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## Conflicts in fisheries resource use along the Vipingo - Mida Creek stretch of the Kenyan coast: Causes and implications for fisheries management

**Tunje JG, Tole MP, Hoorweg JC, Shauri HS and Munga CN**

### Abstract

A total of 197 artisanal fishers along the Vipingo-Mida Creek stretch of the Kenyan coast were interviewed using semi-structured questionnaires with the goal of identifying causes of conflicts in fisheries resource use. The collected primary data was coded and entered into Microsoft Excel, then analyzed descriptively. Further qualitative analyses were performed with the help of SPSS statistical software where selected variables were subjected to non-parametric test using Chi-square and, with STATISTICA statistical software where 1-way ANOVA was used for parametric test. Majority of fishers (53.8%) from the study area were youth of less than 35 years of age while 14.2% were older fishers above 50 years. Results of 1-way ANOVA indicated no significant difference in age of fishers among the study sites of Vipingo, Kuruwitu and Mnarani within the study area ( $df = 2$ ;  $f = 1.004$ ;  $p = 0.368$ ). Further, the most common fishing gear was the gill net (39.1%), followed by fishing line (29.8%), and spear gun (21.2%) in that order. Chi-square test revealed a significant difference in gear usage between study sites ( $\chi^2 = 46.658$ ;  $df = 8$ ;  $p < 0.001$ ). The study found out that most (>95%) of the fishers in the area had experienced conflicts, either from other fishers at work or from other stakeholders. Fisheries resource use conflicts in the area were mainly as a result of fish theft from passive gears (34.1%), use of other fishers' gear without consent (20%), lack of payment for fish sold (14.1%), competition for fishing grounds (10.3%), destructive activities of aquarium fishers (8.1%), opposition of fishers to conservation policies (8.1%), and failure of traders to pay fishers (5.4%). To minimize fisheries resource use conflicts, and promote harmony amongst resource users and achieve sustainable use and management of fisheries resource, the study suggests education, awareness and sensitization programmes targeting the local artisanal fishers, zonation of fishing grounds and assigning them appropriate gear use, as well as providing exclusive fishing rights to a first comer to a fishing ground.

**Keywords:** Artisanal fishers, fishery resource, conflicts, sustainability, fisheries management

### 1. Introduction

Conflicts over, both access to and use of coastal and marine resources, have become increasingly common throughout the world (Maarten <sup>[1]</sup>, 2001; Muhfuzuddin, *et al.* <sup>[2]</sup>, 2006). This trend is also becoming evident in tropical developing countries where artisanal coastal and marine fisheries are particularly important because they provide the much needed employment and protein requirements of the coastal population (Malleret-King <sup>[3]</sup>, 1996). Several factors including increase in human population, reduced income levels and decline in the standard of living drive fishers to employ more effective, but destructive fishing methods (Ikiara <sup>[4]</sup>, 1999). The increasing fishing pressure and over-harvesting of fisheries resources, for instance, have resulted in an uptight competition for the fisheries resources between the multiple users and subsequent reduction or collapse of important viable fish populations. These, in turn, have led to conflicts among the different user groups and even within individuals in a particular fisher user group over the declining fisheries resources.

Along the Kenyan coast, the artisanal coastal and marine fisheries sub-sector is characterized by multi-gear, multi-fleet and multi-species. This is a situation that often makes the diverse users to target the same species in the same fishing grounds triggering conflicts. In fact, when different fishing gears, both passively and actively operated, are used in the same fishing ground, fisheries resource use conflicts eventuate. That is to say, confrontation or disagreement between individuals within a fisher user group or between fisher groups with discordant interests or uses over the scarce marine fisheries resources ensues.

Oliver *et al.* [5], (2005) have defined conflict as the pursuit of incompatible goals by different groups. Fisheries resource use conflicts result from conflicts of interest over competing goals (Suryanarayan [6], 2005). These resource use conflicts, if not well understood and managed, can be a constraint towards achieving sustainable use and management of the resource with some associated negative socio-economic implications.

