**Analysis of fisheries data collected from Small Scale Fisheries (2014-2018) with focus on the RUMAKI seascape**

When quoted this report should be referred to as:

Kuguru, B. 2020. Analysis of fisheries data collected from small scale fishers with focus on RUMAKI seascape. WWF-Tanzania Report.

**Table of Content**

**Executive Summary**

It is widely recognized that knowledge of the status and trends of capture fisheries, including socio-economic aspects, is a key to sound policy-development, better decision-making and responsible fisheries management. For the fisheries to contribute to food security it is important that information related to a particular stock or entire fisheries is available on an instant basis.

Countries in coastal East Africa have taken up a scheme to decentralized management of the fisheries. The countries have introduced fisheries co-management systems as an approach to manage coastal and marine resources. It was anticipated that participation of BMUs in the data collection would improve coverage and timely collection of the fisheries data.

In the year 2016, TAFIRI in collaboration with WWF conducted a pilot study to explore the use of the mobile application as a tool in fisheries data collection (e-CAS). The initiative started with five (5) selected BMUs, members were trained on the use of mobile application in fisheries data collection. It was through this initiative species of tuna and tuna-like were recorded for the first time (Kuguru and Sailale 2018). As of today, the initiative has been rolled out to all coastal districts landing sites and endorsed by the Government.

The current assignment undertook an analysis of data collected from the e-CAS and regular CAS survey collected from 2014 to 2018 to assess stock healthiness and quality of the collected data from small-scale fisheries landings in Rufiji, Mafia, and Kilwa districts (RUMAKI).

The status of fish stock healthiness in the RUMAKI and Non-RUMAKI districts was assessed based on the data from CAS spanning from 2014 to 2018 and additional data from the eCAS spanning from 2016 to 2019 respectively. Fisheries catch variation spatial maps, total catch and catch trends of the six priority fishery categories were used to assess the status of fish stock healthiness in the RUMAKI districts. The report is focused on major five priority fisheries groups due the reasons that there was inconsistent in the data collection in terms of specific species or particular family groups. The groups were drawn from the ongoing SWIOFISH project. These include Octopus, Small pelagics, Tuna and tuna like species, Reef species and Elasmobranch.

The average annual total catch for the octopus fishery was found to be (xx-xx tones per year) in the non-RUMAKI and (xx-xx tones per year) in the RUMAKI districts; the district of xx and xx had higher landings in the RUMAKI and no-RUMAKI respectively. For tuna and tuna-like, the average total annual catch for the tuna and tuna-like species was found to be (xx-xx tones per year) in the non-RUMAKI and (xx-xx tones per year) in the RUMAKI districts. The average annual total catch for the Small pelagic fishery was found to be (xx-xx tones per year) in the non-RUMAKI and (xx-xx tones per year) in the RUMAKI districts; the district of xx and xx had higher landings in the RUMAKI and no-RUMAKI respectively. In addition, for reef species the average annual landing was found to be (xx-xx tones per year) in the non-RUMAKI and (xx-xx tones per year) in the RUMAKI districts; the district of xx and xx had higher landings in the RUMAKI and no-RUMAKI respectively. Finally, for elasmobranch, annual average catch was (xx-xx tones per year) in the non-RUMAKI and (xx-xx tones per year) in the RUMAKI districts; the district of xx and xx had higher landings in the RUMAKI and no-RUMAKI respectively.

In general, findings indicate there is a decrease in total catch from artisanal fishers in the RUMAKI districts for all major fisheries groups with the exception of small pelagic based on the data collected by BMUs from 2016-2019. Data collection is improving, in terms of timely submission of the data, but there is inconsistency in the data collection and little focus on the species of interest.

Among others, the current report recommended the following: The Department of Fisheries (DoF) in collaboration with TAFIRI should consider identifying representative species for all priority (major) fisheries groups and consistency follow up the data collection on the identified species. The DoF should consider adapting and upscaling the eCAS as the main data collection tool. Promote timely preparation of fishery statistics through the application of the databases. This should go along with the timely sharing of the statistics with relevant stakeholders. In addition, promote capacity development to all levels in the area of data collection, processing, analysis, interpretation and reporting. This should go hand in hand with periodic strategic planning/system review of marine fisheries as data collection should be in a position to answer some of the management questions of the time.

