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Review

Avoiding "Paper Parks": A Global Literature Review on Socioeconomic Factors Underpinning the Effectiveness of Marine Protected Areas

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Abstract: Marine protected areas (MPAs) are a common management tool for preserving marine biodiversity and halting resource depletion. Despite the number of MPAs rapidly increasing worldwide, there are concerns over the full achievement of their objectives. Indeed, in some cases—the phenomenon of so-called "paper parks"—protected areas totally fail to achieve their conservation and socioeconomic targets. Therefore, identifying the factors underpinning MPA success or failure is crucial to increase their effectiveness. To achieve this goal, we performed a global literature review on the socioeconomic factors that managers should pursue to enhance MPA effectiveness on a global scale. A search of the Scopus database, using strings of keywords connected by Boolean operators, generated a batch of 715 items, out of which 68 were retained after the application of inclusion/exclusion criteria. Six other articles were added through the scanning of the literature cited in selected papers. We grouped MPA success-factors into 13 main groups and ranked them according to the frequency of citation in the literature. Our findings identify stakeholder involvement, increasing communication and awareness between specific stakeholder groups, as well as ensuring appropriate enforcement and monitoring, control and surveillance, as the leading factors for MPA success. Our results will assist in the process of upcoming global expansion of MPAs, thus contributing to improving conservation of marine biodiversity and associated livelihoods.

Keywords: marine protected areas; literature review; nature-based solutions; EU biodiversity strategy; small-scale fisheries; stakeholder engagement

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1. Introduction

Marine resources are being depleted at an alarming rate worldwide; according to the Food and Agriculture Organization of the United Nations [1], the percentage of stocks fished at biologically unsustainable levels has been increasing from 10% in 1974 to 35.4% in 2019. In particular, the Mediterranean is one of the most overexploited seas in the world [2,3], with 73% of stocks found outside biologically sustainable limits in 2020 [4]. Fisheries in the region (especially small-scale ones) have been suffering decades-long crisis, mostly due to a reduction in finfish, crustacean and mollusk stocks [5,6]. Overfishing causes the loss of marine habitats and fish stocks, which can, in turn, jeopardize the functioning of ecosystems and the services these generate [7,8]. The situation is worsened by the effects of climate change [9–12], illegal, unreported and unregulated (IUU) fishing, pollution, destructive extractive activities, harmful subsidies and the environmental impact of aquaculture [13]. The establishment of marine protected areas (MPAs) is a common management approach for protecting relevant habitats and associated stocks [14]. MPAs represent a nature-based solution (NBS), which are defined by the International Union for Conservation of Nature (IUCN) as "Actions to protect, sustainably manage and restore

natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits" [15] (p. 2). A similar definition is provided by the European Union (EU): "Living solutions inspired by, continuously supported by and using nature, which are designed to address various societal challenges in a resource-efficient and adaptable manner and to provide simultaneously economic, social and environmental benefits" [16] (p. 121). MPAs can generate multiple benefits, including the preservation of biodiversity, protection of endangered species and valuable habitats, control of fishing mortality, promotion of stock recovery and spillover effects and increase in catch mean size and egg density [17–25]. As mentioned in the NBS definition from both the IUCN and the EU, the consideration of the socioeconomic dimension is a pivotal component of ecosystem preservation. This is also reflected in the principles of the ecosystem approach to fisheries (EAF), proposed more than two decades ago at the 2001 Reykjavik Conference [26], and endorsed by the FAO Committee on Fisheries (COFI) in 2003 [27]. Potential socioeconomic benefits of MPAs include, but are not limited to, the following: safeguarding medium and long-term employment in the fishing sector, creation of new employment in non-extractive sectors such as tourism or recreational activities, resolution of conflicts among different stakeholders, enhanced opportunities for specific fishing segments (e.g., artisanal or recreational fisheries), support to scientific research, generation of non-market values, raised awareness on the importance of biodiversity and, finally, showing that management is able of reaching combined results (e.g., ensuring the long-term viability of fishing while preserving biodiversity) [19,25,28].

Recognizing the importance of implementing NBSs with the goal of halting the concerning trend of resource degradation, the EU has launched the EU Biodiversity Strategy, calling for 30% of the EU seas and 30% of the EU land to be protected by 2030 [29]. Yet, the establishment of an MPA is not per se a guarantee of successful conservation [30]. In fact, several factors can undermine the effectiveness of protected areas, up to the point of resulting in the so-called "paper parks": protected areas that exist in legal terms, but are virtually non-existent as concerns their ability to protect natural resources [31,32] and to deliver the socioeconomic benefits for which they were created [33]. In addition, ineffective MPAs can be detrimental to the perception of marine protection [34] and have the potential of preventing the establishment of additional MPAs if an acceptable extension of protected areas has already been reached on paper [35,36]. Recent research has argued that the large majority of MPAs—potentially $\geq$70%—partially or totally fails to achieve its conservation goals [31,37–39]. Therefore, identifying the factors that regulate MPA effectiveness is key for ensuring the sound functioning of these management measures. Towards this goal, we performed a global review of the literature on the main lessons learnt from MPA case-studies in order to identify the main factors in which managers and other key stakeholders should invest to ensure the achievement of MPA goals.

Several authors have previously carried out a literature review to investigate the main factors influencing MPA effectiveness (Figure 1). Focusing on South East Asia, in 2017, Ahmad Kamil et al. [40] used biological, socioeconomic and governance indicators provided by the IUCN to measure MPA effectiveness. Likewise, Beger et al. (2004) [41] presented a series of "lessons learnt" on the key factors granting success to an MPA during the process of its establishment. In 2016, Di Franco et al. [42] ran similar research focusing on Europe, with the peculiarity of pairing a process of literature review (secondary data) with one of data collection through interviews in several MPAs (primary data), with the ultimate goal of identifying a set of attributes characterizing sound management of artisanal fisheries in MPAs. By comparing literature on both biological–ecological and socioeconomic variables of protected and unprotected areas, Ferreira et al. (2022) [43] tested whether some MPA characteristics could be associated with their performance. Gallacher et al. (2016) [44] aimed at identifying the most common indicators used for defining MPA success and applied these to a practical case study in an MPA in the southern UK through a traffic light system to test how MPA success can be evaluated. By contrast, Iacarella et al. (2021) [45] did not focus on MPA effectiveness directly, but rather on the drivers of non-compliance

in MPAs. The latter issue is, however, tightly related to MPA effectiveness; the ability of an MPA to achieve its goals is strongly influenced by resource user acceptance and respect of the rules [46–48]. Mizrahi et al. (2019) [36] highlighted those socioeconomic factors that influence the socioecological impacts of MPAs, also including external/context variables such as poverty rates and population density, thus expanding the analysis to non-MPA variables. Nonetheless, to the best of our knowledge, there has been no attempt to synthesize the socioeconomic factors that managers should pursue in order to ensure MPA effectiveness on a global scale. The present study is implemented to achieve this goal by extending the literature on MPA success-factors, given that the most recent studies consider works until 2019 but are either geographically limited [43], do not focus on MPA success-factors directly [45], consider factors and aspects beyond the possibility of intervention of MPA managers [36], concentrate on the indicators of MPA effectiveness [49] or focus on the effectiveness of management rather than on that of the MPA itself [50].