The coastal and marine fisheries sub-sector at the Kenyan coast is important as it directly employs more than 13,000 fishers (Ochiewo [7], 2004; Government of Kenya [8], 2014), and between 20,000 – 60,000 people that are indirectly employed in fishing support activities such as boat building and repair, and gear manufacture, and contributes to about 0.3% of the Gross Domestic Product (UNEP [9], 2006; Kamau, *et al.* [10], 2009). Indeed, 6% of livelihoods at the Kenyan coast are entirely dependent on the marine sub-sector (Government of Kenya [11], 2009). Understanding the causes of fisheries resource use conflicts is therefore a step towards attainment of sustainable use and management of the fisheries resources that will ultimately improve the socio-economic wellbeing of individual fishers, the community and the Kenya coast region in general. Fisheries resource use conflicts, if not well understood and managed, can undermine effective fisheries management with far reaching negative ecological and socio-economic implications. This study therefore, identified and assessed the causes of coastal and marine fisheries resource use conflicts among and between fishers and other stakeholders in three study sites along the Vipingo-Mida Creek stretch of the Kenyan coast and provides recommendations to enhance sustainable fisheries management.

## 2. Materials and Methods

### 2.1 The Study Area

The study was done along the Kenyan coast, in Kilifi County, covering an estimated 80 Km from Vipingo to Mida Creek in the North, and focusing mainly on artisanal fishers who were registered members of Kuruwitu, Mnarani and Uyombo Beach Management Units (BMUs), and therefore landing their fish catches there. These three landing sites therefore constituted the study sites for the present study (Fig. 1).

The three study sites, all found in Kilifi County, are among the major designated fish landing sites along the Kenyan coastline, which lies between Latitude 1° 41' S and Longitude 4° 40' S. These sites have many and diverse resource users making them potentially conflict-prone areas. Kuruwitu is adjacent to a community conservation area; Mnarani located along the Kilifi Creek is a non-protected area, while Uyombo is situated along the Mida Creek and adjacent to the Watamu Marine National Park and Reserve.

The study area has four major topographical features. The Coastal Plain which is a narrow belt, varying in width between 3 and 20 Km, and lies below 30 M above sea level except for occasional prominent peaks on the western boundary. The Foot Plateau characterized by slightly undulating terrain, falling between 60 M and 135 M above the sea level, and slopes towards the sea. The Coastal Rangeland is beyond the Foot Plateau and has distinct low range of sandstone hills of about 150 - 450 M in altitude. The rest of the area is broken by creeks and estuaries giving rise to excellent marine and estuarine swamps. These swamps are endowed with mangrove forests that provide good fish nursery and feeding grounds. The Vipingo-Mida Creek stretch of the Kenya coastline lies in this strip. The last topographic feature is the Nyika Plateau along the western side occupying two-third of the county. It is characterized by sparse human population and is semi-arid land.

The climate of the area is mainly influenced by the Indian Ocean and monsoon winds. The annual average rainfall varies from about 500-900 MM, with a bio-modal pattern– the long rains come in May while the short rains are experienced in October. Temperatures range from a minimum of 24°C to a maximum of 30°C.

Kilifi County has a population of 1,109,735 (Males 48%; Females 52%) and accounts for 2.9% of the national population, with a growth rate of 3.05% per year and a density of 450 people per Km<sup>2</sup> (Government of Kenya [12], 2010). Population distribution in the region is largely influenced by rainfall, altitude, agricultural zones and administrative policy through which a number of settlement schemes have been created (Hoorweg, *et al.* [13], 2000). The economy of the area depends much on natural resources on which various activities form the livelihoods of the people- agriculture, trade, tourism, fishing and mining.