The collection and analysis of fishery data and information is a costly and timely exercise. To be relevant and cost-effective, fishery data and information collection systems must have a clear set of objectives and appropriate strategies to collect data, which should be based on priorities and requirements of data users. However, chronic problems of insufficient human and financial resources allocated for data collection often resulted in the poor quality of information that further led to no- or limited use of statistics for fishery management and policy development. Consequently only dwindling support was given to the systematic improvement of national fishery data and information collection systems. There is an urgent need to terminate this vicious cycle of problems. The previous budget allocated by the Government for data collection during CAS should be more than enough if re-allocated to the used in the improved eCAS data collection system.

# Background

Tanzania coastal marine fisheries are largely dominated by artisanal fishers (Sobo, 2004), catches are used for subsistence purpose while few species are traded for internal and external markets (Hamidu, 2012). The fishery contributes to the social-economic development of the coastal community and beyond (Hamidu, 2012), However, proper management of the fishery resource is yet to be realized (Berachi, 2003; Hamidu, 2012; Jacquet and Zeller, 2007).

It is widely recognized that knowledge of the status and trends of capture fisheries, including socio-economic aspects, is a key to sound policy-development, better decision-making and responsible fisheries management. For the fisheries to contribute to food security it is important that information related to a particular stock or entire fisheries is available on an instant basis. Fisheries information can be used to validate the policy in place and track the performance of fisheries management. Therefore, the importance of fisheries data collection can not be overemphasized.

Management measures for small-scale fisheries must also account for strategies to collect and analyse data (Robertson et al 2018). In many data-poor countries, full stock assessment is hardly conducted, scientists are forced to use data-poor methods to come up with estimated stock status which in many cases does not reflect the actual situation. For instance, landings of coastal fisheries in Tanzania are chronically under-reported (landings are at least 1.7 times higher than the actual reported landing) and catch rates appear to be maintained by a continual increase in effort (Jacquet and Zeller, 2007, Bush et al., 2017). Improvement in data collection systems is therefore essential to ensure proper management of the fisheries resource.

Countries in coastal East Africa have taken up a scheme to decentralized management of the fisheries. The countries have introduced fisheries co-management systems as an approach to manage coastal and marine resources. It is in this context, more accurate and timely information should reach to relevant stakeholders and result in a better-informed decision at all levels. In Tanzania, the system was introduced in the year 2003, it entails establishments of community-based co-management groups commonly known as BMUs (Beach Management Units; Sobo, 2012). Since the inception of the BMUs, the government, in collaboration with the World Wildlife Fund (WWF) has established more than 204 BMUs along the coast (Kanyange et al., 2014). One of the major tasks of the BMUs is to participate in fisheries data collection, particularly data related to the Catch Assessment Survey (CAS). The outputs of the CAS are the estimation of the total fish production by weight and value, catch per unit effort, and to conduct stock assessments.

It was anticipated that participation of BMUs in the data collection would improve coverage and timely collection of the fisheries data. This has been true but challenges are inevitable. One o f the challenges is related to the systems itself, the use of hard copies. BMUs had to collect and send back filled forms to the centralized offices (department of fisheries statistics) for compilation and analysis. This process involved a number of human resources and is time-consuming. However, feedback to the community has been a steep mountain. Following the introduction of smart mobile phones, it was thought, the use of mobile applications in fisheries data collection will facilitate instant submission of catch data to a centralized database, reduce backlog and cost related to the transportation of hard copies and finally facilitate timely feedback to the communities and other stakeholders. In this context, WWF and Tanzania Fisheries Research Institute (TAFIRI) have been working to realize this concept in the RUMAKI seascape.

In the year 2016, TAFIRI in collaboration with WWF conducted a pilot study on the use of the mobile application in fisheries data collection (e-CAS). The initiative started with selected 5 BMUs, selected members were trained on the use of the mobile application in fisheries data collection. Initial analysis suggested the proof of concept is possible. It was through this initiative species of tuna and tuna-like were recorded for the first time. As of today, the initiative has been rolled out to all coastal districts landing sites and endorsed by the government.

