these objectives, and divergences, to push for further discussions between different actors based on their potentially conflicting visions.

2.2. Background and study site

The Philippines has a long history of community-based marine conservation^{62–65}. Most of the country's population is coastal and depends on coral reefs and associated ecosystems for their food security and livelihoods^{66,67}. To counteract the depletion of coastal resources⁶⁸, public actors and non-governmental organizations (NGOs) have long promoted the implementation of fishery management tools⁶⁹. Among these, MPAs have been presented as particularly relevant, benefitting both coastal ecosystems and fishers⁷⁰. Such projects in the

Philippines are usually initiated by NGOs and researchers in partnership with local governments and local civil society organizations⁶⁹.

In the Shark Fin Bay locality, our case study site, there are about 7000 inhabitants spread around five coastal districts. Fishing and farming represent the main sources of livelihood. An NGO, Sulubaa Environmental Foundation (SEF), has been active in the area since 2011 and has promoted the development of marine conservation initiatives. What started as a private endeavor with the 2016 creation of Pangatalan Island Marine Protected Area managed by SEF slowly turned into a project involving more local communities and decision-makers. The interviews used for this study were conducted between 2019 and 2020 when SEF was starting the Sea Academy project aiming at creating new community-based MPAs, and shifting from a private to a collaborative governance arrangement. At the time, these stakeholders were consulted by SEF but did not take an active part in management processes.

2.3. Sampling

Respondents were selected through purposive sampling, asking for recommendations to residents, representatives of Fisherfolks Associations, and different municipal offices. The first group included 52 residents from five local districts spread around Shark Fin Bay: Batas, Depla, Mabini, Sandoval and Silanga, with about 10 individuals per district, men and women, fishers, farmers, and people with different livelihoods. The second group included 11 decision-makers: five district elected officials, or *barangay captains* and six decision-makers from the municipality of Taytay, representatives of the Office of the Municipal Environment and Natural Resources, Office of the Municipal Agriculturist, Office of the Municipal Tourism Development and Managements. Most decisions pertaining to coastal resources management are taken at the municipal scale, making these actors central to all discussions on marine sustainability. Prior informed consent from all participants was collected before the interview started and interviews were recorded.

2.4. Interview guide

Semi-structured interviews were conducted using an interview guide (available in Supplementary Materials) organized around seven sections: i) environmental stressors in the

province, ii) ecosystem services, iii) local environmental stressors and links with fishing activities, iv) proposed management options to tackle environmental stressors, v) objectives of MPAs and benefits expected, vi) perception of SEF and other NGOs, and vii) visions for the future. Interviews with community members were conducted in Filipino and those with decision-makers in English. They lasted between 20 and 30 minutes.

2.5. Analyses

We transcribed and translated all interviews to English and performed a content analysis and thematic coding⁷¹. We used an inductive approach to identify individual codes we termed perceptions and classified them across the four domains of our framework (Figure 1). We coded these perceptions in a matrix associating each respondent with the set of perceptions derived from their responses. For example, when a respondent talked about dynamite and cyanide fishing being an issue for coral reefs, the columns corresponding to “dynamite fishing” and “cyanide fishing” were checked. This coding was performed twice and checked in order to ensure its consistency. Individual perceptions were coded to be as specific as possible at first, in order to allow for subsequent groupings in larger themes. For example, dynamite fishing and cyanide fishing were both grouped under the “destructive fishing practices” theme. The number of respondents for each theme was then summed to measure their relative importance in discourses. This data, along with the content of the interviews, allowed us to analyze qualitatively the dominant discourses and those more marginal and/or conflicting with the discourses of other stakeholders. Data manipulation and analyses were conducted in R Studio version 4.2.2⁷².

3. Results

Using semi-structured interviews, we investigated the perceptions of 64 local community members and decision-makers across the four domains of our framework (Figure 1). After content analysis, we identified 151 individual perceptions and grouped them into 27 themes (Table 1 & Figure 2, complete list of perceptions in Supplementary Materials). This allowed us to study how local stakeholders define the potential needs for and objectives of MPAs. We then proposed a synthesis of these perceptions and a rationale for local marine conservation projects in the form of a narrative integrating those elements.