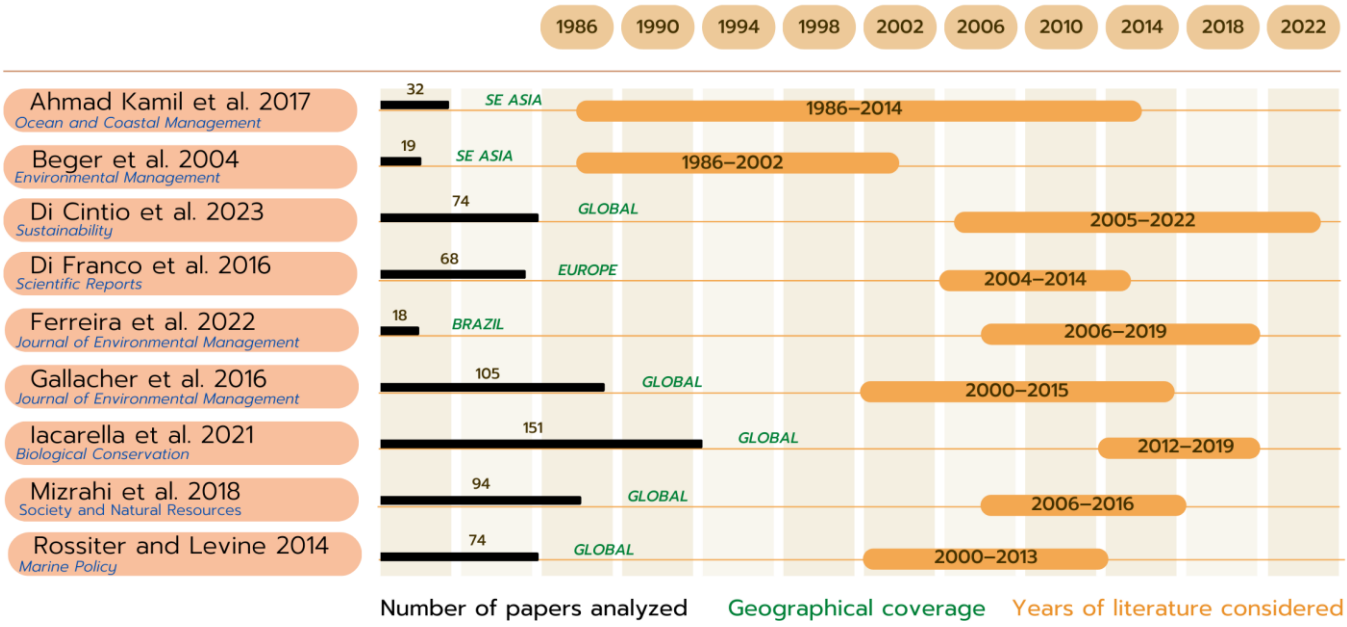

Figure 1. Comparison among the main characteristics of the present study and previous literature reviews on the factors underpinning MPA effectiveness [36,40–45,51].

2. Materials and Methods

According to the IUCN, an MPA is "any (protected) area of intertidal or sub-tidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features" [52] (p. 98). For the purpose of this paper, all marine protection statuses were considered; hence, no distinction was made among, e.g., national parks, marine reserves, MPAs, etc. This is in line with similar reviews run by other authors in recent years, e.g., [42]. As an initial step, before running the review, we have contextualized our work and compared it to the reviews already present in the literature in terms of research goals, year of publication, geographical coverage and number and time interval of papers considered. The approach followed for the review was that reported by Pullin and Stewart (2006) [53], which has already been successfully tested (e.g., [36,44]). We ran Boolean research on the Scopus database. The type of literature included scientific articles, books and book chapters. Although they could add potential benefits in terms of limiting publication bias [54], grey literature and MPA reports were not considered due to both resource limitations and the difficulty of gathering this material for global MPAs, as well as to the need of keeping research activities within a tight time frame. Both the research and the consequent review were performed between May and September 2022. Manuscripts in different languages (i.e., English and Spanish) were reviewed and processed. When deemed necessary, the

papers' Supplementary information was analyzed. The papers considered were published between 2005 and 2022. The details of the literature research are summarized in Table 1.

Table 1. Characteristics of the literature review.

Database	Scopus
Boolean operators	(TITLE-ABS-KEY ("marine protected area") OR TITLE-ABS-KEY ("marine reserve") OR TITLE-ABS-KEY ("no take zone") AND TITLE-ABS-KEY (performance OR improv* OR effectiv* OR success OR enhan* OR ameliorat* OR management OR co-management OR decentralisation OR organiz* OR "decision making" OR policy OR planning OR zoning OR governance OR inclusion OR involvement OR participation OR engagement OR "capacity building" OR "community based management" OR perception OR opinion OR feeling OR empowerment OR support OR perspective OR evaluation OR "social license" OR satisfaction OR communication OR bound OR "market based incentives" OR "market based" OR incentiv* OR market OR strategies OR tool* OR solution OR transform* OR increas* OR compens* OR subsid* OR investment OR investing OR capital OR revenue OR livelihood OR income OR diversif* OR alternart* OR motivation OR social OR socio OR economic OR "adaptive capacity" OR tradition OR heritage OR cultur* OR *tourism OR tourist OR ecotourism OR pescatourism OR visit* OR diving OR diver OR conflict OR conflict AND resolution OR resol* OR mitigat* OR bargain* OR "management compromise" OR awareness OR educat* OR enforc* OR patrol* OR illegal AND fishing OR poaching OR iuu OR surveillance OR funding OR financ* OR "financial resource"))
Domain	Title, abstract, keywords
Type of literature	Papers, books, book chapters
Years of publication	2005–2022
Total literature items retrieved	715
Items after title reading	115
Items after abstract reading	95
Items after full text scan	68
Items after reference search	74