Monitoring and evaluation of the mobile data collection system have been a work in progress over the years. The monitoring program is meant to fine-tune the application, quality check and provide a recommendation to different stakeholders. At this end, WWF has assigned TAFIRI to undertake analysis of e-CAS and CAS fisheries data collected from 2014 to 2018 to assess stock healthiness and quality of the collected fisheries collected from small-scale fisheries landings. Specific tasks under the current agreement are:

1. To review the status of stock healthiness in the RUMAKI districts based on the data collected from 2014 to 2018.
2. Compare stock healthiness between RUMAKI and the rest of the coastal districts outside the RUMAKI area.
3. To provide recommendations on the quality of e-CAS fisheries data.
4. To assess the reappearance of fish species in the study area and its link to conservation initiatives.
5. To prepare a brief summary of the findings for local artisanal fisher communities.
6. To develop a statistical fact sheet based on the findings
7. To develop a manual for e CAS mobile system
8. To prepare documentation for a stakeholders’ workshop.

The current report is prepared based on the above agreements particularly number 1-4, other deliverables (5-8) will be submitted as independent documents.

# Methodology

## Approach

The current assignment was desktop-based. The fisheries annual statistics reports from 2014 to 2018 were the source of data. The Department of Fisheries publishes these reports annually and available upon request from the department. In addition, we retrieved e-CAS, an online platform for storing fisheries data in Tanzania mainland, this particular data span from 2016-2019. The database is currently hosted by the Department of Fisheries and periodically updated by TAFIRI.

For the purpose of this report, the RUMAKI area comprises the districts of Kibiti, Mafia, Kilwa, Kigamboni and Mtwara Rural. These are located in the southern coast of Dar es salaam. Non-RUMAKI area comprises all other remaining coastal districts, from the northern end it includes, Mkinga, Mheza, Pangani, Bagamoyo, Kinondoni, Ilala and Mkuranga; from the southern end the districts of Mtwara urban, Lindi rural and urban.

## Data collection

The current assignment used the official Catch Assessment Survey (CAS) data spanning from the year 2014 to 2018. In addition, we also extracted data collected by BMUs members from the RUMAKI districts, this additional data span from 2016-2019. The database is currently hosted by the Department of Fisheries and available online upon permission.

Prior to the analysis, we conducted data cleaning and quality check-up, this exercise removed all data points that were either wrongly recorded, duplicate or name of species/genus were missing/misspelt. Afterwards, we checked for major fisheries groups that have appeared consistently over the years. There is no single species that has appeared in the data set consistently from 2014 to 2018. Therefore, the dataset was grouped according to major six fishery groups with few common representative species where available (Table 1). The groups/priority fisheries are Octopus, Small pelagic, Tuna and tuna-like, Reef fishes, Elasmobranch and Prawns. These groups were adopted from priority fisheries under the SWIOFish Project with an addition of Elasmobranch .

Table 1. Priority fisheries Category and their respective fish species pooled from the eCAS database and Annual statistics CAS reports.

|  |  |  |  |
| --- | --- | --- | --- |
| **FISHERIES CATEGORY** | **Species** | **FISHERIES CATEGORY** | **Species** |
| OCTOPUS | Octopus cyanea | REEF FISH | Red snapper |
| SMALL PELAGIC SPECIES | *Amblygaster sirm* | Serranidae |
| Sardine | Carrotomus carolinus |
| Mackerel | Lutjanus spp |
| *Dussumieria acuta* | Lethrinus |
| TUNA AND TUNA LIKE SPECIES | *Auxis thazard* | ELASMOBRANCH | *Carcharhinus spp* |
| *Euthynnus affinis* | *Rhynchobatus spp* |
| *Istiophorus platypterus* | *Himantura uarnak* |
| *Katsuwonus pelamis* | *Maculabatis ambigua* |
| *Scomberomorus* spp | *Manta alfredi* |

**3. Results and Discussion**

The results and discussion section is based on the five priority fishery groups presented above. First, we are providing a general picture of areas with high and low catches along the coast. Second, we zoom in into specific group performance in each coastal district.