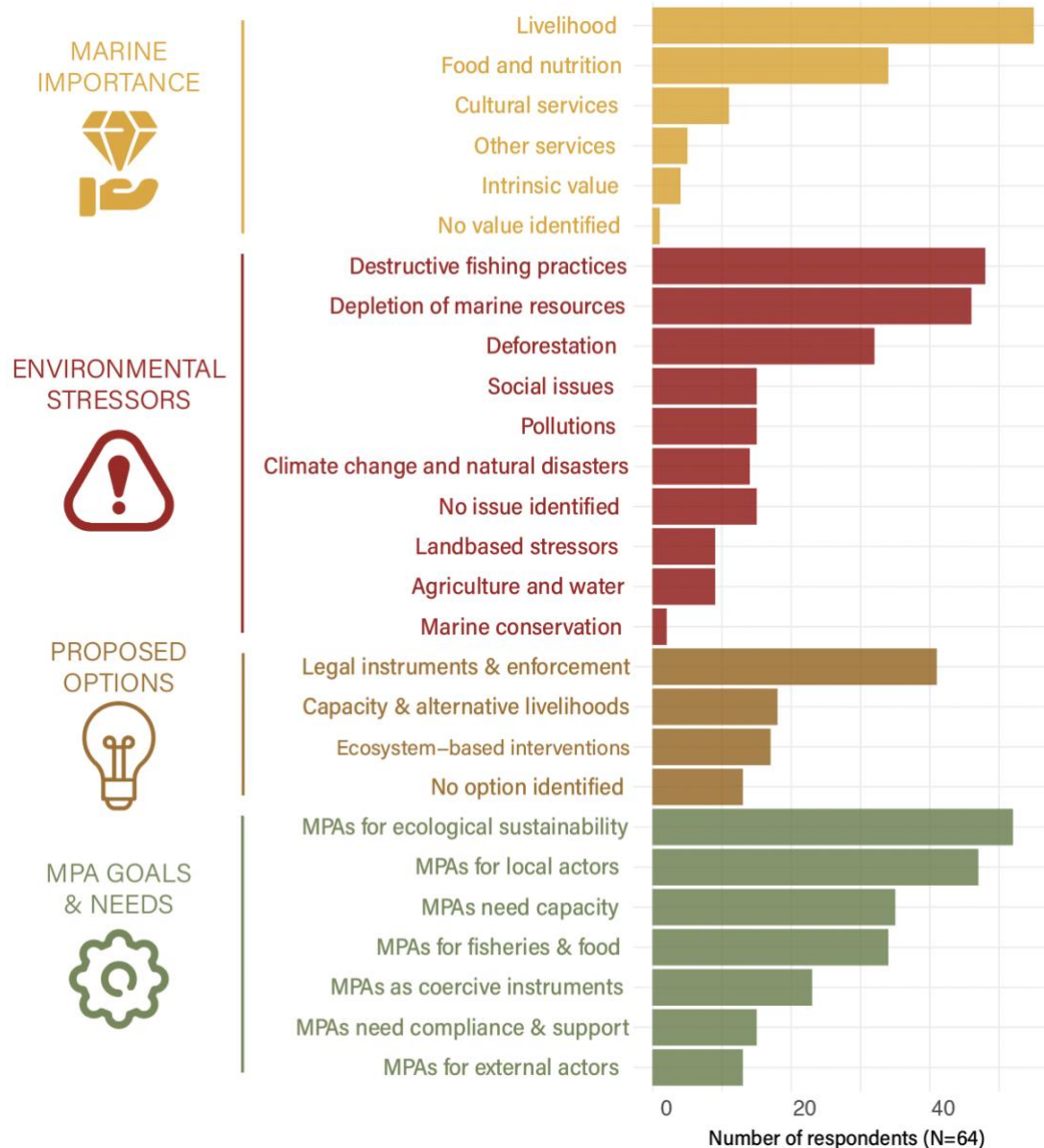


Figure 2. Main perceptions of different stakeholders grouped in the four perception domains proposed in our framework.

