Assessing the impacts of project interventions using fisheries indicators in Northern Mozambique

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Background

Northern Mozambique has the highest levels of marine biodiversity in the Western Indian Ocean (WIO) region. Critical habitats such as coral reefs and species of conservation concern such as Bolbometapon muracatum (Bumphead parrotfish) and Cheilinus undulatus (Napoleon wrasse) have been recorded in the region. However, the region is among the poorest in the country and coastal communities are highly dependent on marine resources. Declining fisheries stock have been reported and attributed to increasing fishing pressure from resident and migrant fishers and the use of unsustainable gears. Maintaining a business as usual scenario will threaten the health of the marine ecosystem and people’s livelihoods.

Fisheries indicators are commonly used to measure impacts of fisheries management interventions. They can help detect change in the state of the fisheries over the period of a project.

The objective of the study was to track achievement of two objectives set out in Our Sea Our Life (OSOL) using fisheries indicators notably:

  a) Decreasing trends in biomass of key fisheries species (and key biodiversity metrics) halted or reversed within pilot Community Fisheries Councils (CCPs) management areas by year 3.
  b) Increasing trends in populations of 5 flagship IUCN red list species within CCP management areas by year 3.

Methods

The state of the coastal fisheries in the OSOL project sites in Palma and Mocimboa da Praia, Cabo Delgado was compared before and after the start of the project’s conservation interventions.

Fishery catch landings were monitored through creel surveys in northern Cabo Delgado spread over 80.13 km of coastline in six villages. Baseline fisheries data collection took place in 2014, while the “post intervention”, was made in 2016. This study used data collected in the months of September to December as the replicable months spread over three years 2014-2016.

Three broad activities designed to support coastal communities in establishing Locally Managed Marine Areas (LMMAs) were used to categorise the sites into Control and Impact sites. These included support to the CCPs, establishment and development of LMMAs and progress made in savings by village savings loan associations (VSLAs). These activities were not uniform across
all project sites, and therefore lends itself to a Before, After, Control, Impact (BACI) design approach.

The BACI design analysis resulted in grouping 2014-2015 data as Before and 2016 data as After and used the following metrics to assess the changes: Catch Per Unit Effort (CPUE) and relative abundance of species were selected as reliable and replicable indicators in this study. Trends in CPUE, biomass of key fisheries species and 5 flagship IUCN Red List species. A two-way ANOVA was used to compare the mean differences in CPUE between period (Before and After) and sites (Control and Impact). This was done for both gears and species CPUE.

**Results**

Overall CPUE at Impact sites was significantly lower than at Control sites, in both the Before period and the After period (F=2.797; p=0.0394). ANOVA found no significant differences in gear CPUE between Before and After periods and between Impact and Control sites except for spearguns (Before vs After F= 4.376; p=0.0393) and mosquito nets (Control vs Impact; F= 10.59; p=0.0017). In the After period, three flagship species *Epinephelus fuscoguttatus* (Marbled grouper), *Plectorhinchus laevis* (Coral trout grouper) and *Cheilinus undulatus* (Napoleon wrasse), were recorded in catches at Impact sites but not at Control sites. A significant increase in species CPUE was recorded from Before to After periods but in both Control and Impact sites. Only three species did not show this pattern: *Siganus sutor* (Shoemaker spinefoot rabbitfish) increased in CPUE over time in Control sites but a decrease was recorded at Impact sites; *Variola louti* (Yellow-edged lyretail) CPUE increased at Impact sites and decreased over time at Control sites and *Naso brevirostris* (Spotted unicornfish) showed a strong decrease in CPUE over time, at Impact sites with a marginal increase at Control sites.

**Conclusion**

Total aggregated CPUE (all gears and all species lumped) provides no evidence that the project’s interventions have had any impact on catches. Trends in CPUE at Impact and Control sites did not differ in a direction that could be attributed to the conservation activities, and the After period did not show higher CPUE at Impact sites compared with Control sites.

Species CPUE did not provide evidence of an effect at the project intervention sites (Impact sites) but instead recorded increasing CPUE at all sites suggesting the increase is due to other factors.

Aggregating all fishing gears into a total CPUE can mask changes. However, gear based CPUE analyses provided little evidence for higher CPUE in any gears at the Impact sites in the After period. Catches of *E. fuscoguttatus* (Marbled grouper), *P. laevis* (Coral trout grouper) and *C. undulatus* (Napoleon wrasse) showed some evidence for an improvement in the population abundance of these three important flagship conservation species (Vulnerable or Endangered on the IUCN Red List) using catch biomass as a proxy for population biomass.

Key words: Indicators, Catch Per Unit Effort, Before After Control Impact, Flagship species