



Global patterns of management and governance of small-scale fisheries: contributions towards the implementation of the SSF Guidelines. In: FAO, Duke University & WorldFish. 2023. Illuminating Hidden Harvests: the contributions of small-scale fisheries to sustainable development. Rome, FAO; Durham, USA, Duke University; Penang, Malaysia, WorldFish. pp203-210

Basurto X., Siegelman B., Navarro M., Mancha-Cisneros M, Burgos A, Hélène Artaud, Pauwelussen A, Kraan M., Toonen H

► To cite this version:

Basurto X., Siegelman B., Navarro M., Mancha-Cisneros M, Burgos A, et al.. Global patterns of management and governance of small-scale fisheries: contributions towards the implementation of the SSF Guidelines. In: FAO, Duke University & WorldFish. 2023. Illuminating Hidden Harvests: the contributions of small-scale fisheries to sustainable development. Rome, FAO; Durham, USA, Duke University; Penang, Malaysia, WorldFish. pp203-210. FAO. 2023. hal-04071592

HAL Id: hal-04071592

<https://hal.science/hal-04071592>

Submitted on 21 Apr 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Global patterns of management and governance of small-scale fisheries: contributions towards the implementation of the SSF Guidelines

with contributions to Section 8.6.5 from Ariadna Burgos (French Museum of Natural History) and Hélène Artaud (French Museum of Natural History) and to Section 8.7.1 from Annet Pauwelussen (Wageningen University), Marloes Kraan (Wageningen University and Wageningen Economic Research) and Hilde Toonen (Wageningen University)



8.1 Key findings and messages

The management of small-scale fisheries and governance of tenure

- The analysis of small-scale fisheries in this chapter showed that management rights are formally granted to fishers in nearly 75 percent of countries included in the study,³³ governing more than one-third of the marine (35 percent) and inland catch (39 percent) reported for these countries.
- Co-management policies and the amount of catch governed by them were analysed for 55 percent of the estimated global small-scale fisheries catch. Results show that at the national level, 40 percent of the catch comes from fisheries with formal co-management provisions, but according to experts' perceptions, only half of these involve a high level of fisher participation in co-management arrangements. Co-management is more common at the local level but, nevertheless, while 90 percent of the catch comes from fisheries with local co-management provisions that are formal, only 40 percent are perceived to involve a high level of fisher participation.
- In order to further strengthen the role of fishers in decision-making processes, more effort is needed to create local enabling conditions for them to be able to exercise their tenure rights. This can be accomplished through local supporting institutions, such as civil society organizations (CSOs) and decentralized fisheries agencies with clear roles and responsibilities.
- Combining management rights with the rights of exclusion and transferability can also increase fishers' empowerment to manage their fisheries, as long as processes and the outcomes for exclusion and transfers respect the principles of fairness and equity in line with the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines). This fuller form of devolved rights is currently very limited in formal small-scale fisheries laws and regulations, governing less than 5 percent of catch.
- For most fishers, there is often a lack of clear mechanisms for participation in national decision-making processes. The majority of formal small-scale fisheries policies that grant management rights to fishers only have jurisdiction in small geographic areas, not throughout the entire country. As a consequence, fishers' ability to

³³ Similar results were found by an independent survey conducted by FAO in 2020, where 81 percent of FAO Member Nations (n = 92) reported involvement of fishers in fisheries management (FAO, 2021g).

participate in and influence national-level decision-making processes is likely to be limited. Developing national-level spaces for the participation of fishers, their organizations and their supporters could help to address current limitations.

- State policies have often failed to protect indigenous fishers' tenure rights, who have as a result experienced loss of rights to access, harvest and manage resources, thus threatening the survival of their culture and way of life. Attempts to correct colonial legacies have prompted some states to take measures distinguishing indigenous fishers from non-indigenous small-scale fisheries, and to legally recognize indigenous rights to land and water. Although six countries in the Illuminating Hidden Harvests (IHH) dataset reported fisheries laws that acknowledge distinct rights for indigenous fishers, these laws are rarely implemented; yet their existence creates leverage for indigenous fishers.

Factors influencing governance and management effectiveness

- Social and cultural identity plays a vital role in the viability and day-to-day organization of small-scale fisheries, determining who is part of a group and who is not. This influences how management and governance is locally received, shaped or resisted, and ultimately how effective it is. Incorporating social and cultural identity into small-scale fisheries policy research requires complementing quantitative and technical research with qualitative and interpretative studies of how small-scale fisheries work in practice, as well as acknowledging fishers and fishing communities themselves for the valuable insights they can give.

Civil society organizations

- The analysis of the goals of more than 424 producer organizations shows that there is high alignment between the goals of fishers and the goals of the SSF Guidelines, indicating fishers are active contributors to SSF Guidelines implementation and not passive recipients of state action.
- The analysis also shows that most fishers' organizations see high compatibility between

sustainable fisheries management and human well-being, as practically all of them expressed goals related to harvesting and sustainable fisheries management, with about 60 percent also expressing goals related to human well-being, labour rights, food security, or to human and environmental health.

Contributions to the Sustainable Development Goals (SDGs), in particular Target 14.b

- An analysis of coastal preferential access areas for small-scale fisheries showed they are a commonly used spatial tool in all regions of the world for marine fisheries. In a sample of 52 countries the median coverage of such areas was 3 percent of the exclusive economic zone (EEZ). While coverage varies between countries, this median shows that preferential access for small-scale fisheries globally is very low. As small-scale fisheries are likely to be the largest employer in the ocean economy, greater attention to securing access to resources for small-scale fisheries through preferential access areas could also be an important mechanism towards achieving SDG 1 (No poverty).
- Licensing is the most commonly used tool in legislation for regulating access to resources for small-scale fishers. While licensing regulations govern about 70 percent of marine and inland small-scale fisheries catch, only about 45 percent of the catch they govern is paired with devolved rights. Licensing on its own is least likely to empower fishers and fishworkers, and thus their ability to participate in decision-making processes concerning their fisheries is limited. With some less commonly used access strategies such as place of residence or history of use, tenure rights are devolved in more than 95 percent of cases, thereby making them better suited to contribute to SDG Target 14.b ("Provide access for small-scale artisanal fishers to marine resources and markets"). Yet, currently these alternative management approaches govern less than 30 percent of marine and inland small-scale fisheries catch.

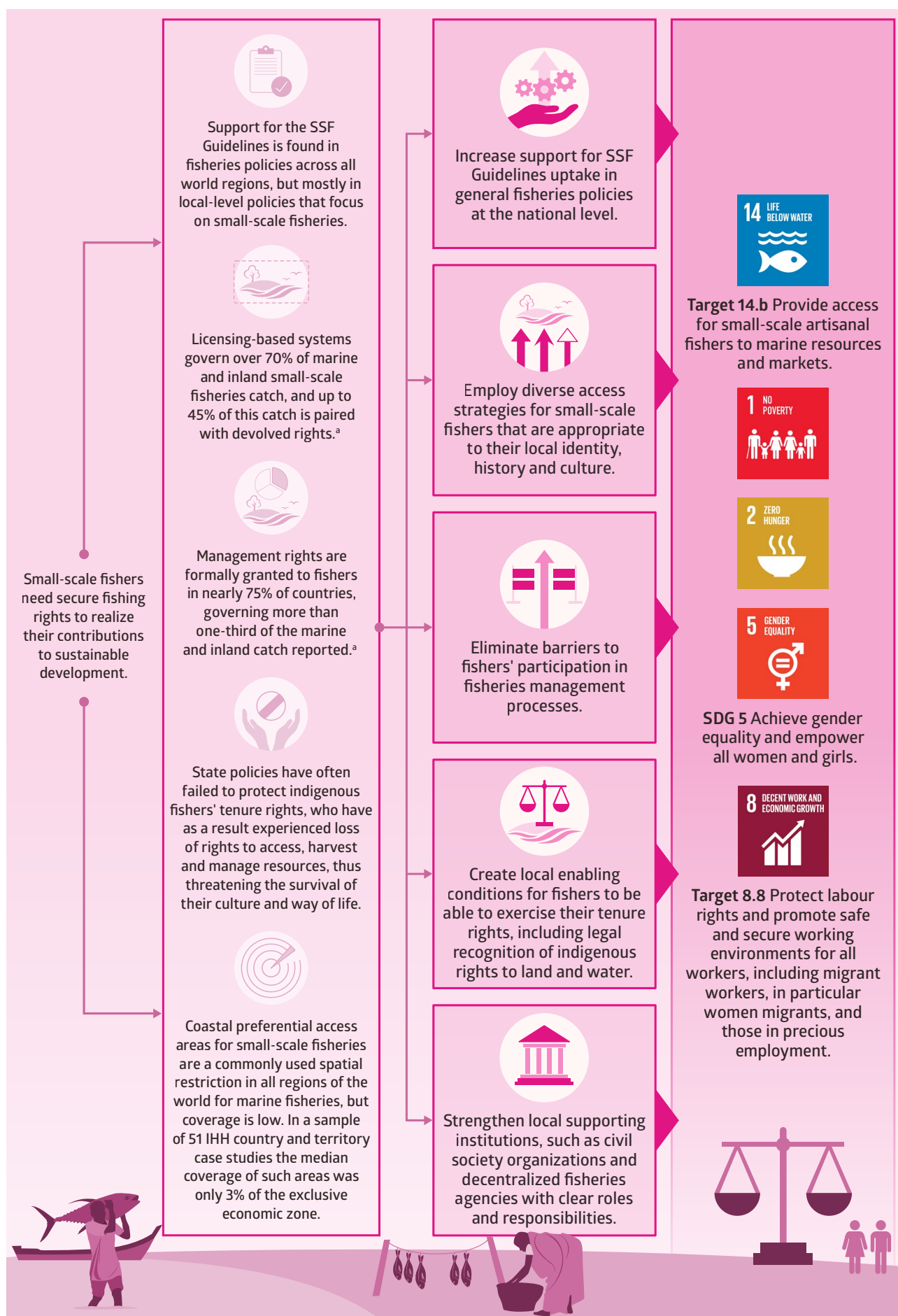
Figure 8.1 describes the ways in which small-scale fishers can secure fishing rights, ultimately supporting their contributions to sustainable development.

8.2 Introduction

Governance has been a fundamental component of societies since the beginning of human civilization, but in recent decades the concept of governance has been discussed more and more frequently as the world grapples with the many challenges of sustainable development at local, national and global levels. The importance of good governance cannot be overestimated: it has been described by the United Nations as being "perhaps the single most important factor in eradicating poverty and promoting development" (UN, 1998).

From these discussions, many definitions of governance have been put forward by organizations and individuals, including FAO (FAO, 2021f), the World Bank (Ringold *et al.*, 2012) and the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP, 2008), among others. The definition used for the purposes of this chapter can be summarized as, "the formal policies in place to manage small-scale fisheries through interaction between governments and the public in particular regarding access to and use of fishing resources..."

Figure 8.1 Key pathways through which securing rights to fishing resources for small-scale fishers can contribute to sustainable development



Note: ^a Based on 52 IHH country and territory case studies.

In essence, governance involves the means and processes by which decisions are made and put into practice. Good governance therefore requires the existence of effective and efficient institutions to facilitate those processes. Depending on several factors (e.g. the scope of the governance), the institutions may be formal, legislated entities, or informal systems based on social relationships. Critically, they should be accepted by society as being legitimate; in turn, society should participate in and be empowered by them. From this starting point, good governance can be broken down into eight primary elements. It should be participatory; adhere to the use of legal frameworks that are fair and just; be transparent in making and implementing decisions; be responsive to stakeholders; involve mediation between different groups and consensus-building; be equitable and inclusive; function effectively and efficiently; and be accountable to its stakeholders and the public (UNESCAP, 2008).

These eight elements are encompassed in the Guiding Principles (Chapter 3) of the SSF Guidelines, which go into greater detail on what is required for governance, with an emphasis on vulnerable and marginalized groups. Thus, for example, the principles reference the need to respect human rights and dignity, ensure gender equality and promote justice, alongside the importance of consultation, social responsibility and the rule of law.

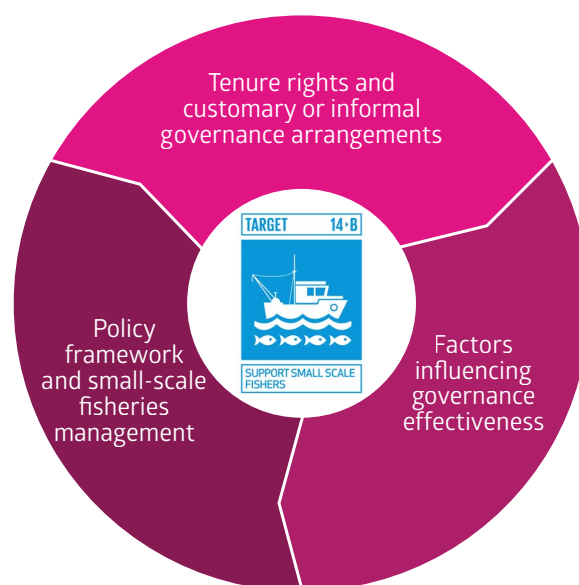
The considerations embodied by the modern ideas of governance are a result of a transition that occurred during the later decades of the twentieth century, away from the more limited conceptualization of conventional fisheries management towards this broader, holistic understanding of governance. The earlier approaches to fisheries management were strongly influenced by natural scientists and managers, and thus they tended to focus on biological sustainability. Social and economic considerations were typically taken into account separately, usually through top-down or informal processes (Garcia and Cochrane, 2009; Berkes, 2015). The failings of these approaches are well known (e.g. Hardin, 1968; FAO, 2003), and have prompted a growing awareness of the importance of all the elements of good governance for securing sustainable development (Ostrom, 1990).

This chapter explores the characteristics and scope of governance in small-scale fisheries, and also how this differs between countries and fishery units. In particular, the chapter considers three distinct but interacting components of fisheries governance (Figure 8.2): i) the policy framework and management of small-scale fisheries in relation to environmental, social and economic objectives; ii) the status of tenure rights in fisheries, including the role of customary or informal governance arrangements, especially community-based management; and iii) factors influencing governance and management

effectiveness. In this way, the chapter addresses the following key research questions: What does the policy framework governing small-scale fisheries look like, and how well aligned is it with the SSF Guidelines? What are the main management tools used to govern small-scale fisheries, and how much catch is governed through them? How is access governed in small-scale fisheries? What formal rights do fishers have to manage small-scale fisheries, and how much catch is governed through the devolution of rights to fishers?

The chapter is organized to provide the reader with assessments of the different components of governance from case studies that, in combination, represent about 55 percent of the reported global small-scale fisheries catch. The assessments are based on policies that have been formalized in writing, not (unless explicitly noted) on evaluations of whether and how the diverse governance arrangements are implemented. After a brief description in Section 8.3 of the methods employed in the chapter, Section 8.4 describes the prevalent policy frameworks in small-scale fisheries. Section 8.5 then analyses the management of the subsector, focusing on the most frequently used strategies to grant access to small-scale fisheries and the most common harvesting management measures in place. It also examines which measures are empirically associated with more devolution of rights to fishers, and which are associated with less. Section 8.6 focuses on governance of tenure for both formally and customarily governed small-scale fisheries. The issue of devolution of rights is further explored here, as well as how scale of operation and income of fisheries affect the nature of governance. Section 8.7 summarizes important factors *influencing* governance and management effectiveness, including the participation of fishers in co-management.

Figure 8.2 The three components of small-scale fisheries governance



Section 8.8 brings to light the usually overlooked but key role of CSOs in small-scale fisheries governance, providing some initial snapshots of global patterns of CSO alignment with the SSF Guidelines and SDGs. Last, Section 8.9 ties together the main findings from the chapter with the contributions that small-scale fisheries governance systems can make to the SDGs, in particular Target 14.b in regard to securing access to fishing areas.

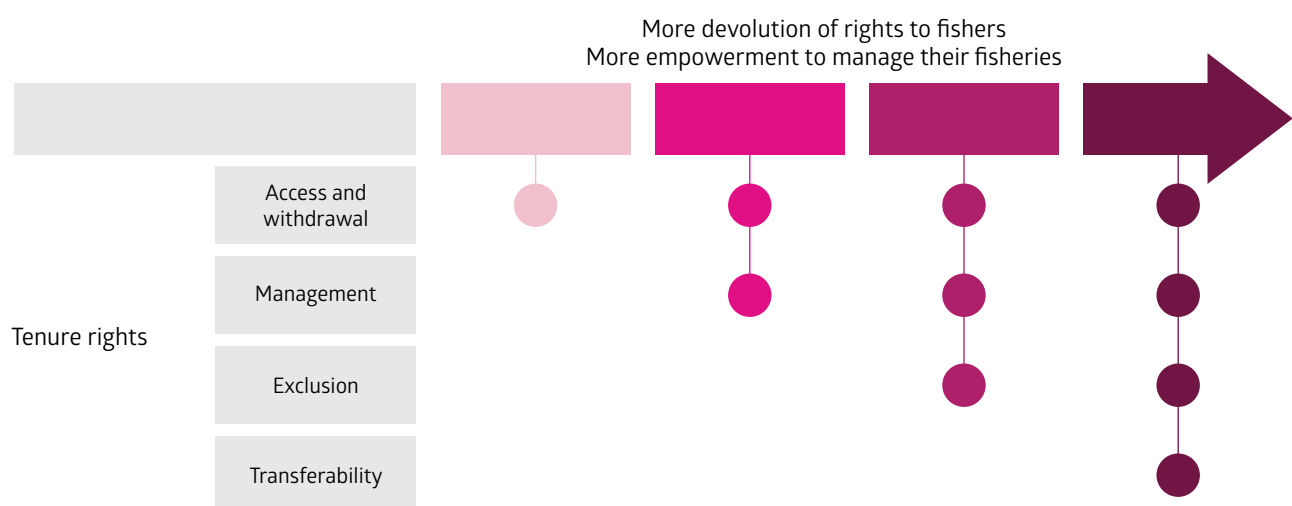
The nature, status and impacts of tenure rights in the different fishery units considered in the Illuminating Hidden Harvests (IHH) study form a central theme in this chapter. It is generally accepted that long-term sustainability will not be secured under open-access regimes (Berkas, 2015), and hence small-scale fishers and fishing communities require secure access to resources. However, at present, access to many small-scale fisheries remains unregulated (Arthur, 2020; FAO, 2020b). Tenure rights (sometimes referred to as property rights) limit access by authorizing who can use resources and the conditions under which those resources can be used (Figure 8.3). They can also include rights concerning management of resources, typically through some form of co-management with the government, as well as the rights of exclusion and transferability (FAO, 2015; Schlager and Ostrom, 1992; World Bank, 2012). Tenure rights are therefore at the heart of governance. There have been both successes and failures with different systems of rights, and the details of the approaches need to be tailored to each fisheries context. Still, the available evidence indicates that a suitable system of tenure rights that provides users with adequate control in

decision-making through devolution and decentralization of authority and management, as well as the enforcement of regulations, also provides the incentives to strive for responsible management and sustainable use of resources (Agrawal and Ostrom, 2001; Berkas, 2015; Ostrom, 2009; Schlager and Ostrom, 1992).

In order to be effective, devolution and decentralization measures require the capacity, at the devolved level, to fulfil the necessary obligations and functions of authority and management. This is often a challenge for fisheries of all types, typically requiring support from government fisheries authorities to supplement and complement stakeholder capacity as required. These authorities are often relatively well equipped and experienced in providing support to national, commercial fisheries through systems of co-management, but less so when it comes to small-scale fisheries, which are typically more diverse in the species they target and gear types they use. Insufficient and inappropriate management, made worse in some cases by disruption of customary practices in tenure, have failed to address the ecological, social and economic crises that confront so many small-scale fishers.

As this management problem has been increasingly recognized, there has also been growth in the use of co-management³⁴ approaches in small-scale fisheries worldwide. This is not a guarantee of success, but research has demonstrated that where important attributes are present, such as suitable institutional frameworks, strong leadership and social cohesion, co-management can lead to improved ecological, social and institutional

Figure 8.3 Different types of tenure rights often granted to fishers



Source: Modified from Schlager, E. & Ostrom, E. 1992. Property-rights regimes and natural resources: a conceptual analysis. *Land Economics*, 68(3): 249–262.

³⁴ Co-management constitutes a partnership arrangement in which government, the community of local resource users (fishers), external agents (non-governmental organizations, research organizations), and sometimes other fisheries and coastal resource stakeholders (boat owners, fish traders, credit agencies or money lenders, tourism industry, etc.) share the responsibility and authority for decision-making over the management of a fishery. See full definition and references in the glossary.

Box 8.1

Devolution rights index

The devolution rights index considers three levels of devolution based on rights of management, exclusion and transferability: **partially devolved**, when any one of these rights is devolved to fishers; **mostly devolved**, when any two are devolved; and **fully devolved**, when all three rights are devolved at the same time in a fishery.

outcomes (Cinner *et al.*, 2012b; d'Armengol *et al.*, 2018; Gutiérrez, Hilborn and Defeo, 2011). The relationship between rights-based natural resources management and the devolution and decentralization of authority, as well as the factors influencing governance and management effectiveness, are therefore also addressed in this chapter.

Providing fishers with tenure rights of access and withdrawal (e.g. the right to access fishing areas and the right to harvest fish from them) constitutes the basis for just and effective small-scale fisheries management. But when fishers are also devolved the rights of management, exclusion and transferability,³⁵ coupled with supportive institutional structures, they become significantly more empowered to manage their fisheries. To synthesize and summarize the large diversity of tenure rights found in small-scale fisheries around the world, the tenure rights classification system (Figure 8.3) of Schlager and Ostrom (1992) has proven useful. By paying attention to five different broad types of tenure rights (i.e. access, withdrawal, management, exclusion and transferability) granted by governments through legislation or through national, subnational or local policy, it has been possible to measure the devolution of rights across the thousands of fisheries included in this report. To that end, a simple “devolution rights index” is used throughout the analysis in this chapter (Box 8.1).

In the analysis, it was assumed that the more different types of rights are devolved, the more empowered fishers are to manage their fisheries.³⁶ Fishers are then more likely to contribute to social and ecological objectives, because of the range of control they have over the fishery process (Ostrom, 2005). Linking the devolution of rights to management also provided a proxy to evaluate the potential contributions of a fishery unit to the SDGs. In particular, in this chapter

attention is paid to progress towards Target 14.b: “Provide access for small-scale artisanal fishers to marine resources and markets.” This target is also addressed in the economic and gender chapters (Chapters 5 and 6), given the important role women play in the value chain.³⁷

The nature and role of policy frameworks in the governance of small-scale fisheries is another aspect explored here. The SSF Guidelines call for policies and management measures compatible with a human rights framework to be developed through consultation with small-scale fishers (FAO, 2015), which implies the need for local-level policies that reflect the realities and context of these fishers and their communities (Allison and Ellis, 2001), including differences between marine and inland fisheries. How well these needs are being met is examined by considering the impacts of different types of policies on small-scale fisheries governance and, particularly, differences between policies that address the fisheries sector as a whole and those aimed specifically at small-scale fisheries. Other factors likely to impact on governance are also examined, including the scale of operation of fisheries and national income level.

Policies, laws and regulations are important for fisheries governance, but social relationships – especially in small-scale fisheries – also play an important part. Well-connected networks, trust and cohesive communities have been found to be key factors contributing to effective co-management (Gutiérrez, Hilborn and Defeo, 2011). The role of social relationships in governance, and the importance of taking these relationships into account in developing and implementing formal governance systems and arrangements, is therefore also an important component of this chapter.

³⁵ As per Schlager and Ostrom (1992), management is the right to regulate internal use patterns and transform the resource by making improvements. Exclusion is the right to determine who will have an access right, and how that right may be transferred. Transferability (or alienation) is the right to sell or lease either or both of the above collective choice rights.

³⁶ It is always possible that one right (e.g. management) could allow for most or all control over a fishery, and therefore the addition of other rights (e.g. exclusion and transferability) would have little or no additional effect. However, in general, because these rights have different functions, the more different types of rights are devolved to fishers, the more in control they will be of their fisheries.

³⁷ The focus of this chapter is on the access to marine resources component of SDG Target 14.b. Access to markets is addressed in Chapter 5.

8.3 Methods

The analyses provided in this chapter were mostly based on three independent sources of data. The first source was the IHH governance dataset, consisting of 976 formal policies from the IHH case studies of 52 countries and territories,³⁸ plus the associated catch (in tonnes) and other metadata related to these policies. All of these policies influence the management of the 2 169 fishery units around the world covered in this study. The IHH approach has made it possible, for the first time, to link policies to small-scale fisheries catch as a way to estimate the relative importance of different policy types.³⁹ A detailed description of country and territory case study (CCS) selection criteria and the general IHH methodology is provided in Annex A (with specific caveats and methodological nuances described in footnotes throughout this chapter, as relevant). Altogether, the policies analysed formally govern about 83 percent of the reported small-scale fisheries catch, representing 55 percent of estimated global catch. The second data source for this chapter was the FAOLEX fisheries legislation database.

The database was consulted throughout 2019 and 2020, mostly to verify and complement the policy information obtained through the CCS (for example, 38 of the CCS were missing policies). This review also resulted in the addition of inland countries to the analysis, which is noted in the text where relevant. To build confidence that the most complete dataset on small-scale fisheries policies was being analysed, the entire body of fisheries policies found in FAOLEX was coded for the 19 top producing countries (in terms of catch).⁴⁰ The third data source was a global database of 717 fisheries CSOs compiled by Duke University, consisting of CSO characteristics (type of organization, location, main goals, membership, etc.) captured through an online survey. The survey was deployed in English, French and Spanish through a network of Duke and FAO contacts, using a “snowball” sampling approach. In addition to these data sources, thematic studies on social and cultural identity in small-scale fisheries and on indigenous small-scale fisheries were undertaken by experts in these fields.

8.4 Small-scale fisheries policy framework

The small-scale fisheries policy framework refers to the laws, regulations, policies, plans or strategies (hereafter referred to as “policies”) governing small-scale fisheries: i.e. concerning what, where, when and how to fish. The diversity and complexity of these policies cannot be overstated. Different national, subnational and local fisheries policies can have jurisdiction over the same fishery at any given time, sometimes regulating different components or sometimes governing the same activity. The issue can be confounded when multiple authorities have jurisdiction over the same areas of fishing activity, as it can be with energy generation, shipping or protected areas (for inland fisheries cases, see Song *et al.*, eds., 2017).

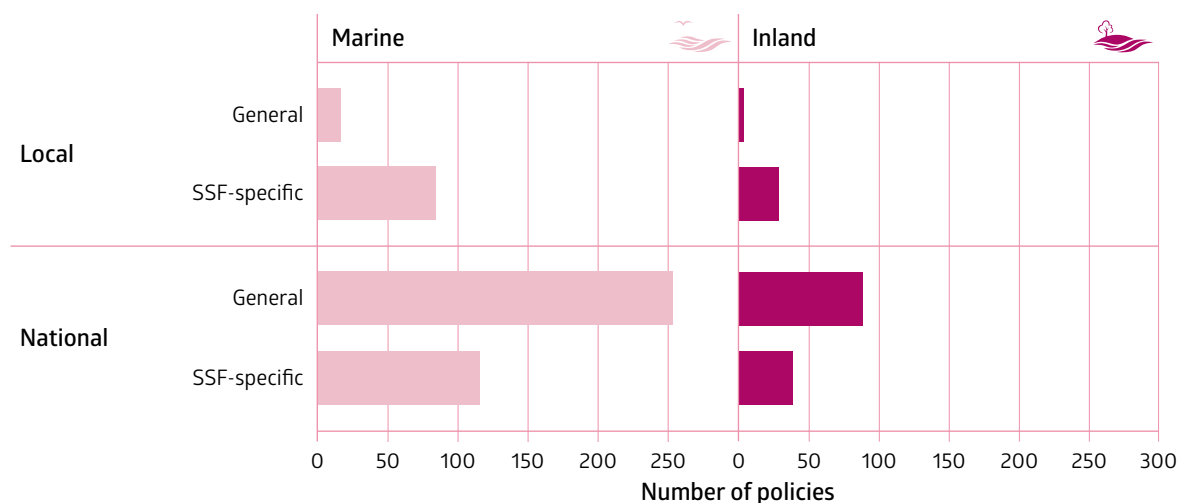
While it was not possible to attend to all the complexity surrounding the governance of small-scale fisheries, this section contributes to the development of an initial, basic understanding of the characteristics of marine and inland small-scale fisheries frameworks by identifying three major characteristics of policies affecting governance: (i) policy focus – whether policies apply to all fisheries or only to small-scale fisheries; (ii) policy level – whether policies apply to all national waters or only to local jurisdictions; and (iii) policy integration – whether policies focus only on production or incorporate other considerations that affect fishers’ livelihoods, in line with the aims of the SSF Guidelines (e.g. social, environmental and economic sustainability, or participation in management). Finally, the amount of

³⁸ Six countries did not provide governance data. However, including the 58 IHH countries and territories was appropriate for certain analysis. The number of countries included in each analysis is indicated where appropriate.

³⁹ Important caveats: It was assumed that the entirety of a fishery unit was governed by an arrangement. As such, an arrangement was assumed to apply to the full spectrum of particular attributes of the fishery unit (its catch, the species included, etc.) that it governed. Given that countries define fishery units in different ways, it is likely that some governance arrangements in the study did not apply to entire fishery units: for example, when the arrangement covered an area smaller than the fishery unit, or when the arrangement was restricted to only some species caught or to certain types of gear used in that unit. In these cases, the analyses possibly led to the overestimation of the catch governed by certain arrangements. It is also important to note that not all fishery units had available catch data. Therefore, all results that took catch into consideration should be understood in terms of reported catch. In addition, for 17 percent of this global reported catch there was no information on governance arrangements. However, this catch was still included as the denominator of calculations for “percent of total catch”. For this reason, the amount of governed catch is likely an underestimation. Given the sources of overestimation and underestimation, no artificial weights were implemented in the estimations of governed catch to account for these issues.

⁴⁰ FAOLEX is a natural resources policies database maintained by FAO for all Member Nations. It is the most comprehensive depository of fisheries legislation to date. While it cannot be guaranteed to contain the most up-to-date legislation for all Member Nations, it is to our knowledge the best source available to complement the governance arrangements provided by the CCS.

Figure 8.4 .Distribution of marine and inland small-scale fisheries (SSF) policies (in absolute numbers) by policy level and focus, based on 625 policies from 44 countries and territories



catch governed by each type of policy was used as a measure of the relative importance countries give to these policies.

Policy focus was determined using two categories: general fisheries policies, and those specific to small-scale fisheries (for brevity, referred to as “SSF-specific”). General fisheries policies are those that refer to fisheries without explicitly distinguishing between small-scale and large-scale fisheries. SSF-specific policies are those that make explicit reference to only small-scale fisheries in the description of the policy provided by the CCS authors or coded from the FAOLEX database. When policies explicitly refer to both, they have been categorized as general fisheries policies.

Figure 8.4 provides a first look at the distribution of small-scale fisheries policies based on their different characteristics. It shows that at the national level, there is a larger number of general fisheries policies than policies that focus solely on small-scale fisheries, while at the local level the opposite is true. These general patterns apply to both marine and inland fisheries.

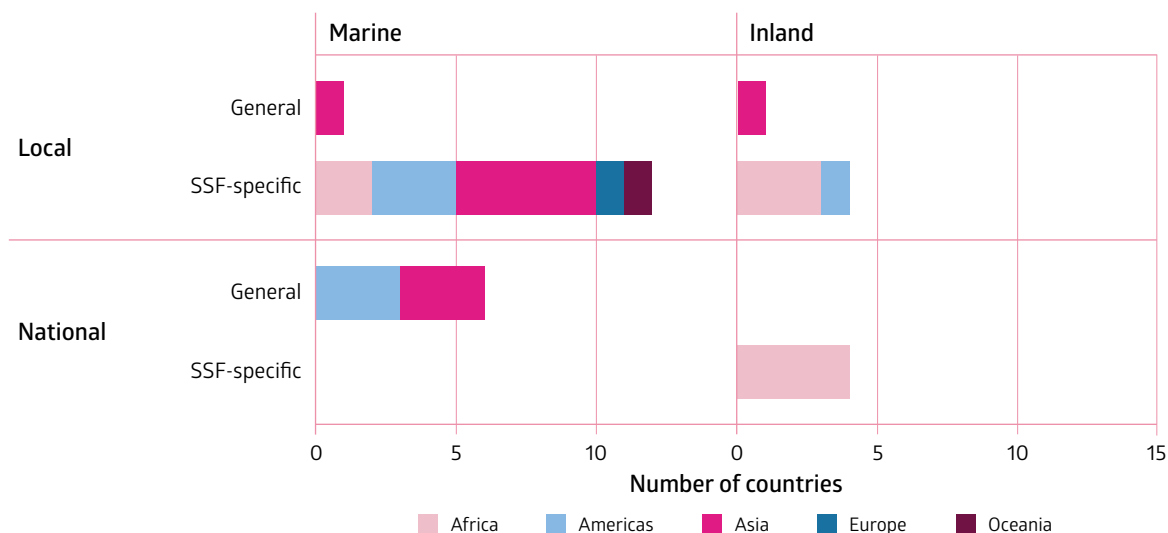
In the analysis, it was encouraging to find that most countries around the world have developed national and local policies that specifically target small-scale fisheries. This finding is supported by recent national-level analyses in Kerezi *et al.*, eds. (2020) on a number of selected countries, as well as a recent FAO 2020 Code of Conduct questionnaire indicating that about 70 percent of Member Nations have small-scale fisheries policies in place.⁴¹ Yet, the existence of SSF-specific policies cannot necessarily be taken as an indication they are well suited to support the responsible use of fisheries resources and the sustainable socioeconomic development of small-scale fishers and fishworkers (FAO, 2015). Even more concerning are the general fisheries policies based on

revenue-generation and commercialization models – inspired by large-scale fisheries and “classical” natural resource harvesting paradigms – which, although they do not have the non-production functions, needs and characteristics of small-scale fisheries in their purview (e.g. food security and nutrition), are still used to govern small-scale fisheries (e.g. Twongo, Reynolds and Mwene-Beyanga, 1991; Berkes *et al.*, 2001; Bavington, 2002; Malasha, 2003; Hortle, Lieng and Valbo-Jorgensen, 2004; Bavinck, 2005; Opondo, 2011; Kolding, Béné and Bavinck, 2014; Tezzo *et al.*, 2018; Smith and Basurto, 2019). Inland fisheries experts have also described instances where colonial authorities have conceptualized fisheries only as revenue extraction activities that focus on species of economic value rather than also considering their value for local food security and livelihoods (Kolding and van Zwieten, 2011; Singh and Gupta, 2017; Kolding *et al.*, 2019). Experts argue that this tendency has persisted in those larger inland fisheries that can be operated along commercial lines, with the management approach often borrowing heavily from marine stock management models (Hickling, 1953; Kolding and van Zwieten, 2011; Kolding *et al.*, 2019).

As an initial approach to assess the degree to which general and SSF-specific fisheries policies might promote the contribution of small-scale fisheries to responsible fisheries management and sustainable development (Part 2 of the SSF Guidelines) and ensure an enabling environment and supporting implementation (Part 3 of the SSF Guidelines), the analysis in this chapter counted the number of countries whose policies included mentions of themes from Part 2 and Part 3 of the SSF Guidelines. For example, themes included the responsible governance of tenure; sustainable resource management; social development, employment and decent work; gender equality; and disaster risks and

⁴¹ Table 77 of the 2020 FAO questionnaire asked respondents to state yes or no to the existence of laws, regulations, policies, plans or strategies that specifically target or address the small-scale fisheries subsector. See FAO, 2021g.

Figure 8.5 Distribution of countries by world region that have fisheries policies which mention topics in support of the SSF Guidelines. Based on an analysis of 52 countries and territories, with 30 found to have such policies (5 in the Americas, 14 in Africa, 8 in Asia, 1 in Europe and 1 in Oceania)



Note: Policies are organized based on two main characteristics: political jurisdiction (national or local) and fisheries focus (general or specific to small-scale fisheries [SSF]).

climate change.⁴² The results (Figure 8.5) show that topics in support of the SSF Guidelines are mentioned more often in local-level SSF-specific fisheries policies than in national-level general fisheries policies, and more regions of the world are represented in marine than in inland fisheries.

The above findings do not account for the possibility that the social, economic, environmental, gender and governance dimensions of small-scale fisheries might be addressed through policies outside of the fishing sector, as investigating non-fisheries policies was outside of the scope of this chapter. These findings suggest the need for better alignment between national, general fisheries policy frameworks and the SSF Guidelines. See also Kerezi *et al.*, eds. (2020) for some country-level examples.

Finally, the importance of fisheries policies was quantified in terms of the percentage of catch they govern. Figure 8.6 shows catch governed by general fisheries policies, SSF-specific fisheries policies, or both. While in marine small-scale fisheries 68 percent of catch is governed by both general and SSF-specific fisheries policies, in inland systems this proportion is only 32 percent, with the highest proportion of catch (43 percent) governed by general fisheries policies only. This difference is important, given that it was found that general fisheries policies are the least likely to incorporate SSF Guidelines objectives (see Figure 8.5), while SSF-specific policies are the most likely. Therefore, catch governed simultaneously

by general and SSF-specific fisheries policies could provide the opportunity for SSF-specific policies to inform general fisheries frameworks. This opportunity for feedback between the two policy types in a way that is coherent with the aims of the SSF Guidelines is much higher for marine fisheries than for inland fisheries, evidencing the need for further local policy development that is specific to the needs and characteristics of inland fisheries.

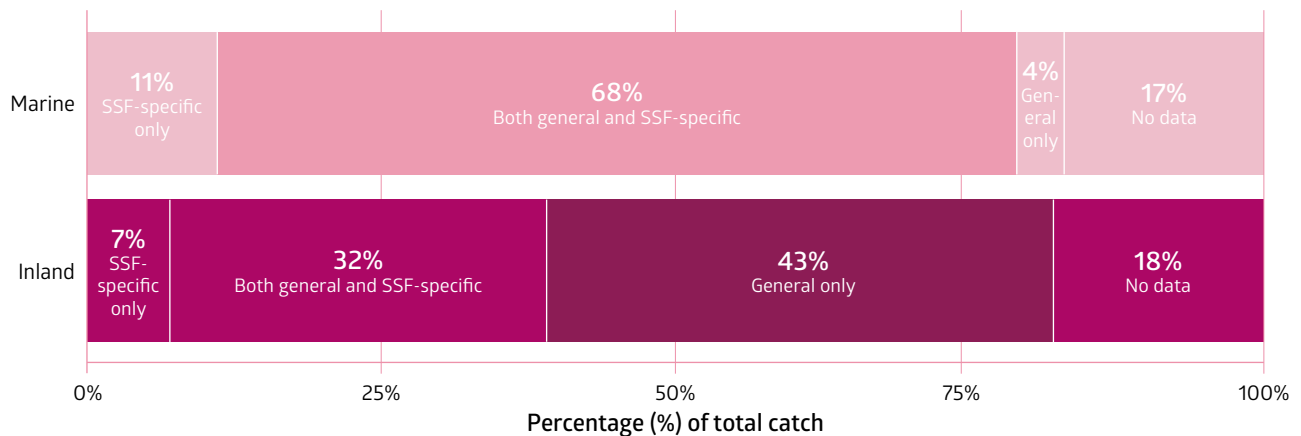
The amount of catch governed by policies operating at different jurisdictional levels was also estimated, disaggregated by management type (with or without co-management). Findings show that most estimated global catch is governed through national-level policies without co-management arrangements (Figure 8.7). In contrast, less than half of marine and inland catch falls within the mandate of local policies that are predominantly characterized by co-management arrangements and are therefore likely to be better aligned with the aims of the SSF Guidelines. The percentage of co-management is particularly low for subnational policies, which mostly include those with state or provincial political jurisdictional levels or biophysically defined regions (management plans for river basins, a watershed, a coastal region, etc.) in the dataset of this analysis. In some of these instances, this might be due to subnational policies being subsumed under national-level policies in their authority to devolve rights to fishers (e.g. those that represent river basins, watersheds or other large biophysical regions).

⁴² Examples of keywords coded as representative of Part 2 and Part 3 of the SSF Guidelines include: "participation" and "co-management", coded as examples of Chapter 5a (Responsible governance of tenure); "sustainable use of resources" and "conservation", coded as examples of Chapter 5b (Sustainable resource management); and "human rights", "livelihood sustainability" and "equality", coded as examples of Chapter 6 (Social development, employment and decent work). "Food security" was also coded as a cross-cutting theme for the Guidelines and not particularly associated to one particular section in the document. For an in-depth analysis refer to Koehn *et al.* (2021).

In any case, these findings suggest that local governance and policies disproportionately contribute to the devolution of management rights to small-scale fisheries. Examples of local policies include those governing fisheries closures of bays, estuaries or reefs where often local fishers are involved in their monitoring and enforcement, and whose jurisdiction is limited to these particular closures and waterbodies.

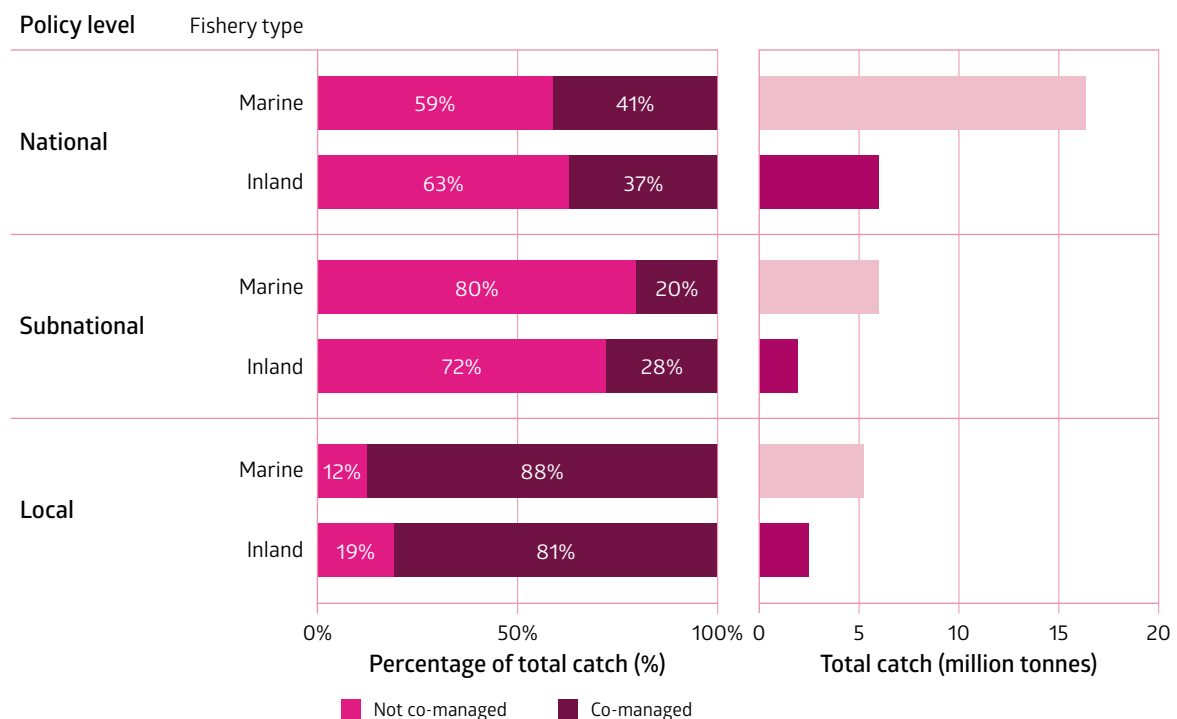
Local-level policies, while governing less catch, are most important for the devolution of management rights to fishers because when catch is governed with input from these policies, it is much more likely to involve devolved management rights (Figure 8.7). In fact, over 80 percent of both marine and inland catch governed by local arrangements involves devolved management rights.