227 *Table 1. List of themes identified through content analysis. Each theme is composed of several individual*
 228 *perceptions detailed in Supplementary Materials.*

Category	Theme	Description
Marine importance	Livelihood	Marine ecosystems are valuable because people get their livelihoods and income from them.
	Food and nutrition	Local communities get affordable and healthy food from the sea, mostly fish but also shells, shrimps or seaweeds.
	Cultural services	Local communities value marine ecosystems for their contribution to local traditions, for religious reasons and as a responsibility for future generations.
	Other services	Other ecosystem services mentioned by respondents such as coastal protection, carbon capture and tourism.
	Intrinsic value	Respondents mentioned the intrinsic value of nature, biodiversity or particular species.
	No value identified	The respondent could not identify any ecosystem service.
Environmental stressors	Destructive fishing practices	A threat to marine ecosystems is the use of destructive fishing practices such as cyanide, dynamite, small-meshed nets or compressors.
	Depletion of marine resources	Fishery resources have decreased and habitats noticeably damaged because of the increasing number of fishers and the use of destructive practices.
	Deforestation	Respondents described issues such as deforestation for timber, slash-and-burn agriculture (<i>kaingin</i>), or mangrove cutting for charcoal (<i>uling</i>).
	Social issues	Environmental issues have root causes that can be found in social issues such as poverty, lack of education and opportunities, or demography.
	Pollutions	Pollutions such as plastic pollution, wastewater, solid waste, pesticides or fertilizers, are perceived to be stressors to both terrestrial and marine ecosystems.
	Climate change and disasters	Climate change, changes in weather patterns and disasters such as typhoons and floods, are affecting ecosystems and the well-being of coastal communities.
	No issue identified	No environmental issue could be identified by the respondent.
	Land-based stressors	Some land-based stressors such as mining, erosion, the development of infrastructure, tourism or pearl farms are affecting terrestrial and marine ecosystems.
	Agriculture and water	Pests are affecting plantations, and water appears to be more and more scarce.
	Marine conservation	Marine conservation, in particular MPAs, is perceived as a factor of vulnerability.
Proposed options	Legal instruments & enforcement	Coercive social interventions can be put in place such as reinforcing patrolling and arresting offenders.
	Capacity building & alternative livelihoods	Non-coercive social interventions include the increase of education, better cooperation between stakeholders, or capacity building.
	Ecosystem-based interventions	Ecosystem-based interventions such as marine reserves and ecosystem restoration activities can be efficient in responding to environmental stressors.
	No option identified	No option to face environmental issues could be identified by the respondent.
Marine protected areas	MPAs for ecological sustainability	The role of MPAs is to improve the state of ecological habitats, of their components including fishes, corals, shells, and functions such as nurseries.
	MPAs for local actors	MPAs are made primarily to benefit to neighboring communities.
	MPAs need capacity	In order to be efficient, MPAs need capacity such as funding, staff and in general appropriate management.
	MPAs for fisheries & food	The primary goal of MPAs is to improve the status of fisheries and the food security of coastal communities.
	MPAs as coercive instruments	MPAs are seen primarily as coercive tools, guarded areas expected to expel illegal fishers, and can be a tool to apply existing fisheries regulations.
	MPAs need compliance & support	MPAs, in order to be efficient, need awareness compliance and the support of all actors from fishers to local officials
	MPAs for external actors	MPAs are primarily made for external actors, in particular tourists and resort owners.