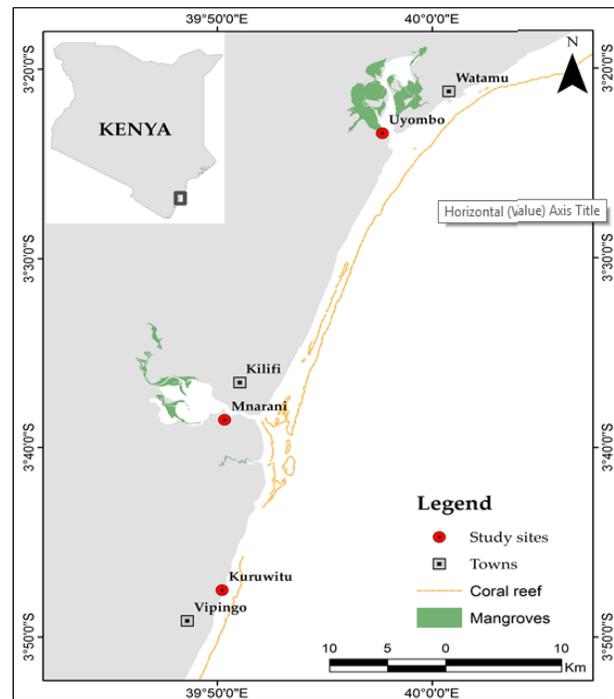


Fig 1: Map of the Kenyan Coastline showing Study Sites

### 2.2 Data Collection, Analysis and Statistical Tests

Primary data were collected from a study sample of 197 artisanal fishers from the three landing sites, namely: Kuruwitu, Mnarani and Uyombo. Primary data were collected through survey that involved the administration of a questionnaire, with both closed and open ended questions. At each study site, Systematic Random Sampling (SRS) technique (Bunce, *et al.* [14], 2000) was used to select a representative sample. Quantitative raw data collected were coded and entered into Microsoft Excel, then analyzed descriptively with the help of SPSS. Some variables such as fishers' experience of conflicts, the frequency of engagement in conflicts, causes of conflicts and gear use were subjected to Chi-square test. The differences in fishers' age and their experience in fishing between study sites were tested using 1-way ANOVA).

## 3. Results

### 3.1 Characteristics of Fishers

Age distribution of the fishers across the study sites ranged from 19-67 years, with a mean age of 36.5 ±14 years and a mode of

40 years that constituted 6.1% of the study sample. The oldest fishers came from Kuruwitu (Mean = 38.7 ±1.9), while the youngest were from Uyombo (Mean = 35.6 ±1.2). The fishers from the study area were found to be mainly youthful as more than half (53.8%, n=106) were less than 35 years of age, while only slightly more than one-tenth (14.2% n=28) were of 50 years and above. Results of 1-way ANOVA indicated no significant difference in age of fishers among the study sites (df = 2; f = 1.004; p = 0.368). This implies that fishing as a profession does not segregate in terms of age of fishers, young or old and therefore, fishing seems to be easily accessible to all people of all age brackets.

Fishing experience of the fishers sampled ranged from 1–49 years, with a mean of 16.7 ±0.8 years, with Mnarani study site having fishers with longest (49 years) fishing experience compared to Uyombo (35 years) and Kuruwitu (10 years). The mean fishing experience per site was recorded at Kuruwitu (18.1 ±1.6 years) and this was followed by Mnarani (17.5 ±1.4) and then Uyombo (15.4 ±1.1). However, results of 1-way ANOVA test indicated no significant difference in fishing experience of fishers among the study sites (df = 2; f = 1.121; p = 0.328). This suggests that fishing as a profession does not segregate based on individual’s experience. The implication is that those with less and more experience are all accommodated in the fishing profession. This finding supports an earlier one of the study where age does not matter for one to be a fisher. The age and fishing experience of fishers slightly varied among the fishing sites (Fig. 2).