Figure 8.6 Percentage of marine and inland small-scale fisheries (SSF) catch governed by general and SSF-specific fisheries policies, based on marine catch data from 51 countries and territories and inland catch data from 42 countries and territories



Note: For 17 percent of marine catch data and 18 percent of inland catch data, no governance data were provided by country and territory case study authors, or they could not be reliably associated to governance and therefore were not included.

Figure 8.7 Governance of marine and inland small-scale fisheries catch, by policy level and type (with or without co-management), based on analysis of policies from 43 marine and 38 inland countries and territories



Note: The calculation of total catch involves double-counting because the same fishery can be concurrently governed by policies at different levels.



© 2019 IIMB Akademi, Bangladesh

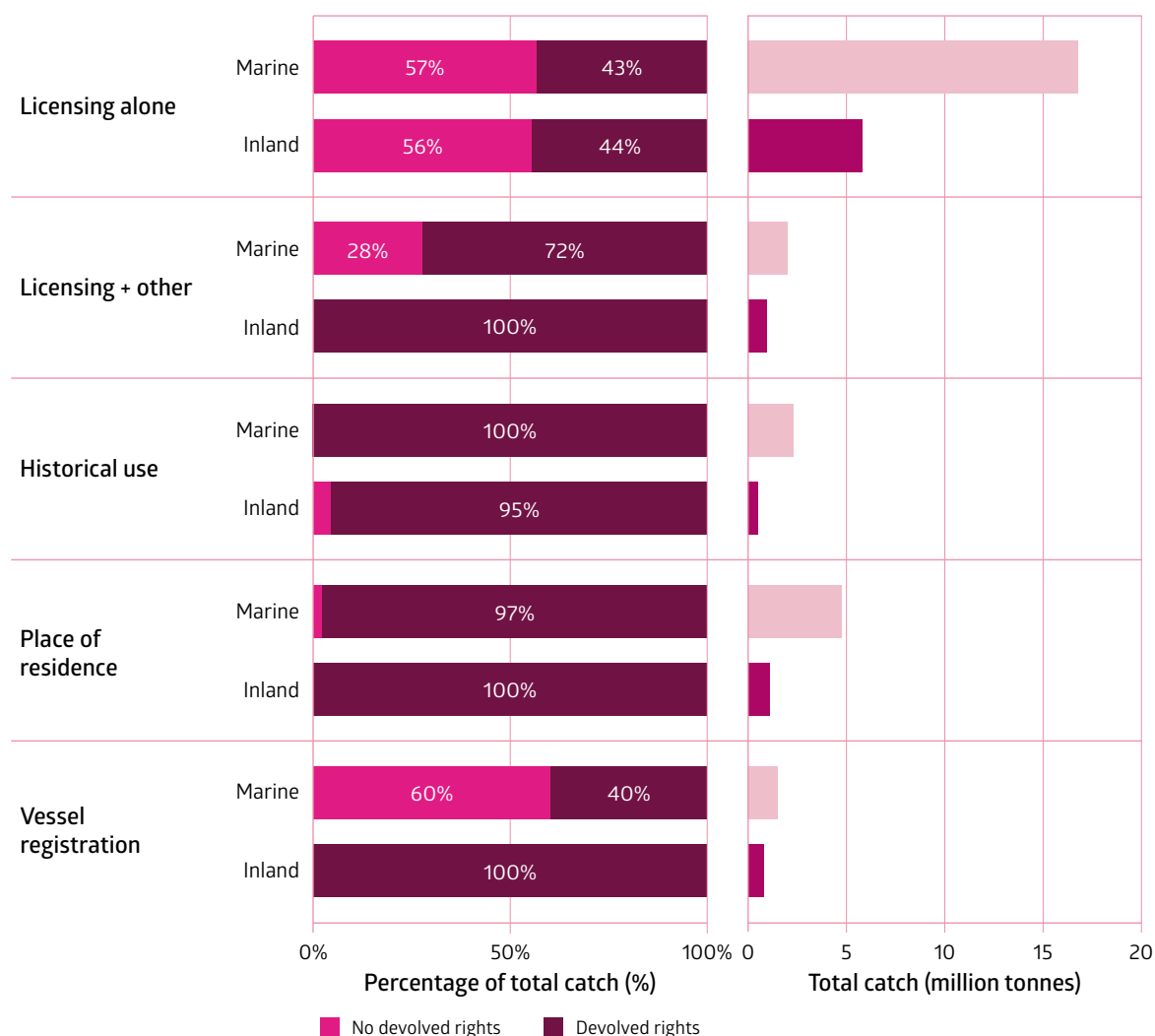
8.5 Access and harvesting management in small-scale fisheries

Many fishers, fishworkers and their communities, including vulnerable and marginalized groups, are directly dependent on access to fisheries resources (FAO, 2015). The importance of this access to sustain small-scale fisheries livelihoods has also been recognized in SDG Target 14.b. The diverse ways in which small-scale fishers access resources, as well as the challenges they face, have been amply documented in the literature (e.g. Jentoft and Chuenpagdee, eds., 2015). Yet, providing a global estimate of the main access strategies used remains elusive, due in part to the informality of the subsector. It is possible, however, to provide a global snapshot of the formal or de jure policies on access that countries have put in place.⁴³ This section provides such a snapshot as a first step towards improving understanding of how access is managed in small-scale fisheries. The importance of different access strategies is quantified using the amount of catch (in tonnes) governed under each strategy. In addition, the percentage of devolved rights associated with each access strategy is also reported, providing an indicator of the involvement fishers can have in the management of access recognized by the state.

Achieving adequate access to small-scale fisheries constitutes an important aim of the SSF Guidelines. Of the countries and territories analysed, 85 percent acknowledged not having formal access controls in place for all their small-scale fisheries. For those that are formally managed, it was assumed that the four main categories or criteria used around the world to manage access are licensing, vessel registration, place of residence and historical use. Figure 8.8 (right panel) shows licensing is the most important formal strategy for controlling access in small-scale fisheries in terms of the amount of catch governed. This is not particularly surprising; it is significant, however, that less than half of these licences involve the devolution of rights to fishers. This means that most of the time, fishers have no say in decision-making concerning various characteristics of access covered by the licences, such as type of species, areas of operation, and when harvesting can take place. In contrast, other criteria such as “place of residence” and “historical use” are associated with a much higher proportion of devolved rights (> 95 percent of catch). Yet, these access criteria govern a significantly smaller portion of the total marine and inland small-scale fisheries catch (Figure 8.8, right panel).

⁴³ The analysis in this section does not distinguish between access granted to specific areas or territories and that granted to resources, or between access granted to communities/organizations and that granted to individuals, because these different dimensions are not independent.

Figure 8.8 Main criteria for granting access to small-scale fisheries and the extent of devolved rights associated with each access strategy, based on analysis of policies from 43 marine and 38 inland countries and territories

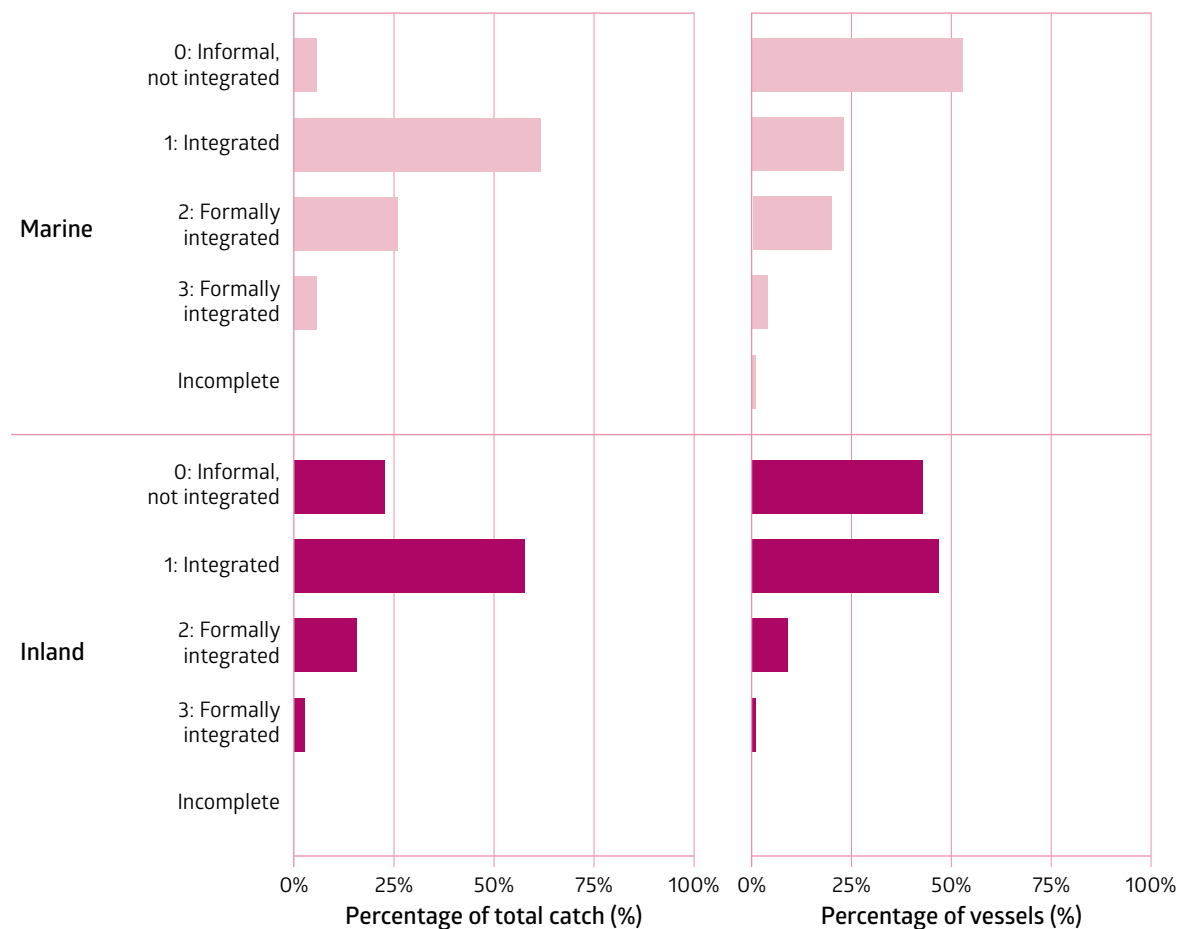


Notes: Given the importance of licensing in managing access to small-scale fisheries, a comparison of licensing used alone and in combination with other strategies is included. Most catch for inland “vessel registration” is associated with the African Great Lakes region (e.g. Malawi, United Republic of Tanzania, and Zambia). Note there is double-counting in the calculation of total catch because the same fishery can be concurrently governed by different access strategies.

Licences around the world differ in their aims and functions, but in Figure 8.8 they are bundled into a single category for the purpose of comparison with other access strategies. Licensing is also often used in combination with certain strategies. For instance, some fisheries in Indonesia and Maldives combine licensing and place of residence by issuing licences through provincial officers, an increasingly common practice in decentralized fisheries management regimes. In other cases, national licensing systems may provide access to fisheries resources while local management councils grant access rights based only on residence. Interestingly, data in Figure 8.8 (coloured panel) show that when licensing is combined with other access criteria it is much more likely to involve devolved rights than when it is used alone, highlighting the importance of combining different access strategies according to the local social, cultural and environmental context.

Finally, an analysis using the characterization matrix described in Chapter 3 provides insight as to the degree to which fishing resources are accessed through informal mechanisms. This analysis shows that a significant proportion of inland small-scale fishery vessels (43 percent) are informally integrated into management and taxation systems, but their catch comprises only 23 percent of the total (Figure 8.9). A slightly larger proportion (47 percent) are registered (i.e. integrated) and account for 58 percent of the total inland catch. Formally integrated inland fishing with landing fees or licensing and taxation accounts for only 10 percent of vessels and 19 percent of the total catch. In marine small-scale fisheries, the catch is predominantly (~93 percent) from fisheries that are formally integrated into management and regulatory frameworks (this includes the three different degrees of integration), but this represents only 47 percent of the vessels. The remaining vessels (53 percent) operate in the informal setting, but their aggregate

Figure 8.9 Degree of integration of small-scale fisheries into fisheries management and taxation systems, based on data for 58 countries and territories



Notes: 0 = informal, not integrated (occasional, no fees required); 1 = integrated (registered/recognized fisher, untaxed); 2 = formally integrated (licensed fisher, landing fees and/or personal taxes paid); 3 = formally integrated (registered, licensed, taxed as a commercial concern); Incomplete = invalid or incomplete information.

catch is remarkably low and estimated at less than 6 percent. This suggests that either the informal sector catches relatively little fish, or that at least some catch remains hidden, presumably a result of the limited amount of management and monitoring dedicated to this group. These results indicate a need to develop new management methods that enable documentation of catch not associated to a licence or to a vessel, such as those used to study household socioeconomic well-being (for an example see Chapter 5).

In addition to access management, the analysis for this chapter also identified the most common harvesting management measures formally in place around the world and measured their relative importance in terms of the amount of catch each harvesting restriction regulates. Findings show most reported catch is governed by gear and spatial restrictions (Figure 8.10). Restrictions on gear are often associated with particular places and seasons: different types of gear will have different impacts depending on where and when they are used, among other associated conditions. Certain net types (e.g. beach seines), mesh sizes and hook sizes are permitted or forbidden depending on habitat conditions, biology and species

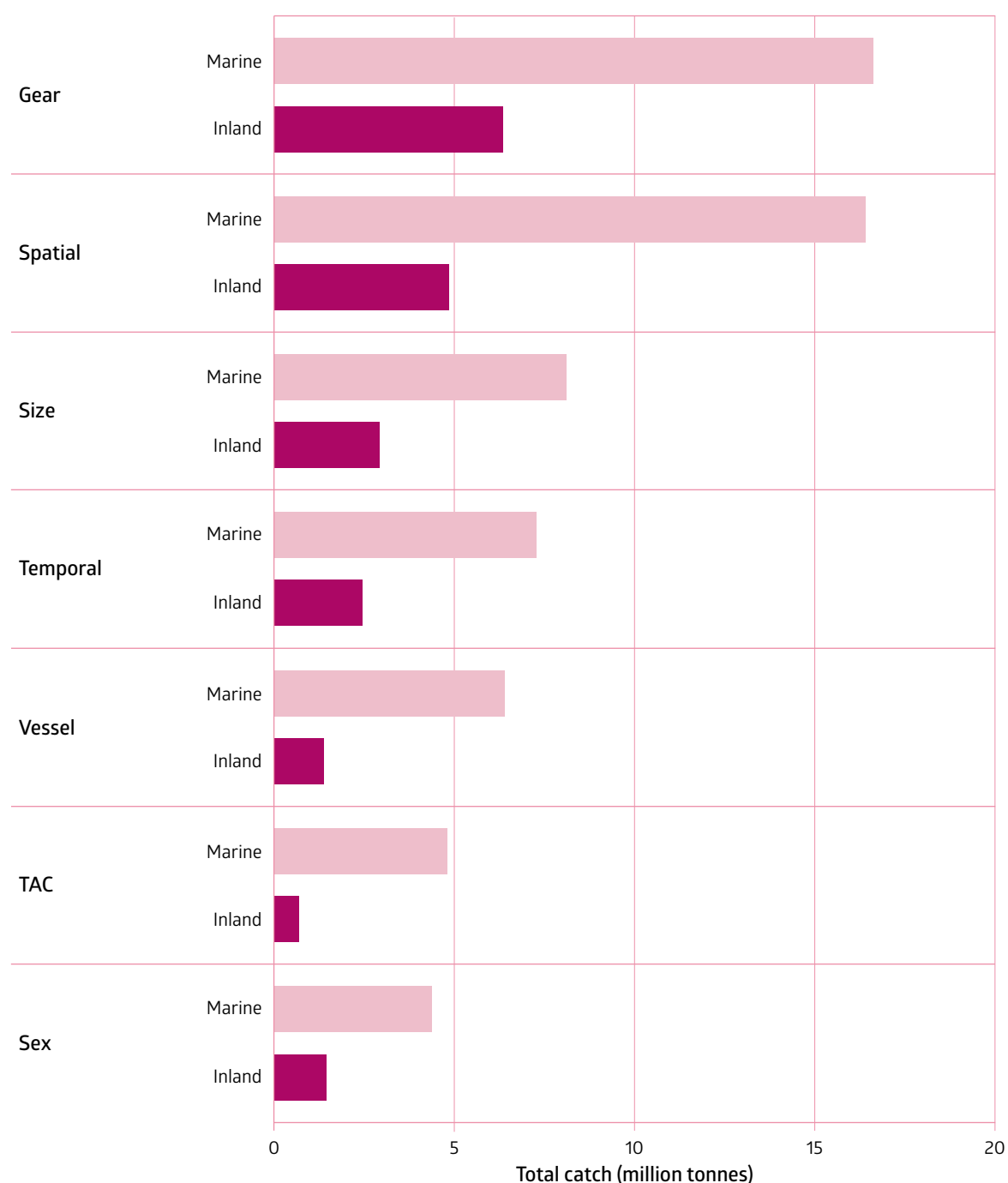
targeted. Trolling might be forbidden in shallow areas unless the net size, motor size or trolling procedure meets certain requirements, and the location of fixed nets may be forbidden in nursery or migratory sites at particular times of the year. In general, the use of particularly destructive methods is forbidden, such as dynamite or certain poisons. As for spatial restrictions, preferential access areas are an important example of this measure, and are discussed later in this section.

Other common harvesting management measures are also presented in Figure 8.10. Total allowable catch (TAC) is usually associated with large-scale fisheries because of its high costs of implementation, due to the significant technical assistance and close monitoring of landings required. In this chapter analysis, 20 developed and developing countries or areas reported having fisheries with TAC management measures. Some of those measures are likely part of a given country's quota within regional fisheries management organization (RFMO) agreements. Such TAC systems are established by RFMOs and not at the level of the local small-scale fisheries. This is the case for some of the small-scale fisheries catch reported to be under TAC systems for Indonesia and

the Philippines, which are part of the Indian Ocean Tuna Commission (IOTC) and the Western and Central Pacific Fisheries Commission (WCPFC), respectively. These two countries, together with Chile and Sri Lanka, accounted for 73 percent of overall catch by small-scale fisheries under TAC systems reported here. The rest was distributed among 16 countries from all world regions. The diversity of harvesting management measures used, including TAC systems, illustrates the complexity of governance arrangements involved in the management of small-scale fisheries, and the need to better understand differences between small-scale fisheries at various scales of operation (see Chapter 3).

In general, it is likely that the more frequent use of gear and spatial restrictions compared to other harvesting management measures is related to how well they align with livelihood issues (e.g. while temporal closures such as closed seasons are common management measures in large-scale fisheries, they might be less common among small-scale fisheries because of the subsistence role these fisheries play) or to their lower costs of implementation (compared to TAC systems, for instance). The low monitoring and enforcement costs of implementing gear and spatial restrictions relative to other options makes these restrictions a common feature of customary self-

Figure 8.10 Small-scale fisheries catch categorized by type of harvesting management measure applied, based on analysis of policies from 43 marine and 38 inland countries and territories



Notes: "Size" and "Sex" refer to restrictions on the size or sex of harvested species, respectively; "TAC" refers to total allowable catch.

governed systems in a diversity of geographies and cultural contexts (Cinner *et al.*, 2006, 2012b; Johannes, 1978, 2002). Indeed, low implementation costs are an important enabling condition of self-governance systems according to Ostrom (1990).

A type of spatial restriction that may be particularly important for small-scale fisheries, as indicated by the extent it is used within national jurisdictions, is that of preferential access areas for marine small-scale fisheries, where, for instance, activities from large-scale fisheries or certain types of gear (such as trawls) are prohibited. An analysis of formal legislation and expert consultations in 52 countries and territories showed that preferential access areas of this type are common in coastal waters in all regions around the world. These access areas are identified in formal national, regional or local legislation either by designating areas of the sea that are restricted (or that give preference) to small-scale fisheries, or through regulations that implicitly or explicitly favour small-scale fisheries by mandating moratoriums on the operation of large-scale vessels in those areas. Areas of the sea that are de facto exclusive to small-scale fisheries, by nature of the absence of large-scale fleets, are also included.

On average, countries have designated a median of 3 percent of their EEZs as preferential access areas for small-scale fisheries (average is 17 percent). Assuming the median holds for the world's EEZs, and these are the areas most used by small-scale fisheries, it would be possible to conclude that less than 5 percent of the

worlds' EEZs overall are reserved by law to support most of the direct employment and income in the ocean, and therefore make the highest contributions toward SDG 1 (No poverty). This assumption is based on findings from this report (see Chapter 5 for details) suggesting that small-scale fisheries are likely to provide most of the direct employment and income as compared to other employers of the ocean (large-scale fishing, shipping, and oil and gas), which are likely to occupy or occur in larger areas of EEZs.

Given that most small-scale fishers fish close to shore on the continental shelf (see characterization matrix in Chapter 3), assessing the amount of continental shelf with preferential access provides a rough, but useful, metric of the potential size of preferential access areas for small-scale fisheries. The median proportion of continental shelf with preferential access designation for small-scale fisheries worldwide is 18 percent. This suggests that the area that could potentially be reserved for small-scale fishers is considerably larger than that currently designated as preferential access areas. However, the feasibility of exploitation by small-scale fishers typically declines as depth increases, at least for some fisheries (e.g. demersal), which is an important consideration that affects competition among fishers with diverse types of gear.

Figure 8.11 shows that most countries and territories in this chapter analysis, particularly those in the African continent (soft pink dots in lower-left quadrant in figure), have a low percentage of preferential access areas in relation to the size of their continental shelf,

Figure 8.11 Distribution of 33 countries and territories by world region, by percentage of exclusive economic zone with preferential access for small-scale fisheries plotted against percentage of continental shelf with preferential access



indicating that if these areas were increased they could potentially benefit small-scale fisheries by reducing competition with large-scale fisheries. The other two clusters of countries shown in the figure have designated their entire continental shelf area as preferential access for small-scale fisheries, but differ in how much it represents of their EEZ. The cluster of Small Island Developing States (SIDS) mostly from the Oceania region (upper-left quadrant in Figure 8.11) have small continental shelves; therefore small-scale fishers cannot use the rest of the EEZ under current technology (because of its depth), so this portion is used by large-scale fishing fleets. The cluster of several SIDS mostly from the Americas (upper-right quadrant in Figure 8.11) have large, shallow continental shelves, which is reflected in their provision of preferential access to small-scale fisheries in 100

percent of the ocean in their national jurisdiction. These countries seem to have no or very limited large-scale fishing fleets.

One of the challenges to fulfilling the potential that preferential access areas offer to small-scale fisheries is the lack of adequate management of access. A study of 33 African maritime countries and territories bordering the Atlantic and Indian Oceans (but not the Mediterranean) cited enforcement as a particular governance challenge. Using satellite technology to predict fishing operations by large-scale fleets, it found these fleets spent 3–6 percent of their fishing time within preferential access areas during 2012–2016 (Belhabib *et al.*, 2020). Even without competition from large-scale fleets, without adequate management these preferential access areas can suffer from overexploitation from small-scale fishers themselves.

8.6 Governance of tenure in small-scale fisheries

The SSF Guidelines advocate the empowering of men and women in small-scale fishing communities to participate in decision-making processes and to assume responsibilities for sustainable use of fisheries resources (FAO, 2015). Over the past 50 years, the devolution of tenure rights (i.e. management, exclusion and transferability)⁴⁴ has been central to policy reforms shifting fisheries governance away from command-and-control approaches and toward co-management or community-based management of the use of natural resources (d'Armengol *et al.*, 2018; Evans, Cherrett and Pems, 2011; Sen and Nielsen, 1996). This section provides an initial global overview of the devolution of formal rights, followed by a comparison between formal and customary governance systems and analyses of the effects of income and scale of operation. It also includes a subsection on customary governance and management in indigenous fisheries.

8.6.1 Devolution of formal rights

The analysis of small-scale fisheries in this chapter showed that management rights are formally granted to fishers in nearly 75 percent of countries,⁴⁵ governing more than one-third of the marine (35 percent) and inland (39 percent) catch reported for these countries (Figure 8.12). For the portion of catch that has devolved rights, most of it involves “mostly devolved” rights (meaning that fishers have been granted two out of the three types of tenure rights), accounting for 19 percent of marine and 22 percent of inland catch (Figure 8.13).

Fishers enjoying fully devolved rights have been granted all management, exclusion and transferability rights over the catch. This implies that they are involved in management, but not necessarily in full control of it. In some settings, transferability rights (i.e. the right to transfer management, exclusion and transferability rights to someone else) constitute the defining element for private property. This does not usually apply to small-scale fisheries, and while a more nuanced analysis of how transferability rights operate in these fisheries is beyond the scope of this chapter, findings reveal that these rights have a very limited application in the subsector, as most of the marine (9 percent) and inland (8 percent) small-scale fisheries catch comes from only six countries (Figure 8.12).

8.6.2 Customary governance systems

The SSF Guidelines call on states and all other parties, in accordance with their legislation, to respect and protect all forms of legitimate tenure rights, taking into account (where appropriate) customary rights to aquatic resources, land and fishing areas (FAO, 2015). When fishers and their communities have tenure rights, the various harvesting management restrictions (i.e. spatial, temporal, gear, species and access) they implement are often designed to manage conflict, improve equity of access, or prevent the most environmentally egregious forms of fishing, among others (Berkes, ed., 1989; Cinner and Aswani, 2007; Johannes, 1978, 2002; McCay and Acheson, 1987; Ruddle, 1994). These multifaceted management objectives are more closely aligned with the aims of the Guidelines, in contrast with management objectives that are focused almost exclusively on production and rent extraction (see Figure 8.5).

⁴⁴ Enforcement and enforcement rights fell outside the scope of this chapter.

⁴⁵ Similar results were found by an independent survey conducted by FAO in 2020, where 81 percent of FAO Member Nations (n = 92) reported involvement of fishers in fisheries management (FAO, 2021g).

Figure 8.12 Percentage of marine and inland small-scale fisheries catch for which fishers are granted management, exclusion and transferability tenure rights, based on analysis of policies from 43 marine and 38 inland countries and territories

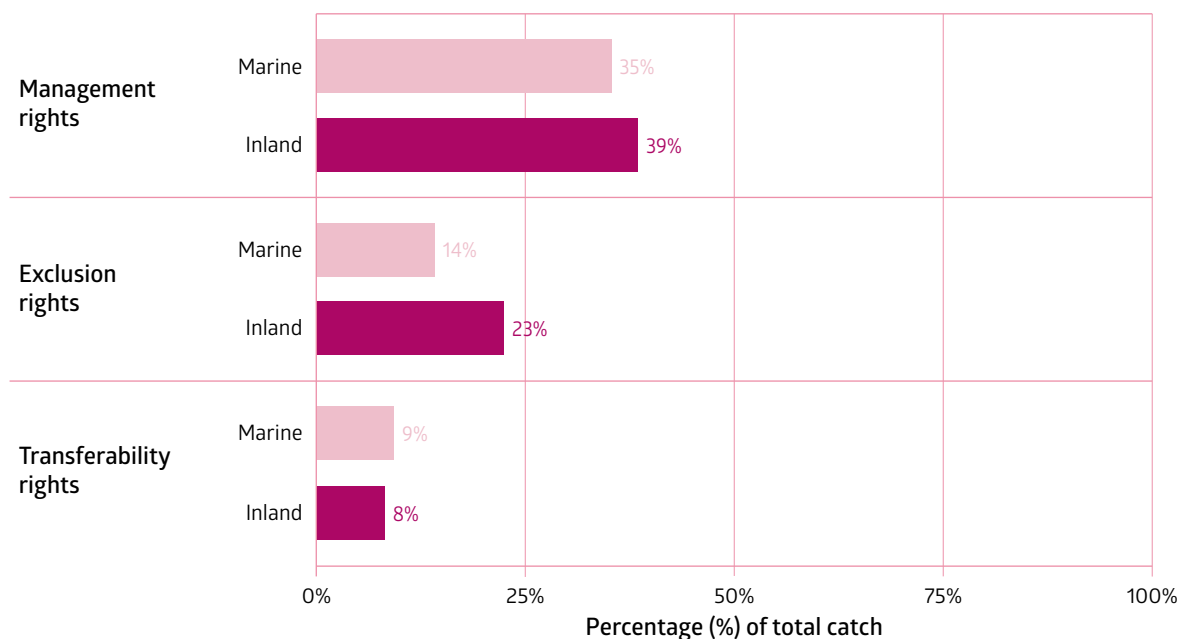
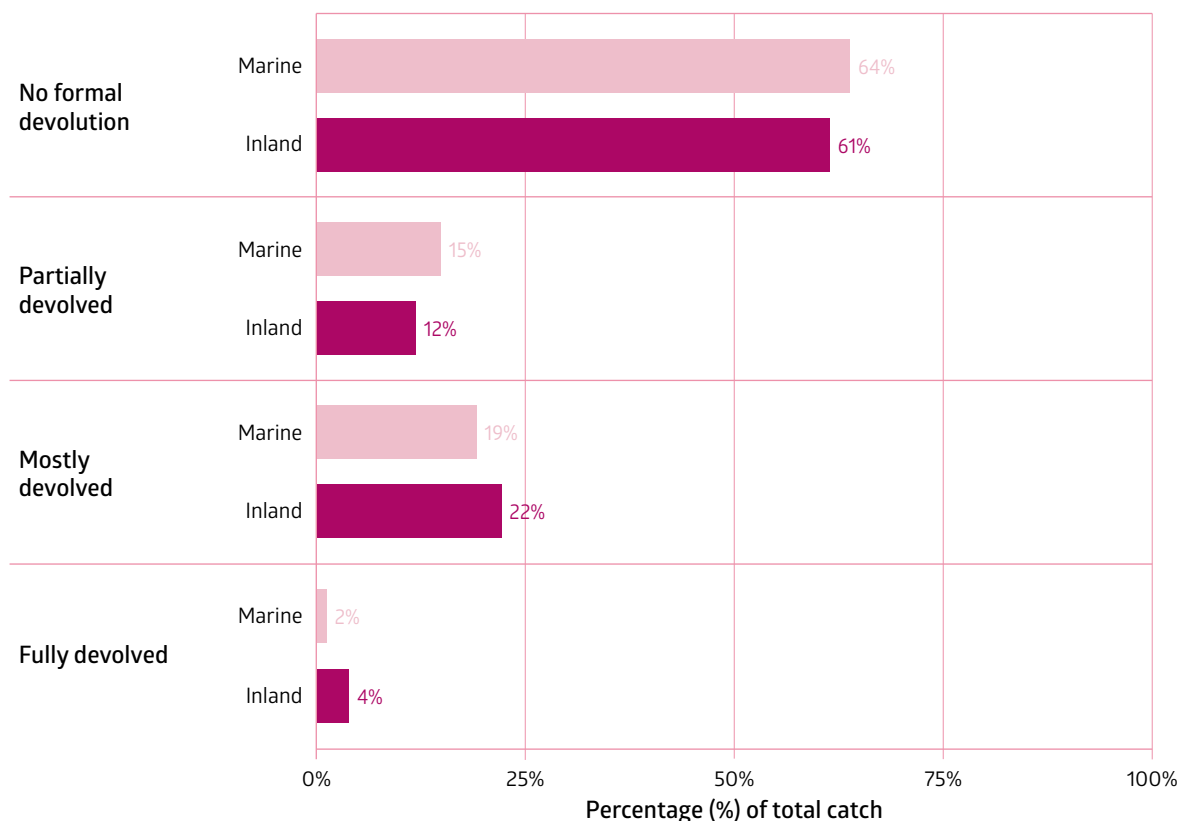


Figure 8.13 Percentage of marine and inland catch with different levels of rights devolution in formally governed small-scale fisheries, based on analysis of policies from 43 marine and 38 inland countries and territories



Notes: Partially devolved = when any single right is devolved to fishers; mostly devolved = when any two rights are devolved; fully devolved = when all three rights are devolved at the same time. This analysis only included devolved rights formally recognized in laws, regulations, policies, plans or strategies. It did not include governance regimes with informally devolved rights, which are recognized to be important around the world but for which data and analysis are not currently available or feasible at a global scale.



©FAO/Petri Suuronen, Thailand

The legalization and formalization of customary governance systems is an important challenge for small-scale fisheries, but there is a risk of oversimplifying management strategies such that they become rigid institutional structures, which would threaten small-scale fishers' adaptive capacity (Cinner and Aswani, 2007). When formalization processes do not take into account the interaction of legal and customary rules or build the necessary linking institutions, they can result in reduced governability and associated social losses (Carlisle and Gruby, 2019; Lau *et al.*, 2020; Rohe *et al.*, 2019). Approaching these issues will require the following: (i) aligning “legal pluralism” through proper inclusion of customary knowledge holders, (ii) carefully defining roles, (iii) developing a shared understanding of the process and desired outcomes, and (iv) addressing conflicts early on, among other important considerations (Jentoft and Bavinck, 2014; Kolding, Béné and Bavinck, 2014).

It is important to deepen the understanding of how customarily governed small-scale fisheries can develop productive interactions with fisheries authorities. For instance, from this chapter analysis it was learned that in countries such as Chile, India, Peru and Sierra Leone, fishers have organized under different co-management systems to establish and

enforce gear restrictions, sometimes informally collaborating with government institutions to monitor fishing efforts. In Sierra Leone these organizations are called co-management associations. In cases like these, customarily governed small-scale fisheries may devolve management and exclusion rights to formally organized groups of fishers such as cooperatives, *cofradias*, syndicates and other types of associations, rather than to individual fishers. In these instances, groups of fishers make collective decisions and determine fisheries access and harvesting rules through membership.

8.6.3 Comparing formal and customary governance systems

This subsection provides a limited comparison between formal and customary governance systems in relation to how access is granted and tenure rights are devolved. Comprehensive data about either system at a global level were not available. Yet, as part of this chapter analysis a small database was assembled consisting of 37 customarily governed small-scale fisheries from 12 countries in Asia, Africa and South America (a subset of the entire IHH database).⁴⁶ Despite the potential limitations on the external validity of the comparison, it was deemed

⁴⁶ The 12 countries were Bangladesh, Brazil, Chile, Congo, Ghana, India, Indonesia, Madagascar, Nigeria, Peru, Sierra Leone and Sri Lanka. The subset does not constitute an exhaustive list of customarily governed small-scale fisheries, only those the CCS authors considered to be most important or for which they had information from their countries. See Annex A for a more detailed description of case selection criteria and the general methodological approach to this chapter.

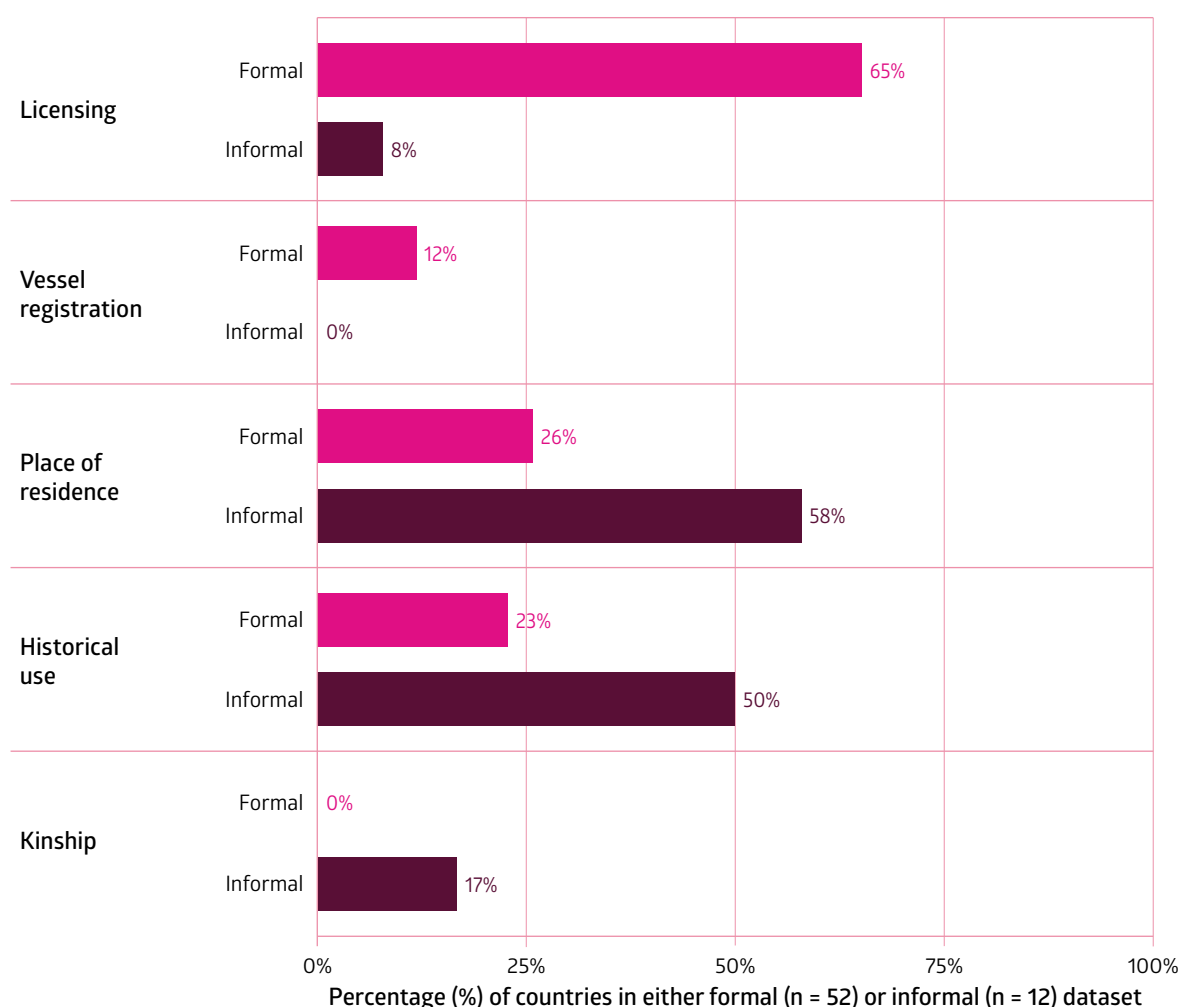
useful to show similarities and differences between both governance regimes regarding access and devolution of rights. Figure 8.14 shows that formal and customary governance systems grant access to fishers very differently. In customary regimes, place of residence and historical use are the most common criteria for granting access. Licensing is also used in customary regimes as a criterion but does not feature as prominently as in legislation of formally governed small-scale fisheries. Findings from the 12 countries analysed here suggest that when local fishers are involved in governance, they overwhelmingly choose place of residence or historical use over licensing.

Place of residence or historical use can serve in some cases as a basis to develop tenure rights linked to geographic areas in coastal environments, also known as territorial use rights in fisheries (TURFs) (Christy, 1982). TURFs are often informally held, yet management regimes can emerge in these areas (Orensanz *et al.*, 2013). For instance, customarily governed small-scale fisheries in Peru and India have set restrictions banning gear types associated with stock decline or habitat destruction in specific

shallow-water areas. TURFs can also allow informally governed fisheries to adapt to changing conditions based on local knowledge, as has happened in Brazil where clam harvesters use weather patterns to determine seasonal and temporal restrictions. The existence of low-mobility aquatic foods such as benthic crustaceans or molluscs facilitates the accumulation of knowledge among fishers and the predictability of future resource availability by the simple fact of them being more easily and frequently observable (Ostrom, Gardner and Walker, 1994), expediting adaptation to socioecological change (Castilla and Defeo, 2001; Gelcich *et al.*, 2010).

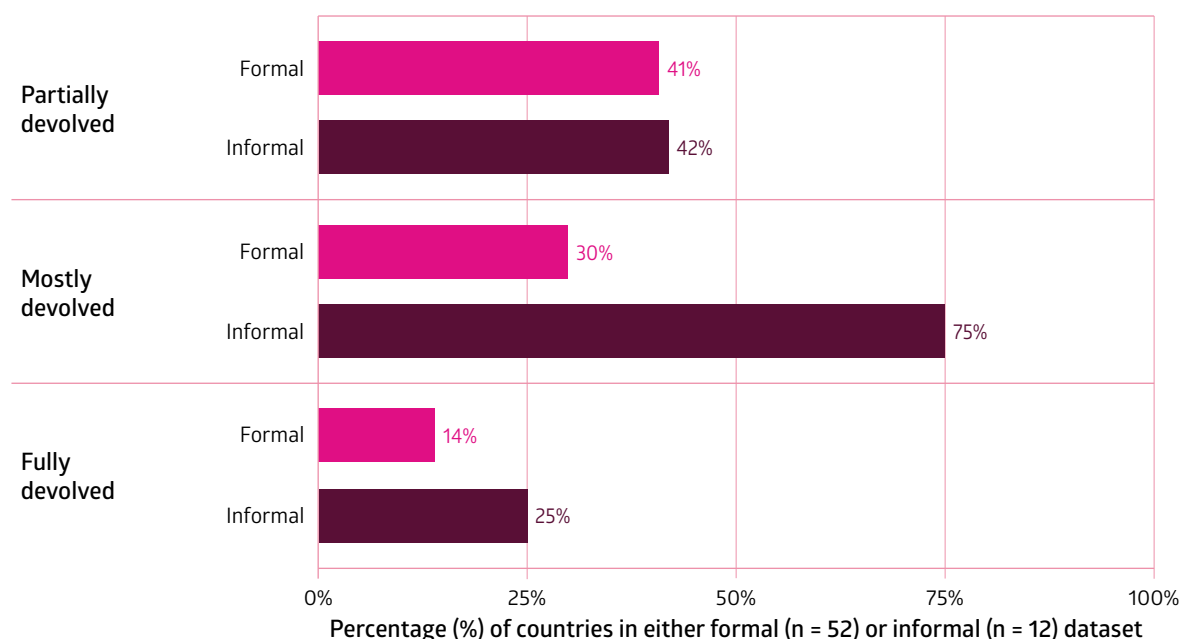
While a large number of customary governance arrangements in the IHH dataset were tied to benthic or sedentary species, examples have also been documented for non-benthic species. In the north of New Caledonia, some migratory species have been associated with the exclusive harvesting of particular clans among the Nemea people. Harvesting historically took place at precise times of the year based on known migratory routes, and the species considered sacred were not harvested

Figure 8.14 Comparison of main access strategies between customarily governed and formally governed small-scale fisheries, by percentage of countries and territories using each type of access strategy



Notes: For each country, strategies were included if at least one fishery in the country used them. More than one access strategy could apply to each country, which is reflected in the percentages not adding up to 100.

