

Capacity-building paper or Feature Article or Opinion Paper

Fishing logbook as stewardship action within TURF management in Kepulauan Seribu Marine National Park, Indonesia

Rifki Furqan^{a,b,*}, Achim Schlüter^{a,b}^a Working Group Institutional and Behavioral Economics, Social Science Department, Leibniz Center for Tropical Marine Research (ZMT), Bremen, Germany^b School of Business, Social & Decision Sciences, Constructor University Bremen, Germany

ARTICLE INFO

Keywords:

Territorial Use Rights in Fisheries (TURF)
 Stewardship
 Fishing logbook
 Motivation
 Agency
 Knowledge integration
 Knowledge co-creation

ABSTRACT

Stewardship, as a concept that relates to any action taken by a steward in favor of the sustainability of their environment, has attracted attention. However, research on stewardship action taken by fishers at the local level is particularly understudied. Our study was conducted in Kepulauan Seribu Marine National Park, where fishing logbook activity occurred as part of the introduction of Territorial Use Rights for Fisheries (TURF) management. Logbook writing is the local stewardship action in the center of interest of this study. We collected empirical data using the local environmental stewardship framework to analyze the main causes why the fishing logbook writing discontinued and determine the leverage strategies to relaunch the activity. Semi-structured interviews with fishers who did and did not submit the logbook reveal that the fisher's intrinsic motivation and agency are strongly intertwined with the social, cultural, and political contexts, which together provide a good understanding of why stewardship action stopped. Applying the framework demonstrates that the failure of the stewardship action is a result of a mismatch between the TURF approach and the fishers' understanding of how the problem should be managed and solved. Despite being granted exclusive management rights by the authorities, the fishers have little intrinsic motivation and a lack of agency, and they ask heavily for government action. Fishing logbooks are an example of stewardship action that integrates local and fishery biology knowledge for creating a basis to determine strategies to address local overfishing problems. We outline different leveraging strategies that could potentially relaunch the logbook activity in Kepulauan Seribu.

1. Introduction

Local coastal populations in Indonesia normally rely heavily on near-shore fisheries resources due to a lack of options and capacity to explore far-shore fishing grounds. Unfortunately, they are vulnerable because of complex problems such as overfishing and ineffective fisheries management (Hilborn, 2007). Fisheries spatial-based co-management in a form of Territorial Use Rights for Fisheries (henceforth called "TURF") is one of the current management options offered by scientists and conservationists to address overfishing and issues in fisheries governance.

Territorial Use Rights for Fisheries (TURF) is a fisheries management strategy that grants exclusive fishing rights to a specific area to a designated group or individual (Doerr et al., 2013). The objective is to encourage sustainable fishing practices and preserve local fisheries resources (Franco-Meléndez et al., 2021). TURFs provide management and property rights, which are normally held by the government, to local fishing communities (Afflerbach et al., 2014; Nguyen Thi Quynh

et al., 2017). The concept of TURFs is based on the assumption that granting local fishers exclusive management rights to a resource enhances their stewardship because they directly reap the benefits of long-term well-being and productivity (Gelcich et al., 2012). This strategy differs from open-access regimes, which lack exclusive rights and often result in overfishing and resource degradation owing to the "tragedy of the commons." (Hardin, 1968).

Building on the theory of property rights, TURFs are expected to increase fishers' sense of ownership (Retnoningtyas et al., 2021; Wade et al., 2019). They allow fishers to have a formal and legitimate decision-making mechanism, which, in theory, encourages stewardship behavior (Gilmour et al., 2012) which would lead to more sustainable methods of managing fisheries resources. However, although theoretically TURFs should lead to excellent results, managing fisheries resources often seems to remain a difficult task.

The implementation of TURFs presents both opportunities and challenges. Studies on TURFs indicate that they can be effective in

* Corresponding author. Leibniz Center for Tropical Marine Research (ZMT), Fahrenheitstraße 6, 28359, Bremen, Germany.

E-mail address: rifki.furqan@leibniz-zmt.de (R. Furqan).

fostering sustainable fishing practices and enhancing economic outcomes under specific circumstances. Successful TURFs have been linked to the existence of networks of conservation areas, which can enhance productivity despite the uneven allocation of shared advantages and varying carrying capacities (Aceves-Bueno et al., 2020). Nevertheless, the efficacy of TURFs might differ, and their influence on economic advantages relies on elements such as collaboration and particular socio-ecological circumstances (Gallier et al., 2016; Oyanedel et al., 2020a). TURF studies have emphasized the necessity of adopting a comprehensive and holistic approach to TURF management (Franco-Meléndez et al., 2021). It is crucial to consider the social interconnections of stakeholders in the designated TURF regions. This implies that the effectiveness of TURFs is determined by their spatial or biological attributes and by the social and economic dynamics that drive their establishment and execution (Aswani, 2017). Insufficient monitoring and enforcement can render TURFs ineffective in preventing resource overexploitation, resulting in their inactivity and becoming problematic for stakeholders (Furqan and Schlüter, 2023).

Co-management of fisheries, including TURF, requires a clear division of rights between authorities and local communities (Gelcich et al., 2019). Active participation, i.e. environmental stewardship action, from local communities is important, because they finally determine if the management measures work (Fulton et al., 2011). Therefore, local stewardship behavior is a critical component of sustainable fisheries management practices (Bennett et al., 2018; Cockburn et al., 2019; Filip, 2020). Stewardship actions consist of collective and individual actions (Bennett et al., 2018). The two are closely intertwined, as are the concepts of collective and stewardship action. The former has gotten important attention since the seminal work of Elinor Ostrom (1990) and helps us to understand a huge proportion of stewardship action. This paper looks deliberately at an individual action which is writing a fishing logbook. Therefore, we use the local environmental stewardship framework developed by Bennett et al. (2018) which puts a particular emphasis on individual motivations for action.

In the context of TURFs, there are few empirical studies on local stewardship actions of fishing logbooks. Fishing logbooks serve as an essential tool in advocating for responsible fishing methods, facilitating efficient fisheries management, and aiding in the sustainable utilization of local fisheries resources (Sari et al., 2021). In the context of our study, we used a fishing logbook as an example of an individual stewardship action. Writing a logbook is a part of the TURF project at Kepulauan Seribu. The TURF project was initiated as an alternative solution to address fisheries-related concerns that arise on a regular basis. These challenges include decreased catches which reduce fishers' income, smaller fish size, and competition between locals and fishers from other areas. To fill the gap in empirical research on stewardship within TURF implementation, we conducted a qualitative field study in the Kepulauan Seribu Marine National Park, where an environmental NGO (Rare Indonesia) has been active to establish a TURF management since 2015.