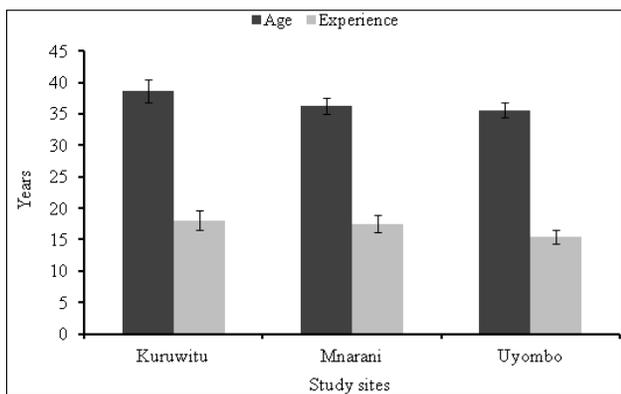


Fig 2: Mean Age and fishing experience of fishers by study site

**3.2 Fishing gears**

A total of 151 gear units were sampled from the three study sites; Uyombo (n=70), Mnarani (n=70) and Kuruwitu (n=11) (Fig. 3). However, results of Chi-square test revealed a significant difference in gear usage between study sites ( $\chi^2 = 46.658$ ; df=8;  $p \leq 0.001$ ). This may be attributed to more abundant gill nets used in Mnarani compared to Kuruwitu and Uyombo. Notably though, Kuruwitu was associated with the least usage of more hand lines (63.3%; n=7) than Mnarani and Uyombo both at 27.1% (n=19). The use of spear gun was highest in Uyombo, and this gear made the highest proportions in Uyombo (34.3%; n=24) and Kuruwitu (27.3; n=3) sites. On the other hand, the use of hand lines was common in Mnarani and Uyombo sites. Field observation revealed that gear used were based on the area because each fishing area has its own uniqueness and challenges. This meant that fishers were aware of the uniqueness and challenges and had to respond with an appropriate gear, explaining the diversity of gear use.

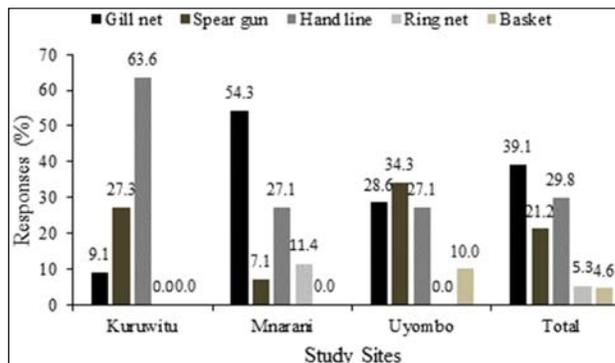


Fig 3: Proportions of gear usage in the different study sites

**3.3 Fisheries Resource use conflicts**

The study found out that fishers were embroiled in fisheries resource use conflicts in all the three study sites, irrespective of the gear used. Most fishers (>95%) reported having experienced some conflicts with either their colleagues at work or other stakeholders in the course of undertaking fishing activities. However, very few fishers from all sites reported no conflicts (Fig. 4).

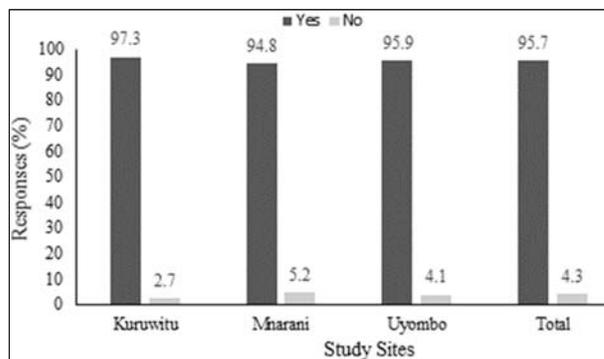


Fig 4: Responses on fishers' experience of conflict by landing site

Conflicts are common among fishers in the Vipingo-Mida Creek area as reported by 95.7% (n=179) of the interviewees. However, Chi-square test revealed no significant differences on fishers' confirmation of conflicts across the study sites ( $\chi^2 = 0.629$ ; df = 2; p = 0.730), approving the fact that all fishers across all study sites had experienced some form of conflicts in the course of their fishing expeditions.

**3.4 Causes of Fishery Resource-use Conflicts**

This study identified several causes of fisheries resource use conflicts ranging from commercial, societal to conservation issues inter alia. Field observation revealed a plethora of causes classed into four different diagrams per study site and a summary diagram for easy of understanding (Fig. 5). Results indicate that fishers in the study area experience resource use conflicts that emanate from several causes. The diversity of causes actually portrays the heterogeneous nature of the study area and the resource users themselves. From the findings of the study the leading and common causes of fisheries resource use conflicts were identified as fish theft from gears (34.1%; n=63), using other fishers' gear without consent (20%; n=37), destructive activities of aquarium fishers (18.1%; n=15), lack of payment for fish sold (14.1%; n=26), competition for fishing grounds (10.3%; n=19), opposition to conservation policies (8.1%; n=15), and failure of traders to pay fishers (5.4%; n=10) respectively.

