Biological Conservation 244 (2020) 108531

Contents lists available at ScienceDirect

Biological Conservation

journal homepage: www.elsevier.com/locate/biocon

Social equity and marine protected areas: Perceptions of small-scale fishermen in the Mediterranean Sea

Nathan J. Bennett[a,b,c,*,1], Antonio Calò[c,d,1], Antonio Di Franco[c,e], Federico Niccolini[f], Daniela Marzo[g], Ilenia Domina[g], Charalampos Dimitriadis[h], Francisco Sobrado[i,j,k], Marie-Catherine Santoni[l], Eric Charbonnel[m], Maria Trujillo[n], Jose Garcia-Charton[n], Leila Seddiki[o], Valentina Cappanera[p], Josipa Grbin[q], Luka Kastelic[r], Marco Milazzo[d,g], Paolo Guidetti[c,g]

[a] The Peopled Seas Initiative, Institute for the Oceans and Fisheries, University of British Columbia, Vancouver, Canada, V6T 1Z4
[b] Institute for Resources, Environment and Sustainability, University of British Columbia, Vancouver V6T 1Z4, Canada
[c] Université Côte d'Azur, CNRS, ECOSEAS, Nice 06108, France
[d] Dipartimento di Scienze della Terra e del Mare, Università di Palermo, Palermo 90123, Italy
[e] Stazione zoologica Anton Dohrn, Dipartimento Ecologia Marina Integrata, Sede Interdipartimentale della Sicilia, Palermo 90142, Italy
[f] Department of Economics and Management, University of Pisa, Pisa 56124, Italy
[g] CoNISMa (National Interuniversity Consortium of Marine Sciences), Rome 00196, Italy
[h] National Marine Park of Zakynthos, Zakynthos 29100, Greece
[i] GEN-GOB, Ibiza 07800, Spain
[j] SOLDECOCOS, Seville 41003, Spain
[k] WWF-Spain, Madrid 28005, Spain
[l] Office de l'Environnement de la Corse, Service Espaces Protégés, Corte 20250, France
[m] Côte Bleue Marine Park, Observatoire PMCB, Carry-le-Rouet 13620, France
[n] Department of Ecology and Hydrology, University of Murcia, Campus de Espinardo, Murcia 30100, Spain
[o] ACPCR - Association du Cantonnement de Pêche du Cap Roux, Frejus 83600, France
[p] Portofino Marine Protected Area, Genova 16038, Italy
[q] Nature Park Telašćica, Sali 23281, Croatia
[r] Strunjan Landscape Park, Strunjan, Portorož 152 6320, Slovenia

ARTICLE INFO

Keywords:
Social equity
Marine protected areas
Protected area management
Environmental governance
Small-scale fisheries
Conservation social science

ABSTRACT

Global conservation policy requires the scaling up of effectively and equitably managed networks of marine protected areas (MPAs). While progress has been made on spatial coverage, the fundamental aspects of effectiveness and equity are falling short. Past research has focused on management effectiveness in MPAs, but less attention has been given to social equity though it is an ethical imperative and instrumental to conservation. This study assessed the perceptions of SSF regarding recognitional, procedural and distributional dimensions of social equity using quantitative surveys in 11 MPAs across 6 countries on the Mediterranean Sea. To do so, we developed individual indicators from which we created composite scores for recognitional, procedural, and distributional equity, and a combined social equity score. Overall, descriptive results showed that SSF perceptions of social equity were quite varied but slightly skewed towards positive perceptions. Then, we developed predictive models to analyze the effects of geographic (i.e., MPA and country) and individual (i.e., SSF demographics and characteristics) factors on the composite social equity scores. All social equity scores differed significantly between MPAs. Being an older fisher was associated with a decrease in recognitional equity, while having a higher level of relative wealth or more diversified livelihoods was associated with higher scores for distributional equity. These results point to the need for tailored management actions to improve equity in different MPA sites and for different groups. This paper presents a novel quantitative method for using

* Corresponding author at: The Peopled Seas Initiative, Institute for the Oceans and Fisheries, University of British Columbia, Vancouver V6T 1Z4, Canada.
E-mail addresses: nathan.bennett@ubc.ca (N.J. Bennett), federico.niccolini@unipi.it (F. Niccolini), xdimitriadis@marine.aegean.gr (C. Dimitriadis), Marie-Catherine.Santoni@oec.fr (M.-C. Santoni), charbonnel.eric@parcmarincotebleue.fr (E. Charbonnel), jcharton@um.es (J. Garcia-Charton), leilaseddiki@apampeche.eu (L. Seddiki), v.cappanera@portofinoamp.it (V. Cappanera), josipa.grbin@telascica.hr (J. Grbin), Luka.Kastelic@gov.si (L. Kastelic), marco.milazzo@unipa.it (M. Milazzo), Paolo.GUIDETTI@univ-cotedazur.fr (P. Guidetti).
[1] Equal co-lead authors.

https://doi.org/10.1016/j.biocon.2020.108531
Received 29 July 2019; Received in revised form 5 March 2020; Accepted 20 March 2020
Available online 31 March 2020

stakeholder perceptions to examine social equity that might be applied to marine and terrestrial conservation initiatives elsewhere.

1. Introduction

Protected areas around the world are often created in locations where local people and resource users live and work. In the past, it was common to create both terrestrial and marine protected areas without inclusion or consideration of local people's needs, livelihoods and perspectives (Bennett et al., 2017; Dearden and Bennett, 2016). Indeed, many conservation initiatives purposefully excluded local people from decision-making and displaced them from areas critical to their livelihoods (Agrawal and Redford, 2009; Brockington and Igoe, 2006; Sandlos, 2011). The rationale for this separation of humans from nature was that it was felt that this was necessary to achieve environmental protection objectives. Despite the fact that conservation of the environment has the potential to produce positive outcomes for the long term prosperity and well-being of local communities (Ban et al., 2019; IUCN, 2005; Leisher et al., 2007; Naidoo et al., 2019), exclusionary conservation practices have also produced a number of well-documented and extensively critiqued negative impacts for local people (Sowman and Sunde, 2018; West et al., 2006; West and Brockington, 2006). In recent years, however, conservation policy and practice has sought a more balanced and equitable approach to reconcile the relationship between protected areas and local people (Augustine and Dearden, 2014; Borrini et al., 2004; Bray and Velazquez, 2009; Lele et al., 2010; Lockwood, 2010).

Marine protected areas (MPA) policies and practice have followed this trajectory from strict exclusion towards consideration and inclusion of local people and stakeholders (Christie et al., 2017; De Santo et al., 2011; Freeman et al., 2018; Gurney et al., 2015; Hill et al., 2016; Jones, 2009; Micheli and Niccolini, 2013). MPAs are a spatial tool employed worldwide for marine conservation and fisheries management (Day et al., 2012; Kelleher and Kenchington, 1992). However, they are often created in marine and coastal areas that are historically used and relied on by small-scale fishers (SSF), gleaners and indigenous peoples (Ban and Frid, 2018; Di Franco et al., 2016; Guénette et al., 2008; Kleiber et al., 2018; Said et al., 2017). This spatial overlap has led many researchers and practitioners to argue it is just and ethical that the rights, needs, and livelihoods of local people and indigenous communities are taken into account in the planning and management of MPAs (Bennett et al., 2017; Charles et al., 2016). Furthermore, signatories to the Convention on Biological Diversity (CBD) have agreed to create networks of MPA in 10% of the oceans by 2020 that are both “effectively and equitably managed” as per Aichi Target 11 (CBD, 2010). While progress has been made on spatial coverage, with > 6.97% of the global oceans and 16.03% of territorial waters covered in MPAs (Álvarez-Romero et al., 2018), the achievement of equally important qualitative elements of “effectiveness” and “equity” may be falling short (De Santo, 2013a; Spalding et al., 2016). While there has been growing attention to the topic of MPA management effectiveness (Fox et al., 2014; Gill et al., 2017; Pomeroy et al., 2004; Scianna et al., 2019), substantially less research effort has gone into understanding and addressing social equity issues in MPAs (Halpern et al., 2013; Hill et al., 2016; Richmond and Kotowicz, 2015). The importance of understanding and addressing equity will only increase after Aichi Target 11 expires in 2020, as it is expected that the Post-2020 Global Biodiversity Framework will increase the MPA target to 30% aerial coverage – with similar requirements for effectiveness and equity remaining.

This study draws on the social equity and conservation literatures and contributes to the emerging body of research on social equity in MPAs. In particular, we developed and used a quantitative survey to explore the perceptions of SSF of social equity in 11 MPAs from 6 countries across the northern Mediterranean Sea. Through this exploratory study, the contributions that we seek to make are advancing methods for monitoring social equity, contributing to empirical evidence on social equity for SSF in Mediterranean MPAs, and producing practical and theoretical insights that are of broader relevance for conservation policy and practice. In the following sections, we briefly review the literature on social equity and conservation, introduce the research context, and describe our methods. Then, we describe SSF perceptions of social equity across the MPAs and examine predictors of recognitional, procedural, distributional, and combined equity.

2. Social equity and conservation

There has been a recent surge in publications on social equity in relation to terrestrial protected areas (Dawson et al., 2018; Friedman et al., 2018; McDermott et al., 2013; Moreaux et al., 2018; Pascual et al., 2014; Schreckenberg et al., 2016; Sikor et al., 2014; Zafra-Calvo et al., 2017, 2019) and in sustainability science more broadly (Hamann et al., 2018; Leach et al., 2018; Loft et al., 2017; Martin et al., 2014a, 2014b; McDermott et al., 2013; Pascual et al., 2014; Sikor et al., 2014). There are several important points to be drawn from this body of literature. First, it is recognized that there are inherent positive and negative feedbacks between (in)equity and (un)sustainability (Hamann et al., 2018; Leach et al., 2018). For example, positive perceptions of fairness of social impacts and legitimacy of governance can lead to support for conservation and compliance with regulations (Bennett et al., 2019; Pascual et al., 2014). The insight that equity begets sustainability further emphasizes the importance of understanding equity and incorporating results back into management of protected areas.

Second, the literature converges around three dimensions of social equity that need to be considered in conservation: recognitional, procedural and distributional equity. Drawing from McDermott et al. (2013), Pascual et al. (2014), Schreckenberg et al. (2016) and Zafra-Calvo et al. (2019), we define the three dimensions of social equity as follows:

- Recognitional equity refers to the acknowledgement and representation of the rights, cultures and identities, values and visions, knowledge systems and livelihoods of local groups in conservation planning and management;
- Procedural equity concerns the inclusive and effective participation of all relevant actors and groups in rule and decision-making for conservation policies and programs; and,
- Distributional equity signifies the fairness of distribution of benefits and burdens between different groups, including current and future generations, of the outcomes of conservation actions.

It is important to recognize here that much of the thinking regarding and indeed the three dimensions of equity referred to in the conservation and sustainability literatures originally emerged from earlier critical scholarship on environmental justice (Agyeman et al., 2003; Bullard, 1994; Cutter, 1995; Schlosberg, 2009; Walker, 2009, 2012) and social justice (Fraser, 1998; Miller, 1979, 1999).

Third, while recent years have seen the development of conceptual frameworks and definitions for equity, few of the studies that focus on social equity in conservation have focused on all three dimensions (Friedman et al., 2018). Furthermore, methods and indicators to operationalize the monitoring of social equity in protected areas are still nascent (Dawson et al., 2018; Franks et al., 2018; Schreckenberg et al., 2016; Zafra-Calvo et al., 2017, 2019). The most notable past effort is Zafra-Calvo et al. (2017) who developed a set of indicators (further discussed below) to be applied to measure each of the three dimensions

of equity, and subsequently applied these indicators to a global study of 225 protected areas using a survey of individual representatives of community-based organizations (CBOs), non-governmental organizations (NGOs), governments, academics, and protected areas management (Zafra-Calvo et al., 2019). Yet, those surveyed in the Zafra-Calvo et al. (2019) study were not from local groups (e.g., small-scale fishers, Indigenous peoples) who rely on the resource for their livelihood.