Experts in fisheries economics and ecology suggest that one of the important contributions to sustainable fisheries management is reliable and robust fish stock data (Froese, 2004; Khan and Neis, 2010). It can only be co-produced by integrating local and fishery biology data. It takes years to produce high-quality stock data, therefore, regular submission of the fishing logbook by the fishers would be an important contribution to sustainable management. This long-term engagement requires a high degree of stewardship. By understanding local stewardship in relation to logbook activity, we aim to understand how to integrate better local and fisheries biologist knowledge, the aim of this special issue.

In the first step we revise the literature on environmental stewardship and justify why we have chosen the local environmental stewardship framework. After explaining the empirical approach and describing the research questions in more detail, we present the results, which are then discussed and used for identifying leverage points for increasing stewardship actions. We finish with a conclusion.

2. The local environmental stewardship framework

Environmental stewardship has been discussed in numerous frameworks in the literature. Some of them examine it in a broader context, focusing on the strong relationship between human well-being and the ecosystem (Masterson et al., 2019) or between caring, knowledge, and agency (Peçanha Enqvist et al., 2018). Furthermore, other frameworks, such as the stewardship frameworks suggested by Chapin Iii et al. (2015) and Peçanha Enqvist et al., 2018, are intended to be implemented in multi-level governance systems. While Chapin et al. (2010) provide a stewardship framework as a guideline for society to actively shape pathways of ecological and social change to improve both ecosystem quality and long-term social welfare. Peçanha Enqvist et al. (2018) developed a "boundary object" concept that is adaptable to the needs and constraints of the various stakeholders who use the concept to achieve a common goal.

Much of the available literature on stewardship deals with noble action of people to their environment. Peçanha Enqvist et al. (2018) defined stewardship as an idea about how people should act to show that they care about, protect, and are responsible for the environment. Responsible usage, sustainable management, long-term sustainability, care, local traditional knowledge, and human accountability are some of the keywords (Peçanha Enqvist et al., 2018).

Bennett et al. (2018) local environmental stewardship framework was developed to better understand stewardship particularly at the local level. The framework highlights the relevance of the context in which the stewardship action is taking place, and it also emphasizes who the actors are, their motivations and capacities. The framework is designed to serve as an analytic, evaluative and prescriptive tool. Its focus at the local level makes it a suitable tool for our analysis. First, we applied the local environmental framework as an analytical tool to diagnose and analyze stewardship actions. Second, we use the framework to prescribe leverage strategies that might help to revitalize stewardship actions.

Bennett et al. (2018, p.599) define stewardship actions "as the actions taken by individuals, groups or networks of actors, with various motivations and levels of capacity, to protect, care for or responsibly use the environment in pursuit of environmental and/or social outcomes in diverse social-ecological contexts".

In the framework (see Fig. 1), the social and ecological contexts influence other elements, such as actors, motivations, capacities and ultimately the practicality of an action. Even though it focuses on the local level, the broader social and ecological context influences the other elements in many aspects. The social, cultural, political, ecological and economic context need to be considered. The condition for stewardship is complex, dynamic, to a large degree unpredictable, and context dependent. The dynamics of social and ecological conditions regulate whether actions are socially acceptable, culturally fit, ecologically safe, politically feasible or economically effective. The context is crucial to provide supporting conditions to other elements to thrive.

Which actors become stewards is a key factor for success. Bennett et al. (2018) argue to apply a subsidiarity principle, which means that stewardship should take place as decentralized as possible, with the stewards being those who are as close as possible to the resource and hence are capturing many of the benefits of the stewardship action and therefore are also willing to bear the cost of the action (Ostrom, 1990). It is crucial to understand and analyze the characteristics of the actors, such as their resource dependence, socioeconomic status, or gender.

Motivation is crucial for determining whether a steward's actions endure. Following the standard psychological literature, intrinsic and extrinsic motivations must be distinguished (Ryan and Deci, 2000). The difference between intrinsic and extrinsic motivation is determined by where the reason for doing the activity comes from: inside or outside the person (Bennett et al., 2018; Ryan and Deci, 2000; Zabala, 2015). While intrinsic motivation is driven by anything inherently exciting, delightful, or fun, extrinsic motivation requires extra enticement, often in the form of reward or punishment (Ryan and Deci, 2000).

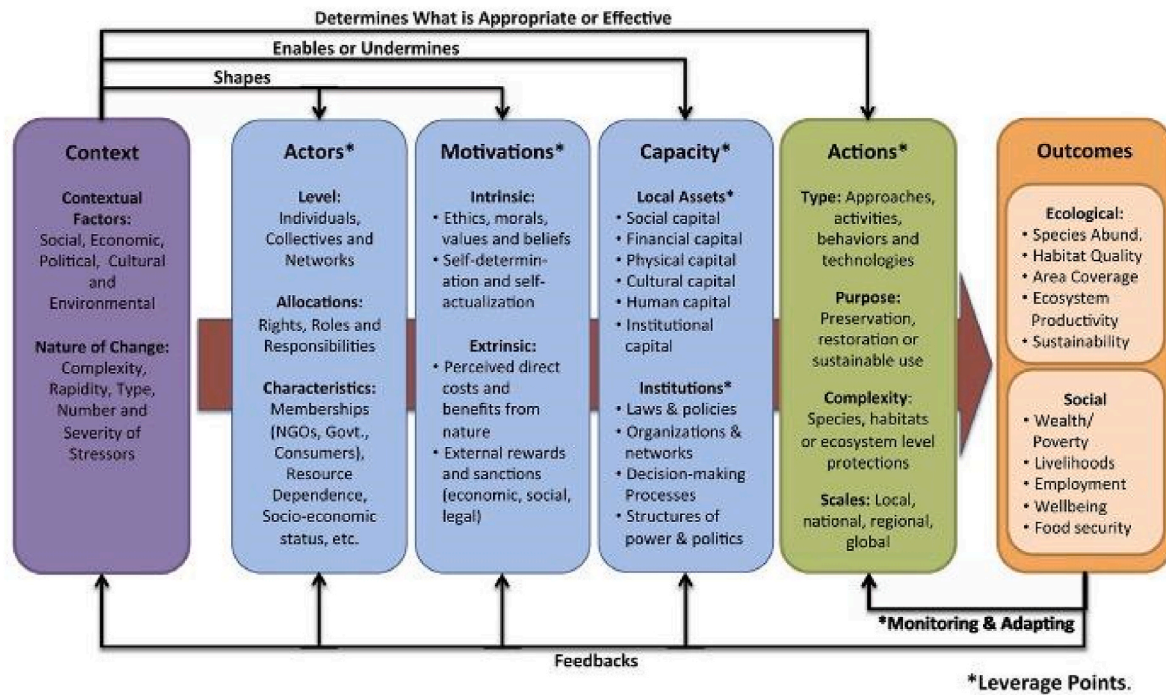


Fig. 1. The analytical framework for the elements of local environmental stewardship (Bennett et al., 2018).

