

SPACES Working Paper Series

No: 004 / January 2017

Exiting fishing behaviour in Kenya and Mozambique

A first glance

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This working paper results from the project 'Sustainable Poverty Alleviation from Coastal Ecosystem Services (SPACES) NE-K010484-1' funded with support from the Ecosystem Services for Poverty Alleviation (ESPA) programme. The ESPA programme is funded by the Department for International Development (DFID), the Economic and Social Research Council (ESRC) and the Natural Environment Research Council (NERC).

ABSTRACT

Fishermen can have diverse responses when facing the decline of fishery catches. They may continue fishing following different strategies, or exit fishing when a threshold of low catch is reached. As part of a broader household survey, the SPACES project asked fishers in 7 coastal communities across the Kenyan and Mozambican coast what would they do if their catch was reduced by 50%.

The results shown in this paper provide a picture to better understand fishermen behavior in the region. In this context, 25% of all fishermen stated that they would exit fishing and 75% that would continue in some way. More than half of the fishermen that would continue fishing state that their impediment to exit fishing is the lack of alternatives. Fishermen that would exit fishing stated diverse alternatives to their fishing activities. We also observed that fisher's behavior varies across the 7 coastal communities studied.

In addition, we analyzed the relationship between place attachment and the exiting fishing response. Place attachment does not seem to explain the probability of exiting fishing in Kenya, but high levels of place attachment seem to be related to a higher probability of exiting fishing in Mozambique.

This preliminary analysis allows for further research to investigate which social-ecological characteristics at different scales influence fishermen behavior. As a way of exemplification, the discussion suggests three issues that could benefit from future research.

About this working paper

This work was conducted by Blanca González García-Mon, MSc student, within a 5-weeks internship during May-June 2016. This internship is part of the Social-Ecological Resilience for Sustainable Development (SERSD) master's programme at the Stockholm Resilience Center. Blanca is a scholar of "la Caixa" banking foundation.

To cite this working paper:

González García-Mon, Blanca et al. 2016, 'Exiting fishing behavior in Kenya and Mozambique: A first glance', SPACES Working Papers, no. 4. Available from: [www. Espa-spaces.org](http://www.espaces.org). [date accessed].

1. Introduction

Fishermen can have diverse responses in light of environmental changes such as the decline in fishery catches. It is generally accepted that fisheries resources are declining in many parts of the world (Watson et al. 2013; Ye et al. 2013), thus understanding how fishers deal with this environmental change is important to face current sustainability challenges.

It has been suggested that when facing a decline in their catches, fishers can continue fishing or reach a social threshold and exit fishing. If they continue fishing they can either adapt their fishing practices (i.e. adaptive response) or continue fishing in the same way (i.e. coping strategy) (Cinner et al. 2011). When adapting their fishing practices they can increase their fishing effort, which can create an amplifying feedback increasing the environmental degradation (Cinner et al. 2011). When they adapt by reducing their effort or exit the fisheries, they create a dampening feedback that can mitigate the fisheries decline (Cinner et al. 2011). However, the exiting fishing response can change the system's identity, for example if half of the fishers of a fishing community change their occupation (Blythe 2014).

In this context, the SPACES project analyzed the exiting fishing behavior of fishermen households in 7 coastal communities across the Kenyan and Mozambican coast: Kongowea, Mkwirow (Wasini island), Tsunza, Vanga, Lalane, Maringanha and Ilha Vamizi. The results shown here provide a picture to better understand fishermen's behavior in East Africa. It allows for further research to investigate which social-ecological characteristics at different scales influence fishermen behavior. As a way of exemplification, this preliminary study analyzes the relationship between place attachment and the exiting fishing response.