Figure 8.15 Percentage of formally and customarily governed small-scale fisheries with different levels of rights devolution



Notes: Partially devolved = when any single right is devolved to fishers; mostly devolved = when any two rights are devolved; fully devolved = when all three rights are devolved at the same time. Devolved rights were included if at least one fishery in the country used them. More than one level of devolved right could apply to each country, which is reflected in the percentages not adding up to 100.

for commercialization. The use of poisoning and other particularly destructive harvesting techniques required the authorization of the chief, who gave it only rarely, such as during times of famine (Teulières, 1992). In inland fisheries, the use of customary norms and taboos to protect fish spawning areas or deep pools used during fish migration is well documented for the Lower Mekong Basin (Baird and Flaherty, 2005). These pools serve as fishing refuges during the dry season. Many have been formalized into fishery conservation zones, and under the right conditions can benefit highly migratory species (Baird, 2006).

Around the world, customary governance regimes exhibit a rich diversity of measures combining access criteria and harvesting management (Johannes, 1978; Ruddle, 1994). One way in which they combine is through TURFs. For the analysis in this chapter, 29 countries reported almost 1 500 instances of formal and informal TURFs, including arrangements such as the Indonesian *adat*, which establishes gear and spatial restrictions, or the Malagasy *dina*, which combines customary harvesting restrictions with exclusion rights that act as informal TURFs. Ghana, India, Sierra Leone and Sri Lanka (among other countries) use temporal restrictions tied to customary days of rest, celebration or mourning. In many countries, such rules are arbitrated and enforced by traditional authority figures or institutions that tie fisheries governance to larger social and political institutions extending into broader community affairs. Other examples of formally established TURFs include 28 federal and provincial Marine Extractive Reserves in Brazil and more than 700 marine areas of Chile's National Benthic Resources TURF Program.

Many more unrecorded traditional TURFs can be found in inland waters around the world, such as in the Lake Chad Basin. In these environments TURFs are often temporary, based on seasonal flooding and the rainy season, such as in the land-tenured Congolese floodplains, among other areas.

Looking at the level of devolution of rights, there are some differences between the two types of governance regimes in small-scale fisheries. Not surprisingly, fewer tenure rights are devolved to fishers in formally governed fisheries than in customarily governed fisheries (Figure 8.15). Interestingly, both are relatively similar at the level of devolving only one tenure right ("partially devolved"), usually the right of management (a prevalence of 42 percent and 41 percent, respectively). Yet, formally governed small-scale fisheries fall behind on the devolution of two or more rights: "mostly devolved" tenure rights are found in 75 percent of countries with customarily governed small-scale fisheries, as opposed to 30 percent of countries with formally governed small-scale fisheries.

Continued movement towards more participatory governance approaches will require looking beyond the devolution of management rights and improving understanding of what enabling conditions are needed for local fishers to be able to act effectively on their devolved rights. Also, when multiple rights are devolved to fishers as is common in customary systems, the likelihood increases that fisheries governance will take broader community contexts and values into consideration (Fabinyi, Foale and Macintyre, 2015; see also Chapter 6 on gender). For instance, equity and resource distribution are common concerns in

Box 8.2

Institutional Diversity in Small-scale fisheries

Small-scale fisheries display considerable diversity in their characteristics, with some stark differences between regions. In Europe, for instance, 92 percent of marine small-scale fisheries are formally integrated into the economy, whereas in Asia the figure is only 3 percent. And in inland fisheries, more than 50 percent of fishery units are engaged in seasonal employment, compared to less than 17 percent

among marine fishery units. However, there are also some remarkable similarities between marine small-scale fisheries in developing and developed countries or areas, namely in the proportion of owner/operators (58 percent and 61 percent, respectively), the typical one-day length of fishing trips (70 percent and 73 percent), and the proportion of non-motorized vessels (18 percent and 19 percent).

reports on customary small-scale fisheries governance arrangements in the IHH dataset. In Peru, some fishers' associations have established a "last call" on catch, ensuring members sell their fish simultaneously and therefore receive fair and uniform prices. In Sri Lanka, the informal *raula kapanawa* practice sets norms for the redistribution of catch at shore, ensuring fishers who have a bad day do not go home empty-handed. And in Congo, as in many other places, informal rules delineate financial responsibilities for fishing trips and equitable income distribution among fishers.

It is important to note that, according to the literature, not all customary governance regimes are fair. Community leaders often keep the best fishing areas for their kin, or require "informal tariffs" from members of the community or outsiders in exchange for granting access to communal fishing areas. The processes that emerge from the negotiation and handling of these inequities can lead to either resource overexploitation or long-term sustainable use, depending on the particularities of communal social relations and local values (Basurto and Garcia Lozano, 2021). A fuller treatment of the role of values and identity in small-scale fisheries is provided in Section 8.7.1.

8.6.4 The effects of scale of operation and income

The SSF Guidelines recognize the great diversity of small-scale fisheries (see Box 8.2), and thus do not prescribe a standard definition for the subsector, nor do they prescribe how they should be applied in a national context. The Guidelines also recognize that to assure transparency and accountability in their application, it is important to ascertain which activities and operators are considered small-scale. In light of this, the characterization matrix presented

in Chapter 3 was developed in order to better disentangle different scales of operation within small-scale fisheries and harness their diversity (Short *et al.*, 2021). This subsection illustrates what can be learned from disaggregating data by scale of operation and income level. Findings show that for small-scale fisheries in general, the larger the scale of operation⁴⁷ or the higher the country income level, the greater the diversity of management approaches used (i.e. access strategies and harvesting management measures).

Figure 8.16 shows that the larger the scale of operation of a fishery, the greater the diversity of harvesting restrictions used to govern it. When the data are looked at in aggregate, spatial and gear harvesting restrictions dominate globally (Figure 8.10). Yet, when the data are disaggregated into the four scales of operation, the dominance of spatial and gear harvesting restrictions becomes less evident. For the largest marine and inland small-scale fisheries (Category 4 scale of operation), no particular harvesting management measure dominates. Marine fisheries at this scale of operation use six harvesting measures to govern at least 70 percent of marine catch, with similar heterogeneity for inland fisheries. At smaller scales of operation, the management measures in inland fisheries are much more homogeneous, with the most noticeable contrast seen between marine and inland "smallest" (Category 1) fisheries. In this category, while marine fisheries use all seven harvesting management measures to govern their catch, inland fisheries almost exclusively use gear, spatial and size restrictions to govern their fisheries.

The above interpretations need to be considered together with an understanding of which countries dominate the catch in each category, as this may have a disproportionate effect on the overall results. In Category 1, 82 percent of marine reported catch

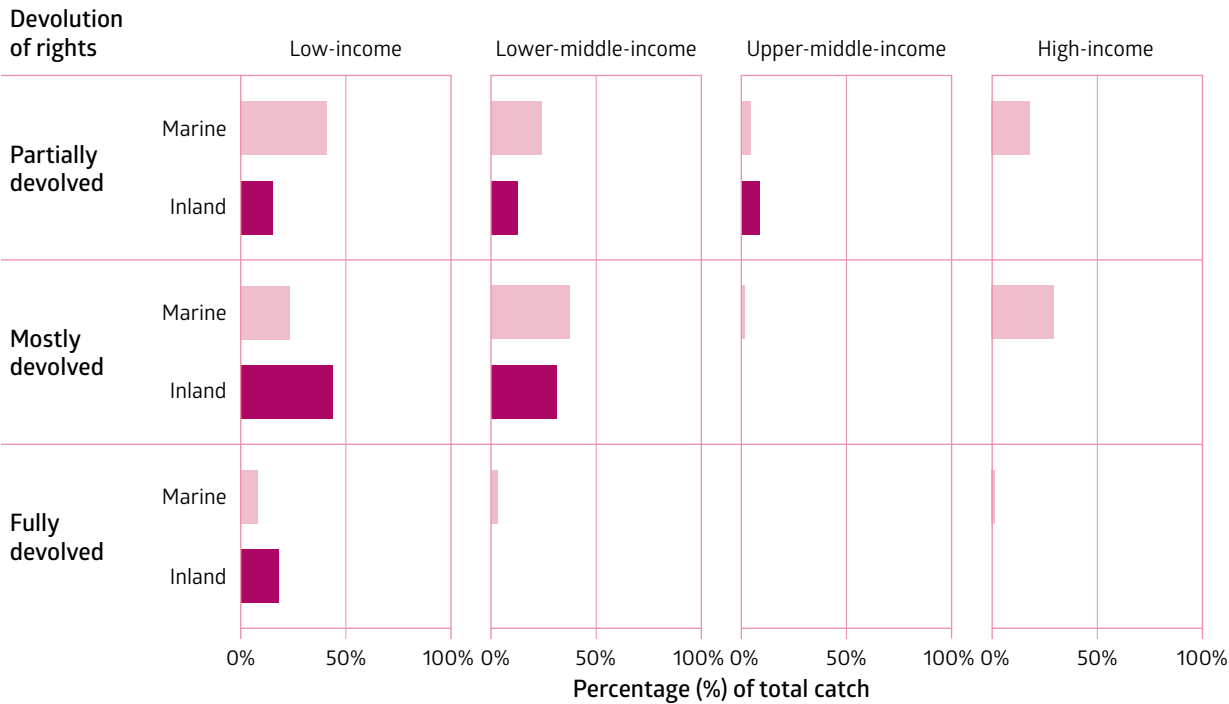
⁴⁷ Determination of scale of operation is based on the characterization matrix described in Chapter 3. Fisheries with low characterization scores indicate a small scale of operation; their scores increase as the scale of operation increases. For this analysis, catch was categorized into four scales of operation based on the fishery characterization scores, from smallest (Category 1) to largest (Category 4). Category 1, for example, includes fisheries that employ gleaning and most artisanal and non-motorized methods, while Category 4 includes fisheries with highly motorized boats and the capacity for multi-day trips, making these fisheries border on the large scale.

Figure 8.16 Relationship between type of harvesting management measure employed and scale of operation in marine and inland small-scale fisheries, by proportion of total catch, based on analysis of policies from 43 marine and 38 inland countries and territories



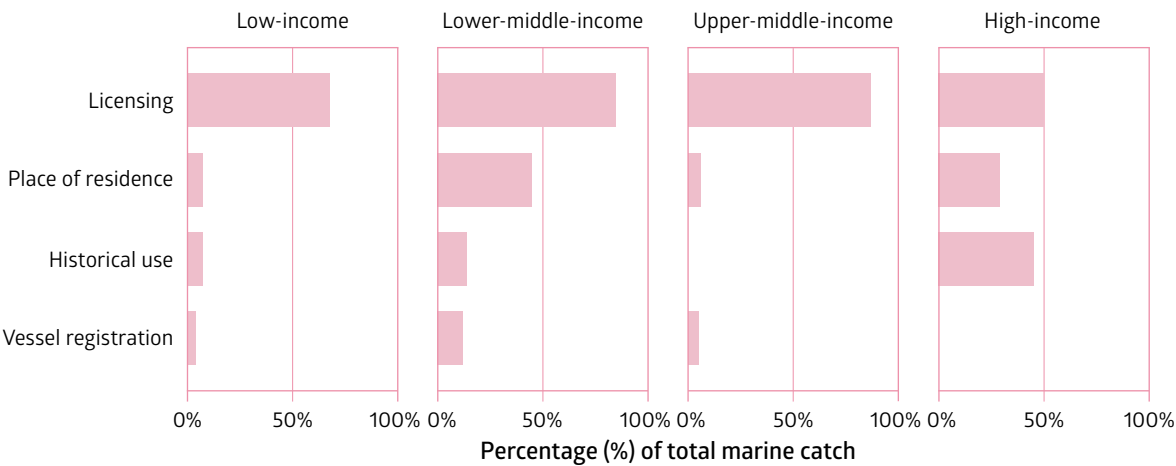
Notes: "Size" and "sex" refer to restrictions on the size or sex of harvested species, respectively; "TAC" refers to total allowable catch.

Figure 8.17 Relationship between the level of devolution of rights and country income group in marine and inland small-scale fisheries, by proportion of total catch, based on analysis of policies from 43 marine and 38 inland countries and territories



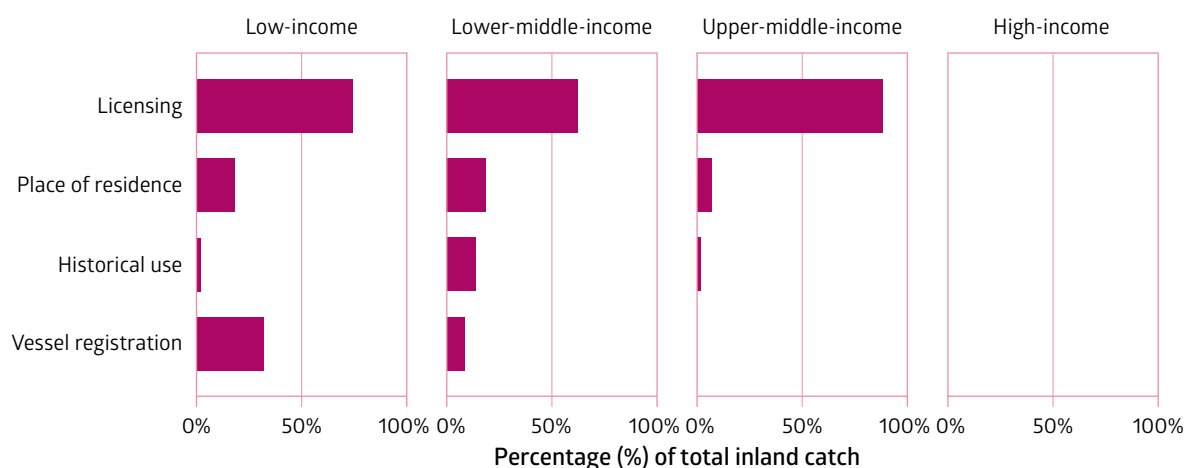
Note: World Bank income group classification is used.

Figure 8.18 Relationship between access strategy and country income group, as a percentage of total catch in marine small-scale fisheries, based on analysis of policies from 43 countries and territories



Note: World Bank income group classification is used.

Figure 8.19 Relationship between access strategy and country income group, as a percentage of total catch in inland small-scale fisheries, based on analysis of policies from 38 countries and territories



Note: World Bank income group classification is used.

comes from the Philippines and India, with the rest coming from 16 countries from all world regions. For inland reported catch, 89 percent comes from Bangladesh and China and the rest from 14 countries from all regions except Europe. Category 2 includes 35 countries for marine and 31 for inland. For this category, 69 percent of marine and 44 percent of inland reported catch comes from China, with the rest distributed among countries in all regions of the world. Category 3 includes fisheries from 39 countries. For the marine reported catch, 28 percent comes from Chile, Indonesia and Viet Nam, with the rest distributed among all regions of the world. For the inland reported catch, 62 percent comes from the Democratic Republic of the Congo, Malawi, Uganda and the United Republic of Tanzania, with the rest distributed among 14 countries in Africa, the Americas and Asia. In Category 4, marine catch is only represented by seven countries; 62 percent comes from Indonesia and the rest from six countries in Europe, Africa, the Americas and Asia. Inland catch is represented by five countries, with 93 percent of the reported catch coming from the United Republic of Tanzania, and the rest from four countries in Africa and the Americas.

National income is also associated with how small-scale fisheries are governed, and findings show low-income and lower-middle-income countries feature the highest proportions of catch involving formally devolved rights (Figure 8.17). Marine small-scale fisheries in high-income countries also have catch involving devolved rights, but at lower proportions in the aggregate than low-income and lower-middle-income countries.

When it comes to access strategies, findings for marine fisheries show that the higher a country's income, the more diverse the criteria it uses to grant access to small-scale fisheries. Licensing is normally the dominant criterion used worldwide, but in

high-income countries it only governs 50 percent of marine small-scale catch, while historical use is used to govern 45 percent (Figure 8.18). Notably, place of residence governs almost half of the catch among lower-middle-income countries, including Bangladesh, India, Indonesia, the Philippines and Viet Nam, among others. For inland fisheries, the reverse pattern is found: the higher the income, the lesser the diversity of access strategies used. In upper-middle-income countries licensing dominates, while in low-income and lower-middle-income countries a diversity of access criteria is found (Figure 8.19).

The low-income category used in Figure 8.18 and Figure 8.19 uses small-scale fisheries catch from nine marine countries, of which the Democratic Republic of the Congo, Guinea, Mozambique and Sierra Leone account for 81 percent, with the rest distributed among five other African countries; and ten inland countries, where the Democratic Republic of the Congo, Malawi, Uganda and the United Republic of Tanzania account for 76 percent of overall reported catch, with the rest distributed among six other African countries. The lower-middle-income category is based on catch from 16 marine countries, of which Bangladesh, India, Indonesia, the Philippines, Sri Lanka and Viet Nam account for 75 percent, with the rest distributed among ten countries in Africa and Oceania; for the inland catch in this category, Bangladesh, Egypt, Indonesia, Nigeria and the Philippines account for 74 percent, the rest being distributed among countries mostly in Africa and Asia. The upper-middle-income category uses catch from 18 marine countries, with China and Peru combined representing 80 percent and the rest distributed among 16 countries in all regions of the world. For inland fisheries catch in this category, Brazil and China combined represent 84 percent, the rest being distributed among seven countries in all regions of the world. The high-income category is based on catch from nine

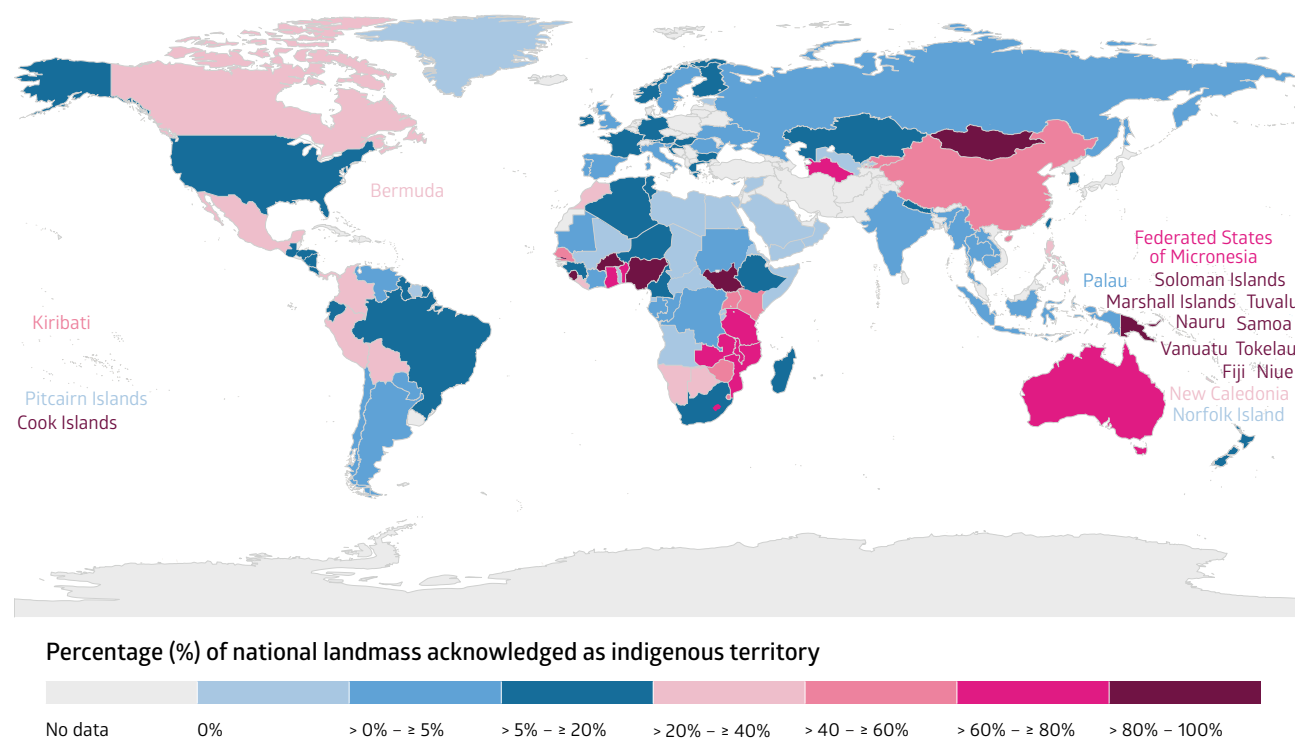
BOX 8.3

Indigenous Peoples in the UN legal framework

- The 1989 Convention of the International Labour Organization (ILO 169)^a and the 2007 UN Declaration on the Rights of Indigenous Peoples (UNDRIP)^b have progressively advanced the recognition of indigenous rights.
- UNDRIP introduced the right of free, prior and informed consent, an essential mechanism for protecting indigenous rights to participation and self-determination.
- The UN Permanent Forum on Indigenous Issues (UNPFII)^c was established in 2000 to engage with indigenous issues related to social and economic development, culture, environment, health, education and human rights.
- The 2014 World Conference on Indigenous Peoples produced an action-oriented document with major commitments to advance indigenous rights.
- The UN 2030 Agenda for Sustainable Development Goals specifically calls for Indigenous Peoples' empowerment, inclusion and access to quality education, as well as their engagement in implementing the Agenda.

Notes: **a** International Labour Organization (ILO), Indigenous and Tribal Peoples Convention, C169, 27 June 1989, C169. **b** UN General Assembly, United Nations Declaration on the Rights of Indigenous Peoples: resolution adopted by the General Assembly, 2 October 2007, A/RES/61/295. **c** UN Permanent Forum on Indigenous Issues (UNPFII), Permanent Forum on Indigenous Issues: report on the 12th session (20–31 May 2013), 31 May 2013, E/2013/43–E/C.19/2013/25.

Figure 8.20 Percentage of national lands under Indigenous Peoples' tenure and acknowledged by the government, according to the LandMark global platform



Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties. Final boundary between the Sudan and South Sudan has not yet been determined.

Source: Adapted from Dubertret, F. & Wily, L.A. 2015. Percent of Indigenous and Community Lands. In: *LandMark – Global Platform of Indigenous and Community Lands*. www.landmarkmap.org/data/

marine countries, with Chile and the United States of America accounting for 81 percent, and the rest distributed among countries in all regions, with the exception of Asia and Oceania. For inland fisheries catch, only Spain is found in this category in the sample of countries and territories analysed, and its reported catch is rounded down to zero.

8.6.5 Customary governance and management in indigenous fisheries

No single culture or language defines Indigenous Peoples, and no common image, gear or species can represent the full variety of indigenous fisheries. Their fishing methods range from hook and line, spears and various traps to mechanized gear. The fishers themselves range from nomadic sea-faring peoples in tropical waters to marine mammal hunters in the Arctic, and from coastal gleaners to inland river and lake fishers.

Aquatic foods are key sources of nutrition for Indigenous Peoples, and are also critical to their food security. Cisneros-Montemayor *et al.* (2016) have found that Indigenous Peoples consume only about 2 percent of the world's marine fisheries catch, but up to 15 times more fish than non-indigenous populations. Other studies reveal similar evidence of indigenous dependence on inland aquatic foods as well, making fisheries a pillar of their food systems (Franz *et al.*, 2015; Bennett *et al.*, 2021; FAO, 2016). But increasing extractive pressures at local and global scales have limited indigenous fishers' access to aquatic foods, as have climatic upheavals and other threats. This weakens the diversity of indigenous food systems and exacerbates economic, political and ecological hardships.

This story is not limited to indigenous fishers,⁴⁸ and these fishers aren't alone in claiming a strong sense of place in relation to their fisheries, or in voicing experiences of marginalization, rights violations and dispossession. Yet indigenous fisheries are unique: they feature a variety of fishing techniques, languages and cultures, embedded in centuries-long histories of localized resource management, all resulting in very particular relationships with nature. However, these factors create especially high stakes for indigenous fishers in seeking recognition of their rights to access and manage resources (see Box 8.3). At the same time, these fishers may have legal recourse or access rights that are unavailable to non-indigenous groups, which may create special opportunities for indigenous sustainability while sometimes creating conflicts with non-indigenous small-scale fishers.

Indigenous fisheries are products of long-developed relationships between people and the environment. Through millennia of interactions with the aquatic

world, Indigenous Peoples have developed an astounding diversity of fishing technologies including vessels, baskets, traps, nets, harpoons, spears, hooks, poisons, and body techniques not requiring tools. These highly specialized technologies reflect lasting bonds between indigenous fishers and their aquatic ecosystems. Despite these strong links between indigenous fishers, their cultural identity and sustainable resource management, disruption has also been a central experience for many of their fisheries, including infringements of rights.

In light of these rights infringements, as well as more general attempts at correcting colonial legacies, some states have taken measures to distinguish indigenous fisheries from non-indigenous small-scale fisheries. A large portion of the world's countries legally recognize indigenous rights to land and water in some capacity (Figure 8.20). In fact, six countries in the IHH dataset reported fisheries laws that acknowledge distinct rights for indigenous fishers. Though these laws are rarely implemented to the full protection of these fishers, their existence gives them leverage. That said, laws distinguishing indigenous fisheries from non-indigenous small-scale fisheries may spark resentment and even conflict among non-indigenous fishers who themselves feel marginalized (Mackey, 2005; Burnett, 1996; Wilmer and Alfred, 1997). It is therefore important to recognize indigenous fishers and non-indigenous small-scale fishers as overlapping groups who share some defining features and common concerns, but who differ in their histories, food system contexts and legal options. For this very reason policy discourse should distinguish between Indigenous Peoples and other local communities, rather than combining them as a single constituency. This distinction acknowledges the interests that separate indigenous fishers and the rights they have fought for at national and international scales (ICC, 2020).

Ancestral ties connect indigenous fishers to their territories and set a foundation for sustainable fishing practices. Many Indigenous Peoples "consider all the earth to be sacred and regard themselves as an integral part of this holistic and living landscape" (Buggey, 1999). This binds fishers to their ecosystems and makes fishing grounds central to indigenous identity, even beyond the harvest (Collignon, 2006; Ingersoll, 2016). The multigenerational relationships between indigenous fishers and their territories have given rise to customary laws that support sustainable fishing (see Box 8.4).

⁴⁸ For the purposes of this chapter, indigenous fishers (or fisheries) are considered to be small-scale.

BOX 8.4

Indigenous customary fisheries management

To maintain ties to their territory, indigenous fishers have often established rules guiding the use of rivers, lakes and coastlines. Cinner (2008)^a found four categories of traditional restrictions, or *fady*, in Madagascar which limit coastal resource exploitation: spatial restrictions, temporal restrictions, gear restrictions and species restrictions. Such management tools are common around the world. In parts of Australia, for example, customary marine tenure divides sea property by island, community, clan and lineage.^b Tenure is backed by collective and individual access rights which allow for adaptive management even amid conflict, and which support the reasoned regulation of stocks.^c The displacement of Indigenous Peoples and erosion of their culture disrupts these protective measures.

The links between indigenous land, identity and fishing practices are perhaps clearest in the relationships between fishers and the aquatic species they harvest. Many Indigenous Peoples develop personal and cultural bonds with particular species. The Baniwa and Enawene of the Amazon rainforest, for example, understand fish as ancestral kin whose artistic, ritual and social life mirrors that of humans.^d These close ties inform fishing prohibitions when sacred species are targeted. In the Congo Basin, the Bakwele apply 25 such restrictions on 46 fish species.^e According to these customs, eating or even touching restricted species can bring sickness or disorder to pregnant women and their families. Prohibitions like these can protect vulnerable species, define tenure, and set the foundation for both food security and equitable resource distribution.^f

Recent research shows that these traditional restrictions contribute to conservation as well.^g When customary sea turtle bans were lifted in Madagascar, for example, turtle populations declined significantly.^h Some conservation programmes have included indigenous values in a bid to strengthen their impact.ⁱ In Eastern Polynesia, the restoration of ancient *rahui* access restrictions has increased the richness and biomass of fish species.^j These examples show how much policymakers and fisheries managers can learn from the practices, beliefs and values that shape indigenous fisheries.

Notes: **a** Cinner, J. 2008. Le rôle des tabous dans la conservation des ressources côtières à Madagascar. *Ressources marines et traditions. Bulletin de la CPS*, 22: 15–23. **b** Lalancette, A. 2017. Creeping in? Neoliberalism, indigenous realities and tropical rock lobster (kaiar) management in Torres Strait, Australia. *Marine Policy*, 80: 47–59. **c** Peterson, N. & Rigsby, B., eds. 2014. *Customary marine tenure in Australia*. Sydney, Australia, Sydney University Press; Johannes, R.E. 2002. The renaissance of community-based marine resource management in Oceania. *Annual Review of Ecology and Systematics*, 33(1): 317–340; Vaughan, M.B., Thompson, B. & Ayers, A. 2017. *Pāwehe Ke Kai a'o Hā'ena: creating state law based on customary indigenous norms of coastal management. Society & Natural Resources*, 30(1): 31–46. **d** Garnelo, L. 2007. Cosmologia, ambiente e saúde: mitos e ritos alimentares baniwa. *História, Ciências e Saúde*, 14: 191–212; Mendes dos Santos, G. & Mendes dos Santos, G. 2008. Men, fish and spirits: the fishing ritual of the Enawene-Nawe. *Tellus*, 8: 39–59. **e** Oishi, T. 2016. Ethnoecology and ethnomedicinal use of fish among the Bakwele of southeastern Cameroon. *Revue d'ethnoécologie*, 10. **f** Colding, J. & Folke, C. 2001. Social taboos: "invisible" systems of local resource management and biological conservation. *Ecological applications*, 11(2): 584–600; Coté, C. 2017. *Spirits of our whaling ancestors: revitalizing Makah and Nuu-chah-nulth traditions*. Seattle, USA, University of Washington Press; Leblie, I. 2008. *Vivre de la mer, vivre avec la terre ... en pays kanak. Savoirs et techniques des pêcheurs kanak du sud de la Nouvelle-Calédonie*. Travaux et documents océanistes. Paris, Société des Océanistes. **g** Alexander, L., Agyekumhene, A. & Allman, P. 2017. The role of taboos in the protection and recovery of sea turtles. *Frontiers in Marine Science*, 4: 237; Foale, S., Cohen, P., Januchowski-Hartley, S., Wenger, A. & Macintyre, M. 2011. Tenure and taboos: origins and implications for fisheries in the Pacific. *Fish and fisheries*, 12(4): 357–369; Jones, J.P., Andriamarivololona, M.M. & Hockley, N. 2008. The importance of taboos and social norms to conservation in Madagascar. *Conservation biology*, 22(4): 976–986; Shalli, M.S. 2017. The role of local taboos in the management of marine fisheries resources in Tanzania. *Marine Policy*, 85: 71–78. **h** Cinner, J. 2008. Le rôle des tabous dans la conservation des ressources côtières à Madagascar. *Ressources marines et traditions. Bulletin de la CPS*, 22: 15–23. **i** Evans, K.E. & Klinger, T. 2008. Obstacles to bottom-up implementation of marine ecosystem management. *Conservation Biology*, 22(5): 1135–1143; Kaplan, I.M. & McCay, B.J. 2004. Cooperative research, co-management and the social dimension of fisheries science and management. *Marine Policy*, 28(3): 257–258. **j** Bambridge, T. 2017. Le «rahui» polynésien au secours de l'environnement. In: *The Conversation*. Cited 9 March 2017. <https://theconversation.com/le-rahui-polynesien-au-secours-de-lenvironnement-73382>



8.7 Factors influencing governance and management effectiveness

Active, free, effective, meaningful and informed participation of fishers, fishworkers and their communities constitutes one of the Guiding Principles of the SSF Guidelines. This section begins with an overview of how social and cultural identity is important to governance, then provides a global overview of the level of participation of fishers in management processes, according to the CCS authors. It then responds to the call in the SSF Guidelines for overcoming barriers to participation by briefly highlighting three examples of these: power imbalances in the value chain, gender inequality, and the privilege afforded to certain forms of knowledge over others. (For a fuller exploration of gender, please refer to Chapter 6.)

8.7.1 Social and cultural identity

Small-scale fisheries play an important role in the formation of social and cultural identities, particularly for Indigenous Peoples (see Box 8.5). Identity formation is a fundamental element of social and cultural practice, as it revolves around how people understand themselves and are seen by others (Béland, 2017). Identity influences what people do, how they interact, and where they feel they

belong. While it is subject to change, identity may nevertheless be perceived as the essence of who one is, and hence be used to sustain collectivity, or rather to emphasize differences instead.

It is in this dynamic of sameness and difference, and of stability and change, that identity plays a vital role in the viability and day-to-day organization of small-scale fisheries. The practice of fishing as well as pre- and post-harvest activities sustain a diversity of specialized skills and knowledge systems connected to coastal, marine and freshwater environments. Hence, the value of small-scale fisheries for both fishers and the broader society extends beyond livelihoods and food security to include heritage and well-being. Moreover, how and where fishers and fishing communities feel they do or do not belong affects how approaches to fisheries governance are locally received or resisted, making identity also relevant for policymaking. In turn, customary governance and management arrangements in these fisheries can also affect and shape identities and cultural practices related to fishing.

Nevertheless, the value of small-scale fisheries in terms of identity and heritage has often remained hidden. It is hardly quantifiable, which is probably a major reason for it not being given due attention. Yet,

BOX 8.5

The unique characteristics of indigenous fisheries

Though no definition can sufficiently encompass the vast diversity of peoples who identify as indigenous, international policy frameworks have established practical and inclusive criteria. Based on these, the FAO Policy on Indigenous and Tribal Peoples^a lists four main attributes of Indigenous Peoples: i) priority in time, with respect to occupation and use of territory; ii) voluntary perpetuation of cultural distinctiveness, including language, social organization, spirituality, modes of production, laws and institutions; iii) self-identification, as well as recognition by other groups or states, as a distinct collectivity; and iv) experience of subjugation, marginalization, dispossession, exclusion or discrimination, whether or not these persist. Indigenous fishers are those who fit these criteria and rely on the harvest of aquatic fauna for some combination of food, livelihood, identity and cultural heritage.

Indigenous fishing practices are often central to larger food systems and cultural identities. For indigenous fishers, fishing is rarely limited to a livelihood or profession. Rather, it is typically understood as part of a biodiverse food system that may include hunting, cultivating and gathering. Often, fishing is also a key component of identities grounded in family, traditions, language and spirituality. The ancestral continuity of many indigenous fishing practices and of the environments they steward is a testament to the links between indigenous fisheries, indigenous identities, and the ecosystems in which Indigenous Peoples live.^b

Notes: a FAO. 2010. *FAO Policy on Indigenous and Tribal Peoples*. Rome. *b* Woodley, E., Crowley, E., Dey de Pryck, J. & Carmen, A. 2006. *Cultural indicators of Indigenous Peoples' food and agro-ecological systems*. Rome, FAO.

identity and heritage must still be taken into account in the design of governance measures to ensure they foster well-being, sustainability and equity in these fisheries (Allison *et al.*, 2020).

Below are three aspects of identity in small-scale fisheries that are factors in governance and management:

- **Diverse communities of practice:** Small-scale fisheries contribute to sociocultural diversity, and there is a significant positive association between their diverse fisheries practices and the resilience and well-being of coastal and inland water communities. At the same time, small-scale fishing communities are also vulnerable to processes of displacement, exclusion and stigmatization. Particularly in locations where there are mixed livelihoods, people may not be recognized as fishing communities even if they engage in fishing activities. What constitutes a “fishing community” is not necessarily geographically or administratively defined. As different cases show, fishers, traders and fish processors often sustain “communities of practice” among people living in different places (Clay and Olsen, 2008).
- **Cultural heritage:** Given humanity’s long history of living with (and off) the sea as well as inland waters, coastal, riparian and maritime societies usually harbour a rich cultural heritage related to fishing, fish trade and seafaring (e.g. King and Robinson, eds., 2019). The translocality (i.e. presence in multiple locations) of these practices

has generated shared identities and a sense of belonging across places, but cultural heritage in small-scale fisheries is also often tied to specific geographical locations. Thus it can have political consequences, but also an important role in structuring community life.

- **Self-definition and self-determination:** There is growing recognition of the value of small-scale fishers’ knowledge and experiences in fisheries management. But to effectively and equitably involve these fishers in governance processes (i.e. co-management), it is important to take seriously not only their worldviews, but also how they identify themselves (both as fishers and as groups in society). Furthermore, this must be done without stereotyping, as this can hinder effective and just governance when the categories and proposed measures in policymaking are at odds with the social realities on the ground or at sea (Steins, 2006; see also Box 8.6).

8.7.2 Fisher participation in fisheries management

CCS authors for the countries and territories involved in the IHH study were asked to provide their expert knowledge about fisher participation in the co-management of their fisheries. Participation was defined to encompass a broad spectrum of involvement: fishers being passive recipients of information shared by the government concerning decisions it plans to make; government and fishers

cooperating as equal partners in decision-making, data collection, and monitoring and surveillance; and fishers making most decisions and advising the government, with said government then endorsing such decisions (Sen and Nielsen, 1996). Responses indicated that more than 60 percent of the small-scale fisheries catch with at least partially devolved rights involves participation from “some” or the “majority” of fishers (Figure 8.21).⁴⁹

These findings are consistent with the positive relationship between co-management and participation found in the literature (Cinner *et al.*, 2012b; Cohen *et al.*, 2021; d’Armengol *et al.*, 2018; Evans, Cherrett and Pems, 2011; Gutiérrez, Hilborn

and Defeo, 2011). Looking at co-management and participation disaggregated by region (Figure 8.22), this positive relationship is evident in some regions (especially Oceania), but not so much in others. Africa in particular has a large gap between catch with co-management provisions and catch where co-management is perceived by CCS authors to have a high level of engagement from fishers.

Debate is ongoing about the direction of the causal relationship between co-management and participation, or whether participation is a necessary but nonetheless insufficient condition for co-management effectiveness (Béné and Neiland, 2006; Nunan and Cepić, 2020; Speer, 2012).

BOX 8.6

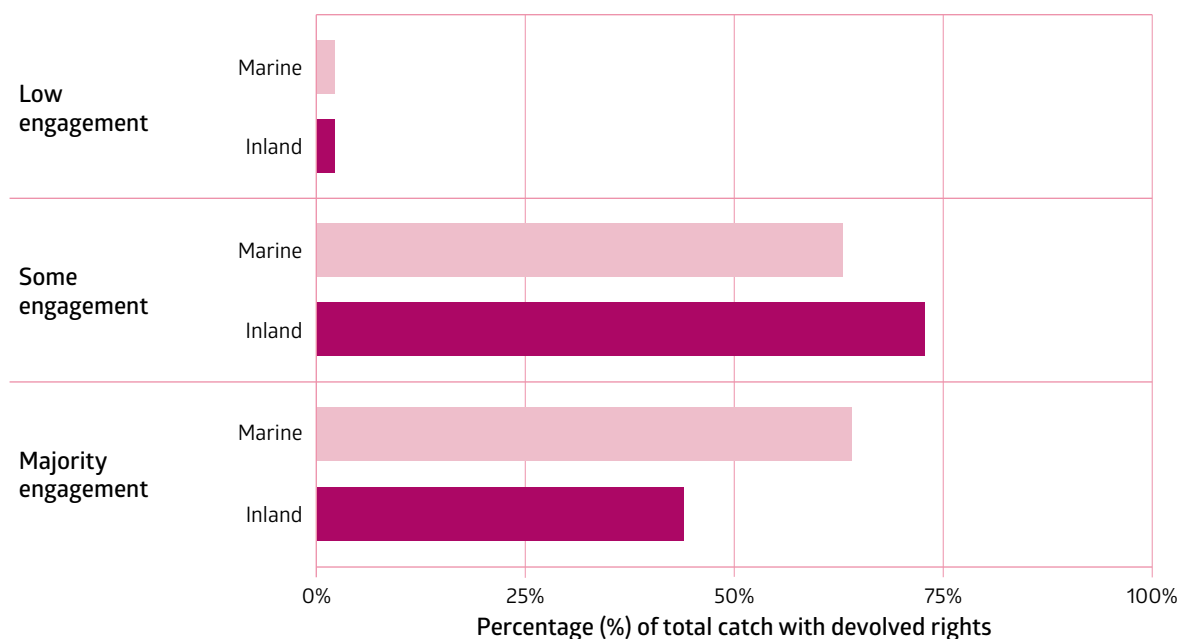
Co-management, self-determination, and participation in decision-making

It is the responsibility of governments to enable the co-management process, ensuring that it is fair and just.^a Cultural differences can be a constraining factor and fuel conflict.^b Identity, however, can be a motivating and enabling factor that supports collectivity and meaningful representation, most clearly demonstrated by the emerging recognition and legal anchoring of Indigenous Peoples’ right to self-determination and to intellectual and cultural property.^c Furthermore, fishers’ ability to participate at different levels is an important prerequisite for effective co-management. This is not just linked to resource availability and individual skills, but also to the ability to organize collective political action.^d Such community organization requires, and sustains, a sense of belonging and moral obligation, and is shaped by specific (local) power dynamics.^e In designing policies and institutional arrangements, state and other authorities need to be responsive to such social realities and emergent forms of organization in fisheries management.^f Due to their community bonds and particular heritage, small-scale fishers have socially distinguishing features, including different understandings, views, values and skills. This makes them different – as individuals or groups – from each other and from other stakeholders, which then affects their engagement in political processes.^g While this distinctiveness of small-scale fishers becomes visible in the process of decision-making, and their particularity is often recognized, the ways in which their identity affects governance processes often remain unaddressed.

Notes: a Jentoft, S. 2005. Fisheries co-management as empowerment. *Marine Policy*, 29(1): 1–7. *b* Natcher, D.C., Davis, S. & Hickey, C.G. 2005. Co-management: managing relationships, not resources. *Human Organization*, 64(3): 240; Trimble, M. & Berkes, F. 2015. Towards adaptive co-management of small-scale fisheries in Uruguay and Brazil: lessons from using Ostrom’s design principles. *Maritime Studies*, 14(1): 14. *c* Burri, M. 2019. Cultural heritage and intellectual property. In: F. Francioni & A.F. Vrdoljak, eds. *The Oxford handbook of international cultural heritage law*, pp. 459–482. Oxford, UK, Oxford University Press. *d* Jentoft, S. 2005. Fisheries co-management as empowerment. *Marine Policy*, 29(1): 1–7; Pomeroy, R.S. & Berkes, F. 1997. Two to tango: the role of government in fisheries co-management. *Marine Policy*, 21(5): 465–480. *e* Gehrig, S., Schlüter, A. & Jiddawi, N.S. 2018. Overlapping identities: the role of village and occupational group for small-scale fishers’ perceptions on environment and governance. *Marine Policy*, 96: 100–110; Jentoft, S. 2005. Fisheries co-management as empowerment. *Marine Policy*, 29(1): 1–7; Nightingale, A. 2013. Fishing for nature: the politics of subjectivity and emotion in Scottish inshore fisheries management. *Environment and Planning A: Economy and Space*, 45(10): 2362–2378. *f* Glaser, M., Baitoningsih, W., Ferse, S., Neil, M. & Deswandi, R. 2010. Whose sustainability? Top-down participation and emergent rules in marine protected area management in Indonesia. *Marine Policy*, 34(2010): 1215–1225. *g* Fearon, J.D. 1999. *What is identity (as we now use the word)?* Working paper. Palo Alto, USA, Stanford University. <https://web.stanford.edu/group/fearon-research/cgi-bin/wordpress/wp-content/uploads/2013/10/What-is-Identity-as-we-now-use-the-word-.pdf>; Turnhout, E., Van Bommel, S. & Aarts, N. 2010. How participation creates citizens: participatory governance as performative practice. *Ecology and Society*, 15(4): 26; Bennett, N.J., Whitty, T.S., Finkbeiner, E., Pittman, J., Bassett, H., Gelcich, S. & Allison, E.H. 2018. Environmental stewardship: a conceptual review and analytical framework. *Environmental Management*, 61(4): 597–614.