The Scopus search generated 715 research items. From this initial body of literature, relevant articles were selected by recurring to inclusion and exclusion criteria [53]. The criterion utilized in this study was to include all those items of literature that dealt with socioeconomic factors identified as relevant in determining MPA effectiveness. This includes, but it is not limited to, MPA governance, management, funding, enforcement, incentives and engagement of stakeholders. By contrast, all articles dealing with biological or ecological features, such as the type of protected habitat, type of species considered (demersal/pelagic, crustacean/finfish, etc...), analysis of species spatiotemporal dynamics, impacts of larval and egg dispersal over recruitment or habitat suitability models, were excluded. This choice is justified by the aim of this review, which consists in the identification of the actions that can be implemented *on land* to ameliorate MPA effectiveness, focusing solely on the socioeconomic factors often overlooked in favour of biotic and abiotic features [55,56].

The application of these criteria to the analysis of the title of the initial list of 715 papers led to the selection of 115 literature items. Subsequently, through the reading of titles and abstracts, we retained 95 items and eliminated 20. Upon full text reading, 68 papers were retained. Due to their analogy with the selected literature in terms of proposing solutions for MPA effectiveness, 6 further items were added through the scanning of the references cited by the selected papers, for a final number of 74 items.

The main bibliographic features of each publication were listed, including author(s), study area, year of publication, country of affiliation of first author, journal impact factor and paper keywords. Subsequently, for those studies whose data collection was based on interviews, we classified the stakeholder category interviewed in the studies (following similar classifications from, e.g., [57–62], as well as the number of successfully completed interviews in each study. Sixteen categories are included in the paper: (1) Professional fishers; (2) Recreational fishers; (3) Aquaculture workers; (4) Boat owners; (5) MPA managers; (6) MPA staff; (7) Local population; (8) Tour guide/Tourism operators; (9) Tourists; (10) Government/Official agencies; (11) Coastguard/Rangers; (12) NGOs; (13) Academia/researchers; (14) Association/community leaders; (15) Environmentalist associations; (16) Sports/cultural/tourism associations. Further, we specified whether socioeconomic factors to increase MPA effectiveness were based on a single-MPA case study,

a multiple-MPA case study (two or more MPAs) or were not taking place in a specific MPA, despite still being correlated to the MPA effectiveness concept. Some examples of non-MPA case-studies that were included in the present review include, but are not limited to, the following: fisher perceptions towards upcoming MPAs, community-based management and Territorial Use Right for Fisheries (TURF), drivers of stakeholder support for MPAs or community-based approaches for sustainable management of artisanal fisheries. Thus, some of the general conclusions drawn from this literature review are not strictly intended to the sole improvement of MPAs but could be also applied to the management of non-MPA fisheries. The main factors underpinning MPA effectiveness were categorized into 13 macro-groups, based on MPA success-factors presented in dedicated previous literature (see Table S2 in Online Resource 1 for details about the literature items each factor group was sourced from):

1. Stakeholder inclusion;
2. Conflict avoidance and resolution;
3. Economic and market-based incentives;
4. Ecotourism/pescatourism;
5. Enforcement and Monitoring, control and surveillance;
6. Enhance legislation/political will;
7. Improve communication/raising awareness;
8. Peer pressure;
9. Increase and secure funding/human resources;
10. Provide MPA with adequate infrastructure and equipment;
11. Consider the surrounding network of MPAs;
12. Presence of management objectives and plans;
13. Research/Capacity development.

These groups were ranked according to the number of literature items indicating each of them as a tool to foster MPA success, with a higher ranking implying a greater relevance of the factors belonging to each group. In fact, each of the 13 groups was not recorded with a simple binary code (yes/no), but rather in terms of the specific factor proposed by literature items. For instance, the group "Improve communication/raising awareness" included factors such as "Outreach and public education activities", "Communicate to fishers information about the benefits of MPA", "Provide information on the MPA to fishers and tourists" and others. The composition of each group including MPA-enhancement factors is reported in Table S2, as well as in Table S1 of the Supplementary information (Online Resource 1). We classified the suggested factors to analyze MPA effectiveness according to the area of origin; in particular, we ran a Cramer-V statistical test on Microsoft Excel to assess whether MPA-enhancing factor groups (n = 13) and the macro-region from which these were reported (n = 7) were positively associated (i.e., if a factor group was tied to a specific region of the world).

3. Results

Among the 74 literature items considered, 42% presented socioeconomic factors to increase MPA effectiveness based on a single case study, while 37% presented a multiple-MPA case study analysis (two or more MPAs). The remaining 21% of the studies did not focus on a specific MPA.

The most common continents of affiliation of first authors of selected studies were Europe (28%) and North America (21%), all others being $\leq$6%. The most represented affiliation countries were the USA (24%), the UK (19%) and Australia (12%). All other countries (n = 18) were $\leq$6%, with 12 of them occurring only once. The largest number of studies was carried out in Europe (30%), followed by Central America/Caribbean (21%) and Asia (15%) (Figure 2). None of the MPAs that were investigated by the papers we retrieved from the literature were located in areas beyond national jurisdiction (ABNJs). The list of the case studies presented in this review per country of origin is reported in the Supplementary Information. Specifically, Spain was the most represented country (n = 8

case studies), followed by Australia (6), Italy (5) and the Philippines, France and the USA (4 each). Of the papers assessed, 83% were published in journals with a 2021 impact factor ≤4 (66% of these are comprised in the 3–4 impact factor interval).