While the broader body of literature on equity and conservation has grown, there has been a relative dearth of literature that has explicitly focused on social equity and MPAs. Several notable exceptions include: research by Jones (2009) examining the perspectives of fishers on the social equity implications of no-take MPAs in England; an examination of the impacts of the Marianas Trench Marine National Monument on access for traditional indigenous communities (Richmond and Kotowicz, 2015); a study on MPAs in Japan and the Solomon Islands that emphasizes the importance of considering the perspectives of stakeholders in achieving equity (Hill et al., 2016); and several papers on balancing distributional equity with conservation in MPA network reserve planning (Gurney et al., 2015; Halpern et al., 2013; Kockel et al., 2019). The global study by Zafra-Calvo et al. (2019) also included MPAs, but results were aggregated for both marine and terrestrial protected areas. Though not explicitly focused on social equity, numerous other studies have also touched on closely related topics in the context of MPAs, including research on human well-being and benefits (Ban et al., 2019; Gjertsen, 2005; Mahajan and Daw, 2016), participation and co-management in governance (Bennett et al., 2017; Cormier-Salem, 2014; Gaymer et al., 2014; Hogg et al., 2017), rights (Ban and Frid, 2018; Mascia and Claus, 2009), justice (De Santo, 2013b; Gustavsson et al., 2014), livelihoods (Bennett and Dearden, 2014; Charles et al., 2016; Cinner et al., 2014), and social impacts (Gill et al., 2019; Mascia et al., 2010; Sowman and Sunde, 2018). There have also been a number of studies focusing on the social and governance implications of MPAs for small-scale fisheries in the Mediterranean Sea (Gómez et al., 2006; Himes, 2003; Hogg et al., 2017; Said et al., 2017). Moreover, there is a need for further attention to and advancement of research methods, evidence, and theory on social equity in relation to MPAs.

3. Research context

The Mediterranean Sea is an enclosed sea with a surface area of approximately 2.5 million km^2. Three continents - Europe, Asia and Africa – lie to the north, east and south and it is surrounded by 20 countries and contains 2 island nations. The coastline is highly populated, dotted with large cities and small-villages, and used for a variety of purposes, including fishing, shipping, tourism, aquaculture, and other forms of intense development therefore rendering this region vulnerable to a multitude of threats (Micheli et al., 2013). This region is well acknowledged for its ecological and fisheries values (Azzurro et al., 2019; Coll et al., 2010; FAO, 2016; Giakoumi et al., 2013). Approximately 85% of fish stocks are harvested at biologically unsustainable levels, which has also led to declines in total catches from around 2 million tons in the 1980s to 787,000 tonnes in 2013 (FAO, 2016). Due to the large number of countries surrounding the Mediterranean Sea, there are a suite of different fisheries management and marine conservation measures and frameworks, including an extensive network of MPAs. In 2016, this included a total of 1231 MPAs covering 7.14% of the Mediterranean Sea (MedPAN, 2016). However, their average size is relatively small (~5 km^2) and only 0.04% of the area is covered with MPAs that are no-take or fully protected (PISCO and UNS, 2016). Most no-take MPAs are very small - almost half are between 0.01 and 1 km^2 (Di Franco et al., 2018).

It is estimated that there are 92,700 fishing boats in the Mediterranean and Black Sea, of which small-scale fishers account for ~80% (FAO, 2016). Overall, SSF are declining in many areas of the Mediterranean with a downward trend in the number of vessels and licenses (Gómez et al., 2006; Guyader et al., 2013; Lloret et al., 2018). In addition, populations of small scale fishers are progressively ageing: the age distribution is skewed towards older ages and young fishers represent a fairly small fraction (Lloret et al., 2018). Although SSF has a relevant social and economic role in many Mediterranean countries, from a legal viewpoint they have long been relegated to a marginal role with a gap in fisheries policy and management. SSF are also exposed to competition with many other maritime sectors, such as large-scale fleets, recreational fishing, diving activities, tourism, aquaculture and

Fig. 1. Map of case studies sites.

other users of the coastal zone (Guyader et al., 2013). Particularly concerning is the unfair competition between licensed SSF and some forms of IUU (illegal, unreported and unregulated) fishing (Lamine et al., 2018).

4. Methods

4.1. Survey sampling methods and design

We developed and implemented a quantitative survey of small-scale fishers in 11 Mediterranean MPAs. We conducted research in the following MPAs: Cabo de Palos (Spain), Es Freus (Spain), Côte Bleue (France), Cap Roux (France), Bonifacio (France), Portofino (Italy), Egadi Islands (Italy), Torre Guaceto (Italy), Strunjan (Slovenia), Telašćica (Croatia) and Zakynthos (Greece) (Fig. 1). The MPAs varied quite significantly in age since establishment (i.e., 1983–2003), size (90–76,000 ha), and percentage no take area (2–100% of the total MPA) (Table 1). In all cases, SSF lived in communities within or near the MPAs – and their numbers ranged from 5 to 40 according to local key informants, which included local managers and SSF representatives (Table 1). Our aim was to sample a minimum of 30% of SSF in each area, and to increase the percent sampled as the overall population of SSF decreased. In the end, we sampled between 5 and 21 SSF in the vicinity of each MPA, or roughly 34.2–100% of SSF in each area (Table 1). Surveys were conducted with a convenience sample of available SSF from those who lived in each area.

The survey focused on a broad set of questions related to the demographics (e.g., gender, age, education, location, origin, people in household) and characteristics (e.g., income from fisheries, diversification, dependence) of small-scale fishers (see Supplementary materials – Table S1), as well as perceptions of social equity and MPA management. Our use of perceptions of small-scale fishers to evaluate levels of social equity is consistent with the idea that people will have different notions about what constitutes fair and acceptable (Bennett, 2016; Zafra-Calvo et al., 2019).

In this paper, we focus on a subset of survey questions and results related to social equity, which focused on recognitional, procedural, and distributional dimensions (see details in Table 2 and Supplementary materials – Table S2). In developing the survey items, we drew substantially from the indicators developed by Zafra-Calvo et al. (2017) while making significant modifications to the questions and developing some of our own indicators for additional attributes as explained below. For recognitional equity, we asked survey participants about the extent to which the cultural identity, rights, and traditional knowledge of SSF were taken into account in MPA management – and added an indicator related to consideration of SSF livelihoods. For procedural equity, we queried SSF perceptions of levels of participation, transparency, access to justice, accountability, and consultation and consent (i.e., Free, Prior and Informed Consent) – as well as developing new indicators related to communication of scientific information (i.e., "informed"), trust and legitimacy. For distributional equity, we developed a set of indicators related to the perceived social impacts of the MPA on different aspects of well-being – including income, livelihoods, food security, knowledge and education, community well-being, connection to nature, fish abundance - and used an item related to perceptions of fairness (in distribution of benefits) (Biedenweg et al., 2016; Breslow et al., 2016; Kaplan-Hallam and Bennett, 2018; Weeratunge et al., 2014). Our rationale for developing indicators for perceptions of the impacts of conservation on human-well-being for distributional equity is that this is a way to understand how the benefits and burdens of conservation are experienced by individuals and further analysis can help us explore how these perceived impacts differ by group (Dawson et al., 2018; Zafra-Calvo et al., 2017). Responses to survey items were on different scales, ranging from 2-point to 5-point scales.

4.2. Data analysis

All data analysis was completed in R Version 3.4.4 (R Core Team, 2018). First, we calculated descriptive statistics for all survey items focused on SSF demographics and characteristics, as well as for individual items related to the three categories of social equity.

Second, we created composite scores for each of the three categories of social equity (our primary outcomes) using the individual indicators (see Table 2). Before composing scores, the dataset was treated to deal with missing values (NAs). Although the number of NAs in the dataset was low (3.6%), composite scores could not be computed for a given questionnaire when one of the composing items was a missing value. Therefore, NA correction was done to avoid discarding a number of questionnaires in score computation. Specifically, we used the mice package in R (van Buuren and Groothuis-Oudshoorn, 2010) that creates multiple imputations (replacement values) for multivariate missing data. The method is based on Fully Conditional Specification, where each incomplete variable is imputed by a separate model (van Buuren, 2007). Once missing variables were imputed, for each category of equity (recognitional, procedural and distributional) the composite score was calculated by firstly normalizing to 0–2 all individual items composing the score as they were previously on different scales. Normalized items were then summed up and the resulting sum normalized again to 0–10 so that each category of social equity was on the same scale. Before summing the single items, internal coherence of the items in each scale was checked using Chronbach's alpha co-efficient. No issue with internal coherence was highlighted for any of the 3 composite scores created (always > 0.7). We also merged the 3 scores (recognitional, procedural and distributional) to create a combined equity score. This was done through summing the three composite equity scores, and then normalizing this new combined equity score on a scale

Table 1
Information about the selected marine protected areas, small-scale fishers (SSF) and interview sample.
(Sources: MPA websites, https://www.medpan.org/SIG/MAPAMEDvisualisation.html & *Key informant interviews with managers and SSF representatives).

MPA name	Designation	Established (year)	Age of MPA at time of survey (years)	Total area (ha)	Total no take area (ha) (% of total)	Estimated # of SSF in each site*	# of surveys (%) (total n = 149)
Cabo de Palos (Spain)	Marine Reserve	1995	22	1931	270 (14.0)	19	17 (89)
Es Freus (Spain)	Marine Reserve	1999	18	15,000	407 (2.7)	18	12 (66)
Cap Roux (France)	Cantonnement de Pêche	2003	14	445	445 (100)	30	14 (46)
Côte Bleue (France)	Marine Park	1983	35	9995	295 (3.0)	27	17 (63)
Bonifacio (France)	Natural Reserve	1999	18	76,000	4000 (5.3)	38	13 (34)
Portofino (Italy)	MPA	1999	18	346	19 (5.5)	22	15 (68)
Egadi Islands (Italy)	MPA	1991	26	54,000	1097 (2.0)	40	21 (52)
Torre Guaceto (Italy)	MPA	2001	16	2100	322 (15.3)	5	5 (100)
Strunjan (Slovenia)	Landscape Park	1990	27	90	33 (36.7)	10	9 (90)
Telašćica (Croatia)	Nature Park	1988	29	7000	141 (2.0)	7	7 (100)
Zakynthos (Greece)	National Marine Park	1999	18	8330	800 (9.6)	35	19 (54)

Table 2
Survey questions for indicators related to recognitional, procedural an distributional equity (Note: All survey responses have been converted to the following symbols: + + = Very positive/+ = Somewhat positive/N = Neutral/- = Somewhat negative/– = Very negative; see further details in Supplementary materials – Table S2).

