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Perceptions towards governance of billfish resource use: The lens of artisanal fishers in Kenya

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Multiple fisher groups target billfish species, each with different motivations and experiences, which can influence the effectiveness and sustainability of governance approaches. However, limited studies underscore the perceptions of billfish resource users in defining and implementing governance in the Western Indian Ocean region. We conducted 211 semi-structured qualitative interviews between December 2020 and September 2021, to explore how artisanal fishers perceive the performance and sustainability of governance approaches in Kenya, with a focus on billfish. Our findings show that artisanal fishers have adequate knowledge of fishing laws and regulations, as well as governing institutions and their performance. Further, artisanal fishers had a positive attitude and support for fishing rules, managing institutions, and effectiveness of governance intervention. Specifically, the fishers rated Beach Management Units (BMUs) as highly effective in implementing fisheries rules, indicating the involvement of fishers in co-management of fisheries and tendency for governance success and sustainability. This highlights the need to strengthen and support BMUs as an effective governance tool in the co-management of fisheries. We draw attention to our first-time study of the contribution of artisanal billfish fishers to governance of shared fisheries resources. We show that involvement of resource users promotes a bottom-up approach to the co-management of billfish which compliments the current regional and national efforts that have largely focused on commercial fisheries. Our research adds to the scientific body of knowledge on the importance of perceptions in the formation of natural resource governance interventions at varying scales, especially for transboundary species in data-poor areas.

Introduction

Declining fish catches and an increasing number of people joining artisanal fisheries coupled with current global challenges lead to potential fisheries crises (Hendrix and Glaser, 2011; Kadagi et al., 2020). The application of governance is therefore necessary to secure sustainability of fisheries for posterity. 'Governance is the whole body of public as well as private interactions taken to solve problems and create societal opportunities. It includes the formulation of principles guiding those interactions and care for institutions that enable them' (Kooiman and Bavinck, 2005). In this study, we define governance as the structures and processes that determine how decisions are made, power is exercised, and responsibilities are assigned. We explore the perceptions of artisanal fishers towards the governance of billfish.

Fisheries governance has increasingly focused on co-management to mitigate user conflicts in shared resources (Chuenpagdee and Jentoft, 2009; Hauzer et al., 2013; McClanahan & Abunge, 2020). The operationalization of co-management has paved the way for a varying degree of power-sharing and the involvement of artisanal fishers in decision-making (Okafor-Yarwood et al., 2020). Studies indicate that effective fisheries governance should be inclusive of voices and experiences of multiple actors across different scales (Bennett et al., 2019). Artisanal fishers' perceptions can be crucial in assessing the performance, legitimacy, and sustainability of governance approaches (Kadagi et al., 2020; Murunga et al., 2021; Bennett et al., 2021).

Multiple frameworks, such as interactive governance, the social-ecological systems approach, or co-management, acknowledge the importance of understanding and promoting support for and participation in management actions by local resource users (Beyerl et al., 2016; Bennett, 2016, Chuenpagdee and Jentoft, 2009). For example, in Kenya, fisheries are governed by formal co-management institutions known as Beach Management Units (BMUs) which attempt to integrate various fisheries actors (i.e., fishers, traders, and processors) into decision-making and policy processes, while also connecting local communities and government (Murunga et al., 2021). Successful collective action is not always so simple, support is heavily dependent on what people think about and how they experience the system to be governed and the governing system (Gehrig et al., 2018). Understanding resource users' perspectives in socio-ecological systems contributes to projecting likely actions that lead to the success or failure of governance approaches (Silva and Lopes, 2015). Resource users' perceptions entail understanding the variables that act on users and their likely responses in an effort to determine the implications of management strategies (Cinner et al., 2011; Silva and Lopes, 2015; Lau et al., 2018). Social demographics play a

crucial role in the formation of attitudes, understandings, and world views (Gehrig et al., 2018). For instance, the age of a fisher influences perception about conservation and management, where older fishers tend to be more resistant to changing habits (Bennett et al., 2016; Marshall and Marshall, 2007).

In environmental psychology literature, intentions which are based on attitudes and awareness towards environmental processes may lead to pro-environmental behavior. At the same time, sustainability and conservation are greatly influenced by perceptions (Bennett, 2016; Beyerl et al., 2016; Gehrig et al., 2018). Furthermore, perceptions of resource users regarding the legitimacy of management measures and their social and ecological consequences affect acceptance and, ultimately, compliance behavior (Silva and Lopes, 2015). Consequently, perceptions are an indispensable form of evidence that is useful at all stages of conservation from planning and implementation to ongoing management (Bennett, 2016).

