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MEETING ON THE SMALL PELAGIC MARINE FISHERY IN THE UNITED REPUBLIC OF TANZANIA

Bagamoyo - Tanzania



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the United Republic of Tanzania

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Executive summary

The United Republic of Tanzania (Tanzania) is composed of mainland Tanzania and Zanzibar. Within the union framework, mainland Tanzania and Zanzibar have full mandate for the management of marine fisheries located in their territorial and internal waters. Fisheries operating in the waters of mainland Tanzania and Zanzibar are managed by the Ministry of Livestock and Fisheries Development (MLFD) of mainland Tanzania and the Ministry of Livestock and Fisheries (MLF) of Zanzibar.

The marine fishery sector plays a significant role in the development of coastal economies in both mainland Tanzania and Zanzibar, with the small pelagic fishery being an important component of the sector. The governance and management system of the small pelagic fishery in Tanzania faces various weaknesses and shortcomings, including the absence of any institutional mechanism to support collaboration between the mainland and Zanzibar. However, the small pelagic fishery is *de facto* a 'shared' fishery amongst the two political and administrative entities.

The aim of this meeting was to foster collaboration and contribute to the institutionalization of a dialogue between the two parties for improved governance and management of the small pelagic marine fishery. Representatives of key public and private stakeholders concerned by the development and management of the fishery participated in the meeting.

The format of the meeting included presentations of papers aimed at guiding discussions on the current situation of the fishery and major issues to be addressed to guarantee sustainability and enhance the contribution of the fishery to local and national economies. These presentations also included a paper on possible collaborative mechanisms for the concerted management of the 'shared' fishery. A working group session was also organized to identify priority areas for collaboration on actions of common interest.

During the meeting, detailed discussions were held on these different topics. The meeting however deplored the lack of data and information on the fishery and its related value chains, as this hampers proper management and results in significant underestimations of the real social and economic performance of the fishery. By the end of the meeting, both parties confirmed the need to set up a collaborative mechanism for the concerted management of Tanzania's small marine pelagic fishery. Participants also identified the need to establish a specific inter-ministerial committee for small pelagic fisheries as the best option for institutionalizing permanent dialogue and promoting priority areas for collaboration between mainland Tanzania and Zanzibar for this fishery.

Résumé exécutif

La République Unifiée de Tanzanie (Tanzanie) est composée de la Tanzanie continentale et de Zanzibar. Dans le cadre de l'Union, la Tanzanie continentale et Zanzibar ont plein mandat pour gérer les pêcheries marines situées dans leurs eaux territoriales et intérieures. Les pêcheries marines situées dans les eaux sous juridiction de la Tanzanie continentale et de Zanzibar sont gérées respectivement par le Ministère de l'élevage et du développement des pêches (MLFD) de la Tanzanie continentale et par le Ministère de l'élevage et des pêches (MLF) de Zanzibar.

Le secteur des pêches maritimes joue un rôle important dans le développement des économies côtières aussi bien de la Tanzanie continentale que de Zanzibar, et la pêche de petits pélagiques est une composante essentielle du secteur. Le système de gouvernance et d'aménagement de la pêche de petits pélagiques en Tanzanie présente un certain nombre de dysfonctionnements et lacunes parmi lesquels l'absence de mécanismes institutionnels de concertation/collaboration entre la Tanzanie continentale et Zanzibar. Or, la pêche de petits pélagiques est de facto une pêche partagée entre ces deux entités politiques et administratives.

L'objet de la réunion était de promouvoir les échanges et de contribuer à la mise en place d'un dialogue permanent entre les deux parties pour une meilleure gouvernance et gestion de la pêche maritime de petits pélagiques. Les participants à la réunion comprenaient des représentants d'institutions et de parties prenantes clés concernées par le développement et l'aménagement de la pêche.

Dans sa forme, la réunion a consisté à présenter plusieurs communications destinées à susciter des discussions sur la situation actuelle de la pêche et sur les principales problématiques à prendre en compte pour garantir sa durabilité et augmenter sa contribution aux économies locales et nationales. L'une de ces présentations a porté sur les mécanismes de collaboration envisageables pour une gestion concertée de la pêche 'partagée' entre les deux parties. Des groupes de travail ont également été organisés afin d'identifier les domaines prioritaires de collaboration sur des actions d'intérêt commun.