⁴⁹ The opinions of respondents were based on their own experience of co-management in their countries and that of the rest of their CCS team, which often included one or more staff working in government, academia or CSOs, therefore representing a diversity of perspectives and experiences regarding small-scale fisheries. Average team size was 5 members, with a minimum of 1 and a maximum of 17, for a total of 248 interviewees.

Figure 8.21 Comparison of different levels of fisher participation (as perceived by key respondents) for marine and inland small-scale fisheries catch with at least partially devolved management rights (based on 43 countries reported to have devolved rights)



Notes: Percentages in marine and inland categories exceed 100 percent, given that the same catch can involve different levels of participation when it is under the influence of different policies (i.e. different policies can contribute to different participation levels). The opinions of respondents were based on their own experience of co-management in their countries and that of the rest of their country and territory case study team, which often included one or more staff working in government, academia or civil society organizations, therefore representing a diversity of perspectives and experiences regarding small-scale fisheries.

A number of other enabling conditions are mentioned in the literature as necessary for co-management to be effective. These include the presence of central fisheries agencies capable of developing equitable participatory processes and reliable support for the implementation of devolved fishing rights, as well as commitments to downward accountability, provision of access to information and learning, and culturally appropriate processes of engagement (Armitage *et al.*, 2018; Barratt, Seeley and Allison, 2015; Trimble, de Araujo and Seixas, 2014). Without commitment from the state, as well as enhanced capacity for local organizations that create these enabling conditions for fishers to exercise their devolved rights, devolution typically fails, at times resulting in the reappropriation of indigenous resources, proliferation of management ideas incompatible with communal livelihoods, and the subsequent creation of other undue burdens on small-scale fishers (Carothers and Chambers, 2012; Davis and Ruddle, 2012). Three barriers that reduce fishers' incentives for participation and weaken overall governance and management effectiveness are outlined below.

8.7.3 Power imbalances in the value chain

Fish buyers or traders constitute important actors with significant influence over the effectiveness of small-scale fisheries governance, but they have not

received enough attention in the design of governance and management systems. In many settings, fish buyers form patron–client relationships with fishers that dictate the de facto rules determining how, where and when to harvest, and these can be more influential than formal mandates established by the state. Patrons can accumulate power and influence by gaining control of the means of fishing production, fishing licences and/or commercialization channels, requiring fishers to contract with them in order to engage in fishing activities. Fishers in good standing with these patrons can receive a number of services that they often cannot access in any other way, such as monetary loans, health care access, education and political backing (Pelras, 2000; Wolf, 2004; Ruddle, 2011; Sudarmono and Bakar, 2012; Basurto *et al.*, 2020). While most fishing patrons are men, in Western Africa “fish mummies” constitute an example of women patrons who have gained good financial stature by forming rotating savings/credit and labour organizations. These organizations share labour and profits, regulate market prices for fish inputs, and mobilize protests against activities that might diminish their incomes (Browne, 2001; O'Neill, Asare and Ahato, 2018). Patrons can emerge via leadership roles within fishing communities but may also arise from elsewhere, operating outside formal local institutions or customary leadership roles – and effectively challenging them. In some settings, patrons have consolidated enough power to control the structure of markets and access to global supply chains, as in

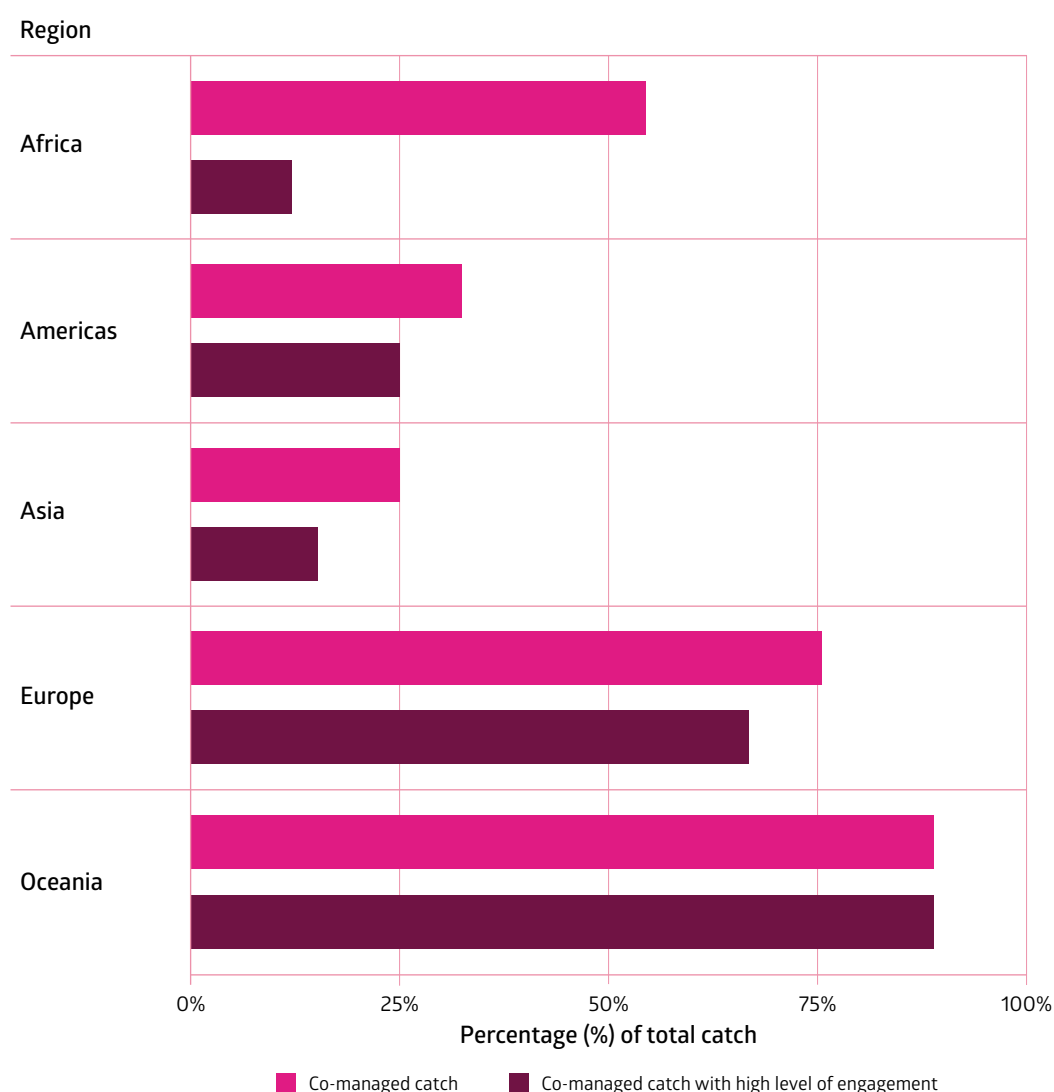
the case of the Mahi artisanal fisheries in Ecuador and Peru. They can also have considerable influence in defining target species, facilitating access to fishing gear, limiting the capacity of fishers to organize, and even subverting formal governance or enforcement institutions (Johnson, 2010; Nurdin and Grydehøj, 2014; Pauwelussen, 2015; Steenbergen *et al.*, 2019).

8.7.4 Gender in decision-making

The role of gender in decision-making has similarly not received enough attention from small-scale fisheries policymakers, despite the fact that gender shapes many aspects of the subsector such as fishing practices, social life, livelihoods, division of labour, resource access and power dynamics (FAO, 2017b). More extensive evaluation of the role of gender in small-scale fisheries is provided in Chapter 6.

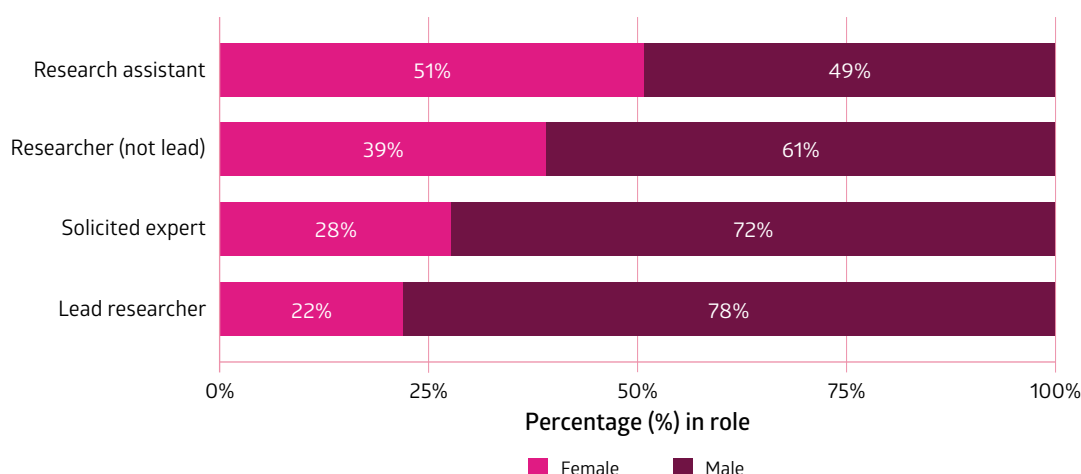
Despite the number of women actually involved in small-scale fisheries value chains – women whose unpaid reproductive, caregiving and domestic labour are the mainstay of small-scale fishing communities – the subsector’s governance systems and policies typically overlook intrahousehold dynamics (Williams, 2008; Kleiber *et al.*, 2017). Male identities dominate the conceptualization of fishing, not only among managers but among fishers themselves, and this affects fishing behaviour. For example, the hypermasculine idea of toughness can encourage illegal and dangerous fishing techniques as “a form of group socialization that celebrates masculine values of courage, independence, and bravery” (Fabinyi, 2007, p. 525). This socialization creates pressure for fishers – especially younger and poorer fishers – to be “manly” and exposes them to ridicule if they turn to other economic endeavours (Turgo, 2014). Lobster or sea cucumber divers in Central America and

Figure 8.22 Regional distribution of small-scale fisheries catch formally governed under co-management, and catch governed under co-management with a high level of fisher engagement (reported for 43 countries: 6 in the Americas, 5 in Africa, 6 in Asia, 2 in Europe, 1 in Oceania)



Note: High level of engagement refers to the perception by country and territory case study experts that the majority of fishers engage or participate in co-management.

Figure 8.23 Research roles by gender within IHH case study teams from 53 countries and territories



Mexico, for instance, choose to risk their lives not only because the fisheries are profitable, but because “that is what men are supposed to do”. Similarly, strong gender stereotypes about what “women are not supposed to do” can result in increases in domestic violence when women diverge from or challenge existing gender norms. Turgo (2015) has documented how increased incomes for women from new market opportunities in fishing is often associated with domestic violence, illustrating the challenges that remain regarding women’s increased participation in commercialized fishing activities within existing gender structures. Other dynamics can also contribute to women’s marginalization in fisheries. For instance, exclusively male access to fisheries that are farther from shore may cause gendered income inequalities, and the hypermasculine norms that encourage risky behaviour can have grave impacts on women in fishing households. Though the topic still warrants more study, masculine norms have been shown to increase environmentally destructive fishing, bolster resistance to conservation efforts, and hinder engagement in fishers’ organizations (Siegelman, Haenn and Basurto, 2019; Fabinyi, 2007).

The influence of gender goes beyond fishers and fishing communities. For instance, male dominance in fisheries research and management institutions has long influenced the type of data available, the factors prioritized in decisions, and the outcomes of fisheries management (Kleiber, Harris and Vincent, 2015; Harper *et al.*, 2020; Fröcklin *et al.*, 2013; Munk-Madsen, 1998). This has too often led to siloed fisheries agencies and institutions that lack the expertise and data to prioritize pressing socioecological concerns through gender-focused programming (Kleiber *et al.*, 2017; Mangubhai and Lawless, 2021). As Figure 8.23 shows, the present IHH report is no exception. Despite making gender a central cross-cutting theme, there was a consistent overrepresentation of men in IHH country-level research, especially in leadership positions. These inequalities are likely to have resulted in data gaps

as research teams lacking gender expertise struggled to find effective strategies for collecting gender-disaggregated data, underscoring the importance of commitments to diversity and inclusion in fisheries agencies and institutions (see Chapter 6).

Fisheries research and policymaking will benefit from further examination of the impact of gender-related factors on small-scale fisheries governance. These include the disadvantages and stigma women face, the stereotyping of women’s roles, gender imbalances in participation in governance, the emphasis on male identities, and exclusionary institutions in fisheries and fisheries management (Cornwall and Rivas, 2015; Siegelman, Haenn and Basurto, 2019).

8.7.5 Privileged forms of knowledge

Fisheries management has tended to prioritize the knowledge and preferences of biologists, conservation scientists and economists. This has weakened the effectiveness of small-scale fisheries governance because often these experts are not sensitive to, or equipped to answer, important questions about socioecological impacts, community interests, gender relations and power dynamics in small-scale fisheries, which are essential considerations for management and governance (Bromley, 2009; Armitage *et al.*, 2009; Fabinyi, Foale and Macintyre, 2015). With these limited perspectives, scientists and policymakers have frequently failed to account for the ways in which fishers self-organize, and how this influences fisheries outcomes (Campbell *et al.*, 2016; Arias-Schreiber *et al.*, 2017). In addition, a lack of attention to gender in fisheries research and management has contributed to data gaps concerning women’s roles in small-scale fisheries, with resulting impacts on the ability to provide gender-responsive interventions (Kleiber, Harris and Vincent, 2015; Leisher *et al.*, 2016; Harper *et al.*, 2020).

This is not to suggest that knowledge of natural science and economics is bad for management of small-scale fisheries; it is indeed necessary, but insufficient

BOX 8.7

Indigenous languages and knowledge

Indigenous languages are important as repositories of memory, knowledge and beliefs that help sustain fisheries. These languages communicate ecological information, fishing techniques and management practices.^a For example, the Marovo in Oceania describe the characteristics of entire groups of animals at a given moment, rather than individual species, using over 400 words for fish and 100 for shells.^b The term used for aquatic creatures depends on collective traits including the shape of the group, its apparent purpose, its movements, and the behaviours of individuals within the group. In this case and others, indigenous language offers information essential to the sustainable harvest of these ecological communities. This knowledge extends beyond target species, and has been recognized as important for an ecosystem approach to fisheries.^c

Mollusc fisheries in South-eastern Asia provide an excellent example of the intricate knowledge embedded in indigenous language. While English is often limited to vague terms like “shellfishing”, “gleaning” and “gathering”, the Mentawai of this region use an array of terms to denote target species and specific harvesting techniques. Their vocabulary is precise enough to describe features of the mangrove environment including tidal influence, water salinity, soil characteristics and forest type.^d Paired with Mentawai toponyms, this lexicon helps fishers locate resources and describe changes in distribution or abundance. In this way, the Mentawai language facilitates communication within the fishery and informs decisions about future fishing grounds and target species.

Though knowledge transmission is important for all fisheries, indigenous oral traditions have been especially susceptible to erosion. For example, South-eastern Asian Mandar fishing songs have traditionally demarcated customary tenure, but district courts have stepped in to override this form of fishery management.^e The songs outline complex customary rights based on gear, target species, geography and historical access, and also communicate Mandar spiritual beliefs and fishing knowledge that guide resource management. The disregard for such traditions is especially regrettable because indigenous knowledge can set a foundation for sustainability. Long-practiced oral traditions and the knowledge they convey offer expert insights into the state of aquatic ecosystems, changes over time, and the proper adaptive responses for sustainable harvesting. These make indigenous fishers' language and knowledge critical sources of information for understanding climate change, modelling resilience, conserving aquatic resources and upholding collective rights.^f

Notes: a Johannes, R.E., Lasserre, P., Pliya, J., Nixon, S.W. & Ruddle, K., 1983. *Traditional knowledge and management of marine coastal systems: report of the Ad Hoc Steering Group, IABO-UNESCO*. Report No. 4. <http://hdl.handle.net/102.100.100/286080?index=1>; Henderson, J.K. & Nash, D., eds. 2002. *Language in native title*. Canberra, Aboriginal Studies Press; UNESCO. 2019. *Strategic outcome document of the 2019 International Year of Indigenous Languages*. General Conference, 40th session, Paris. https://en.iyil2019.org/wp-content/uploads/2019/11/strategic-outcome-document_iyil2019_eng.pdf. *b* Hviding, E. 1996. *Guardians of Marovo Lagoon: practice, place, and politics in maritime Melanesia*. Honolulu, USA, University of Hawai'i Press. *c* Foale, S. 1998. What's in a name? An analysis of the West Nggela (Solomon Islands) fish taxonomy. *SPC Traditional Marine Resource Management and Knowledge Information Bulletin*, 9: 3–20. Nouméa, Pacific Community; May, D. 2005. Folk taxonomy of reef fish and the value of participatory monitoring in Wakatobi National Park, southeast Sulawesi, Indonesia. *SPC Traditional Marine Resource Management and Knowledge Information Bulletin*, 18: 18–35. Nouméa, Pacific Community; Moesinger, A. 2018. Catching names: folk taxonomy of marine fauna on Takuu Atoll, Papua New Guinea. *SPC Traditional Marine Resource Management and Knowledge Information Bulletin*, 39: 2–14. Nouméa, Pacific Community; Indigenous People Major Group. 2019. *Global report on the situation of lands, territories and resources of Indigenous Peoples*. www.iwgia.org/en/resources/publications/3335-global-report-on-the-situation-of-lands-territories-and-resources-of-indigenous-peoples *d* Burgos, A. 2016. Savoirs naturalistes et stratégies de collecte de *Geloina erosa*, *Geloina expansa* et *Polymesoda bengalensis* dans la mangrove de l'île de Siberut (Indonésie). *Revue d'ethnoécologie*, 9; Burgos, A. & Dillais, P. 2012. Les femmes, les coquillages et la mangrove: collecte d'*Anodonta philippiana* et *Austriella corrugata* à Siberut (Indonésie). *Techniques & Culture*, 59: 326–337. *e* Zerner, C. 2003. Sounding the Makassar Strait: the poetics and politics of an Indonesian marine environment. In: C. Zerner, ed. *Culture and the question of rights: forests, coasts, and seas in Southeast Asia*, pp. 56–108. Durham, USA, Duke University Press. *f* Indigenous People Major Group. 2019. *Global report on the situation of lands, territories and resources of Indigenous Peoples*. www.iwgia.org/en/resources/publications/3335-global-report-on-the-situation-of-lands-territories-and-resources-of-indigenous-peoples

when underlying values and assumptions related to the socioecological systems being considered go unquestioned. While local and traditional knowledge has been understood to include a subjective component, incorporating values, norms and beliefs from the larger social context, this knowledge also consists of important facts and historic understanding (Berkes, 2015). Yet, too often, scientific knowledge is still treated as superior, and sufficient by itself to guide management decisions. This type of knowledge is poorly suited to most fisheries and especially small-scale fisheries, where there tends to be deep and comprehensive ties between the harvesting of resources and local social contexts. As such, meeting the objective of sustainability

requires learning from a diversity of knowledge types and recognizing multiple worldviews (Berkes, 2017; Reid *et al.*, 2021). Scientific knowledge is a key part of the information and insight required, but it may omit important questions and thus provide misleading or incomplete information to managers. Incorporating local knowledge can allow managers to better account for and correct shortcomings. In some instances, researchers have found more effective and equitable management solutions where they have heeded local knowledge, including indigenous knowledge and fishers' customary rule-making processes (Hauzer, Dearden and Murray, 2013b; Allison *et al.*, 2020; Reid *et al.*, 2021; see also Box 8.7).

8.8 Civil society organizations

In this report, CSOs mostly refer to fisher and fish harvester organizations including producers, non-state supporters, hybrid federations or platforms, and private corporations. These organizations have a strong role to play in the development of enabling conditions that will allow fishers to secure and exercise tenure rights, protect their human rights, increase their participation in decision-making processes and, overall, become central actors in the implementation of the SSF Guidelines (Jentoft and Chuenpagdee, eds., 2015). Yet there is little basic systematic knowledge about their characteristics and capabilities available, particularly from a global perspective.

To this end, this report conducted a global survey of 717 CSOs in three languages: English, Spanish and French. Organizations were selected using a "snowball" sampling approach, with FAO as the initial source of information. When large hybrid federations or platforms were identified, such as the African Confederation of Artisanal Fisheries Professional Organizations (CAOPA) or the International Collective in Support of Fishworkers (ICSF), their assistance was requested to survey their members or affiliates. Other surveys were also deployed through networks of non-state supporter contacts, such as the Oak Foundation's network of grantees. The global distribution of the CSOs surveyed (Figure 8.24) indicates that 40 percent are found in Africa, 20 percent in Asia, 19 percent in Europe, 18 percent in Latin America and the Caribbean, 3 percent in Oceania and 0.6 percent in Northern America, with the remaining 0.3 percent consisting of organizations that categorize themselves as global.

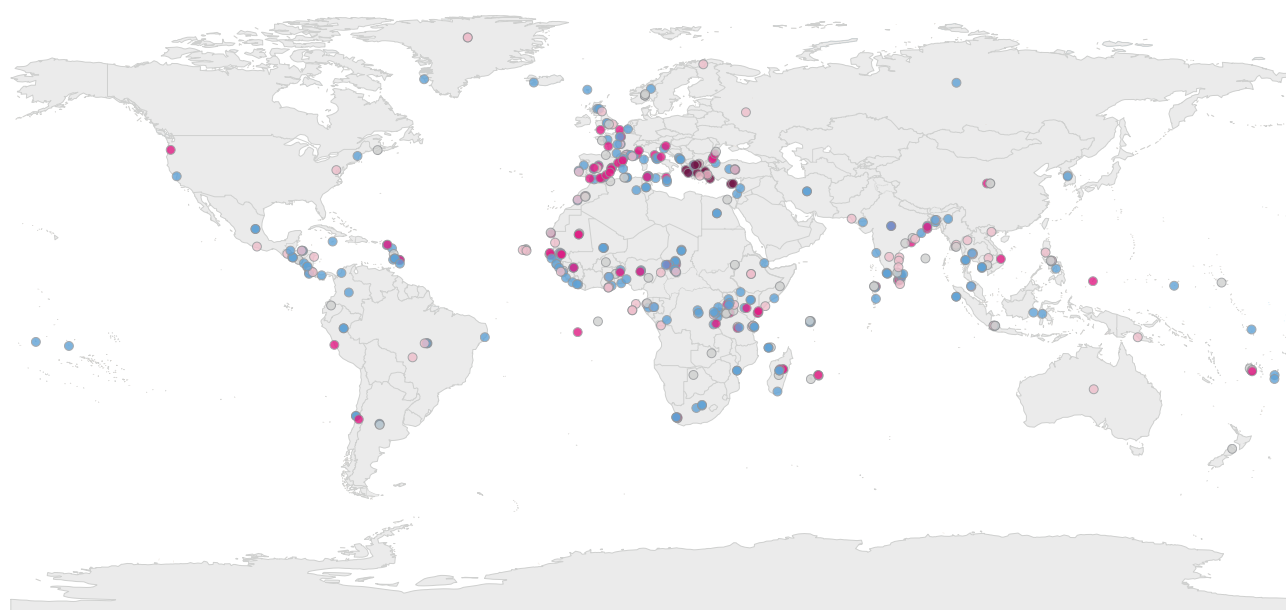
As an initial exploration of the potential role for CSOs in the governance of small-scale fisheries and the implementation of the SSF Guidelines, the stated objectives of producer organizations

were identified and mapped against important SSF Guidelines themes (Table 8.1).⁵⁰ Of the 424 producer organizations surveyed, only 151 provided information about their stated objectives. Overall, findings show that small-scale fishers form producer organizations with varied and multiple objectives, not only for production or fisheries management motivations. Findings cannot be considered representative of the subsector, as some regions such as Africa are likely to be overrepresented, and others like the Americas underrepresented. Often, organizations listed more than one objective; each objective was counted only once per organization and coded under the SSF Guidelines theme considered most applicable. All objectives were assumed to have the same importance within the organization. With these caveats taken into consideration, the findings provide some initial understanding of what issues fishers themselves consider to be important and worth organizing for.

Given that this assessment pertained to producer organizations, it should not be surprising that SSF Guidelines themes most related to harvesting and fisheries management were mentioned by almost all organizations (n = 149). These themes are most closely aligned with SDG Target 14.b, highlighting the priority producer organizations put on having adequate access to fishing resources and markets. SSF Guidelines themes related to various dimensions of well-being were mentioned by fewer organizations (n = 90), but this still helps illustrate that the goals of producer organizations go beyond harvesting and fisheries management. For instance, the theme of "social development, employment and decent work" was mentioned by 73 organizations, ranking third out of all themes mentioned.

⁵⁰ Using a coding book developed with definitions for each theme, three coders independently coded the data with at least 85 percent of intercoder reliability. Table 8.1 findings represent the average results for the three coders.

Figure 8.24 Location of civil society organizations surveyed



Types of fisher and fish harvester organizations

- Producers (n = 424)
- Non-state supporters (n = 94)
- Hybrid federations or platforms (n = 92)
- Private corporations (n = 12)
- Other (or unknown) organizations (n = 95)

Source: United Nations Geospatial. 2020. Map geodata [shapefiles]. New York, USA, United Nations, modified by the authors.

Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties. Final boundary between the Sudan and South Sudan has not yet been determined.

Some specific examples of objectives most related to harvesting and fisheries management, as stated by the producer organizations themselves, include the following:

- “To make the government sufficiently sensitized to the need of a National Policy on Inland Fisheries and also to ensure that the concerns mentioned above are incorporated in it.”
- “To ensure representation and promotion at the regional level of the general interests of professionals engaged in sea fishing.”
- “To defend a localized approach to management.”
- “Policy research and advocacy to support interests of artisanal fishers.”
- “To fight, lobby and advocate for a subsidy to strengthen the local industry.”
- “To promote good fish handling practices in order to produce quality products at their fish market and command premium prices.”
- “Sustainable management of fishing resources.”
- “To provide an open forum for its member cooperatives in which ideas on achieving best practices are discussed and encouraged.”

Objectives related to well-being were expressed in a variety of ways, including:

- “Provides social services, financial assistance, treatment benefits and in-kind loans to vessel owners participating in the association.”
- “To compensate fishers [in case of] loss of life and belongings.”
- “To provide health care facilities for fishing villages.”
- “To promote and organize collective protection actions, including the establishment of mutual societies or supplementary social security and health funds for assisting members.”
- “To improve the living conditions of fishers and their families.”
- “To ensure women take an active role in fisheries management and improve their conditions of work.”

The alignment between producer organizations’ objectives and the SSF Guidelines and the SDGs cannot be attributed to influence from narratives about the Guidelines or the SDGs: 95 percent of the organizations analysed were created before the SSF Guidelines were published in 2014, and the SDGs were publicly presented in 2016.

Table 8.1 SSF Guidelines themes mentioned in the objectives of a global sample of producer organizations (n = 151)

Themes	Number of organizations	Relevant SDGs and targets
SSF Guidelines themes most related to harvesting and fisheries management		
Policy coherence, institutional coordination, and collaboration	99	<ul style="list-style-type: none">• Access to fishing resources and markets (Target 14.b)
Sustainable resource management (and use)	79	
Value chains, post-harvest and trade	50	
Capacity development	48	
Responsible governance of tenure	45	
Information, research and communication	27	
At least one of these themes was reported in 149 out of 151 producer organizations total (99%)		
SSF Guidelines themes related to well-being		
Social development, employment and decent work	73	<ul style="list-style-type: none">• Reduce poverty (SDG 1)• Safety at sea (SDG 8.8)• Support the role of women (SDG 5)• Life underwater (SDG 14)• Zero hunger (SDG 2)
Gender equality	16	
Conservation of ecosystems	15	
Food sovereignty and nutrition security	10	
Cultural heritage	10	
Disaster risks and climate change	4	
Implementation support and monitoring	4	
Indigenous rights	4	
At least one of these themes was reported in 90 out of 151 producer organizations total (60%)		

Notes: Findings are organized by SSF Guidelines themes most related to harvesting and fisheries management, and those themes related to various dimensions of well-being. Organizations often mentioned more than one theme. Findings represent the average obtained by three independent coders.

8.9 Contributions of governance systems to the SDGs, in particular Target 14.b

The varied analyses conducted in this chapter shed some light on the contributions that small-scale fisheries governance systems can make in regard to securing access to fishing areas (Target 14.b). To link governance with Target 14.b it is assumed that the more different types of rights are devolved (see Figure 8.3), the more empowered fishers are to govern their fisheries, and hence the more likely they are to ensure rights of access for their fishers.

The first observation is that the current policy frameworks under which small-scale fisheries are governed generally hinder the achievement of the SDGs. The analysis of these frameworks suggests that most small-scale fisheries are governed under general fisheries policies that are not sufficiently tailored to their characteristics. Future policy design for the subsector must have a broad enough national scope and provide the necessary enabling conditions so that subsidiary policies and regulations can be drafted at the local level (or the level appropriate to specific small-scale fisheries) to address the diverse needs and community objectives of particular marine or inland fisheries in relation to important livelihood issues, such as food security and nutrition (SDG 2), poverty alleviation (SDG 1) and life underwater (SDG 14), to name a few.

The analyses of access strategies provide a more direct measure of the contribution of small-scale fisheries governance systems to Target 14.b. They show that licensing is the dominant access strategy governing most of the global catch, yet it is the least likely to involve the devolution of rights to fishers in comparison with access strategies based on place of residence or historical use. The latter two are used to manage access for more than 95 percent of catch with devolved rights, yet overall represent less than half of the overall marine and inland small-scale fisheries catch (Figure 8.8). When conditions for access are associated with the devolution of rights to fishers, it is more likely that local fishers can develop governance arrangements in a way that benefits their livelihoods, while also benefiting the conservation of their fishing resources, and therefore their potential contribution to Target 14.b. A number of ethnographic (Basurto *et al.*, 2012; Johannes, 1978) and wide-scale studies of customary governance regimes support these claims (Cinner *et al.*, 2012b).

Furthermore, there are two drawbacks most likely to be associated with licensing systems (which are mentioned in the literature) that can hinder the contributions of small-scale fisheries to Target 14.b.

The first is that licences (or regulations) can lock fishers into a single gear type, species, or taxonomic group regime. Limiting the ability of these fishers to switch between gear type and target species can limit their adaptive capacity to ecological and socioeconomic changes (Coulthard, 2008; Finkbeiner, 2015; Stoll, Fuller and Crona, 2017). Rather, devolving rights to small-scale fishers gives them greater flexibility, which should increase their adaptive capacity. For example, this allows them to devise socially and ecologically appropriate combinations of gear – i.e. combinations that are not destructive to key habitats, while at the same time are well-tailored to local species assemblages, local weather patterns and culturally appropriate fishing techniques. The second drawback is that payments for licences may not be reinvested in local management. Often, this revenue is centralized and spent elsewhere, instead of being reinvested in the local small-scale fisheries activities that generated it (Silver and Stoll, 2019). When this happens, the geographically dispersed or lower-value small-scale fisheries (especially those that are inland), where such investments are usually most needed, are the most negatively affected.

Similarly, the potential contribution of spatial restrictions, such as preferential access areas, to Target 14.b is currently hindered by the lack of devolved tenure rights, which represent less than half of catch caught under these restrictions. Managers must better understand the enabling conditions required for fishers to be able to exercise devolved rights, as well as the barriers to devolving tenure rights, and when these can generate undesirable outcomes (e.g. Cohen, Cinner and Foale, 2013; Gelcich *et al.*, 2006). When fishers can participate in governance and decision-making, institutional arrangements that might increase the effectiveness of local access restrictions are more likely to emerge. For instance, fishers are often willing to become local monitors of their fishing grounds, because the unauthorized entry of other fishers can have negative effects on their income and overall livelihoods. As it has been well documented, the use of local monitors then has positive effects on the health of common-pool resources due to the local knowledge of these monitors², which allows for the design of monitoring and enforcement schemes that are more effective than those designed by authorities from outside a given fishery (Coleman, 2009).

Required citation for this chapter:

Basurto, X., Siegelman, B., Navarro, M. I., Mancha-Cisneros, M.M., Artaud, H., Burgos, A., Kraan, M., Pauwelussen, A., Toonen, H. 2023. Global patterns of management and governance of small-scale fisheries: contributions towards the implementation of the SSF Guidelines. In: FAO, Duke University & WorldFish. 2023. *Illuminating Hidden Harvests: the contributions of small-scale fisheries to sustainable development*. Rome, FAO; Durham, USA, Duke University; Penang, Malaysia, WorldFish.

References

- Aakre, I., Bøkevoll, A., Chaira, J., Bouthir, F.Z., Frantzen, S., Kausland, A. & Kjellevoid, M.** 2020. Variation in nutrient composition of seafood from North West Africa: implications for food and nutrition security. *Foods*, 9(10): 1516.
- Abdul, W., Omoni, I. & Udolisa, R.** 2004. *Economic potentials of Iken brush park fishing practice in Iwopin Lagoon, Ogun State, Nigeria*.
- Adeokun, O.A. & Adereti, F.O.** 2003. Agricultural extension and fisheries development: training for women in fish industry in Lagos State, Nigeria. *Journal of Agriculture and Social Research*, 3(2): 64–76.
- Adu-Afarwuah, S., Lartey, A. & Dewey, K.G.** 2017. Meeting nutritional needs in the first 1000 days: a place for small-quantity lipid-based nutrient supplements. *Annals of the New York Academy of Sciences*, 1392(1): 18–29.
- Aduomih, O.A.A.** 2019. *Gender Analysis: Ghana's Artisanal Fisheries 2019*. Environmental Justice Foundation & Hen Mpoano.
- Agapito, M., Chuenpagdee, R., Deviller, R., Gee, J., Johnson, A.F., Pierce, G.J. & Trouillet, B.** 2019. Beyond the basics: improving information about small-scale fisheries. In: R. Chuenpagdee & S. Jentoft, eds. *Transdisciplinarity for small-scale fisheries governance: analysis and practice*, pp. 377–395. MARE Publication Series Vol. 21. Cham, Switzerland, Springer International Publishing.
- Agrawal, A. & Ostrom, E.** 2001. Collective action, property rights, and decentralization in resource use in India and Nepal. *Politics & Society*, 29(4): 485–514.
- Ahamed, F., Hossain, M.Y., Fulanda, B., Ahmed, Z.F. & Ohtomi, J.** 2012. Indiscriminate exploitation of wild prawn postlarvae in the coastal region of Bangladesh: a threat to the fisheries resources, community livelihoods and biodiversity. *Ocean & Coastal Management*, 66: 56–62.
- Ainsworth, R., Cowx, I.G. & Funge-Smith, S.J.** 2021. *A review of major river basins and large lakes relevant to inland fisheries*. FAO Fisheries and Aquaculture Circular No. 1170. Rome, FAO. <https://doi.org/10.4060/cb2827en>
- Akintola, S.L. & Fakoya, K.A.** 2017. Small-scale fisheries in the context of traditional post-harvest practice and the quest for food and nutritional security in Nigeria. *Agriculture and Food Security*, 6(1): 1–17.
- Albert, J., Bogard, J., Siota, F., McCarter, J., Diatalau, S., Maelaia, J., Brewer, T. & Andrew, N.** 2020. Malnutrition in rural Solomon Islands: an analysis of the problem and its drivers. *Maternal & Child Nutrition*, 16(2): e12921.
- Albert, R.J., McLaughlin, C. & Falatko, D.** 2014. Characterization of fish hold effluent discharged from commercial fishing vessels into harbor waters. *Marine Pollution Bulletin*, 87(1): 29–38.
- Alfaro-Shigueto, J., Mangel, J.C., Pajuelo, M., Dutton, P.H., Seminoff, J.A. & Godley, B.J.** 2010. Where small can have a large impact: structure and characterization of small-scale fisheries in Peru. *Fisheries Research*, 106(1): 8–17.
- Alho, C.J.** 2020. Environmental effects of the unsustainable harvest of live bait for sport fishing in the Brazilian Pantanal Biome: a review. *Oecologia Australis*, 24(3): 538–549.
- Allan, J.D., Abell, R., Hogan Z., Revenga, C., Taylor, B.W., Welcomme, R.L. & Winemiller, K.** 2005. Overfishing of inland waters. *BioScience*, 55: 1041–1051.
- Allison, E.H. & Ellis, F.** 2001. The livelihoods approach and management of small-scale fisheries. *Marine Policy*, 25(5): 377–388.
- Allison, E.H. & Horemans, B.** 2006. Putting the principles of the Sustainable Livelihoods Approach into fisheries development policy and practice. *Marine Policy*, 30: 757–766.
- Allison, E.H., Kurien, J., Ota, Y., Adhuri, D.S., Bavinck, J.M., Cisneros-Montemayor, A., Fabinyi, M. et al.** 2020. *The human relationship with our ocean planet*. Washington DC, Word Resources Institute. 88 pp. <https://oceanpanel.org/blue-papers/HumanRelationshipwithOurOceanPlanet>
- Allison, E.H. & Mills, D.J.** 2018. Counting the fish eaten rather than the fish caught. *Proceedings of the National Academy of Sciences of the United States of America*, 115(29): 7459–7461.
- Allison, E.H., Perry, A.L., Badjeck, M.C., Adger, W.N., Brown, K., Conway, D., Halls, A.S. et al.** 2009. Vulnerability of national economies to the impacts of climate change on fisheries. *Fish and Fisheries*, 10(2): 173–196.
- Allison, E.H. & Seeley, J.A.** 2004. HIV and AIDS among fisherfolk: A threat to 'responsible fisheries'? *Fish and Fisheries*, 5(3): 215–234.

- Alston, J.M. & Pardey, P.G.** 2014. Agriculture in the global economy. *Journal of Economic Perspectives*, 28(1): 121–146.
- Alva, S., Johnson, K., Jacob, A., D'Agnes, H., Mantovani, R. & Evans, T.** 2016. Marine protected areas and children's dietary diversity in the Philippines. *Population and Environment*, 37(3): 341–361.
- Amarasinghe, U.S., Amarasinghe, M.D. & Nissanka, C.** 2002. *Investigation of the Negombo estuary (Sri Lanka) brush park fishery, with an emphasis on community-based management*.
- Anderson, L.G. & Seijo, J.C.** 2010. *Bioeconomics of fisheries management*. Hoboken, USA, Wiley-Blackwell.
- Arias-Schreiber, M., Säwe, F., Hultman, J. & Linke, S.** 2017. Addressing social sustainability for small-scale fisheries in Sweden: institutional barriers for implementing the Small-Scale Fisheries Guidelines. In S. Jentoft, R. Chuenpagdee, M.J. Barragán-Paladines & N. Franz, eds. *The Small-Scale Fisheries Guidelines: global implementation*, pp. 717–736. MARE Publication Series 14. Cham, Switzerland, Springer International Publishing. https://doi.org/10.1007/978-3-319-55074-9_34
- Armitage, D., Dzyundzyak, A., Baird, J., Bodin, Ö., Plummer, R. & Schultz, L.** 2018. An approach to assess learning conditions, effects and outcomes in environmental governance. *Environmental Policy and Governance*, 28(1): 3–14.
- Armitage, D.R., Plummer, R., Berkes, F., Arthur, R.I., Charles, A.T., Davidson-Hunt, I.J., Diduck, A.P. et al.** 2009. Adaptive co-management for social-ecological complexity. *Frontiers in Ecology and the Environment*, 7(2): 95–102.
- Arthington, A.H., Dulvy, N.K., Gladstone, W. & Winfield, I.J.** 2016. Fish conservation in freshwater and marine realms: status, threats and management. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 26(5): 838–857.
- Arthur, R.I.** 2020. Small-scale fisheries management and the problem of open access. *Marine Policy*, 115: 103867.
- Arthur, R.I., Skerrett, D.J., Schuhbauer, A., Ebrahim, N., Friend, R.M. & Sumaila, U.R.** 2021. Small-scale fisheries and local food systems: transformations, threats and opportunities. *Fish and Fisheries*, 23(1): 109–124.
- ASEAN (Association of Southeast Asian Nations).** 2015. ASEAN: Strategic Plan Of Action on ASEAN Cooperation on Fisheries 2016–2020. http://www.seafdec.org/documents/2020/11/23fcg_wp05-3.pdf
- Asiedu, B., Failler, P. & Beygens, Y.** 2018. Ensuring food security: an analysis of the industrial smoking fishery sector of Ghana. *Agriculture and Food Security*, 7(1): 38.
- Aswathy, P. & Kalpana, K.** 2018. The 'stigma' of paid work: capital, state, patriarchy and women fish workers in South India. *Journal of International Women's Studies*, 19(5): 113–128.
- Aura, C.M., Nyamweya, C.S., Odoli, C.O., Owiti, H., Njiru, J.M., Otuo, P.W., Waithaka, E. & Malala, J.** 2020. Consequences of calamities and their management: the case of COVID-19 pandemic and flooding on inland capture fisheries in Kenya. *Journal of Great Lakes Research*, 46(6): 1767–1775.
- Ayaz, A., Acarli, D., Altinagac, U., Ozekinci, U., Kara, A. & Ozen, O.** 2006. Ghost fishing by monofilament and multifilament gillnets in Izmir Bay, Turkey. *Fisheries Research*, 79(3): 267–271.
- Bahri, T., Vasconcellos, M., Welch, D.J., Johnson, J., Perry, R.I., Ma, X. & Sharma, R., eds.** 2021. *Adaptive management of fisheries in response to climate change*. FAO Fisheries and Aquaculture Technical Paper No. 667. Rome, FAO.
- Bailey, M. & Sumaila, U.R.** 2015. Destructive fishing and fisheries enforcement in eastern Indonesia. *Marine Ecology Progress Series*, 530: 195–211.
- Baird, I.G.** 2006. Strength in diversity: fish sanctuaries and deep-water pools in Lao PDR. *Fisheries Management and Ecology*, 13(1): 1–8.
- Baird, I.G. & Flaherty, M.S.** 2005. Mekong River Fish Conservation Zones in Southern Laos: assessing effectiveness using local ecological knowledge. *Environmental Management*, 36(3): 439–454.
- Baker-Médard, M.** 2017. Gendering marine conservation: the politics of Marine Protected Areas and fisheries access. *Society and Natural Resources*, 30(6): 723–737.
- Baki, M.A., Hossain, M.M., Akter, J., Quraishi, S.B., Shojib, M.F.H., Ullah, A.A. & Khan, M.F.** 2018. Concentration of heavy metals in seafood (fishes, shrimp, lobster and crabs) and human health assessment in Saint Martin Island, Bangladesh. *Ecotoxicology and environmental safety*, 159: 153–163.
- Bakker, E.S., Wood, K.A., Pagès, J.F., Veen, G.F.C., Christianen, M.J.A., Santamaría, L., Nolet, B.A. & Hilt, S.** 2016. Herbivory on freshwater and marine macrophytes: a review and perspective. *Aquatic Botany*, 135: 18–36.
- Bao, M., Pierce, G.J., Strachan, N.J., Pascual, S., González-Muñoz, M. & Levsen, A.** 2019. Human health, legislative and socioeconomic issues caused by the fish-borne zoonotic parasite *Anisakis*: challenges in risk assessment. *Trends in Food Science & Technology*, 86: 298–310.