**3.1. Status of stock healthiness in RUMAKI and Non-RUMAKI districts.**

The status of fish stock healthiness in the RUMAKI and Non-RUMAKI (area outside FISHCOM project) districts was assessed based on the data from CAS spanning from 2014 to 2018 and additional data from the eCAS spanning from 2016 to 2019 respectively. To visualize the magnitude of fisheries landing from each district spatial maps were developed (Figure 1-5) for the five priority fishery groups (Table1).

**3.1.1 Spatial variation of fisheries total landings in the RUMAKI and non-RUMAKI districts for selected major fisheries groups.**

**Octopus cyanea**

There are only one species of octopus in Tanzania (Guard, 2002; Table 1). The average annual total catch for the octopus fishery was found to be (xx-xx tones per year) in the non-RUMAKI and (xx-xx tones per year) in the RUMAKI districts. The spatial maps indicate the district of Ilala had the highest catches in the non-RUMAKI, whereas districts of Kilwa and Lindi revealed the highest catch landings for RUMAKI areas (Figure 1). The possible explanation for Ilala to have the highest catch could be the country's main marine fisheries market (The Ferry Market) is located in Ilala, Dar es Salaam. It receives landings from other parts of the country, particularly from the southern coast regions. Therefore, apart from Ilala being a landing site it also serves as the main market for fishers and fish traders from other parts of the country. On the other hand, the lowest catches noted at Temeke and Mtwara could be related to the limited seascape for these districts and close proximity to the main ferry market for the case of Temeke. Rufiji is exceptional, the large part of its fishing ground is dominated by mudflats and continuous influx of riverine waters from the delta. This habitat is known to be favourable for prawn fishing. Kilwa is well known for octopus fisheries particularly Songosongo archipelago (Gaurd, ..). Surprisingly Mafia districts have not surfaced as an area with higher Octopus landings, but other studies (Muhaji xx, Guard xx and Kishe et xx, WWF xx ) reported higher landings of octopus from Mafia. The possible explanation was weakness in CAS data collection in Mafia.

|  |  |
| --- | --- |
|  |  |

**Figure 1:** Average annual catch for Octopus fishery in the (a) Non-RUMAKI and (b) RUMAKI coastal districts.

**Tuna and tuna-like species**

The average annual catch for the tuna and tuna-like species was found to be (xx-xx tones per year) in the non-RUMAKI and (xx-xx tones per year) in the RUMAKI districts. The spatial maps indicate the districts of Ilala have highest catches while Muheza, Pangani and Mkuranga and xx have lowest catches in the non-RUMAKI and RUMAKI areas respectively (Figure 2). Description of the output from statistical analysis of the CAS data of tuna and tuna like species reveals Ilala district to be healthier ecologically than other coastal districts. However, this may be misleading information. The route cause could be the existing weak statistical data collection system. Ilala is a market center for tuna and tuna like fish species . Good prices are found in Dar es salaam because of high demand from restaurants and hotels. The purchasing power of the residents of Dar es salaam is relatively higher compared to other districts along the coast of Tanzania. Therefore, most fishermen from other coastal districts depend on the ferry market for the high value of their catch. Information on tuna and tuna like fisheries in Tanzania is limited Mshana et al (XX) and the recent preliminary SwioFish priority tuna and tuna like fisheries study findings suggest Tanga city and Mtwara municipal are leading in landing of tuna and tuna like species. It is advised that more effort is needed to improve the data collection system particularly at the marketing center, making sure the catch information of the original district where the catch is from is captured (improvement in traceability). The priority representatives species for each fishery are well captured based on fisheries experts. However, data related to artisanal tuna and tuna-like species is hardly known, the current data eCAS collection systems in Tanzania is an initiative addressing this challenge. The initiative has managed to separate tuna from other fish species but the effort is needed to collect error-free data at species level as required by the Indian Ocean Tuna Commission (IOTC).