Au cours de la réunion, des discussions approfondies ont pu se tenir sur ces différents sujets. Les participants à la réunion ont toutefois déploré le manque de données et d'information sur la pêche, ce qui porte préjudice à sa bonne gestion et a pour effet de largement minimiser son importance des points de vue social et économique. A la fin de la réunion, les deux parties ont confirmé le besoin de mettre en place un mécanisme de collaboration pour appuyer la gestion concertée de la pêche de petits pélagiques en Tanzanie. Ils ont également identifié la création d'un Comité interministériel spécifique sur la pêche de petits pélagiques comme étant la meilleure option pour l'institutionnalisation d'un dialogue permanent et la promotion de domaines prioritaires de collaboration entre la Tanzanie continentale et Zanzibar sur cette pêche.

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Acronyms and abbreviations

BMU	Beach Management Unit
DFO	District Fisheries Office
DRC	Democratic Republic of Congo
EAF	Ecosystem Approach to Fisheries
EU	European Union
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organization
IOC	Indian Ocean Commission
IUU	Illegal, Unreported and Unregulated
LGA	Local Government Authority
MCA	Marine Conservation Area
MCS	Monitoring, Control and Surveillance
MLF	Ministry of Livestock and Fisheries, Zanzibar
MLFD	Ministry of Livestock and Fisheries Development, mainland Tanzania
NGO	Non-Governmental Organization
RFA	Regional Fishery Arrangement
RFB	Regional Fishery Body
SWIOFC	South West Indian Ocean Fisheries Commission
SWIOFish	South West Indian Ocean Fisheries Governance and Shared Growth Programme
USSD	Unstructured Supplementary Service Data System
VFC	Village Fishing Committee

1. Background

The United Republic of Tanzania (Tanzania) is composed of mainland Tanzania and Zanzibar. Within the union framework, mainland Tanzania and Zanzibar have full mandate for the management of the marine fisheries located in their territorial waters (12 NM) and internal waters (the waters extending out from their respective territorial waters to the equidistance line between the mainland and Zanzibar). Fisheries operating in the territorial and internal waters of mainland Tanzania and Zanzibar are managed by the Ministry of Livestock and Fisheries Development (MLFD) of mainland Tanzania and the Ministry of Livestock and Fisheries (MLF) of Zanzibar.

The marine fishery sector plays a significant role in the development of coastal economies of both mainland Tanzania and Zanzibar. Marine fisheries are essentially composed of artisanal fishing units, mostly operating in the inshore waters with the main and most productive fishing grounds being habitats such as coral reefs, mangrove creeks, sea grass beds, and sand banks and targeting demersal resources. Other important fishery resources located further offshore include small and medium pelagic fish species as well as tuna and tuna-like species.

Small pelagic species are usually referred to as 'Dagaa' and this term may include many different species of sardines (Clupeidae) such as *Sardinella neglecta* and *Dussumieria acuta*, anchovies (Engraulidae) such as *Stolephorus commersonii* and mackerels (Scombridae) such as *Rastrelliger kanagurta*. The distribution of the concerned fish stocks extends over territorial and internal waters of both mainland Tanzania and Zanzibar.

The official statistics of marine fish production is close to 70,000 MT per year altogether in the waters under the jurisdiction of mainland Tanzania and Zanzibar (i.e. excluding tuna and tuna-like species caught in Exclusive Economic Zone - EEZ). Small pelagic fishes officially account for approximately one third of total catch. However, recent value chain analysis as well as recent initiatives on licensing gives indications that the estimated total landings in both mainland Tanzania and Zanzibar are largely underestimated. The small pelagic fishery and related value chain is mostly dominated by low-income fishers and plays a highly significant role in job creation and in food and nutritional security in Tanzania. It can be roughly estimated that up to 10,000 people in both mainland Tanzania and Zanzibar are directly engaged in the small pelagic fishery and related activities: fishers, porters, boiling and drying workers, processing entrepreneurs, traders, wood and salt suppliers, transporters and food vendors. This fishery also contributes to the development of regional trade with most exported products (dried Dagaa) going to the Democratic Republic of Congo (DRC).