In addition, it is fundamental to observe the set of capacities of actors. Individual stewards have distinct capacities that impact whether the stewardship action will be sustained. According to the framework, capacity is a critical determinant governed by two major factors: assets of the local community and its institutions in the sense of rules (Bennett et al., 2018, 2019; Fowler et al., 2020). Individual capacities were assessed through interviews on social, cultural, financial, physical, human, and institutional capital. In addition to the list of local capacities, governance factors (i.e. laws/regulations, policies, formal and informal rules, and decision-making processes) play crucial roles to enable or disable stewardship action.

According to Bennett et al. (2018), those four factors – the context, the actors, their motivations, and capacities - determine the stewardship actions taken. Those actions might then influence the ultimate goal to be intended by the stewardship action, which has positive effects on ecological and social outcomes. All those factors find themselves in an iterative feedback loop.

3. Research locations, questions and method

The study was conducted in the Kepulauan Seribu Marine National Park, which is north of Jakarta in Indonesia. The national park area was established in 1982 and since 2004 has had four zones, namely the core zone, buffer zone, tourism utilization zone, and settlement zone, with a total area covering 107,489 ha. This study was done on three small islands: Kelapa, Kelapa Dua and Harapan. It was selected as a case study, because the project of Rare Indonesia for TURF establishment had just recently been finished and information from Rare Indonesia, the national park team and interviews with fishers confirmed that logbook activities had stopped after the project had ended. The main question of this study therefore was: Why was the fishing logbook activity stopped?

Applying the framework, leads to the following derived questions:

1. What is the broader social-ecological context that influences the action?
2. Who are the actors involved? What do they think of the logbook?
3. What are actors' internal and external motivations for keeping a fishing logbook?

4. What capacities exist, and how do such capacities influence the development of fishing logbook activity?

The first author did fieldwork and data collection (May to June 2021). A semi-structured interview method was used to collect data from local fishers. It was carried out during the COVID-19 pandemic in Indonesia, particularly when the Delta variant emerged (June 2021). According to the interviews, fishing logbook activities have been inactive since before the pandemic began, therefore we can be certain that COVID-19 did not play a role in the breakdown of the activity.

The study started with two in-person test interviews. This helped us change the way we talked and ensured that all questions could be understood. However, as the pandemic situation worsened, travel restrictions were imposed, and only islanders were allowed to go there, so we had to collect data remotely. The interviews were conducted over the phone. We hired two local assistants to organize the interviews because the first author was not allowed to enter the national park area due to the COVID-19 pandemic at that time. The first local assistant assisted us in conducting phone interviews with respondents from the Harapan and Kelapa islands, while the second focused on Kelapa Dua, which is disconnected from the other islands.

According to a local statistics report shared by the authority, the total number of fishers on the three islands was 1361 individuals. However, the target audience for this project was only 210 fishers. The target audience was selected basically according to the TURF project's need; therefore, it was only fishers who access the TURF location as their main fishing ground and catch the TURF target species using allowable fishing gears according to the TURF rules were included as target population in this study. More precisely, as this study focused on the fishing logbook as a stewardship action, our study was centered around fishers who engaged in fishing logbook activity which was a total of 23 fishers. A purposive and targeted snowball sampling approach was conducted by the local assistant with guidance from the first author. Initially, we had names from each island of those who participated in logbook activity. We started with a person, who then suggested names of people, who did or did not contribute to the logbook activity. This process was continued until saturation was attained. Saturation is reached when no new information is brought up or when the respondents keep bringing up

similar ideas even though they use different words (Bryman, 2012). No specific criteria were used to choose respondents, except that they should have heard of a fishing logbook. Finally, we managed (with the help of local assistants) to interview 15 respondents. Many of the respondents, who had agreed on providing the logbook data, felt bad about not doing it anymore and tried to explain why they behaved as they did.

The local assistant visited the respondent's house with his phone. After obtaining brief information about the interview, the assistant called the first author, the phone was put on loudspeaker mode and the interview began. First, the purpose of the study was communicated to all respondents. We ensured the confidentiality of their identities and asked for permission to record the audio. We hired a transcriber to type exactly what was said.

All respondents agreed to participate in the phone interview. They agreed that the interviews were recorded for data analysis. Prior to data collection, participants were informed about the study's aims, what they should do, and how their data would be used. All respondents were advised that they could end the phone interview at any time and that the recorded data would be destroyed. This study was approved by the ethical committee of the Leibniz Centre for Tropical Marine Research (ZMT) Bremen.

4. Result (stewardship elements)

In the following section, we report the results of the various elements of the framework. We follow the structure provided by the framework.

4.1. Social-ecological context

The cultural context is of extreme importance for understanding why the logbook activity was discontinued immediately after Rare Indonesia finished its TURF project. The government (both the national park and local government) supervised the activities with minimal care. In fact, according to the fishers, the government officials believed that helping to organize the logbook activity was not their business because it was started by Rare Indonesia and should be continued by the TURF management team (local fishers). However, the management team and fishers wanted and needed, from their cultural understanding, the leadership and support of a government organization. Consequently, the TURF management group struggled to continue the activity and motivate their members after the completion of the project. Rare Indonesia organized informal social gatherings or "hangouts" for sharing results and motivating people to continue their logbook activities. These were important to the people. However, once Rare Indonesia had ended the project, this practice was abandoned. This also allowed people to forget the logbook (Respondent #H11810). It was difficult for the local management team to take the lead in both activities.

Another contextual factor is related to the geographic location of the islands, which has huge economic implications. Due to its relatively accessible location, there are many projects that take place in the Kepulauan Seribu. The more projects that are happening there, the more funding they receive, and the busier they are with activities other than fishing. A coral transplantation project from the national park was an example. Some of the respondents participated, and they were paid daily for a period of time. Another project was the mangrove seedling project, funded by one of the state-owned companies in Jakarta through a Corporate Social Responsibility (CSR) scheme. Fishers get used to external funding sources, they can easily switch to another project and therefore become disinterested in the logbook activity as it does not provide immediate economic benefit.

In an ecological context, one of the reasons why fishing logbook activity was initiated in the TURF project is to inform better decision-making in addressing local overfishing by writing a logbook to collect catch trends at the local level. Qualitative data extracted from most of the respondents suggested that catch decline is apparent and considered

the main fisheries problem in the Harapan, Kelapa and Kelapa Dua islands. While the TURF project is still running, it is hopeful that the fishing logbook will continue. However, this initiative has been prematurely inactive for many reasons, mainly because of the lack of incentives received by the main actor: the fishers. Therefore, the effect of fishing logbook activity on the ecological condition in Kepulauan Seribu cannot be determined accurately in this study.