Category	Attribute	Survey questions	Potential responses
Recognitional Equity	Rights	The rights of small-scale fishers are taken into account in MPA planning and management.	5 point scale (–/-/N/+/+ +)
	Livelihoods	The MPA management aligns with the livelihood needs of small-scale fishers.	5 point scale (–/-/N/+/+ +)
	Traditional Knowledge	The traditional knowledge of local small-scale fishers is documented and included in the MPA management	5 point scale (–/-/N/+/+ +)
	Culture	The MPA acknowledges and celebrates the unique culture and practices of small-scale fishers.	5 point scale (–/-/N/+/+ +)
Procedural Equity	Informed	Is there research and scientific information available (from the MPA management) about the marine environment and status of fisheries?	5 point scale (–/-/N/+/+ +)
	Transparency	Is information about how MPA decisions are made and the reasons for MPA management decisions readily available?	5 point scale (–/-/N/+/+ +)
	Participation	How much participation is there of small-scale fishers in MPA decision-making and management activities?	4 point scale (–/-/+/+ +)
	Consultation & consent	Which of the following statement describes the way that MPA management decisions are made with regards to consultation and consent?	4 point scale (–/-/N/+/+ +)
	Accountability	When issues arise for small-scale fishers related to the management of the marine protected area you know with whom and how to communicate?	2 point scale (-/+)
	Access to justice	Are there mechanisms to address disagreements or conflicts that arise between small-scale fishers and MPA management?	4 point scale (–/-/+/+ +)
	Trust	How would you classify the level of trust between small-scale fisher's and MPA management?	4 point scale (–/-/+/+ +)
	Legitimacy	Please read the following statements and rate your level of satisfaction: The overall management activities for the MPA	5 point scale (–/-/N/+/+ +)
Distributional Equity	Impacts on income	What do you think has been the impact of the MPA on your income?	3 point scale (-/N/+)
	Impacts on livelihoods	How do you think the MPA has impacted your livelihood?	4 point scale (–/-/+/+ +)
	Impacts on food security	In your opinion, how does the MPA impact the ability of small-scale fishers from the village to access and harvest fish for household consumption?	3 point scale (-/N/+)
	Impacts on knowledge and education	Please, indicate how the MPA affects the following aspects of the village: The knowledge of education of children or adults in the village about the marine environment	5 point scale (–/-/N/+/+ +)
	Impacts on community social well-being	Please, indicate how the MPA affects the following aspects of the village: Community activities and the overall sense of social well-being of people in the village	5 point scale (–/-/N/+/+ +)
	Impacts on cultural connection to nature	Please, indicate how the MPA affects the following aspects of the village: The connection between people in the village and the local marine environment	5 point scale (–/-/N/+/+ +)
	Impacts on fish abundance	In your opinion, the MPA is: decreasing/neither decreasing or increasing/increasing the number of fish	3 point scale (-/N/+)
	Perceptions of fairness	How do you view the fairness of the overall impacts and benefits of the MPA?	3 point scale (-/N/+)

of 0–10. We ran basic descriptive statistics to characterize the composition of all four equity scores.

Third, we tested for univariate associations (one-way ANOVA) between each of the four composite equity scores and geographic (i.e., MPA and country) and individual (i.e., SSF demographics and characteristics) factors. Given the substantial absence of information about perceptions of social equity in the context of MPAs and SSF, single factor analysis was implemented as a way to assess patterns for each single predictor. The potential predictors were chosen based on our knowledge of the literature and context, as factors that might influence the various dimensions of equity. Specifically, MPA, country and fishers' origin were used as factors in one-way ANOVAs. The number of years living in the village was treated as a continuous variable in a linear regression. All other predictors (namely: fishers' age, education, number of people in the household, relative wealth, percentage of incomes deriving from SSF, number of livelihoods, number of nights per week eating fish and fishery diversification) were ordinal. Thus, ANOVAs for factors with ordered levels were used (Gertheiss, 2014).

Finally, we used linear mixed effect models to develop predictive models for each composite social equity score using all geographic and individual factors (i.e., MPA, country, origin, number of years living in the village, age, education, number of people in the household, relative wealth, percentage of incomes deriving from SSF, number of livelihoods, number of nights per week eating fish and fishery diversification). In the linear mixed effect models (implementing the function lmer in the lme4 package R (Bates et al., 2015), MPA and country were considered random factors, while all other predictors were treated as fixed. Kenward-Roger F-test was implemented to test factor significance (Kenward and Roger, 1997). Pseudo-R^2 was used to calculate conditional and marginal coefficient of determination for the models and determining the proportion of variability explained by random and fixed components (Nakagawa et al., 2017).

5. Results

5.1. Characteristics of survey sample of small-scale fishers

Our sample consisted of 149 small-scale fishers who lived within or near the 11 MPAs. Our sample was 100% male. Many fishers were in older age brackets, with 48.9% (n = 72) older than 50 and only 6.8% (n = 10) between 20 and 30 years of age. Most (72.3%; n = 107) had completed only elementary or middle school. In terms of economic reliance on fisheries, for 39.9% (n = 57) all of their income came from fisheries, while for 29.4% (n = 42) it was more than half, and for 30.8% (n = 44) it was less than half. Only 31.5% (n = 45) reported that being a small-scale fisherman enables them to have a good quality of life, while 24.5% felt that “it can be challenging” and 44.1% said they are “just barely able” to make enough to live a good quality of life. Survey participants most often had 1 (53.3%; n = 73) or 2 (39.4%; n = 54) distinct livelihoods; however, fisheries portfolios were often quite diverse with those surveyed participating in an average of 2.8 distinct fisheries. Further details regarding the sample can be found in Supplementary materials – Table S3.

5.2. Small-scale fishers' perceptions of social equity

This section describes small-scale fishers' perceptions of individual items related to social equity and composite scores representing recognitional, procedural, distributional, and overall social equity.

5.2.1. Perceptions of individual items related to social equity

The descriptive analysis of the individual items or indicators related to social equity showed varied results across social equity categories (see Fig. 2 and Supplementary materials – Table S4). All of the indicators related to recognitional equity (i.e., culture, traditional knowledge, livelihoods, and rights) were slightly more slanted towards positive perceptions, but there was also a considerable spread from negative to positive evaluations. Different procedural indicators showed dissimilar results – with perceptions of legitimacy, voice and conflict management being balanced between positive and negative views, perceptions of accountability and consultation being slightly more positive, perceptions of trust and accountability being highly skewed towards the positive perceptions, and perceptions of communications of scientific information being slightly skewed towards the negative. Several indicators related to distributional equity were evaluated quite neutrally by participants – in particular for perceptions of impacts on incomes (64% neutral), food security (65% neutral), and impacts on community social well-being (49% neutral). Other distributional equity indicators showed different results – with perceptions of impacts on knowledge and education being evaluated quite positively overall, perceptions of impacts on fish abundance, cultural connections to nature and livelihoods being skewed slightly towards the positive, and perceptions of fairness of impacts skewed slightly to the negative.

5.3. Perceptions of recognitional, procedural, distributional, and combined social equity

Descriptive analysis showed that the distributions of all composite social equity scores – i.e., recognitional, procedural, distributional and combined - were slightly more positive than negative (Fig. 3a and Supplementary materials – Table S5). The mean and standard deviations for each was as follows: recognitional equity (Mean = 5.19, sd = 2.7), procedural equity (Mean = 5.38, sd = 2.51), distributional equity (Mean = 5.48, sd = 2.26), and combined social equity (Mean = 5.34, sd = 2.21). When we re-categorized the scores into 5 categories, ranging from very negative through to very positive, recognitional equity showed the largest variation with the least number of participants falling into the neutral category (n = 32, % = 21.48) and simultaneously the most positive and negative results (Fig. 3b). For

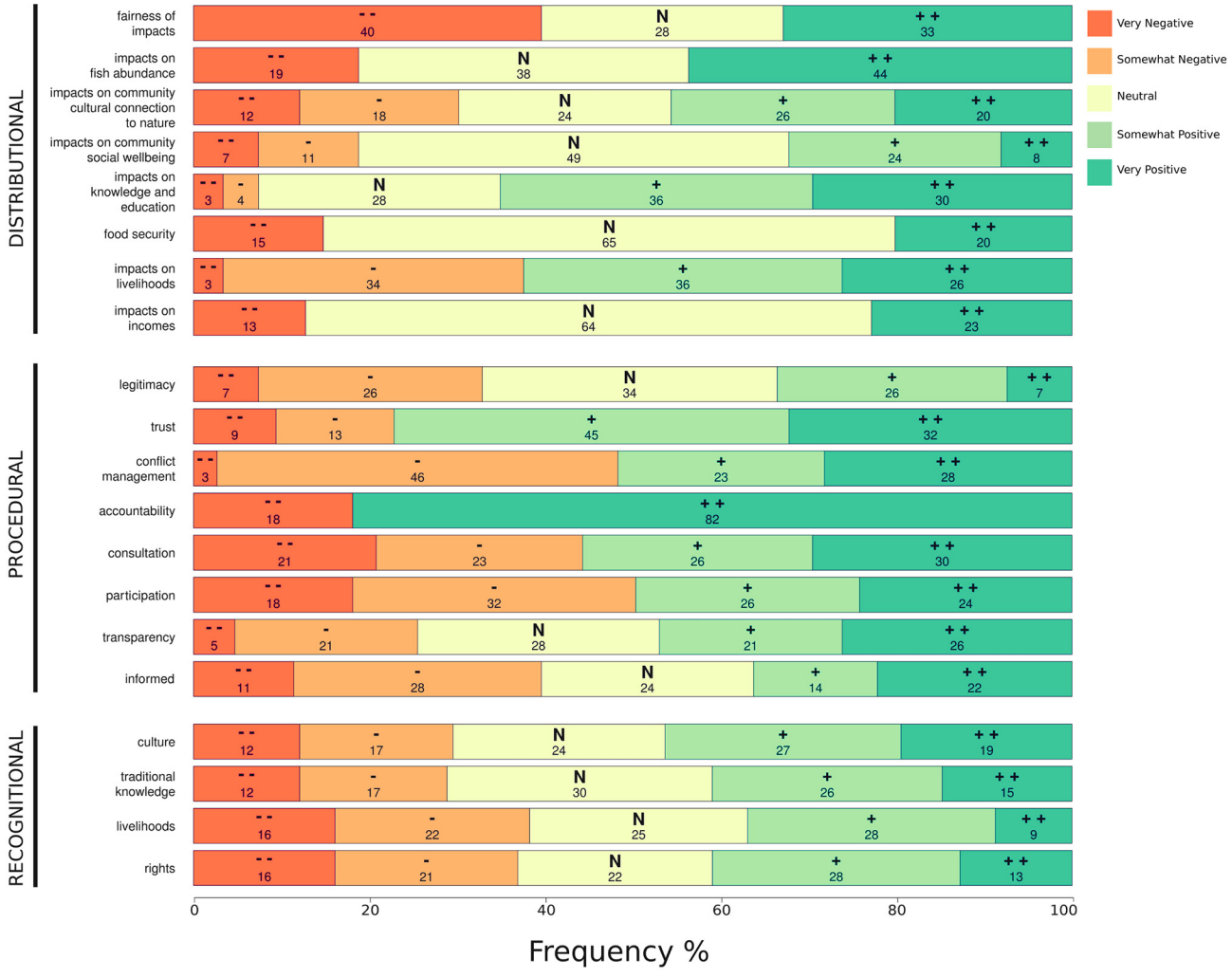

Fig. 2. Stacked bar charts showing frequency distributions for all individual indicators of social equity, organized by recognitional, procedural, and distributional categories. For ease of communication, all survey responses have been converted to the following symbols: + + = Very positive/ + = Somewhat positive/ N = Neutral/- = Somewhat negative/– = Very negative (See Table 2 and Supplementary materials – Table S2). Numbers inside the bars indicate percentages. (Further details are provided in Supplementary Materials – Table S4).

