1 # Assessing stakeholder perceptions to guide social-ecological fit of

2 # marine protected areas

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15 **Summary**

16 To halt the degradation of ecosystems and subsequent negative impacts on human wellbeing,

17 effective social and ecological interventions that can benefit both nature and people are

18 needed. Marine protected areas (MPAs) are commonly used to foster the sustainability of

19 coastal social-ecological systems. However, because MPAs are often proposed and

20 implemented by external actors, ensuring they are fit to the local social-ecological context

21 remains a challenge. Here, we introduce a framework to identify the place-based social and

22 ecological objectives for an MPA. We use as case study a marine conservation project in the

23 Philippines. We assess the perceptions of local communities and decision-makers across four

24 domains: i) ecosystem services, ii) environmental stressors, iii) proposed management

25 options, and iv) MPA goals and needs. Assessing these is a way to locally refine the objectives

26 of marine conservation, adapt the implementation of planned interventions, and monitor

27 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 pace[5]. 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 externally[8], 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 systems[23]. MPAs can deliver benefits to people across diverse wellbeing dimensions (Ban et al. 2019), and thus, can be appealing to local communities[24]. 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 governance[25] 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 obligation[33]. 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 services[34], assess threats to ecosystems[35], help design the MPA[36], understand barriers and
62 levers to a specific MPA feature like the level of protection[37], or assess local support for
63 conservation[38]. 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.

80   ## 2. Methods

81   **2.1. A framework to assess the social-ecological fit of marine protected areas**

82   We aimed to develop a framework designed to determine the expectations of local

83   stakeholders and the objectives of a project of new community-based MPAs to guide their

84   social-ecological fit. The survey was designed to collect perceptions in the following four

85   domains: i) marine importance, ii) environmental stressors, iii) proposed management

86   options, and iv) MPA goals and needs (Figure 1). It helps ensure management is more likely

87   to be aligned with local values, needs, cultural and governance systems, meaning a greater

88   likelihood of local leadership, support, compliance, and therefore social and ecological

89   outcomes. The following sections detail each domain using existing literature and provide

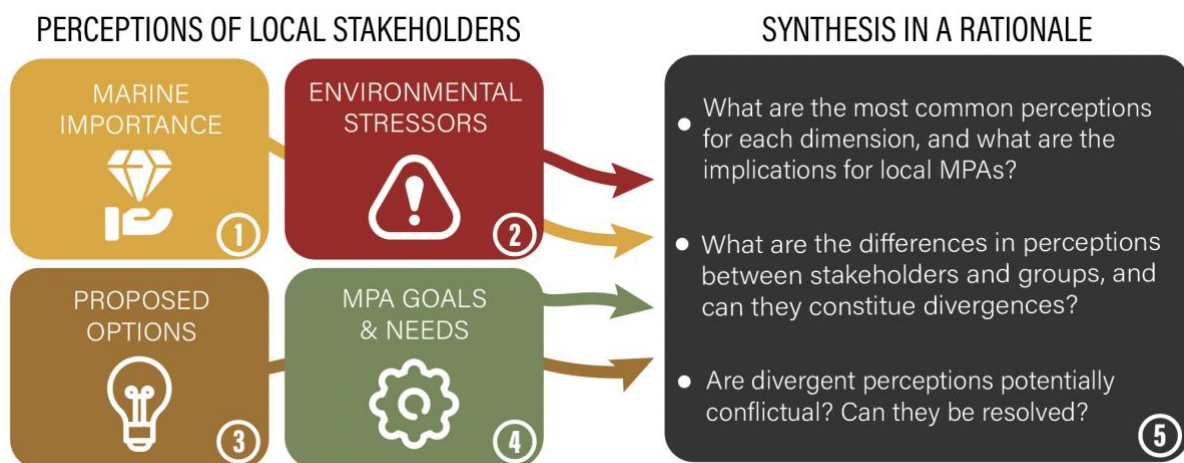90   examples of their use in the context of area-based marine conservation social-ecological fit.