- Barange, M., Bahri, T., Beveridge, M.C.M., Cochrane, K.L., Funge-Smith, S. & Poulain, F., eds.** 2018. *Impacts of climate change on fisheries and aquaculture: synthesis of current knowledge, adaptation and mitigation options*. FAO Fisheries and Aquaculture Technical Paper No. 627. Rome, FAO.
- Barber, C.V. & Pratt, V.R.** 1999. Poison and profits: cyanide fishing in the Indo-Pacific. Information Paper 18, 1st SPC Heads of Fisheries Meeting, Nouméa, 9–13 August 1999. Nouméa, SPC (Pacific Community).
- Barbier, E.B.** 2015. Climate change impacts on rural poverty in low-elevation coastal zones. *Estuarine, Coastal and Shelf Science*, 165: A1–A13.
- Barbieri, F., Machado, R., Zappes, C.A. & de Oliveira, L.R.** 2012. Interactions between the Neotropical otter (*Lontra longicaudis*) and gillnet fishery in the southern Brazilian coast. *Ocean & Coastal Management*, 63: 16–23.
- Barclay, K., Leduc, B., Mangubhai, S. & Donato-Hunt, C., eds.** 2019. *Pacific handbook for gender equity and social inclusion in coastal fisheries and aquaculture*. First edition. Nouméa, SPC.
- Barneche, D.R., Ross Robertson, D., White, C.R. & Marshall, D.J.** 2018. Fish reproductive-energy output increases disproportionately with body size. *Science*, 360(6389): 642–645.
- Barradas, J.I., Chow, F., Dias, G.M. & Ghilardi-Lopes, N.P.** 2018. The influence of trampling disturbance on the fluorescence and pigment concentration of *Sargassum* beds (Fucales). *Journal of Experimental Marine Biology and Ecology*, 506: 163–170.
- Barratt, C., Seeley, J. & Allison, E.H.** 2015. Lacking the means or the motivation? Exploring the experience of community-based resource management among fisherfolk on Lake Victoria, Uganda. *The European Journal of Development Research*, 27(2): 257–272.
- Bartley, D.M., De Graaf, G.J., Valbo-Jørgensen, J. & Marmulla, G.** 2015. Inland capture fisheries: status and data issues. *Fisheries Management and Ecology*, 22(1): 71–77.
- Basurto, X., Bennett, A., Lindkvist, E. & Schlüter, M.** 2020. Governing the commons beyond harvesting: an empirical illustration from fishing. *PLoS ONE*, 15(4): e0231575. <https://doi.org/10.1371/journal.pone.0231575>
- Basurto, X., Cinti, A., Bourillón, L., Rojo, M., Torre, J. & Weaver, A.H.** 2012. The emergence of access controls in small-scale fishing commons: a comparative analysis of individual licenses and common property-rights in two Mexican communities. *Human Ecology*, 40(4): 597–609.
- Basurto, X., Franz, N., Mills, D., Virdin, J. & Westlund, L.** 2017a. *Improving our knowledge on small-scale fisheries: data needs and methodologies*. Workshop proceedings, 27–29 June 2017, Rome, FAO. FAO Fisheries and Aquaculture Proceedings No. 56. <https://doi.org/10.31230/osf.io/vnwc2>
- Basurto, X. & Garcia Lozano, A.** 2021. Commoning and the commons as more-than-resources: a historical perspective on Comcáac or Seri Fishing. In P.K. Nayak, ed. *Making commons dynamic: understanding change through commonisation and decommonisation*, pp. 167–190. Abingdon, UK, Routledge. <https://doi.org/10.4324/9780429028632-13>
- Basurto X., Virdin, J., Smith, H. & Juskus, R.** 2017b. *Strengthening governance of small-scale fisheries: an initial assessment of the theory and practice*. Oak Foundation.
- Bath, S.C., Steer, C.D., Golding, J., Emmett, P. & Rayman, M.P.** 2013. Effect of inadequate iodine status in UK pregnant women on cognitive outcomes in their children: results from the Avon Longitudinal Study of Parents and Children (ALSPAC). *The Lancet*, 382(9889): 331–337.
- Batsleer, J., Hamon, K.G., van Overzee, H.M.J., Rijnsdorp, A.D. & Poos, J.J.** 2015. High-grading and over-quota discarding in mixed fisheries. *Reviews in Fish Biology and Fisheries*, 25(4): 715–736.
- Bavinck, M.** 2005. Understanding fisheries conflicts in the South — a legal pluralist perspective. *Society & Natural Resources*, 18(9): 805–820.
- Bavington, D.** 2002. Managerial ecology and its discontents: exploring the complexities of control, careful use and coping in resource and environmental management. *Environments*, 30: 3–22.
- Beal, T., Massiot, E., Arsenault, J.E., Smith, M.R. & Hijmans, R.J.** 2017. Global trends in dietary micronutrient supplies and estimated prevalence of inadequate intakes. *PLoS ONE*, 12(4): e0175554. <https://doi.org/10.1371/journal.pone.0175554>
- Beamish, R.J., McFarlane, G.A. & Benson, A.** 2006. Longevity overfishing. *Progress in Oceanography*, 68(2–4): 289–302.
- Beckett, S.** 1995. *Stata Technical Bulletin*. March Issue.
- Begossi, A.** 2010. Small-scale fisheries in Latin America: management models and challenges. *MAST*, 9(2): 7–31.
- Béland, D.** 2017. Identity, politics, and public policy. *Critical Policy Studies*, 11(1): 1–18.
- Belhabib, D., Cheung, W.W.L., Kroodsma, D., Lam, V.W.Y., Underwood, P.J. & Virdin, J.** 2020. Catching industrial fishing incursions into inshore waters of Africa from space. *Fish and Fisheries*, 21(2): 379–392.
- Belhabib, D., Sumaila, U.R. & Pauly, D.** 2015. Feeding the poor: contribution of West African fisheries to employment and food security. *Ocean & Coastal Management*, 111(July): 72–81.

- Bell, J.D., Kronen, M., Vunisea, A., Nash, W.J., Keeble, G., Demmke, A., Pontifex, S. & Andréfouët, S.** 2009. Planning the use of fish for food security in the Pacific. *Marine Policy*, 33(1): 64–76.
- Bell, J. & Nash, W.** 2004. When should restocking and stock enhancement be used to manage sea cucumber fisheries? In: A. Lovatelli, C. Conand, S. Purcell, S. Uthicke, J.F. Hamel & A. Mercier, eds. *Advances in sea cucumber aquaculture and management*, pp. 173–180. FAO Fisheries Technical Paper No. 463. Rome, FAO.
- Bell, J.D., Ratner, B.D., Stobutzki, I. & Oliver, J.** 2006. Addressing the coral reef crisis in developing countries. *Ocean and Coastal Management*, 49(12): 976–985.
- Bell, J.D., Rothlisberg, P.C., Munro, J.L., Loneragan, N.R., Nash, W.J., Ward, R.D. & Andrew, N.L., eds.** 2005. *Restocking and stock enhancement of marine invertebrate fisheries*. Volume 49, 1st Edition. Academic Press.
- Béné, C.** 2003. When fishery rhymes with poverty: a first step beyond the old paradigm on poverty in small-scale fisheries. *World Development*, 31: 949–975.
- Béné, C.** 2006. *Small-scale fisheries: assessing their contribution to rural livelihoods in developing countries*. FAO Fisheries Circular 1008. Rome, FAO.
- Béné, C.** 2009. Are fishers poor or vulnerable? Assessing economic vulnerability in small-scale fishing communities. *Journal of Development Studies*, 45: 911–933.
- Béné, C., Arthur, R., Norbury, H., Allison, E.H., Beveridge, M., Bush, S., Campling, L. et al.** 2016. Contribution of fisheries and aquaculture to food security and poverty reduction: assessing the current evidence. *World Development*, 79: 177–196.
- Béné, C., Bennett, E. & Neiland A.** 2004. The challenge of managing small-scale fisheries with reference to poverty alleviation. In A.E. Neiland & C. Béné, eds. *Poverty and small-scale fisheries in West Africa*, pp. 83–102. Dordrecht, The Netherlands, Springer. <https://doi.org/10.1007/978-94-017-2736-5>
- Béné C, Chijere Asafu, D.G., Allison, E.H. & Snyder, K.** 2012. Design and implementation of fishery modules in integrated household surveys in developing countries. Paper prepared for the Living Standards Measurement Study – Integrated Surveys on Agriculture project. Penang, Malaysia, WorldFish Center.
- Béné, C. & Friend, R.M.** 2011. Poverty in small-scale fisheries: old issue, new analysis. *Progress in Development Studies*, 11(2): 119–144.
- Béné, C., Hersoug, B. & Allison, E.H.** 2010. Not by rent alone: analyzing the pro-poor functions of small-scale fisheries in developing countries. *Development Policy Review*, 28: 325–358.
- Béné, C., Lawton, R. & Allison, E.H.** 2010. Trade matters in the fight against poverty: narratives, perceptions, and (lack of) evidence in the case of fish trade in Africa. *World Development*, 38(7): 933–954.
- Béné, C., Macfadyen, G. & Allison, E.H.** 2007. *Increasing the contribution of small-scale fisheries to poverty alleviation and food security*. FAO Fisheries Technical Paper No. 481. Rome, FAO.
- Béné, C. & Neiland, A.** 2006. *From participation to governance: a critical review of the concepts of governance, comanagement and participation, and their implementation in small-scale inland fisheries in developing countries*. WorldFish Center Studies and Reviews No. 29. Penang, Malaysia, WorldFish Center, and Colombo, CGIAR Challenge Program on Water and Food.
- Ben-Gal, I.** 2013. Outlier detection. In: O. Maimon & L. Rokach, eds. *Data Mining and Knowledge Discovery Handbook: a complete guide for practitioners and researchers, 2001–2009*. Boston, USA, Springer.
- Benkenstein, A.** 2013. *Small-scale fisheries in a modernizing economy: opportunities and challenges in Mozambique*. SAIIA Research Report 13, Governance of Africa's Resources Program. Johannesburg, SAIIA (South African Institute of International Affairs).
- Bennett, A., Basurto, X., Virdin, J., Lin, X., Betances, S.J., Smith, M.D., Allison, E.H. et al.** 2021. Recognize fish as food in policy discourse and development funding. *Ambio*, 50: 981–989.
- Bennett, A., Patil, P., Kleisner, K., Rader, D., Virdin, J. & Basurto, X.** 2018. *Contribution of fisheries to food and nutrition security: current knowledge, policy, and research*. Nicholas Institute Report 18-02. Durham, USA, Duke University. <http://nicholasinstitute.duke.edu/publications>
- Berkes, F., ed.** 1989. *Common property resources. Ecology and community-based sustainable development*. London, Belhaven Press.
- Berkes, F.** 2003. Alternatives to conventional management: lessons from small-scale fisheries. *Environments*, 31(1).
- Berkes, F.** 2015. *Coasts for people: interdisciplinary approaches to coastal and marine resource management*. New York, USA, Routledge.
- Berkes, F.** 2017. *Sacred Ecology*. Fourth edition. New York, USA, Routledge. 394 pp. <https://doi.org/10.4324/9781315114644>
- Berkes, F. & Kislalioglu, M.** 1989. A comparative study of yield, investment and energy use in small-scale fisheries: some considerations for resource planning. *Fisheries Research*, 7(3): 207–224.

- Berkes, F., Mahon, R., McConney, P., Pollnac, R. & Pomeroy, R.** 2001. *Managing small-scale fisheries. Alternative directions and methods*. Ottawa, International Development Research Centre.
- Bernal, P., Ferreira, B., Inniss, L., Marschoff, E., Rice, J., Rosenberg, A. & Simcock, A.** 2016. Chapter 54: Overall assessment of human impact on the oceans. In: United Nations, ed. *The first global integrated marine assessment. World Ocean Assessment I*, pp. 935–944. Cambridge, UK, Cambridge University Press.
- Bertrand, A., Lengaigne, M., Takahashi, K., Avadí, A., Poulain, F. & Harrod, C.** 2020. *El Niño Southern Oscillation (ENSO) effects on fisheries and aquaculture*. FAO Fisheries and Aquaculture Technical Paper No. 660. Rome, FAO.
- Bhattacharya, P., Welch, A.H., Stollenwerk, K.G., McLaughlin, M.J., Bundschuh, J. & Panaullah, G.** 2007. Arsenic in the environment: biology and chemistry. *Science of the total environment*, 379(2–3): 109–120.
- Bilecki, D.** 2019. The burden of invisibility: a case study of the fisheries crisis in Ghana, and the USAID/Ghana Sustainable Fisheries Management Project's gender mainstreaming strategy. University of Rhode Island. Master's thesis.
- Bilecki, D., Torell, E. & Owusu, A.** 2015. *A formative assessment of the USAID/Ghana SFMP gender mainstreaming strategy*. USAID/Ghana Sustainable Fisheries Management Project (SFMP). Narragansett, USA, Coastal Resources Center, Graduate School of Oceanography, University of Rhode Island; and Takoradi, Ghana, Hen Mpoano. www.crc.uri.edu/projects_page/ghanasfmp/
- Bindoff, N.L., Cheung, W.W., Kairo, J.G. et al.** 2019. Changing ocean, marine ecosystems, and dependent communities. In: H.O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck et al., eds. *IPCC Special Report on the ocean and cryosphere in changing climate*, pp. 447–588. IPCC.
- Bjorndal, T., Child, A. & Lem, A., eds.** 2014. *Value chain dynamics and the small-scale sector: policy recommendations for small-scale fisheries and aquaculture trade*. FAO Fisheries and Aquaculture Technical Paper No. 581. Rome, FAO. 112 pp.
- Blue Food Assessment.** 2021a. *Building Blue Food Futures for People and the Planet. The Report of the Blue Food Assessment*. <https://bluefood.wpenginpowered.com/wp-content/uploads/The-Report-of-the-Blue-Food-Assessment-Digital.pdf>
- Blue Food Assessment.** 2021b. *The vital roles of blue foods in the global food system*. Policy brief to the UNFSS Scientific Group. https://sc-fss2021.org/wp-content/uploads/2021/04/FSS_Brief_Blue_Economy_MT.pdf
- Bogard, J.R., Hother, A.L., Saha, M., Bose, S., Kabir, H., Marks, G.C. & Thilsted, S.H.** 2015a. Inclusion of small indigenous fish improves nutritional quality during the first 1000 days. *Food and Nutrition Bulletin*, 36(3): 276–289.
- Bogard, J.R., Thilsted, S.H., Marks, G.C., Wahab, A., Hossain, M.A.R., Jakobsen, J. & Stangoulis, J.** 2015b. Nutrient composition of important fish species in Bangladesh and potential contribution to recommended nutrient intakes. *Journal of Food Composition and Analysis*, 42: 120–133.
- Bomfeh, K., Jacxsens, L., Amoa-Awua, W.K., Tandoh, I., Afoakwa, E.O., Gamarro, E.G., Ouadi, Y.D. & De Meulenaer, B.** 2019. Reducing polycyclic aromatic hydrocarbon contamination in smoked fish in the Global South: a case study of an improved kiln in Ghana. *Journal of the science of food and agriculture*, 99(12): 5417–5423.
- Bonaldo, R.M. & Bellwood, D.R.** 2009. Dynamics of parrotfish grazing scars. *Marine Biology*, 156(4): 771–777.
- Bonebrake, T.C., Brown, C.J., Bell, J.D., Blanchard, J.L., Chauvenet, A., Champion, C., Cheng, I.C. et al.** 2018. Managing consequences of climate-driven species redistribution requires integration of ecology, conservation and social science. *Biological Reviews of the Cambridge Philosophical Society*, 93(1): 284–305.
- Bonhommeau, S., Dubroca, L., Le Pape, O., Barde, J., Kaplan, D.M., Chassot, E. & Nieblas, A.E.** 2013. Eating up the world's food web and the human trophic level. *Proceedings of the National Academy of Sciences of the United States of America*, 110: 20617–20620. Supplementary Materials, Appendix 2.
- Bose, M.L. & Dey, M.M.** 2007. Food and nutritional security in Bangladesh: going beyond carbohydrate counts. *Agricultural Economics Research Review*, 20: 203–225.
- Brander, K.M.** 2007. Global fish production and climate change. *Proceedings of the National Academy of Sciences of the United States of America*, 104: 19709–19714.
- Bromley, D.W.** 2009. Abdicating responsibility: the deceptions of fisheries policy. *Fisheries*, 34(6): 280–290.
- Bronwell Jr, R., Reeves, R. & Read, A.** 2019. Bycatch in gillnet fisheries threatens critically endangered small cetaceans and other aquatic megafauna. *Endangered Species Research*, 40: 285–296.
- Brosius, J.P. & Russell, D.** 2003. Conservation from above: imposing transboundary conservation. *Journal of Sustainable Forestry*, 17(1–2): 39–65.

- Brown, C.J., Schoeman, D.S., Sydeman, W.J., Brander, K., Buckley, L.B., Burrows, M., Duarte, C.M. et al.** 2011. Quantitative approaches in climate change ecology. *Global Change Biology*, 17(12): 3697–3713.
- Browne, P.B.** 2001. Women do fish: a case study on gender and the fishing industry in Sierra Leone. Paper presented at Proceedings of the Global Symposium on Women in Fisheries, 29 November 2001, Kaohsiung, Taiwan.
- Bruckner, A.W.** 2001. Tracking the trade in ornamental coral reef organisms: the importance of CITES and its limitations. *Aquarium Sciences and Conservation*, 3(1–3): 79–94.
- Buggey, S.** 1999. *An approach to aboriginal cultural landscapes*. Ottawa, Historic Sites and Monuments Board of Canada.
- Bugoni, L., Neves, T.S., Leite Jr, N.O., Carvalho, D., Sales, G., Furness, R.W., Stein, C.E., Peppes, F.V., Giffoni, B.B. & Monteiro, D.S.** 2008. Potential bycatch of seabirds and turtles in hook-and-line fisheries of the Itaipava Fleet, Brazil. *Fisheries Research*, 90(1–3): 217–224.
- Buma, B. & Schultz, C.** 2020. Disturbances as opportunities: learning from disturbance-response parallels in social and ecological systems to better adapt to climate change. *Journal of Applied Ecology*, 57(6): 1113–1123.
- Bundy, A., Chuenpagdee, R., Cooley, S.R., Defeo, O., Glaeser, B., Guillotreau, P., Isaacs, M., Mitsutaku, M. & Perry, R.I.** 2016. A decision support tool for response to global change in marine systems: the IMBER-ADApT Framework. *Fish and Fisheries*, 17: 1183–1193.
- Bundy, A. & Pauly, D.** 2001. Selective harvesting by small-scale fisheries: ecosystem analysis of San Miguel Bay, Philippines. *Fisheries Research*, 53(3): 263–281.
- Burnett, M.A.** 1996. The dilemma of commercial fishing rights of indigenous peoples: comparative study of the common law nations. *Suffolk Transnational Law Review*, 19(2): 389–434.
- Buvinic, M. & Levine, R.** 2016. Closing the gender data gap. *Significance*, 13(2): 34–37.
- Byrd, K.A., Pincus, L., Pasqualino, M.M., Muzofa, F. & Cole, S.M.** 2021. Dried small fish provide nutrient densities important for the first 1000 days. *Maternal & Child Nutrition*, 17(4): e13192. <https://doi.org/https://doi.org/10.1111/mcn.13192>
- Byrd, K.A., Thilsted, S. H. & Fiorella, K.J.** 2020. Fish nutrient composition: a review of global data from poorly assessed inland and marine species. *Public Health Nutrition*, 24(3): 476–486.
- Cai, W., Borlace, S., Lengaigne, M., Van Rensch, P., Collins, M., Vecchi, G., Timmermann, A. et al.** 2014. Increasing frequency of extreme El Niño events due to greenhouse warming. *Nature Climate Change*, 4(2): 111–116.
- Cambodia National Institute of Statistics, Director General of Health & ICF.** 2015. *Cambodia Demographic and Health Survey 2014*.
- Campana, S., Joyce, W. & Manning, M.** 2009. Bycatch and discard mortality in commercially caught blue sharks *Prionace glauca* assessed using archival satellite pop-up tags. *Marine Ecology Progress Series*, 387: 241–253.
- Campbell, L.M., Gray, N.J., Fairbanks, L., Silver, J.J., Gruby, R.L., Dubik, B.A. & Basurto, X.** 2016. Global oceans governance: new and emerging issues. *Annual Review of Environment and Resources*, 41(1): 517–543.
- Campbell, M.J. & Sumpton, W.D.** 2009. Ghost fishing in the pot fishery for blue swimmer crabs *Portunus pelagicus* in Queensland, Australia. *Fisheries Research*, 95(2–3): 246–253.
- Campbell, S.J. & Pardede, S.T.** 2006. Reef fish structure and cascading effects in response to artisanal fishing pressure. *Fisheries Research*, 79(1–2): 75–83.
- Carlisle, K.M. & Gruby, R.L.** 2019. Customary marine tenure in Palau: social function and implications for fishery policy. *Human Ecology*, 47(4): 527–539.
- Carothers, C. & Chambers, C.** 2012. Fisheries privatization and the remaking of fishery systems. *Environment and Society: Advances in Research*, 3(1): 39–59.
- Carpenter, R.C.** 1986. Partitioning herbivory and its effects on coral reef algal communities. *Ecological Monographs*, 56(4): 345–364.
- Carvalho, N., Edwards-Jones, G. & Isidro, E.** 2011. Defining scale in fisheries: small versus large-scale fishing units in the Azores. *Fisheries Research*, 109(2–3): 360–369.
- CAS Regional Working Group.** 2015. *Regional Catch assessment Survey Synthesis Report, June 2005 to November/December 2015*. Jinja, Uganda, East African Community. 31 pp.
- Cashion, T., Le Manach, F., Zeller, D. & Pauly, D.** 2017. Most fish destined for fishmeal production are food-grade fish. *Fish and Fisheries*, 18(5): 837–844.
- Castello, L., Hess, L.L., Thapa, R., McGrath, D.G., Arantes, C.C., Reno, V.F. & Isaac, V.J.** 2017. Fishery yields vary with land cover on the Amazon River floodplain. *Fish and Fisheries*, 19(3): 431–440.

- Castello, L., Viana, J.P., Watkins, G., Pinedo-Vasquez, M. & Luzadis, V.A.** 2009. Lessons from integrating fishers of arapaima in small-scale fisheries management at the Mamirauá Reserve, Amazon. *Environmental Management*, 43(2): 197–209.
- Castilla, J.C. & Defeo, O.** 2001. Latin American benthic shellfisheries: emphasis on co-management and experimental practices. *Reviews in Fish Biology and Fisheries*, 11(1): 1–30.
- Castrejón M. & Defeo, O.** 2015. Co-governance of small-scale shellfisheries in Latin America: institutional adaptability to cope with external drivers of change. In: S. Jentoft & R. Chuenpagdee, eds. *Interactive governance for small-scale fisheries: global reflections*, pp. 605–625. MARE Publication Series Vol. 13. Cham, Switzerland, Springer International Publishing.
- Castro-González, M.I. & Méndez-Armenta, M.** 2008. Heavy metals: implications associated to fish consumption. *Environmental toxicology and pharmacology*, 26(3): 263–271.
- Caswell, B.L., Talegawkar, S.A., Siamusantu, W., West, K.P. & Palmer, A.C.** 2018. Usual nutrient intake adequacy among young, rural Zambian children. *The British Journal of Nutrition*, 119(1): 57–65.
- CBD (Convention on Biological Diversity).** 2010. *Strategic Plan for Biodiversity 2011–2020 and the Aichi Targets*. www.cbd.int/doc/strategic-plan/2011-2020/Aichi-Targets-EN.pdf
- Central Marine Fisheries Research Institute.** 2010. Marine Fisheries Census 2010. New Delhi.
- CGIAR Research Program on Fish Agri-Food Systems.** 2017. *CGIAR Research Program on Fish Agri-Food Systems (FISH): gender strategy*. Penang, Malaysia.
- Chacraverti, S.** 2014. *The Sundarban fishers: coping in an overly stressed mangrove estuary*. Samudra Monograph. Chennai, India, ICSF (International Collective in Support of Fishworkers).
- Chai, J.Y., Murrell, K.D. & Lymbery, A.J.** 2005. Fish-borne parasitic zoonoses: status and issues. *International journal for parasitology*, 35(11–12): 1233–1254.
- Chaiphongpachara, T.** 2019. Detection of *Anisakis* spp. and residual formaldehyde in Indian mackerel and splendid squid from a fish market in Samut Songkhram Province, Thailand. *Tropical Biomedicine*, 36(1): 53–59.
- Chambers, R. & Conway, G.R.** 1991. *Sustainable rural livelihoods: practical concepts for the 21st century*. IDS Discussion Paper 296. Brighton, UK, Institute of Development Studies.
- Chan, C.Y., Tran, N., Pethiyagoda, S., Crissman, C.C., Sulser, T.B. & Phillips, M.J.** 2019. Prospects and challenges of fish for food security in Africa. *Global Food Security*, 20: 17–25.
- Charles, A.** 2011. Small-scale fisheries: on rights, trade and subsidies. *MAST 2011*, 10(2): 85–94.
- Chen, C.L. & Liu, T.K.** 2013. Fill the gap: developing management strategies to control garbage pollution from fishing vessels. *Marine Policy*, 40(1): 34–40.
- Cheung, W.W.L., Watson, R. & Pauly, D.** 2013. Signature of ocean warming in global fisheries catch. *Nature*, 497: 365–368.
- Christensen, V., De la Puente, S., Sueiro, J.C., Steenbeek, J. & Majluf, P.** 2014. Valuing seafood: the Peruvian fisheries sector. *Marine Policy*, 44: 302–311.
- Christy, F.T.** 1982. Territorial use rights in marine fisheries: definitions and conditions. FAO Fisheries Technical Paper No. 227. Rome, FAO. 10 pp. www.fao.org/3/T0507E/T0507E00.htm
- Chuenpagdee, R. & Jentoft, S., eds.** 2019. *Transdisciplinarity for small-scale fisheries governance: analysis and practice*. MARE Publication Series Vol. 21. Cham, Switzerland, Springer International Publishing.
- Chuenpagdee, R., Liguori, L., Palomares, M.L.D. & Pauly, D.** 2006. *Bottom-up, global estimates of small-scale marine fisheries catches*. Fisheries Centre Research Reports, Vol. 14 No. 8. Vancouver, Canada, University of British Columbia.
- Cinner, J., Marnane, M., McClanahan, T. & Almany, G.** 2006. Periodic closures as adaptive coral reef management in the Indo-Pacific. *Ecology and Society*, 11(1).
- Cinner, J.E.** 2009. Poverty and the use of destructive fishing gear near east African marine protected areas. *Environmental Conservation*, 36(4): 321–326.
- Cinner, J.E., Adger, W.N., Allison, E.H., Barnes, M.L., Brown, K., Cohen, P.J., Gelcich, S. et al.** 2018. Building adaptive capacity to climate change in tropical coastal communities. *Nature Climate Change*, 8: 117–123.
- Cinner, J.E. & Aswani, S.** 2007. Integrating customary management into marine conservation. *Biological Conservation*, 140(3): 201–216.
- Cinner, J.E., Huchery, C., Darling, E.S., Humphries, A.T., Graham, N.A.J., Hicks, C.C., Marshall, N. & McClanahan, T.R.** 2013. Evaluating social and ecological vulnerability of coral reef fisheries to climate change. *PLoS ONE*, 8(9): e74321. <https://doi.org/10.1371/journal.pone.0074321>

- Cinner, J.E., McClanahan, T.R., Graham, N.A., Daw, T.M., Maina, J., Stead, S.M., Wamukota, A., Brown, K. & Bodin, Ö. 2012a. Vulnerability of coastal communities to key impacts of climate change on coral reef fisheries. *Global Environmental Change*, 22(1): 12–20.
- Cinner, J.E., McClanahan, T.R., MacNeil, M.A., Graham, N.A.J., Daw, T.M., Mukminin, A., Feary, D.A. *et al.* 2012b. Comanagement of coral reef social-ecological systems. *Proceedings of the National Academy of Sciences of the United States of America*, 109(14): 5219–5222.
- Cinner, J.E., McClanahan, T.R. & Wamukota, A. 2010. Differences in livelihoods, socioeconomic characteristics, and knowledge about the sea between fishers and non-fishers living near and far from marine parks on the Kenyan coast. *Marine Policy*, 34(1): 22–28.
- Cipriani, P., Sbaraglia, G.L., Palomba, M., Giulietti, L., Bellisario, B., Bušelić, I., Mladineo, I., Cheleschi, R., Nascetti, G. & Mattiucci, S. 2018. *Anisakis pegreffii* (Nematoda: Anisakidae) in European anchovy *Engraulis encrasicolus* from the Mediterranean Sea: fishing ground as a predictor of parasite distribution. *Fisheries Research*, 202: 59–68.
- Cisneros-Montemayor, A.M., Pauly D., Weatherdon, L.V. & Ota, Y. 2016. A global estimate of seafood consumption by coastal Indigenous peoples. *PLoS ONE*, 11(12): e0166681.
- Clarke, S., Milner-Gulland, E.J. & Trond, B. 2007. Social, economic, and regulatory drivers of the shark fin trade. *Marine Resource Economics*, 22(3): 305–327.
- Clay, P.M. & Olson, J. 2008. Defining fishing communities: issues in theory and practice. *NAPA Bulletin*, 28(1): 27–42.
- Coates, D. 2002. *Inland capture fishery statistics of Southeast Asia: current status and information needs*. FAO RAP Publication 2002/11. Bangkok, FAO Regional Office for Asia and the Pacific.
- Cochrane, K.L., ed. 2002. *A fishery manager's guidebook. Management measures and their application*. FAO Fisheries Technical Paper No. 424. Rome, FAO. 231 pp. www.fao.org/3/y3427e/y3427e00.htm
- Cochrane, K.L. 2021. Reconciling sustainability, economic efficiency and equity in marine fisheries: Has there been progress in the last 20 years? *Fish and Fisheries*, 22: 298–323.
- Cochrane, K.L. & Garcia, S.M., eds. 2009. *A Fishery Manager's Guidebook*. Second edition. Rome, FAO & Hoboken, USA, Wiley-Blackwell. www.fao.org/3/i0053e/i0053e.pdf
- Cochrane, K.L., Ortega-Cisneros, K., Iitembu, J.A., dos Santos, C.I. & Sauer, W.H.H. 2020. Application of a general methodology to understand vulnerability and adaptability of the fisheries for small pelagic species in the Benguela countries: Angola, Namibia and South Africa. *African Journal of Marine Science*, 42(4): 473–493.
- Cochrane, K.L., Rakotondrazafy, H., Aswani S., Chaigneau, T., Downey-Breedy, N., Lemahieu, A., Paytan, A. *et al.* 2019. Tools to enrich vulnerability assessment and adaptation planning for coastal communities in data-poor regions: application to a case study in Madagascar. *Frontiers in Marine Science*, 5: 505.
- Cohen, P.J., Allison, E.H., Andrew N.L., Cinner, J., Evans, L.S., Fabinyi, M., Garces, L.R. *et al.* 2019. Securing a just space for small-scale fisheries in the blue economy. *Frontiers in Marine Science*, 6: 171.
- Cohen, P.J., Cinner, J.E. & Foale, S. 2013. Fishing dynamics associated with periodically harvested marine closures. *Global Environmental Change*, 23(6): 1702–1713.
- Cohen, P.J. & Foale, S.J. 2013. Sustaining small-scale fisheries with periodically harvested marine reserves. *Marine Policy*, 37(1): 278–287.
- Cohen, P.J., Roscher, M., Wathsala Fernando, A., Freed, S., Garces, L., Jayakody, S., Khan, F. *et al.* 2021. *Characteristics and performance of fisheries co-management in Asia. Synthesis of knowledge and case studies: Bangladesh, Cambodia, Philippines and Sri Lanka*. Bangkok, FAO. 120 pp. <https://doi.org/10.4060/cb3840en>
- Cole, S.M., Kaminski, A.M., McDougall, C., Kefi, A.S., Marinda, P.A., Maliko, M. & Mtonga, J. 2020. Gender accommodative versus transformative approaches: a comparative assessment within a post-harvest fish loss reduction intervention. *Gender, Technology and Development*, 24(1): 48–65.
- Coleman, E.A. 2009. Institutional factors affecting biophysical outcomes in forest management. *Journal of Policy Analysis and Management*, 28(1): 122–146.
- Collignon, B. 2006. *Knowing places: the Inuinait, landscapes, and the environment*. Circumpolar Research Series ISSN 0838-133X, No. 10. Edmonton, Canada, Canadian Circumpolar Institute Press, University of Alberta. 304 pp.
- Cornish, A. & McKellar, D. 1998. A history of fishing with explosives and poisons in Hong Kong waters. *NAGA*, 21(3): 4–9.
- Cornwall, A. & Rivas, A.M. 2015. From 'gender equality and 'women's empowerment' to global justice: reclaiming a transformative agenda for gender and development. *Third World Quarterly*, 36(2): 396–415.

- Corten, A., Braham, C.B. & Sadeh, A.S.** 2017. The development of a fishmeal industry in Mauritania and its impact on the regional stocks of sardinella and other small pelagics in Northwest Africa. *Fisheries Research*, 186: 328–336.
- Costa, K.G. & Netto, S.A.** 2014. Effects of small-scale trawling on benthic communities of estuarine vegetated and non-vegetated habitats. *Biodiversity and Conservation*, 23(4): 1041–1055.
- Coulthard, S.** 2008. Adapting to environmental change in artisanal fisheries — insights from a South Indian Lagoon. *Global Environmental Change*, 18(3): 479–489.
- Cranford, P.J., Ward, J.E. & Shumway, S.E.** 2011. Bivalve filter feeding: variability and limits of the aquaculture biofilter. In: S. Shumway, ed. *Shellfish aquaculture and the environment*, pp. 81–124. Hoboken, USA, Wiley-Blackwell.
- Crona, B.I., Basurto, X., Squires, D., Gelcich, S., Daw, T.M., Khan, A., Havice, E. et al.** 2016. Towards a typology of interactions between small-scale fisheries and global seafood trade. *Marine Policy*, 65: 1–10.
- Crona, B.I., Van Holt, T., Petersson, M., Daw, T.M. & Buchary, E.** 2015. Using social-ecological syndromes to understand impacts of international seafood trade on small-scale fisheries. *Global Environmental Change*, 35: 162–175.
- Cumming, G.S., Cumming, D.H. & Redman, C.L.** 2006. Scale mismatches in social-ecological systems: causes, consequences, and solutions. *Ecology and Society*, 11(1): 14.
- Danielsen, K., Wong, F.F., McLachlin, D. & Sarapura, S.** 2018. *Typologies of change: gender integration in agriculture & food security research. A gender synthesis of Canadian International Food Security Research Fund projects*. Amsterdam, Royal Tropical Institute.
- d'Armengol, L., Prieto Castillo, M., Ruiz-Mallén, I. & Corbera, E.** 2018. A systematic review of co-managed small-scale fisheries: social diversity and adaptive management improve outcomes. *Global Environmental Change*, 52: 212–225.
- Dave, R., Tompkins, E.L. & Schreckenber, K.** 2017. Forest ecosystem services derived by smallholder farmers in northwestern Madagascar: storm hazard mitigation and participation in forest management. *Forest Policy and Economics*, 84: 72–82.
- Davies, R.W.D., Cripps, S.J., Nickson, A. & Porter, G.** 2009. Defining and estimating global marine fisheries bycatch. *Marine Policy*, 33(4): 661–672.
- Davies, T.W., Duffy, J.P., Bennie, J. & Gaston, K.J.** 2014. The nature, extent, and ecological implications of marine light pollution. *Frontiers in Ecology and the Environment*, 12(6): 347–355.
- Davis, A. & Ruddle, K.** 2012. Massaging the misery: recent approaches to fisheries governance and the betrayal of small-scale fisheries. *Human Organization*, 71(3): 244–254.
- Davis, B., Di Giuseppe, S. & Zezza, A.** 2017. Are African households (not) leaving agriculture? Patterns of households' income sources in rural Sub-Saharan Africa. *Food Policy*, 67: 153–174.
- Davis, M.W.** 2002. Key principles for understanding fish bycatch discard mortality. *Canadian Journal of Fisheries and Aquatic Sciences*, 59(11): 1834–1843.
- Deb, A.K., Emdad Haque, C. & Thompson, S.** 2015. “Man can't give birth, woman can't fish”: gender dynamics in the small-scale fisheries of Bangladesh. *A Journal of Feminist Geography*, 22(3): 305–324.
- Dedjiho, C.A., Alassane, A., Chouti, W., Sagbo, E., Changotade, O., Mama, D., Boukari, M. & Sohounhloue, D.C.K.** 2014. Negative impacts of the practices of acadjas on the Aheme Lake in Benin. *Journal of Environmental Protection*, 5(4): 301–309.
- Defeo, O. & Castilla, J.C.** 2012. Governance and governability of coastal shellfisheries in Latin America and the Caribbean: multi-scale emerging models and effects of globalization and climate change. *Current Opinion in Environmental Sustainability*, 4(3): 344–350.
- Defeo, O., Castrejón, M., Perez-Castañeda, R., Castilla, J.C., Gutiérrez, N.L., Essington, T.E. & Folke, C.** 2014. Co-management in Latin American small-scale shellfisheries: assessment from long-term case studies. *Fish and Fisheries*, 17(1): 176–192.
- Defeo O. & Elliott, M.** 2021. The ‘triple whammy’ of coasts under threat – Why we should be worried! *Marine Pollution Bulletin*, 163: 111832.
- Defeo, O., Gianelli, I., Martínez, G., Ortega, L., Celentano, E., Lercari, D. & de la Rosa, A.** 2018. Natural, social and governance responses of a small-scale fishery to mass mortalities: the yellow clam (*Mesodesma mactroides*) in Uruguay. In: P. Guillotreau, A. Bundy & R.I. Perry, eds. *Global change in marine systems: societal and governing responses*, pp. 237–252. Routledge Studies in Environment, Culture, and Society Series. London, Routledge.
- Defeo, O., McLachlan, A., Armitage, D., Elliott, M. & Pittman, J.** 2021a. Sandy beach social-ecological systems at risk: regime shifts, collapses and governance challenges. *Frontiers in Ecology and the Environment*, 19(10): 564–573.
- Defeo, O., Gianelli, I., Ortega, L. & Pittman, J.** 2021b. Responses of a small-scale shellfishery to climate change: foundations for adaptive management. In: T. Bahri, M. Vasconcellos, D. Welch, J. Johnson, R.I. Perry, X. Ma & R. Sharma, eds. *Adaptive management of fisheries in response to climate change*, pp. 147–160. FAO Fisheries and Aquaculture Technical Paper No. 667. Rome, FAO.

- Defeo, O. & Vasconcellos, M.** 2020. *Transición hacia un enfoque ecosistémico de la pesca: Lecciones aprendidas de esquerías de América del Sur*. FAO Documento Técnico de Pesca y Acuicultura No. 668. Rome, FAO.
- de Graaf, G. & Garibaldi, L.** 2014. *The Value of African Fisheries*. FAO Fisheries and Aquaculture Circular No. 1093. Rome, FAO.
- de Graaf, G.J., Grainger, R.J., Westlund, L., Willmann, R., Mills, D., Kelleher, K. & Koranteng, K.** 2011. The status of routine fishery data collection in Southeast Asia, central America, the South Pacific, and West Africa, with special reference to small-scale fisheries. *ICES Journal of Marine Science*, 68(8): 1743–1750.
- Deines, A.M., Bunnell, D.B., Rogers, M.W., Bennion, D., Woelmer, W., Sayers, M.J., Grimm, A.G. et al.** 2017. The contribution of lakes to global inland fisheries harvest. *Frontiers in Ecology and the Environment*, 15(6): 293–298.
- de la Torre-Castro, M., Fröcklin, S., Börjesson, S., Okupnik, J. & Jiddawi, N.S.** 2017. Gender analysis for better coastal management – increasing our understanding of social-ecological seascapes. *Marine Policy*, 83(December 2016): 62–74.
- Desiere, S., Hung, Y., Verbeke, W. & Haese, M.D.** 2018. Assessing current and future meat and fish consumption in Sub-Saharan Africa: learnings from FAO Food Balance Sheets and LSMS household survey data. *Global Food Security*, 16: 116–126.
- Dewey, K.G.** 2013. The challenge of meeting nutrient needs of infants and young children during the period of complementary feeding: an evolutionary perspective. *Journal of Nutrition*, 143(12): 2050–2054.
- Dewey-Mattia, D., Manikonda, K., Hall, A.J., Wise, M.E. & Crowe, S.J.** 2018. Surveillance for foodborne disease outbreaks—United States, 2009–2015. *MMWR Surveillance Summaries*, 67(10): 1–11.
- Dienye, P., Akani, A. & Okokon, I.** 2016. Respiratory effects of biomass fuel combustion on rural fish smokers in a Nigerian fishing settlement: a case control study. *African Health Sciences*, 16(2): 516–523.
- D'Ignazio, C. & Klein, L.F.** 2020. *Data feminism*. Cambridge, USA, MIT Press.
- Ding, Q., Chen, X., Hilborn, R. & Chen, Y.** 2017. Vulnerability to impacts of climate change on marine fisheries and food security. *Marine Policy*, 83: 55–61.
- Doherty, P.D., Alfaro-Shigueto, J., Hodgson, D.J., Mangel, J.C., Witt, M.J. & Godley, B.J.** 2014. Big catch, little sharks: insight into Peruvian small-scale longline fisheries. *Ecology and Evolution*, 4(12): 2375–2383.
- Drewnowski, A., Rehm, C.D., Martin, A., Verger, E.O., Voinnesson, M. & Imbert, P.** 2015. Energy and nutrient density of foods in relation to their carbon footprint. *American Journal of Clinical Nutrition*, 101(1): 184–191.
- Duarte, C.M., Agusti, S., Barbier, E., Britten, G.L., Castilla, J.C., Gattuso, J.P., Fulweiler, R.W. et al.** 2020. Rebuilding marine life. *Nature*, 580: 39–51.
- Dulvy, N.K. & Kindsvater, H.K.** 2017. Chapter 3 – The future species of Anthropocene seas. In: P.S. Levin & M.R. Poe, eds. *Conservation for the Anthropocene ocean*, pp. 39–64. London, Academic Press. <https://doi.org/10.1016/B978-0-12-805375-1.00003-9>
- Dunlop, E.S., Goto, D. & Jackson, D.A.** 2019. Fishing down then up the food web of an invaded lake. *Proceedings of the National Academy of Sciences of the United States of America*, 116(40): 19995–20001.
- Dutra, L.X., Sporne, I., Haward, M., Aswani, S., Cochrane, K.L., Frusher, S., Gasalla, M.A. et al.** 2019. Governance mapping: a framework for assessing the adaptive capacity of marine resource governance to environmental change. *Marine Policy*, 106: 103392.
- Eastham, J., Mpelasoka, F., Mainuddin, M., Ticehurst, C., Dyce, P., Hodgson, G., Ali, R. & Kirby, M.** 2008. *Mekong River Basin water resources assessment: impacts of climate change*. Water for a Healthy Country Flagship Report series. CSIRO.
- Edinger, E.N., Jompa, J., Limmon, G.V., Widjatmoko, W. & Risk, M.J.** 1998. Reef degradation and coral biodiversity in Indonesia: effects of land-based pollution, destructive fishing practices and changes over time. *Marine Pollution Bulletin*, 36(8): 617–630.
- EFSA (European Food Safety Authority).** 2010. Scientific opinion on risk assessment of parasites in fishery products. *EFSA Journal*, 8(4): 1543.
- EFSA.** 2014. Scientific opinion on health benefits of seafood (fish and shellfish) consumption in relation to health risks associated with exposure to methylmercury. *EFSA Journal*, 12(7): 3761.
- Elliott, M., Borja, Á., McQuatters-Gollop, A., Mazik, K., Birchenough, S., Andersen, J.H., Painting, S. & Peck, M.** 2015. Force majeure: Will climate change affect our ability to attain Good Environmental Status for marine biodiversity? *Marine Pollution Bulletin*, 95(1): 7–27.
- Ellis, F. & Bahiigwa, G.** 2003. Livelihoods and rural poverty reduction in Uganda. *World Development*, 31(6): 997–1013.
- Emborg, J. & Dalgaard, P.** 2008. Growth, inactivation and histamine formation of *Morganella psychrotolerans* and *Morganella morganii* – development and evaluation of predictive models. *International Journal of Food Microbiology*, 128(2): 234–243.