The small pelagic fishery is of an artisanal nature; fishers use locally made vessels and different types of gear. However, the most commonly used gears and fishing methods include purse seine nets, seine nets, scoop nets and ring nets operated by motorized dhows and bigger boats. One fishing unit consists of 15 – 20 crew members.

The abundance of small pelagic harvesting is seasonal as it is reliant on the cycle of the moon for night fishing (purse seine nets and seine nets). The monsoon winds also have a pronounced influence on the fish catch. During the northeast monsoon, from October to March, catches are greater since the sea is relatively calm with weaker currents. Due to this effect of monsoons, fishers have a migratory pattern, locally known as '*dago*', where fishermen travel and camp, fishing away from their homes during various seasons. A migratory pattern of fishers from mainland Tanzania to Zanzibar and vice-versa can also be highlighted; this is to be put in relation to the seasonal variation of fish abundance as well as fish prices at landing sites.

In 2011-2012, the MLFD of mainland Tanzania promoted a Management Plan for the Tanzanian Artisanal Fishery for Small and Medium Pelagic Fish Species, with the assistance of the FAO EAF-Nansen Project. In 2013-2014, the MLF of Zanzibar promoted a Strategy for Improved Fisheries Governance and Management in Zanzibar, with assistance from the IOC SmartFish programme. Both initiatives have proved to be valuable with respect to the political will of promoting dialogue between mainland Tanzania and Zanzibar for the management of the small pelagic fishery. There is now a need to consolidate these initiatives to boost the process of concerted management of small pelagic fishery and related value chains for the mutual benefits of mainland Tanzania and Zanzibar.

2. Programme of the meeting and opening session

2.1. Venue and participation

The meeting took place at the Millennium Sea Breeze Resort, Bagamoyo, Tanzania on 11-12 August 2015.

Thirty-two participants including representatives from key public and private stakeholders of the small pelagic fishery (central administration, research, monitoring, control & surveillance - MCS, local governments, fishers' and traders' associations, and community-based organizations) from mainland Tanzania and Zanzibar, as well as SmartFish experts and consultants, took part in the meeting. A list of all the participants can be found in Annex A.

2.2. Opening session

The opening session included welcome speeches from the Ministry of Livestock and Fisheries Development (MLFD) of mainland Tanzania and IOC SmartFish.

Dr Yohana L. Budeba, Permanent Secretary of the MLFD, welcomed the participants to the meeting and highlighted the importance of the event given that the small pelagic fishery is a shared fishery of significant importance for both mainland Tanzania and Zanzibar.

Dr Yohana L. Budeba insisted on the need that everyone should be responsible for the sustainable management of this fishery and reminded those present that it was the spirit of collective action that brought about the development of the Management Plan for the Tanzanian Artisanal Fishery for Small and Medium Pelagic Fish Species. He also mentioned that various activities from this management plan are being implemented, including licensing activities with the support of IOC SmartFish. Zanzibar has recently adopted a Strategy for Improved Fisheries Governance and Management in Zanzibar, which *inter alia* highlights the need to promote dialogue between mainland Tanzania and Zanzibar for the management of the small pelagic fishery. Dr Budeba stated that the meeting could make use of these recent initiatives to develop a common platform for better management of the fishery in the marine waters of Tanzania. The meeting could also seek to identify activities that would provide tangible results and concrete benefits to the communities involved, including inputs for the development of management plans. Before declaring the meeting officially opened, he reiterated the government's sincere appreciation of the European Union through IOC SmartFish and FAO for this support.

Mrs Clotilde Bodiguel, Chief Technical Adviser of IOC SmartFish activities implemented by FAO, joined Dr Budeba in welcoming those present and thanked them for coming to Bagamoyo to participate in the meeting. Mrs Bodiguel said that the meeting was organized in response to several exchanges and country initiatives that have recently taken place, and three of which needed to be highlighted. Firstly, a few years ago mainland Tanzania prioritized the development of a management plan for small and medium marine pelagics with the support of the FAO EAF Nansen project. As this plan was developed for the mainland, it does not cover waters under the jurisdiction of Zanzibar, however the stocks of anchovy, sardines and mackerel are common to both the mainland and Zanzibar. Secondly, in July 2013 in Zanzibar, IOC SmartFish organized a workshop to draw lessons learnt from the development of fishery management plans in the IO region. On this occasion, the idea of initiating discussions on cooperation mechanisms for the management of small marine pelagics was first informally raised and discussed between partners with the support of the FAO component of SmartFish. Finally, in 2014/2015, Zanzibar developed its governance strategy for fisheries, opening the door to cooperation on the management of common stocks with the mainland, with particular reference to small pelagics.

