

# Fishing Forever?

## *Social and Biophysical Implications of No-take Fishing Zones*

### **Case Study in Moma District, Nampula Province, Mozambique**

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### **Executive Summary**

Between September 2013 and February 2014, the CARE-WWF Alliance undertook both biophysical and household surveys in the Moma Estuary. The goal was to understand the livelihood dependencies on the marine system in the area, as well as the biophysical impacts of marine management. Across six communities and 290 households, we found that: 90% of households rely on farming for either their main source of income, or their main source of food; 79% of households eat fish on a daily basis; and 52% of households have at least one male who actively fishes. Only five households indicated that women had any role in catching fish; however, 28% of households reported that women collect marine species such as clams, mussels, and crabs. Our biophysical surveys showed that the current management regime of community-managed 'no-take' zones deliver between 1.5 to 2 times the number of species, when compared to the areas outside these zones. Moreover, over the three years of management, species diversity in the no-take zones has increased 3 to 4 fold. Linking the two studies, we found that communities support the no-take zones, widely believe them to deliver positive social and biological outcomes, and are also in favor of additional management approaches (e.g., seasonal closures) to the extent that the community is considered an active partner to local government management agencies.



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## Introduction

Roughly 300,000 people live within 25km of the coast in the Primeiras e Segundas area in northern coastal Mozambique. Working there since 2008, the CARE-WWF Alliance has a deep understanding of the livelihood approaches of households and the level of poverty in the region. From regionally representative survey of over 1500 households, we know that 81% of households rely on agriculture for at least a portion of their household welfare. A typical household will farm a plot of land between 0.25-1ha; less than 10% of households own more than 2 ha. For the region as a whole, around 31% of households actively fish, and within these households close to 90% of them also farm. Over one-third of all households are vulnerable to chronic food insecurity – that rate is doubled for female-headed households. Less than 30% of household heads have finished primary school. With respect to local resources, local perception agrees with rapid assessments that most fishing grounds are in severe decline. The story is a similar one with regards to farmland productivity.

In this context, the Alliance seeks a better understanding of household and community livelihoods, their reliance on coastal marine resources, and their assessment of different opportunities for improved management of their terrestrial and marine resources. We were interested in understanding the biophysical impact of two community managed no-take zones in the Moma Estuary, Moma District, as well as the perceptions of communities of this management tool. To meet these ends, the Alliance carried out two complimentary studies: 1) biophysical surveys of fish species within, adjacent to, and outside of the community managed no-take zones; and 2) household surveys in six communities situated along the Moma estuary, including the two communities from where the no-take zones are managed – Thapua and Corane.

Together, these studies help us to assess the social and biological outcomes of small, community-managed fish sanctuaries and to measure the perceptions of effectiveness and fairness of potential fisheries interventions in small-scale fishing communities facing extreme poverty. This document summarizes initial results and insights from this work. (*In Appendix A*, find preliminary findings from the qualitative study and interviews that accompanied this household survey work. In the near future, we will check these qualitative findings against the survey and use them to build out lessons for the region.)

## Fishing and Livelihoods in Moma District

In our survey of 291 households across six communities, we found that 90% of households rely on farming for either their main source of income or their main source of food. At the same time, fish products are an important source of both food and livelihoods. In response to our standardized dietary recall survey, 79% of households reported eating fish within the past 24 hours. This is in line with the results from our 2008 survey that found 66% of households consuming fish on a daily basis. The discrepancy here is likely due to the fact that the 2008 survey was broader in its geographic scope, capturing communities up to 15km from the coastline (i.e., we expect lower reporting levels in the 2008 survey). With respect to fishing livelihoods, 52% of households have at least one male who actively fishes. Only five households indicated that women had any role in catching fish; however, 28% of households report that women collect marine species, such as clams, mussels, and crabs.