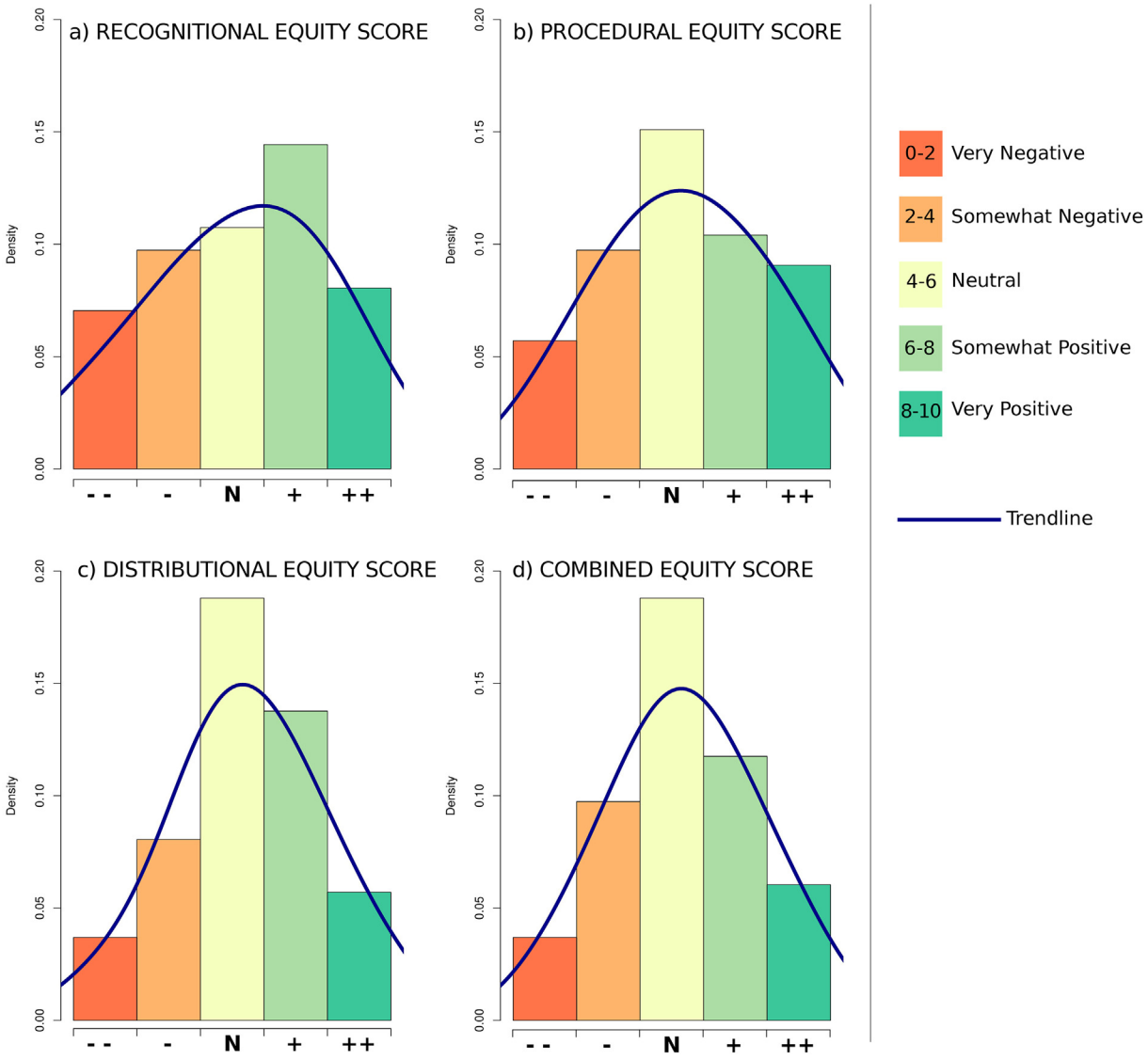

Fig. 3. Frequency distribution of recognitional, procedural, distributional and combined equity scores. The blue lines represent smooth density estimates (Further details are provided in Supplementary Materials – Table S5). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

the combined social equity score, 37.58% of survey participants (n = 56) fell within the neutral range, while 35.57% (n = 53) were positive or very positive, and 26.84% (n = 40) were negative or very negative.

5.4. Understanding how geographic and individual factors relate to perceptions of social equity

This section presents results of one-way associations and mixed-effects models that were employed to understand the relationship between different geographic and individual factors and recognitional, procedural, distributional, and combined social equity scores.

5.4.1. Effect of MPA and country on perceptions of social equity

All mean composite equity scores were significantly different among MPAs (Fig. 4 and Supplementary materials – Table S6). The highest values of recognitional equity were recorded in Torre Guaceto 9.06 ± 0.16 (mean ± se) and Côte Bleue (8.05 ± 0.34) while the lowest scores were in Cabo de Palos (3.2 ± 0.63) and Zakynthos (3.65 ± 0.47). The same pattern of high scores was recorded for the procedural, recognitional, distributional and combined equity scores. For distributional equity the lowest mean value was recorded for Egadi (2.42 ± 0.39). Finally, for the combined equity score, low mean values were recorded for Cabo de Palos, Zakynthos and Egadi.

Equity scores were also significantly different between countries (Table 3 & Supplementary materials – Fig. S1). Overall, mean combined scores were highest for surveys from France and Slovenia, while lowest mean scores were from Spain, Croatia and Greece. Slovenia and Italy had variable rankings depending on the score considered (Supplementary materials – Table S6).

5.4.2. Effect of SSF characteristics and demographics on perceptions of social equity

For single-factor models, higher recognitional equity scores were associated with a decrease in the proportion of SSF household incomes coming from fishing (i.e., as the proportion of income from fishing increased the distributional equity score decreased) and with fewer different gears used by fishers. Meanwhile, higher recognitional equity scores were associated with higher levels of education. The same relationship with education was found for procedural equity. Procedural equity was also inversely associated with the number of people in a fisherman's household, the number of different gears used by a SSF, and

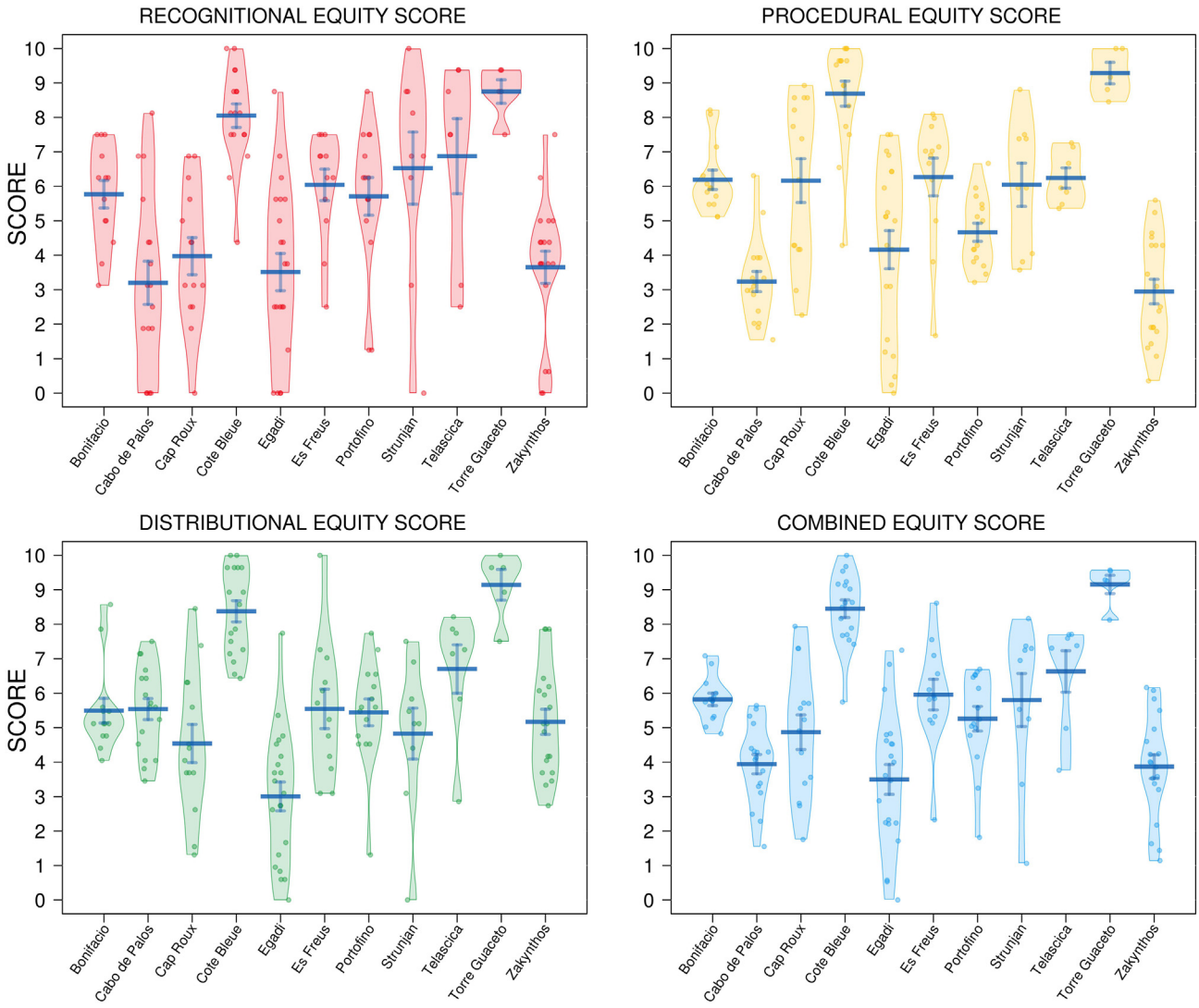

Fig. 4. Pirate plots of composite social equity scores separated by marine protected area. Blue horizontal and vertical bars represent means and standard errors respectively. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Table 3
Summary of results from univariate models of relationship between predictors and composite social equity scores. (Notes: the symbols ↗(+) or ↘(-) indicates the direction of the relationship for fixed factors with ordinal levels. Significance levels: blank = non-significant, * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$).

Predictors	Recognitional equity score (0 – 10)	Procedural equity score (0–10)	Distributional equity score (0–10)	Combined equity score (0–10)
Associated MPA (ANOVA)	***	***	***	***
Associated country (ANOVA)	**	***	*	***
Age (ordered ANOVA)				
Education (ordered ANOVA)	↗ *	↗ *		↗ *
People in household (ordered ANOVA)		↘ *		
Years in village (linear regression)				
Origin (ANOVA)				
Relative wealth (ordered ANOVA)			↗ **	
Percent income from fishing (ordered ANOVA)	↘ *			
Livelihood multiplicity (ordered ANOVA)				
Fisheries diversification (ordered ANOVA)	↘ *	↘ *		↘ *
Dependence on fish for food (ordered ANOVA)		↘ **		

the level of dependence on the seafood they catch for food. For distributional equity, the score was significantly and positively related with SSF perceptions of relative wealth, i.e. fishers who felt they earned enough money to have a good life quality had higher values for distributional equity. Finally, the combined equity score was significantly and positively related with education, while negatively related with fishery diversification.

5.4.3. Predictors of perceptions of social equity

The linear mixed effect models showed a statistical effect of MPAs on all of the composite social equity scores, while country was not significant for all equity scores (Table 4). For each social equity score, variability in the data was mainly explained by the random component (i.e., MPA), with marginal Rm^2 (i.e. the variance explained by the fixed component) ranging between 0.12 and 0.22, and the conditional Rm^2 (variance explained by the entire model) ranging between 0.64 and 0.72 (specifically: Rm 0.22 – Rc 0.66 for the Recognitional equity score; Rm 0.12 – Rc 0.64 for the Procedural score; Rm 0.20 – Rc 0.69 for the Distributional score and Rm 0.13 – Rc 0.72 for the Combined score). Significant effects of some fixed components were also apparent. Age showed a significant effect ($p < 0.01$) on the recognitional equity score, which decreased with increasing age (Fig. 5a). This pattern was consistent among all MPAs, except for Torre Guaceto where respondents all belonged to the same age group. A similar pattern, although only marginally significant ($p < 0.1$), was highlighted for age with distributional and combined equity scores. Significant relationships ($p < 0.05$) were also found between increasing levels of relative wealth (consistent across the MPAs) and the number of livelihoods and the distributional equity score (Fig. 5b & c).