These three major initiatives paved the way for this meeting on small marine pelagics that aims to be a first step towards better cooperation for the sustainable management of Tanzania's small marine pelagic fishery to ensure increased economic, social and nutritional benefits.

2.3. Meeting objectives and structure

Mrs Bodiguel went on to explain the objectives of the meeting and expected outcomes.

The objective of the meeting was to foster collaboration and contribute to the institutionalization of a dialogue between mainland Tanzania and Zanzibar for improved governance and management of the small pelagic marine fishery in Tanzania.

Accordingly, the major expected outcomes from the meeting included:

- A simplified state-of-the art small pelagic marine fishery and related value chains in Tanzania;
- Critical issues relating to the management of the small pelagic fishery in Tanzania discussed in a collegiate manner;
- Possible entry points for furthering mechanisms and initiatives aimed at promoting concerted management of the small pelagic fishery in Tanzania.

Mrs Bodiguel also explained that the structure of the meeting would consist of plenary presentations and discussions as well as one working group session.

The purpose of the plenary presentations was to discuss the current situation and major issues relating to the governance and management of the small pelagic fishery in Tanzania as well as possible institutional mechanisms to support the concerted management of the fishery by mainland Tanzania and Zanzibar. Plenary presentations included: An overview of the small pelagic fishery in mainland Tanzania and in Zanzibar; Preliminary results and lessons learnt from the on-going initiative on the licensing of small pelagic fishing boats in mainland Tanzania; Main findings of a recent value chain analysis of *dagga* in Mafia Island and; Various possible institutional options to support collaboration.

During the working group session, participants were divided into three groups that were made up as follows: one composed of private sector' representatives from both the mainland and Zanzibar; one composed of representatives of Zanzibar's administration and academic institutes; one composed of representatives from administration and academic institutes in mainland Tanzania. Each group was asked to identify their priority areas for collaboration on actions of common interest in view of the concerted management of the small pelagic fishery in Tanzania.

At the end of the meeting, participants were invited to formulate conclusions and recommendations for a strengthened and sustained dialogue for the concerted management of the small pelagic fishery in Tanzania.

The meeting was co-facilitated by Mrs Bodiguel, Mr Marcel Kroese, IOC SmartFish MCS specialist, and four IOC SmartFish consultants: Mr Christophe Breuil, International Consultant in Fisheries Planning and Management; Dr Narriman Jiddawi, National Fisheries Consultant from Zanzibar; Dr Winfried Haule, National Fisheries Consultant from mainland Tanzania and; Mr Tom Shipton, International Consultant in Fisheries MCS.

The meeting agenda can be found in Annex B.

3. Plenary sessions

3.1. Current situation and major issues faced by the small pelagic fishery in Tanzania

3.1.1. Overview of the small pelagic fishery in mainland Tanzania and in Zanzibar

Dr Winfried Haule and Dr Narriman Jiddawi presented overviews of the small pelagic fishery in mainland Tanzania and Zanzibar respectively (see Annexes D and E).

Dr Haule confirmed that the fishery plays a significant role in the social and economic development of communities in coastal areas of mainland Tanzania. The fishery is however faced with several constraints including the open access to resources, poor enforcement of existing regulations and a loss of wealth in fishing and related activities. He also highlighted some weaknesses in the provision of basic fisheries management services such as statistics and research. Official data, for the most part, are estimated and cannot be used for fisheries management decision-making. For instance, the annual catch of small pelagics for mainland Tanzania could be close to 700,000 MT, whereas official data indicate an average catch of approximately 21,000 MT per year. Official data on fish exports, in particular to the DRC, are also believed to be largely underestimated.