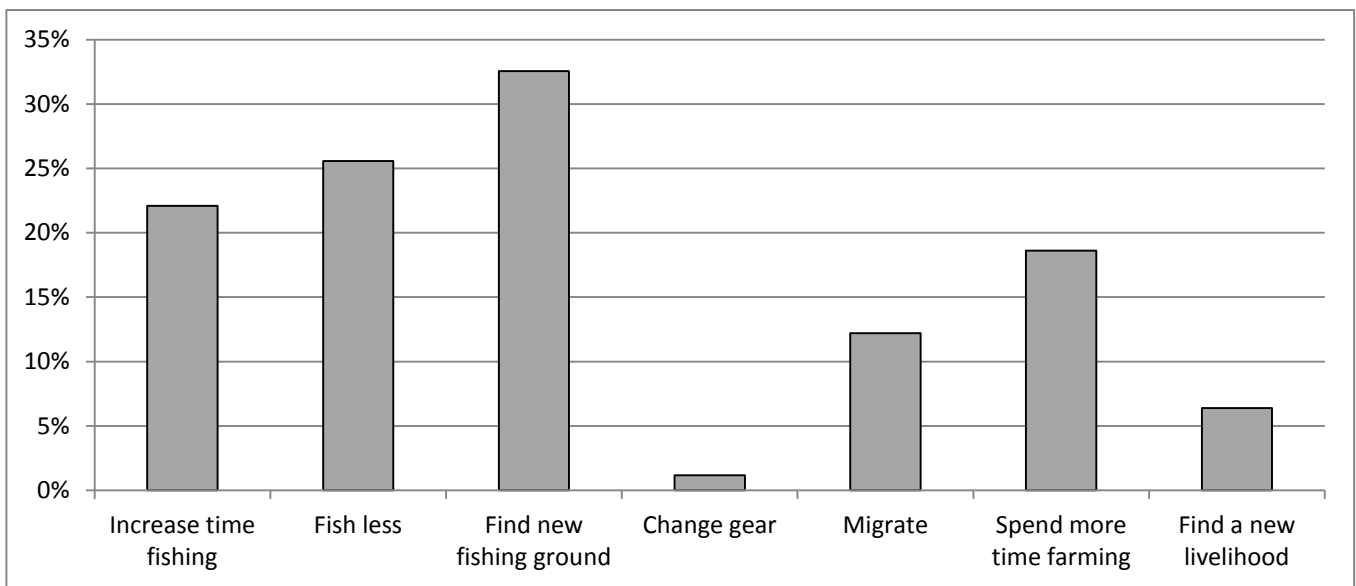
Several questions in the survey helped to paint a picture of fishing practices in these communities. On average, males fish about 3.5 days per week. Fishing consists of beach seining on the P&S islands, beach seining in the estuaries, line fishing both in the estuaries as at sea, and spear fishing. (Some trawling by semi-industrial boats is also happening at sea, but no one in the survey communities was involved in this type of fishing.) 18% of fishing households admitted to using mosquito nets to catch fish. Some cited the high cost of real fishing nets and the fact that mosquito nets were often distributed for free during health campaigns.

There is little post-harvest processing and few value-added activities going on in the surveyed communities. Only 19% of fishing households process fish in any way, and the bulk of processing consists of sun-drying the part of the catch that was not sold or consumed that day. Therefore, 81% of all fish catch is sold fresh or eaten fresh. Little fish leaves the community where it is landed; 79% stays within the community and most of the remaining stays within the district. This makes sense, as the region is relatively isolated, few people have any mechanized mode of transportation, and petrol prices are high.

Half of all fishing households reported that too many fishermen are one of the main problems in coastal fisheries. One-third said that there are significantly fewer fish available today as compared with five years ago. Following up with this perceived trend of declining fish stocks, we asked fishermen how they are or would cope with a large catch decline. *Figure 1 (below)* shows fishermen’s distribution of answers when asked how they would cope if they were to see a 50% reduction in their fish catch. While the most popular strategies are spending more time at sea and finding new fishing grounds, 25% responded that they would fish less, and up to 24% would leave fishing altogether.