This first-time study seeks to provide a baseline of information on perceptions of artisanal billfish fishers on the governance of billfish in Kenya. The objectives of this paper are: i) to document the socio-demographic factors influencing perceptions of the artisanal billfish fishers on governance; ii) to examine how perceptions of artisanal billfish fishers influence the performance of governance and sustainability of the governance approaches. The integration of perceptions of resource users is essential in buttressing the success and legitimacy of governance institutions. Subsequently, the perceived suitability and acceptance of institutions by resource users and the general public are integral to the success of governance (DeCaro and Stokes, 2013; Turner et al., 2014). This paper highlights how fishers' perceptions contribute to compliance with fishing laws and regulations, thus minimizing conflict amongst resource users.
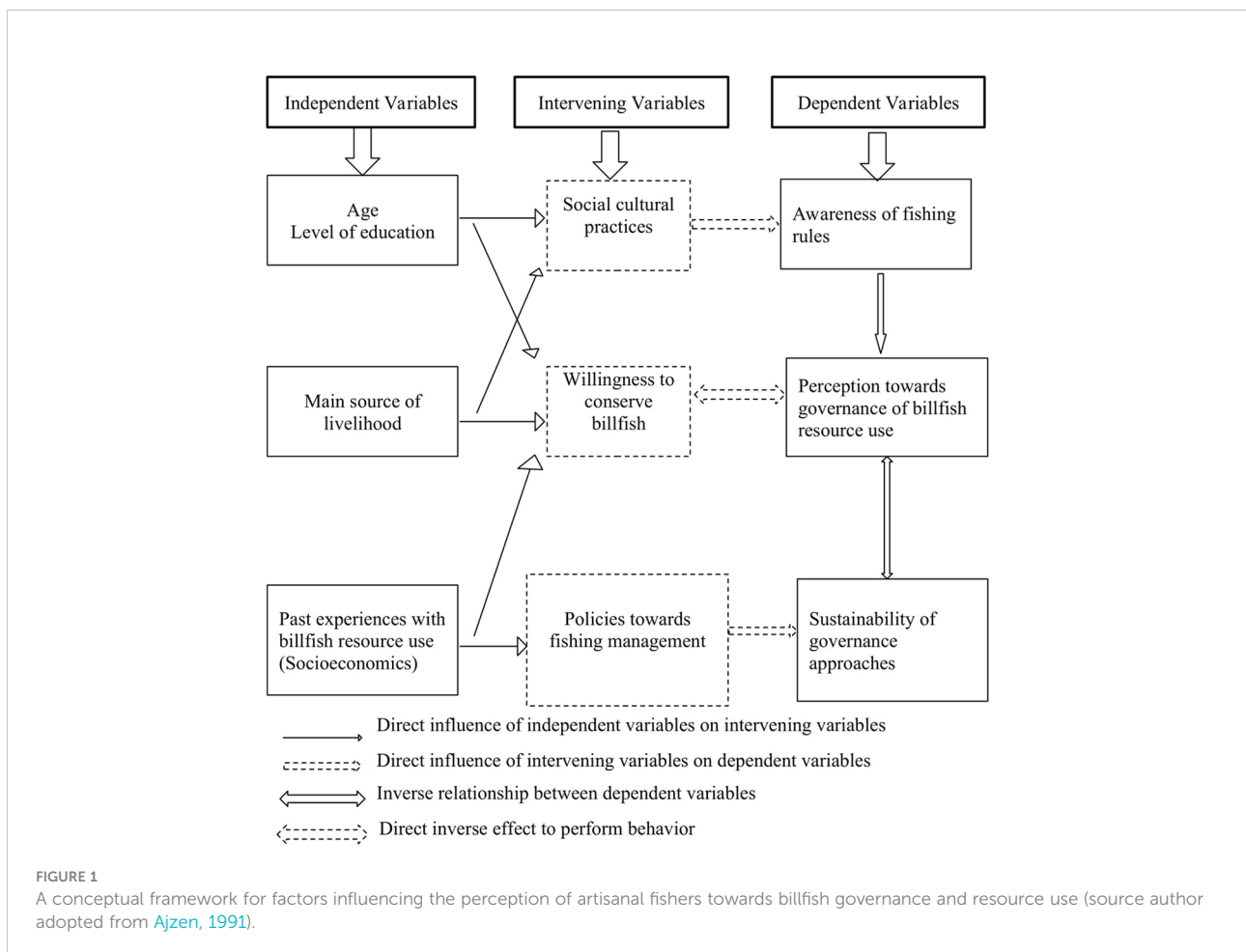
In the Western Indian Ocean billfish fishery is conducted by artisanal, recreational, and industrial fishers for socio-cultural and economic benefits (Kadagi et al., 2020; Kadagi et al., 2021; Sharma et al., 2018). Billfish species comprise the families *Istiophoridae* and *Xiphiidae* (Sharma et al., 2018; Pepperell et al., 2017), and populations of billfish species have continued to decline with several species considered over-exploited (Sharma et al., 2018). In the Western Indian Ocean (WIO), six billfish species have been documented. These include swordfish (*Xiphias gladius*), black marlin (Makaira indica), blue marlin (*Makaira nigricans*), striped marlin (*Kajikia audax*), short bill spearfish (*Tetrapturus angustirostris*) and Indo-Pacific sailfish (*Istiophorus platypterus*) (Mueni et al., 2019; Pepperell et al., 2017; Kadagi et al., 2011). Artisanal billfish fishers use diverse gears including gillnets, long lines, hand lines, and trolling lines. The open-access nature of billfish fishery and interconnected resource user groups complicates governance (Van der Elst, 2003; Gjerde et al., 2013; Kadagi et al., 2021).

The attitudes and motivations for fishing billfish vary depending on the user groups as either recreational, commercial, conservation or consumptive use (Brinson et al., 2006; Johnson & Griffith, 2010). This variation in motivation and attitudes toward billfish resource use has the potential to cause conflict among resource users. Therefore, it is important to examine perceptions and lived experiences in order to identify and prioritize governance interventions relevant to resource user groups (Salas and Gaertner, 2004; Rocliffe et al., 2014; Murunga et al., 2021).

Few studies have examined motivations and perceptions for targeting billfishes in developing nations in the WIO region (Kadagi et al., 2020) and in West Africa (Brinson et al., 2006). According to Kadagi et al. (2020), recreational and artisanal fishers have different incentives for targeting billfish. On the one hand, artisanal fishers are motivated by the high yield produced by large billfish, which earns them a high price/income. On the other hand, recreational fishers are motivated by the thrill of catching a "grand slam" or "fantasy slam" (Kadagi et al., 2020). In West Africa, Brinson et al. (2006) reported that billfish resource users have different motives, influencing the relative weight given to management performance. According to

Brinson et al. (2006), commercial fishers emphasize yield and profit measures; subsistence fishers seek to harvest enough protein; non-consumptive users seek exclusive access to specific sites while conservationists seek to improve a site's "intrinsic value" or the conservation value of a species or stock.

The study is built on a conceptual framework (Figure 1) that is guided by the theory of planned behavior (Ajzen, 1991). Artisanal fishers' beliefs, attitudes, values, norms, preferences, and motivations are seen as determinants of behaviors, responses, and level of support for the governance approaches and the sustainability of these approaches. The independent factors such as the socio demographics, main source of livelihood and past experiences may be linked to either positive or negative attitudes towards billfish resource use. These directly influence the intervening variables which in turn affect the outcome of the direct variables. The intervening variables like social cultural practises and willingness to conserve billfish and policies towards fishing management dictate resource users' perceptions and affect the intention to perform particular behavior. This is demonstrated in how they respond to the governance approach and their support towards

FIGURE 1
A conceptual framework for factors influencing the perception of artisanal fishers towards billfish governance and resource use (source author adopted from Ajzen, 1991).