Fish theft from other fishers' gear was rated high in almost all study sites; Mnarani 39% (n=32); Uyombo 35.7%; n=25), and Kuruwitu 18.2% (n=6), portraying fishers as not being honest and exhibiting some iniquities that make them want to get more catch irrespective of the legality of the means fueling conflicts. In Kuruwitu site, the leading causes for conflict were reported to be lack of payment for fish sold and usage of other fishers' gear without consent both at 24.2% (n=8); whereas the least source of conflict was opposition to conservation policies (3%; n=1). In Mnarani, the least cause of conflict was the failure of traders to pay fishers reported at 6.1%; (n=5). However, theft of fish from gears (39.0%; n=32) and opposition to conservation ideologies (14.6%; n=12) were the major causes of resource use conflict in Mnarani.

The main cause of conflict in Uyombo were fish theft (35.7%; n=25) and usage of other fishers' gear without consent with 34.3% (n=24) of the responses. The least mentioned sources of conflict in this site included destructive activities of aquarium fishers (1.4%; n=1), and failure of traders to pay fishers (2.9%; n=2). Additionally, opposing conservation policies were also the least mentioned at Uyombo site (2.9%; n=2) in comparison to Kuruwitu (3%; n=1) and Mnarani (14.6%; n= 12). A further analysis of this data using the Chi-square test reveal significant differences in causes of conflict between the study sites ( $\chi^2=38571$ ;  $df=12$ ;  $p\leq 0.001$ ). The Chi-square results confirm the uniqueness of each site and hence the diversity of the causes of resource use conflicts in these areas. The implication of the finding is that there are multiple causes to the fishery resource use conflicts that are context based.