**Figure 1. Coping strategies of Moma fishermen faced with a hypothetical 50% reduction in fish catches**

*Note:* Fishermen were permitted to respond to more than one category



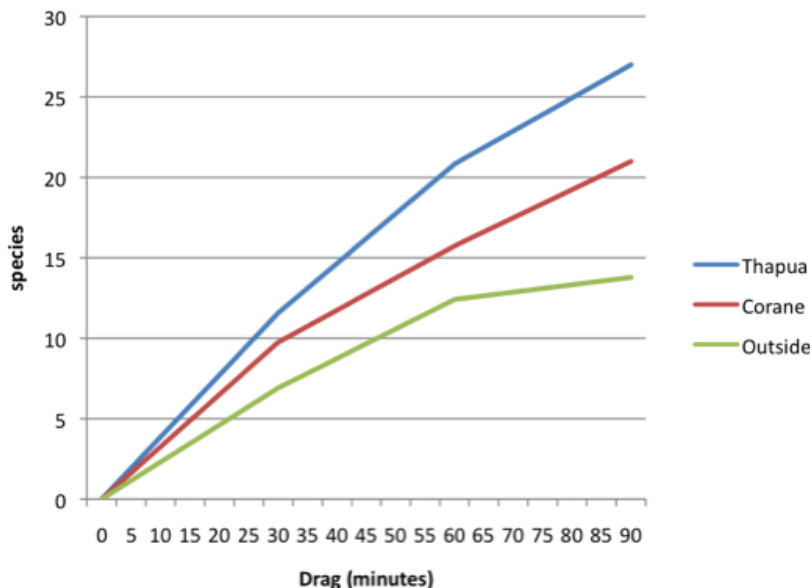
### **Fish Surveys in Moma Estuary**

The biological fish surveys in the Moma Estuary followed up on surveys conducted in February 2010, when two experimental fish sanctuaries adjacent to the villages of Thapua and Corane were established. Each community oversees their sanctuary, which prohibits all fishing in specific no-take zones, while allowing artisanal fishing in spill-over areas. These communities were also part of our household survey work in February 2014. The goal of this work was two-fold. First, we wanted to see how species diversity varied between areas inside and outside the no-take zones. Second, we wanted to detect any discernable changes in species composition between the 2010 survey and the 2014 survey as a result of the community-managed no-take zones.

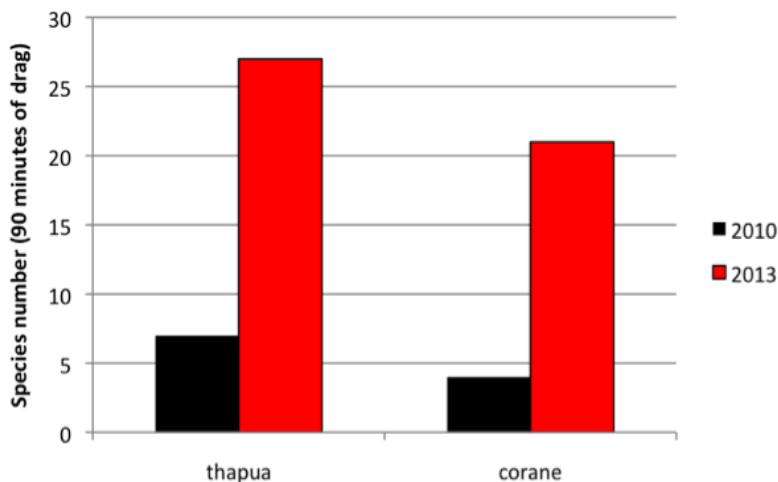
**Methods:** Our sampling method consisted of 30-minute beach seine drags. The team, lead by fisheries association members and local fishermen, sampled sites within, between and outside of the two sanctuaries. We completed three drags in each sanctuary, and three drags 50 meters outside its boundaries. Additional drags were carried out in the 3km buffer zone between the Corane and Thapua sanctuaries. The fishermen set a 100m drag net and hauled it onto the beach. A team on the beach recorded the time of the haul, usually around 30 minutes. When the catch was in, each fish was measured, weighed and identified by its local and Latin names (when known). A photograph was taken of each species. Fish caught inside the sanctuaries were released back into the water. The team kept fish caught outside of the sanctuaries.

**Figure 2. Cumulative species curves for 90 minutes of beach seining**

Note: Species overlap across zones – totaling 45 distinct species.



**Figure 3. Species diversity in no-take zones in 2010 and 2013**



**Results:** Over the week, the team caught over 600 fish in the estuary representing 45 distinct species. Standardized to 90-minutes of drag time (3 replicates per zone), Corane and Thapua fish sanctuaries had 1.5 to 2 times the number of species compared with the areas outside the sanctuaries (see *Figure 2, above right*).