91

92   *Figure 1. Conceptual diagram representing the four perception domains guiding the assessment of the social-*

93   *ecological fit of an area-based marine conservation project.*

94   2.1.1. Marine importance

95   The first domain we propose to explore is the perceived importance of the marine and coastal

96   environment. The diversity of ways in which communities depend on environmental features

97   constitutes an important part of their well-being, in particular in the context of coastal

98   communities depending on fishing[39]. The framing of this dependence as ecosystem services

99   or nature's contributions to people has caused some debate[39–42]; yet these definitions hold

100   in common the idea that disrupting ecological processes, or managing ecosystems will in turn

101   affect either negatively or positively human well-being. Depending on contexts, MPAs can

102   have positive or negative economic, governance and health outcomes[10,43]. Assessing marine

103 importance can help for ecological, social, and SES fit[19], as it is informative on how, where and

104 how people use and perceive they benefit from ecosystems. In other words, it highlights the

105 core values and relationships between ecosystems and human wellbeing[14,44]. That reliance

106 indeed varies between contexts, within groups, and is susceptible to radically change in

107 time[45–49]. Finally, it is important to note that many of the impacts of MPAs on people are

108 direct, not mediated by changes in ecosystem services[15] for example, loss of agency. These

109 impacts can be critical motivators whether or not people support management and are

110 important to consider when designing options to fit the social-ecological context.

111 2.1.2. Environmental stressors

112 Assessing environmental stressors can help guide the ecological fit of MPAs, defined as an

113 "alignment between the spatial, temporal and functional characteristics of biophysical

114 problems and institutions"[19]. After documenting how marine ecosystem services contribute

115 to the well-being of local communities, we propose to assess what stressors are thought to

116 potentially affect that contribution. The perception of environmental stressors to marine

117 ecosystems varies between actors, cultures and knowledge systems[50–53]. These stressors

118 encompass drivers linked to climate change, or various pollution sources, but also the root-

119 causes of these threats: more distal drivers such as urbanization or poverty. Using the

120 traditional ecological knowledge of local stakeholders is a way to ensure MPAs can effectively

121 tackle the threats at play in that particular ecosystem. It is also a step forward in assessing

122 their expected future outcomes. For instance, if stakeholders are considering the main threat

123 is a decrease in population of a specific group of species, subsequent monitoring could focus

124 on that group of species.

125 2.1.3. Proposed options

126 We refer to "proposed options" to reflect what different stakeholders bring up in the

127 discussion as a potential solution to curb the stressors previously identified. Those who do

128 not identify specific stressors in the area should not be asked to propose options. When an

129 MPA is planned or already exists, asking stakeholders to discuss all potential management

130 options is a way to verify if and how they bring this MPA to the discussion. It also allows

131 describing stakeholders' understanding of MPAs, refine their objectives and improve their

132 management[54,55]. Leaving space for different stakeholders to make management

133 propositions can be vital to increasing their support and legitimacy[56,57]. Also, other effective

134 area-based conservation measures (OECMs) can complement MPAs and offer synergies[58].

135 2.1.4. MPA goals

136 The objectives of MPAs can be geared towards ecological outcomes, biodiversity outcomes,

137 or both[23]. Values and objectives can be quite opposed between community members and

138 with external actors[59,60], it is therefore vital to make them explicit when seeking for better

139 outcomes of area-based management. Gurney et al. (2017) set the boundaries of a

140 community based on people's use and valuation of marine resources. Diving deeper into how

141 community members perceive the objectives of MPAs based on their use of marine

142 ecosystems, allows to directly question potential oppositions and conflicts. It can also help

143 refine what external actors initially considered as objectives. We propose to disaggregate this

144 domain in three linked themes: i) what are the objectives of MPAs, ii) who are they made for,

145 and iii) what do they need to be efficient.

146 2.1.5. Synthesis in a rationale

147 Building on the four prior domains, the last step is to integrate these results and build what

148 we call a rationale for MPAs. This rationale, or narrative, can include present objectives,

149 future ones, resources, actors, consider potential trade-offs and conflicts, and constitute a

150 summarized statement on how this MPA should be fit to the social-ecological context. The

151 framework we propose is exploratory and should guide subsequent decision and conflict

152 resolution stages. The way we propose to synthetize these results is to examine alignments,

153 unveiling a shared narrative for these objectives, and divergences, to push for further

154 discussions between different actors based on their potentially conflicting visions.