EPPSO (Economic Policy, Planning and Statistics Office), FAO & SPC (Pacific Community). 2021. *Republic of the Marshall Islands food security profile*. Nouméa, SPC. https://sdd.spc.int/digital_library/republic-marshall-islands-food-security-profile

Epstein, G., Pittman, J., Alexander, S.M., Berdej, S., Dyck, T., Kreitmair, U., Rathwell, K.J. et al. 2015. Institutional fit and the sustainability of social-ecological systems. *Current Opinion in Environmental Sustainability*, 14: 34–40.

Eriksson, B.H., de la Torre-Castro, M., Eklöf, J. & Jiddawi, N. 2010. Resource degradation of the sea cucumber fishery in Zanzibar, Tanzania: a need for management reform. *Aquatic Living Resources*, 23(4): 387–398.

Eriksson, H., de la Torre-Castro, M. & Olsson, P. 2012. Mobility, expansion and management of a multi-species scuba diving fishery in east Africa. *PLoS ONE*, 7(4): e35504. <https://doi.org/10.1371/journal.pone.0035504>

Erzini, K., Bentes, L., Coelho, R. & Lino, P. 2008. Catches in ghost-fishing octopus and fish traps in the northeastern Atlantic Ocean (Algarve, Portugal). *Fishery Bulletin*, 106(3): 321–327.

ESA (European Space Agency) & UCLouvain. 2010. GlobCover 2009 (Global Land Cover Map). In: *European Space Agency*. ESA GlobCover 2009 Project. Cited 15 October 2021. http://due.esrin.esa.int/page_globcover.php

Essington, T.E., Beaudreau, A.H. & Wiedenmann, J. 2006. Fishing through marine food webs. *Proceedings of the National Academy of Sciences of the United States of America*, 103(9): 3171–3175.

European Parliament Committee on Fisheries. 2012. *Report on small-scale coastal fishing, artisanal fishing and the reform of the Common Fisheries Policy*. No. A7-0291/2012. www.europarl.europa.eu/doceo/document/A-7-2012-0291_EN.html

European Union. 2014. Regulation (EU) No 508/2014 of the European Parliament and of the Council of 15 May 2014 on the European Maritime and Fisheries Fund and repealing Council Regulations (EC) No 2328/2003, (EC) No 861/2006, (EC) No 1198/2006 and (EC) No 791/2007 and Regulation (EU) No 1255/2011 of the European Parliament and of the Council. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0508&rid=4>

Evans, L., Cherrett, N. & Pems, D. 2011. Assessing the impact of fisheries co-management interventions in developing countries: a meta-analysis. *Journal of Environmental Management*, 92(8): 1938–1949.

Exton, D.A., Ahmadi, G.N., Cullen-Unsworth, L.C., Jompa, J., May, D., Rice, J., Simonin, P.W., Unsworth, R.K. & Smith, D.J. 2019. Artisanal fish fences pose broad and unexpected threats to the tropical coastal seascape. *Nature Communications*, 10(1): 1–9.

Fabinyi, M. 2007. Illegal fishing and masculinity in the Philippines: a look at the Calamianes Islands in Palawan. *Philippine Studies*, 55(4): 509–529.

Fabinyi, M., Foale, S. & Macintyre, M. 2015. Managing inequality or managing stocks? An ethnographic perspective on the governance of small-scale fisheries. *Fish and Fisheries*, 16(3): 471–485.

Fakoya, K.A. 2020. *Turning points: a decade of change for women in fisheries*. Yemaya Newsletter on Gender and Fisheries, No. 60, April 2020. ICSF.

FAO. 1990. *Coordinating Working Party on Atlantic Fishery Statistics (CWP). Handbook of fishery statistics*. Rome.

FAO. 1995. *Code of Conduct for Responsible Fisheries*. Rome. 41 pp.

FAO. 2002. *The State of World Fisheries and Aquaculture 2002*. Rome.

FAO. 2003. *The Ecosystem Approach to Fisheries*. FAO Technical Guidelines for Responsible Fisheries No. 4, Suppl. 2. Rome. 112 pp.

FAO. 2004. *Report of the Second Session of the Working Party on Small-scale Fisheries, Bangkok, Thailand, 10–21 November 2003*. FAO Fisheries Report No. 735. Rome.

FAO. 2007a. *Gender policies for responsible fisheries: policies to support gender equity and livelihoods in small-scale fisheries*. Rome.

FAO. 2007b. *Fishery Country Profile: The Republic of Mozambique*. Rome.

FAO. 2010. *Fishery Country Profile: Sierra Leone*. Rome.

FAO. 2011a. *Towards voluntary guidelines on securing sustainable small-scale fisheries*. Rome. www.fao.org/3/a-am431e.pdf

FAO. 2011b. *International Guidelines on Bycatch Management and Reduction of Discards*. Rome. www.fao.org/3/ba0022t/ba0022t00.pdf

FAO. 2011c. *Aquaculture development: 6. Use of wild fishery resources for capture-based aquaculture*. FAO Technical Guidelines for Responsible Fisheries No. 5, Suppl. 6. Rome.

FAO. 2012a. *Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security*. Rome.

- FAO.** 2012b. *The State of World Fisheries and Aquaculture 2012*. Rome.
- FAO.** 2013. FAO Technical Consultation on International Guidelines for Securing Sustainable Small-Scale Fisheries, Rome, 20–24 May 2013. TC-SSF/2013/Inf.3.
- FAO.** 2014. *The State of World Fisheries and Aquaculture 2014. Opportunities and challenges*. Rome.
- FAO.** 2015. *Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication*. Rome.
- FAO.** 2016. *The Rome Declaration: Ten steps to responsible inland fisheries*. Rome, FAO and Michigan State University.
- FAO.** 2017a. *Workshop on improving our knowledge on small-scale fisheries: data needs and methodologies*. Workshop proceedings, 27–29 June 2017, Rome. FAO Fisheries and Aquaculture Proceedings No. 55. Rome.
- FAO.** 2017b. *Towards gender-equitable small-scale fisheries governance and development – A handbook in support of the implementation of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication*. Rome. 169 pp. www.fao.org/3/a-i7419e.pdf
- FAO.** 2018a. *Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication. Second Edition*. Rome. www.fao.org/3/i8347en/i8347EN.pdf
- FAO.** 2018b. *The State of World Fisheries and Aquaculture 2018 – Meeting the Sustainable Development Goals*. Rome.
- FAO.** 2018c. *Fishery and Aquaculture Statistics: Annual Yearbook 2018*. Rome. www.fao.org/fishery/static/Yearbook/YB2018_USBcard/booklet/web_CB1213T.pdf
- FAO.** 2019. *Monitoring the incidental catch of vulnerable species in Mediterranean and Black Sea fisheries: methodology for data collection*. FAO Fisheries and Aquaculture Technical Paper No. 640. Rome.
- FAO.** 2020a. Fishery and Aquaculture Statistics. Global capture production 1950–2018 (FishStatJ). In: *FAO Fisheries Division*. Rome. Updated 2020. www.fao.org/fishery/statistics/software/fishstatj/en
- FAO.** 2020b. *The State of World Fisheries and Aquaculture 2020. Sustainability in action*. Rome. <https://doi.org/10.4060/ca9229en>
- FAO.** 2020c. *The State of Mediterranean and Black Sea Fisheries 2020*. General Fisheries Commission for the Mediterranean. Rome. <https://doi.org/10.4060/cb2429en>
- FAO.** 2020d. *Proceedings of the International Symposium on Fisheries Sustainability: strengthening the science-policy nexus, FAO headquarters, 18–21 November 2019*. FAO Fisheries and Aquaculture Proceedings No. 65. Rome.
- FAO.** 2021a. *Better data collection in shark fisheries: learning from practice*. FAO Fisheries and Aquaculture Circular No. 1227. Rome.
- FAO.** 2021b. *FAO Yearbook. Fishery and Aquaculture Statistics 2019*. Rome. <https://doi.org/10.4060/cb7874t>
- FAO.** 2021c. Low-Income Food-Deficit Countries (LIFDCs). In: *FAO Country Profiles*. Rome. Updated June 2021. www.fao.org/countryprofiles/lifdc
- FAO.** 2021d. Report of the 34th Session of the Committee on Fisheries (1–5 February 2021). C 2021/23. www.fao.org/3/ne907en/ne907en.pdf
- FAO.** 2021e. Database for fish and animal protein supply quantity. In: *FAOSTAT New Food Balances*. Rome. Cited 15 October 2021. <http://www.fao.org/faostat/en/#data/FBS>
- FAO.** 2021f. FAO Fisheries Glossary. In: *FAO Term Portal*. Rome. Cited 7 June 2021. www.fao.org/faoterm/collection/fisheries/en
- FAO.** 2021g. Regional Statistical Analysis of the Responses by FAO Members to the 2020 Questionnaire on the Implementation of the Code of Conduct for Responsible Fisheries and Related Instruments. Presented as part of the FAO Committee on Fisheries (COFI), Thirty-fourth Session, 1–5 February 2021 (rescheduled from 13–17 July 2020). COFI/2020/SBD.4. Rome.
- FAO.** 2021h. *Minimum dietary diversity for women*. Rome.
- FAO.** 2022a. *The State of World Fisheries and Aquaculture 2022. Towards Blue Transformation*. Rome. <https://doi.org/10.4060/cc0461en>
- FAO.** 2022b. *Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security*. First revision. Rome. <https://doi.org/10.4060/i2801e>
- FAO, IFAD (International Fund for Agricultural Development), UNICEF (United Nations Children's Fund), WFP (World Food Programme) & WHO (World Health Organization).** 2020. *The State of Food Security and Nutrition in the World 2020. Transforming food systems for affordable healthy diets*. Rome, FAO. <https://doi.org/10.4060/ca9692en>
- FAO, IFAD, UNICEF, WFP & WHO.** 2021. *The State of Food Security and Nutrition in the World 2021. Transforming food systems for food security, improved nutrition and affordable healthy diets for all*. Rome, FAO. <https://doi.org/10.4060/cb4474en>

- FAO & MRC (Mekong River Commission).** 2003. *New approaches for the improvement of inland capture fishery statistics in the Mekong Basin*. Report of the FAO, MRC, Government of Thailand, Government of the Netherlands Ad-hoc Expert Consultation, Udon Thani, Thailand, 2–5 September 2002. RAP Publication 2003/01. Bangkok, FAO Regional Office for Asia and Pacific.
- FAO & SPC.** 2020. *Pacific Nutrient Database User Guide*. Nouméa, SPC.
- FAO & WHO.** 2010. Fats and fatty acids in human nutrition. Proceedings of the Joint FAO/WHO Expert Consultation. November 10–14, 2008. Geneva, Switzerland. *Annals of Nutrition and Metabolism*, 55(1–3): 5–300.
- FAO & WHO.** 2018. *Technical guidance for the development of the growing area aspects of Bivalve Mollusc Sanitation Programmes*. Food Safety and Quality Series No. 5. Rome, FAO. www.fao.org/3/ca1213en/CA1213EN.pdf
- FAO & WHO.** 2019. *Safety and Quality of Water Used in Food Production and Processing. Meeting report*. Microbiological Risk Assessment Series No. 33. Rome, FAO. <https://www.fao.org/documents/card/en/c/ca6062en>
- FAO & WHO.** 2020. *Report of the Expert Meeting on Ciguatera Poisoning. Rome, 19–23 November 2018*. Food Safety and Quality No. 9. Rome, FAO. <https://doi.org/10.4060/ca8817en>
- Fazrul, H., Hajisamae, S., Ikhwanuddin, M. & Pradit, S.** 2015. Assessing impact of crab gill net fishery to bycatch population in the Lower Gulf of Thailand. *Turkish Journal of Fisheries and Aquatic Sciences*, 15(3): 767–777.
- Ferguson, C.E.** 2021. A rising tide does not lift all boats: intersectional analysis reveals inequitable impacts of the seafood trade in fishing communities. *Frontiers in Marine Science*, 8: 246.
- Ferguson, E., Chege, P., Kimiywe, J., Wiesmann, D. & Hotz, C.** 2015. Zinc, iron and calcium are major limiting nutrients in the complementary diets of rural Kenyan children. *Maternal & Child Nutrition*, 11(53): 6–20.
- Ferreira-Rodríguez, N., Defeo, O., Macho, G. & Pardo, I.** 2019. A social-ecological system framework to assess biological invasions: *Corbicula fluminea* in Galicia (NW Iberian Peninsula). *Biological Invasions*, 21: 587–602.
- Finkbeiner, E.M.** 2015. The role of diversification in dynamic small-scale fisheries: lessons from Baja California Sur, Mexico. *Global Environmental Change*, 32: 139–152.
- Fiorella, K.J., Hickey, M.D., Salmen, C.R., Nagata, J.M., Mattah, B., Magerenge, R., Cohen, C.R., Bukusi, E.A., Brashares, J.S. & Fernald, L.H.** 2014. Fishing for food? Analyzing links between fishing livelihoods and food security around Lake Victoria, Kenya. *Food Security*, 6(6): 851–860.
- Fiorella, K.J., Milner, E.M., Bukusi, E. & Fernald, L.C.H.** 2017. Quantity and species of fish consumed shape breast-milk fatty acid concentrations around Lake Victoria, Kenya. *Public Health Nutrition*, 21(4): 777–784.
- Fiorella, K.J., Seto, K., Gavenus, E., Milner, E.M., Omollo, D.O., Mattah, B., Fernald, L.C. & Brashares, J.** 2016. Examining local fish consumption in the globalized Lake Victoria fishery. *The FASEB Journal*, 30(S1): 894–4.
- Fischer, J., Jorgensen, J., Josupeit, H., Kalikoski, D. & Lucas, C.M., eds.** 2015. *Fishers' knowledge and the ecosystem approach to fisheries: applications, experiences and lessons in Latin America*. FAO Fisheries and Aquaculture Technical Paper No. 591. Rome, FAO. www.fao.org/3/i4664e/i4664e.pdf
- Fisher, E., Attah, R., Barca, V., O'Brien, C., Brook, S., Holland, J., Kardan, A., Pavanello, S. & Pozarny, P.** 2017. The livelihood impacts of cash transfers in sub-Saharan Africa: beneficiary perspectives from six countries. *World Development*, 99: 299–319.
- Fluet-Chouinard, E., Funge-Smith, S. & McIntyre, P.B.** 2018. Global hidden harvest of freshwater fish revealed by household surveys. *Proceedings of the National Academy of Sciences of the United States of America*, 115(29): 7623–7628.
- Fordyce, F.M.** 2013. Selenium deficiency and toxicity in the environment. In: O. Selinus, ed. *Essentials of medical geology*, pp. 375–416. Dordrecht, the Netherlands, Springer.
- Forsyth, S., Gautier, S. & Salem, N. Jr.** 2017. Dietary intakes of arachidonic acid and docosahexaenoic acid in early life – with a special focus on complementary feeding in developing countries. *Annals of Nutrition and Metabolism*, 70(3): 217–227.
- Fox, H.E. & Caldwell, R.L.** 2006. Recovery from blast fishing on coral reefs: a tale of two scales. *Ecological Applications*, 16(5): 1631–1635.
- Fox, H.E., Pet, J.S., Dahuri, R. & Caldwell, R.L.** 2003. Recovery in rubble fields: long-term impacts of blast fishing. *Marine Pollution Bulletin*, 46(8): 1024–1031.
- Franco, B.C., Defeo, O., Piola, A.R., Barreiro, M., Yang, Hu., Ortega, L., Gianelli, I. et al.** 2020. Climate change impacts on the atmospheric circulation, ocean, and fisheries in the southwest South Atlantic Ocean: a review. *Climatic Change*, 162: 2359–2377.

- Frangoudes, K. & Gerrard, S.** 2018. (En)gendering change in small-scale fisheries and fishing communities in a globalized world. *Maritime Studies*, 17(2): 117–124.
- Frangoudes, K. & Keromnes, E.** 2008. Women in artisanal fisheries in Brittany, France. *Development*, 51(2): 265–270.
- Franz, N., Fuentevilla, C., Westlund, L. & Willmann, R.** 2015. A human rights-based approach to securing livelihoods depending on inland fisheries. In: J.F. Craig, ed. *Freshwater fisheries ecology*, pp. 513–523. Hoboken, USA, John Wiley & Sons. <https://doi.org/10.1002/9781118394380.ch40>
- Freduah, G., Fidelman, P. & Smith, T.F.** 2019. A framework for assessing adaptive capacity to multiple climatic and non-climatic stressors in small-scale fisheries. *Environmental Science & Policy*, 101: 87–93.
- Free, C.M., Thorson, J.T., Pinsky, M.L., Oken, K.L., Wiedenmann, J. & Jensen, O.P.** 2019. Impacts of historical warming on marine fisheries production. *Science*, 363(6430): 979–983.
- Friedman, K., Eriksson, H., Tardy, E. & Pakoa, K.** 2011. Management of sea cucumber stocks: patterns of vulnerability and recovery of sea cucumber stocks impacted by fishing. *Fish and Fisheries*, 12(1): 75–93.
- Fröcklin, S., de la Torre-Castro, M., Lindström, L. & Jiddawi, N.S.** 2013. Fish traders as key actors in fisheries: gender and adaptive management. *Ambio*, 42(8): 951–62.
- Fulgencio, K.** 2009. Globalisation of the Nile perch: assessing the socio-cultural implications of the Lake Victoria fishery in Uganda. *African Journal of Political Science and International Relations*, 3(10): 433–442.
- Funge-Smith, S.** 2018. *Review of the State of World Fishery Resources: inland fisheries*. FAO Fisheries and Aquaculture Circular No. C942, Rev. 3. Rome, FAO. 397 pp.
- Funge-Smith, S.J. & Bennett, A.** 2018. Estimating the contribution of large-scale and commercial inland fisheries. In: S.J. Funge-Smith, ed. *Review of the state of world fishery resources: inland fisheries*, pp. 8–20. FAO Fisheries and Aquaculture Circular No. C942, Rev. 3. Rome, FAO.
- Funge-Smith, S. & Bennett, A.** 2019. A fresh look at inland fisheries and their role in food security and livelihoods. *Fish and Fisheries*, 20(6): 1176–1195.
- Funge-Smith, S., Briggs, M. & Miao, W.** 2012. *Regional overview of fisheries and aquaculture in Asia and the Pacific 2012*. RAP Publication 2012/26. Bangkok, Asia-Pacific Fishery Commission, FAO Regional Office for Asia and the Pacific. 139 pp.
- Galappaththi, E.K., Ford, J.D., Bennett, E.M. & Berkes, F.** 2021. Adapting to climate change in small-scale fisheries: insights from indigenous communities in the global north and south. *Environmental Science & Policy*, 116: 160–170.
- Garcia, S.M. & Cochrane, K.L.** 2009. From past management to future governance: a perspective view. In S.M. Garcia & K.L. Cochrane, eds. *A fishery manager's guidebook*, 2nd edition, pp. 445–472. Hoboken, USA, John Wiley & Sons. <https://doi.org/10.1002/9781444316315.ch17>
- García-Flórez, L., Morales, J., Gaspar, M.B., Castilla, D., Mugerza, E., Berthou, P., de la Fuente, L.G. et al.** 2014. A novel and simple approach to define artisanal fisheries in Europe. *Marine Policy*, 44: 152–159.
- Gee, J. & Bacher, K.** 2017. Engendering statistics for fisheries and aquaculture. *Asian Fisheries Science*, 30S: 277–290.
- Gelcich, S., Edwards-Jones, G., Kaiser, M.J. & Castilla, J.C.** 2006. Co-management policy can reduce resilience in traditionally managed marine ecosystems. *Ecosystems*, 9(6): 951–966.
- Gelcich, S., Hughes, T.P., Olsson, P., Folke, C., Defeo, O., Fernandez, M., Foale, S. et al.** 2010. Navigating transformations in governance of Chilean marine coastal resources. *Proceedings of the National Academy of Sciences of the United States of America*, 107(39): 16794–16799.
- Gerrard, S. & Kleiber, D.** 2019. Women fishers in Norway: few, but significant. *Maritime Studies*, 18: 259–274.
- Gianelli, I., Ortega, L. & Defeo, O.** 2019. Modeling short-term fishing dynamics in a small-scale intertidal shellfishery. *Fisheries Research*, 209(4): 242–250.
- Gianelli, I., Ortega, L., Pittman, J., Vasconcellos, M. & Defeo, O.** 2021. Harnessing scientific and local knowledge to face climate change in small-scale fisheries. *Global Environmental Change*, 68: 102253.
- Gibson, D.** 2017. Socio-economic contribution of small-scale and large-scale fisheries in British Columbia. University of British Columbia. MSc thesis.
- Gibson, D. & Sumaila, U.R.** 2017. Determining the degree of 'small-scaleness' using fisheries in British Columbia as an example. *Marine Policy*, 86: 121–126.
- Gibson, E., Stacey, N., Sunderland, T.C. & Adhuri, D.S.** 2020. Dietary diversity and fish consumption of mothers and their children in fisher households in Komodo District, eastern Indonesia. *PLoS ONE*, 15(4): e0230777.
- Gillett, R.** 2009. *Fisheries in the economies of Pacific Island Countries and Territories*. Pacific Studies Series. Mandaluyong City, Philippines, Asian Development Bank. www.adb.org/sites/default/files/publication/27511/pacific-fisheries.pdf

- Gillett, R.** 2011. *Fisheries of the Pacific Islands: regional and national information*. RAP publication 2011/03. Bangkok, FAO Regional Office for Asia and the Pacific.
- Gillett, R., Jauharee, A.R. & Adam, M.S.** 2013. *Maldives Livebait Fishery Management Plan 2013*. Malé, Marine Research Centre, Maldives Ministry of Fisheries and Agriculture. <http://saruna.mnu.edu.mv/jspui/handle/123456789/4460>
- Giron-Nava, A., Lam, V.W.Y., Aburto-Oropeza, O., Cheung, W.W.L., Halpern, B.S., Sumaila, U.R. & Cisneros-Montemayor, A.M.** 2021. Sustainable fisheries are essential but not enough to ensure well-being for the world's fishers. *Fish and Fisheries*, 22(4): 812–821.
- Gladyshev, M.I., Sushchik, N.N., Tolomeev, A.P. & Dgebuadze, Y.Y.** 2018. Meta-analysis of factors associated with omega-3 fatty acid contents of wild fish. *Reviews in Fish Biology and Fisheries*, 28(2): 277–299.
- Godoy, N., Gelcich, S., Vásquez, J.A. & Castilla, J.C.** 2010. Spearfishing to depletion: evidence from temperate reef fishes in Chile. *Ecological Applications*, 20(6): 1504–1511.
- Golden, C.D., Koehn, J.Z., Shepon, A., Passarelli, S., Free, C.M., Viana, D.F., Matthey, H. et al.** 2021. Aquatic foods to nourish nations. *Nature*, 598(7880): 315–320.
- Golder, A.M., Erhardt, J.G., Scherbaum, V., Saeed, M., Biesalski, H.K. & Fürst, P.** 2001. Dietary intake and nutritional status of women and pre-school children in the Republic of the Maldives. *Public Health Nutrition*, 4(3): 773–780.
- Gomma, A. & Rana, K.** 2007. Inter-household and intra-household patterns of fish and meat consumption in fishing communities in two states in Nigeria. *British Journal of Nutrition*, 97(1): 145–152.
- Gonçalves, J.M.S., Stergiou, K.I., Hernando, J.A., Puente, E., Moutopoulos, D.K., Arregi, L., Soriguer, M.C., Vilas, C., Coelho, R. & Erzini, K.** 2007. Discards from experimental trammel nets in southern European small-scale fisheries. *Fisheries Research*, 88(1–3): 5–14.
- Gonzalvo, J., Giovos, I. & Moutopoulos, D.K.** 2015. Fishermen's perception on the sustainability of small-scale fisheries and dolphin-fisheries interactions in two increasingly fragile coastal ecosystems in western Greece. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 25(1): 91–106.
- Gopakumar, G., Pillai, P.P. & Koya, K.P.S.** 1991. Population characteristics of tuna live baits in Lakshadweep. *Journal of the Marine Biological Association of India*, 33(1–2): 255–277.
- Gopal, N., Hapke, H.M., Kusakabe, K., Rajaratnam, S. & Williams, M.J.** 2020. Expanding the horizons for women in fisheries and aquaculture. *Gender, Technology and Development*, 24(1): 1–9.
- Government of Malawi.** 2016. *National Fisheries and Aquaculture Policy*. Lilongwe.
- Government of Malawi.** 2019. *2019 Annual Economic Report*. Ministry of Finance, Economic Planning and Development. Lilongwe.
- Graham, N.A.J.** 2014. Habitat complexity: coral structural loss leads to fisheries declines. *Current Biology*, 24(9): R359–R361.
- Grandjean, P., Bjerve, K.S., Weihe, P. & Steuerwald, U.** 2001. Birthweight in a fishing community: significance of essential fatty acids and marine food contaminants. *International Journal of Epidemiology*, 30(6): 1272–1278.
- Grant, S. & Berkes, F.** 2007. Fisher knowledge as expert system: a case from the longline fishery of Grenada, the Eastern Caribbean. *Fisheries Research*, 84(2): 162–170.
- Guardone, L., Armani, A., Nucera, D., Costanzo, F., Mattiucci, S. & Bruschi, F.** 2018. Human anisakiasis in Italy: a retrospective epidemiological study over two decades. *Parasite*, 25(41).
- Gudmundsson, L., Boulange, J., Do, H.X., Gosling, S.N., Grillakis, M.G., Koutroulis, A.G., Leonard, M. et al.** 2021. Globally observed trends in mean and extreme river flow attributed to climate change. *Science*, 371(6534): 1159–1162.
- Guevara-Carrasco, R. & Bertrand, A., eds.** 2017. *Atlas de la pesca artesanal del mar del Perú*. Edición IMARPE-IRD. Lima, IMARPE. <https://repositorio.imarpe.gob.pe/handle/20.500.12958/3167>
- Guillory, V.** 1993. Ghost fishing by blue crab traps. *North American Journal of Fisheries Management*, 13(3): 456–466.
- Gustavsson, M.** 2020. Women's changing productive practices, gender relations and identities in fishing through a critical feminisation perspective. *Journal of Rural Studies*, 78(June): 36–46.
- Gutiérrez, N.L.** 2017. Harnessing citizenry awareness and technology to improve fisheries information: the power of data. *Fisheries*, 42: 613–618.
- Gutiérrez, N.L., Hilborn, R. & Defeo, O.** 2011. Leadership, social capital and incentives promote successful fisheries. *Nature*, 470(7334): 386–389.
- Guyader, O., Berthou, P., Koutsikopoulos, C., Alban, F., Demaneche, S., Gaspar, M.B., Eschbaum, R. et al.** 2013. Small scale fisheries in Europe: a comparative analysis based on a selection of case studies. *Fisheries Research*, 140: 1–13.

- Hall, S.J.** 2011. Climate change and other external drivers in small-scale fisheries: practical steps for responding. In: R.S. Pomeroy & N.L. Andrew, eds. *Small-scale fisheries management: frameworks and approaches for the developing world*, pp. 132–159. Wallingford, UK, CAB International.
- Hallström, E., Bergman, K., Mifflin, K., Parker, R., Tyedmers, P., Troell, M. & Ziegler, F.** 2019. Combined climate and nutritional performance of seafoods. *Journal of Cleaner Production*, 230: 402–411.
- Hallwass, G. & Silvano, R.A.M.** 2016. Patterns of selectiveness in the Amazonian freshwater fisheries: implications for management. *Journal of Environmental Planning and Management*, 59(9): 1537–1559.
- Halpern, B.S., Cottrell, R.S., Blanchard, J.L., Bouwman, L., Froehlich, H.E., Gephart, J.A., Jacobsen, N. et al.** 2019b. Putting all foods on the same table: achieving sustainable food systems requires full accounting. *Proceedings of the National Academy of Sciences of the United States of America*, 116(37): 18152–18156.
- Halpern, B.S., Frazier, M., Afflerbach, J., Lowndes, J.S., Micheli, F., O'Hara, C., Scarborough, C. & Selkoe, K.A.** 2019a. Recent pace of change in human impact on the world's ocean. *Scientific Reports*, 9: 11609.
- Hamilton, J., Basurto, X., Smith, H. & Viridin, J.** 2021. How does the World Bank shape global environmental governance agendas for coasts? 50 years of small-scale fisheries aid reveals paradigm shifts over time. *Global Environmental Change*, 68: 102246.
- Hanich, Q., Wabnitz, C.C.C., Ota, Y., Amos, M., Donato-Hunt, C. & Hunt, A.** 2018. Small-scale fisheries under climate change in the Pacific Islands region. *Marine Policy*, 88: 279–84.
- Hardin, G.** 1968. The tragedy of the commons. *Science*, 162(3859): 1243–12248.
- Harper, S., Adshade, M., Lam, V.W.Y., Pauly, D. & Sumaila, U.R.** 2020. Valuing invisible catches: estimating the global contribution by women to small-scale marine capture fisheries production. *PLoS ONE*, 15(3): e0228912. <https://doi.org/10.1371/journal.pone.0228912>
- Harper, S., Grubb, C., Stiles, M. & Sumaila, U.R.** 2017. Contributions by women to fisheries economies: insights from five maritime countries. *Coastal Management*, 45(2): 91–106.
- Harper, S., Zeller, D., Hauzer, M., Pauly, D. & Sumaila, U.R.** 2013. Women and fisheries: contribution to food security and local economies. *Marine Policy*, 39: 56–63.
- Harris, R.M., Beaumont, L.J., Vance, T.R., Tozer, C.R., Remenyi, T.A., Perkins-Kirkpatrick, S.E., Mitchell, P.J. et al.** 2018. Biological responses to the press and pulse of climate trends and extreme events. *Nature Climate Change*, 8: 579–587.
- Harris, R.M., Loeffler, F., Rumm, A., Fischer, C., Horchler, P., Scholz, M., Foeckler, F. & Henle, K.** 2020. Biological responses to extreme weather events are detectable but difficult to formally attribute to anthropogenic climate change. *Scientific Reports*, 10: 14067.
- Harrod, C., Ramírez, A., Valbo-Jørgensen, J. & Funge-Smith, S.** 2018a. Chapter 18 – How climate change impacts inland fisheries. In: M. Barange, T. Bahri, M.C.M. Beveridge, K.L. Cochrane, S. Funge-Smith & F. Poulain, eds. *Impacts of climate change on fisheries and aquaculture: synthesis of current knowledge, adaptation and mitigation options*, pp. 375–446. FAO Fisheries and Aquaculture Technical Paper No. 627. Rome, FAO.
- Harrod, C., Ramírez, A., Valbo-Jørgensen, J. & Funge-Smith, S.** 2018b. Chapter 19 – Current anthropogenic stress and projected effect of climate change on global inland fisheries. In: M. Barange, T. Bahri, M.C.M. Beveridge, K.L. Cochrane, S. Funge-Smith & F. Poulain, eds. *Impacts of climate change on fisheries and aquaculture: synthesis of current knowledge, adaptation and mitigation options*, pp. 393–448. FAO Fisheries and Aquaculture Technical Paper No. 627. Rome, FAO.
- Hasselberg, A.E., Wessels, L., Aakre, I., Reich, F., Atter, A., Steiner-Asiedu, M., Amposah, S., Pucher, J. & Kjelleve, M.** 2020. Composition of nutrients, heavy metals, polycyclic aromatic hydrocarbons and microbiological quality in processed small indigenous fish species from Ghana: implications for food security. *PLoS ONE*, 15(11): e0242086.
- Hatai, J., Rahaman, S.A., Dasgupta, D. & Bandyopadhyay, S.** 2019. Instant detection of cyanide in seafood with a tryptophan based fluorescence probe. *Analytical Methods*, 11(28): 3563–3569.
- Hauzer, M., Dearden, P. & Murray, G.** 2013a. The fisherwomen of Ngazidja island, Comoros: fisheries livelihoods, impacts, and implications for management. *Fisheries Research*, 140: 28–35.
- Hauzer, M., Dearden, P. & Murray, G.** 2013b. The effectiveness of community-based governance of small-scale fisheries, Ngazidja island, Comoros. *Marine Policy*, 38: 346–354.
- He, Q. & Silliman, B.R.** 2019. Climate change, human impacts, and coastal ecosystems in the Anthropocene. *Current Biology*, 29(9): R1021–R1035.
- Headey, D.D. & Alderman, H.H.** 2019. The relative caloric prices of healthy and unhealthy foods differ systematically across income levels and continents. *The Journal of Nutrition*, 149(11): 2020–2033.
- Headey, D., Hirvonen, K. and Hoddinott, J.** 2017. *Animal sourced foods and child stunting: evidence from 112,887 children in 46 countries*. No. 2054-2017-5556. Conference paper submitted to Agricultural and Applied Economics Association (AAEA).

- Herrero, M., Thornton, P.K., Mason-D'Croz, D., Palmer, J., Benton, T.G., Bodirsky, B.L., Bogard, J.R. et al.** 2020. Innovation can accelerate the transition towards a sustainable food system. *Nature Food*, 1(5): 266–272.
- Hibbeln, C.J.R., Spiller, P., Brenna, J.T., Golding, J., Holub, B.J., Harris, W.S., Kris-Etherton, P. et al.** 2019. Relationships between seafood consumption during pregnancy and childhood and neurocognitive development: two systematic reviews. *Prostaglandins, Leukotrienes and Essential Fatty Acids*, 151: 14–36.
- Hickling, C.F.** 1953. *A memorandum on fisheries legislation addressed to the Secretary of State for the Colonies*. Circular 118/53. London. Available at the Bodleian Library, University of Oxford.
- Hicks, C.C., Cohen, P.J., Graham, N.A.J., Nash, K.L., Allison, E.H., D'Lima, C., Mills, D.J. et al.** 2019. Harnessing global fisheries to tackle micronutrient deficiencies. *Nature*, 574(7776): 95–98.
- Hiddink, J.G., Jennings, S., Sciberras, M., Szostek, C.L., Hughes, K.M., Ellis, N., Rijnsdorp, A.D. et al.** 2017. Global analysis of depletion and recovery of seabed biota after bottom trawling disturbance. *Proceedings of the National Academy of Sciences of the United States of America*, 114(31): 8301–8306.
- HLPE.** 2014. *Sustainable fisheries and aquaculture for food security and nutrition. A report by the High Level Panel of Experts on Food Security and Nutrition*. Rome. <http://www.sureaqua.no/Sureaqua/library/HLPE%20-%202014,%20Sustainable%20Fisheries%20and%20Aquaculture%20for%20Food%20Security%20and%20Nutrition.pdf>
- Hobday, A.J., Cochrane, K., Downey-Breedy, N., Howard, J., Aswani, S., Byfield, V., Duggan, G. et al.** 2016. Planning adaptation to climate change in fast-warming marine regions with seafood-dependent coastal communities. *Reviews in Fish Biology and Fisheries*, 26: 249–264.
- Hobday, A.J. & Pecl, G.T.** 2014. Identification of global marine hotspots: sentinels for change and vanguards for adaptation action. *Reviews in Fish Biology and Fisheries*, 24: 415–425.
- Hodge, V.J. & Austin, J.** 2004. A survey of outlier detection methodologies. *Artificial Intelligence Review*, 22(2): 85–126.
- Hoque Mozumder, M.M., Shamsuzzaman, M.M., Rashed-Un-Nabi, M. & Karim, E.** 2018. Social-ecological dynamics of the small scale fisheries in Sundarban Mangrove Forest, Bangladesh. *Aquaculture and Fisheries*, 3(1): 38–49.
- Hortle, K.G.** 2007. *Consumption and the yield of fish and other aquatic animals from the Lower Mekong Basin*. MRC Technical Paper No. 16. Vientiane, MRC. www.mrcmekong.org/assets/Publications/technical/tech-No16-consumption-n-yield-of-fish.pdf
- Hortle, K.G. & Bamrungrach, P.** 2015. *Fisheries habitat and yield in the Lower Mekong Basin*. MRC Technical Paper No. 47. Phnom Penh, MRC.
- Hortle, K.G., Lieng, S. & Valbo-Jorgensen, J.** 2004. *An introduction to Cambodia's inland fisheries*. Mekong Development Series No. 4. Phnom Penh, MRC.
- Huang, B.F.F. & Boutros, P.C.** 2016. The parameter sensitivity of random forests. *BMC Bioinformatics*, 17(1): 1–13.
- Huff, T.M.** 2011. Effects of human trampling on macro- and meiofauna communities associated with intertidal algal turfs and implications for management of protected areas on rocky shores (Southern California). *Marine Ecology*, 32(3): 335–345.
- Humber, F., Andriamahaino, E.T., Beriziny, T., Botosoamananto, R., Godley, B.J., Gough, C., Pedron, S., Ramahery, V. & Broderick, A.C.** 2017. Assessing the small-scale shark fishery of Madagascar through community-based monitoring and knowledge. *Fisheries Research*, 186: 131–143.
- Huss, H.H.** 1994. *Assurance of food safety*. Rome, FAO.
- Hutchings, K. & Lamberth, S.** 2002. Catch-and-effort estimates for the gillnet and beach-seine fisheries in the Western Cape, South Africa. *African Journal of Marine Science*, 24.
- ICC (Inuit Circumpolar Council).** 2020. *Food sovereignty and self-governance: Inuit role in managing Arctic marine resources*. Anchorage, USA, Inuit Circumpolar Council Alaska.
- ICCAT.** 2015. Resolution By ICCAT on criteria for the allocation of fishing possibilities. www.iccat.int/Documents/Recs/compendiopdf-e/2015-13-e.pdf
- ICLS (International Conference of Labour Statisticians).** 2013. Resolution concerning statistics of work, employment and labour underutilization. www.ilo.org/wcmsp5/groups/public/-dgreports/-stat/documents/normativeinstrument/wcms_230304.pdf
- ILO (International Labour Organization).** 2017. *World Employment Social Outlook: Trends 2017*. Geneva, Switzerland.
- ILO.** 2018. *Women and men in the informal economy: a statistical picture*. Third edition. Geneva, Switzerland.
- ILO.** 2021. Employment by sex and economic activity – ILO modelled estimates. In: *ILOSTAT*. Geneva, Switzerland. Cited 14 February 2020. <https://ilostat.ilo.org/data>
- Imhoff-Kunsch, B., Briggs, V., Goldenberg, T. & Ramakrishnan, U.** 2012. Effect of n-3 long-chain polyunsaturated fatty acid intake during pregnancy on maternal, infant, and child health outcomes: a systematic review. *Paediatric and Perinatal Epidemiology*, 26(s1): 91–107.