|  |  |
| --- | --- |
|  |  |

**Figure** **2**:Average annual catch for tuna and tuna-like species in the RUMAKI and non-RUMAKI coastal districts.

**Small pelagics**

The average annual catch for the small pelagic is (xx-xx tones per year) in the non-RUMAKI and (xx-xx tones per year) in the RUMAKI districts. The spatial maps indicate the districts of Kindondoni and Mkuranga have highest catch, this is true for Kilwa and Mtwara in the RUMAKI area. Pangani and Temeke and Rufiji have lowest catch in the non-RUMAKI and RUMAKI areas respectively (Figure 3). A quick interpretation of these results is that most landings of small pelagic fish are in Dar es salaam but in the actual sense Dar es salaam is a marketing center and most fishermen from the northern coastal district as well as southern coastal districts bring fish to the market. Pangani and particularly Kipumbwi is known to be among the best landing sites for small pelagic fisheries in Tanzania coastal districts, however the analysis of CAS data reveals the opposite. The general conclusion there was a weakness in the data collection system. Data related to small pelagic is scarce and in most cases underestimated. This is due to the nature of the fishery itself, landing is usually packed in boxes or buckets and sold in bulk, makes the estimation difficult. A dedicated effort is needed to make sure data related to small pelagic is accurately collected, more important during the peak season in NEM (calm sea with favourable temperature and nutrients (Abdellaoui et al 2017).

|  |  |
| --- | --- |
|  |  |

**Figure 3:** Average annual catch for small pelagic species in the RUMAKI and non-RUMAKI coastal districts.

**Reef species**

Reef fisheries contributes to over 90% of total fish lanThe average annual catch for the reef fishery is (xx-xx tones per year) in the non-RUMAKI and (xx-xx tones per year) in the RUMAKI districts. The spatial map indicates catch (MT) variation for reef fishery among the non-RUMAKI area (Figure 4), the districts of Pangani ranked highest (catches above 225 tonnes/year), followed by Mkinga and Kinondoni. Muheza and Bagamoyo ranked least with catches below 75 tonnes/yr.

|  |  |
| --- | --- |
|  |  |

**Figure 4:** Average annual catch for reef species in the non-RUMAKI and RUMAKI coastal districts**.**

**3.1.2 Catch trend comparison of stock healthiness between FISHCOM area and the rest of the district**

The average fish landings in the RUMAKI area seems to be higher compared to other areas (Figure 8a) from the year 2015-2017 and declined in 2018. This trend is true for reef and tuna fishery (Figure 8b-e). However, one has to interpret this trend cautiously as the number of fishers, vessels, fishing areas and other parameters are not the same. If the above parameters are integrated (standardized) a good comparison can be made. Overall, the RUMAKI area seems to be doing better compared to other districts, this could be linked to the ongoing implementation of the fisheries co-management initiative spearheaded by WWF.

|  |  |
| --- | --- |
|  |  |

**Figure 5.** Mean catches and standard error for the four common fisheries group in RUMAKI and non-RUMAKI area (2014 to 2018)

**3.2 Status of stock healthiness in the RUMAKI districts**

The status of fish stock healthiness in the RUMAKI districts was assessed based on the data obtained from the eCAS for the year 2016 to 2019 . The use of mobile application in fisheries data collection was firstly implemented as a pilot project in the three districts of Mafia, Kilwa and Rufiji/Kibiti. Therefore, during this period data from Kigamboni and Mtwara rural is missing in the system. Part of the next analysis (Figure 6-8) excluded data collected in the year 2014-2015 as districts of Kigamboni and Kibiti were not part of the pilot project.

**3.2.1 Catch Trends for priority fisheries stock in the RUMAKI**

The current findings indicate there is a decrease in total catch from artisanal fishers in the RUMAKI districts for all major fisheries groups with the exception of small pelagic (Figure 5a). This is based on the data collected by BMUs members at different landing sites from 2016-2019. The direct reasons linked to this trend could not be established, as environment data, catch and effort and other parameters are not part of the general fisheries data collection. Potential reasons could be due to the environmental variability and specifically increased in sea surface temperature (SST). TAFIRI is independently monitoring change in environmental conditions for the entire coast, findings suggest from 2016 to 2019 there has been a change in sea surface water temperature annual anomaly of 1.7oC and particularly in 2017 (Fig. 5a and b). The other reason could be anthropogenic, specifically dynamite fishing, but this is yet to be linked/confirmed. However, Pandu (2014) suggested, increasing demand from the hotel sector is leading to overfishing as well as the escalating use of destructive fishing methods .

|  |  |
| --- | --- |
|  |  |

**Figure 6.** (a) Trends of Mean catches for the five common fish group in RUMAKI area from 2016 to 2019 (b) Sea surface Temperature annual anomaly in Tanzanian waters between 2014 to 2018