2. Methods

2.1. Data collection

The data was collected as part of the household survey of the SPACES project. Household surveys were conducted by trained local enumerators in 8 rural coastal communities in Kenya and Mozambique in 2014. The household survey gathered data on livelihoods, different dimensions of wellbeing, demographics, food consumption and details of livelihood activities. A randomly selected sample of households was included in the survey. In communities in which the density of fishing households (and thus the number of fisher interviews within the random sample) was low, fishers were oversampled with additional interviews with fishers in addition to the random household sample to ensure a number of fisher interviews were collected at all sites. A total of 425 surveys with fishers were recorded.

Fishers were asked what would they do if their catch was reduced by 50%, similar to previous work studying exiting fishing behavior (e.g. Cinner et al. 2009; Daw et al. 2012). The exiting fishing responses were recorded according to the following categories: 1) continue fishing (and *why*); 2) Increase effort (and *how*); 3) reduce effort (and *what will you do instead*); 4) change fishing area (and *where will you go*); 5) change the type of gear used (and *to which one*); 6) stop fishing (and *what will you do instead*); and 7) Other.

2.2. Data analysis

The exiting fishing responses were recoded to create binary variables about the exiting behavior: i) *exiting fishing*, if respondents stated that they would stop fishing and did not say they would continue or adapt; ii) *adaptive strategy*, if stated that they would adapt their fishing practices increasing or reducing their fishing effort; iii) *increase effort*, if stated that they would increase the effort, change place, or change the type of gear used¹; iv) *reduce effort*, if stated that they would reduce the fishing effort. The qualitative responses regarding why would they continue fishing and the alternative mentioned if exiting fishing were coded as described in tables 1 and 2.

From the 425 surveys recorded, 8 were removed from the analysis because they did not answer any question or because they say they would both exit and not exit fishing. The remaining 417 surveys were used for further analysis.

More information about the data analysis process can be found in Appendix I.

Table 1: Codes of the main reasons given to continue fishing if the catches were reduced by 50%.

Reason	Description
Profession	Respondent stated that fishing is their job, it is what they know how to do, or manifest that it is what they traditionally do/ have always done (attachment to the profession)
No Alternatives	Respondent manifest that they have no other alternatives, which is usually related to their livelihood and income. Typical expressions would be: being the only or most important source for income and food; not seeing or having any other alternative; not having an alternative place to go; or being experienced only in fishing.
Expect change	Respondent expect that the situation will normalize. Some recognize that this is part of fishing and accept it. Others state it is part of the ecological dynamics or that there is uncertainty about the best days to fish and next day could be better. Others hope the situation will change.
Beliefs	Respondent would accept God's plans for them.
Others	Respondent will continue fishing but do not really state why or answer any question.

¹ It is assumed that change place and gear imply an increase in the fishing effort for this local context.

Table 2: Codes of the strategy that fishers would adopt if they stopped fishing.

Strategy	Description
Housework	Respondents mention activities directly related to their house such as taking care of the house or family or rebuilding or repairing infrastructures.
Non-Timber forest product	Respondents mention cutting poles or mangroves as their alternative
Farm	Respondents mention working on the farm or farming as their alternative.
Trade	Respondents mention trade or trading as their alternative
Specific activity	Respondents mention a specific income generating activity or business as their alternative.
Non-specific activity	Respondents state that they would look for a livelihood alternative or do a casual job, not specifying the activity.
Marine activity	Respondents mention other activities directly related to the coastal ecosystem or marine environment

2.3. Place attachment analysis

Household members were also asked about their place attachment in the surveys. The place attachment data was analyzed as explained in the working paper “*Challenges of measuring place attachment in Kenya and Mozambique*” to create a Place Attachment Index. We applied a binary logistic-regression model to test if place attachment could predict the probability of exiting fishing. We used the Generalized Lineal Model (“glm”) function in *R*. Kenya and Mozambique were treated as separate samples for this analysis, due to particularities (see working paper no. 2) in the place attachment measurement (Kenya, n=303; Mozambique, n=114).