the success and sustainability of these approaches. In this study, perceptions refer to the way an individual observes, understands, interprets, and evaluates a referent object, action, experience, individual, policy, or outcome. A myriad of contextual factors (e.g., culture, politics, socioeconomics, livelihoods, past experiences of similar events, as well as individual and collective attributes) mediate and influence perceptions. These include values, norms, beliefs, preferences, knowledge, and motivations (Bennett, 2016).
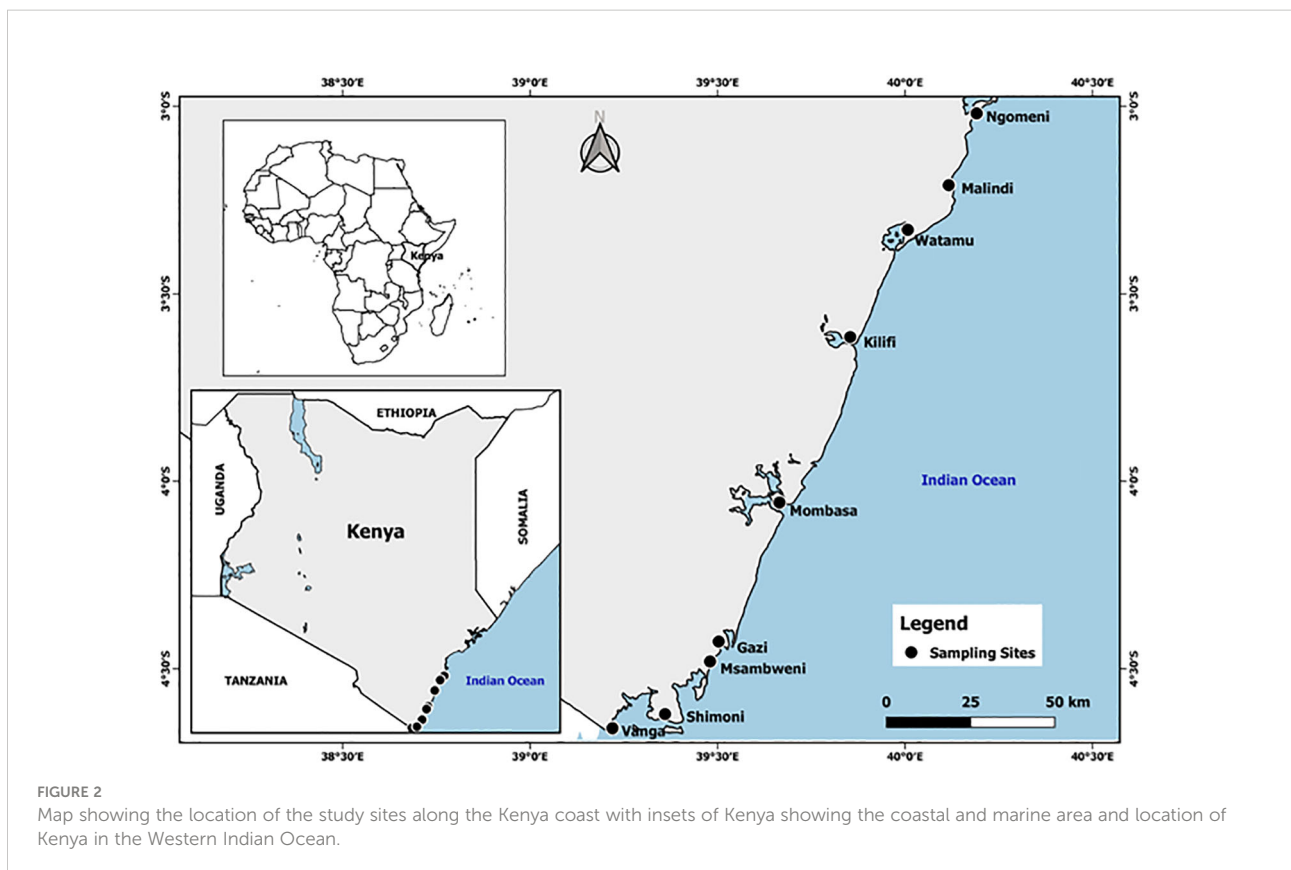
Information on perceptions of resource user groups on the governance of species such as billfish is inadequate and often incomplete in many regions across the globe. This information is important for planning approaches to reduce and manage conflict among resource users (Silva and Lopes, 2015). Understanding the awareness, attitudes, and perceptions of resource users is essential for success in management and governance. It defines their compliance with the management and governance rules, how they cope with the governing bodies and institutions, their view of the value of the billfish resource, and the level at which they are able to cope with the changes in the resource use over time (Bennett, 2016). Furthermore, fishers' perceptions of the status of their resources provide insight into the attitudes and motivations

behind their behavior, including decisions on fishing regulations (Hauzer et al., 2013). Hence, documenting the socio-demographic factors influencing perceptions on governance; and how perceptions influence the performance of governance and sustainability of the governance approaches facilitates broad-based support for management, securing billfish populations for the benefit of ecosystems and future generations.

Materials and methods

Study site

The study was carried out in 9 study sites along the Kenyan coast; Ngomeni, Malindi, Watamu, and Kilifi central fish landing sites in Kilifi County in the North; Mombasa Old Port fish landing site in Mombasa County; Gazi, Msambweni, Shimoni, and Vanga fish landing sites in Kwale County in the South (Figure 2) between December 2020 and September 2021. These sites have a significant number of artisanal longline, handline, and gillnet fisheries that catch a range of large pelagic species including billfish. They have also been reported as major billfish

FIGURE 2
Map showing the location of the study sites along the Kenya coast with insets of Kenya showing the coastal and marine area and location of Kenya in the Western Indian Ocean.

landing sites according to the marine frame survey (Government of Kenya, 2016).

Sampling method and data collection

Respondent Driven Sampling (RDS) method was used to identify the participants in the study. This is a non-random sampling strategy that is employed when there are no precise lists of members of the accessible population(s) of interest, as was the case in this study (Hauzer et al., 2013; Young et al., 2016). Probability samples require a sampling frame, which is a list of the members of the group to be sampled. However, such listings are frequently either incomplete or non-existent (Kadagi et al., 2020). To address potential bias, this study relied on highly knowledgeable individuals of billfish species fishers' population as the key informants for the purpose of identification of seeds, the first tier, or wave of respondents. Subsequently, each participant in the first tier was requested to further identify other potential respondents, making the second tier. This second tier then identified the third tier and so forth. Hypothetically, the RDS recruitment process produces long "chains" made up of several tiers. As the chains lengthen, the composition of the sample size reaches a point of equilibrium, where no new participants/information is given, an indication that the final sample is not biased by the purposeful sampling of the key informants (seeds) (Malekinejad et al., 2008).