155

156 **2.2. Background and study site**

157 The Philippines has a long history of community-based marine conservation[62–65]. Most of the

158 country's population is coastal and depends on coral reefs and associated ecosystems for

159 their food security and livelihoods[66,67]. To counteract the depletion of coastal resources[68],

160 public actors and non-governmental organizations (NGOs) have long promoted the

161 implementation of fishery management tools[69]. Among these, MPAs have been presented as

162 particularly relevant, benefitting both coastal ecosystems and fishers [70]. Such projects in the

163 Philippines are usually initiated by NGOs and researchers in partnership with local
164 governments and local civil society organizations[69].

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

175

176 **2.3. Sampling**

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

189

190 **2.4. Interview guide**

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

193   province, ii) ecosystem services, iii) local environmental stressors and links with fishing

194   activities, iv) proposed management options to tackle environmental stressors, v) objectives

195   of MPAs and benefits expected, vi) perception of SEF and other NGOs, and vii) visions for the

196   future. Interviews with community members were conducted in Filipino and those with

197   decision-makers in English. They lasted between 20 and 30 minutes.

198

199   **2.5. Analyses**

200   We transcribed and translated all interviews to English and performed a content analysis and

201   thematic coding[71]. We used an inductive approach to identify individual codes we termed

202   perceptions and classified them across the four domains of our framework (Figure 1). We

203   coded these perceptions in a matrix associating each respondent with the set of perceptions

204   derived from their responses. For example, when a respondent talked about dynamite and

205   cyanide fishing being an issue for coral reefs, the columns corresponding to "dynamite

206   fishing" and "cyanide fishing" were checked. This coding was performed twice and checked

207   in order to ensure its consistency. Individual perceptions were coded to be as specific as

208   possible at first, in order to allow for subsequent groupings in larger themes. For example,

209   dynamite fishing and cyanide fishing were both grouped under the "destructive fishing

210   practices" theme. The number of respondents for each theme was then summed to measure

211   their relative importance in discourses. This data, along with the content of the interviews,

212   allowed us to analyze qualitatively the dominant discourses and those more marginal and/or

213   conflicting with the discourses of other stakeholders. Data manipulation and analyses were

214   conducted in R Studio version 4.2.2[72].