Comparison with the data collected when the sanctuaries were established is also striking. After 3.5 years of community management, the number of species in the two sanctuaries have increased 3 to 4 fold (see *Figure 3, left*).

The initial results indicate that the sanctuaries are helping to increase fish diversity and abundance. The increased abundance and diversity within the sanctuaries could point to one of two things. It could be an indication that the sanctuaries were put in place in the appropriate areas necessary for biological rebound, i.e. areas with diverse habitats that foster and protect juvenile fish. It could also be an indication that the governance of no-take zones, the community endorsement of the regulations has been effective. In order to better understand this and perception of the community of no-take zones as management instruments, we asked a suite of questions in our household survey.

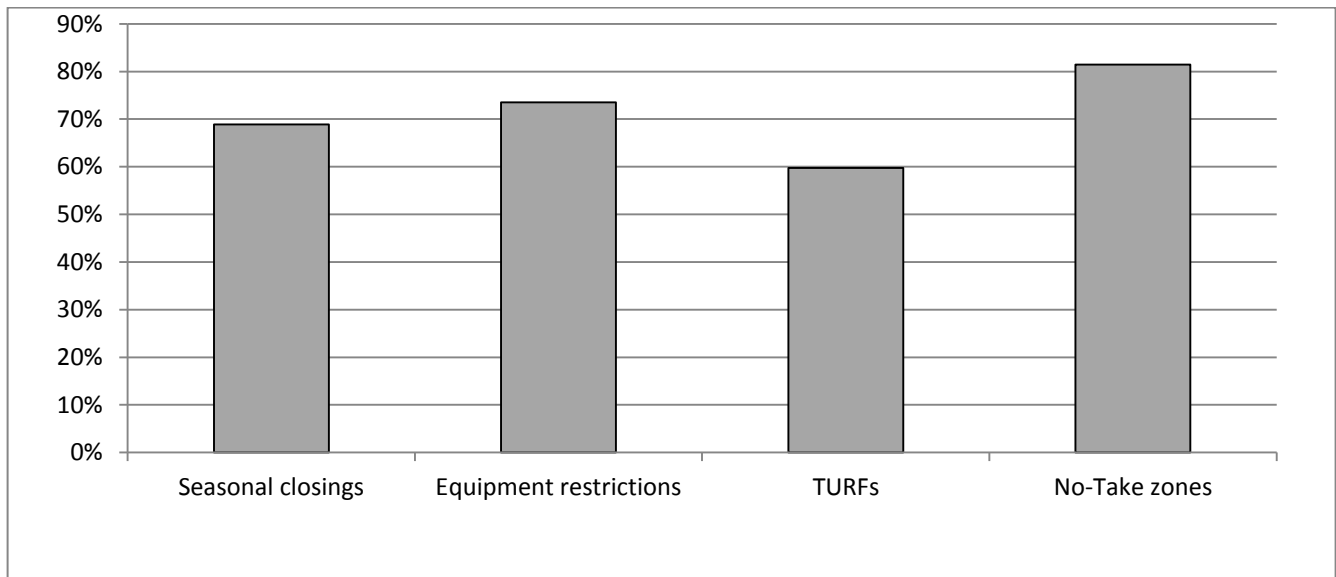
### Community Perception of no-take zones and regulations

Among the first things we wanted to know about the social implications of the no-take zones in Corane and Thapua was how widely they are recognized. In our survey of the six Moma coastal communities, 94% of households responded that they knew of the Corane or Thapua no-take zones. We followed up by asking about the perceived benefit of the no-take zones. 79% of households reported that they thought there were positive community benefits of having and being involved in the no-take zone. 88% of fishermen reported that they thought the no-takes help to increase fish stocks, and a similar magnitude (84%) thought that the no-take zones deliver an increased number of species.

Within the limitations of a survey tool, we conclude that there is both broad support for the no-take zones and a perception that they improve the fisheries' biological conditions. We wanted to go one step further and understand the perceptions of these communities towards other management tools for coastal small-scale fisheries. We also found widespread support of management regimes including seasonal closings, equipment restrictions, territorial user rights (TURFs) and no-take zones (see *Figure 4, below*). Perhaps it is not surprising that the management regime the communities are most familiar with, the no-take zones, received the widest support: 82% "strongly agree" with no-take zones as a management option.