According to Dr Haule, some of the major strengths of the fishery in mainland Tanzania include the following:

- The small pelagic species form a vast, valuable and accessible resource for local fishers and there is a demand for fish and fishery products from both domestic and foreign markets;
- The governance framework is relatively favourable with the existence of fisheries policy and regulations, the existence of a specific fishery management plan, the presence of public institutions at local and central levels that support development and management initiatives and the presence of Beach Management Units (BMUs) and fishing communities that have been empowered to enforce fisheries legislation;
- The valuable presence of development partners and non-governmental organizations (NGOs) that support sustainable conservation and the development of natural resources including small pelagics.

Some of the major weaknesses in the small pelagic fishery in mainland Tanzania include:

- Persistence of an open access regime and weak implementation of measures aimed at regulating access to resources (e.g. registration, licensing);
- Poor compliance with existing regulations aimed at conserving fishery resources such as the banning of ring nets in depths of less than 50 metres and dynamite fishing;

- Lack of accurate data and scientific information on the small pelagic fishery to support fisheries management;
- Concentration of fishing efforts in nearshore waters and absence of fishing fleets in the offshore areas;
- Inadequacy and weak functioning of BMUs and fishers organizations/associations to influence decision making and support the effectiveness of management measures;
- Potential value added to small pelagic fish and fishery products not fully expressed;
- Inadequate human, financial and institutional capacity to manage the small pelagic fishery;
- Weak implementation of the Tanzania small and medium pelagic fishery management plan;
- Poor collaborative mechanisms between mainland Tanzania and Zanzibar for the management of the shared small pelagic fishery.

Dr Jiddawi confirmed that the fishery also plays a significant role in the social and economic development of coastal communities in Zanzibar, especially as a source of food security, nutrition, income and livelihood support. The government also benefits through its contribution to foreign exchange earnings especially from the export of anchovies. However, the fishery is faced with several constraints including overcapitalization, poor enforcement of existing regulations and a low level of wealth creation in post-harvest due to a lack of proper handling and storage facilities.

Dr Jiddawi also highlighted some weaknesses in the provision of basic fisheries management services such as statistics, research and MCS particularly in marine conservation areas (MCAs). Official data on catch and trade are, for the most part, estimated which is prejudicial to the management process of the fishery.

According to Dr Jiddawi, some of the major strengths of the fishery in Zanzibar include the following:

- Opportunities to increase the contribution of the fisheries sector to the national economy and household food security if properly exploited;
- A rapidly growing tourism industry and thus domestic demand for fish could grow quickly;
- Fishers of Zanzibar have shown their fishing capability (purse seine and light fishing);
- The development of private fishery enterprises has potential to create strategic partnerships between small scale fishers and entrepreneurs;
- Various recent policy and legal instruments can assist with the better management of the fishery, such as the Fisheries Policy of Zanzibar (2014) and the Fisheries Act of 2010;

- The small pelagic fishery is a priority fishery for some development partners; therefore it is hoped that some activities, including research, may be undertaken through various projects.

Some of the major weaknesses in the small pelagic fishery in Zanzibar include:

- Persistence of an open access regime in the fishery;
- Weaknesses of the fisheries legislative and regulatory framework which is incomplete;
- Weakness of the research system, with no proper research agenda for the small pelagic fishery;
- Deficiencies in the MCS and enforcement system, resulting in a high occurrence of illegal, unreported and unregulated (IUU) fishing by migrant fishers especially since each side is carrying out their own MCS exercises;
- Inadequacy of the statistical system which is mostly of an administrative nature and cannot support sound decision-making for fisheries management;
- Absence of a specific management plan for the small pelagic fishery in Zanzibar;
- Existence of some environmental impacts associated with small pelagic fishing techniques and fish processing techniques.