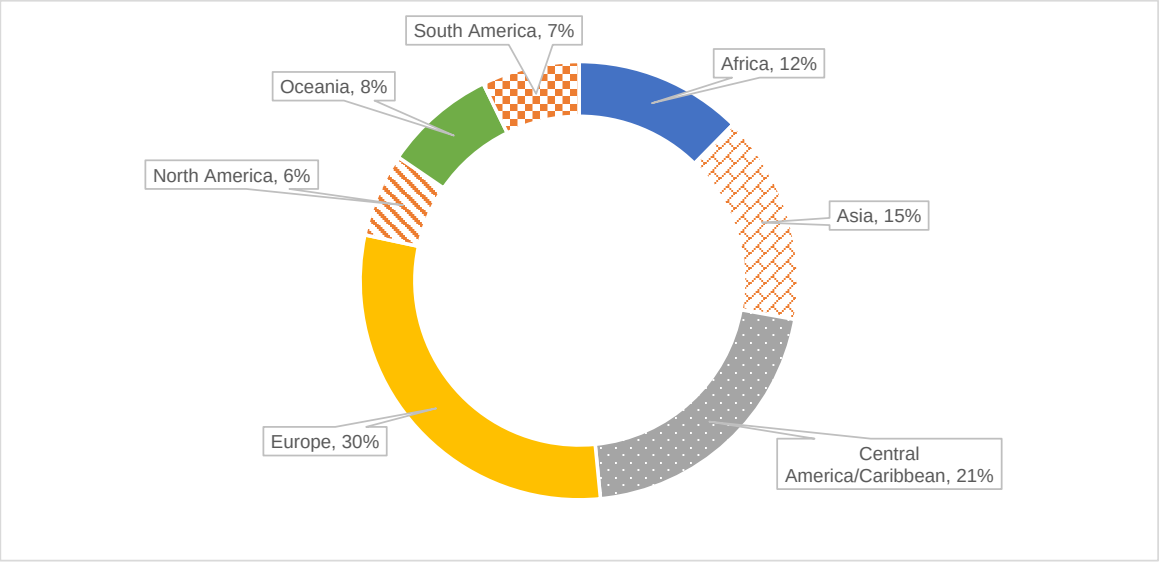

Figure 2. Geographical location of the case-studies of the papers included in the literature review per macro-region of origin.

In papers reporting on studies based on interviews, the most commonly interviewed stakeholder group was that of professional fishers (nearly 20%), followed by government/official agencies (12%) and MPA managers (nearly 9%). All the other stakeholder classes (n = 13) were below 8% (Figure 3).

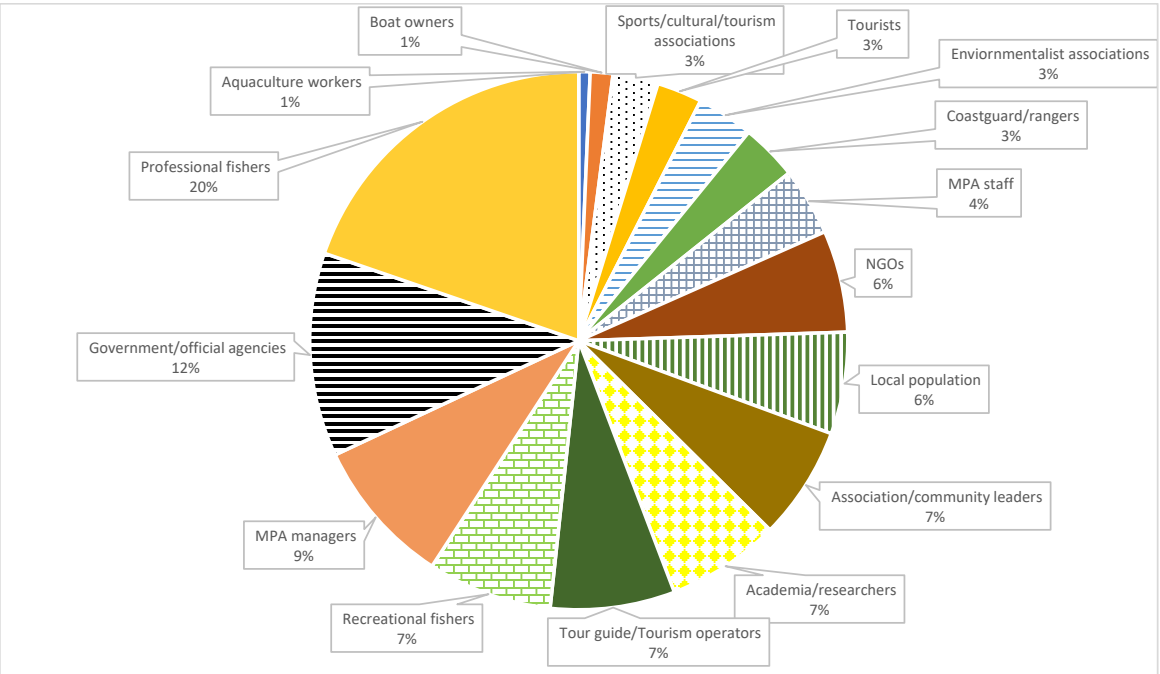

Figure 3. Type of stakeholders interviewed in the case-studies' data-collection of the papers included in the literature review.

The number of interviews held in each study showed strong heterogeneity, ranging from a minimum of 10 in Camacho and Steneck (2017) [63] to a maximum of 3030 in Stevenson et al. (2012) [64] (Figure 4), with an average of 292 interviews.