3. Results

3.1. Fishers behavior confronting 50% catch decline

25% of all fishermen stated that they would exit fishing and 75% that would continue in some way in response to a 50% decline in the catch on a normal day (Figure 1). Amongst the fishermen that would continue, 43% (N=134) state that they would adapt their fishing practices. Most of these fishermen (N=122) would adapt by increasing their fishing effort,

and for the 80% (N=97) this includes changing fishing area. Fishermen would also increase fishing effort by changing the type of gear used (about 20%) and a few of them (7%) would increase fishing hours. Out of the 12 fishermen that would reduce the fishing effort, 3 would allocate more time to farming activities and the remaining would not fish but try again in the near future.

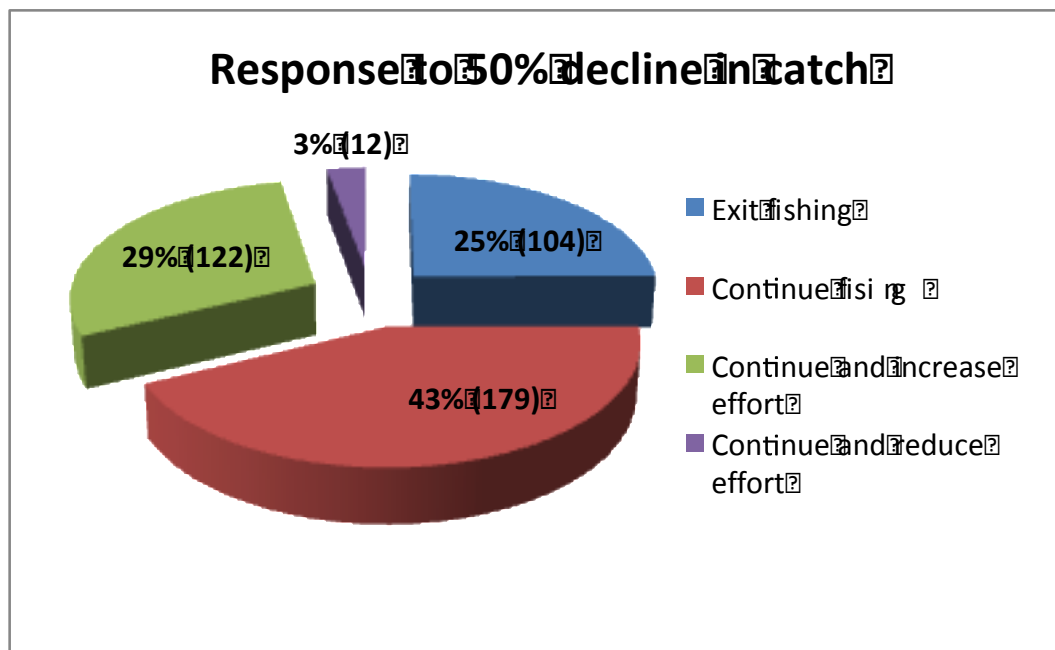


Figure 1: Proportion of fishermen that would adopt different strategies in face of a 50% decline in their catches (n=417).

Figure 2a shows the main reasons given by fishermen to continue fishing. More than half of respondents state that their impediment to exit fishing is the lack of alternatives. In other respects, fishermen that would exit fishing stated various alternatives to their fishing activities (Figure 2b). It is worth noticing that 38% (N=40) of respondents do not seem to have a specific activity to replace fishing, stating for example that they would *look for alternatives* or *do a casual job*. Other respondents would focus on a specific activity. Although diverse livelihood alternatives were mentioned, household-related activities represent an important proportion: 30% of respondents would focus on different types of housework or farming, which is usually an existing household enterprise.