229 **3.1. Marine importance**

230 The main benefits provided by marine ecosystems identified by respondents were
 231 provisioning ecosystem services, in particular those related to fisheries. 83% of respondents
 232 considered that the value of marine ecosystems came from their importance for local
 233 livelihoods and 52% emphasized their importance for food security. A respondent from Depla
 234 (farmer) for instance, said: *“The very first and original way of subsistence here is the sea, our*

sea". The idea of subsistence is usually completely linked to the tradition of fishing, a sentiment of ownership, and generational aspects: *"The ocean is very valuable, especially for the next generations. If it is damaged (...), they will not have a fishery and a beautiful environment anymore"* (respondent from Depla, civil servant). The most notable divergence between respondents lies in the identification of other ecosystem services such as coastal protection, carbon sequestration, or tourism, mainly mentioned by the decision-makers from Taytay. Only one respondent (a farmer from Mabini) could not think of any value pertaining to marine ecosystems.

3.2. Environmental stressors

Dynamite and cyanide fishing, and their effects on marine ecosystems, were central in the discourses of respondents when questioned about environmental stressors: 73% of them talked about destructive fishing practices and 70% said they observed a depletion in fish resources. *"A lot of people here are using sodium [cyanide]. It kills the small fish... I think there is no other issue here, this is what is causing damages"* (respondent from Mabini, fisher and farmer). This perspective is shared among decision-makers: *"the main issue here is illegal fishing: dynamite and cyanide fishing, using compressors"* (respondent from Taytay, decision-maker). Respondents widely agreed on the impact of illegal practices, along with the increasing number of (legal) fishers and associated fishing effort: fish stocks are decreasing and it is a cause of concern for food and livelihood security. Deforestation was also an important source of discussion, in particular mangrove cutting. Many respondents noted the connectivity between ecosystems and the importance of mangrove forests as nurseries for many fish species. Some underlying social issues were described by respondents such as poverty, increasing demography, or lack of agency. Although most respondents proposed similar descriptions of the situation, there were also some differences in interpretations. Illegal fishing, for instance, was considered to be decreasing in frequency by 9% of respondents; some also said that overfishing outweighed the effect of illegal practices. 23% of respondents could not point to any environmental stressor; some respondents explained this could be interpreted as apprehension to talk about themes such as illegal fishing, and potentially pointing at other members of the community, often relatives and close friends. Some simply state they had no idea on what could constitute environmental stressors in the province or the area.

3.3. Proposed options

A wide array of options to counteract the issues identified were proposed by respondents. We clustered them into three distinct groups (Table 1): legal instruments and enforcement, capacity building and alternative livelihoods, and ecosystem-based interventions. 20% of respondents did not identify any potential management option, or considered there was none available. The most common one, identified by 62% of respondents, was to reinforce law enforcement in order to fight illegal activities: *“When it comes to illegal activities, there should be more law enforcement. One of the best ways is to establish MPAs”* (respondent from Taytay, decision-maker). 35% of respondents linked MPAs to more efficient law enforcement. Ecosystem-based interventions, and socio-centric interventions such as alternative livelihoods or capacity building, were more frequent among the respondents who had typically been involved in NGO and government sustainability projects: *“The solution is to give a proper livelihood to people and illegal fishers. Give them a proper job to make a living”* (respondent from Batas, fisher). Others tended to insist more on law enforcement: *“Maybe some guards could catch [illegal fishers]. The military could also arrest them, they could be sent”* (respondent from Batas, fisher).

3.4. MPAs

MPAs were most commonly perceived as a tool to increase the sustainability of marine ecosystems (79% of respondents) and fish stocks (52% of respondents) to the benefits of local communities (71% of respondents), in particular fishers. A respondent from Depla (farmer and pastor) explains: *“The purpose [of MPAs] is to offer the fish a nursery ground. And of course, that will produce more fish”*, and later adds that MPAs are made for *“the people of Barangay Depla: the fishers. But not only the fishers, other people too because they will eat the catch.”* Along with this discourse, many respondents pointed out that MPAs need capacity to be efficient, in particular legal and financial capacity: *“We have a marine sanctuary here in Mabini. But our problem is sustaining it: we cannot sustain it because the Barangay's funds are too little”* (respondent M13, elected official). Some respondents, in particular decision-makers, pointed out the need for monitoring. Aside from this more common discourse, two divergent and more marginal definitions of MPAs should be noted. First, 3% of respondents identified MPAs as a potential threat to livelihood, such as this respondent from Silanga (elected official and fish trader): *“[Fishers] have to go far to fish now because there are*