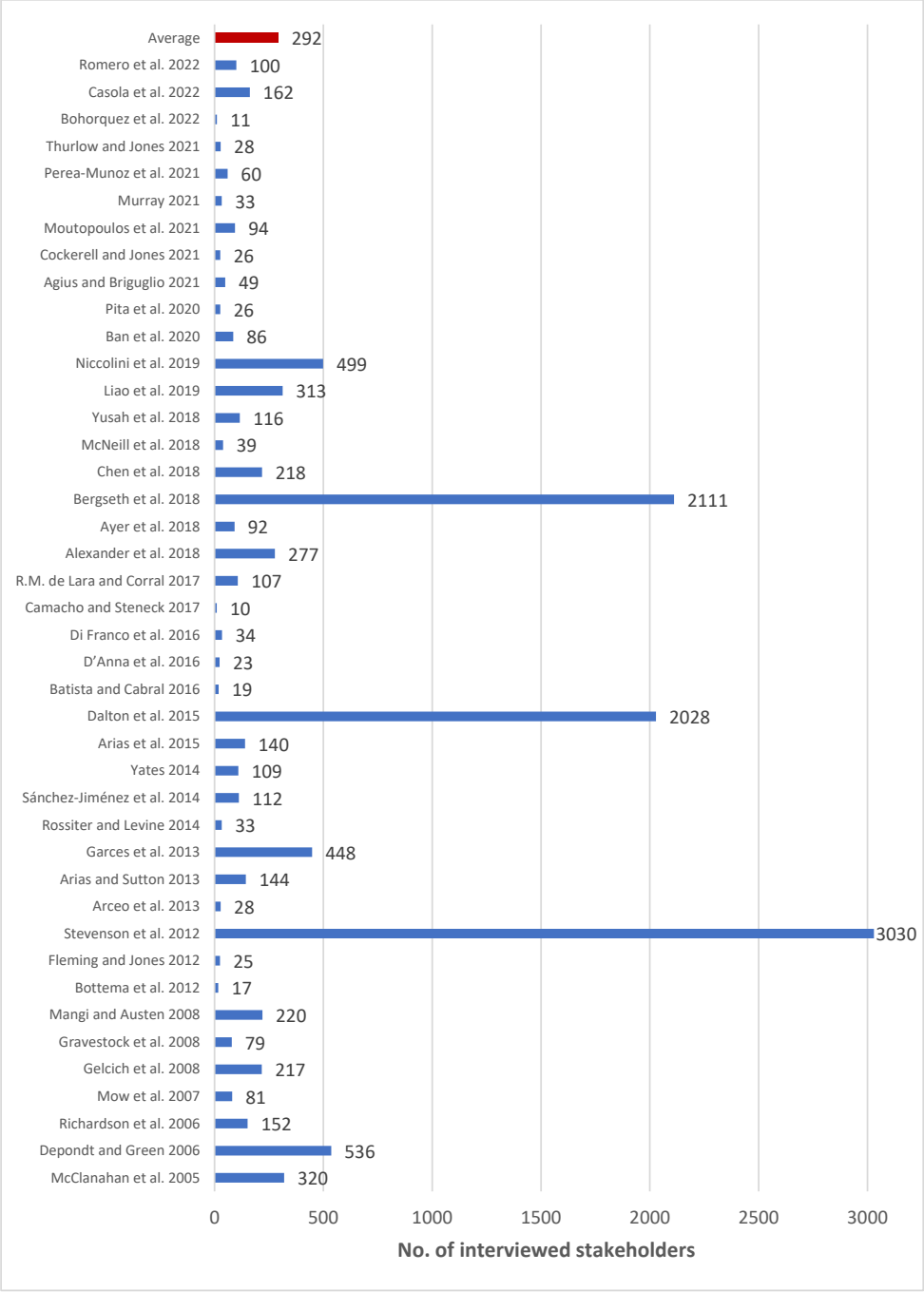

Figure 4. Number of interviewed stakeholders in each case-study of the papers in which interviews were used for data collection, in chronological order [42,48,51,57–95].

The analysis of the literature allowed us to identify the most important socioeconomic factors for sustaining MPA effectiveness. The 74 items of literature suggested a total of 242 factors, which we divided into 13 main groups (Figure 5, Table 2). The complete list of factors is reported in Table S1 in the Supplementary information (Online Resource 1). The most important group (n = 40; 17%) identified by the global literature is the inclusion of stakeholders (mostly fishers) throughout the different phases that go from the desig-

nation of an area to be protected to the monitoring of its effectiveness. This encompasses MPA consultation, design, planning, management, rule-agreement and decision-making, surveillance and monitoring, regulation changes, penalty impositions, use of space or size and/or catch limitations. The second most important factor group is that of raising awareness about MPA characteristics and potential advantages, as well as the improvement of communication channels between management authorities and stakeholders (mostly, fishers) (n = 38; 16%). The third most important group of factors to be considered is the need of ensuring an adequate level of enforcement and monitoring, control and surveillance (MCS) inside the MPA perimeter (n = 31; 13%). The fourth ranked group for improving MPA effectiveness is to increase and secure appropriate funding and human resources for the MPA to work effectively (n = 26; 11%). All of the other 10 group of factors are below 10%, with seven ≤5%.

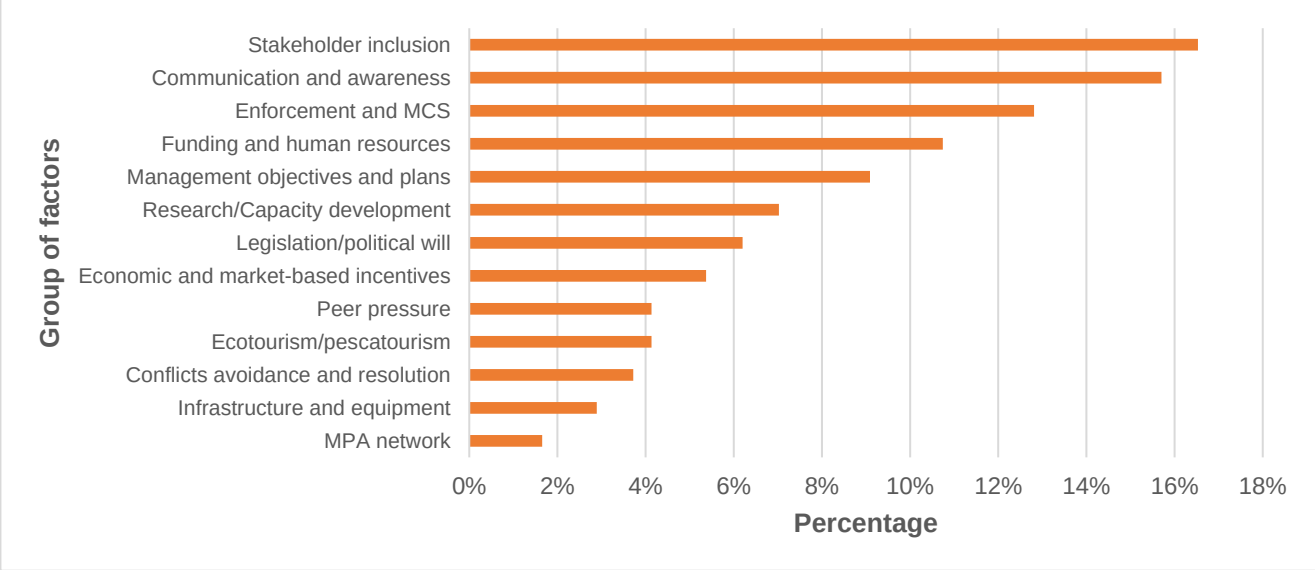

Figure 5. Group of factors for sustaining MPA effectiveness as derived from the literature review. Percentages refer to the number of factors (gathered in groups) suggested from each study over the total amount of factors suggested by the papers (n = 242). For instance, 40 different papers suggested stakeholder inclusion as a factor to sustain MPA effectiveness (40/242 = 16.5%).

Each of the 13 above-identified groups is composed of several specific factors that we grouped for ease of analysis while carrying out the literature review. These are summarized in Tables S1 and S2 in the Supplementary information (Online Resource 1), together with the number of literature items that included each of them as a valuable means to pursue MPA effectiveness.