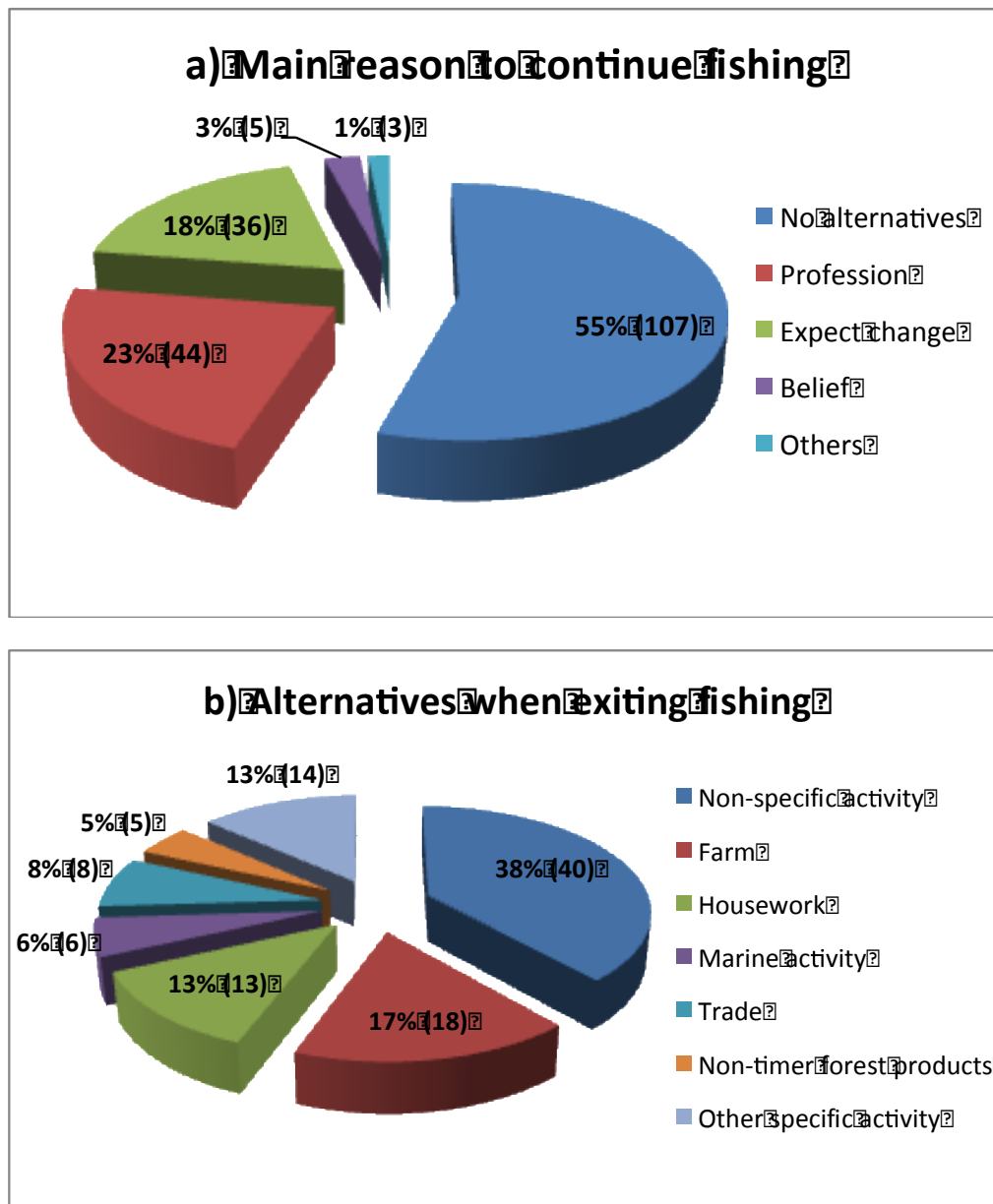


Figure 2: Results of the qualitative exiting fishing analysis: a) reasons stated to continue fishing (n=195); b) livelihood alternatives mentioned when exiting fishing (n=104).