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.
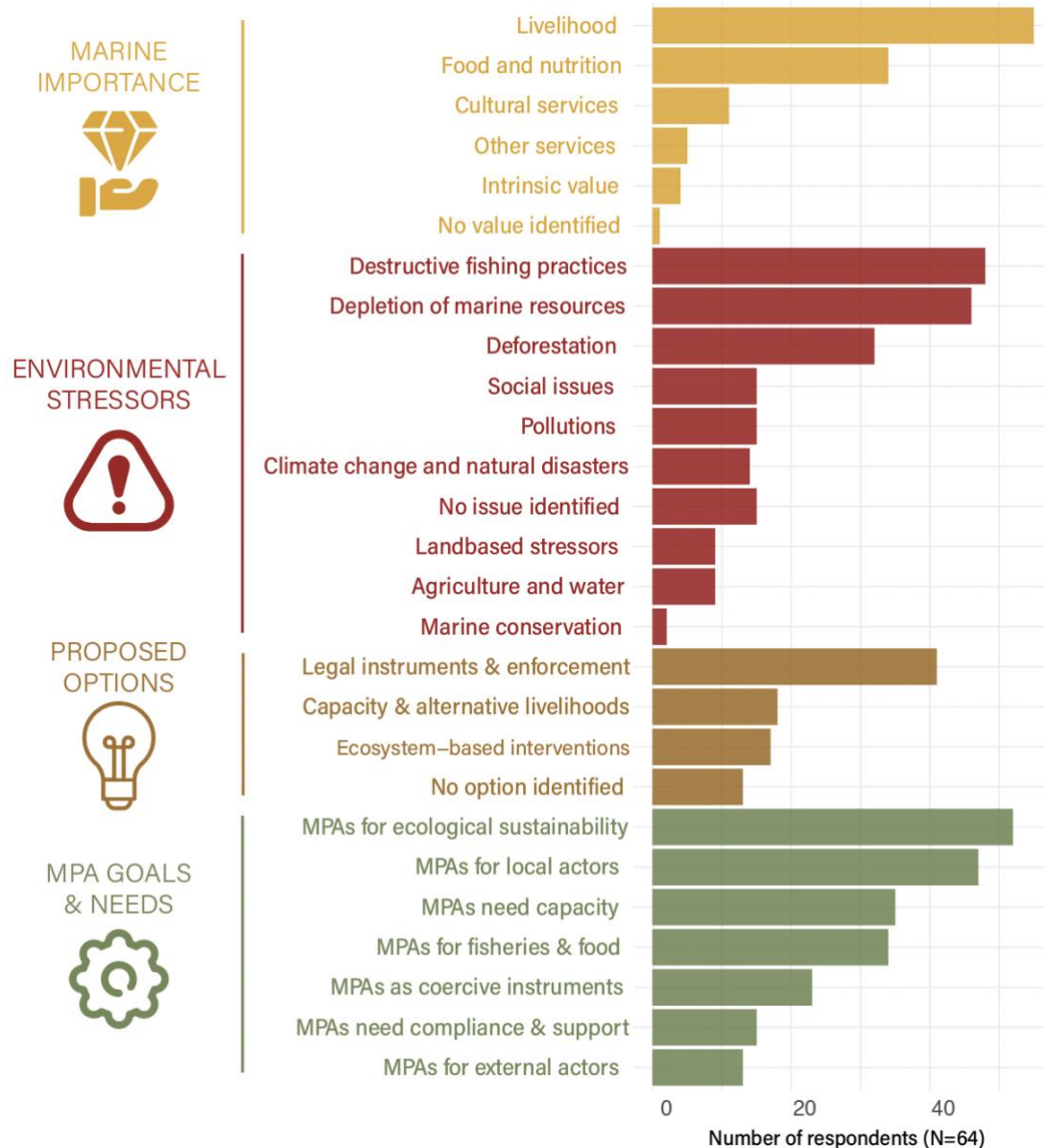

Figure 2. Main perceptions of different stakeholders grouped in the four perception domains proposed in our framework.

226

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 (*kaingin*), or mangrove cutting for charcoal (*uling*).
	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*

235   *sea*". The idea of subsistence is usually completely linked to the tradition of fishing, a

236   sentiment of ownership, and generational aspects: "*The ocean is very valuable, especially for*

237   *the next generations. If it is damaged (…), they will not have a fishery and a beautiful*

238   *environment anymore*" (respondent from Depla, civil servant). The most notable divergence

239   between respondents lies in the identification of other ecosystem services such as coastal

240   protection, carbon sequestration, or tourism, mainly mentioned by the decision-makers from

241   Taytay. Only one respondent (a farmer from Mabini) could not think of any value pertaining

242   to marine ecosystems.

243   **3.2. Environmental stressors**

244   Dynamite and cyanide fishing, and their effects on marine ecosystems, were central in the

245   discourses of respondents when questioned about environmental stressors: 73% of them

246   talked about destructive fishing practices and 70% said they observed a depletion in fish

247   resources. "*A lot of people here are using sodium [cyanide]. It kills the small fish… I think there*

248   *is no other issue here, this is what is causing damages*" (respondent from Mabini, fisher and

249   farmer). This perspective is shared among decision-makers: "*the main issue here is illegal*

250   *fishing: dynamite and cyanide fishing, using compressors*" (respondent from Taytay, decision-

251   maker). Respondents widely agreed on the impact of illegal practices, along with the

252   increasing number of (legal) fishers and associated fishing effort: fish stocks are decreasing

253   and it is a cause of concern for food and livelihood security. Deforestation was also an

254   important source of discussion, in particular mangrove cutting. Many respondents noted the

255   connectivity between ecosystems and the importance of mangrove forests as nurseries for

256   many fish species. Some underlying social issues were described by respondents such as

257   poverty, increasing demography, or lack of agency. Although most respondents proposed

258   similar descriptions of the situation, there were also some differences in interpretations.