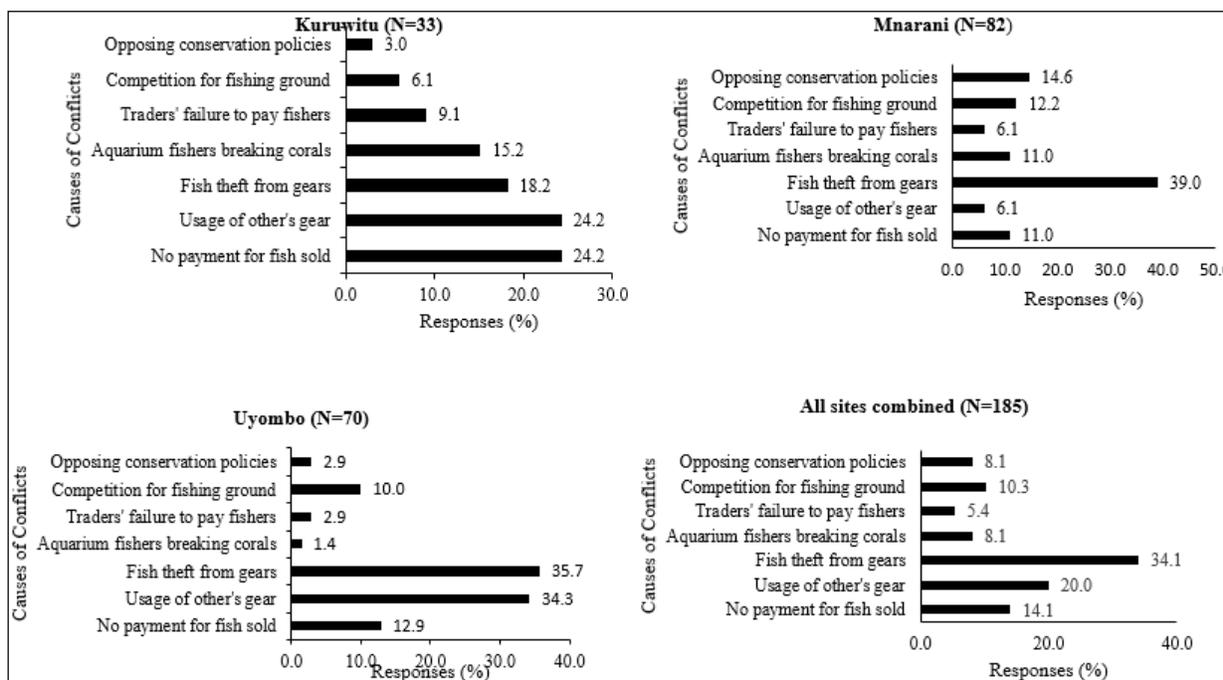


Fig 5: Causes of fisheries resource use conflicts by site

5. Discussion

Fishing in the Vipingo-Mida Creek area of the Kenyan coast is dominated by male fishers, making it a masculine economic activity supporting the purview of patriarchy. Most of the fishers are less than 35 years of age. The average entry age in fishing industry was found to be 19 years while the exit age was 67 years, which is just above the government retirement age of 60 years. At such an age, a person is likely to be weak and worn out, making them not able to undertake fishing since it is a labour-intensive and masculine activity. The demographic characteristics of fishers revealed in this study concur with those of studies by Tunje [15], (2002) and Okeyo [16], (2010), which allude to the fact that there are more youths in the fishing industry. The dominance of youthful fishers is because, as an economic activity, artisanal fishing is labour intensive and requires great physical strength. This is because of the traditional nature of the fishing equipments and vessels. In fact, field observation revealed that most fishers used human powered vessels to the deep sea and back, supporting the need for the youth to propel these vessels to the high seas. There are five types of fishing gears that were commonly used in the area, namely gill net, hand lines, spear gun, ring net and

fishing basket, and the way they are deployed can be a potential source of conflicts. Young fishers in the area characterized by low literacy levels, lack of technical skills, and capital to venture into other livelihood strategies, especially in the formal sector, were easily recruited in the ring net boats as crew with higher income expectations. Apparently, the use of ring net is associated with overfishing and habitat degradation, a fact that ring net fishers were observed to be aware of and acknowledge. Field observation showed that ring net fishers landed their catch in undesignated landing sites probably to avoid conflicts with the local fishers, supporting Okeyo [16], (2010). The use of spear gun as a fishing gear preferred by the youths in the coastal waters of Kenya has been well documented (Samoilys, *et al.* [17], (2011), Tunje [15], (2002), Obura [18], (2001), and Versleijen [19], (2001) due to several reasons. First, it requires less capital investment and second, it requires less skill in usage, and third, can easily be assembled using local available materials. The spear gun, being an active gear, was closely associated with theft of fish from other fishers' passive gear, destruction of coral habitats, thus being with a cause of conflicts as reported by Samoilys, *et al.* [17], (2011) and Obura [18], (2001).

The fishing basket, though made from cheap local available materials, was not popular, was associated with old fishers, and was reported not to bring in high fish catch. This is a passive gear, hence it is in most cases affected by activities of other active fishing gears, especially when used in the same fishing ground. For instance, it was alleged during field work that spear gun fishers steal fish trapped in the fishing baskets, while gill net fishers were accused of destroying the fishing baskets. All these factors probably explain why this fishing gear was reported to be less popular among fishers in the study sites, implying that this gear could be on its way to being phased out. The fishing line was the gear of choice for older fishers in the study sites because the gear probably does not require much physical strength, and the fact that it is a traditional fishing method. Finding the gear popular among the old fisher folk signifies the persistence of indigenous and traditional knowledge characteristics of all sectors in society.

The use of monofilament gill nets with 2-3" mesh size was most preferred gear in the area and its usage cuts across all age groups because of several factors including ability to catch relatively large fish sizes, it is locally available, and has relatively low maintenance costs. The gear was mainly used in in-shore fishing grounds that were frequented by several other fishers, making its use a potential source of conflicts. Again, the gear is outlawed according to Fisheries Act Cap 378 (Revised 2012) because of its non-biodegradable nature and potential to continuously catch fish as a ghost (Samoilys, *et al.* [17], 2011). Its usage therefore creates conflicts with fisheries managers.