3.2. Differences in fisher's behavior per coastal community

When comparing the 7 coastal communities studied, we observe that the probability of exiting fishing varies for each site (Figure 3a). Amongst fishermen that would continue, we can observe that the number of fishermen that have mentioned adapting their fishing practices (adaptive strategy) also varies across different coastal communities (Figure 3b).

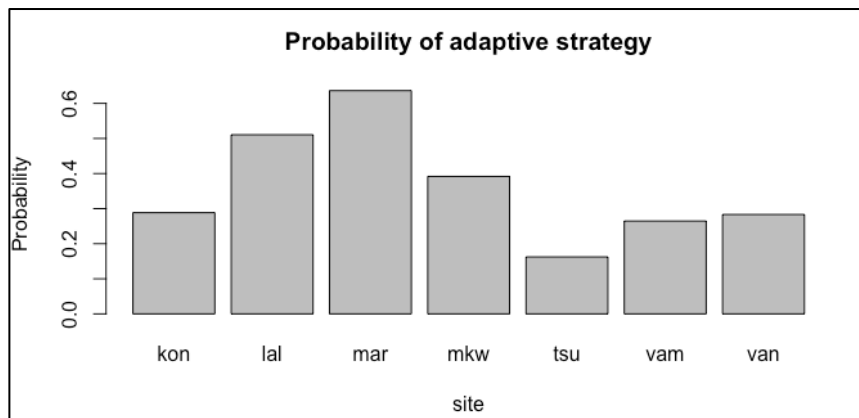
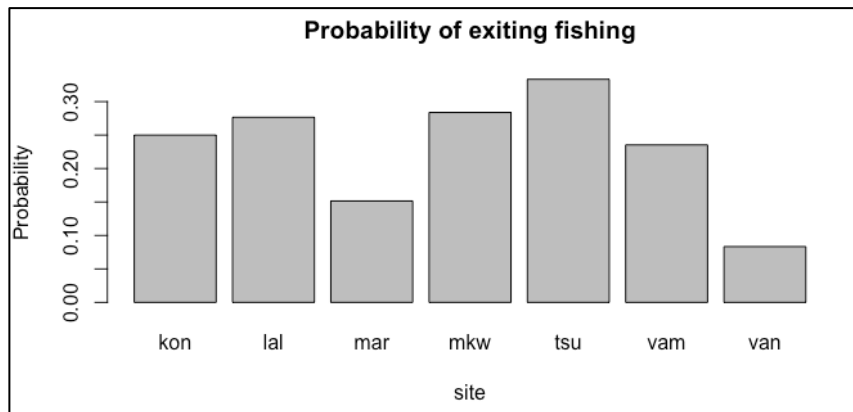


Figure 3: Probability of adopting different strategies after a 50% decline in their fishing catches per site studied: kon, Kongowea; lal, Lalane; mar, Maringanha; mkw, Mkwiro (Wasini island); tsu, Tsunza; vam, Ilha Vamizi; van, Vanga.

The main reasons given by fishermen to continue fishing are similar across sites, although the proportion of fishermen that manifest each reason varies as shown in Figure 4. It is worth noticing that people's beliefs related to God were only mentioned in Mkwiro and Lalane.