- Ingersoll, K.A.** 2016. *Waves of knowing: a seascape epistemology*. Durham, USA, Duke University Press.
- IPCC (Intergovernmental Panel on Climate Change).** 2014. *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Core Writing Team, R.K. Pachauri and L.A. Meyer, eds. Geneva, Switzerland.
- IOTC (Indian Ocean Tuna Commission).** 2019. *Monitoring of Artisanal Fisheries in the Indian Ocean*. Indian Ocean Tuna Commission Final Report, November 2019. www.iotc.org/documents/WPDCS/15/INF01
- Isaacs, M., Onyango, P. & Akintola, S.L., eds.** 2020. *Small-scale fisheries in Africa: a regional portrait*. TBTI Global Publication Series. St. John's, Canada, TBTI (Too Big To Ignore). 132 pp.
- Islam, M.S.** 2003. Perspectives of the coastal and marine fisheries of the Bay of Bengal, Bangladesh. *Ocean and Coastal Management*, 46(8): 763–796.
- Islam, M.S. & Ahmed, S.U.** 2001. By-catch mortality during collection of *penaeus monodon* (FAB.) post-larvae from the rivers of Khulna, Bangladesh. *Journal of the National Science Foundation of Sri Lanka*, 29(3–4): 107–115.
- Iwamoto, M., Ayers, T., Mahon, B.E. & Swerdlow, D.L.** 2010. Epidemiology of seafood-associated infections in the United States. *Clinical Microbiology Reviews*, 23(2): 399–411.
- Jackson, M.C., Woodford, D.J. & Weyl, O.L.F.** 2016. Linking key environmental stressors with the delivery of provisioning ecosystem services in the freshwaters of southern Africa. *Geo: Geography and Environment*, 3(2): e00026. <https://doi.org/10.1002/geo2.26>
- Jacquet, J. & Pauly, D.** 2008. Funding priorities: big barriers to small-scale fisheries. *Conservation Biology*, 22(4): 832–835.
- Jaini, M. & Hisham, J.** 2013. Sustainable pole and line tuna fisheries in the Indian Ocean: Does Lakshadweep hold up to Maldives' MSC standards? International Conference on Small-Scale Fisheries Governance: Development for Wellbeing and Sustainability. Hosted by the Centre for Economic and Social Studies, Hyderabad, India, 1–17.
- Jennings, S., Kaiser, M. & Reynolds, J.D.** 2001. *Marine fisheries ecology*. Wiley.
- Jentoft, S. & Bavinck, M.** 2014. Interactive governance for sustainable fisheries: dealing with legal pluralism. *Current Opinion in Environmental Sustainability*, 11: 71–77.
- Jentoft, S. & Chuenpagdee, R., eds.** 2015. *Interactive governance for small-scale fisheries*. MARE Publication Series 13. Cham, Switzerland, Springer International Publishing. 775 pp. <https://doi.org/10.1007/978-3-319-17034-3>
- Jentoft, S., Chuenpagdee, R., Barragán-Paladines, M.J. & Franz, N., eds.** 2017. *The Small-Scale Fisheries Guidelines: global implementation*. MARE Publication Series Vol. 14. Cham, Switzerland, Springer International Publishing.
- Jimenez-Badillo, L.** 2007. Management challenges of small-scale fishing communities in a protected reef system of Veracruz, Gulf of Mexico. *Fisheries Management and Ecology*, 15(1): 19–26.
- Johannes, R.E.** 1978. Traditional marine conservation methods in Oceania and their demise. *Annual Review of Ecology & Systematics*, 9: 349–364.
- Johannes, R.E.** 2002. The renaissance of community-based marine resource management in Oceania. *Annual Review of Ecology and Systematics*, 33(1): 317–340.
- Johnson, D.S.** 2006. Category, narrative and value in the governance of small-scale fisheries. *Marine Policy*, 30(6): 747–56.
- Johnson, D.S.** 2010. Institutional adaptation as a governability problem in fisheries: patron–client relations in the Junagadh fishery, India. *Fish and Fisheries*, 11(3): 264–277.
- Johnson, G., Attrill, M., Sheehan, E. & Somerfield, P.** 2007. Recovery of meiofauna communities following mudflat disturbance by trampling associated with crab-tilling. *Marine Environmental Research*, 64(4): 409–416.
- Jones, B., Unsworth, R., Udagedara, S. & Cullen-Unsworth, L.** 2018. Conservation concerns of small-scale fisheries: by-catch impacts of a shrimp and finfish fishery in a Sri Lankan lagoon. *Frontiers in Marine Science*, 5(FEB): 52.
- Jones, G.D., Droz, B., Greve, P., Gottschalk, P., Poffet, D., McGrath, S.P., Seneviratne, S.I., Smith, P. & Winkel, L.H.E.** 2017. Selenium deficiency risk predicted to increase under future climate change. *Proceedings of the National Academy of Sciences of the United States of America*, 114(11): 2848–2853.
- Josuweit, H.** 2016. *Research for PECH Committee. Small-scale fisheries markets: value chain, promotion and labelling*. European Parliament, Directorate-General for Internal Policies. Policy Department B: Structural and Cohesion Policies. IP/B/PECH/IC/2015_180. Brussels, European Union. [www.europarl.europa.eu/RegData/etudes/STUD/2016/573443/IPOL_STU\(2016\)573443_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2016/573443/IPOL_STU(2016)573443_EN.pdf)
- Jul-Larsen, E., Kolding, J., Nielsen, J.R., Overa, R. & van Zwieten, P.A.M.** 2003. *Management, co-management or no management? Major dilemmas in southern African freshwater fisheries. Part 1: Synthesis Report*. FAO Fisheries Technical Paper No. 426/1. Rome, FAO. 137 pp.

- Kabahenda, M.K., Amega, R., Okalany, E., Husken, S.M.C. & Heck, S.** 2011. Protein and micronutrient composition of low value fish products commonly marketed in the Lake Victoria region. *World Journal of Agricultural Sciences*, 7(5): 521–526.
- Kalikoski, D.C., Jentoft, S., Charles, A., Salazar Herrera, D., Cook, K., Béné, C. & Allison, E.H.** 2018. Understanding the impacts of climate change for fisheries and aquaculture: applying a poverty lens. In: M. Barange, T. Bahri, M.C.M. Beveridge, K.L. Cochrane, S. Funge-Smith & F. Poulain, eds. *Impacts of climate change on fisheries and aquaculture: synthesis of current knowledge, adaptation and mitigation options*, pp. 19–39. FAO Fisheries and Aquaculture Technical Paper No. 627. Rome, FAO.
- Kallon, A., Lebbie, A., Sturm, B., Garnett, T. & Wadsworth, R.** 2017. Comparative studies of fish smoking and solar drying in the Sierra Leone artisanal fishing industry. *Journal of Stored Products and Postharvest Research*, 8(3): 40–48.
- Kaminski, A.M., Cole, S.M., Al Haddad, R.E., Kefi, A.S., Chilala, A.D., Chisule, G., Mukuka, K.N. et al.** 2020. Fish losses for whom? A gendered assessment of post-harvest losses in the barotse floodplain fishery, Zambia. *Sustainability*, 12(23): 1–20.
- Kao, Y.C., Rogers, M.W., Bunnell, D.B., Cowx, I.G., Qian, S.S., Anneville, O., Beard, T.D. et al.** 2020. Effects of climate and land-use changes on fish catches across lakes at a global scale. *Nature Communications*, 11(1): 1–14.
- Karp, M.A., Peterson, J.O., Lynch, P.D., Griffis, R.B., Adams, C.F., Arnold, W.S., Barnett, L.A. et al.** 2019. Accounting for shifting distributions and changing productivity in the development of scientific advice for fishery management. *ICES Journal of Marine Science*, 76(5): 1305–1315.
- Katikiro, R.E. & Mahenge, J.J.** 2016. Fishers' perceptions of the recurrence of dynamite-fishing practices on the coast of Tanzania. *Frontiers in Marine Science*, 3(NOV): 233.
- Kauppinen, T., Siira, A. & Suuronen, P.** 2005. Temporal and regional patterns in seal-induced catch and gear damage in the coastal trap-net fishery in the northern Baltic Sea: effect of netting material on damage. *Fisheries Research*, 73(1–2): 99–109.
- Kawarazuka, N.** 2010. *The contribution of fish intake, aquaculture, and small-scale fisheries to improving food and nutrition security: a literature review*. WorldFish Center Working Paper No. 2106. Penang, Malaysia, WorldFish Center.
- Kawarazuka, N. & Béné, C.** 2010. Linking small-scale fisheries and aquaculture to household nutritional security: an overview. *Food Security*, 2(4): 343–357.
- Kawarazuka, N. & Béné, C.** 2011. The potential role of small fish species in improving micronutrient deficiencies in developing countries: building evidence. *Public Health Nutrition*, 14(11): 1927–1938.
- KC, K.B., Bond, N., Fraser, E.D.G., Elliott, V., Farrell, T., McCann, K., Rooney, N. & Bieg, C.** 2017. Exploring tropical fisheries through fishers' perceptions: fishing down the food web in the Tonlé Sap, Cambodia. *Fisheries Management and Ecology*, 24(6): 452–459.
- Kelly, E.L.A., Eynaud, Y., Williams, I.D., Sparks, R.T., Dailer, M.L., Sandin, S.A. & Smith, J.E.** 2017. A budget of algal production and consumption by herbivorous fish in an herbivore fisheries management area, Maui, Hawaii. *Ecosphere*, 8(8): e01899. <https://doi.org/10.1002/ecs2.1899>
- Kerezi, V., Nakamura, J., El Halimi, M. & Chuenpagdee, R., eds.** 2020. *Unlocking legal and policy frameworks for small-scale fisheries: global illustrations*. TBTI Global Publication Series. St. John's, Canada, TBTI.
- Kesteven, G.L.** 1973. *Manual of fisheries science. Part 1: an introduction to fisheries science*. FAO Fisheries Technical Paper No. 118. Rome, FAO.
- King, T.J. & Robinson, G., eds.** 2019. *At home on the waves. Human habitation of the sea from the Mesolithic to today*. New York, USA and Oxford, UK, Berghahn Books.
- Kirema-Mukasa, C.T.** 2012. *Regional fish trade in eastern and southern Africa, products and markets: a fish traders guide*. Ebène, Mauritius, Indian Ocean Commission. www.fao.org/3/az089e/az089e.pdf
- Kittinger, J.N.** 2013. Human dimensions of small-scale and traditional fisheries in the Asia-Pacific region. *Pacific Science*, 67(3): 315–325.
- Kleiber, D.** 2014. Gender and small-scale fisheries in the Central Philippines. University of British Columbia. PhD thesis.
- Kleiber, D., Cohen, P., Gomese, C. & McDougall, C.** 2019. *Gender-integrated research for development in Pacific coastal fisheries*. Program Brief: FISH-2019-02. Penang, Malaysia, CGIAR Research Program on Fish Agri-Food Systems. <https://digitalarchive.worldfishcenter.org/bitstream/handle/20.500.12348/2826/FISH-2019-02.pdf>
- Kleiber, D., Frangoudes, K., Snyder, H., Choudhury, A., Cole, S.M., Soejima, K., Pita, C. et al.** 2017. Promoting gender equity and equality through the Small-Scale Fisheries Guidelines: experiences from multiple case studies. In: S. Jentoft, R. Chuenpagdee, M. Barragán-Paladines & N. Franz, eds. *The Small-Scale Fisheries Guidelines: global implementation*, pp. 737–759. MARE Publication Series 14. Cham, Switzerland, Springer International Publishing.

- Kleiber, D., Harris, L.M. & Vincent, A.C.J.** 2014. Improving fisheries estimates by including women's catch in the Central Philippines. *Canadian Journal of Fisheries and Aquatic Sciences*, 71(5): 656–664.
- Kleiber, D., Harris, L.M. & Vincent, A.C.J.** 2015. Gender and small-scale fisheries: a case for counting women and beyond. *Fish and Fisheries*, 16(4): 547–562.
- Knowlton, N.** 2001. The future of coral reefs. *Proceedings of the National Academy of Sciences of the United States of America*, 98(10): 5419–5425.
- KNSO (Kiribati National Statistics Office), FAO & SPC.** 2021. *Kiribati food security profile*. Nouméa, SPC. https://spccfpstore1.blob.core.windows.net/digital-library-docs/files/fe/fe09f9ab143acf2411d1f171d6701ee7.pdf?sv=2015-12-11&sr=b&sig=FjSNL3wcjMnK9RMloR1h-KNnZS5BFPeGo3eUFVTtKFlw%3D&se=2023-06-10T22%3A31%3A21Z&sp=r&rsc=public%2C%20max-age%3D864000%2C%20max-stale%3D86400&rsct=application%2Fpdf&rscd=inline%3B%20filename%3D%22Kiribati_food_security_profile.pdf%22
- Koehn, J.Z., Allison, E.H., Villeda, K., Chen, Z., Nixon, M., Crigler, E., Zhao, L. et al.** 2021. Fishing for health: Do the world's national policies for fisheries and aquaculture align with those for nutrition? *Fish and Fisheries*.
- Kolding, J., Béné, C. & Bavinck, M.** 2014. Small-scale fisheries: importance, vulnerability and deficient knowledge. In S.M. Garcia, J. Rice & A. Charles, eds. *Governance of marine fisheries and biodiversity conservation*, pp. 317–331. Hoboken, USA, John Wiley & Sons. <https://doi.org/10.1002/9781118392607.ch22>
- Kolding, J., Medard, M., Mkumbo, O. & van Zwieten, P.A.M.** 2014. Status, trends and management of the Lake Victoria Fisheries. In R.L. Welcomme, J. Valbo-Jørgensen & A.S. Halls, eds. *Inland fisheries evolution and management – case studies from four continents*, pp. 49–62. FAO Fisheries and Aquaculture Technical Paper No. 579. Rome, FAO.
- Kolding, J. & van Zwieten, P.A.M.** 2011. The tragedy of our legacy: How do global management discourses affect small scale fisheries in the South? *Forum for Development Studies*, 38(3): 267–297.
- Kolding, J. & van Zwieten, P.A.** 2012. Relative lake level fluctuations and their influence on productivity and resilience in tropical lakes and reservoirs. *Fisheries Research*, 115: 99–109.
- Kolding, J., van Zwieten, P., Marttin, F., Funge-Smith, S. & Poulain, F.** 2019. *Freshwater small pelagic fish and their fisheries in the major African lakes and reservoirs in relation to food security and nutrition*. FAO Fisheries and Aquaculture Technical Paper No. 642. Rome, FAO. 124 pp. <https://doi.org/10.4060/ca0843en>
- Kolding, J., van Zwieten, P., Mkumbo, O., Silsbe, G. & Hecky, R.** 2008. Are the Lake Victoria fisheries threatened by exploitation or eutrophication? Towards an ecosystem-based approach to management. In: G. Bianchi & H.R. Skjoldal, eds. *The ecosystem approach to fisheries*, pp. 309–350. Wallingford, UK, CAB International.
- Königson, S., Fjälling, A., Berglind, M. & Lunneryd, S.G.** 2013. Male gray seals specialize in raiding salmon traps. *Fisheries Research*, 148: 117–123.
- Kranz, S., Jones, N.R.V. & Monsivais, P.** 2017. Intake levels of fish in the UK paediatric population. *Nutrients*, 9(4): 1–10.
- Kratzer, I.M.F., Schäfer, I., Stoltenberg, A., Chladek, J.C., Kindt-Larsen, L., Larsen, F. & Stepputtis, D.** 2020. Determination of optimal acoustic passive reflectors to reduce bycatch of odontocetes in gillnets. *Frontiers in Marine Science*, 7: 539.
- Kronen, M. & Vunisea, A.** 2009. Fishing impact and food security – gender differences in finfisheries across Pacific Island countries and cultural groups. *SPC Women in Fisheries Information Bulletin*, 19: 3–10. Nouméa, SPC.
- Kruijssen, F., Tedesco, I., Ward, A., Pincus, L., Love, D. & Thorne-Lyman, A.L.** 2020. Loss and waste in fish value chains: a review of the evidence from low and middle-income countries. *Global Food Security*, 26: 100434.
- Kuipers, R.S., Fokkema, M.R., Smit, E.N., Van Der Meulen, J., Boersma, E.R. & Muskiet, F.A.J.** 2005. High contents of both docosahexaenoic and arachidonic acids in milk of women consuming fish from lake Kitangiri (Tanzania): Targets for infant formulae close to our ancient diet? *Prostaglandins Leukotrienes and Essential Fatty Acids*, 72(4): 279–288.
- Kurien, J.** 1996. *Towards a new agenda for sustainable small-scale fisheries development*. Trivandrum, India, South Indian Federation of Fishermen Societies.
- Kurien, J.** 2005. *Responsible fish trade and food security*. FAO Fisheries Technical Paper No. 456. Rome, FAO.
- Lamberth, S.** 1997. The status of the South African beach-seine and gill-net fisheries. *African Journal of Marine Science*, 18.
- Lamberth, S., Bennett, B. & Clark, B.** 1994. Catch composition of the commercial beach-seine fishery in False Bay, South Africa. *South African Journal of Marine Science*, 14(1): 69–78.
- Lampe, M., Demmalino, E.B., Neil, M. & Jompa, J.** 2017. Main drivers and alternative solutions for destructive fishing in south Sulawesi, Indonesia: lessons learned from Spermonde Archipelago, Taka Bonerate, and Sembilan Islands. *Science International (Lahore)*, 29(1): 159–164.

- Lau, J.D., Cinner, J.E., Fabinyi, M., Gurney, G.G. & Hicks, C.C. 2020. Access to marine ecosystem services: examining entanglement and legitimacy in customary institutions. *World Development*, 126: 104730.
- Lawless, S., Cohen, P., McDougall, C., Orlana, G., Siota, F. & Doyle, K. 2019. Gender norms and relations: implications for agency in coastal livelihoods. *Maritime Studies*, 18: 347–358.
- Lawless, S., Cohen, P.J., Mangubhai, S., Kleiber, D. & Morrison, T.H. 2021. Gender equality is diluted in commitments made to small-scale fisheries. *World Development*, 140: 105348.
- Laneri, K., Louzao, M., Martínez-Abraín, A., Arcos, J.M., Belda, E.J., Gualart, J., Sánchez, A., Giménez, M., Maestre, R. & Oro, D. 2010. Trawling regime influences longline seabird bycatch in the Mediterranean: new insights from a small-scale fishery. *Marine Ecology Progress Series*, 420: 241–252.
- Lauriano, G., Caramanna, L., Scarnó, M. & Andaloro, F. 2009. An overview of dolphin depredation in Italian artisanal fisheries. *Journal of the Marine Biological Association of the United Kingdom*, 89(5): 921–929.
- Leisher, C., Tamsah, G., Booker, F., Day, M., Samberg, L., Prosnitz, D., Agarwal, B. *et al.* 2016. Does the gender composition of forest and fishery management groups affect resource governance and conservation outcomes? A systematic map. *Environmental Evidence*, 5(1): 6.
- Lentisco, A. & Lee, R. 2015. *A review of women's access to fish in small-scale fisheries*. FAO Fisheries and Aquaculture Circular No. 1098. Rome, FAO. <http://ezproxy.lib.ucalgary.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eih&AN=109998014&site=ehost-live>
- Lenton, T.M. 2020. Tipping positive change. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 375(1794): 20190123.
- Leroy, J.L., Frongillo, E.A., Dewan, P., Black, M.M. & Waterland, R.A. 2020. Can children catch up from the consequences of undernourishment? Evidence from child linear growth, developmental epigenetics, and brain and neurocognitive development. *Advances in Nutrition*, 11(4): 1032–1041.
- Leroy, J.L., Ruel, M., Frongillo, E.A., Harris, J. & Ballard, T.J. 2015. Measuring the food access dimension of food security: a critical review and mapping of indicators. *Food and Nutrition Bulletin*, 36(2): 167–195.
- Lewison, R.L., Crowder, L.B., Wallace, B.P., Moore, J.E., Cox, T., Zydelis, R., McDonald, S. *et al.* 2014. Global patterns of marine mammal, seabird, and sea turtle bycatch reveal taxa-specific and cumulative megafauna hotspots. *Proceedings of the National Academy of Sciences of the United States of America*, 111(14): 5271–5276.
- Lindquist, A. 1988. Thanks for using NAGA. *ICLARM Quarterly*, 11: 16–17.
- Lo, M., Narulita, S. & Ickowitz, A. 2019. The relationship between forests and freshwater fish consumption in rural Nigeria. *PLoS ONE*, 14(6): e0218038. <https://doi.org/10.1371/journal.pone.0218038>
- Loch, C., Marmontel, M. & Simões-Lopes, P.C. 2009. Conflicts with fisheries and intentional killing of freshwater dolphins (Cetacea: Odontoceti) in the Western Brazilian Amazon. *Biodiversity and Conservation*, 18(14): 3979–3988.
- Locke, C., Muljono, P., McDougall, C. & Morgan, M. 2017. Innovation and gendered negotiations: insights from six small-scale fishing communities. *Fish and Fisheries*, 18(5): 943–957.
- Loeung, D., Degen, P. & van Zalinge, N. 2003. *Fishing gears of the Cambodian Mekong*. Phnom Pen, Inland Fisheries Research and Development Institute of Cambodia.
- Long, S., Jones, P.J.S., Randriana, Z. & Hadj-Hammou, J. 2017. Governance analysis of a community managed small-scale crab fishery in Madagascar: novel use of an empirical framework. *Marine Policy*, 127: 102974.
- Lorentsen, S.H., Sjøtun, K. & Grémillet, D. 2010. Multi-trophic consequences of kelp harvest. *Biological Conservation*, 143(9): 2054–2062.
- Lucas, M., Dewailly, É., Muckle, G., Ayotte, P., Bruneau, S., Gingras, S., Rhainds, M. & Holub, B. 2004. Gestational age and birth weight in relation to n-3 fatty acids among inuit (Canada). *Lipids*, 39(7): 617–626.
- Luckett, B.G., DeClerck, F.A.J., Fanzo, J., Mundorf, A.R. & Rose, D. 2015. Application of the Nutrition Functional Diversity indicator to assess food system contributions to dietary diversity and sustainable diets of Malawian households. *Public Health Nutrition*, 18(13): 2479–2487.
- Lupton, J.R., Brooks, J.A., Butte, N.F., Caballero, B., Flatt, J.P. & Fried, S.K. 2002. *Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids*. Washington, DC, National Academies Press.
- Lymer, D., Marttin, F., Marmulla, G. & Bartley, D.M. 2016. A global estimate of theoretical annual inland capture fisheries harvest. In: W.W. Taylor, D.M. Bartley, C.I. Goddard, N.J. Leonard & R. Welcomme, eds. *Freshwater, fish and the future: proceedings of the global cross-sectoral conference*, pp. 63–75. Bethesda, USA, American Fisheries Society, FAO & Michigan State University.

- Lynch, A.J., Cooke, S.J., Deines, A.M., Bower, S.D., Bunnell, D.B., Cowx, I.G., Nguyen, V.M. et al.** 2016. The social, economic, and environmental importance of inland fish and fisheries. *Environmental Reviews*, 24(2): 115–121.
- Lynch, A.J., Cowx, I.G., Fluët-Chouinard, E., Glaser, S.M., Phang, S.C., Beard, T.D., Bower, S.D. et al.** 2017. Inland fisheries: invisible but integral to the UN Sustainable Development Agenda for ending poverty by 2030. *Global Environmental Change*, 47: 167–173.
- Machias, A., Maiorano, P., Vassilopoulou, V., Papaconstantinou, C., Tursi, A. & Tsimenides, N.** 2004. Sizes of discarded commercial species in the eastern-central Mediterranean Sea. *Fisheries Research*, 66(2–3): 213–222.
- Mackey, E.** 2005. Universal rights in conflict: “backlash” and “benevolent resistance” to indigenous land rights. *Anthropology today*, 21(2): 14–20.
- MacNeil, A. et al.** (forthcoming). Fishbase Nutrient Analysis Tool. <https://github.com/mamacneil/NutrientFishbase>
- Madeira, D. & Calado, R.** 2019. Defining research priorities to detect live fish illegally collected using cyanide fishing in Indo-Pacific coral reefs. *Ecological Indicators*, 103: 659–664.
- Malasha, I.** 2003. Colonial and postcolonial fisheries regulations: the cases of Zambia and Zimbabwe. In E. Jul-Larsen, J. Kolding, R. Overå, J. Raakjær Nielsen & P.M. van Zwieten, eds. *Management, co-management or no management? Major dilemmas in Southern African freshwater fisheries. Case studies*, pp. 253–266. FAO Fisheries Technical Paper 426/2. Rome, FAO. <https://www.fao.org/3/y5056e/y5056e00.htm>
- Malawi National Statistics Office & ICF.** 2017. *Malawi Demographic and Health Survey 2015–16*.
- Mangi, S.C. & Roberts, C.M.** 2006. Quantifying the environmental impacts of artisanal fishing gear on Kenya’s coral reef ecosystems. *Marine Pollution Bulletin*, 52(12): 1646–1660.
- Mangubhai, S., & Cowley, A.** 2021. *Gender equity and social inclusion analysis for coastal fisheries*. Suva, Fiji, Wildlife Conservation Society.
- Mangubhai, S. & Lawless, S.** 2021. Exploring gender inclusion in small-scale fisheries management and development in Melanesia. *Marine Policy*, 123: 104287.
- Mantyka, C.S. & Bellwood, D.R.** 2007. Direct evaluation of macroalgal removal by herbivorous coral reef fishes. *Coral Reefs*, 26(2): 435–442.
- Manyungwa, C.L., Hara, M.M. & Chimatiro, S.K.** 2019. Women’s engagement in and outcomes from small-scale fisheries value chains in Malawi: effects of social relations. *Maritime Studies*, 18(3): 275–285.
- Marinda, P.A., Genschick, S., Khayeka-Wandabwa, C., Kiwanuka-Lubinda, R. & Thilsted, S.H.** 2018. Dietary diversity determinants and contribution of fish to maternal and under-five nutritional status in Zambia. *PLoS ONE*, 13(9): e0204009. <https://doi.org/10.1371/journal.pone.0204009>
- Marshall, B.E.** 2018. Guilty as charged: Nile perch was the cause of the haplochromine decline in Lake Victoria. *Canadian Journal of Fisheries and Aquatic Sciences*, 75(9): 1542–1559.
- Martin, M.A., Lassek, W.D., Gaulin, S.J.C., Evans, R.W., Woo, J.G., Geraghty, S.R., Davidson, B.S., Morrow, A.L., Kaplan, H.S. & Gurven, M.D.** 2012. Fatty acid composition in the mature milk of Bolivian forager-horticulturalists: controlled comparisons with a US sample. *Maternal and Child Nutrition*, 8(3): 404–418.
- Mathijs, E., Stals, A., Baert, L., Botteldoorn, N., Denayer, S., Mauroy, A., Scipioni, A. et al.** 2012. A review of known and hypothetical transmission routes for noroviruses. *Food and environmental virology*, 4(4): 131–152.
- Matsue, N., Daw, T. & Garrett, L.** 2014. Women fish traders on the Kenyan coast: livelihoods, bargaining power, and participation in management. *Coastal Management*, 42(6): 531–554.
- McCauley, D.J., Pinsky, M.L., Palumbi, S.R., Estes, J.A., Joyce, F.H. & Warner, R.R.** 2015. Marine defaunation: animal loss in the global ocean. *Science*, 347: 1255641.
- McCay, B.J. & Acheson, J. M.** 1987. *The question of the commons: the culture and ecology of communal resources*. Tucson, USA, University of Arizona Press. 439 pp.
- McCluskey, S.M. & Lewison, R.L.** 2008. Quantifying fishing effort: a synthesis of current methods and their applications. *Fish and Fisheries*, 9(2): 188–200.
- McCoy, M.A.** 2006. *Addressing shark finning in FFA member countries: issues and considerations*. Honiara, Forum Fisheries Agency.
- McGoodwin, J.** 2001. *Understanding the cultures of fishing communities: a key to fisheries management and food security*. FAO Fisheries Technical Paper No. 401. Rome, FAO.
- McLachlan, A. & Defeo, O.** 2018. *The ecology of sandy shores. Third Edition*. London, Elsevier Academic Press.
- Mcmanus, J.W., Reyes, R.B. & Nañola, C.L.** 1997. Effects of some destructive fishing methods on coral cover and potential rates of recovery. *Environmental Management*, 21(1): 69–78.
- Medard, M.** 2012. Relations between people, relations about things: gendered investment and the case of the Lake Victoria Fishery, Tanzania. *Signs*, 37(3): 555–566.

- Mejía, L.E. & Turbay, S.** 2007. Uso y simbolismo de los enenose de pesca en las tierras bajas de Colombia, Suramérica. *ITINERARIES: Journal of Linguistic, Literary, Historical and Anthropological Studies*, 5: 167–182.
- Melnychuk, M.C., Clavelle, T., Owashi, B. & Strauss, K.** 2017. Reconstruction of global ex-vessel prices of fished species. *ICES Journal of Marine Science*, 74: 121–133.
- Méndez-Medina, C., Schmook, B., Basurto, X., Fulton, S. & Espinoza-Tenorio, A.** 2020. Achieving coordination of decentralized fisheries governance through collaborative arrangements: a case study of the Sian Ka'an Biosphere Reserve in Mexico. *Marine Policy*, 117: 103939.
- Merkel, F.R. & Johansen, K.L.** 2011. Light-induced bird strikes on vessels in Southwest Greenland. *Marine Pollution Bulletin*, 62(11): 2330–2336.
- Michaelsen, K.F., Hoppe, C., Roos, N., Kaestel, P., Stougaard, M., Lauritzen, L., Molgaard, C. et al.** 2009. Choice of foods and ingredients for moderately malnourished children 6 months to 5 years of age. *Food and Nutrition Bulletin*, 30(3 Suppl): S343–404.
- Milazzo, M., Badalamenti, F., Ceccherelli, G. & Chemello, R.** 2004. Boat anchoring on *Posidonia oceanica* beds in a marine protected area (Italy, western Mediterranean): effect of anchor types in different anchoring stages. *Journal of Experimental Marine Biology and Ecology*, 299(1): 51–62.
- Mills, D.J., Westlund, L., de Graaf, G., Kura, Y., Willman, R. & Kelleher, K.** 2011. Under-reported and undervalued: small-scale fisheries in the developing world. In: R.S. Pomeroy & N.L. Andrew, eds. *Small-scale fisheries management: frameworks and approaches for the developing world*, pp. 1–15. Wallingford, UK, CAB International.
- Mintzer, V.J., Martin, A.R., da Silva, V.M.F., Barbour, A.B., Lorenzen, K. & Frazer, T.K.** 2013. Effect of illegal harvest on apparent survival of Amazon River dolphins (*Inia geoffrensis*). *Biological Conservation*, 158: 280–286.
- Mok, J.S., Ryu, A., Kwon, J.Y., Kim, B. & Park, K.** 2019. Distribution of *Vibrio* species isolated from bivalves and bivalve culture environments along the Gyeongnam coast in Korea: virulence and antimicrobial resistance of *Vibrio parahaemolyticus* isolates. *Food Control*, 106: 106697.
- Monnereau, I., Mahon, R., McConney, P. & Nurse, L.** 2017. The impact of methodological choices on the outcome of national-level climate change vulnerability assessments: an example from the global fisheries sector. *Fish and Fisheries*, 18(4): 717–731.
- Monnier, L., Gascuel, D., Alava, J.J., Barragán, M.J., Gaibor, N., Hollander, F.A., Kanstinger, P., Niedermueller, S., Ramírez, J. & Cheung, W.W.L.** 2020. *Small-scale fisheries in a warming ocean: exploring adaptation to climate change*. Scientific report. Berlin, WWF Germany.
- Mous, P.J., Sadovy, Y., Halim, A. & Pet, J.S.** 2006. Capture for culture: artificial shelters for grouper collection in SE Asia. *Fish and Fisheries*, 7(1): 58–72.
- MRC & UNEP (United Nations Environment Programme).** 1997. *Mekong River Basin diagnostic study. Final report*. Bangkok, MRC.
- Muallil, R.N., Mamauag, S.S., Cababaro, J.T., Arceo, H.O. & Aliño, P.M.** 2014. Catch trends in Philippine small-scale fisheries over the last five decades: the fishers' perspectives. *Marine Policy*, 47: 110–117.
- Mumby, P.J.** 2009. Herbivory versus corallivory: Are parrotfish good or bad for Caribbean coral reefs? *Coral Reefs*, 28(3): 683–690.
- Munk-Madsen, E.** 1998. The Norwegian fishing quota system: Another patriarchal construction? *Society & Natural Resources*, 11(3): 229–240.
- Muyodi, F.J., Bugenyi, F.W. & Hecky, R.E.** 2010. Experiences and lessons learned from interventions in the Lake Victoria Basin: the Lake Victoria environmental management project. *Lakes & Reservoirs: Research & Management*, 15(2): 7–88.
- Nagoli, J., Binauli, L. & Chijere, A.** 2018. Inclusive ecosystems? Women's participation in the aquatic ecosystem of Lake Malawi. *Environments*, 6(1): 3.
- Nair, C.** 1990. Pollution control through water conservation and wastewater reuse in the fish processing industry. *Water Science and Technology*, 22(9): 113–121.
- Nam, S., Souvanny, P., Vuthy, L., Theerawat, S., Nguyen, H.S., Malasri, K., Ngor, P.B., Sovanara, K., Degen, P. & Starr, P.** 2015. Lower Mekong fisheries estimated to be worth around \$17 billion a year. *Catch and Culture*, 21(3): 4–7.
- Natugonza, V., Ogutu-Ohwayo, R., Musinguzi, L., Kashindye, B., Jónsson, S. & Valtysson, H.T.** 2016. Exploring the structural and functional properties of the Lake Victoria food web, and the role of fisheries, using a mass balance model. *Ecological Modelling*, 342: 161–174.
- Ndiaye, O., Komivi, B.S. & Ouadi, Y.D.** 2015. *The FAO Thiaroye Processing Technique (FTT-Thiaroye)*. Rome, FAO.
- Needham, S. & Funge-Smith, S.** 2015. *The consumption of fish and fish products in the Asia-Pacific region based on household surveys*. Rome, FAO. <http://www.fao.org/3/a-i5151e.pdf>

- Neiland, A.E., Cunningham, S., Arbuckle, M., Baio, A., Bostock, T., Coulibaly, D., Gitonga, N.K., Long, R. & Sei, S. 2016. Assessing the potential contribution of fisheries to economic development – the case of post-Ebola Sierra Leone. *Natural Resources*, 7(6): 356–376.
- Njie, M. & Drammeh, O. 2011. *Value chain of the artisanal oyster harvesting fishery of the Gambia*. Narragansett, USA, Coastal Resources Center, University of Rhode Island.
- Novotny, L., Dvorska, L., Lorencova, A., Beran, V. & Pavlik, I. 2004. Fish: a potential source of bacterial pathogens for human beings. *Veterinární Medicína*, 49(9): 343–358.
- Nunan, F. & Cepić, D. 2020. Women and fisheries co-management: limits to participation on Lake Victoria. *Fisheries Research*, 224: 105454.
- Nurdin, N. & Grydehøj, A. 2014. Informal governance through patron–client relationships and destructive fishing in Spermonde Archipelago, Indonesia. *Journal of Marine and Island Cultures*, 3(2): 54–59.
- OECD (Organisation for Economic Co-operation and Development). 2016. *The Ocean economy in 2030*. Paris.
- OECD. 2021. Fish landings (indicator). In: *OECD*. Paris. Cited 8 July 2021. <https://data.oecd.org/fish/fish-landings.htm>
- O'Meara, L., Cohen, P.J., Simmance, F., Marinda, P., Nagoli, J., Teoh, S.J., Funge-Smith, S., Mills, D.J., Thilsted, S.H. & Byrd, K.A. 2021. Inland fisheries critical for the diet quality of young children in sub-Saharan Africa. *Global Food Security*, 28: 100483.
- O'Neill, E.D., Asare, N.K. & Aheto, D.W. 2018. Socioeconomic dynamics of the Ghanaian tuna industry: a value-chain approach to understanding aspects of global fisheries. *African Journal of Marine Science*, 40(3): 303–313.
- O'Neill, E.D., Crona, B., Ferrer, A.J.G., Pomeroy, R. & Jiddawi, N.S. 2018. Who benefits from seafood trade? A comparison of social and market structures in small-scale fisheries. *Ecology and Society*, 23(3): 12.
- Opondo, P.A. 2011. Fishers and fish traders of Lake Victoria: colonial policy and the development of fish production in Kenya 1880–1978. University of South Africa. PhD thesis.
- Orensanz, J.M., Cinti, A., Parma, A., Burotto, L., Espinosa-Guerrero, S., Sosa-Cordero, E., Sepúlveda, C. et al. 2013. Latin-American rights-based fisheries targeting sedentary resources. In J.M. Orensanz & J.C. Seijo, eds. *Rights-based management in Latin American fisheries*, pp. 72–134. FAO Fisheries and Aquaculture Technical Paper No. 582. Rome, FAO.
- Ortega, L., Castilla, J.C., Espino, M., Yamashiro, C. & Defeo, O. 2012. Effects of fishing, market price, and climate on two South American clam species. *Marine Ecology Progress Series*, 469: 71–85.
- Ortega, L., Celentano, E., Delgado, E. & Defeo, O. 2016. Climate change influences on abundance, individual size and body abnormalities in a sandy beach clam. *Marine Ecology Progress Series*, 545: 203–213.
- Ortiz, N., Mangel, J.C., Wang, J., Alfaro-Shigueto, J., Pingo, S., Jimenez, A., Suarez, T., Swimmer, Y., Carvalho, F. & Godley, B.J. 2016. Reducing green turtle bycatch in small-scale fisheries using illuminated gillnets: the cost of saving a sea turtle. *Marine Ecology Progress Series*, 545: 251–259.
- Ostrom, E. 1990. *Governing the commons: the evolution of institutions for collective action*. Cambridge, UK, Cambridge University Press.
- Ostrom, E. 2005. *Understanding institutional diversity*. Princeton, USA, Princeton University Press.
- Ostrom, E. 2009. A general framework for analyzing sustainability of social-ecological systems. *Science*, 325(5939): 419–422.
- Ostrom, E., Gardner, R. & Walker, J. 1994. *Rules, games, and common-pool resources*. Ann Arbor, USA, University of Michigan Press.
- Overa, R. 2011. Modernisation narratives and small-scale fisheries in Ghana and Zambia. *Forum for Development Studies*, 38(3): 321–343.
- Oya, C. 2015. *Decent Work Indicators for agriculture and rural areas: conceptual issues, data collection challenges and possible areas for improvement*. ESS Working Paper No. 15-10. Rome, FAO. www.fao.org/3/a-i5060e.pdf
- Painter, J.A., Hoekstra, R.M., Ayers, T., Tauxe, R.V., Braden, C.R., Angulo, F.J. & Griffin, P.M. 2013. Attribution of foodborne illnesses, hospitalizations, and deaths to food commodities by using outbreak data, United States, 1998–2008. *Emerging infectious diseases*, 19(3): 407–415.
- Parker, M., Allen, T., Pearson, G., Peach, N., Flynn, R. & Rees, N. 2012. Border parasites: schistosomiasis control among Uganda's fisherfolk. *Journal of Eastern African Studies*, 6(1): 98–123.
- Parmesan, C., Burrows, M.T., Duarte, C.M., Poloczanska, E.S., Richardson, A.J., Schoeman, D.S. & Singer, M.C. 2013. Beyond climate change attribution in conservation and ecological research. *Ecology Letters*, 16(51): 58–71.
- Pascual-Fernández, J.J., Pita, C. & Bavinck, M., eds. 2020. *Small-scale fisheries in Europe: status, resilience and governance*. MARE Publication Series 23. Cham, Switzerland, Springer International Publishing. <https://doi.org/10.1007/978-3-030-37371-9>

- Paukert, C.P., Lynch, A.J., Beard, T.D., Chen, Y., Cooke, S.J., Cooperman, M.S., Cowx, I.G. et al.** 2017. Designing a global assessment of climate change on inland fishes and fisheries: knowns and needs. *Reviews in Fish Biology and Fisheries*, 27(2): 393–409.
- Pauly, D.** 2006. Major trends in small-scale marine fisheries, with emphasis on developing countries, and some implications for the social sciences. *MAST*, 4(2): 7–22.
- Pauly, D., Christensen, V., Dalsgaard, J., Froese, R. & Torres, F.** 1998. Fishing down marine food webs. *Science*, 279(5352): 860–863.
- Pauly, D. & Chua, T.E.** 1988. The overfishing of marine resources: socioeconomic background in Southeast Asia. *Ambio*, 17(3): 200–206.
- Pauwelussen, A.P.** 2015. The moves of a Bajau middlewoman: understanding the disparity between trade networks and marine conservation. *Anthropological Forum*, 25(4): 329–349.
- Pecl, G.T., Hobday, A.J., Frusher, S., Sauer, W.H.H. & Bates, A.E.** 2014. Ocean warming hotspots provide early warning laboratories for climate change impacts. *Reviews in Fish Biology and Fisheries*, 24: 409–413.
- Pecl, G.T., Ogier, E., Jennings, S., van Putten, I., Crawford, C., Fogarty, H., Frusher, S. et al.** 2019. Autonomous adaptation to climate-driven change in marine biodiversity in a global marine hotspot. *Ambio*, 48: 1498–1515.
- Pedroza-Gutiérrez, C.** 2019. The gender division of labor in fish processing in Lake Chapala. A source of bargaining power. *Marine Policy*, 107(September 2019): 103597.
- Pelras, C.** 2000. Patron–client ties among the Bugis and Makassarese of South Sulawesi. *Journal of the Humanities and Social Sciences of Southeast Asia*, 156(3): 393–432.
- Pérez-Jiménez, J.C. & Mendez-Loeza, I.** 2015. The small-scale shark fisheries in the southern Gulf of Mexico: understanding their heterogeneity to improve their management. *Fisheries Research*, 172: 96–104.
- Pet, J.S. & Pet-Soede, L.** 1999. A note on cyanide fishing in Indonesia. *SPC Live Reef Fish Information Bulletin*, 5: 21–22. Nouméa, SPC.
- Pet-Soede, L., Cesar, H.S.J. & Pet, J.S.** 1999. An economic analysis of blast fishing on Indonesian coral reefs. *Environmental Conservation*, 26(2): 83–93.
- Philipsen, D.** 2015. *The little big number: how GDP came to rule the world and what to do about it*. Princeton, USA, Princeton University Press.
- Phillips, B.F. & Pérez-Ramírez, M., eds.** 2018. *Climate change impacts on fisheries and aquaculture. A global analysis*. 2 Volumes. Hoboken, USA, John Wiley & Sons.
- Pinnegar, J.K., Engelhard, G.H., Norris, N.J., Theophille, D. & Sebastien, R.D.** 2019. Assessing vulnerability and adaptive capacity of the fisheries sector in Dominica: long-term climate change and catastrophic hurricanes. *ICES Journal of Marine Science*, 76(5): 1353–1367.
- Pita, P., Fernández-Márquez, D., Antelo, M., Macho, G. & Villasante, S.** 2019. Socioecological changes in data-poor S-fisheries: a hidden shellfisheries crisis in Galicia (NW Spain). *Marine Policy*, 101: 208–224.
- Pittman, J., Gianelli, I., Trinchín, R., Gutiérrez, N., de la Rosa, A., Martínez, G., Masello, A. & Defeo, O.** 2019. Securing sustainable small-scale fisheries through co-management: the yellow clam fishery in Uruguay. In: L. Westlund & J. Zelasney, eds. *Securing sustainable small-scale fisheries: sharing good practices from around the world*, pp. 9–37. FAO Fisheries and Aquaculture Technical Paper No. 644. Rome, FAO.
- Polasky, S., Crépin, A.S., Biggs, R., Carpenter, S.R., Folke, C., Peterson, G., Scheffer, M. et al.** 2020. Corridors of clarity: four principles to overcome uncertainty paralysis in the Anthropocene. *BioScience*, 70(12): 1139–1144.
- Pomeroy, R. & Williams, M.** 1994. *Fisheries co-management and small-scale fisheries: a policy brief*. Manila, ICLARM (International Center for Living Aquatic Resources Management). <https://digitalarchive.worldfishcenter.org/handle/20.500.12348/2857>
- Popkin, B.M.** 2004. The nutrition transition: an overview of world patterns of change. *Nutrition Reviews*, 62(2 Suppl): S140–143.
- Poulain, F., Himes-Cornell, A. & Shelton, C.** 2018. Chapter 25: Methods and tools for climate change adaptation in fisheries and aquaculture. In: M. Barange, T. Bahri, M.C.M. Beveridge, K.L. Cochrane, S. Funge-Smith & F. Poulain, eds. *Impacts of climate change on fisheries and aquaculture. Synthesis of current knowledge, adaptation and mitigation options*, pp. 535–566. FAO Fisheries and Aquaculture Technical Paper No. 627. Rome, FAO.
- Purcell, S.W., Crona, B., Lalavanua, W. & Eriksson, H.** 2017. Distribution of economic returns in small-scale fisheries for international markets: a value-chain analysis. *Marine Policy*, 86: 9–16.
- Purcell, S.W., Mercier, A., Conand, C., Hamel, J.F., Toral-Granda, M.V., Lovatelli, A. & Uthicke, S.** 2013. Sea cucumber fisheries: global analysis of stocks, management measures and drivers of overfishing. *Fish and Fisheries*, 14(1): 34–59.