**3.2.2 Comparison of the total catch for priority fisheries groups among RUMAKI districts**

Catch trends of the major fishery groups in the RUMAKI area are shown in Figure 6. Despite the general trend of decreased fish catch in the RUMAKI districts, a detailed analysis for each district indicates some fisheries categories seem to be doing better in some places between 2016 to 2019. For instance, octopus and tuna species catches show an increase in Kigamboni, likewise, reef fish and octopus in Mtwara rural. More importantly, there is some consistency in the data collection for Kibiti, Kigamboni, Kilwa and Mafia districts (Fig 6a&b). This is good news. Though this is not yet to the standard that will assist a full stocks assessment it is a good starting point. The data points gaps in Mtwara and Kibiti indicate the inconsistency in the data collection. Both Kigamboni and Mtwara picked up a year later after the piloting phase, but Kigamboni has kept the consistency.

|  |  |
| --- | --- |
|  |  |

**Figure 7:-** Catch trend of the major priority fisheries in the RUMAKI districts a) all priority fisheries grouped and b)individual priority fishery..

**3.2.3 Catch composition of major priority fisheries groups in RUMAKI districts**

The current findings suggest reef fishes are the dominant landing in almost all districts, with the exception of Kilwa and Mtwara districts. Octopus is also common in the four districts except for Rufiji. Interestingly there is more elasmobranch caught in Mtwara rural than any other area, likewise, more small pelagic group in Kilwa than any other area. Rufiji in this context seems to be catching reef fishes and elasmobranch only, however, this is not true, the main fishery in this area is the prawn, catch related to prawn is documented from the industrial fishery. In general, in terms of catch composition, Kilwa and Temeke have all five fisheries; Mafia and Mtwara four fisheries; and Rufiji two fisheries.