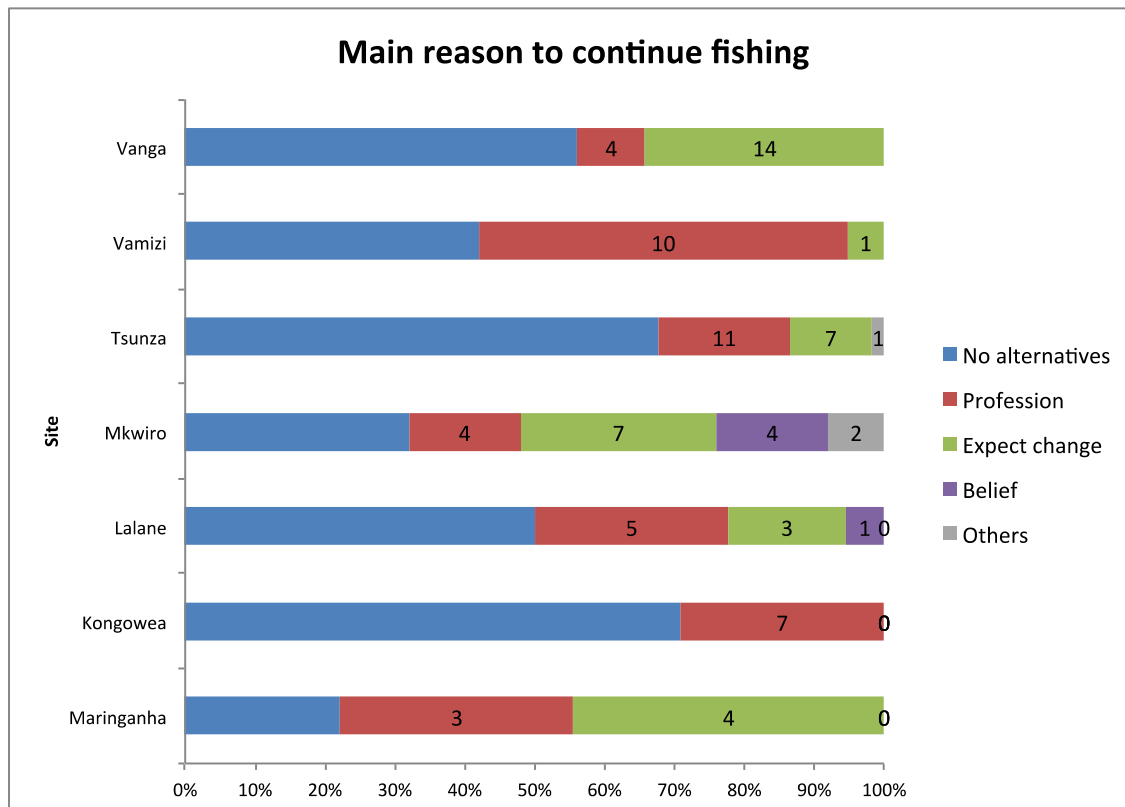


Figure 4. Number and proportion of fishermen per site in relation to the reasons stated to continue fishing.

For fishermen that would exit fishing, not all alternative occupations were mentioned in every site (Figure 5). For example, occupations such as trading, farming, cutting poles or mangroves, or doing an activity related to the marine environment, were only mentioned in some sites. Fishermen from Tsunza and Kongowea stand out for not specifying a concrete alternative occupation to fishing.