6. Discussion

This paper builds on a long history of literature on social and environmental justice (Agyeman et al., 2003; Bullard, 1994; Cutter, 1995; Fraser, 1998; Miller, 1979, 1999; Schlosberg, 2009; Walker, 2009, 2012) and a growing literature and body of research on social equity in conservation (Dawson et al., 2018; Friedman et al., 2018; McDermott et al., 2013; Moreaux et al., 2018; Pascual et al., 2014; Schreckenberg et al., 2016; Sikor et al., 2014; Zafra-Calvo et al., 2017, 2019) and marine protected areas (Gill et al., 2019; Halpern et al., 2013; Hill et al., 2016; Kockel et al., 2019; Richmond and Kotowicz, 2015). In particular, we present the results of a quantitative survey of SSF perceptions of social equity in 11 MPAs across 6 countries in the Mediterranean Sea. Below, we summarize and situate our results within the literature, consider their broader management and practical implications, reflect on our methods, and offer some thoughts on future research.

In summary, our results showed significant variability in how different individual indicators of social equity are perceived. Descriptive analysis also demonstrated that recognitional, procedural, distributional, and combined social equity scores were quite varied and all were slightly more skewed towards positive perceptions. This variation could be expected in a study with multiple sites as it is typical of the broader literature on topics related to equity and MPAs, which range from very positive to highly negative assessments (Ban et al., 2019; Bennett and Dearden, 2014; Gurney et al., 2014; Jones, 2009; Said et al., 2017; Sowman and Sunde, 2018). These results further confirm that MPAs are neither monolithically positive or negative for stakeholders – and that we need to move beyond over-simplified and polarized narratives and towards more nuanced analyses of the social implications of conservation (Ban et al., 2019; Gill et al., 2019). Thus, we wanted to know what was driving the variability in perceptions of social equity and expected to see significant differences by place and among groups. In predictive models, only MPAs remained a highly significant predictor for all categories of social equity, while only age had a significant negative effect on perceptions of recognitional equity, and only relative wealth and number of livelihoods had a significant positive effect on perceptions of distributional equity.

Here, we situate these results in the broader literature and offer some insights into their implications for management. First, while we expected to find more significant effects of different SSF demographics and characteristics (e.g., dependence on fisheries, relative wealth, etc.) on perceptions of social equity, overall, MPA was the only predictor that was always a highly significant driver of differences in perceptions of social equity. This pattern likely stems from heterogeneity in MPA governance and management, that has been highlighted in previous studies (Gill et al., 2017; Scianna et al., 2019) and that could affect stakeholders' perceptions (Bennett et al., 2019). This finding also seems to confirm the claim that conservation actions tend to be site specific and thus that the best level at which to evaluate social equity and identify management actions to improve social equity is at each individual conservation initiative (Zafra-Calvo et al., 2019). Second, increasing age was associated with worsening perceptions of recognitional equity and, marginally, distributional and combined equity. Negative feelings regarding recognitional equity among older fishers may be relics, or memories, of the manner in which MPAs were originally implemented or past management actions (Bennett and Dearden, 2014; Durand et al., 2014). Younger generations of SSF may also share MPA core values. Either way, MPA managers might consider taking additional actions to further re-build relationships and trust with older generations of SSF through taking actions to engage them or recognize their rights, culture, knowledge and livelihoods in MPA management (Young et al., 2016). This is particularly important in the light of the gradual “graying of the fleet” that is happening in the fishing sector globally and in the Mediterranean Sea. Third, higher relative wealth and more diverse livelihoods led to improved perceptions of distributional equity. This result suggests that those with more socioeconomic advantages may be benefiting more than those with less wealth or opportunities, a scenario often described as “elite capture” in the conservation and development literature (Mansuri and Rao, 2004; Nunan, 2018; Persha and Andersson, 2014). It also confirms that programs to provide alternative and diversified livelihoods - in particular, those that target more vulnerable or poor segments of the population - are justified management interventions for conservation (Charles et al., 2016; Chen and Chang, 2017; Cillari et al., 2012; Wright et al., 2016).

One novel contribution of this research is that it is the first study to take an explicitly quantitative approach to the study of social equity in MPAs using the perceptions of local stakeholders. In particular, we sought to field test a method for assessing how small-scale fishers perceive levels of social equity in order to provide actionable insights for improving equity in MPA management. Here, we briefly reflect on

Table 4
Results of mixed effects models showing only remaining components that were significant. (Notes: significance of fixed predictors result from F-test on the linear mixed model; “neg” and “pos” indicates negative or positive trends.)

Score	Fixed component									
	Predictor	Chisq	pvalue	Rc^2	Predictor	df	Ftest	pvalue	Trend	Rm^2
Recognitional	MPA	33.96	< 0.0001	0.66	Age	4	3.36	0.012	neg	0.22
Procedural	MPA	30.95	< 0.0001	0.64						0.12
Distributional	MPA	46.06	< 0.0001	0.69	Years in village	1	3.288	0.072	pos	0.2
					Relative wealth	2	4.119	< 0.05	pos	
					Number of livelihoods	2	3.542	< 0.05	pos	
					Fishery diversification	5	1.905	0.099	neg	
					Age	4	2.081	0.088	neg	
Combined	MPA	53.26	2.91E-13	0.72	Age	4	2.102	0.085	neg	0.13

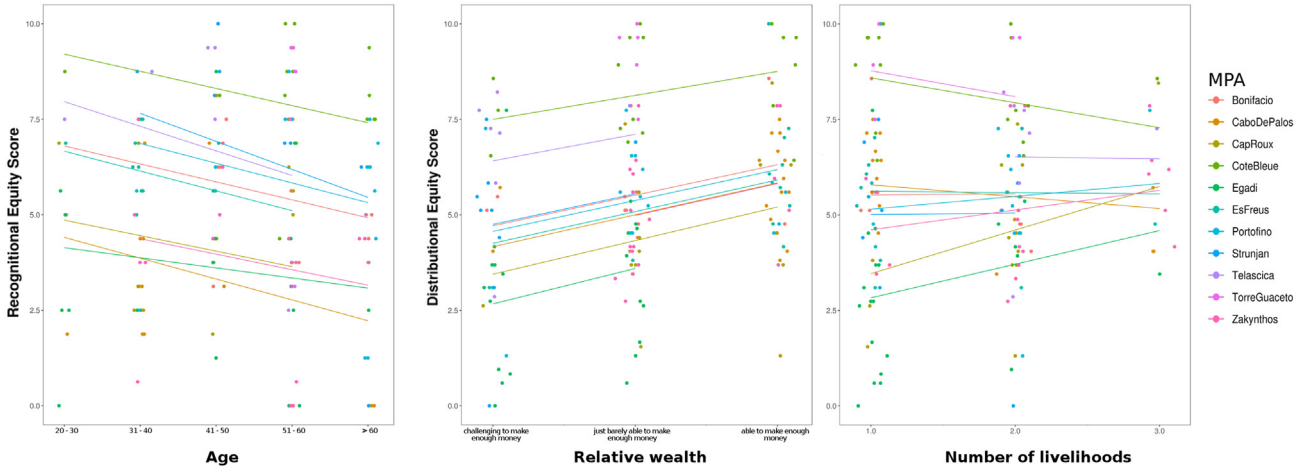

Fig. 5. Visualization of models where both MPA (represented by colored lines) and fixed components (on bottom) remained significant at $p < 0.05$ or greater. Original (dots) and predicted values by lme (lines) of: (left panel or a) recognitional equity score with increasing fishers' age and by MPA. Predicted values for Torre Guaceto not reported as not computed (all fishers belong to the same age class); (central panel or b) distributional equity score with increasing fishers' relative wealth and by MPA; (right panel – c) distributional equity score with increasing fishers' number of livelihoods and by MPA. Jittering added on the x-axis for better visualization.

the strengths and potential future improvements to our methods and approach. Overall, the survey was well-received by participants and it provided useful insights into how SSF perceived recognitional, procedural and distributional equity. Site level results offered insights into strong points and shortcomings with regards to equity, and thus potential interventions to improve local management. Thus, in sites where perceptions of procedural equity are found to be lower (e.g., Zakynthos, Cabo de Palos, Egadi, Portofino), management actions might be taken to improve transparency, participation in decision making or communication (Dawson et al., 2018; Lockwood, 2010). In MPAs where SSF have lower perceptions of distributional equity (e.g., Egadi, Cap Roux, Strunjan), management actions might be identified and taken to improve livelihoods, mitigate or compensate for negative social impacts, or communicate evidence of the benefits of MPAs (Kaplan-Hallam and Bennett, 2018). However, we would recommend that future research on this topic move beyond SSF to focus on multiple stakeholder groups to compare and contrast perceptions of equity. A simultaneous assessment of whether actions are being taken by management to pursue equity would also provide valuable insights. Further refinement of some indicators is also recommended – including using indicators that are all on the same scale (e.g., a 5-point Likert scale with a mid-point) as well as the addition of new indicators as social equity theory and practice continues to develop (Dawson et al., 2018; Friedman et al., 2018; Zafra-Calvo et al., 2017, 2019). For example, in the distribution section, we would recommend adding an indicator related to the presence or absence of mitigation, compensation, and restitution mechanisms to help balance harms and benefits of conservation (Bennett et al., 2017). Finally, there is a need to communicate results from equity assessments so that they can be incorporated into adaptive management (Armitage et al., 2010; Kaplan-Hallam and Bennett, 2018).

Lastly, for those pursuing further work on these topics, there are numerous useful directions for future research and analysis related to social equity – for example, examining the relationships (e.g., trade-offs and synergies) between different dimensions of equity (Gill et al., 2019), combining qualitative and quantitative approaches, comparing subjective perceptions of equity and observed measures of social equity (Dawson et al., 2018), understanding the geographic, contextual, managerial (e.g., staff and budget capacity, presence of a management plan) or governance factors leading to positive or negative perceptions of equity, and testing the bi-directional relationship between MPA effectiveness and various dimensions of equity. The last line of inquiry might draw insights from previous research on MPAs features (e.g. design, management and governance) that are significant predictors of MPA effectiveness in delivering ecological and social benefits (Ban et al., 2017, 2019; Di Franco et al., 2016; Edgar et al., 2014; Gill et al., 2017). Accomplishing some of these research recommendations would require a much larger number of case study sites.

7. Conclusion

Global conservation policy requires that the conservation community establish and “effectively and equitably” manage networks of terrestrial and marine protected areas. While there have been substantial efforts to assess and improve protected area management effectiveness, less attention has been paid to the assessment and management of social equity in conservation. Yet, social equity is an ethical imperative and it might also be instrumental to the long-term success and effectiveness of conservation. This paper builds on the growing body of work in this area and presents a novel method for using stakeholder perceptions to examine social equity. Our results show that small-scale fishers had varied and generally positive perceptions of recognition, procedural, distributional and combined social equity. The strongest predictor of these differences was the MPA, suggesting that improvements to management and governance actions need to be made at the site level to improve social equity. Additional predictors of recognitional equity included age (negative trend) and distributional equity included relative wealth and number of livelihoods (positive trend). These findings suggest that managers and policy makers might target specific groups of stakeholders (i.e., older, less wealthy, less diversified) with tailored management actions to enhance perceptions of social equity. In general, greater attention is needed to monitoring the human dimensions of conservation and communicating results to decision-makers and managers in order to facilitate the pursuit of social equity in conservation at all scales from local sites to national networks of protected areas. We encourage the adaptation, improvement and application of the methods presented here to understand and improve social equity in both marine and terrestrial conservation initiatives elsewhere. More broadly and more importantly, there is a need for the global conservation community to further develop clear policies and guidance, and national governments to provide personnel, training and financing, to support conservation planning and management processes that pursue social equity alongside environmental sustainability.