Semi-structured interviews with open and close-ended questions were used to gain insight into the motivations and attitudes of artisanal billfish fishers on management and governance of billfish resource use. Respondents discussed their experiences during semi-structured interviews, which allowed for the emergence of new topics for analysis (Baker and Constant, 2020). Furthermore, semi-structured interviews allowed respondents to share more in-depth information, which improved data quality (Kadagi et al., 2020).

The questionnaire covered various topics including fishers' demographics, motivations for fishing billfish, and views on challenges facing the billfish fishery. To assess the level of awareness of the fishing rules, participants were asked to list the fishing rules they knew. To gauge their attitudes, they were asked if they disagreed with any of the rules and probed to give reasons if they disagreed. To assess their level of awareness of governing institutions/bodies, participants were asked to identify institutions or groups of people that control rules about fishing activities in order to support healthy stocks. Additionally, a five-point Likert scale (1=very effective, 2=effective, 3=ineffective, 4=very ineffective, 5=non-existent), was used to gauge the effectiveness of the institutions and/or groups of people responsible for management and fishing rules. This also incorporated comparison of the periods when a fisher started fishing, the last five years, the present, and future five years. Attitudes towards resource management are likely to be

influenced by a fisher's perceptions about the condition of the relevant resources. Therefore, participants were asked to describe any changes in the catch from the main target gear and the number of fishers targeting billfish over the last five years. This was gauged at two-level, increased or decreased, and the respective reasons.

Data analysis

The data was analyzed using descriptive statistics to determine the frequencies, percentages, and distribution. Pearson Chi-square was used to test the relationships between the socio-demographic characteristics and perceptions of the resource users. Thematic analysis (Vohra, 2014) was used to categorize the themes of the rules identified as governing fishing activities and perceptions of the fishers towards the management and governance. This approach entailed "careful reading and re-reading of the data obtained through the questionnaire" to identify themes (Pope, 2001). Further, text mining was used to understand the patterns of the fishers' responses within the data, where emerging themes became the categories for analyses. The coding process relied on deductive reasoning based on pre-existing information on fisheries resource use. Data was analysed using R and SPSS (IBM SPSS Statistics for Windows, Version 25.0) statistical programs.

Ethical statement

All procedures performed in this study were in accordance with the ethical standards of the Office of Research Ethics at Pwani University in Kilifi, Kenya, which approved the research project. Informed consent was obtained from all participants involved in the study. No personal information of the participants or detailed data that could identify them was recorded.

Results

Socio-demographic characteristics

A total of 211 respondents were interviewed, all male (100%). Majority of fishers were in the age category of 25 to 40 years accounting for 46% of the total number of respondents. Fishers aged between 40 to 55 years accounted for 38.4%, and those below 25 years and above 55 years of age accounted for 8.1% and 6.6% of fishers respectively. The average number of fishing years was 17.8, with the oldest fisher having 70 years of experience, whereas the least experienced fisher had 3 months. Of the participants interviewed 42.2%, had madrassa[1] training as their highest level of education. Tables 1A, B show the social

TABLE 1A School attendance among artisanal fishers in the nine study sites along the Kenyan coast.

Education Level	Gazi	Klf	Mld	Msa	Msamb	Ngome	Shimo	Vga	Wtm	Total Percent
n	19	25	26	10	6	61	21	26	17	211
None									5.9%	5.9%
Madrassa	52.6%	20.0%	57.7%	40.0%	33.3%	55.7%	42.9%	23.1%	23.5%	38.8%
Primary School	36.8%	64.0%	23.1%	50.0%	66.7%	36.1%	33.3%	61.5%	17.6%	43.2%
High School	10.5%	16.0%	19.2%	10.0%		6.6%	19.0%	15.4%	52.9%	18.7%
Technical Training						1.6%	4.8%			3.2%

TABLE 1B Age categories among the artisanal fishers in the nine study sites along the Kenyan coast[2].

Age Group(Years)	Gazi	Klf	Mld	Msa	Msamb	Ngome	Shimo	Vanga	Wtm	Total Percent
n	19	25	25	10	6	60	21	26	17	209
Below 25		16.0%	20.0%	10.0%		6.7%		11.5%		12.8%
25 to 40	57.9%	60.0%	48.0%	60.0%	50.0%	43.3%	42.9%	7.7%	76.5%	49.6%
40 to 55	36.8%	24.0%	24.0%	20.0%	50.0%	43.3%	33.3%	76.9%	23.5%	36.9%
55 and Above	5.3%		8.0%	10.0%		6.7%	23.8%	3.8%		9.6%

demographic characteristics among artisanal fishers across the study sites including education level and age categories respectively. Pearson's chi-square test of independence found the age categories and level of education to be independent (X^2 = 228.33, df = 152, p <0.05).

Awareness of fishing rules relevant for billfish fishing

Participants were asked to list the fisheries management rules that they were aware of. Two key categories were identified from the list (i) management restrictions (such as gear, species, and fishing zones) and (ii) permits and licenses (e.g. fishing license, Beach Management Unit (BMU) registration, and Coxswain permit). Other categories included fisher safety at sea e.g. the fishers reported that it was a requirement to have protective gear during a fishing trip.