The geographical distribution of each group of factors for MPA effectiveness is quite homogeneous (Figure 6). Seven groups out of thirteen (54%) have a global coverage. By contrast, "MPA networks" and "Infrastructures and equipment" are mentioned in only three macro-regions, while "Peer pressure", "Ecotourism/pescatourism", "Economic and market-based incentives" and "Conflict avoidance and resolution" are mentioned in five. Thus, the relevance of the seven most important groups of factors for sustaining MPA effectiveness (i.e., "Stakeholder inclusion", "Communication and awareness", "Enforcement and MCS", "Funding and human resources", "Management objectives and plans", "Research/Capacity development" and "Legislation/political will") is derived from case studies from each macro-region of the world. This also seems to imply a high degree of applicability of the suggested factors outside the case-studies from which these were derived. The Cramer-V test confirms a low correlation between MPA success-factor and the region of origin (V = 0.0168).

Table 2. Composition of each of the 13 groups of factors to sustain MPA effectiveness. On the right side, the number of literature items that included each factor, together with the sum of literature items per factor (the number of studies per subgroup can be larger than the number of studies per factor, as the same paper can recommend one or multiple actions listed in the table).

Rank	Group	Subgroup	No. of Studies per Subgroup	No. of Studies per Factor
1	Stakeholder inclusion	Engagement of professional fishers	13	40
		Engagement of local communities	12	
		Promotion of joint ventures among local leaders, government members, professional and recreational fishers, fishing industry, academia, NGOs and entrepreneurs	11	
		Engagement of recreational fishers	3	
		Engagement of entrepreneurs	1	
2	Improve communication/ Raise awareness	Communication to stakeholders	25	38
		Fishery-specific communication	13	
3	Enforcement and monitoring, control and surveillance	Enforcement and monitoring, control and surveillance	31	32
4	Increase and secure funding/human resources	Increase and secure funding/human resources	24	26
		NGO/Private/Philanthropic funding	6	
		Visitor fees	4	
		Public funding	2	
		Conservation-finance area	1	
		MPA fund	1	
		Ecotourism	1	
		Fines	1	
		Non-extractive use rights from industry	1	
		Research permits	1	
		Biodiversity offsets	1	
5	Presence of management objectives and plans	Presence of management objectives and plans	22	22
6	Research/Capacity development	Implement sound scientific research	11	17
		Capacity development	7	
7	Enhance legislation/Secure political will	Legislation	9	15
		Political will	8	
8	Economic and market-based incentives	Livelihood diversification	9	13
		Compensation	6	
		Eco-labelling	3	
9	Peer pressure	Direct involvement of fishers	10	10
10	Conflict avoidance and resolution	Conflict avoidance	7	9
		Conflict resolution	2	
11	Ecotourism	Promotion of ecotourism	9	9
		Promotion of pescatourism		
12	Infrastructures and equipment	Securing adequate infrastructures	7	7
13	Considering the surrounding network of MPAs	Considering the surrounding network of MPAs when managing the mpa	4	4

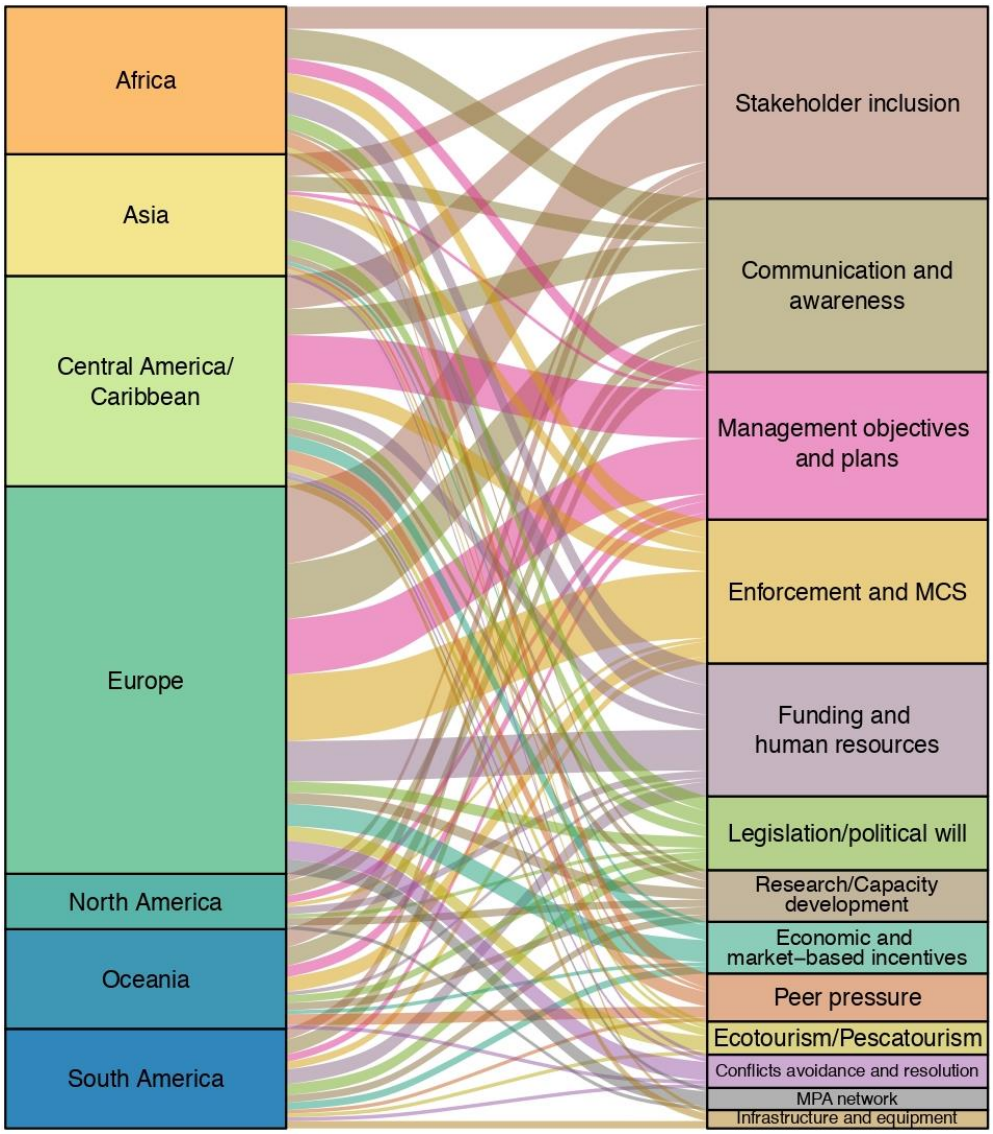

Figure 6. Groups of factors for MPA effectiveness per macro-region of origin. The size of the bands indicates the number of times each factor is suggested from each paper as well as from which macro-region. That is: the macro-region hosting the most case-studies in this literature is Europe, and the most common factor group suggested is "stakeholder inclusion".