259   Illegal fishing, for instance, was considered to be decreasing in frequency by 9% of

260   respondents; some also said that overfishing outweighed the effect of illegal practices. 23%

261   of respondents could not point to any environmental stressor; some respondents explained

262   this could be interpreted as apprehension to talk about themes such as illegal fishing, and

263   potentially pointing at other members of the community, often relatives and close friends.

264   Some simply state they had no idea on what could constitute environmental stressors in the

265   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*

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

309   **3.5. Synthesis of a rationale for conservation**

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

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

327   *livelihood, any entity proposing the creation of an MPA should ensure the rights of*

328   *local communities are respected and their voices heard.*

329   ## 4. Discussion

330   Our framework helped us identify a strong overall convergence on the need for diverse and

331   well-enforced management options. It provided concrete recommendations to foster the

332   social-ecological fit of the project studied. In particular, it helped us conceptualize MPAs first

333   and foremost as fishery management tools while highlighting their expected benefits for food

334   security. It also showed that MPAs are locally considered by most respondents as a relevant

335   tool, which is not the case for all contexts[73]. This is in line with other studies conducted in the

336   same province where environmental stressors such as overfishing and illegal fishing make

337   local communities, along with NGOs, researchers and local governments, call for better

338   management[53,74,75]. Our framework, and the semi-structured interviews and inductive

339   approach in the coding process we used allowed the discussion to be pushed further, in order

340   to efficiently collect the diversity of discourses associated with marine sustainability.

341   Management interventions should always be tailored to local contexts. For MPAs, this can

342   include the size and placement of the area to be under protection, or the rules on

343   harvesting[32]. These rules, linked to the ecological context, are also rooted in the

344   socioeconomic context, and their reception can be different between individuals[22,76,77].

345   Marine conservation navigates in very complex systems and has to arbitrate between

346   divergent voices. In our case study divergences in perceptions did not appear to bear a high

347   level of potential conflict, aside probably from the idea regularly expressed in Silanga that

348   MPAs are "made for tourists". Conflicts between tourism and fishing have already been

349   demonstrated in Palawan[78]. Other case studies have shown how generally conflict can

350   emerge when MPAs pay little attention to local stakes and become exclusionary to resource

351   users[73,78,79]. On the other hand, in places where MPAs are considered more fair, social and

352   ecological outcomes tend to be more positive[38,49]. Increasing participation and perception of

353   positive outcomes often comes with time[49]. When arbitration is needed, external actors

354   should rely on existing formal and informal decision processes to ensure both legal and

355   equitable outcomes. Most of the differences in perceptions between stakeholder groups

356   were attributable to their knowledge and experience. For example, decision-makers from

357   Taytay were those who focused on the diversity of ecosystem services and MPA benefits,

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

366 Our framework proved beneficial in gaining a better understanding of the different
367 perceptions local stakeholders had on marine sustainability and MPAs in particular. While
368 MPAs can display a wide range of ecological and social benefits[6,10], it showed what specific
369 objectives were those of local stakeholders. Open-ended interviews in the form of guided
370 discussions give more chances than closed questions to successfully explore the diversity of
371 perceptions on that matter. In general, qualitative social research can effectively complement
372 quantitative social and ecological data to improve management[80]. An important feature
373 evident in our case study was how the discourse of certain stakeholders was informative on
374 the experiences of other stakeholders: for instance, many non-fishing farmers and decision-
375 makers focused on the difficulties fishers were facing. The results from this research have
376 effectively fueled the discussions on marine conservation in the study area, showing local
377 NGOs and decision-makers that marine conservation initiatives should have fisheries and food
378 security as a main focus side-to-side with biodiversity benefits, an objective included in
379 subsequent management. Welfare policies should better include nature[81], and similarly, food
380 and nutrition policies in coastal areas should be more tightly linked to fisheries management.

381 The support coming from external actors can offer important opportunities to marine
382 conservation ranging from an increase in capacity, to improving the links between
383 stakeholders such as community-government collaborations[26,27,82]. In the case of small-scale
384 fisheries management, financial or social external support should target both economic and
385 social conditions and be maintained in time to be truly efficient[83]. NGOs can represent a
386 bridge between communities and governments when undertaking conservation projects and
387 improve their social-ecological fit[21]. In our case study, after the initial discussions held
388 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.

5. Limitations of the study

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

6. Acknowledgments

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