- Purcell, S.W., Polidoro, B.A., Hamel, J.F., Gamboa, R.U. & Mercier, A.** 2014. The cost of being valuable: predictors of extinction risk in marine invertebrates exploited as luxury seafood. *Proceedings of the Royal Society B: Biological Sciences*, 281(1781): 20133296.
- Purcell, S.W. & Pomeroy, R.** 2015. Driving small-scale fisheries in developing countries. *Frontiers in Marine Science*, 2(JUN): 44.
- Raby, G.D., Colotelo, A.H., Blouin-Demers, G. & Cooke, S.J.** 2011. Freshwater commercial bycatch: an understated conservation problem. *BioScience*, 61(4): 271–280.
- Reeves, R., McClellan, K. & Werner, T.** 2013. Marine mammal bycatch in gillnet and other entangling net fisheries, 1990 to 2011. *Endangered Species Research*, 20(1): 71–97.
- Reid, A.J., Eckert, L.E., Lane, J.F., Young, N., Hinch, S.G., Darimont, C.T., Cooke, S.J. et al.** 2021. “Two-eyed seeing”: an indigenous framework to transform fisheries research and management. *Fish and Fisheries*, 22(2): 243–261.
- Reksten, A.M., Somasundaram, T., Kjelleevold, M., Nordhagen, A., Bøkevoll, A., Pincus, L.M., Md. Rizwan, A.A. et al.** 2020. Nutrient composition of 19 fish species from Sri Lanka and potential contribution to food and nutrition security. *Journal of Food Composition and Analysis*, 91: 103508.
- Riegl, B. & Luke, K.E.** 1999. Ecological parameters of dynamited reefs in the northern Red Sea and their relevance to reef rehabilitation. *Marine Pollution Bulletin*, 37(8–12): 488–498.
- Ringold, D., Holla, A., Koziol, M. & Srinivasan, S.** 2012. *Citizens and service delivery: assessing the use of social accountability approaches in the Human Development Sectors*. Directions in Development. Washington, DC, World Bank.
- Rohe, J.R., Govan, H., Schlüter, A. & Ferse, S.C.A.** 2019. A legal pluralism perspective on coastal fisheries governance in two Pacific Island countries. *Marine Policy*, 100: 90–97.
- Roos, N., Islam, M.M. & Thilsted, S.H.** 2003. Small indigenous fish species in Bangladesh: contribution to vitamin A, calcium and iron intakes. *The Journal of nutrition*, 133(11): 4021S–4026S.
- Roos, N., Leth, T., Jakobsen, J. & Thilsted, S.H.** 2002. High vitamin A content in some small indigenous fish species in Bangladesh: perspectives for food-based strategies to reduce vitamin A deficiency. *International journal of food sciences and nutrition*, 53(5): 425–437.
- Rotjan, R.D. & Lewis, S.M.** 2009. Predators selectively graze reproductive structures in a clonal marine organism. *Marine Biology*, 156(4): 569–577.
- Rousseau, R., Watson, R.A., Blanchard, J.L. & Fulton, E.A.** 2019. Evolution of global marine fishing fleets and the response of fished resources. *Proceedings of the National Academy of Sciences of the United States of America*. 116(25): 12238–12243.
- Ruddle, K.** 1994. *A Guide to the Literature on Traditional Community-Based Fishery Management in the Asia-Pacific Tropics*. FAO Fisheries Circular No. 869. Rome, FAO. 114 pp. www.fao.org/3/t3233e/t3233e00.htm
- Ruddle, K.** 2011. “Informal” credit systems in fishing communities: issues and examples from Vietnam. *Human Organization*, 70(3): 224–232.
- Ruiz-Díaz, R., Liu, X., Aguión, A., Macho, G., deCastro, M., Gómez-Gesteira, M. & Ojea, E.** 2020. Social-ecological vulnerability to climate change in small-scale fisheries managed under spatial property rights systems. *Marine Policy*, 121: 104192.
- Ruppert, J.L., Travers, M.J., Smith, L.J., Fortin, M.J. & Meekan, M.G.** 2013. Caught in the middle: combined impacts of shark removal and coral loss on the fish communities of coral reefs. *PLoS ONE*, 8(9): e74648.
- Ryckman, T., Beal, T., Nordhagen, S., Chimanya, K. & Matji, J.** 2021a. Affordability of nutritious foods for complementary feeding in Eastern and Southern Africa. *Nutrition reviews*, 79(Supplement_1): 35–51.
- Ryckman, T., Beal, T., Nordhagen, S., Murira, Z. & Torlesse, H.** 2021b. Affordability of nutritious foods for complementary feeding in South Asia. *Nutrition reviews*, 79(Supplement_1): 52–68.
- Sachs, J.D., Schmidt-Traub, G., Mazzucato, M., Messner, D., Nakicenovic, N. & Rockström, J.** 2019. Six transformations to achieve the sustainable development goals. *Nature sustainability*, 2(9): 805–814.
- Sadovy, Y.J.** 1996. Reproduction of reef fishery species. In: N.V.C Polunin & C.M. Roberts, eds. *Reef fisheries*, pp. 15–59. Chapman & Hall Fish and Fisheries Series, Vol. 20. Dordrecht, Netherlands, Springer. https://doi.org/10.1007/978-94-015-8779-2_2
- Saila, S.B., Kocic, V.L. & McManus, J.W.** 1993. Modelling the effects of destructive fishing practices on tropical coral reefs. *Marine Ecology Progress Series*, 94: 51–60.
- Sala, E., Aburto-Oropeza, O., Reza, M., Paredes, G. & López-Lemus, L.G.** 2011. Fishing down coastal food webs in the Gulf of California. *Fisheries*, 29(3): 19–25.
- Salas, S., Chuenpagdee, R., Seijo, J.C. & Charles, A.** 2007. Challenges in the assessment and management of small-scale fisheries in Latin America and the Caribbean. *Fisheries Research*, 87(1): 5–16.

- Salayo, N., Garces, L., Pido, M., Viswanathan, K., Pomeroy, R., Ahmed, M., Siason, I., Seng, K. & Masae, A.** 2008. Managing excess capacity in small-scale fisheries: perspectives from stakeholders in three Southeast Asian countries. *Marine Policy*, 32(4): 692–700.
- Salgueiro-Otero, D. & Ojea, E.** 2020. A better understanding of social-ecological systems is needed for adapting fisheries to climate change. *Marine Policy*, 122: 104123.
- Sandström, B., Almgren, A., Kivistö, B. & Cederblad, Å.** 1989. Effect of protein level and protein source on zinc absorption in humans. *The Journal of Nutrition*, 119(1): 48–53.
- SBS (Samoa Bureau of Statistics) & FAO.** 2019. *Samoa food security profile*. Rome, FAO. www.fao.org/3/ca7206en/CA7206EN.pdf
- Scarsbrook, J.R., McFarlane, G.A. & Shaw, W.** 1988. Effectiveness of experimental escape mechanisms in sablefish traps. *North American Journal of Fisheries Management*, 8(2):158–161.
- Schaffer, C.** 1993. Technical Note: selecting a classification method by cross-validation. *Machine Learning*, 13(1): 135–143.
- Scheer, R. & Moss, D.** 2011. How dangerous is it to use cyanide to catch fish? *Scientific American*, 10 August 2011. www.scientificamerican.com/article/cyanide-fishing/
- Schlager, E. & Ostrom, E.** 1992. Property-rights regimes and natural resources: a conceptual analysis. *Land Economics*, 68(3): 249–262.
- Schmitt, C.J. & McKee, M.J.** 2016. Concentration trends for lead and calcium-normalized lead in fish fillets from the Big River, a mining-contaminated stream in southeastern Missouri USA. *Bulletin of environmental contamination and toxicology*, 97(5): 593–600.
- Schoeman, D.S., Schlacher, T.A. & Defeo, O.** 2014. Climate-change impacts on sandy-beach biota: crossing a line in the sand. *Global Change Biology*, 20(8): 2383–2392.
- Schroeter, S.C., Gutiérrez, N.L., Robinson, M., Hilborn, R. & Halmay, P.** 2009. Moving from data poor to data rich: a case study of community-based data collection for the San Diego red sea urchin fishery. *Marine and Coastal Fisheries*, 1(1): 230–243.
- Schuhbauer, A. & Sumaila, U.R.** 2016. Economic viability and small-scale fisheries: a review. *Ecological Economics*, 124(C): 69–75.
- Sea Around Us.** 2016. Real 2010 value (US\$) by fishing sector in the global ocean. In: *Sea Around Us*. Vancouver, Canada. Cited 11 October 2021. <https://www.seaaroundus.org/data/#/global?chart=catch-chart&dimension=sector&measure=value&limit=10>
- SEAFDEC (Southeast Asian Fisheries Development Center).** 2018. *Applying human rights-based and gender equality approaches to small-scale fisheries in Southeast Asia*. Policy brief. Bangkok.
- Seddon, N., Chausson, A., Berry, P., Girardin, C.A.J., Smith, A. & Turner, B.** 2020. Understanding the value and limits of nature-based solutions to climate change and other global challenges. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 375(1794): 20190120.
- Sen, S. & Nielsen, J.R.** 1996. Fisheries co-management: a comparative analysis. *Marine Policy*, 20(5): 405–418.
- Senanayake, F.** 1981. The athu kotu (brush park) fishery of Sri Lanka. *ICLARM Newsletter*, 4(4): 20–21.
- Sheridan, P., Hill, R., Matthews, G., Appeldoorn, R., Kojis, B. & Matthews, T.** 2005. Does trap fishing impact coral reef ecosystems? An update. *Proceedings of the Gulf and Caribbean Fisheries Institute*, 56: 511–519.
- Shester, G.G. & Micheli, F.** 2011. Conservation challenges for small-scale fisheries: bycatch and habitat impacts of traps and gillnets. *Biological Conservation*, 144(5): 1673–1681.
- Short, R.E., Gelcich, S., Little, D.C., Micheli, F., Allison, E.H., Basurto, X., Belton, B. et al.** 2021. Harnessing the diversity of small-scale actors is key to the future of aquatic food systems. *Nature Food*, 2: 733–741.
- Short, R.E., Mussa, J., Hill, N.A.O., Rowcliffe, M. & Milner-Gulland, E.J.** 2020. Challenging assumptions: the gendered nature of mosquito net fishing and the implications for management. *Gender, Technology and Development*, 24(1): 66–88.
- Shovonil, R.** 2018. Distributions of phytoplankton carbohydrate, protein, and lipid in the world oceans from satellite ocean colour. *The ISME Journal*, 12(6): 1457–1472.
- Siar, S.V.** 2003. Knowledge, gender, and resources in small-scale fishing: the case of Honda Bay, Palawan, Philippines. *Environmental Management*, 31(5): 569–580.
- Siegelman, B., Haenn, N. & Basurto, X.** 2019. “Lies build trust”: social capital, masculinity, and community-based resource management in a Mexican fishery. *World Development*, 123: 104601.
- Sigh, S., Roos, N., Chamnan, C., Laillou, A., Prak, S. & Wieringa, F.T.** 2018. Effectiveness of a locally produced, fish-based food product on weight gain among Cambodian children in the treatment of acute malnutrition: a randomized controlled trial. *Nutrients*, 10(7): 909.

- Silver, J.J. & Stoll, J.S.** 2019. How do commercial fishing licences relate to access? *Fish and Fisheries*, 20(5): 993–1004.
- Simmance, F.A.** 2017. The role of small-scale inland capture fisheries for food security in Lake Chilwa. University of Southampton. Doctoral thesis.
- Simmance, F.A., Cohen, P.J., Huchery, C., Sutcliffe, S., Suri, S.K., Tezzo, X., Thilsted, S.H. et al.** 2021. Nudging fisheries and aquaculture research towards food systems. *Fish and Fisheries*, 23(1): 34–53.
- Simmance, F.A., Cohen, P.J., Huchery, C., Sutcliffe, S., Suri, S.K., Tezzo, X., Thilsted, S.H. et al.** 2022a. Nudging fisheries and aquaculture research towards food systems. *Fish and Fisheries*, 23(1): 34–53.
- Simmance, F.A., Nico, G., Funge-Smith, S., Basurto, X., Franz, N., Teoh, S.J., Byrd, K.A. et al.** 2022b. Proximity to small-scale inland and coastal fisheries is associated with improved income and food security. *Communications earth & environment*, 3(1): 1–11.
- Singh, V. & Gupta, S.K.** 2017. Modern acts, conservation of fish and colonial interest: inland fisheries in mid-Ganga diara ecology, India. In A.M. Song, S.D. Bower, P. Onyango, S.J. Cooke & R. Chuenpagdee, eds. *Intersectoral governance of inland fisheries*, pp. 122–133. TBTI Publication Series. St. John's, Canada, TBTI.
- Sloth, J.J. & Julshamn, K.** 2008. Survey of total and inorganic arsenic content in blue mussels (*Mytilus edulis* L.) from Norwegian fiords: revelation of unusual high levels of inorganic arsenic. *Journal of Agricultural and Food Chemistry*, 56(4): 1269–1273.
- Smith, H. & Basurto, X.** 2019. Defining small-scale fisheries and examining the role of science in shaping perceptions of who and what counts: a systematic review. *Frontiers in Marine Science*, 6(Article 236).
- Smith, I.R.** 1979. *A research framework for traditional fisheries*. ICLARM Studies and Reviews No. 2. Manila, ICLARM. 45 pp. [https://doi.org/10.1016/0165-7836\(81\)90022-9](https://doi.org/10.1016/0165-7836(81)90022-9)
- Smith, J.R. & Murray, S.N.** 2005. The effects of experimental bait collection and trampling on a *Mytilus californianus* mussel bed in southern California. *Marine Biology*, 147(3): 699–706.
- Solomon, O.O. & Ahmed, O.O.** 2016. Fishing with light: ecological consequences for coastal habitats. *International Journal of Fisheries and Aquatic Studies*, 4(2): 474–483.
- Song, A.M., Bower, S.D., Onyango, P., Cooke, S.J. & Chuenpagdee, R., eds.** 2017. *Intersectoral governance of inland fisheries*. TBTI Publication Series, E-01/2017. St. John's, Canada, TBTI. <http://toobigtoignore.net/research-highlights-1/e-book-inter-sectoral-governance-of-inland-fisheries/>
- Soukhaphon, A., Baird, I.G. & Hogan, Z.S.** 2021. The impacts of hydropower dams in the Mekong River Basin: a review. *Water*, 13(3): 265.
- Sovannarith, K.** 2020. Drought, dams on Mekong River drop Cambodia's Tonle Sap Lake to record low levels. *Radio Free Asia*, 27 July 2020. Cited 10/3 2021. www.rfa.org/english/news/cambodia/lake-07272020174242.html
- Sowman, M.** 2020. Participatory and rapid vulnerability assessments to support adaptation planning in small-scale fishing communities of the Benguela Current Large Marine Ecosystem. *Environmental Development*, 36: 100578.
- Sowman, M. & Raemaekers, S.** 2018. Socio-ecological vulnerability assessment in coastal communities in the BCLME region. *Journal of Marine Systems*, 188: 160–171.
- Soykan, C.U., Moore, J.E., Ždelis, R., Crowder, L.B., Safina, C. & Lewison, R.L.** 2008. Why study bycatch? An introduction to the Theme Section on fisheries bycatch. *Endangered Species Research*, 5(2–3): 91–102.
- Speer, J.** 2012. Participatory governance reform: a good strategy for increasing government responsiveness and improving public services? *World Development*, 40(12): 2379–2398.
- Steenbergen, D., Fabinyi, M., Barclay, K., Song, A.M., Cohen, P.J., Eriksson, H. & Mills, D.J.** 2019. Governance interactions in small-scale fisheries market chains: examples from the Asia-Pacific. *Fish and Fisheries*, 20(4): 697–714.
- Stephenson, R.L., Paul, S., Wiber, M., Angel, E., Benson, A.J., Charles, A., Chouinard, O. et al.** 2018. Evaluating and implementing social-ecological systems: a comprehensive approach to sustainable fisheries. *Fish and Fisheries*, 19(5): 853–873.
- Steins, N.A.** 2006. Interactive approaches to global and local fisheries management: a challenge for fisheries social scientists. *MAST*, 4(2): 29–31.
- Stiglitz, J., Fitoussi, J. & Durand, M.** 2018. *Beyond GDP: measuring what counts for economic and social performance*. Paris, OECD. <https://doi.org/10.1787/9789264307292-en>
- Stobberup, K., Garza Gil, M., Stirnemann-Relot, A., Rigaud, A., Franceschelli, N. & Blomeyer, R.** 2017. *Research for PECH Committee: small-scale fisheries and "Blue Growth" in the EU*. European Parliament, Directorate-General for Internal Policies. Policy Department B: Structural and Cohesion Policies. Brussels, European Union. [www.europarl.europa.eu/RegData/etudes/STUD/2017/573450/IPOL_STU\(2017\)573450_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2017/573450/IPOL_STU(2017)573450_EN.pdf)

- Stoll, J.S., Fuller, E. & Crona, B.I.** 2017. Uneven adaptive capacity among fishers in a sea of change. *PLoS ONE*, 12(6): e0178266. <https://doi.org/10.1371/journal.pone.0178266>
- Sudarmono, J.S. & Bakar, N.R.H.A.** 2012. Patron–client relationship of urbanized fishing communities in Makassar. *International Journal on Social Science Economics & Art*, 2(2): 1–5.
- Suebpa, W., Yeemin, T., Sutthacheep, M., Pengsakun, S., Samsuvan, W., Chuenpagdee, R. & Nitithamyong, C.** 2021. Impacts of fish trap fisheries on coral reefs near Ko Mak and Ko Kut, Trat Province, Thailand. *Journal of Fisheries and Environment*, 45(1): 46–63.
- Sumaila, U.R., Cheung, W.W.L., Lam, V.W.Y., Pauly, D. & Herrick, S.** 2011. Climate change impacts on the biophysics and economics of world fisheries. *Nature Climate Change*, 1: 449–456.
- Sumaila, U.R., Liu, Y. & Tyedmers, P.** 2001. Small versus large-scale fishing units in the North Atlantic. *Fisheries Centre Research Report*, 9(5): 28–35.
- Sumaila, U.R., Marsden, A.R., Watson, R. & Pauly, D.** 2007. A global ex-vessel fish price database: construction and applications. *Journal of Bioeconomics*, 9(1): 39–51.
- Sun, N.** 2020. As the Tonle Sap dries up, villagers worry about dwindling fish catch. *VOA Khmer*, 20 August 2020. Cited 10/3 2021. www.voacambodia.com/a/as-the-tonle-sap-dries-up-villagers-worry-about-dwindling-fish-catch/5551123.html
- Sunday, K.I. & Ada, F.B.** 2020. Fish zoonoses of the tropics: a review. *Journal of Agriculture, Forestry and the Social Sciences*, 18(1): 1–12.
- Svanevik, C.S. & Lunestad, B.T.** 2011. Characterisation of the microbiota of Atlantic mackerel (*Scomber scombrus*). *International Journal of Food Microbiology*, 151(2): 164–170.
- Svanevik, C.S., Roiha, I.S., Levsen, A. & Lunestad, B.T.** 2015. Microbiological assessment along the fish production chain of the Norwegian pelagic fisheries sector—results from a spot sampling programme. *Food Microbiology*, 51: 144–153.
- Swartz, W., Sumaila, U.R. & Watson, R.** 2013. Global ex-vessel fish price database revisited: a new approach for estimating ‘missing’ prices. *Environmental and Resource Economics*, 56: 467–480.
- Tacon, A.G.J. & Metian, M.** 2009. Fishing for feed or fishing for food: increasing global competition for small pelagic forage fish. *Ambio*, 38(6): 294–302.
- Tai, T.C., Cashion, T., Lam, V.W.Y., Swartz, W. & Sumaila, U.R.** 2017. Ex-vessel fish price database: disaggregating prices for low-priced species from reduction fisheries. *Frontiers in Marine Science*, 4: 363.
- TBTI (Too Big To Ignore).** 2016. *European small-scale fisheries: a regional synthesis*. TBTI Research Report R04/2016. St. John’s, Canada.
- TBTI.** 2018a. *Asia and Oceania small-scale fisheries: a regional synthesis*. TBTI Research Report R-04/2018. St. John’s, Canada.
- TBTI.** 2018b. *Latin America and the Caribbean small-scale fisheries: a regional synthesis*. TBTI Research Report R-02/2018. St. John’s, Canada.
- Teh, L.C.L., Ota, Y., Cisneros-Montemayor, A.M., Harrington, L. & Swartz, W.** 2020. Are fishers poor? Getting to the bottom of marine fisheries income statistics. *Fish and Fisheries*, 21(3): 471–482.
- Teh, L.C.L. & Sumaila, U.R.** 2013. Contribution of marine fisheries to worldwide employment. *Fish and Fisheries*, 14: 77–88.
- Tekanene, M.** 2006. The women fish traders of Tarawa, Kiribati. In: P.S. Choo, S.J. Hall & M.J. Williams, eds. *Global Symposium on Gender and Fisheries (Seventh Asian Fisheries Forum, 1–2 December 2004)*, pp. 115–120. Penang, Malaysia, WorldFish Center.
- Temple, A.J., Kiszka, J.J., Stead, S.M., Wambiji, N., Brito, A., Poonian, C.N., Amir, O.A. et al.** 2018. Marine megafauna interactions with small-scale fisheries in the southwestern Indian Ocean: a review of status and challenges for research and management. *Reviews in Fish Biology and Fisheries*, 28(1): 89–115.
- Temsah, G., Johnson, K., Evans, T. & Adams, D.K.** 2018. Benefits of biodiverse marine resources to child nutrition in differing developmental contexts in Hispaniola. *PLoS ONE*, 13(5): e0197155. <https://doi.org/10.1371/journal.pone.0197155>
- Teulières, M.H.** 1992. Management of marine resources by Kanak fishermen in New Caledonia: Towards what evolution? In K. Ruddle, ed. *SPC traditional marine resource management and knowledge information bulletin*, pp. 14–15. Nouméa, South Pacific Commission.
- Tezzo, X., Belton, B., Johnstone, G. & Callow, M.** 2018. Myanmar’s fisheries in transition: current status and opportunities for policy reform. *Marine Policy*, 97: 91–100.
- Therkildsen, N.O.** 2007. Small- versus large-scale fishing operations in New England, USA. *Fisheries Research*, 83(2–3): 285–296.
- Thiault, L., Gelcich, S., Cinner, J.E., Tapia-Lewin, S., Chlous, F. & Claudet, J.** 2019. Generic and specific facets of vulnerability for analysing trade-offs and synergies in natural resource management. *People and Nature*, 1(4): 573–589.

- Thiault, L., Gelcich, S., Marshall N., Marshall, P., Chlous, F. & Claudet, J.** 2020. Operationalizing vulnerability for social–ecological integration in conservation and natural resource management. *Conservation Letters*, 13(1): e12677.
- Thilsted, S.H., Thorne-Lyman, A., Webb, P., Bogard, J.R., Subasinghe, R., Phillips, M.J. & Allison, E.H.** 2016. Sustaining healthy diets: the role of capture fisheries and aquaculture for improving nutrition in the post-2015 era. *Food Policy*, 61: 126–131.
- Thomas, A.S., Mangubhai, S., Fox, M., Lalavanua, W., Meo, S., Miller, K., Naisilisili, W. et al.** 2020. Valuing the critical roles and contributions of women fishers to food security and livelihoods in Fiji. *SPC Women in Fisheries Information Bulletin*, 31: 22–29. Nouméa, SPC.
- Thomas, A., Mangubhai, S., Fox, M., Meo, S., Miller, K., Naisilisili, W., Veitayaki, J. & Waqairatu, S.** 2021. Why they must be counted: significant contributions of Fijian women fishers to food security and livelihoods. *Ocean & Coastal Management*, 205: 105571.
- Thomson, D.** 1980. Conflict within the fishing industry. *ICLARM Newsletter*, 3(3): 3–4.
- Thorpe, A., Pouw, N., Baio, A., Sandi, R., Ndomahina, E.T. & Lebbie, T.** 2014. “Fishing na everybody business”: women’s work and gender relations in Sierra Leone’s fisheries. *Feminist Economics*, 20(3): 53–77.
- Thrane, M., Nielsen, E.H. & Christensen, P.** 2009. Cleaner production in Danish fish processing: experiences, status and possible future strategies. *Journal of Cleaner Production*, 17(3): 380–390.
- Ticheler, H., Kolding, J. & Chanda, B.** 1998. Participation of local fishermen in scientific fisheries data collection: a case study from the Bangweulu Swamps, Zambia. *Fisheries Management and Ecology*, 5(1): 81–92.
- Tilami, S.K. & Sampels, S.** 2018. Nutritional value of fish: lipids, proteins, vitamins, and minerals. *Reviews in Fisheries Science & Aquaculture*, 26(2): 243–253.
- Tokrisna, R., Boonchu Wong, P. & Janekarnkij, P.** 1997. *A review on fisheries and coastal community-based management regime in Thailand*. Manila, ICLARM.
- Torell, E.C., Jamu, D.M., Kanyerere, G.Z., Chiwaula, L., Nagoli, J., Kambewa, P., Brooks, A. & Freeman, P.** 2020. Assessing the economic impacts of post-harvest fisheries losses in Malawi. *World Development Perspectives*, 19: 100224.
- Trimble, M., de Araujo, L.G. & Seixas, C.S.** 2014. One party does not tango! Fishers’ non-participation as a barrier to co-management in Paraty, Brazil. *Ocean & Coastal Management*, 92: 9–18.
- Tschernij, V. & Larsson, P.O.** 2003. Ghost fishing by lost cod gill nets in the Baltic Sea. *Fisheries Research*, 64(2–3): 151–162.
- Tsikliras, A.C. & Polymeros, K.** 2014. Fish market prices drive overfishing of the ‘big ones’. *Peer J*, 2: e638.
- Tupper, M. & Sheriff, N.** 2008. Capture-based aquaculture of groupers. In: A. Lovatelli & P.F. Holthus, eds. *Capture-based aquaculture. Global overview*, pp. 217–253. FAO Fisheries and Aquaculture Technical Paper No. 508. Rome, FAO.
- Turgo, N.N.** 2014. Redefining and experiencing masculinity in a Philippine fishing community. *Philippine Sociological Review*, 62: 7–38.
- Turgo, N.N.** 2015. Fishermen, fishmongers, and the sea economic: restructuring and gender dynamics in a Philippine community. *Philippine Studies: Historical & Ethnographic Viewpoints*, 63(3): 365–392.
- Tuz-Zohra, F. & Uddin, M.M.** 2016. Economic reasons behind adulteration issues in fish supply chain in Bangladesh. *Dhaka University Journal of Business Studies*, 37(1).
- Tveteras, S., Asche, F., Bellemare, M.F., Smith, M.D., Guttormsen, A.G., Lem, A., Lien, K. & Vannuccini, S.** 2012. Fish is food: the FAO’s Fish Price Index. *PLoS ONE*, 7(5): e36731. <https://doi.org/10.1371/journal.pone.0036731>
- Twongo, T., Reynolds, J.E. & Mwene-Beyanga, P.** 1991. Management Issues, Options, and Strategies for Lake Victoria Fisheries. Paper presented at The National Seminar on the Management of the Fisheries of Lake Victoria, 6–8 August 1991. Jinja, Uganda. www.fao.org/3/AD147E/AD147E05.htm
- Tzanatos, E., Somarakis, S., Tserpes, G. & Koutsikopoulos, C.** 2007. Discarding practices in a Mediterranean small-scale fishing fleet (Patraikos Gulf, Greece). *Fisheries Management and Ecology*, 14(4): 277–285.
- Ulleweit, J., Stransky, C. & Panten, K.** 2010. Discards and discarding practices in German fisheries in the North Sea and Northeast Atlantic during 2002–2008. *Journal of Applied Ichthyology*, 26(s1): 54–66.
- UN (United Nations).** 1998. *Report of the Secretary-General on the work of the Organization*. Supplement No. 1 (A/53/1). New York, USA. https://digitallibrary.un.org/record/259420/files/A_53_1-EN.pdf
- UN.** 2003. *National accounts: a practical introduction*. Studies in Methods Handbook of National Accounting. Series F, No. 85.

- UN.** 2008. *International Standard Industrial Classification of All Economic Activities (ISIC), Rev. 4.* Statistical Papers Series M No. 4, Rev. 4. New York, USA. https://unstats.un.org/unsd/publication/seriesm/seriesm_4rev4e.pdf
- UN.** 2012. The future we want. Resolution adopted by the General Assembly on 27 July 2012. A/RES/66/288. New York, USA. <http://sustainabledevelopment.un.org/futurewewant.html>
- UN.** 2019. From 7.7 billion in 2020 to 9.7 billion in 2050. In: *United Nations, Department of Economic and Social Affairs*. www.un.org/development/desa/en/news/population/world-population-prospects-2019.html
- UN.** 2021a. UN Population Division Data Portal. In: *United Nations*. New York, USA. Cited 9 August 2021. <https://population.un.org/dataportal/home>
- UN.** 2021b. Civil Society. In: *United Nations*. New York, USA. Cited September 13 2021. www.un.org/en/civil-society/page/about-us
- UNCTAD (United Nations Conference on Trade and Development).** 2014. *The fisheries sector in the Gambia: trade, value addition and social inclusiveness*. United Nations Conference on Trade and Development Enhanced Integrated Framework. Geneva, Switzerland. https://unctad.org/en/PublicationsLibrary/ditc2013d4_en.pdf
- UNCTAD.** 2017. *Fishery exports and the economic development of least developed countries: Bangladesh, Cambodia, Comoros, Mozambique, Myanmar and Uganda*. Geneva, Switzerland. https://unctad.org/system/files/official-document/aldc2017d2_en.pdf
- UNDP (United Nations Development Programme).** 2019. Human Development Index. In: *UNDP – Human Development Reports*. New York, USA. <http://hdr.undp.org/en/composite/HDI>
- UNESCAP (UN Economic and Social Commission for Asia and the Pacific).** 2008. *What is good governance?* Bangkok. www.unescap.org/sites/default/files/good-governance.pdf
- UNICEF.** 2019. *State of the World's Children 2019. Children, food and nutrition: growing well in a changing world*. New York, USA.
- UN Nutrition.** 2021. *The role of aquatic foods in sustainable healthy diets*. Discussion paper. Rome. https://www.unnnutrition.org/wp-content/uploads/FINAL-UN-Nutrition-Aquatic-foods-Paper_EN_.pdf
- USAID.** 2017. *Senegal fisheries applied political economy analysis: applied political economy analysis background*.
- Vaitla, B., Collar, D., Smith, M.R., Myers, S.S., Rice, B.L. & Golden, C.D.** 2018. Predicting nutrient content of ray-finned fishes using phylogenetic information. *Nature communications*, 9(1): 1–10.
- van Vliet, N., Schulte-Herbruggen, B., Vanegas, L., Yair-Cuesta, E., Sandrin, F. & Nasi, R.** 2018. Wild animals (fish and wildmeat) contribute to dietary diversity among food insecure urban teenagers: the case of Quibdó, Colombia. *Ethnobiology and Conservation*, 7(7): 1–6.
- van Zwieten, P.A.M., Kolding, J., Plank, M.J., Hecky, R.E., Bridgeman, T.B., MacIntyre, S., Seehausen, O. & Silsbe, G.M.** 2016. The Nile perch invasion in Lake Victoria: Cause or consequence of the haplochromine decline? *Canadian Journal of Fisheries and Aquatic Sciences*, 73(4): 622–643.
- Vega, G.C. & Wiens, J.J.** 2012. Why are there so few fish in the sea? *Proceedings of the Royal Society B: Biological Sciences*, 279(1737): 2323–2329.
- Victora, C.G., Adair, L., Fall, C., Hallal, P.C., Martorell, R., Richter, L. & Sachdev, H.S.** 2008. Maternal and child undernutrition: consequences for adult health and human capital. *The Lancet*, 371(9609): 340–357.
- Victora, C.G., Christian, P., Vdaletti, L.P., Gatica-domínguez, G., Menon, P. & Black, R.E.** 2021. Revisiting maternal and child undernutrition in low-income and middle-income countries: variable progress towards an unfinished agenda. *The Lancet*, 397(10282): 1388–1399.
- Villasante, S., Antelo, M., Christou, M., Fauconnet, L., Frangoudes, K., Maynou, F., Morato, T. et al.** 2019. The implementation of the Landing Obligation in small-scale fisheries of southern European Union countries. In: S. Uhlmann, C. Ulrich & S. Kennelly, eds. *The European Landing Obligation*, pp. 89–108. Cham, Switzerland, Springer.
- Virdin, J., Vegh, T., Jouffray, J.B., Blasiak, R., Mason, S., Österblom, H., Vermeer, D., Wachtmeister, H. & Werner, N.** 2021. The ocean 100: transnational corporations in the ocean economy. *Science Advances*, 7(3).
- VKM (Norwegian Scientific Committee for Food and Environment).** 2014. *Benefit-risk assessment of fish and fish products in the Norwegian diet – an update. Scientific Opinion of the Scientific Steering Committee*. VKM Report 15. Oslo. 293 pp.
- von Braun, J., Afsana, K., Fresco, L., Hassan, M. & Torero, M.** 2021. *Food Systems: Definition, Concept and Application for the UN Food Systems Summit*. Paper from the Scientific Group of the UN Food Systems Summit.
- Von Moltke, A.** 2014. *Fisheries subsidies, sustainable development and the WTO*. Abingdon, UK, Routledge.

- Vörösmarty, C.J., McIntyre, P.B., Gessner, M.O., Dudgeon, D., Prusevich, A., Green, P., Glidden, S. et al.** 2010. Global threats to human water security and river biodiversity. *Nature*, 467(7315): 555–561.
- Watson, G.J., Murray, J.M., Schaefer, M., Bonner, A. & Gillingham, M.** 2017. Assessing the impacts of bait collection on inter-tidal sediment and the associated macrofaunal and bird communities: the importance of appropriate spatial scales. *Marine Environmental Research*, 130: 122–133.
- Watson, R.A.** 2017. A database of global marine commercial, small-scale, illegal and unreported fisheries catch 1950–2014. *Scientific Data*, 4: 170039.
- WCED (World Commission on Environment and Development).** 1987. *Food 2000: Global policies for sustainable agriculture. A Report of the Advisory Panel on Food Security, Agriculture, Forestry, and Environment to the World Commission on Environment and Development*.
- 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 and Fisheries*, 15(2): 255–279.
- Welcomme, R.** 1972. An evaluation of the acadja method of fishing as practised in the coastal lagoons of Dahomey (West Africa). *Journal of Fish Biology*, 4(1): 39–55.
- Welcomme, R.** 2011. *Review of the state of the world fishery resources: inland fisheries*. Rome, FAO.
- Welcomme, R.L., Cowx, I.G., Coates, D., Béné, C., Funge-Smith, S., Halls, A. & Lorenzen, K.** 2010. Inland capture fisheries. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 365(1554): 2881–2896.
- Welcomme, R. & Kapetsky, J.** 1981. Acadjas: the brush park fisheries of Benin, West Africa. *ICLARM Newsletter*, 4(4): 3–4.
- Westlund, L., Holvoet, K. & Kébé, M., eds.** 2008. *Achieving poverty reduction through responsible fisheries. Lessons from West and Central Africa*. FAO Fisheries and Aquaculture Technical Paper No. 513. Rome, FAO.
- Westlund, L. & Zelasney, J., eds.** 2019. *Securing sustainable small-scale fisheries: sharing good practices from around the world*. FAO Fisheries and Aquaculture Technical Paper No. 644. Rome, FAO.
- Westrell, T., Dusch, V., Ethelberg, S., Harris, J., Hjertqvist, M., Jourdan-da Silva, N., Koller, A., Lenglet, A., Lisby, M. & Vold, L.** 2010. Norovirus outbreaks linked to oyster consumption in the United Kingdom, Norway, France, Sweden and Denmark, 2010. *Eurosurveillance*, 15(12): 19524.
- Wever, L., Glaser, M., Gorris, P. & Ferrol-Schulte, D.** 2012. Decentralization and participation in integrated coastal management: policy lessons from Brazil and Indonesia. *Ocean and Coastal Management*, 66: 63–72.
- WFP.** 2008. *Food consumption analysis: calculation and use of the food consumption score in food security analysis*. Vulnerability Analysis and Mapping Branch. Rome.
- White, A.T., Vogt, H.P. & Arin, T.** 2000. Philippine coral reefs under threat: the economic losses caused by reef destruction. *Marine Pollution Bulletin*, 40(7): 598–605.
- Whitmarsh, D., Pipitone, C., Badalamenti, F. & D'Anna, G.** 2003. The economic sustainability of artisanal fisheries: the case of the trawl ban in the Gulf of Castellammare, NW Sicily. *Marine Policy*, 27(6): 489–497.
- WHO.** 2004. *Vitamin and mineral requirements in human nutrition*. Report of a Joint FAO-WHO Expert Consultation. Geneva, Switzerland.
- WHO.** 2006. *Five keys to safer food manual*. Geneva, Switzerland. <https://www.who.int/publications/i/item/9789241594639>
- WHO.** 2008. *Indicators for assessing infant and young child feeding practices: Part 1 Definitions*. Geneva, Switzerland.
- WHO.** 2021. *Indicators for assessing infant and young child feeding practices: definitions and measurement methods*. Geneva, Switzerland.
- WHO & FAO.** 2004. *Vitamin and mineral requirements in human nutrition*. Second edition. Geneva, Switzerland, WHO.
- Wickens, P.A., Japp, D.W., Shelton, P.A., Kriel, F., Goosen, P.C., Rose, B., Augustyn, C.J., Bross, C.A.R., Penney, A.J. & Krohn, R.G.** 1992. Seals and fisheries in South Africa: competition and conflict. *South African Journal of Marine Science*, 12(1): 773–789.
- Wiech, M., Silva, M., Meier, S., Tibon, J., Berntssen, M.H., Duinker, A. & Sanden, M.** 2020. Undesirables in mesopelagic species and implications for food and feed safety: insights from Norwegian fjords. *Foods*, 9(9): 1162.
- Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T. et al.** 2019. Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet*, 393(10170): 447–492.
- Williams, M.J.** 2008. Why look at fisheries through a gender lens? *Development*, 51(2): 180–185.
- Williams, M.J.** 2015. Pacific invertebrate fisheries and gender – key results from PROCFish. *SPC Women in Fisheries Information Bulletin*, 26: 12–16. Nouméa, SPC.

- Wilmer, F. & Alfred, G.R.** 1997. Indigenous peoples, states and ethnicity. In: D. Carment & P. James, eds. *Wars in the midst of peace: the international politics of ethnic conflict*. Pittsburgh, USA, University of Pittsburgh Press.
- Wolf, E.R.** 2004. Kinship, friendship, and patron–client relations in complex societies. In M. Banton, ed. *Social anthropology of complex societies*, pp. 1–22. London, Routledge.
- Worawit, W., Ahmad, A., Sulit, V.T., Isara, C., Sukchai, A. & Suwanee, S.** 2020. *Terminal Report. Regional sharks, rays and skates data collection*. Southeast Asian Fisheries Development Center.
- World Bank.** 2012. *Hidden Harvest: the global contribution of capture fisheries*. Report No. 66469-GLB. Washington, DC.
- World Bank.** 2017. Fundamentals of purchasing power parities. International Comparison Program (ICP), 2.
- World Bank.** 2021. The Living Standards Measurement Study (LSMS). In: *World Bank*. Washington, DC. Cited 2019–2021. www.worldbank.org/en/programs/lms
- WorldFish, FAO & Duke University.** 2018. *Illuminating Hidden Harvests. The contribution of small-scale fisheries to sustainable development*. Program brief. Penang, Malaysia, WorldFish Center; Rome, FAO; and Durham, USA, Duke University.
- Wosu, A.** 2019. Access and institutions in a small-scale octopus fishery: a gendered perspective. *Marine Policy*, 108(February): 103649.
- WTO (World Trade Organization).** 2021. Factsheet: negotiations on fisheries subsidies. In: *WTO*. Geneva, Switzerland. Cited 5 March 2021. https://www.wto.org/english/tratop_e/rulesneg_e/fish_e/fish_e.htm
- WWF (World Wildlife Fund).** 2004. Global Lakes and Wetlands Database (GLWD). In: *World Wildlife Fund*. Cited 15 October 2021. <http://www.worldwildlife.org/pages/global-lakes-and-wetlands-database>
- WWF.** 2019. Global Lakes and Wetlands Database (GLWD). In: *World Wildlife Fund*. Cited 15 October 2021. <https://www.worldwildlife.org/pages/global-lakes-and-wetlands-database>
- Ye, Y. & Gutierrez, N.L.** 2017. Ending fishery overexploitation by expanding from local successes to globalized solutions. *Nature Ecology & Evolution*, 1(7): 1–5.
- Yergey, M.E., Grothues, T.M., Able, K.W., Crawford, C. & DeCristofer, K.** 2012. Evaluating discard mortality of summer flounder (*Paralichthys dentatus*) in the commercial trawl fishery: developing acoustic telemetry techniques. *Fisheries Research*, 115–116: 72–81.
- Zambia Central Statistics Office, Ministry of Health & ICF.** 2014. *Zambia Demographic and Health Survey 2013–14*.
- Zelasney, J., Ford, A., Westlund, L., Ward, A. & Riego Peñarubia, O., eds.** 2020. *Securing sustainable small-scale fisheries: showcasing applied practices in value chains, post-harvest operations and trade*. FAO Fisheries and Aquaculture Technical Paper No. 652. Rome, FAO.
- Zeller, D., Cashion, T., Palomares, M. & Pauly, D.** 2018. Global marine fisheries discards: a synthesis of reconstructed data. *Fish and Fisheries*, 19(1): 30–39.
- Zeller, D., Palomares, M.L.D., Tavakolie, A., Ang, M., Belhabib, D., Cheung, W.W.L., Lam, V.W.Y. et al.** 2016. Still catching attention: *Sea Around Us* reconstructed global catch data, their spatial expression and public accessibility. *Marine Policy*, 70: 145–152.
- Zeller, D. & Pauly, D.** 2016. Marine fisheries catch reconstruction: definitions, sources, methods and challenges. In: D. Pauly & D. Zeller, eds. *Global Atlas of Marine Fisheries: a critical appraisal of catches and ecosystem impacts*, pp. 12–33. Washington, D.C., Island Press.
- Ziegler, F., Emanuelsson, A., Eichelsheim, J.L., Flysjö, A., Ndiaye, V. & Thrane, M.** 2011. Extended life cycle assessment of southern pink shrimp products originating in Senegalese artisanal and industrial fisheries for export to Europe. *Journal of Industrial Ecology*, 15(4): 527–538.
- Zimmerhackel, J.S., Schuhbauer, A.C., Usseglio, P., Heel, L.C. & Salinas-de-León, P.** 2015. Catch, bycatch and discards of the Galapagos Marine Reserve small-scale handline fishery. *PeerJ*, 3: e995. <https://doi.org/10.7717/peerj.995>
- Zukowski, S., Curtis, A. & Watts, R.J.** 2011. Using fisher local ecological knowledge to improve management: the Murray crayfish in Australia. *Fisheries Research*, 110(1): 120–127.