4.2. Actors

Three groups of actors are key to understanding the development of the stewardship action of writing logbooks. They developed the logbook together including the formulation of logbook form, logbook data collection protocol, and a series of logbook trainings facilitated by both Rare Indonesia and the government. First, there are fishers, who should have participated in the fishing logbook according to project plans. There seems to be a strong informal social network among fishers. They enjoy communicating and exchanging information informally. However, there is differentiation among fishers. Some of them never engaged in the logbook activity, while others abandoned it. The fishers, who filled in logbooks most of the time have been part of the family of the local management group. The local management group, which was originally appointed by the fishers, however with facilitation and endorsement from the NGO and the authority, they had the right to determine rules and procedures of the TURF. The TURF management group consists of 18 members. Most of them are fishers who are residents on Harapan, Kelapa, and Kelapa Dua islands. They did this in close collaboration with the other groups. The government authority had to approve and check if the envisaged rules are in accordance with state laws. As indicated above, the large majority of fishers engaged in the logbook activity have been related to the management group. The other fishers did not see it as a worthwhile activity. The next group is the NGO representatives (Rare Indonesia). They brought money and ideas, and aimed to implement the TURF concept on Seribu Island. Rare had two representatives staying on the islands during the project. However, they were already gone when the fieldwork started because the project ended in 2018. The third important group for comprehension is local government officials, including those from the Kepulauan Seribu Marine National Park. At least from the perspective of fishers, they have not been as present as they would have liked them to be. There were four officers who were formally appointed to work collaboratively with the fishers during the TURF project (2015–2018). However, after the project ends, these four officers have been tasked with another project.

The following is an illustration of the flow of logbook data: Fishers submit their logbooks to a TURF management group coordinator. The coordinator enters the logbook data into Excel file and submits it to the technical team of Rare Indonesia. The technical team engages in communication with the TURF management group coordinator in order to obtain clarification and ensure the completion of the data, hence enabling its interpretation. The findings data are presented and discussed with the fishers. Subsequently, the outcomes of the discussion are documented in a report format and shared to the national park. In summary, connecting the three actor groups, one can say that Rare Indonesia brought the idea - a very well thought through concept based on scientific knowledge on resource governance - and the money, the government (national park) was at least from the perspective of the fishers relatively absent and fishers should have provided the logbook data. As the fishers have been responsible for the logbook activity, we concentrate in the following on their motivations and capacities.

4.3. Motivation

Most fishers do not find filling the fishing logbook intrinsically enjoyable. They said that they were tired, confused, and lazy because they did not get anything for it (referring to extrinsic factors). From their perspective, God is going to provide them with fish and fish will always

be there. Gathering data in a logbook will not change that much. They used their patriarchal power to make their wives or children write the logbook. They spent the entire day fishing and were exhausted when they returned home. Therefore, filling out the logbook was a nuisance that provided little immediate benefit. Respondent #D1087 admitted that he never wrote in the logbook right after fishing. He said, *"I will write in the logbook later, not right away. I'm tired after spending all day fishing."*

Extrinsic motives arise as rewards or punishments. It must be said that many fishers no longer depend to a large degree on their income from fishing. They also have other sources to keep them busy. Therefore, motivation to concentrate on fish stock management and logbook writing was rather low. On the other hand, it was argued that the logbook activity would require a lot of complex data and would be laborious to complete. This would also provide data that they would rather not reveal to others. For example, a location where a good catch was found is normally not shared with others. The same holds true for price data. However, this information is part of the form and should be filled in.

One of the activities associated in former times with this fishing logbook and carried out by the group managers was a "raffle" for everybody who had submitted the logbook. It should provide an incentive to participate. However, the "raffle" was brought up in several of the complaints; for example, one fisher said (#K12811), *"Yes, I think it (the "raffle") is merely to attract fishers, to make all of them fill out and submit their logbooks. However, it is not fair because only one individual received the prize while the others did not."*

Most of the fishers just loved the social gathering during the "raffle," but many were dissatisfied with the reward. Fishers argued that it is preferable to offer something for everybody, even if it is a small amount of money, as opposed to holding a "raffle" for a small rice sack. There was no punishment for individuals who did not submit logbooks, and there was no reward for submission. As a result, it is believed that the costs outweigh the benefits.

Instead of tangible costs and benefits, it was clearly articulated that informal forms of benefits were highly appreciated. From a cultural point of view, it was found that after worship, fishers often hang out in the front yard of one fisher's house or in the mosque. They usually hang out in public places, smoke cigarettes, and engage in casual conversations. This was a way to socialize and distribute information about fishing. When they were together, they talked casually to relieve stress and updated each other about their activities. This also allowed the project coordinator to discuss fishing logbooks. This type of meeting was much simpler to invite fishers to than a formal training program. In fact, they enjoyed it and had a great time with it. Respondent #K12811, for example, said, *"I don't think hanging out like this is a waste of time, it's fun. We talked about us. It's important to know how my friends are doing. We made fun of each other, which is fun. We also get snacks and coffee. When we get home, we're both full and tired of talking."* "Occasionally, he (the coordinator) also teaches us things, such as about the logbook." said respondent #K14815.

4.4. Capacity

Trust is a major topic of discussion in social capital. According to the framework's definition, social capital is both informal and formal interaction among society's members, including the network of kinship and friendship, which fosters trust and reciprocity to motivate and sustain stewardship actions (Bennett et al., 2018). Several interviews have revealed trust-related issues. Some respondents said that the manager is not only unable to organize the activity but that there have also, according to them, been some irregularities in how the funds have been managed. In this study, institutional capital and TURF management practices could not be separated. Respondents observed a lack of response and cooperation between managers and members, as well as weak leadership and non-transparent budget allocation.

Financial capacity relates to the sources of funding that support logbook activities. Two entities funded the logbook activity: an international project of Rare (Fish Forever Indonesia) and a government budget through the Kepulauan Seribu Marine National Park. In practice, fishing logbook activities are inexpensive. Paper logbooks do not require complex technology; rather, they require time and effort to fill in them manually. Basically, they only need a pen, paper, and strong will (stewardship) to write a logbook. After training, the fishers received sufficient logbook paper and a waterproof ruler. The facilitator from the TURF management group also provided each coordinator on the three islands with a manual scale. There was no particular concern regarding the need for more advanced technologies.

We analyzed the individual level of human capital by examining the respondent's education, knowledge, leadership, skills, and demographic profiles (age, household members, income, etc.). Most of the respondents had at least an elementary school certificate (five respondents) and a junior high school certificate (six respondents). Two of them had never been to school, and two respondents had finished senior high school. Fishers complained that the form was far too complex, despite having been involved in the design. It was not clear if that was a lack of human capital or if it was just the motivational structure, as discussed above, that led many fishers not to fill out the forms.

From the interviews, we learned that in principle they have properly learned what the fishing logbook generally is about, however, they have not carried that much about it. For example, when they were asked what they learned from the workshop, they said, *"At that time, they taught us how to measure the size of every fish we caught. Plus, there's the weight. That's all I remembered,"* said respondent #H984. However, a significant portion of this knowledge has not been applied in practice. Although the fundamental task is simple: measuring the size, weighing the catch, and writing the information on logbook paper, it requires more time to complete the activity. Although training appears to be an effective technique to enhance individual capacity, it is insufficient to ensure that fishers who participate in training consistently apply what they have learned.