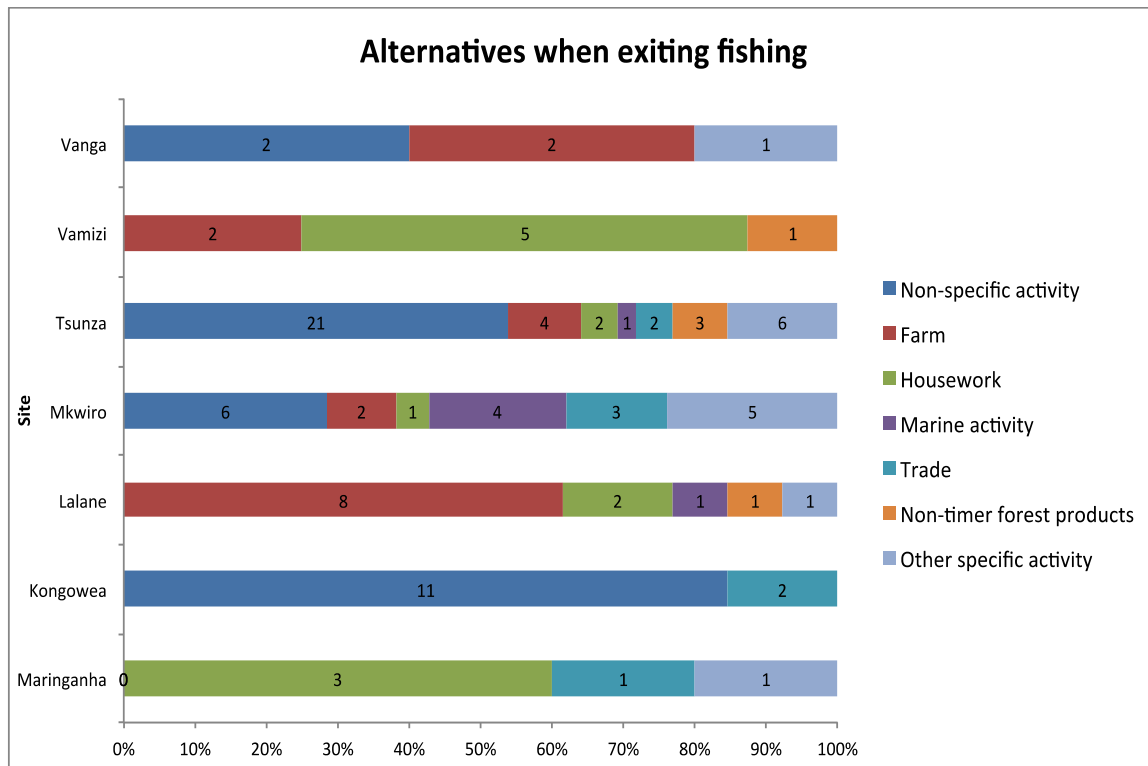


Figure 5. Number and proportion of fishermen per site in relation to the alternative occupation mentioned when exiting fishing.

3.3. Exiting fishing and place attachment

A visual exploration of the place attachment data suggests that the Place Attachment Index is different for Kenyan and Mozambican fishermen (Figure 6). 56% of fishers in Kenya (N=169) have the highest place attachment score, and 72% (N=121) of them would continue fishing. The variability of the index in Mozambique is higher and could show some differences across sites (Figure 6). However, it is worth noticing that in Mozambique the sample size is smaller and that 39% of respondents have the same index score.

Acknowledging the limitations of this data, place attachment does not explain the probability of exiting fishing in Kenya ($p\text{-value} > 0,5$). However, high levels of place attachment seem to be related to a higher probability of exiting fishing in Mozambique ($p\text{-value} < 0,5$).