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1   Madrassa is a form of education where the focus is Islamic religion and literacy

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2   Study site names:Klf - Kilifi central, Mld - Malindi, Msa - Mombasa, Msamb - Msambweni, Ngome - Ngomeni. Shimo - Shimoni, Wtm - Watamu

Support for fishing management from artisanal billfish resource users

Table 2. shows participants' responses when asked if fishing activities should be managed. Overall, 86.5% of the respondents agreed that fishing should be managed, while 13.5% disagreed and stated that fishing should not be managed.
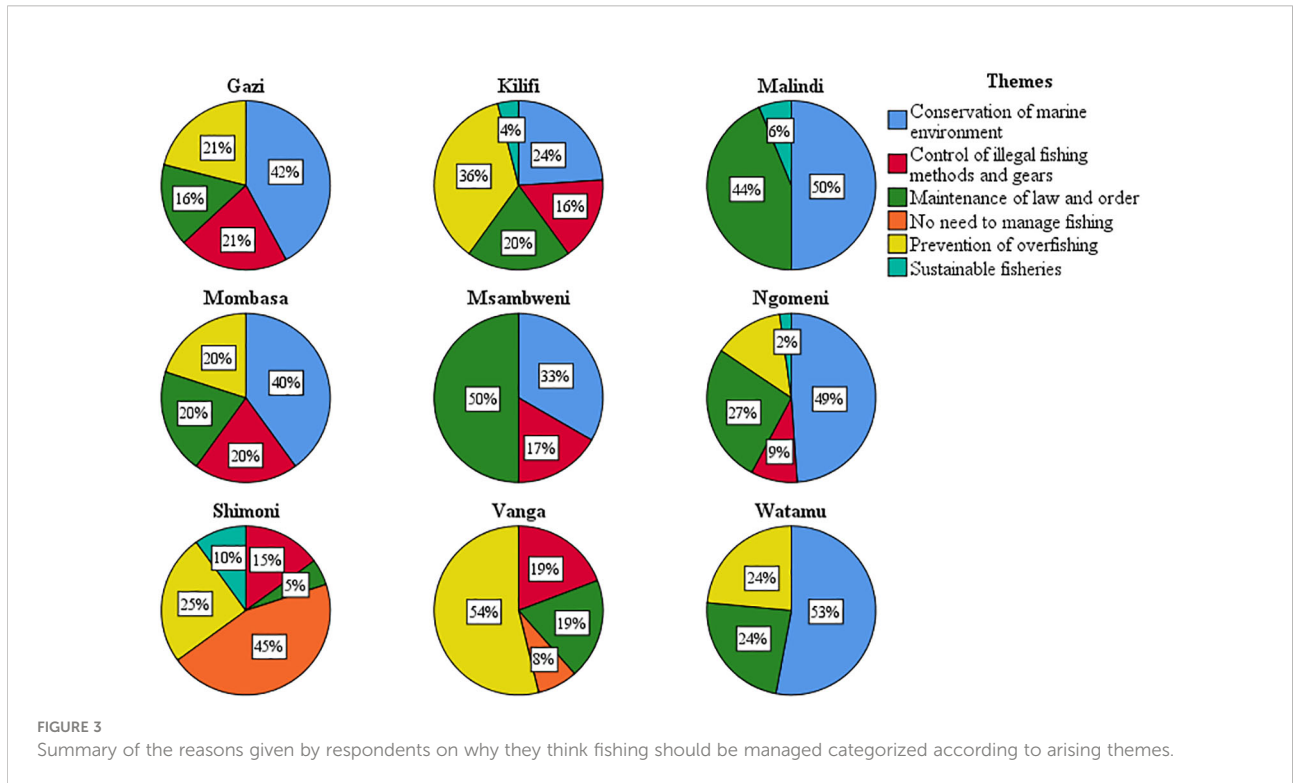
Figure 3 presents reasons given by respondents across the sites categorized by themes on why they think fishing should be managed. The need to manage fishing activities was based on the following themes: i) conservation of the marine environment (31.7%), ii) prevention of overfishing (23.7%), iii) ensuring that law and order are maintained among the fishers (23.1%), iv) controlling the use of illegal fishing methods and gear (12.4%), and v) ensuring the sustainability of fisheries resources (6.5%) (Figure 3). Respondents in Vanga and Shimoni (6.5%) did not support the idea of managing fishing stating that there is no need to manage fishing.

Perception towards changes in the billfish resource

Perceptions of the changes in billfish catches and the number of participants in the billfish fishery varied widely over the last five years. Overall, a decline in the catch was reported. More than half of the respondents (55%) reported a 40 to 60% decrease in their catch using the main gear employed. Another 38% reported

TABLE 2 Fishers' response on whether fishing activities should be managed.

Should fishing be managed?	No of responses	% Responses
Yes	179	84.8
No	28	13.3
No response	4	1.9

FIGURE 3
Summary of the reasons given by respondents on why they think fishing should be managed categorized according to arising themes.

FIGURE 4
Variations in fish catch over the last five years.

an increase of 40 to 60% of their catch (Figure 4). Figure 5 shows the changes in the number of fishers targeting billfish over the last five years. About 49% of the respondents noted that fishers targeting billfish had increased by a 40 to 60% margin while 56% perceived that the number had decreased by the same margin of 40 to 60% (Figure 5).

Acceptance of fishing rules and regulations by artisanal billfish fishers

Majority (66.1%) of the fishers supported the development and implementation of fishing rules and regulations whereas some (33.9%) disagreed. ($\chi^2 = 8.63$, df=4, p= 0.071; $\chi^2 = 5.19$, df=3, p=0.158 respectively). We observed a correlation between the level of education and age categories as well as the acceptance of the fishing rules and regulations. However, influence towards the support of the fishing regulation was not significant

The fishers highlighted the following broad themes as reasons for disagreeing with fishing rules: i) unfair competition in resource utilization (28.8%), ii) restriction of freedom to fish (23.8%), iii) high costs of permits and licenses (17.5%), iv) unfair distribution of resources (17.5%), and v) limitation on livelihoods (7.5%). Other emerging themes included: i) the natural replenishment of fish stock (2.5%), ii) encouragement of illegal fishing (1.3%), and iii) the high cost of protective gear (1.3%). Figure 6 shows the distribution of the reasons across the study sites.

Effectiveness of groups responsible for fishing rules

Over the years fisheries management has evolved, from centralized system to collaborative system. Participants were asked to rate the effectiveness of the institutions and groups responsible for implementing fishing rules and regulations using a five-point Likert scale (1=very effective, 2=effective, 3=ineffective, 4=very ineffective, 5= non-existent). The participants compared the effectiveness over time: when they started fishing, five years ago, the present, and five years in the future. The results showed that the effectiveness of the groups has improved over time.

Figure 7 shows the overall rating of the effectiveness of institutions and groups responsible for implementing fishing rules and regulations over time. When the majority of respondents started fishing, they reported that the institutions were ineffective or non-existent. However, in the present day, institutions were rated very effective (51%), and highly ineffective (88%) during the period most fishers started fishing.