protected areas.” The example of Silanga is evocative because several nearby island-resorts created private MPAs which are now perceived by many as instruments to serve tourism rather than improve fisheries. This discourse, sometimes expressed in more neutral words, without hostility towards resort owners, was more common in Silanga where relatively fewer people considered MPAs as dedicated to local communities. The second divergent discourse that can be noted was found in Batas and is a conception of MPAs as a way to ban fishers coming from other districts or municipalities: local fishers could still fish inside. A respondent from Batas (fisher) explains: *“The goal of marine sanctuaries is to avoid having people from other places fishing here. For them, it is forbidden to fish here in our place.”* This discourse reveals the common perception that local communities own a resource, despite the legal fact that marine resources are managed at the larger municipal scale, hence officially shared by different districts.

3.5. Synthesis of a rationale for conservation

Based on the discourses of local stakeholders, we established a rationale in the form of a simplified narrative with the objective to guide further discussions pertaining to marine conservation in the area:

In Shark Fin Bay, food security, livelihoods and local traditions depend on marine resources that are increasingly depleted. Destructive fishing practices, such as the use of dynamite and cyanide, but also overfishing are to blame for this decline. Underlying social drivers like poverty and the lack of livelihood opportunities represent root causes for these practices. Terrestrial drivers including pollution and deforestation should also be considered as a threat to marine ecosystems and well-being. Local stakeholders identify several management options to face that situation: legal instruments and coercive measures (e.g. improving legislation and patrolling), initiatives to improve capacity and shift to alternative livelihoods, and ecosystem-based interventions (e.g. MPAs). Some stakeholders cannot identify any particular option. The specific role of MPAs, in order to fit with the objectives of local resource-users, must be to preserve fisheries from illegal activities and help restore stocks, not only for local livelihoods, but also for the food and nutrition security of local communities. Because some fishers perceive MPAs as dedicated to tourists and resort owners, or as a potential threat to

livelihood, any entity proposing the creation of an MPA should ensure the rights of local communities are respected and their voices heard.

4. Discussion

Our framework helped us identify a strong overall convergence on the need for diverse and well-enforced management options. It provided concrete recommendations to foster the social-ecological fit of the project studied. In particular, it helped us conceptualize MPAs first and foremost as fishery management tools while highlighting their expected benefits for food security. It also showed that MPAs are locally considered by most respondents as a relevant tool, which is not the case for all contexts⁷³. This is in line with other studies conducted in the same province where environmental stressors such as overfishing and illegal fishing make local communities, along with NGOs, researchers and local governments, call for better management^{53,74,75}. Our framework, and the semi-structured interviews and inductive approach in the coding process we used allowed the discussion to be pushed further, in order to efficiently collect the diversity of discourses associated with marine sustainability.

Management interventions should always be tailored to local contexts. For MPAs, this can include the size and placement of the area to be under protection, or the rules on harvesting³². These rules, linked to the ecological context, are also rooted in the socioeconomic context, and their reception can be different between individuals^{22,76,77}. Marine conservation navigates in very complex systems and has to arbitrate between divergent voices. In our case study divergences in perceptions did not appear to bear a high level of potential conflict, aside probably from the idea regularly expressed in Silanga that MPAs are “made for tourists”. Conflicts between tourism and fishing have already been demonstrated in Palawan⁷⁸. Other case studies have shown how generally conflict can emerge when MPAs pay little attention to local stakes and become exclusionary to resource users^{73,78,79}. On the other hand, in places where MPAs are considered more fair, social and ecological outcomes tend to be more positive^{38,49}. Increasing participation and perception of positive outcomes often comes with time⁴⁹. When arbitration is needed, external actors should rely on existing formal and informal decision processes to ensure both legal and equitable outcomes. Most of the differences in perceptions between stakeholder groups were attributable to their knowledge and experience. For example, decision-makers from Taytay were those who focused on the diversity of ecosystem services and MPA benefits,