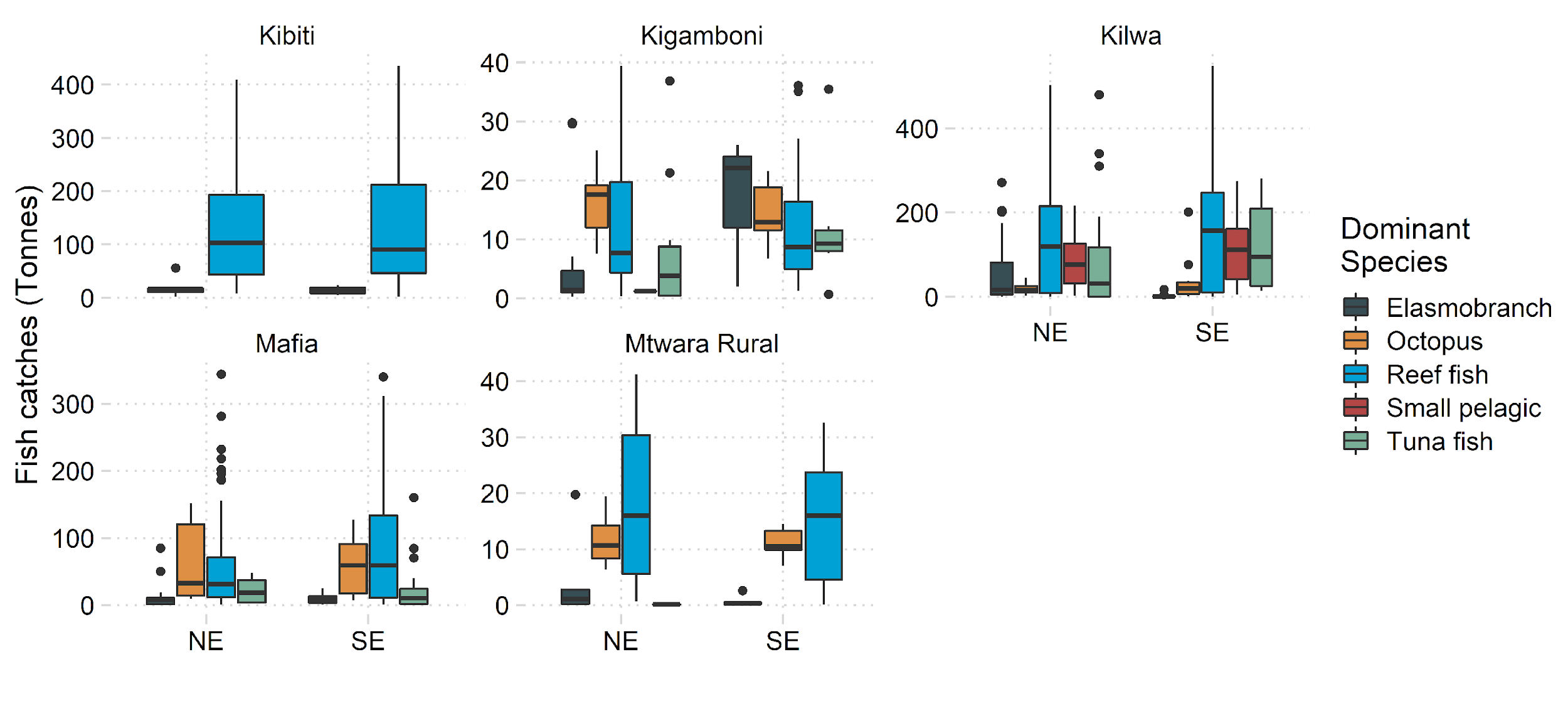
|  |  |
| --- | --- |
|  |  |

|  |  |
| --- | --- |
|  |  |

**Figure 8:-** Catch composition of major priority fisheries groups in RUMAKI districts

**3.2.2 Seasonal variation of the total catch for priority fisheries in RUMAKI**

The use of eCAS helped analysis of the seasonal/ monthly fisheries catch variation of the major fisheries among Rumaki (Figure 7). Analysis of the monthly catch variation did not produce good results necessitating pooling data into the seasonal, North East (NE) and South East (SE)Monsoon. Yet no clear differences in catch variation could be observed in all fisheries categories. The possible explanation is that the dataset was not enough to show such variation. More data needs to be collected for such an analysis to run. In the previous database in the CAS such seasonal comparison in catch variation among sites could not be performed.



**Figure 9:-** Seasonal (NE and South East SE Monsoon) variation in catch (Mt) composition of dominant priority fisheries groups among RUMAKI sites from 2016-2019.

**Comparison on the quality of data between CAS and eCAS data**

* 1. quality: improved in eCAS vs CAS
  2. volume: Bigger Volume of Data in eCAS vs CAS
  3. prawn fishery not surfaced

**CAS:** Delayed processing and reporting of the CAS information due to manual and chain of human intervention as result only annual data of the landings at district level are reported /available (eg the data used in this study). There is high cost involved in data collection and monitoring (data follow-up, entry, processing, and dissemination). The approach is enefficinty in data quality control thus, makes room for underestimating the true catches and making management decisions more difficult and un liable.

**eCAS**: Data collected most efficiently and timely. engaging BMUs the issue of inadequate huma capacity has been reduced. By designing a data analysis strategy, the results could be reported promptly, even on a quarterly basis. Reduce data loss. Reduce the time and cost related to data entry and any delays associated with data entry analysis and reporting has been reduced. monitoring of data quality controlled timely from the data entry point to final data consumer. Therefore help the fisheries managers to have reliable information of the fisheries resources which can be translated into sustainable and responsible management of the fisheries resources.

**Assessment of re-appearances of fish species in the study area and its linkage to conservation**

Previous information recorded on the CAS forms was able to record fish species to the family level. The new version of eCAS has room to record fish species catches to a species level. This is a major improvement, it does not only facilitate mandatory reporting to national and regional fisheries organizations but further allows the analysis of appearance/disappearance of endangered and other species of ecological importance. During the current analysis, we have noted re-appearance of the elasmobranch group in the database with a relatively good resolution. Interestingly Some species of shark and rays are captured in the database to the genus level, though more effort for identification of the elasmobranch to species level is needed.