Figure 8 shows the rating of the effectiveness of individual institutions implementing and enforcing fishery management

rules and regulations. Beach Management Unit (BMU) was the highest rated in the individual group rating compared to other institutions[3].

Discussion

We document (i) the socio-demographic factors influencing perceptions of the artisanal billfish fishers on governance; (ii) how perceptions of artisanal billfish fishers influence the performance of governance and (iii) how perceptions impact the sustainability of the governance approaches. The outcome of the study contributes to the ongoing discussion on good governance for effective natural resource management by providing an understanding of fishers' perceptions, which is paramount in the successful application of governance approaches. Furthermore, individuals' and groups' attitudes and functions toward the resources they exploit, as well as their perceptions of the rules that control their activities, assist in identifying and resolving conservation issues (Cardona and Morales-Nin, 2013; Turner et al., 2014).

Social demographic variables such as age and education have been found to have predictive power for perceptions among fishers. We found a correlation between age, education, and the support for billfish resource use governance approaches. Older fishers had a higher tendency to support conservation of the marine environment and prevention of overfishing. Previous studies have demonstrated that older fishers are more worried about the future of the fishing grounds and more likely to

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3 Beach Management Units (BMU)- an association of fishers, fish traders/mongers, boat owners, fish processors, and other fishery stakeholders located on the coastal landing site and formally led by an executive committee of stakeholders.Kenya Marine and Fisheries Research Institute (KMFRI) – A State Corporation mandated is to undertake research in marine and freshwater fisheries (https://www.kmfri.co.ke/)Kenya Wildlife Service (KWS) –A state corporation undertaking conservation and management of wildlife resources across all protected areas systems in collaboration with stakeholders (http://www.kws.go.ke/)Kenya Port Authority (KPA)- A state corporations responsible to operate improve regulate and schedule sea port operationsCoast guard- A specialized maritime force responsible for law enforcement in national watersNavy - Naval branch of the Kenya Defence Forces whose primary mission is to defend and protect the rights republic of Kenya against sea borne aggressionFisheries - The Kenya Fisheries Service is a body corporate established under the Fisheries Management and Development Act No. 35 of 2016. The purpose of the Service is to Conserve, Manage and Develop Kenya Fisheries and Aquaculture ResourcesGovernment - State Department for Fisheries, Aquaculture and The Blue Economy tasked with management and licensing of local and foreign fishing trawlers in kenya waters and Co-ordination of development of policy, legal, regulatory and institutional framework for the fisheries industry and the blue economy.

FIGURE 5
Changes in the number of fishers targeting billfish over the last five years.

perceive the sea as a finite and vulnerable source of fish (Gehrig et al., 2018). This could imply that more experienced fishers are a valuable source of ecological awareness against the threat of shifting baselines. In Indonesia, more experienced fishers have been found to put more value on environmental protection than income relative to younger fishers (Hoshino et al., 2017). Studies

have found that higher education is associated with the perception that dragnet fishing is most destructive and that bottom-up collective action is essential to improve the local situation (Cinner et al., 2012; Gehrig et al., 2018). Thus, there is a higher perceived threat and perceived behavioral control on this environmental issue among more educated fishers. Education
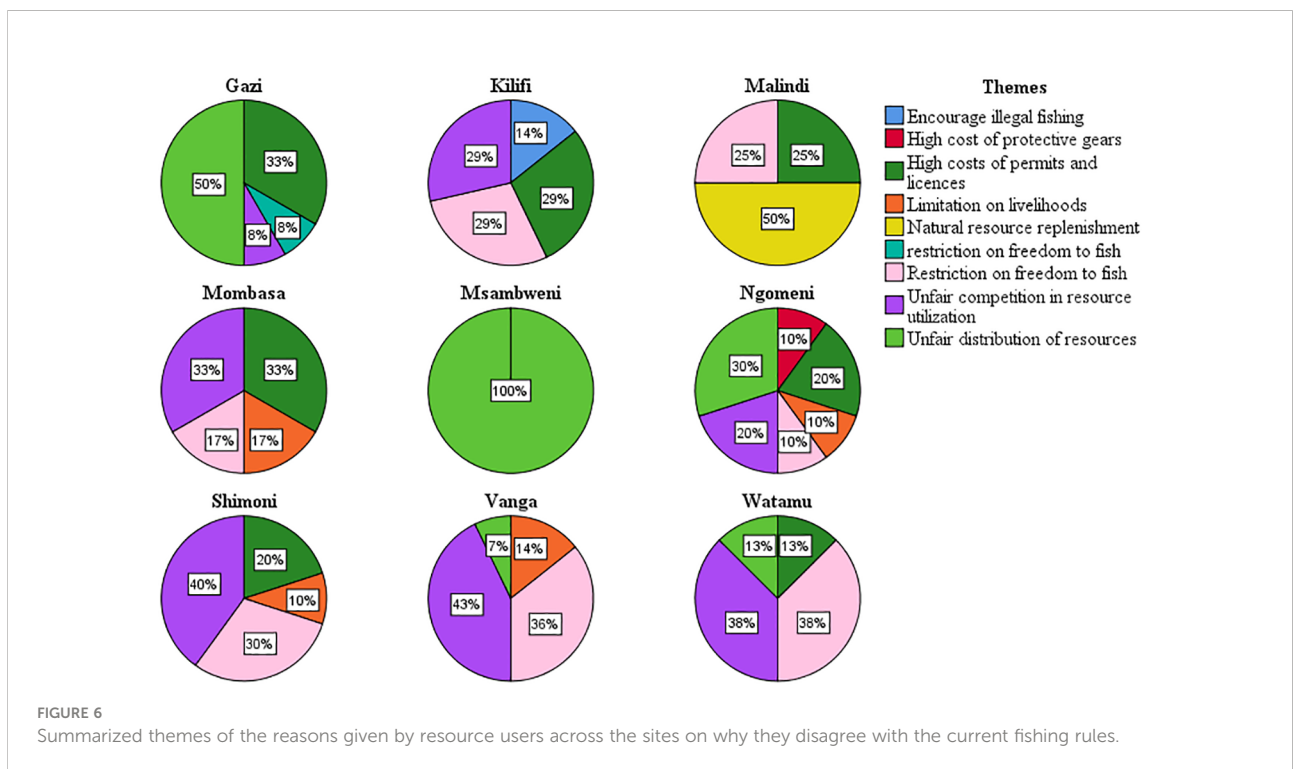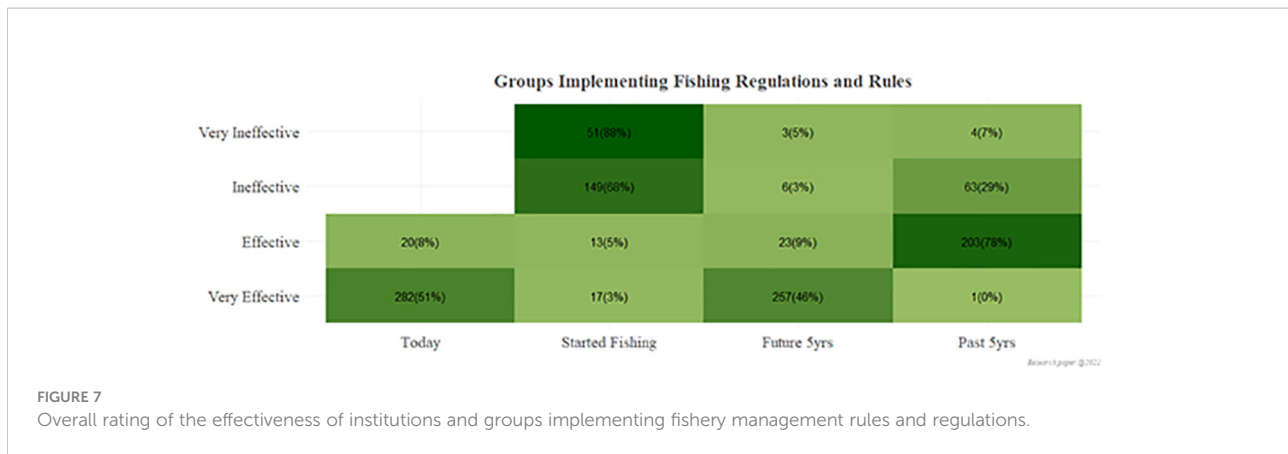