In the discussions that followed the two presentations, participants highlighted the similarity of the situation of the small pelagic fishery in both mainland Tanzania and Zanzibar in terms of its strengths and weaknesses. Critical issues that are common to mainland Tanzania and Zanzibar include the following:

- The need to significantly improve the current statistical and research systems of the fishery;
- The need to be more rigorous with regards to the use and control of ring net fishing given its negative impact on coastal ecosystems under certain conditions;
- Suspicions that the fishery is fully and possibly overexploited: issues relating to resource access should be adequately addressed to ensure sustainability of the fishery;
- The need to harmonize fishing regulations, including conditions attached to registration and licensing, to improve fisheries management in a context where the small pelagic fishery can be considered a 'shared' fishery between mainland Tanzania and Zanzibar and to reduce conflicts that are frequently generated by migrant fishers;
- The need to gradually support the elaboration of a common policy and management approach for the small pelagic fishery in Tanzania for the mutual benefit of both the mainland and Zanzibar;

- The participation of fishery stakeholders, including community-based organizations such as BMUs in mainland Tanzania and Village Fishing Committees (VFCs) in Zanzibar and producers' and traders' associations, is a key condition for the success of any fishery management initiative in Tanzania;
- IUU fishing in the small pelagic fishery is a critical issue given the low levels of compliance of fishers concerning vessel registration and fishing licences: improved MCS and prosecution based on existing regulations should be given priority.

3.1.2. Initiative for the licensing of small pelagic fishing units on mainland Tanzania

The initiative for the licensing of small pelagic fishing units on mainland Tanzania was presented by Mr Tom Shipton, with contributions from Mr Marcel Kroese (see Annex F).

Mr Shipton informed participants that IOC SmartFish has been supporting a pilot vessel registration and licensing programme in mainland Tanzania since 2013. The rationale for the intervention was to address the low level of compliance to vessel registration and licensing which significantly impacts both local and national government revenue streams from the fisheries sector. It was also to demonstrate to the Local Government Authorities (LGAs) that revenue streams derived from fisheries could be significantly increased through improved levels of vessel registration and licensing. In addition, a case was made to allocate some of the additional funding generated by compliance activities to the under-resourced District Fisheries Offices (DFOs), with a view to improving their capacity to manage the fishery, notably MCS operations.

An initial feasibility study was undertaken to establish whether a telephonic vessel licensing and registration system based on an Unstructured Supplementary Service Data System (USSD) linked to an Airtel payment platform could be developed. Whilst technically feasible, the cost and practicality of rolling this type of automated telephonic system out in rural areas would have proved problematic. As a result, a more simple and cost effective solution was sought. Inexpensive, non-transferable, coloured plastic security tags were deemed an appropriate alternative.

The tags can be individually and alphanumerically marked conforming to markings required for vessel registrations in the Fisheries Regulations (2009). The tag markings ensure that vessel owners can be individually identified. Based on the current licensing and registration procedures, two tags are required. The first tag denotes the vessel registration; the second tag shows that the vessel is compliant to the annual licence. The tags are located in conspicuous places on the vessel, making it easy for compliance officers to identify which vessels have been registered and licenced for the year. The colour of the licence tag can be changed on an annual basis, enabling compliance officers to rapidly establish which vessels have been licenced for a particular year.

Whilst the pilot tagging programme has yet to be completed, initial results suggest that a simple tagging system, using resources currently available to the DFOs, can prove effective in increasing regulation compliance levels as well as increase revenues streams accruing to the LGAs. Key success factors include support from compliance officers (marine police) to ensure that the vessel owners understand that failure to register and licence their vessels will result in fines or their vessels being confiscated. They also include the need to return to landing sites on a regular basis to ensure that all vessels have been registered, community education, and ensuring a high level of DFO motivation.

In the discussions that followed, participants were interested in:

- The reasons why the cell phone based registration system had not been further explored. The explanation given was that the available funding precluded such implementation and a cheaper alternative was sought – hence the initiation of the pilot plastic tagging programme;
- The cost of the tags (USD 0.1/tag) and ensuring a stable supply, and the necessary funding and coordination between districts;
- How revenue would be accounted for given there are state and LGA actors;
- In particular, Zanzibar asked for a similar pilot programme to test its viability in Zanzibar, as it did not have the issues concerning various districts and it might prove to be an easier implementation mechanism to monitor as a pilot programme.

3.1.3. Dagaa Value Chain Analysis, Mafia: questions and extrapolation

Mrs Clotilde Bodiguel presented various studies and initiatives, supported by the IOC SmartFish programme, to highlight and discuss certain elements of a state-of-the-art small pelagic fishery for mainland Tanzania and Zanzibar.