Experts, officials, and fishers worked together, according to participatory standards, to develop the logbook form. The preparation of the logbook form was described as a fair and democratic process that considered both sides' needs. The majority of respondents reported participating in a series of meetings to create the logbook form. However, they believed that the form was still too difficult to complete and suggested that it should be simplified. One respondent suggested using a selling note instead of a logbook form. Respondent #K12811 said, *"Yes, I think we can just use the selling note we got from the buyer. There is the date, the number of kilograms, and the number of fish caught. That's enough, I think."*

4.5. Action

We considered the fishing logbook activity at Kepulauan Seribu Marine National Park as a stewardship action because it enables fishers, according to their ecological knowledge, to manage their local fisheries resources more sustainably in the future. It addresses the problem of overfishing.

The final paper-based fishing logbook form included the fisher's information, such as the name and time of departure and return. Differentiated by species, the amount of catch includes the local name of the fish, length, weight, number of fish, and location of the fishing ground. Apart from the fish sold, fishers were also encouraged to declare how many fish they had brought home for household consumption.

Fishers often bring their catch first to their houses and separate what they need for their own consumption. The rest is brought to the buyer. They weigh the fish only there because the buyer has a scale. Nevertheless, all respondents admitted to guess the weight of each fish and to record their best guess in the logbook. It would have been too much effort if they had to weigh each fish because the buyer was only

interested in the total weight of their catch. “No, no, we just weigh it once,” said respondent #H984. He continued, “It is impossible to do so for each individual fish. We only weigh once on the dock when we meet the buyer.”

The lengths were measured using the same method. Despite receiving a waterproof ruler, most respondents said that they did not use it. Instead, they used their fingertips to measure the biggest fish and guess the rest. In some cases, the fisher photographed the ruler over the fish. They estimated the rest and recorded it in the logbook. They were supposed to provide accurate and reliable information, but they never accurately measured the length and weight of each fish species.

In fact, fishers who had previously actively filled out and submitted their logbooks have stopped doing so since the beginning of 2019. As shown by the logbook database kept by the Rare Indonesia Technical Team, there was a clear drop in the number of submissions. Concerns such as the difficult logbook form and unclear handling of logbook submission were the primary complaints of fishers as they began to delay any logbook-related activities.

Five respondents said that their wives helped them complete the logbook. The filling of the logbook did not occur immediately; in fact, it sometimes took days after fishing. Additionally, one respondent mentioned that his son always filled out his logbook because he could not write it. Regarding practice, respondents preferred having someone to assist them in filling out their logbook rather than providing them with a ruler and a scale. When asked what type of assistance he most needed, one respondent from Harapan Island said, “For me, maybe the youth or whoever, could help us write the logbook. Instead of just sitting around, this is better for them.” said respondent #H983.

4.6. Outcome

The ecological and economic outcomes of logbook activities are not immediate. It takes years and has a consistent implementation. If this stewardship action is successful, the direct and measurable outcome will be an improved and more reliable local catch trend, which could then aid the authority but, according to the TURF theory, primarily the fishers in improving their fisheries condition. Having this type of information could aid in determining when the most productive time of the year is, how many kilograms their maximum productivity is, and how to eventually recover from overfishing in the future.

The desired social outcomes of the logbook activity were to build trust and cohesion among stakeholders. Unfortunately, fishing logbook activities were discontinued even before the pandemic. Therefore, neither the ecological nor the social outcomes planned for the logbook activity could materialize.

5. Discussion

Fishing logbooks are essential for knowledge integration in fisheries management for a variety of reasons. Logbooks combine local knowledge with fisheries-related data on capture, gear, size, and location, improving understanding of fish stocks and facilitating adaptive management strategies for local fisheries challenges. Writing logbooks as a stewardship action supports TURF management by integrating local knowledge with statistical information to gain a full understanding of fish stock dynamics and make informed decisions. This hybrid knowledge is an important building block for local right holders to take sustainable management decisions for their TURF.

Utilizing the framework, the study highlights that the challenges associated with the stewardship elements mentioned by Bennett et al. (2018) were dominating. Despite opportunities such as the legal status of the TURF management group and strong collaborative efforts in designing a logbook form, other stewardship elements hindered logbook activity. Writing the logbook was discontinued due to four major challenges (see Fig. 2): a complex social and ecological context; a lack of motivation and agency among fishers; and a lack of active local

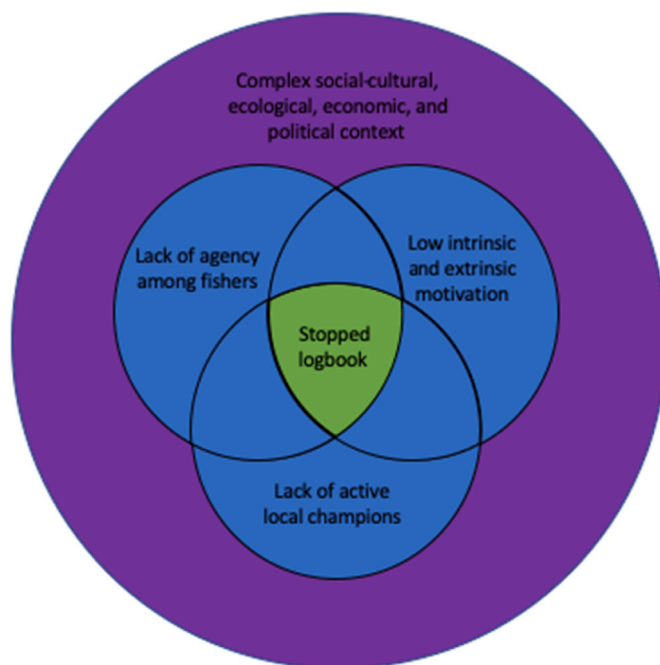


Fig. 2. A summary of the primary reasons why the logbook stopped.

champions. These challenges are described in more detail in the following sections. Despite such challenges, we suggest some strategies to leverage follow-up actions that will, hopefully, allow fishers to re-implement the fishing logbook in the future.

5.1. The underlying causes

A lack of agency among fishers is indicated by the ignorant behavior of the group members in relation to running the organization (Brown and Westaway, 2011; Burkitt, 2016; Peçanha Enqvist et al., 2018). In this context, agency is defined not only as the ability to organize but also as the ability of agents to carry out their own institutional approaches in order to achieve a common goal (Peçanha Enqvist et al., 2018). In the case of TURF management, an active community group is fundamental (Villaseñor-Derbez et al., 2019). Local fisher's active participation has proven to be essential for sustaining TURF management practices (Domondon et al., 2021).