FIGURE 6
Summarized themes of the reasons given by resource users across the sites on why they disagree with the current fishing rules.

FIGURE 7
Overall rating of the effectiveness of institutions and groups implementing fishery management rules and regulations.
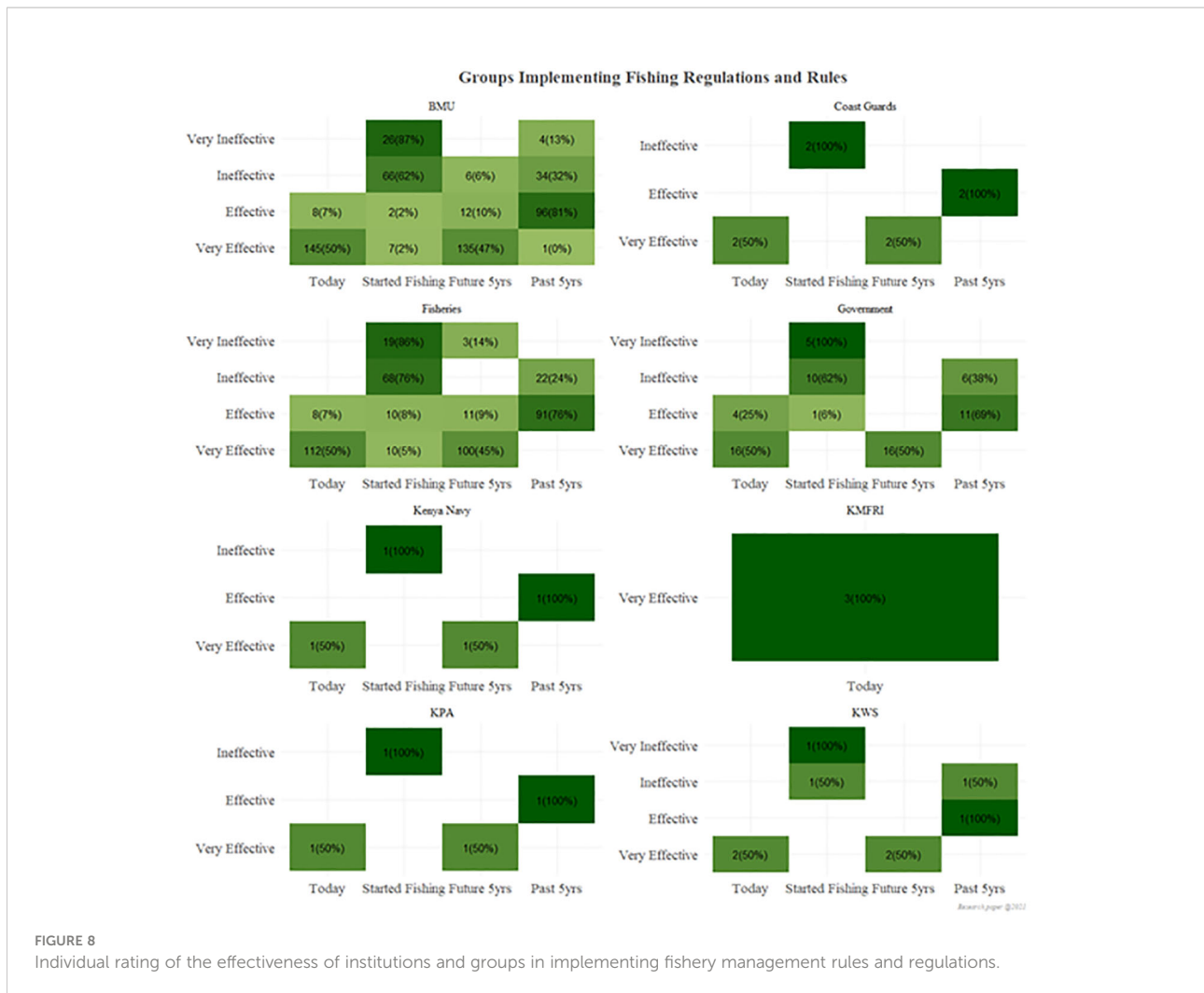
can lead to more pro-environmental perceptions and more positive attitudes towards co-management interventions (Launio et al., 2010). Consequently, this suggests that empowerment through education should thus be prioritized especially in resource use governance.