4. Discussion

This literature review has identified the factors that determine the effectiveness of MPAs in achieving both the bioecological and socioeconomic goals for which they were established. The socioeconomic factors emerging as the most relevant from our study advance our ability to build a framework to support MPA effectiveness. Several of the factors that emerged from the present literature review are not necessarily bound to the cases of MPAs but could also be relevant for the general management of fisheries. In order to achieve a comprehensive account of the factors that determine the effectiveness of MPAs, our findings could be integrated with those of studies assessing biological and ecological features of areas under protection.

Stakeholder inclusion. We identify the engagement of stakeholders throughout the entire MPA process, from design to implementation and management, as the most important factor to boost MPA effectiveness. Specifically, most of the literature items (n = 13) highlighted the importance of engaging professional fishers and fishing cooperatives into MPA design, management, rule-agreement and surveillance. Some of them have also

advocated the presence of fishers within the MPA management board, as well as the creation of fishers' management subcommittees with support from coordinator and monitoring teams, with decision powers on regulation changes, penalty impositions, use of space, size and/or catch limitations. The second most numerous group of papers (n = 12) within the "stakeholder engagement" group of factors called for an engagement of local communities in voluntary surveillance of the MPA, as well as in MPA consultation, designation, decision-making and management processes, possibly through the establishment of community-based co-management organizations and with the support of NGOs. Moreover, this literature group also suggested we incorporate the goals and objectives of local communities into the development of MPA proposals to provide the very same communities with a greater sense of ownership. Furthermore, 11 papers suggested the creation of joint ventures among different stakeholder classes, proposing the participation of various stakeholder groups in MPA establishment, implementation, management and institutional design (i.e., setting boundaries, rule-making), accompanied, when possible, by the creation of a permanent governance and co-management body including government members, fishers, the fishing industry, academia and environmental NGOs. Three literature items stressed the importance of involving also recreational fishers into MPA planning, design, enforcement, advocacy, conservation, management and research, while one paper proposed engaging entrepreneurs in existing networks with coastal communities to create and exploit opportunities for marine conservation.

The results of this review align with those from the existing literature on marine conservation. The participation of stakeholders is becoming a pivotal component of conservation planning [96] and in the application of the ecosystem approach to resource management [88,97,98]. Moreover, achieving good levels of stakeholder engagement can lead to higher acceptance and encourage social monitoring of the MPA [80,99,100]. In fact, the identification of factors for encouraging pro-conservation behavior is pivotal if effective conservation is to be achieved [101]. The results of our review also align with the compliance and common property theories in identifying the legitimacy of management as perceived by stakeholders as well as an effective MCS over natural resources as factors that affect compliance with regulations over common-pool resources [47,102,103]. By contrast, failing to include stakeholders in the management process can generate a negative attitude towards the MPA in the case of increased surveillance and enforcement [42].

Improve communication/raising awareness. The second most important factor highlighted by the literature is that of ensuring a constant and effective communication flow between managers/researchers and resource users, namely, fishers and tourists. Specifically, 25 literature items mentioned the importance of increasing communication from MPA managers to stakeholders, while 13 papers called for fishery-specific communication. In the former group, the most important factor highlighted is that of increasing social capital by implementing outreach education activities for stakeholders, mainly including topics such as environmental education and the benefits that MPAs can generate. In the latter group, the authors stressed the importance of raising awareness among fishers about marine conservation and potential MPA benefits, as well as emphasizing the damages derived from poaching, promoting stewardship and enhancing participation and compliance. As for stakeholder engagement, the results of this review are in agreement with the existing literature about the importance of increasing communication and raising awareness among stakeholders for marine conservation. Interactions with MPA staff and participation in information sharing networks can indeed provide opportunities to build trust and reciprocity among stakeholders [80,104]. The creation of these communications platforms—tightly related to the need of engaging stakeholders—could be facilitated by the support of international organization or NGOs (as, e.g., suggested by Beger et al., 2004 [41] for the Philippines).

Enforcement and MCS. It is known that even in the case of a voluntary agreement of stakeholders on some conservation measures, efforts can be vanished by non-compliance and free-riding, which can lead to the termination of the very same agreement [105]. In

fact, even low levels of illegal fishing can have detrimental impacts on MPA effectiveness [47,106]. Therefore, "Enforcement and MCS" plays a prominent role among the most important factors ensuring MPA success, and 31 literature items highlighted in this review mentioned enforcement and MCS as a pivotal aspect to ensure MPA effectiveness. Some factors include, but are not limited to, the following: ensure sufficient enforcement of rules for both professional and recreational fisheries, increase patrolling activities and ensure surveillance technology, tackle free-riding, implement and respect MPA zoning and ensure clear penalties and sanctions against perpetrators. In most cases, the inability to secure an adequate level of enforcement is related to a shortage of funds for local authorities [107,108], which strongly hinders MPA effectiveness by inhibiting personnel and enforcement capacity [37,38,67]. Thus, ensuring an adequate level of both financial and personnel capacity is necessary to ensure conservation objectives are reached [38,109].

Presence of management objectives and plans. Effective MPAs need to be strategically designed as well as effectively and sustainably managed [58]. Moreover, one of the essential conditions for ensuring effective MPA management is the presence of unambiguous, detailed and measurable objectives [110]. However, in most Mediterranean MPAs, management plans are either lacking or poorly enforced [111]. Specifically, Di Franco et al. (2016) [42] found that 32% of the n = 68 sampled MPAs did not have a management plan in place for artisanal fisheries. This, in turn, has the potential of frustrating long and costly processes of stakeholder engagement [88]. Local capacity needs to be ensured at the MPA level if bioecological results are to be achieved [38]. This entails both management and monitoring/research activities.