CRediT authorship contribution statement

Nathan J. Bennett:Conceptualization, Methodology, Formal analysis, Writing - original draft.**Antonio Calò**:Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft.**Antonio Di Franco**:Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft.**Federico Niccolini**:Conceptualization, Writing - review & editing.**Daniela Marzo**:Investigation, Writing - review & editing.**Ilenia Domina**:Investigation, Writing - review & editing.**Charalampos Dimitriadis**:Investigation, Writing - review & editing.**Francisco Sobrado**:Investigation, Writing - review & editing.**Marie-Catherine Santoni**:Investigation, Writing - review & editing.**Eric Charbonnel**:Investigation, Writing - review & editing.**Maria Trujillo**:Investigation, Writing - review & editing.**Jose Garcia-Charton**:Investigation, Writing - review & editing.**Leila Seddiki**:Investigation, Writing - review & editing.**Valentina Cappanera**:Investigation, Writing - review & editing.**Josipa Grbin**:Investigation, Writing - review & editing.**Luka Kastelic**:Investigation, Writing - review & editing.**Marco Milazzo**:Conceptualization, Writing - review & editing.**Paolo Guidetti**:Conceptualization, Methodology, Writing - review & editing.

Acknowledgements

This research was carried out in the framework of FishMPABlue 2 project (https://fishmpablue-2.interreg-med.eu/) funded by European Territorial Cooperation Programme MED and co-financed by European Regional Development Fund (ERDF). Authors are grateful to MPA managers Frederic Bachet, Olivier Bretton, Francesco de Franco, Victor Decugis, Ivoni Fournari–Konstantinidou, Lorenzo Merotto, Milena Ramov, Francois Cesari for their invaluable help in administering questionnaires. Many thanks also to the 149 fishers who accepted to be interviewed.

Declaration of competing interest

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

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.biocon.2020.108531.

References

Agrawal, A., Redford, K., 2009. Conservation and displacement: an overview. Conserv. Soc. 7 (1). https://doi.org/10.4103/0972-4923.54790.

Agyeman, J., Bullard, R.D., Evans, B., 2003. Just Sustainabilities: Development in an Unequal World. MIT Press.

Álvarez-Romero, J.G., Mills, M., Adams, V.M., Gurney, G.G., Pressey, R.L., Weeks, R., Ban, N.C., Cheok, J., Davies, T.E., Day, J.C., Hamel, M.A., Leslie, H.M., Magris, R.A., Storlie, C.J., 2018. Research advances and gaps in marine planning: towards a global database in systematic conservation planning. Biol. Conserv. 227, 369–382. https://doi.org/10.1016/j.biocon.2018.06.027.

Armitage, D., Berkes, F., Doubleday, N., 2010. Adaptive Co-Management: Collaboration, Learning, and Multi-Level Governance. UBC Press, Vancouver, BC.

Augustine, S., Dearden, P., 2014. Changing paradigms in marine and coastal conservation: a case study of clam gardens in the Southern Gulf Islands, Canada. Can. Geogr. Géographe Can. 58, 305–314. https://doi.org/10.1111/cag.12084.

Azzurro, E., Sbragaglia, V., Cerri, J., Bariche, M., Bolognini, L., Souissi, J.B., Busoni, G., Coco, S., Chryssanthi, A., Fanelli, E., Ghanem, R., Garrabou, J., Gianni, F., Grati, F., Kolitari, J., Letterio, G., Lipej, L., Mazzoldi, C., Milone, N., Pannacciulli, F., Pešić, A., Samuel-Rhoads, Y., Saponari, L., Tomanic, J., Topçu, N.E., Vargiu, G., Moschella, P., 2019. Climate change, biological invasions, and the shifting distribution of Mediterranean fishes: a large-scale survey based on local ecological knowledge. Glob. Change Biol. 25, 2779–2792. https://doi.org/10.1111/gcb.14670.

Ban, N.C., Frid, A., 2018. Indigenous peoples' rights and marine protected areas. Mar. Policy 87, 180–185. https://doi.org/10.1016/j.marpol.2017.10.020.

Ban, N.C., Davies, T.E., Aguilera, S.E., Brooks, C., Cox, M., Epstein, G., Evans, L.S., Maxwell, S.M., Nenadovic, M., 2017. Social and ecological effectiveness of large marine protected areas. Glob. Environ. Change 43, 82–91. https://doi.org/10.1016/j.gloenvcha.2017.01.003.

Ban, N.C., Gurney, G.G., Marshall, N., Whitney, C.K., Mills, M., Gelcich, S., Bennett, N.J., Meehan, M., Butler, C., Ban, S., Tran, T.C., Cox, M.E., Breslow, S.J., 2019. Well-being outcomes of marine protected areas. Nat. Sustain. https://doi.org/10.1038/s41893-019-0306-2.

Bates, D., Mächler, M., Bolker, B., Walker, S., 2015. Fitting linear mixed-effects models using lme4. J. Stat. Softw. 67, 1–48.

Bennett, N.J., 2016. Using perceptions as evidence to improve conservation and environmental management. Conserv. Biol. 30, 582–592. https://doi.org/10.1111/cobi.12681.

Bennett, N.J., Dearden, P., 2014. Why local people do not support conservation: community perceptions of marine protected area livelihood impacts, governance and management in Thailand. Mar. Policy 44, 107–116. https://doi.org/10.1016/j.marpol.2013.08.017.

Bennett, N.J., Teh, L., Ota, Y., Christie, P., Ayers, A., Day, J.C., Franks, P., Gill, D., Gruby, R.L., Kittinger, J.N., Koehn, J.Z., Lewis, N., Parks, J., Vierros, M., Whitty, T.S., Wilhelm, A., Wright, K., Aburto, J.A., Finkbeiner, E.M., Gaymer, C.F., Govan, H., Gray, N., Jarvis, R.M., Kaplan-Hallam, M., Satterfield, T., 2017. An appeal for a code of conduct for marine conservation. Mar. Policy 81, 411–418. https://doi.org/10.1016/j.marpol.2017.03.035.

Bennett, N.J., Franco, A.D., Calò, A., Nethery, E., Niccolini, F., Milazzo, M., Guidetti, P., 2019. Local support for conservation is associated with perceptions of good governance, social impacts, and ecological effectiveness. Conserv. Lett. 12, e12640. https://doi.org/10.1111/conl.12640.

Biedenweg, K., Stiles, K., Wellman, K., 2016. A holistic framework for identifying human wellbeing indicators for marine policy. Mar. Policy 64, 31–37. https://doi.org/10.1016/j.marpol.2015.11.002.

Borrini, G., Kothari, A., Oviedo, G., 2004. Indigenous and Local Communities and Protected Areas: Towards Equity and Enhanced Conservation: Guidance on Policy and Practice for Co-Managed Protected Areas and Community Conserved Areas. IUCN, Gland, Switzerland.

Bray, D., Velazquez, A., 2009. From displacement-based conservation to place-based conservation. Conserv. Soc. 7, 11–14. https://doi.org/10.4103/0972-4923.54791.

Breslow, S.J., Sojka, B., Barnea, R., Basurto, X., Carothers, C., Charnley, S., Coulthard, S., Dolšak, N., Donatuto, J., García-Quijano, C., Hicks, C.C., Levine, A., Mascia, M.B., Norman, K., Poe, M., Satterfield, T., Martin, K.St., Levin, P.S., 2016. Conceptualizing and operationalizing human wellbeing for ecosystem assessment and management. Environ. Sci. Pol. 66, 250–259. https://doi.org/10.1016/j.envsci.2016.06.023.

Brockington, D., Igoe, J., 2006. Eviction for conservation: a global overview. Conserv. Soc. 4, 424.

Bullard, R.D., 1994. Unequal Protection: Environmental Justice and Communities of Color. Sierra Club Books.

van Buuren, S., 2007. Multiple imputation of discrete and continuous data by fully conditional specification. Stat. Methods Med. Res. 16, 219–242. https://doi.org/10.1177/0962280206074463.

van Buuren, S. van, Groothuis-Oudshoorn, K., 2010. Mice: multivariate imputation by chained equations in R. J. Stat. Softw. 1–68.

CBD, 2010. Aichi Biodiversity Targets [WWW Document]. Conv. Biol. Divers URL. http://www.cbd.int/sp/targets (accessed 3.23.13).

Charles, A., Westlund, L., Bartley, D.M., Fletcher, W.J., Garcia, S., Govan, H., Sanders, J., 2016. Fishing livelihoods as key to marine protected areas: insights from the World Parks Congress. Aquat. Conserv. Mar. Freshw. Ecosyst. 26, 165–184. https://doi.org/10.1002/aqc.2648.

Chen, C.-L., Chang, Y.-C., 2017. A transition beyond traditional fisheries: Taiwan's experience with developing fishing tourism. Mar. Policy 79, 84–91. https://doi.org/10.1016/j.marpol.2017.02.011.

Christie, P., Bennett, N.J., Gray, N.J., 'Aulani Wilhelm, T., Lewis, N., Parks, J., Ban, N.C., Gruby, R.L., Gordon, L., Day, J., Taei, S., Friedlander, A.M., 2017. Why people matter in ocean governance: incorporating human dimensions into large-scale marine protected areas. Mar. Policy 84, 273–284. doi:https://doi.org/10.1016/j.marpol.2017.08.002.

Cillari, T., Falautano, M., Castriota, L., Marino, V., Vivona, P., Andaloro, F., 2012. The use of bottom longline on soft bottoms: an opportunity of development for fishing tourism along a coastal area of the Strait of Sicily (Mediterranean Sea). Ocean Coast. Manag. 55, 20–26. https://doi.org/10.1016/j.ocecoaman.2011.10.007.

Cinner, J.E., Daw, T., Huchery, C., Thoya, P., Wamukota, A., Cedras, M., Abunge, C., 2014. Winners and losers in marine conservation: fishers' displacement and livelihood benefits from marine reserves. Soc. Nat. Resour. 27, 994–1005. https://doi.org/10.1080/08941920.2014.918229.

Coll, M., Piroddi, C., Steenbeek, J., Kaschner, K., Lasram, F.B.R., Aguzzi, J., Ballesteros, E., Bianchi, C.N., Corbera, J., Dailianis, T., Danovaro, R., Estrada, M., Froglia, C., Galil, B.S., Gasol, J.M., Gertwagen, R., Gil, J., Guilhaumon, F., Kesner-Reyes, K., Kitsos, M.-S., Koukouras, A., Lampadariou, N., Laxamana, E., Cuadra, C.M.L.-F. de la, Lotze, H.K., Martin, D., Mouillot, D., Oro, D., Raicevich, S., Rius-Barile, J., Saiz-Salinas, J.I., Vicente, C.S., Somot, S., Templado, J., Turon, X., Vafidis, D., Villanueva, R., Voultsiadou, E., 2010. The biodiversity of the Mediterranean Sea: estimates, patterns, and threats. PLoS One 5, e11842. https://doi.org/10.1371/journal.pone.0011842.

Cormier-Salem, M.C., 2014. Participatory governance of Marine Protected Areas: a political challenge, an ethical imperative, different trajectories. S.A.P.I.EN.S 7.2, Online URL : http://journals.openedition.org/sapiens/1560.