demonstrating a familiarity with scientific concepts, while local communities focused more on provision services (livelihoods and food provision in particular). There were also some disparities between different communities, as exemplified by the cases of Batas and Silanga: while most community members talked about MPAs as areas where fishing is prohibited for the benefits of local fisheries, several respondents from Batas and Silanga considered that the surrounding communities should be allowed to fish with a hook-and-line within MPAs. The presence of nearby resorts and private MPAs, and a high exogenous fishing effort in Batas can explain these differences.

Our framework proved beneficial in gaining a better understanding of the different perceptions local stakeholders had on marine sustainability and MPAs in particular. While MPAs can display a wide range of ecological and social benefits^{6,10}, it showed what specific objectives were those of local stakeholders. Open-ended interviews in the form of guided discussions give more chances than closed questions to successfully explore the diversity of perceptions on that matter. In general, qualitative social research can effectively complement quantitative social and ecological data to improve management⁸⁰. An important feature evident in our case study was how the discourse of certain stakeholders was informative on the experiences of other stakeholders: for instance, many non-fishing farmers and decision-makers focused on the difficulties fishers were facing. The results from this research have effectively fueled the discussions on marine conservation in the study area, showing local NGOs and decision-makers that marine conservation initiatives should have fisheries and food security as a main focus side-to-side with biodiversity benefits, an objective included in subsequent management. Welfare policies should better include nature⁸¹, and similarly, food and nutrition policies in coastal areas should be more tightly linked to fisheries management.

The support coming from external actors can offer important opportunities to marine conservation ranging from an increase in capacity, to improving the links between stakeholders such as community-government collaborations^{26,27,82}. In the case of small-scale fisheries management, financial or social external support should target both economic and social conditions and be maintained in time to be truly efficient⁸³. NGOs can represent a bridge between communities and governments when undertaking conservation projects and improve their social-ecological fit²¹. In our case study, after the initial discussions held between NGO members and community representatives, the rest of the community was

389 involved in discussions on the planned MPAs. Then, the discussion was raised at the municipal
390 level, and subsequent public hearings involving both community and government
391 representatives were held before a formal vote for the MPAs to be legislated. Aside from
392 potential benefits, external interventions and particularly top-down approaches also carry
393 risks. In particular, MPAs have proved to be potentially exclusionary interventions, negating
394 the legal or perceived rights of local users when improperly involving them^{10,12}.

395 The marine conservation community at large will have to do better in order to settle the ways
396 in which external actors should participate in the management of marine resources, always
397 keeping in mind the explicit goal of ensuring management is equitable. Our framework can
398 contribute to that by helping to identify local perceptions of marine importance,
399 environmental threats, management options and the goals of MPAs, and thus guide their
400 social-ecological fit.

401 5. Limitations of the study

402 Our approach also showed some limitations, mostly coming from our position as researchers
403 who are outsiders from these communities, and, for some of us, not native from the
404 Philippines. This might have caused certain respondents to refrain from speaking about
405 sensitive issues like illegal fishing. We tried to mitigate this by interviewing a wide array of
406 respondents while insisting on the anonymity of their answers and, in practice, had many of
407 them open up on these challenging themes. We also made sure to use vocabulary and
408 concepts that are commonly used by these communities.