Conflicts are inevitable in situations where natural resources have multiple users with divergent or incompatible interests that they are competing for (Becha [20], 2003, Kamau, *et al.* [10], 2009; Munga *et al.* [21], 2012). The fishery resource in the Vipingo-Mida Creek area, as observed in this study, has many stakeholders with divergent interests and uses, namely exploitative, conservational and management, making conflicts prevalent in the area.

The study identified two types of fisheries resource use conflicts in the area namely inter-fisher conflicts, and, conflicts between fishers and conservationists. The former is conflict or disagreement between members of different fisher user groups, mainly caused by access of the same target species on the same fishing grounds. It mainly involves passive gear *versus* active gear fishers competing for the same fish species in the same fishing grounds. In such scenario, fishers may deliberately or 'accidentally' trample into others' gear or obstruct other fishers from catching fish, triggering conflicts, corroborating findings by Obura *et al.* [22], (2005).

The fact that competition for fishing grounds, and stealing and selling other fishers' catch were reported in Mnarani and Uyombo as causes of conflict could be an indication that the fisheries resource in the two creeks is on the decline due to both anthropogenic and natural causes such as climate change and global warming and/or that the number of fishers is on the increase, making the many fishers scramble for the little available resources. The study observed that sometimes fishers came from a fishing expedition empty handed; a scenario that compels some fishers to use unethical means, including stealing from others so as to place food on the table.

Conflict involving fishers and the State Department of Fisheries (SDF), with fisheries management interest were also identified. The main causes of conflict between these groups include the unwillingness of some fishers to pay for the fishing license, an observation also made by Versleijen [19], (2001), Tunje [15], (2002) and Obura, *et al.* [22], (2005). Fishers argue that the

fisheries resource being God-given and just like any other global common property, should be open and free to exploit.

Conflicts between fishers and Kenya Wildlife Services (KWS) with fisheries resources conservation interests were most felt in Uyombo site, located adjoining to the Watamu Marine Protected Area (MPA), the cause being allegations that the locals undertake fishing within the Marine Park, which is illegal. Versleijen [19] (2001) has confirmed that the management of the Watamu Marine Park faces regular conflicts from artisanal fishermen, who despite the fact that fishing in the MPA is prohibited, do fish poaching at night. Some local artisanal fishers therefore contravene park regulations, a fact also confirmed by McClanahan [23] (2004), who adds that non-compliance with MPA regulations is a problem worldwide. It is also possible that the top-down approach used to establish the park and the fact that it was established in rich fishing grounds denied the local fishers access to their source of livelihood (Ngugi [24], 2002; Ochola, *et al.* [25], 2010; Tuda, *et al.* [26], 2013).

## 6. Conclusion and Recommendation for Fisheries Management

Fisheries resource use conflicts can impact negatively on the community and economy at large as well as the integrity and sustainability of the marine environment that support the livelihoods of coastal communities. Effective fisheries resource management can only be achieved when there is optimal user or community participation. This can only be realized in a conflict-free environment. The following suggestions can be adopted to reduce fisheries resource use conflicts and promote sustainability:

Develop education, awareness and sensitization programmes targeting the local artisanal fishers. Such programmes will increase the level of awareness and adherence of fishers to the fisheries regulations, and see the essence of using the right gear in the right habitat.

Since most conflicts among fishers arise as a result of sharing the same fishing grounds, zonation of fishing grounds and assigning to them appropriate gear will reduce fisheries resource use conflicts and curb future ones. This is because different fishing gear can be effectively used in different habitats without causing ecological destruction.

Fishers should observe "*respect to first-comer user rights of a fishing grounds*" This strategy gives exclusive fishing rights to a fisher or group of fishers being first to visit a fishing ground. This mechanism therefore advocates for one fisher or group of fishers using a fishing zone at a time, thereby avoiding any physical contact with other fisher or group of fishers, and thus abating conflicts.

There is need to constantly vet fishers to ensure that they use the right/legal gear at all times. Currently, vetting is mostly done only to migrant fishers, giving a window to local fishers to use illegal gear that potentially causes ecological degradation and thus causing conflicts.

To achieve all the above, there is need to build both institutional and technical capacities of the State Department of Fisheries (SDF) and Beach Management Units (BMUs) to effectively undertake their core functions.

## 7. Acknowledgement

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