Cutter, S.L., 1995. Race, class and environmental justice. Prog. Hum. Geogr. 19, 111–122.

https://doi.org/10.1177/030913259501900111.
Dawson, N., Martin, A., Danielsen, F., 2018. Assessing equity in protected area governance: approaches to promote just and effective conservation. Conserv. Lett. 11, e12388. https://doi.org/10.1111/conl.12388.
Day, J., Dudley, N., Hockings, M., Holmes, G., Laffoley, D., Stolton, S., Wells, S., 2012. Guidelines for Applying the IUCN Protected Area Management Categories to Marine Protected Areas. IUCN, Gland, Switzerland.
De Santo, E.M., 2013a. Missing marine protected area (MPA) targets: how the push for quantity over quality undermines sustainability and social justice. J. Environ. Manag. 124, 137–146. https://doi.org/10.1016/j.jenvman.2013.01.033.
De Santo, E.M., 2013b. Missing marine protected area (MPA) targets: how the push for quantity over quality undermines sustainability and social justice. J. Environ. Manag. 124, 137–146. https://doi.org/10.1016/j.jenvman.2013.01.033.
De Santo, E.M., Jones, P.J.S., Miller, A.M.M., 2011. Fortress conservation at sea: a commentary on the Chagos marine protected area. Mar. Policy 35, 258–260. https://doi.org/10.1016/j.marpol.2010.09.004.
Dearden, P., Bennett, N.J., 2016. The role of aboriginal people in protected areas. In: Dearden, P., Rollins, R. (Eds.), Parks and Protected Areas in Canada. Oxford University Press, Don Mills, Ontario, pp. 357–390.
Di Franco, A., Thiriet, P., Di Carlo, G., Dimitriadis, C., Francour, P., Gutiérrez, N.L., Jeudy de Grissac, A., Koutsoubas, D., Milazzo, M., Otero, M. del M., Piante, C., Plass-Johnson, J., Sainz-Trapaga, S., Santarossa, L., Tudela, S., Guidetti, P., 2016. Five key attributes can increase marine protected areas performance for small-scale fisheries management. Sci. Rep. 6. https://doi.org/10.1038/srep38135.
Di Franco, A., Plass-Johnson, J.G., Di Lorenzo, M., Meola, B., Claudet, J., Gaines, S.D., García-Charton, J.A., Giakoumi, S., Grorud-Colvert, K., Hackradt, C.W., Micheli, F., Guidetti, P., 2018. Linking home ranges to protected area size: the case study of the Mediterranean Sea. Biol. Conserv. 221, 175–181. https://doi.org/10.1016/j.biocon.2018.03.012.
Durand, L., Figueroa, F., Trench, T., 2014. Inclusion and exclusion in participation strategies in the Montes Azules biosphere reserve, Chiapas, Mexico. Conserv. Soc. 12, 175–189.
Edgar, G.J., Stuart-Smith, R.D., Willis, T.J., Kininmonth, S., Baker, S.C., Banks, S., Barrett, N.S., Becerro, M.A., Bernard, A.T.F., Berkhout, J., Buxton, C.D., Campbell, S.J., Cooper, A.T., Davey, M., Edgar, S.C., Försterra, G., Galván, D.E., Irigoyen, A.J., Kushner, D.J., Moura, R., Parnell, P.E., Shears, N.T., Soler, G., Strain, E.M.A., Thomson, R.J., 2014. Global conservation outcomes depend on marine protected areas with five key features. Nature 506, 216–220. https://doi.org/10.1038/nature13022.
FAO, 2016. The state of Mediterranean and Black Sea fisheries 2016 (SoMFi). In: The State of the Mediterranean and Black Sea Fisheries. FAO, Rome, Italy.
Fox, H.E., Holtzman, J.L., Haisfield, K.M., McNally, C.G., Cid, G.A., Mascia, M.B., Parks, J.E., Pomeroy, R.S., 2014. How are our MPAs doing? Challenges in assessing global patterns in marine protected area performance. Coast. Manag. 42, 207–226. https://doi.org/10.1080/08920753.2014.904178.
Franks, P., Booker, F., Roe, D., 2018. Understanding and Assessing Equity in Protected Area Conservation. IIED, London, UK.
Fraser, N., 1998. Social justice in the age of identity politics: redistribution, recognition, and participation. Tann. Lect. Hum. Values 19, 2–67.
Freeman, E.R., Civera, C., Cortese, D., Fiandrino, S., 2018. Strategising stakeholder empowerment for effective co-management within fishery-based commons. Br. Food J. https://doi.org/10.1108/BFJ-01-2018-0041.
Friedman, R.S., Law, E.A., Bennett, N.J., Ives, C.D., Thorn, J.P.R., Wilson, K.A., 2018. How just and just how? A systematic review of social equity in conservation research. Environ. Res. Lett. 13, 053001. https://doi.org/10.1088/1748-9326/aabcde.
Gaymer, C.F., Stadel, A.V., Ban, N.C., Cárcamo, P.F., Ierna, J., Lieberknecht, L.M., 2014. Merging top-down and bottom-up approaches in marine protected areas planning: experiences from around the globe. Aquat. Conserv. Mar. Freshw. Ecosyst. 24, 128–144. https://doi.org/10.1002/aqc.2508.
Gertheiss, J., 2014. ANOVA for factors with ordered levels. J. Agric. Biol. Environ. Stat. 19, 258–277. https://doi.org/10.1007/s13253-014-0170-5.
Giakoumi, S., Sini, M., Gerovasileiou, V., Mazor, T., Beher, J., Possingham, H.P., Abdulla, A., Çinar, M.E., Dendrinos, P., Gucu, A.C., Karamanlidis, A.A., Rodic, P., Panayotidis, P., Taskin, E., Jaklin, A., Voultsiadou, E., Webster, C., Zenetos, A., Katsanevakis, S., 2013. Ecoregion-based conservation planning in the Mediterranean: dealing with large-scale heterogeneity. PLoS One 8, e76449. https://doi.org/10.1371/journal.pone.0076449.
Gill, D.A., Mascia, M.B., Ahmadia, G.N., Glew, L., Lester, S.E., Barnes, M., Craigie, I., Darling, E.S., Free, C.M., Geldmann, J., Holst, S., Jensen, O.P., White, A.T., Basurto, X., Coad, L., Gates, R.D., Guannel, G., Mumby, P.J., Thomas, H., Whitmee, S., Woodley, S., Fox, H.E., 2017. Capacity shortfalls hinder the performance of marine protected areas globally. Nature 543, 665–669. https://doi.org/10.1038/nature21708.
Gill, D.A., Cheng, S.H., Glew, L., Aigner, E., Bennett, N.J., Mascia, M.B., 2019. Social synergies, tradeoffs, and equity in marine conservation impacts. Annu. Rev. Environ. Resour. 44, 347–372. https://doi.org/10.1146/annurev-environ-110718-032344.
Gjertsen, H., 2005. Can habitat protection lead to improvements in human well-being? Evidence from marine protected areas in the Philippines. World Dev. 33, 199–217. https://doi.org/10.1016/j.worlddev.2004.07.009.
Gómez, S., Lloret, J., Demestre, M., Riera, V., 2006. The decline of the artisanal fisheries in Mediterranean coastal areas: the case of Cap de Creus (Cape Creus). Coast. Manag. 34, 217–232. https://doi.org/10.1080/08920750500531389.
Guénette, S., Chuenpagdee, R., Jones, R., 2008. Marine protected areas with an emphasis on local communities and indigenous peoples: a review. In: Fisheries Centre Research Report No. Volume 8, Number 1. Fisheries Center, University of British Columbia, Vancouver, B.C..
Gurney, G.G., Cinner, J., Ban, N.C., Pressey, R.L., Pollnac, R., Campbell, S.J., Tasidjawa, S., Setiawan, F., 2014. Poverty and protected areas: an evaluation of a marine integrated conservation and development project in Indonesia. Glob. Environ. Change 26, 98–107. https://doi.org/10.1016/j.gloenvcha.2014.04.003.
Gurney, G.G., Pressey, R.L., Ban, N.C., Alvarez-Romero, J.G., Jupiter, S., Adams, V.M., 2015. Efficient and equitable design of marine protected areas in Fiji through inclusion of stakeholder-specific objectives in conservation planning. Conserv. Biol. 29, 1378–1389. https://doi.org/10.1111/cobi.12514.
Gustavsson, M., Lindström, L., Jiddawi, N.S., de la Torre-Castro, M., 2014. Procedural and distributive justice in a community-based managed marine protected area in Zanzibar, Tanzania. Mar. Policy 46, 91–100. https://doi.org/10.1016/j.marpol.2014.01.005.
Guyader, O., Berthou, P., Koutsikopoulos, C., Alban, F., Demanèche, S., Gaspar, M.B., Eschbaum, R., Fahy, E., Tully, O., Reynal, L., Curtil, O., Frangoudes, K., Maynou, F., 2013. Small scale fisheries in Europe: a comparative analysis based on a selection of case studies. Fish. Res. 140, 1–13. https://doi.org/10.1016/j.fishres.2012.11.008.
Halpern, B.S., Klein, C.J., Brown, C.J., Beger, M., Grantham, H.S., Mangubhai, S., Ruckelshaus, M., Tulloch, V.J., Watts, M., White, C., Possingham, H.P., 2013. Achieving the triple bottom line in the face of inherent trade-offs among social equity, economic return, and conservation. Proc. Natl. Acad. Sci. 110, 6229–6234. https://doi.org/10.1073/pnas.1217689110.
Hamann, M., Berry, K., Chaigneau, T., Curry, T., Heilmayr, R., Henriksson, P.J.G., Hentati-Sundberg, J., Jina, A., Lindkvist, E., Lopez-Maldonado, Y., Nieminen, E., Piaggio, M., Qiu, J., Rocha, J.C., Schill, C., Shepon, A., Tilman, A.R., van den Bijgaart, I., Wu, T., 2018. Inequality and the biosphere. Annu. Rev. Environ. Resour. 43, 61–83. https://doi.org/10.1146/annurev-environ-102017-025949.
Hill, L.S., Johnson, J.A., Adamowski, J., 2016. Meeting Aichi target 11: equity considerations in marine protected areas design. Ocean Coast. Manag. 134, 112–119. https://doi.org/10.1016/j.ocecoaman.2016.09.017.
Himes, A.H., 2003. Small-scale Sicilian fisheries: opinions of artisanal fishers and sociocultural effects in two MPA case studies. Coast. Manag. 31, 389–408. https://doi.org/10.1080/08920750390232965.
Hogg, K., Noguera-Méndez, P., Semitiel-García, M., Gray, T., Young, S., 2017. Controversies over stakeholder participation in marine protected area (MPA) management: a case study of the Cabo de Palos-Islas Hormigas MPA. Ocean Coast. Manag. 144, 120–128. https://doi.org/10.1016/j.ocecoaman.2017.05.002.
IUCN, 2005. Benefits beyond Boundaries: Proceedings of the Vth IUCN World Parks Congress: Durban, South Africa 8–17 September 2003. Island Press, Washington, D.C.
Jones, P.J.S., 2009. Equity, justice and power issues raised by no-take marine protected area proposals. Mar. Policy 33, 759–765. https://doi.org/10.1016/j.marpol.2009.02.009.
Kaplan-Hallam, M., Bennett, N.J., 2018. Adaptive social impact management for conservation and environmental management. Conserv. Biol. 32, 304–314. https://doi.org/10.1111/cobi.12985.
Kelleher, G., Kenchington, R.A., 1992. Guidelines for Establishing Marine Protected Areas. IUCN.
Kenward, M.G., Roger, J.H., 1997. Small sample inference for fixed effects from restricted maximum likelihood. Biometrics 53, 983–997. https://doi.org/10.2307/2533558.
Kleiber, D., Harris, L., Vincent, A.C.J., 2018. Gender and marine protected areas: a case study of Danajon Bank, Philippines. Marit. Stud. https://doi.org/10.1007/s40152-018-0107-7.
Kockel, A., Ban, N.C., Costa, M., Dearden, P., 2019. Evaluating approaches for scaling up community-based marine protected areas into socially equitable and ecologically representative networks. Conserv. Biol. https://doi.org/10.1111/cobi.13368. 0, online.
Lamine, E.B., Franco, A.D., Romdhane, M.S., Francour, P., 2018. Comparing commercial, recreational and illegal coastal fishery catches and their economic values: a survey from the southern Mediterranean Sea. Fish. Manag. Ecol. 25, 456–463. https://doi.org/10.1111/fme.12321.
Leach, M., Reyers, B., Bai, X., Brondizio, E.S., Cook, C., Díaz, S., Espindola, G., Scobie, M., Stafford-Smith, M., Subramanian, S.M., 2018. Equity and sustainability in the Anthropocene: a social–ecological systems perspective on their intertwined futures. Glob. Sustain. 1. https://doi.org/10.1017/sus.2018.12.
Leisher, C., van Beukering, P., Scherl, L., 2007. Nature's Investment Bank: How Marine Protected Areas Contribute to Poverty Reduction. The Nature Conservancy/WWF International.
Lele, S., Wilshusen, P., Brockington, D., Seidler, R., Bawa, K., 2010. Beyond exclusion: alternative approaches to biodiversity conservation in the developing tropics. Curr. Opin. Environ. Sustain. 2, 94–100. https://doi.org/10.1016/j.cosust.2010.03.006.
Lloret, J., Cowx, I.G., Cabral, H., Castro, M., Font, T., Gonçalves, J.M.S., Gordoa, A., Hoefnagel, E., Matić-Skoko, S., Mikkelsen, E., Morales-Nin, B., Moutopoulos, D.K., Muñoz, M., dos Santos, M.N., Pintassilgo, P., Pita, C., Stergiou, K.I., Ünal, V., Veiga, P., Erzini, K., 2018. Small-scale coastal fisheries in European seas are not what they were: ecological, social and economic changes. Mar. Policy 98, 176–186. https://doi.org/10.1016/j.marpol.2016.11.007.
Lockwood, M., 2010. Good governance for terrestrial protected areas: a framework, principles and performance outcomes. J. Environ. Manag. 91, 754–766. https://doi.org/10.1016/j.jenvman.2009.10.005.
Loft, L., Le, D.N., Pham, T.T., Yang, A.L., Tjajadi, J.S., Wong, G.Y., 2017. Whose equity matters? National to local equity perceptions in Vietnam's payments for forest ecosystem services scheme. Ecol. Econ. 135, 164–175. https://doi.org/10.1016/j.ecolecon.2017.01.016.
Mahajan, S.L., Daw, T., 2016. Perceptions of ecosystem services and benefits to human well-being from community-based marine protected areas in Kenya. Mar. Policy 74, 108–119. https://doi.org/10.1016/j.marpol.2016.09.005.
Mansuri, G., Rao, V., 2004. Community-based and -driven development: a critical review.