To fulfill management objectives, it is essential that local fishers be heard and facilitated by the authority, particularly throughout the decision-making process. Fishers are more likely to follow rules if they trust that the decision makers operate honestly and believe that the consequences of the rules are fair and effective (Oyanedel et al., 2020b). Trust in the authorities plays an essential role in shaping fishers' internal belief systems and their willingness to follow rules, which in this context is writing a logbook. Their motivations, which were already minimal, diminished significantly due to the lack of support from local authorities. It made the fishers who were active at the beginning of logbook activities become ignorant. The stewards in this study were supposed to be fishers, and among them, there were several individuals who performed quite well in submitting and advocating for logbooks at the beginning. They were “champions” in their local community. Simply put, a local champion is an individual who takes on more responsibility to lead their local group members by collaborating with governmental institutions to achieve stewardship outcomes, regardless of their status, position, or academic background (Abdurrahim et al., 2022; Wessels et al., 2021). However, these champions lost their motivation.

Despite the fact that, in theory, TURF is a kind of management that enables local fishers to implement their own organizational strategies and be self-governed (Villaseñor-Derbez et al., 2019), under the

context-specific conditions of Indonesia, where hierarchy and obedience towards authorities are of major importance (Halik et al., 2022), the authority cannot immediately withdraw its supervision. The lack of supervision, or better put, interest, of the national park, as well as their lack of funding, resulted in a lack of agency among TURF group fishers. It reduced the importance of it. Stewardship needs to be backed up by authority, and it still needs time to grow.

Although the fishers received a series of training to improve their capacities, managing natural resources is not a common job for fishers, and they still need help and guidance. We could clearly observe a misalignment between what a TURF should be in theory: commonly held property rights for a local group of individuals, which therefore should develop agency, responsibility, and stewardship, and how fishers in that particular context interpreted a TURF. Such an individualistic governance scheme seems to have contradicted their conventional wisdom, and more attention and care from the state authorities were strongly requested. Being in charge of resource management was not considered normal for fishers in Seribu. Many have argued that it is the role and duty of the government to manage fish stock.

The opportunity costs of performing the time-consuming logbook writing task are significant. Additionally, they become accustomed to external funding sources, which crowd out intrinsic behavior (Cardenas et al., 2000; Rode et al., 2015) and let them ask for external money if a laborious task such as logbook writing has to be performed.

The lack of intrinsic motivation is a fundamental reason why fishers no longer submit their logbooks. They lost their internal motivation to work on the logbook because they were exhausted from fishing. They do not believe that their fishing behavior or their care in writing a logbook could help protect what God has created for them; they believe that God always provides the necessary resources and that they simply need to work harder to catch more fish. Most of them believed that the depletion of fish stocks would be naturally restored. If there is a contradiction between the mental models of different actors involved in the process of institutional change (the habituation of filling in a logbook), it is extremely difficult to reach a consensus about a change and to make it effective (Schlüter et al., 2013). This is particularly true if those who do not believe in the usefulness of the change are bearing most of the costs. From an ecological and property perspective the mental models of the fishers are too different from the models of those who tried to implement the TURF and make fishers perform the laborious task of logbook activity. Obviously, one has to believe in the usefulness of an activity.

From a sustainability perspective, a steward's intrinsic motivation must be supported by internal values and genuine intentions driven by personal belief systems (Turnbull et al., 2021). However, this finding does not imply that extrinsic motivation is less important. External forces, such as reward and punishment mechanisms, have been shown to be effective catalysts for sustaining a steward's actions (Cetas and Yasué, 2017; Ryan and Deci, 2000). Unfortunately, the extrinsic motivation that encourages fishers to submit their logbooks is no longer present.

5.2. Leverage strategies

In addition to the diagnostic approach, we followed the framework's prescriptive analytic concept to elaborate on any alternative stewardship action improvement strategy. Based on our analysis, some practical strategies may be able to leverage logbook activities to achieve their intended outcomes. It requires some policy changes, particularly from Kepulauan Seribu National Park and the local government.

There are leverage points within the stewardship framework that could be utilized to facilitate more desirable outcomes. According to Bennett et al. (2018), examples of leverage points include introducing new actors, promoting new incentive schemes, enhancing knowledge and capacity, focusing on specific actions, and monitoring and evaluating current results to draw lessons and facilitate future adaptation.

In the case of fishing logbook activity, we suggest that the authorities appoint enumerators in addition to the existing local champions. In this

case, we believe that local champions should come from both community and government institutions. Thus, we advocate for a combination of the existing champions within the TURF group and government actors, such as enumerators or fisheries extensions.

In theory, champions in a natural resources' management context should have strong abilities and networks to help overcome deadlocks and find a resolution to conflicts to enable stewardship actions (Abdurrahim et al., 2022; Ross et al., 2019). By introducing additional champions from the local government and community, there is a greater possibility of exchange in an informal way, which is highly appreciated by fishers. This communication will help to align mental models and understanding on both sides. The person should have a very good understanding of both worlds, not only the world of conservationists and TURF advocates but also that of local fishers, to be able to bridge the necessary gaps (Von Heland and Clifton, 2015). In addition, we believe that it will boost logbook activity as it provides technical support and is perceived as a non-monetary incentive provided by the government to help fishers working on their logbooks.

Our respondents wondered about the government's role in logbook activities. The enumerators or fisheries extension officers, who are government officials, could play a key bridging role between the different prevailing perspectives. Having technical enumerators who are dedicated to and respected by fishers would lead to more engaged and responsible behavior by fishers in utilizing their fisheries resources. Otherwise, the TURF approach, including logbook activity, is not a suitable solution to the overfishing problem in Kepulauan Seribu.

6. Conclusion

This study aimed to understand why the fishing logbook in Kepulauan Seribu Marine National Park was discontinued. We adopted the local environmental stewardship framework and used it as a diagnostic, evaluative, and prescriptive analytical tool to comprehend the implementation of fishing logbooks in TURF management. We have shown that the framework could be used as a way to help stakeholders understand, especially to find the possible weak points of local stewardship actions in the context of small-scale fisheries management.

Our analysis shows that demonstrating, explaining, and providing the material benefits of a logbook to those who are doing so is crucial. It would substantially increase the capacity and, most importantly, the motivation of fishers. This study shows that it is critical to ensure that fishers understand what a TURF is conceptually: a decentralized form of management in which rights (and duties) are delegated to local users. On the other hand, it is crucial that the concept of TURFs consider the particular features of the context where they are applied in their concrete design. Authorities' recognition and strong support were identified as critical success factors. This amalgamation of perspectives would lead to fishers creating an agency, raising their awareness, and a better understanding of both the rights and responsibilities that come along with a TURF. Eventually, they would stop asking first about the role of the authority and their active and, if possible, financial contributions. More actions, interpreted as stewardship, can emerge from the various actors involved.