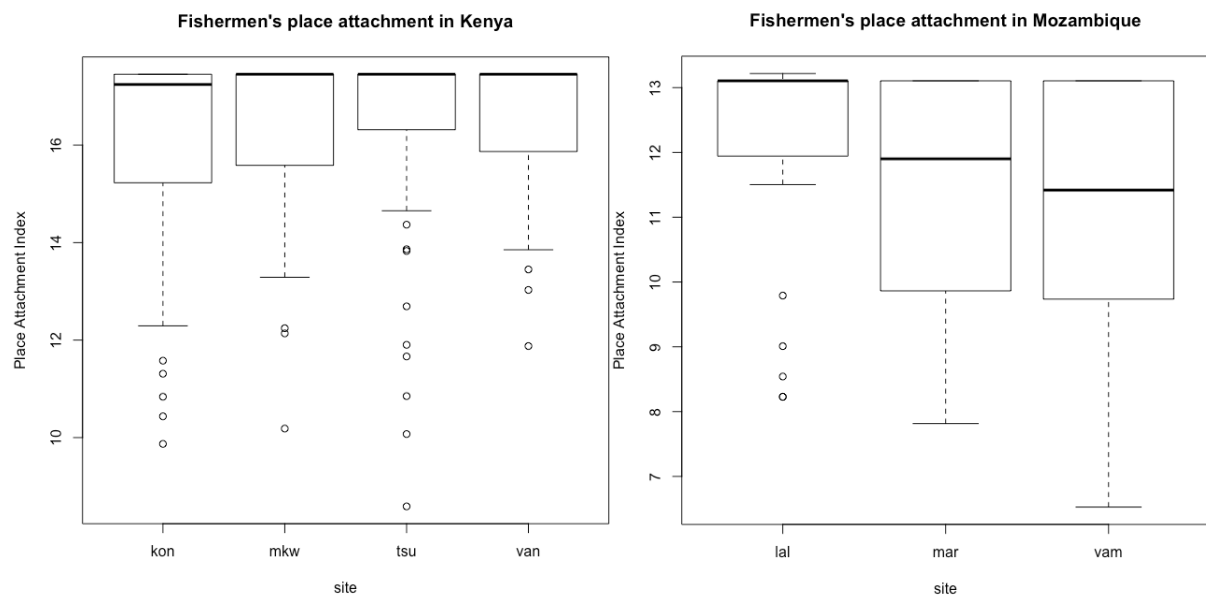


Figure 6. Boxplots of the Place Attachment Index per site in Kenya (left) and Mozambique (right). : kon, Kongowea; lal, Lalane; mar, Maringanha; mkw, Mkwiro (Wasini island); tsu, Tsunza; vam, Ilha Vamizi; van, Vanga.

4. Discussion

The reasons behind continuing fishing are usually diverse, comprising the lack of other livelihood alternatives (Muallil et al. 2011), poverty traps (Cinner et al. 2009), strong attachment to the occupation (Blythe 2014; Polinac and Poggie 2008), high levels of investments or economic development (Daw et al. 2012), or not being able to distinguish short-term environmental fluctuations from long-term trends (Cinner et al. 2009, citing van Densen 2001). The results shown in this study support that most of these reasons influence fisher's behavior in Kenya and Mozambique. Further analysis is required to determine if poverty traps and high levels of investment reduce exiting fishing behavior in the context of this study. These motivations are not trivial, as they can affect the social resilience and wellbeing of fishers in light of environmental thresholds. For instance, a strong attachment to the occupation can be interpreted as social dependence from the resource, which implies that the resource can be essential to maintain fisher's subjective wellbeing (Marshall et al., 2007). A detailed analysis of the different dimensions of wellbeing and fishers exiting behavior could yield insights to better understand these issues.

Other social characteristics such as a strong attachment to place could increase the likelihood of an exiting fishing response or a livelihood diversification strategy to remain living in the community (Blythe, 2014). Hence place attachment could favor the creation of dampening feedbacks. The results of this study in Mozambique seem to support this hypothesis. However, place attachment can also be a reason for social dependence (Marshall et al., 2007), and the dependence to fishing activities would rely on the livelihood alternatives available in the community. Therefore place attachment could both increase and

decrease the probability of exiting fishing depending on other social attributes such as the opportunities to diversify or migrate. Further analysis would be required to clarify the relationship between place attachment and fishers behavior when confronting a catch decline, which could help explaining why place attachment is a more important predictor for Mozambican than for Kenyan communities.

Our results suggest that fisher's behavior varies depending on the coastal community they live in. This relates to results from similar studies in the Western Indian Ocean that demonstrate that fisher's responses are influenced by factors at multiple scales, including the local social and cultural context (Daw et al. 2012). The information available through the SPACES project could lead to a better understanding of the place-based attributes that influence fisher's behavior in these communities. An analysis as such could be important to highlight how different attributes at the community level could affect fisher's and community resilience when confronting environmental changes.

5. References

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Appendix I

A report with the working process of the data analysis is available, together with all the files needed to reproduce the work done during the internship that lead to this paper.

The analysis was done in R and can be repeated from the scripts found in the folder “*Exiting fishing analysis*”. The report where the process is explained is called “*Internship working document for exiting fishing*”.

The graphs created for this paper can be modified in the excel document called “*Exiting fishing_Working paper*” within the “*Exiting fishing working paper*” folder.