Until the 1920's, Kenya's marine fisheries resources were managed by the community elders, after independence the government took over management decisions with little to no input from resource users (Cinner et al., 2009). Decades of this top down management approach was found to be ineffective following the decline of several fisheries (McClanahan et al., 2005). As a way of improving fisheries management, the government proposed legal frameworks that allowed for shared responsibility commonly referred to as co-management of the fisheries resources through establishment of Beach Management Units (Ogwang et al., 2005; Government of Kenya, 2007). Our findings strongly demonstrate a high level of awareness of the current fishing rules and groups of people or institutions controlling fishing activities. Additionally, BMUs were rated highly effective as governing institutions over time. This could be attributed to the involvement of the resource users in the co-management of the fisheries resources. For instance, the introduction of Beach Management Units (BMUs), could have largely contributed to the positive attitude toward the fishing rules (Rocliffe et al., 2014). The involvement of local resource users through the now popular locally managed marine areas (LMMAs), has increased the involvement of the community in management models. This could have led to increased technical support provided by government agencies, private sector stakeholders, or non-governmental organizations. In LMMAs, resource users are encouraged to make the most of the management decisions, including the choice of the location of any protected areas (Gutiérrez et al., 2011; Evans et al., 2011). Furthermore, awareness and inclusion in resource management approaches contribute largely to the perceptions of the resource users.

Assessing fishers' perceptions of the status of their resources offers insight into the attitudes and motivations behind their behavior, including presumptions on and compliance towards fishing regulations (Ajzen, 2012). Our findings indicate variations in the perceptions of the fishing rules. Although most of the fishers show a positive attitude towards the fishing rules, others perceive them negatively. Previous studies have reported negative attitudes and perceptions by resource users towards management and restriction rules, for example, the establishment of Marine Protected Areas (MPAs). Findings from various past studies (Sesabo et al., 2006; Munga et al., 2010; McClanahan and Abunge, 2020) showed that resource users were unwilling to support these management and restriction rules because they felt it would reduce their earnings through reduced catch and fishing ground area. The resource users with positive attitudes were found to have knowledge of the importance of conservation and were involved in the determination of the rules (Munga et al., 2010; McClanahan and Abunge, 2020). In this study, negative attitudes were attributed to unfairness in resource use, where respondents felt they needed to freely utilize the fishing grounds without any restriction. Fishers argued that fish is a God-given renewable natural resource. In addition, licences were reported to be very costly thus giving financially constrained fishers a disadvantage because they are not allowed to go fishing without a licence. These negative attitudes lead to non-compliance with the fishing rules, possibly resulting in conflict among the resource users.

Based on comparative ethnographic research in fishing communities, Gezelius and Hauck (2011) argued that compliance motivations such as deterrence, moral support for the law's content, and the legislator's authority are influenced by three governable preconditions: i) enforcement, ii) empowerment, and iii) civic identity. We found that the majority of fishers have to provide for entire households and most did not have access to alternative livelihoods. Fishing activities are dependent on catches leading fishers to risk

FIGURE 8

Individual rating of the effectiveness of institutions and groups in implementing fishery management rules and regulations.

illegal catches in order to meet quotas and support their families. According to Guirkinger et al. (2021), the most common driver of non-compliance in manta ray fisheries in northern Peru comes from the economic incentives to sustain livelihoods and low social influence. As such, the reliance on fishing as the sole source of income for entire families could influence compliance motivations towards governance initiatives.

Perceptions are certainly subjective and are likely to shift with both changes in governance practice and levels of awareness among those governed (McClanahan and Abunge, 2020). They also provide information on the viewpoints of the resource users being influenced by governance approaches. This information is important for understanding the relationship between the "governance approaches" and "the resource users", essential for the success of management and governance of resource use (Turner et al., 2014). In this study, negative attitudes and perceptions towards the licences, and management and restriction rules are possible causes of conflict

between the resource users. Fisheries management has been reported to be a potential cause of conflict between resource users (Kadagi et al., 2020). As a result, understanding resource user perceptions may be valuable in identifying areas that are likely to cause conflicts, enhance governance areas, and result in more support by resource users.

Our findings indicated continued use of billfish resources evident from the notable increment in the number of fishers targeting billfish. Participants highlighted the increased number of fishers targeting billfish some of them including migrant fishers, especially during the high fishing season. With the increasing population, the demand for fish is likely to increase and this could lead to competition for this common pool resource. Furthermore, there are decreasing employment opportunities and limited livelihood options. People therefore opt for fishing and the open access nature of billfish fishery is likely to experience increased pressure, competition and conflict. These findings corroborate with Kadagi et al. (2020), who

indicated the possibility of conflict resulting from the perceived open access nature of billfish resources hence their overexploitation. The increased number of artisanal fishers targeting billfish resources could be attributed to the value given to the billfish species in terms of income generated due to their large size. According to the value-attitude-behavioral theoretical model, attitude entails consideration of outcomes of performing a behavior e.g. fishers without alternative income options targeting billfish. Thus, the correlation of the huge size of billfish to higher income could be linked to the increased number of fishers targeting billfish.

Conclusion

Diverse factors influence the perceptions of resource users playing a key role in the level of support for the fisheries governance approaches. Knowing the perceptions of resource users is a crucial input to the design of institutions for resource management. Understanding resource users' knowledge and perceptions of governance approaches that regulate their activities are useful tools to assess the effectiveness of rules designed to manage the resources. This assists policymakers in developing regulations that take into account appropriate environmental and socio-economic aspects of the environment, thereby improving users' responses to these policies. In this study, it was evident that the involvement of artisanal fishers in fisheries management through the BMUs at community level helped in ensuring compliance of fisheries regulations. We therefore recommend that all stakeholders be more involved in decision-making, which will result in i) more collective decisions, ii) improved co-management, and iii) enhanced acceptability of the rules and regulations. This will lead to broader support for management and enhanced fisheries sustainability.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Pwani University Ethics and Review Committee. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

Author contributions

DK and NK conceptualized the study. DK, AW, SA, MO, and NK collected the data, analyzed and interpreted the data. DK, NK, SA, MO, and AW contributed equally to the manuscript's development and subsequent revisions.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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