CRediT authorship contribution statement

Rifki Furqan: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Software, Validation, Visualization, Writing – original draft, Writing – review & editing.
Achim Schlüter: Conceptualization, Funding acquisition, Investigation, Methodology, Supervision, Validation, Writing – review & editing.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

Rifki Furqan reports financial support was provided by Deutscher Akademischer Austauschdienst (DAAD), Germany. Rifki Furqan reports financial support was provided by Leibniz-Zentrum für Marine Tropenforschung (ZMT) GmbH, Germany.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ocecoaman.2024.107114>.

References

- Abdurrahim, A.Y., Adhuri, D.S., Ross, H., Phelan, A., 2022. Community champions of ecosystem services: the role of local agency in protecting Indonesian coral reefs. *Front. Ecol. Evol.* 10, 868218 <https://doi.org/10.3389/fevo.2022.868218>.
- Aceves-Bueno, E., Miller, S.J., Cornejo-Donoso, J., Gaines, S.D., 2020. Cooperation as a solution to shared resources in territorial use rights in fisheries. *Ecol. Appl.* 30 <https://doi.org/10.1002/eap.2022>.
- Afflerbach, J.C., Lester, S.E., Dougherty, D.T., Poon, S.E., 2014. A global survey of "TURF-reserves". *Territorial Use Rights for Fisheries coupled with marine reserves*. *Glob. Ecol. Conserv.* 2, 97–106. <https://doi.org/10.1016/j.gecco.2014.08.001>.
- Aswani, S., 2017. Customary management as TURFs: social challenges and opportunities. *Bull. Mar. Sci.* 93, 3–12. <https://doi.org/10.5343/bms.2015.1084>.
- Bennett, N.J., Di Franco, A., Calò, A., Nethery, E., Niccolini, F., Milazzo, M., Guidetti, P., 2019. Local support for conservation is associated with perceptions of good governance, social impacts, and ecological effectiveness. *Conserv. Lett.* 12, e12640 <https://doi.org/10.1111/conl.12640>.
- 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. *Environ. Manag.* 61, 597–614. <https://doi.org/10.1007/s00267-017-0993-2>.
- Brown, K., Westaway, E., 2011. Agency, capacity, and resilience to environmental change: lessons from human development, well-being, and disasters. *Annu. Rev. Environ. Resour.* 36, 321–342. <https://doi.org/10.1146/annurev-environ-052610-092905>.
- Bryman, A., 2012. *Social Research Methods*, fourth ed. Oxford University Press, Oxford; New York.
- Burkitt, I., 2016. Relational agency: relational sociology, agency and interaction. *Eur. J. Soc. Theor.* 19, 322–339. <https://doi.org/10.1177/1368431015591426>.
- Cardenas, J.C., Stranlund, J., Willis, C., 2000. Local environmental control and institutional crowding-out. *World Dev.* 28, 1719–1733. [https://doi.org/10.1016/S0305-750X\(00\)00055-3](https://doi.org/10.1016/S0305-750X(00)00055-3).
- Cetas, E.R., Yasué, M., 2017. A systematic review of motivational values and conservation success in and around protected areas: cetus & Yasué. *Conserv. Biol.* 31, 203–212. <https://doi.org/10.1111/cobi.12770>.
- Chapin, F.S., Carpenter, S.R., Kofinas, G.P., Folke, C., Abel, N., Clark, W.C., Olsson, P., Smith, D.M.S., Walker, B., Young, O.R., Berkes, F., Biggs, R., Grove, J.M., Naylor, R. L., Pinkerton, E., Steffen, W., Swanson, F.J., 2010. Ecosystem stewardship: sustainability strategies for a rapidly changing planet. *Trends Ecol. Evol.* 25, 241–249. <https://doi.org/10.1016/j.tree.2009.10.008>.
- Chapin Iii, F.S., Sommerkorn, M., Robards, M.D., Hillmer-Pegram, K., 2015. Ecosystem stewardship: a resilience framework for arctic conservation. *Global Environ. Change* 34, 207–217. <https://doi.org/10.1016/j.gloenvcha.2015.07.003>.
- Cockburn, J., Cundill, G., Shackleton, S., Rouget, M., Zwinkels, M., Cornelius S.Ancia, Metcalfe, L., Van Den Broeck, D., 2019. Collaborative stewardship in multifunctional landscapes: toward relational, pluralistic approaches. *Ecol. Soc.* 24, 32 <https://doi.org/10.5751/ES-11085-240432>.
- Doerr, A., Cardenas, S., Jardine, S., Yoon, H., Bucaram, S., Sanchirico, J.N., 2013. Territorial use rights in fisheries (TURFs). In: *Encyclopedia of Energy, Natural Resource, and Environmental Economics*. Elsevier, pp. 232–242. <https://doi.org/10.1016/B978-0-12-375067-9.00047-4>.
- Domondon, P.R., Tirona, R.S., Box, S., Pomeroy, R., 2021. Pathways to establishing managed access and networks of reserves. *Mar. Pol.* 130, 104580 <https://doi.org/10.1016/j.marpol.2021.104580>.
- Filip, A.J., 2020. Local institutions of culture as urban stewards: in pursuit of hybrid governance in Warsaw, Poland. *Ecol. Soc.* 25, 7 <https://doi.org/10.5751/ES-11512-250207>.
- Fowler, B.T., Rieder, E., Jackson, S., Shipley, N.J., Lackey, Q., Hill, B., 2020. Harnessing a multifaceted stewardship framework: a bare necessity for parks and protected areas. *Parks Steward. Forum* 36. <https://doi.org/10.5070/P536349862>.
- Franco-Meléndez, M., Cubillos, L.A., Tam, J., Hernández Aguado, S., Quiñones, R.A., Hernández, A., 2021. Territorial Use Rights for Fisheries (TURF) in central-southern Chile: their sustainability status from a transdisciplinary holistic approach. *Mar. Pol.* 132, 104644 <https://doi.org/10.1016/j.marpol.2021.104644>.
- Froese, R., 2004. Keep it simple: three indicators to deal with overfishing. *Fish Fish.* 5, 86–91. <https://doi.org/10.1111/j.1467-2979.2004.00144.x>.
- Fulton, E.A., Smith, A.D.M., Smith, D.C., Van Putten, I.E., 2011. Human behaviour: the key source of uncertainty in fisheries management: human behaviour and fisheries management. *Fish Fish.* 12, 2–17. <https://doi.org/10.1111/j.1467-2979.2010.00371.x>.
- Furqan, R., Schlüter, A., 2023. Drawing on the project initiators' perspectives to evaluate TURF implementation in the Kepulauan Seribu Marine National Park: an online Q methodology study. *Front. Mar. Sci.* 10, 1229096 <https://doi.org/10.3389/fmars.2023.1229096>.