Aside from the licensing initiative mentioned above, IOC SmartFish is also supporting initiatives aimed at improving the Dagaa value chain, with emphasis on reducing post-harvest losses, improving quality standards and exploring new markets including higher value niche urban markets in Tanzania. Such initiatives include the construction of drying racks, the training of individuals on improved handling, processing and packaging, the provision of cooking equipment, demonstrations for cooking and drying rack usage, and market testing in Dar es Salaam. IOC SmartFish also supported a Dagaa value chain analysis in Mafia in 2014 to better understand the journey from the net to the plate¹ and to start exploring potential opportunities for Dagaa to reach higher value niche markets.

¹ Dr Erastus J. Moshia, 2014, *Value Chain Analysis of Clupeidae, Sardinella neglecta (Dagaa-Papa) and Engraulidae, Stolephorus Commersonii (Dagaa-Mchele) in Mafia Island Tanzania, SmartFish Programme*, Indian Ocean Commission, non pub., 41p.

The presentation made by Mrs Bodiguel was built on the findings of the Dagua value chain analysis in Mafia as well as on analysis of different national and regional reports to guide discussions on general issues of relevance for the management of the small pelagic fishing and related activities in Tanzania.

The Dagua value chain analysis, together with other sources of information including recent work on licensing, suggests that official statistics of both the mainland and Zanzibar underestimate the real weight of the small pelagic marine fishery in terms of landings, processing, trade and export.

A rapid expert estimate based on low assumptions² (field observations) gave a minimum landing of 270,000 MT of small marine pelagics landed in mainland Tanzania and 72,000 MT in Zanzibar. With an average landing price estimated at 2,000 TZS per kilo, the landing value would be 54 billion TZS for the mainland and 14.4 billion TZS for Zanzibar.

The objective of these estimations was to question the real importance of the small pelagic fishery compared with current evaluations. *De facto*, plenary discussions were animated on how true these numbers could be; however, exchanges in the plenary session with processors and traders present corroborated the idea of a global underestimation of the fishery, both in terms of landings and the export of processed products. Participants also confirmed that the DRC is the main export market, however, processed products also end up in Zambia, Malawi, Rwanda and Burundi. It is also difficult to estimate the percentage of nationally traded products compared to the export market.

Finally, there was a general acceptance that the accuracy of official data on small pelagics is questionable and that the importance of the fishery in terms of its real contribution to the national economy is likely to be largely underestimated. The weakness of the statistical system also poses a serious threat to the management process of the fishery. Participants therefore highlighted the need to reevaluate the social and economic performance of the fishery.

More important than expected in terms of contribution to national and regional trade, small marine pelagics are also extremely valuable in terms of national and regional contribution to food security and nutrition. Mrs Bodiguel reminded participants of their contribution in terms of proteins (14.4 to 15.7 percent of their weight), Omega 3 fatty acids (DHA and EPA), vitamins (A, D, E, K) and minerals, which are good for preventing cardiovascular disease, for the development of neurons in infants, brain development, vision protection, calcium metabolism, etc.

This real and potential contribution to trade and food security in the region and the need for sustainable management of the small pelagic marine fishery in Tanzania should be looked at in perspective.

² Boats fishing 15 days a month, landing an average of 500kg. A minimum of 3,000 active purse seiners in mainland Tanzania and 800 in Zanzibar.

In July 2015 the UN World Population Prospects: 2015 Revision was launched. Africa continues to experience very high rates of population growth. Between 2015 and 2050, the populations of 28 African countries are projected to more than double and by 2100, ten African countries are projected to increase five-fold at least. Amongst those ten countries, six are market destinations and neighbouring countries of Tanzania: Burundi, DRC, Malawi, Uganda, Tanzania and Zambia.

Moreover, during the period 2015-2050, half of the world's population growth is expected to be concentrated in nine countries³, of which three are crucial markets for Tanzania's small marine pelagics: DRC, the United Republic of Tanzania and Uganda (See Table 1 below).