World Bank Res. Obs. 19, 1–39.
Martin, A., Gross-Camp, N., Kebede, B., McGuire, S., 2014a. Measuring effectiveness, efficiency and equity in an experimental payments for ecosystem services trial. Glob. Environ. Change 28, 216–226. https://doi.org/10.1016/j.gloenvcha.2014.07.003.
Martin, A., Gross-Camp, N., Kebede, B., McGuire, S., Munyarukaza, J., 2014b. Whose environmental justice? Exploring local and global perspectives in a payments for ecosystem services scheme in Rwanda. Geoforum 54, 167–177. https://doi.org/10.1016/j.geoforum.2013.02.006.
Mascia, M.B., Claus, C.A., 2009. A property rights approach to understanding human displacement from protected areas: the case of marine protected areas. Conserv. Biol. 23, 16–23. https://doi.org/10.1111/j.1523-1739.2008.01050.x.
Mascia, M.B., Claus, C.A., Naidoo, R., 2010. Impacts of marine protected areas on fishing communities: MPA social impacts. Conserv. Biol. 24, 1424–1429. https://doi.org/10.1111/j.1523-1739.2010.01523.x.
McDermott, M., Mahanty, S., Schreckenberg, K., 2013. Examining equity: a multidimensional framework for assessing equity in payments for ecosystem services. Environ. Sci. Pol. 33, 416–427. https://doi.org/10.1016/j.envsci.2012.10.006.
MedPAN, 2016. The 2016 Status of Marine Protected Areas in the Mediterranean - Main Findings. MedPAN, UN Environment/MAP - SPA/RAC.
Micheli, F., Niccolini, F., 2013. Achieving success under pressure in the conservation of intensely used coastal areas. Ecol. Soc. 18. https://doi.org/10.5751/ES-05799-180419.
Micheli, F., Levin, N., Giakoumi, S., Katsanevakis, S., Abdulla, A., Coll, M., Fraschetti, S., Kark, S., Koutsoubas, D., Mackelworth, P., Maiorano, L., Possingham, H.P., 2013. Setting priorities for regional conservation planning in the Mediterranean Sea. PLoS One 8, e59038. https://doi.org/10.1371/journal.pone.0059038.
Miller, D., 1979. Social Justice. OUP Oxford, Oxford, UK.
Miller, D., 1999. Principles of Social Justice. Harvard University Press, Cambridge, MA.
Moreaux, C., Zafra-Calvo, N., Vansteelant, N.G., Wicander, S., Burgess, N.D., 2018. Can existing assessment tools be used to track equity in protected area management under Aichi Target 11? Biol. Conserv. 224, 242–247. https://doi.org/10.1016/j.biocon.2018.06.005.
Naidoo, R., Gerkey, D., Hole, D., Pfaff, A., Ellis, A.M., Golden, C.D., Herrera, D., Johnson, K., Mulligan, M., Ricketts, T.H., Fisher, B., 2019. Evaluating the impacts of protected areas on human well-being across the developing world. Sci. Adv. 5, eaav3006. https://doi.org/10.1126/sciadv.aav3006.
Nakagawa, S., Johnson, P.C.D., Schielzeth, H., 2017. The coefficient of determination R2 and intra-class correlation coefficient from generalized linear mixed-effects models revisited and expanded. J. R. Soc. Interface 14, 20170213. https://doi.org/10.1098/rsif.2017.0213.
Nunan, F., 2018. Conservation and people. In: Binns, T., Lynch, K., Nel, E. (Eds.), Handbook of African Development. Routledge, New York, pp. 248–257.
Pascual, U., Phelps, J., Garmendia, E., Brown, K., Corbera, E., Martin, A., Gomez-Baggethun, E., Muradian, R., 2014. Social equity matters in payments for ecosystem services. BioScience 64, 1027–1036. https://doi.org/10.1093/biosci/biu146.
Persha, L., Andersson, K., 2014. Elite capture risk and mitigation in decentralized forest governance regimes. Glob. Environ. Change 24, 265–276. https://doi.org/10.1016/j.gloenvcha.2013.12.005.
PISCO, UNS, 2016. The Science of Marine Protected Areas. Partnership for Interdisciplinary Studies of Coastal Oceans and University of Nice Sophia Antipolis, Nice, France.
Pomeroy, R.S., Parks, J.E., Watson, L.M., 2004. How Is Your MPA Doing?: A Guidebook of Natural and Social Indicators for Evaluating Marine Protected Area Management Effectiveness. IUCN, Gland, Switzerland.
R Core Team, 2018. R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria.
Richmond, L., Kotowicz, D., 2015. Equity and access in marine protected areas: the history and future of 'traditional indigenous fishing' in the Marianas Trench Marine National Monument. Appl. Geogr. https://doi.org/10.1016/j.apgeog.2014.11.007.
Said, A., MacMillan, D., Schembri, M., Tzanopoulos, J., 2017. Fishing in a congested sea: what do marine protected areas imply for the future of the Maltese artisanal fleet? Appl. Geogr. 87, 245–255. https://doi.org/10.1016/j.apgeog.2017.08.013.
Sandlos, J., 2011. Hunters at the Margin: Native People and Wildlife Conservation in the Northwest Territories. UBC Press.
Schlosberg, D., 2009. Defining Environmental Justice: Theories, Movements, and Nature. Oxford University Press, New York.
Schreckenberg, K., Franks, P., Martin, A., Lang, B., 2016. Unpacking equity for protected area conservation. Parks 22, 11–26.
Scianna, C., Niccolini, F., Giakoumi, S., Di Franco, A., Gaines, S.D., Bianchi, C.N., Scaccia, L., Bava, S., Cappanera, V., Charbonnel, E., Culioli, J.-M., Di Carlo, G., De Franco, F., Dimitriadis, C., Panzalis, P., Santoro, P., Guidetti, P., 2019. Organization science improves management effectiveness of marine protected areas. J. Environ. Manag. 240, 285–292. https://doi.org/10.1016/j.jenvman.2019.03.052.
Sikor, T., Martin, A., Fisher, J., He, J., 2014. Toward an empirical analysis of justice in ecosystem governance: justice in ecosystem governance. Conserv. Lett. 7, 524–532. https://doi.org/10.1111/conl.12142.
Sowman, M., Sunde, J., 2018. Social impacts of marine protected areas in South Africa on coastal fishing communities. Ocean Coast. Manag. 157, 168–179. https://doi.org/10.1016/j.ocecoaman.2018.02.013.
Spalding, M., Meliane, I., Bennett, N., Dearden, P., Pawan, P., Brumbaugh, R., 2016. Building towards the marine conservation end-game: consolidating the role of MPAs in a future ocean. Aquat. Conserv. Mar. Freshw. Ecosyst. 26, 185–199.
Walker, G., 2009. Beyond distribution and proximity: exploring the multiple spatialities of environmental justice. Antipode 41, 614–636. https://doi.org/10.1111/j.1467-8330.2009.00691.x.
Walker, G., 2012. Environmental Justice: Concepts, Evidence and Politics. Routledge, New York.
Weeratunge, N., Béné, C., Siriwardane, R., Charles, A., Johnson, D., Allison, E.H., Nayak, P.K., Badjeck, M.-C., 2014. Small-scale fisheries through the wellbeing lens. Fish Fish. 15, 255–279. https://doi.org/10.1111/faf.12016.
West, P., Brockington, D., 2006. An anthropological perspective on some unexpected consequences of protected areas. Conserv. Biol. 20, 609–616. https://doi.org/10.1111/j.1523-1739.2006.00432.x.
West, P., Igoe, J., Brockington, D., 2006. Parks and peoples: the social impact of protected areas. Annu. Rev. Anthropol. 35, 251–277. https://doi.org/10.1146/annurev.anthro.35.081705.123308.
Wright, J.H., Hill, N.A.O., Roe, D., Rowcliffe, J.M., Kümpel, N.F., Day, M., Booker, F., Milner-Gulland, E.J., 2016. Reframing the concept of alternative livelihoods. Conserv. Biol. 30, 7–13. https://doi.org/10.1111/cobi.12607.
Young, J.C., Searle, K., Butler, A., Simmons, P., Watt, A.D., Jordan, A., 2016. The role of trust in the resolution of conservation conflicts. Biol. Conserv. 195, 196–202. https://doi.org/10.1016/j.biocon.2015.12.030.
Zafra-Calvo, N., Pascual, U., Brockington, D., Coolsaet, B., Cortes-Vazquez, J.A., Gross-Camp, N., Palomo, I., Burgess, N.D., 2017. Towards an indicator system to assess equitable management in protected areas. Biol. Conserv. 211 (Part A), 134–141. https://doi.org/10.1016/j.biocon.2017.05.014.
Zafra-Calvo, N., Garmendia, E., Pascual, U., Palomo, I., Gross-Camp, N., Brockington, D., Cortes-Vazquez, J.-A., Coolsaet, B., Burgess, N.D., 2019. Progress toward Equitably Managed Protected Areas in Aichi Target 11: A Global Survey. BioScience 69 (3), 191–197. https://doi.org/10.1093/biosci/biy143.