- Gallier, C., Langbein, J., Vance, C., 2016. That's my TURF: an experimental analysis of territorial use rights for fisheries in Indonesia. *SSRN Electron. J.* <https://doi.org/10.2139/ssrn.2798616>.
- Gelcich, S., Fernández, M., Godoy, N., Canepa, A., Prado, L., Castilla, J.C., 2012. Territorial user rights for fisheries as ancillary instruments for marine coastal conservation in Chile. *Conserv. Biol.* 26, 1005–1015. <https://doi.org/10.1111/j.1523-1739.2012.01928.x>.
- Gelcich, S., Martínez-Harms, M.J., Tapia-Lewin, S., Vasquez-Lavin, F., Ruano-Chamorro, C., 2019. Comanagement of small-scale fisheries and ecosystem services. *Conserv. Lett.* 12 <https://doi.org/10.1111/conl.12637>.
- Gilmour, P.W., Day, R.W., Dwyer, P.D., 2012. Using private rights to manage natural resources: is stewardship linked to ownership? *Ecol. Soc.* 17, 1 <https://doi.org/10.5751/ES-04770-170301>.
- Halik, A., Verweij, M., Schlüter, A., 2022. Deliberating coral reef protection – cultural Theory tested. *Mar. Pol.* 139, 105036 <https://doi.org/10.1016/j.marpol.2022.105036>.
- Hardin, G., 1968. The Tragedy of the Commons: the population problem has no technical solution; it requires a fundamental extension in morality. *Science* 162, 1243–1248. <https://doi.org/10.1126/science.162.3859.1243>.
- Hilborn, R., 2007. Managing fisheries is managing people: what has been learned? *Fish Fish.* 8, 285–296. <https://doi.org/10.1111/j.1467-2979.2007.00263.2.x>.
- Khan, A.S., Neis, B., 2010. The rebuilding imperative in fisheries: clumsy solutions for a wicked problem? *Prog. Oceanogr.* 87, 347–356. <https://doi.org/10.1016/j.pocean.2010.09.012>.
- Masterson, V.A., et al., 2019. Revisiting the relationships between human well-being and ecosystems in dynamic social-ecological systems: Implications for stewardship and development. *Global Sustain.* 2 <https://doi.org/10.1017/sus.2019.5>.
- Nguyen Thi Quynh, C., Schilizzi, S., Hailu, A., Iftekhar, S., 2017. Territorial use rights for fisheries (TURFs): state of the art and the road ahead. *Mar. Pol.* 75, 41–52. <https://doi.org/10.1016/j.marpol.2016.10.004>.
- Ostrom, E., 1990. *Governing the Commons: the Evolution of Institutions for Collective Action*, first ed. Cambridge University Press. <https://doi.org/10.1017/CBO9780511807763>.
- Oyanedel, R., Gelcich, S., Milner-Gulland, E.J., 2020a. A synthesis of (non-)compliance theories with applications to small-scale fisheries research and practice. *Fish Fish.* 21, 1120–1134. <https://doi.org/10.1111/faf.12490>.
- Oyanedel, R., Gelcich, S., Milner-Gulland, E.J., 2020b. Motivations for (non-)compliance with conservation rules by small-scale resource users. *Conserv. Lett.* 13 <https://doi.org/10.1111/conl.12725>.
- Peçanha Enqvist, J., West, S., Masterson, V.A., Haider, L.J., Svedin, U., Tengö, M., 2018. Stewardship as a boundary object for sustainability research: linking care, knowledge and agency. *Landsc. Urban Plann.* 179, 17–37. <https://doi.org/10.1016/j.landurbplan.2018.07.005>.
- Retnoningtyas, H., Yulianto, I., Soemodinoto, A., Herdiana, Y., Kartawijaya, T., Natsir, M., Haryanto, J.T., 2021. Stakeholder participation in management planning for grouper and snapper fisheries in West Nusa Tenggara Province, Indonesia. *Mar. Pol.* 128, 104452 <https://doi.org/10.1016/j.marpol.2021.104452>.
- Rode, J., Gómez-Baggethun, E., Krause, T., 2015. Motivation crowding by economic incentives in conservation policy: a review of the empirical evidence. *Ecol. Econ.* 117, 270–282. <https://doi.org/10.1016/j.ecolecon.2014.11.019>.
- Ross, H., Adhuri, D.S., Abdurrahim, A.Y., Phelan, A., 2019. Opportunities in community-government cooperation to maintain marine ecosystem services in the Asia-Pacific and Oceania. *Ecosyst. Serv.* 38, 100969 <https://doi.org/10.1016/j.ecoser.2019.100969>.
- Ryan, R.M., Deci, E.L., 2000. Intrinsic and extrinsic motivations: classic definitions and new directions. *Contemp. Educ. Psychol.* 25, 54–67. <https://doi.org/10.1006/ceps.1999.1020>.
- Sari, I., Ichsan, M., White, A., Raup, S.A., Wisudo, S.H., 2021. Monitoring small-scale fisheries catches in Indonesia through a fishing logbook system: challenges and strategies. *Mar. Pol.* 134, 104770 <https://doi.org/10.1016/j.marpol.2021.104770>.
- Schlüter, A., Wise, S., Schwerdtner Máñez, K., De Moraes, G., Glaser, M., 2013. Institutional change, sustainability and the sea. *Sustainability* 5, 5373–5390. <https://doi.org/10.3390/su5125373>.
- Turnbull, J.W., Clark, G.F., Johnston, E.L., 2021. Conceptualising sustainability through environmental stewardship and virtuous cycles—a new empirically-grounded model. *Sustain. Sci.* 16, 1475–1487. <https://doi.org/10.1007/s11625-021-00981-4>.
- Villaseñor-Derbez, J.C., Aceves-Bueno, E., Fulton, S., Suarez, A., Hernández-Velasco, A., Torre, J., Micheli, F., 2019. An interdisciplinary evaluation of community-based TURF-reserves. *PLoS One* 14, e0221660. <https://doi.org/10.1371/journal.pone.0221660>.
- Von Heland, F., Clifton, J., 2015. Whose threat counts? Conservation narratives in the wakatobi national park, Indonesia. *Conserv. Soc.* 13, 154. <https://doi.org/10.4103/0972-4923.164194>.

Wade, E., Spalding, A.K., Biedenweg, K., 2019. Integrating property rights into fisheries management: the case of Belize's journey to managed access. *Mar. Pol.* 108, 103631 <https://doi.org/10.1016/j.marpol.2019.103631>.

Wessels, N., Sitas, N., O'Farrell, P., Esler, K.J., 2021. Assessing the outcomes of implementing natural open space plans in a Global South city. *Landsch. Urban Plann.* 216, 104237 <https://doi.org/10.1016/j.landurbplan.2021.104237>.

Zabala, A., 2015. Motivations and incentives for pro-environmental behaviour: the case of silvopasture adoption in the tropical forest frontier. <https://doi.org/10.17863/CAM.16432>.