Economic and market-based incentives; Enhance legislation/political will; Increase and secure funding/human resources; Research/Capacity development. Several factors other than stakeholder inclusion, communication and enforcement are pivotal for enhancing MPA success. Despite the importance of promoting a sound and continuous process of data collection and analysis, worldwide MPAs are, in most cases, affected by inadequate levels of research and monitoring [50]. In some cases, the lack of funds, capacity and research/monitoring activities is due to an inadequate legislation, which can slow down the formation of TURFs and MPAs [91]. In this sense, the presence of a clear political commitment to protect natural resources and the will to sustain MPA effectiveness is pivotal for achieving protection [70]. While the environmental advantages of MPAs are often clear, these do not necessarily entail a full socioeconomic success [112], so much so that the ability of this management tool to generate socioeconomic benefits for fisheries is still under debate [42]. Therefore, the introduction of economic incentives and business-related training is pivotal to seek the support of the fishing sector in those communities seeing their livelihoods at risk [69]. Again, the negative economic impacts of MPAs, including the displacement from once-open fishing grounds, can be reduced through public engagement during the establishment of the MPA [113]. Further than addressing stakeholder needs, the latter process can also reduce or mitigate conflicts arising among them [51,114,115].

This paper has reported and analyzed those factors that MPA managers should take into account in order to ensure MPA effectiveness. However, a few caveats related to the present study are worth to be stressed. First, while a few methods have been proposed to assess MPA management effectiveness (e.g., the WWF Rapid Assessment and Prioritization of Protected Area Management (RAPPAM) Methodology, or the CCEF Marine Protected Area Management Effectiveness Assessment Tool (MEAT)), no consistent method exists for evaluating MPA outcomes and effectiveness. This makes it difficult to establish a causal relationship between MPA characteristics and its socioecological impacts [36]. In more general terms, one cannot simply estimate the effectiveness of a protection area by comparing it to previous exploitation trends/ecosystem status, as other factors could have affected the change [116]. Second, the factors presented in this review summarize the results of peer-reviewed literature only. Hence, despite having included studies from different MPAs worldwide, and despite the fact that a wider selection of case studies would have been too resource-consuming and beyond the scope of this paper, the sample

presented in this research might be not be universally representative of MPAs. Third, the case-studies analyzed in the present review offered from one to eleven factors each. While each of these was accurately reported, the present study does not take into account any synergies that could arise among the proposed factors. For instance, we might see case of, e.g., an enforcement and MCS policy producing effective results in an MPA only because it was preceded by a sound process of stakeholder involvement. In that case, simply applying strict control over fishing activities without involving the fishing community might lead to counterproductive results. Fourth, we did not consider the presence of potential positive feedbacks among the proposed factors. For instance, as observed by Ahmad Kamil et al. (2017) [40] for coral reef fisheries, promoting ecotourism in an MPA might generate new stressors for the environment caused by the high presence of visitors in an area, which might generate adverse environmental outcomes for the very same MPA. Likewise, counterproductive results could be achieved when solely investing one, or a few, of the highlighted factors. For instance, increasing the number of visitors in the MPA by promoting ecotourism might lead to a shortage of funds earmarked to conservation, in case appropriate visitor fees are not introduced. In fact, substantial amounts of MPA incomes (on average, as much as 20%) are subtracted from core conservation-related activities to be earmarked for providing information, toilets and car parks to tourists [90]. Hence, a thorough financial planning process should be implemented to weigh the pros and cons of the factors emerged in this review when considering their application to a specific case-study. The fact that the benefits created by a well-functioning MPA go beyond its boundaries, thus benefiting society as a whole, implies that the decision of whether or not to adopt a given management strategy should also go beyond the budgeting issues of the single MPA, and that public funds should be invested for the introduction and amelioration of such a management tool.

Most of the MPA success-factors highlighted in this paper (Table S1 in Supplementary information—Online Resource 1) involve the active participation of marine resource users, mostly fishers, in the life of the MPA. However, the actual perception of stakeholders as well as their desire for getting involved in future MPA management and/or monitoring will have to be assessed. In other words, while factors for ensuring MPA effectiveness have been identified, whether marine resource users are willing to engage in key activities (e.g., MPA design, planning, management or monitoring) remains to be ascertained. Future research could assist in this respect by gathering stakeholders' perceptions, viewpoints and values on existing management, as well as their degree of interest in engaging in the "control room" of both existing and new protected areas [117,118].

Our review has identified 13 groups of potential factors for sustaining the effectiveness of MPAs on a global scale. When considering the application of these factors for both existing and new MPAs, the spatial heterogeneity (namely, geographical distribution and level of country development) of the case studies highlighted in the review should be kept in mind, thus distinguishing between data about the subject of the case-study, i.e., "the phenomenon", from those external to the case, i.e., related to the macro-level "context" [54]. In fact, this review focused only on aspects that can be directly influenced by MPA managers, and deliberately left out exogenous factors such as the Gross Domestic Product (GDP) per capita or the Human Development Index (HDI) of a given country. Despite factors such as the HDI being relevant in determining MPA success [42], these cannot, by any means, be affected by MPA managers, and were thus excluded. That said, a thorough analysis of the socioeconomic and governance indicators of each case-study is needed for a comprehensive evaluation of the applicability of the suggested factor to the desired MPA. In fact, despite the analysis of existing case-studies allowing for an understanding of real-world cases, as well as the differences occurring among the analyzed studies [119], an appropriate analytic generalization process needs to be implemented to identify the most effective means of practical and concrete application of the case-studies into account [54]. Yet, despite (1) the context-dependency of specific factors i.e., the socioecological effects of MPAs [43,115,120]; (2) the influence of socioeconomic factors on MPA effectiveness [36];

(3) the methodological heterogeneity among the studies evaluating the impacts of MPAs [49]; and (4) the complexity of connections between social and ecological systems [47], the directions to be followed to enhance MPA effectiveness clearly emerge from the literature review.

5. Conclusions

Efficient functioning of MPAs can be sustained by prioritizing the involvement of stakeholders in MPA design, implementation and management, as well as by improving communication channels between management authorities and stakeholders (mostly, fishers). The ultimate goal of these factors is that of working to improve stakeholders' acceptance of MPAs, which represents a pivotal component of MPA effectiveness. The case studies analyzed are almost equally representative of developed and less developed areas in the world, with a slight propension (56% vs. 44%) of the latter group (Africa, Caribbean, Central and South America). Furthermore, the most relevant factors highlighted in this review showed an overall uniformity of distribution across the globe; hence, their application is to be encouraged for the protection of marine resources worldwide. Specifically, the need to attend to these factors arises, in all its urgency, at the European level, in the light of the forthcoming expansion of areas to be granted protection in the EU following the recommendations included in the EU Biodiversity Strategy for 2030.

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