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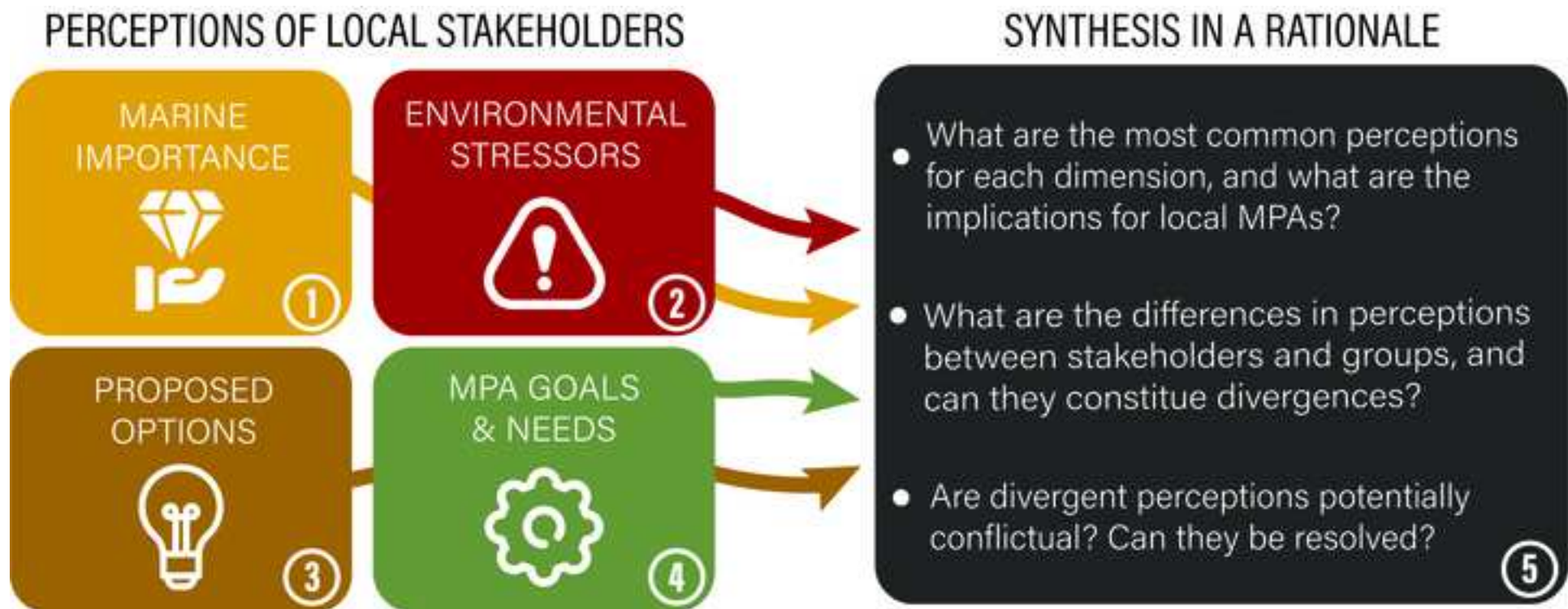
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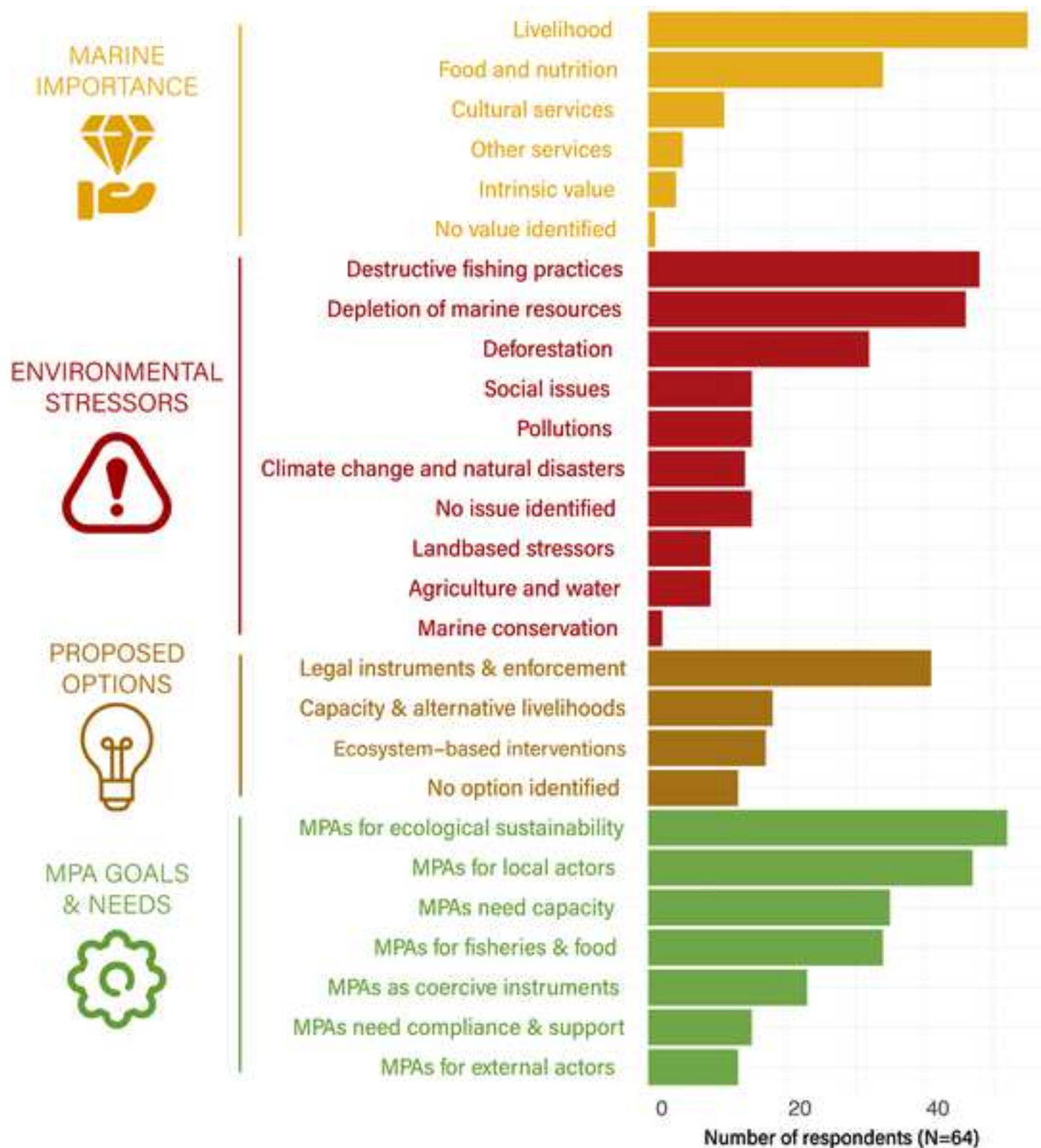
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Supplementary materials – Assessing stakeholder perceptions to guide social-ecological fit of marine protected areas

1. Demographics

		Number of respondents (%) N = 64
Gender	Male	37 (58%)
	Female	27 (42%)
Residence	Batas	13 (20%)
	Depla	13 (20%)
	Mabini	13 (20%)
	Sandoval	9 (14%)
	Silanga	10 (16%)
	Taytay	6 (9%)
Main occupation	Decision-maker	11 (17%)
	Fisher	27 (42%)
	Farmer	9 (14%)
	Other / no occupation	16 (25%)
Age	≤ 30	4 (%)
	30 < age ≤ 50	34 (53%)
	≥ 50	21 (33%)
	NA	5 (8%)

2. Interview guide

1) What are the main environmental issues here in Palawan? When & how did they start?

2) Why is marine/coastal environment important?

3) What are the main issues of fisheries here? What are the causes? When did they start?

4) What are the existing solutions and regulations, or what do you think could be a solution?

5) Do you know what an MPA is?

- a) What are their goals?
- b) Who are MPAs benefitting to?
- c) What do MPAs need to be efficient?



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