**Recommendation on the quality of fisheries data.**

For the purpose of improving fisheries data collection system, the following are sets of recommendations that this report suggests will improve the process and hence facilitate the management of the artisanal fisheries:

* The Department of Fisheries (DoF) in collaboration with TAFIRI should consider identifying representative species for all priority (major) fisheries groups and consistency follow up the data collection on the identified species.
* The DoF should consider adapting and upscaling the eCAS as the main data collection tool. Promote timely preparation of fishery statistics through the application of the databases. This should go along with the timely sharing of the statistics with relevant stakeholders.
* Promote capacity development to all levels in the area of data collection, processing, analysis, interpretation and reporting.
* Periodic strategic planning/system review of marine fisheries, data collection should be in a position to answer some of the management questions at any time.
* Promotion and adoption of statistical systems for small-scale coastal fisheries.
* The DoF in collaboration with other stakeholders should explore ways to develop and implement multi-sectoral indicators analysis as an approach to monitor the stock, such indicators could include socioeconomics and livelihood data, this can be incorporated in the current data collection and analysis.
* ~~A major limiting factor in the formulation and implementation of action plan and management strategy for sustainability of the priority fisheries is the lack of comprehensive data for a sufficiently long period which form the basis of the proper status assessment of the fisheries stocks.~~
* There is a need for improvement on data collection related to data fish species diversity, effort, trade and market value of individual species. This can be integrated into the current system or collected separately.
* ~~The central and state governments should facilitate efficient data collection and research by allocating adequate funds.~~
* ~~Conservation and sustainable management of the priority fisheries need to address the food and livelihood issues of the fishing communities in the country,~~

**Conclusion**

The collection and analysis of fishery data and information is a costly and timely exercise. To be relevant and cost-effective, fishery data and information collection systems must have a clear set of objectives and appropriate strategies to collect data, which should be based on priorities and requirements of data users. However, chronic problems of insufficient human and financial resources allocated for data collection often resulted in the poor quality of information that further led to non- or limited use of statistics for fishery management and policy development. Consequently only dwindling support was given to the systematic improvement of national fishery data and information collection systems. There is an urgent need to terminate this vicious cycle of problems. The previous budget allocated by the Government for data collection during CAS should be more than enough if re-allocated to the used in the improved eCAS data collection system.

**References**

Berachi, I.G., 2003. Bioeconomic Analysis of Artisanal marine Fisheries of Tanzania. pp. 1–46 MSc. Thesis.

Bush, E.R., Short, R.E., Lennox, K., Samoilys, M., Hill, N., 2017. Mosquito net use in an artisanal East African fishery. Conserv. Lett. 10, 450–458. <https://doi.org/10.1111/> conl.12286.

Guard, M.,Mgaya,Y.D.,2002. The Artisanal Fishery for Octopus cyanea Gray in Tanzania. Ambio 31, 528–536

Hamidu, U.M., 2012. Assessment of the Marine Artisanal Fisheries in Tanzania Mainland. Final Proj. United Nations Univ.

Jacquet, J.L., Zeller, D., 2007. Putting the “united” in the United Republic of Tanzania: reconstruction marine fisheries catches. Fish. Cent. Res. Reports 15, 49–60

Kanyange, N., Kimani, P., Onyango, P., Sweenarain, S., Yvergniaux, Y., 2014. Performance Assessment of Beach Management Units along the Coastline of Kenya and Tanzania.

Kuguru B, Sailale I. 2018 Analysis of Data for Artisanal Tuna Fisheries and Production of Information to Report Sustainability and the Status of Tuna Fisheries: A Pilot study in RUMAKI. Tanzania Fisheries Research Institute and WWF Coastal East Africa-Tanzania Country Office, Dar es Salaam, Tanzania, 26pp

Pandu, D.,H., 2014. Experience of octopus management in Zanzibar. Presented at the Regional Symposium On Octopus Fisheries Management In The South West Indian Ocean, Flic en Flac, Mauritius.

Robertsona,M.D., S.R. Midwaya, L. Westb, H. Tillyac, V.H. Rivera-Monroya 2018 Fishery characteristics in two districts of coastal Tanzania. Ocean and Coastal Management 163 254–268

Sobo, F.A.S., 2004. Strengthening of Artisanal Fisheries Data Collection and Management in Tanzania. Final Proj. United Nations Univ, pp. 40.

Sobo, F.S., 2012. Community Participation in Fisheries Management in Tanzania. IIFET 2012, Tanzania, pp. 1–11.