Finally, with fairly strong results regarding 1) the importance of fish for livelihoods in this region, 2) the positive biological impact of the no-take zones, and 3) the social acceptance of a suite management regimes, we asked households who should be responsible for managing the coasts and estuaries. While 51% of the respondents thought that the current situation was characterized by a co-management setup between the local government agencies and local communities, 85% of respondents thought that co-management would be the best regime for the management of the coastal fisheries in this region.

**Figure 4. Percent of fishing households that "strongly agree" with the appropriateness of different management tools for small-scale fisheries**



## *Conclusion*

While this case study is limited in its scope and scale, results from Moma support a number of findings consistent with the wider literature. Our results confirm the efficacy of community-management no-take zones, the importance of fish for coastal diets in poor and marginalized areas, and the social acceptance of localized management regimes in partnership with local government agencies.

Further, this study confirms the merit of the CARE-WWF Alliance's broader agenda of restoring healthy ecosystems and expanding diverse, sustainable livelihood opportunities for vulnerable, impoverished coastal communities. Like community support for marine management, 46% of households surveyed thought the conservation agriculture work the Alliance implements through Farmer Field Schools is increasing agricultural yields. Moreover, 78% of households expressed desire to participate in the Farmer Field Schools (demand far outstripping supply).

Alliance work in Primeiras e Segundas suggests that mixed livelihood strategies are the rule, not the exception, in rural, coastal Mozambique. Working simultaneously on marine resource management and terrestrial-based livelihoods, is one of the most effective ways to build more resilience in the region.

## Appendix A: Highlights from qualitative survey and qualitative interviews

Dominique Bovens, February 2014

These results reflect the perceptions of six villages on the Moma estuary. This involved a quantitative survey with 290 households, followed by focus group discussions.

1. **Farming** – *Agriculture remains the main source of income* for the majority of households. In the majority of the fishing households, agriculture is still an important source of food or income. In most of the communities, families are not using different and more resistant varieties of crops, such as cassava and sweet potato. They are also experiencing destruction to their farms (*machambas*) due to wild animals. A more recent development and increasing problem is the destruction of *machambas* by the Chinese. They are extracting sand in the surrounding areas and do not respect the boundaries of the *machambas*, thereby destroying the crops.
2. **Livestock** – *Many households have livestock, especially chickens and ducks*. One of the most significant problems is that these animals have been getting sick and therefore cannot be eaten or die.
3. **Crop storage** – *Conservation of fruits and vegetables*. In many of the communities, it is feast or famine. In the times of good harvest, there is an abundance of food. However, hunger is common when the harvest is over.
4. **Use of mosquito nets** – Communities have admitted to using mosquito nets for fishing in the past. They also say that they no longer use them, but that neighboring communities still fish with mosquito nets. Fishermen explain the use of mosquito nets: they can catch even the smallest fish, and are given to the community members for free during government health campaigns. In contrast, a proper fishing net costs 5,000 to 8,000 Meticaís (USD \$160-260), which the majority of the community members cannot afford. It was also stated that the use of drag nets is decreasing the fish quantities.
5. **Benefits of fish sanctuaries** – All of the communities benefit from the sanctuaries—either directly, through fishing in the sanctuary, or indirectly because they buy fish from the fisherman that fish in the sanctuary.
6. **Management of the sanctuaries** – Some communities have expressed that they are not completely satisfied with the management of the sanctuaries. Some community members expressed that there is a lack of enforcement of rules, some illegal fishing that occurs at night, and suggested preference for a rotational management system involving the community, as a whole. There is no clarity of understanding regarding the remuneration or non-remuneration of sanctuary monitors, which suggests the need for a stronger “soft” component of program activities.
7. **Lack of committees/associations** – Community-based organizations (CBOs) could help the communities create support structures through which they could join forces to buy nets and increase their fishing capacity. CBOs could also build capacity, focusing on the production of nets to both generate income and make them more accessible to the communities.
8. **Lack of schools** – There is a very low educational level. Schools are located a significant distance from the communities (often, 5 to 7 km away). This means that not only did many adults never attend school, but also their children currently do attending school. In this way, the communities’ low level of human capacity is likely to be maintained in the future.