Table 1. Projected populations for countries neighbouring Tanzania

Population (thousands)					
Country	1950	2015	2030	2050	2100
Burundi	2,309	11,179	17,357	28,668	62,662
DRC	12,184	77,267	120,304	195,277	388,733
Malawi	2,954	17,215	26,584	43,155	87,056
Uganda	5,158	39,032	61,929	101,873	202,868
Tanzania	7,650	53,470	82,927	137,136	299,133
Zambia	2,317	16,212	25,313	42,975	104,869

Source: UN World Population Prospect: 2015 Review

3.2. Possible mechanisms for improved concerted management of the small pelagic fishery in Tanzania

Mr Christophe Breuil presented the session on possible mechanisms for improved and institutionalized concerted management of the small pelagic fishery in Tanzania (see Annex G).

Mr Breuil told participants that the governance and management of the small pelagic marine fishery in Tanzania are known to be inadequate. This includes the weaknesses of certain key fisheries management services such as vessel registration, fishing licensing, statistics, research, MCS, and fish quality control. The youth of the decentralization process and related institutions at community and local government levels is also believed to have impacted the delivery of satisfactory management services.

The management system also faces a critical shortcoming, which relates to the lack of permanent collaborative/concerted mechanisms between mainland Tanzania and Zanzibar. Yet, Tanzania's small pelagic fishery can *de facto* be considered a 'shared' fishery, which is managed by two separate political and administrative entities, the MLFD of mainland Tanzania and the MLF of Zanzibar.

³ 1. India, 2. Nigeria, 3. Pakistan, 4. Democratic Republic of Congo, 5. Ethiopia, 6. United Republic of Tanzania, 7. United States of America, 8. Indonesia, 9. Uganda

Two key questions then have to be raised: (i) What could be the most adequate institutional framework or arrangement to support the concerted management of the fishery; and (ii) What are the main priority areas for cooperation?

Mr Breuil first gave a brief overview on fisheries management as well as the general principles emanating from international law and practices regarding the management of shared fisheries. He then presented some case studies highlighting mechanisms that have been developed at a national or international level to support collaborative management of shared fisheries amongst different legal/administrative entities in order to capture and share some lessons learnt. The case studies on shared fisheries included: Small Pelagic Fisheries in West Africa; Small Pelagic (Kapenta) Fishery on Lake Kariba; Nile Perch Fishery on Lake Victoria; Fishery Resources in USA; Fishery Resources in Australia. At the end of his presentation, he provided some elements to guide discussions in view of the possible establishment of a platform to support the concerted management of Tanzania's 'shared' small pelagic fishery. Whilst doing so, he insisted on the fact that the specificity of the governance framework of the marine coastal fisheries in Tanzania under the Union framework should encourage participants to envisage relatively original arrangements.

During discussions, he invited participants to emphasize nature of the mandate of possible future mechanisms, which could range from a single forum for discussion and coordination of actions of common interest to a joint advisory body or to a joint regulatory body. He also invited participants to focus on the best collaborative mechanisms to be promoted taking into consideration realism and cost-effectiveness. Such mechanisms could make reference to the overarching institutional frameworks offered by either the Regional Fishery Body's (RFB) model, the Regional Fishery Arrangement's (RFA) model or the Inter-ministerial Committee model that is commonly used to support integrated coastal zone management within the same country.

In the discussions that followed, participants confirmed that efficiency in the management of Tanzania's small pelagic marine fishery should involve adequate collaborative mechanisms between the MLFD of mainland Tanzania and the MLF of Zanzibar. They also unanimously underlined that establishing an inter-ministerial committee on small pelagics would be the best way to start. This preference is based on the specificity of the country as well as on the relative robustness and pragmatism of such a mechanism. Such a committee would provide a single forum for discussion and coordination of public actions in favour of the management of the fishery.

In view of the possible setting-up of an inter-ministerial committee, participants suggested making use of mechanisms offered by the South West Indian Ocean Fisheries Governance and Shared Growth Programme (SWIOFish) funded by the World Bank in a context where the small pelagic fishery has been identified as a priority fishery by both mainland Tanzania and Zanzibar for this project. In particular, it was mentioned that SWIOFish would be involved with the setting-up of a Technical Management Committee whose mandate would include discussing issues of common interest with emphasis on small pelagics.

In addition to supporting discussions for the concerted management of the fishery, the project's structure would also facilitate synergizing actions and resources allocated to the small pelagic fishery for the mutual benefit of mainland Tanzania and Zanzibar.

At the same time, participants insisted on the need to raise the political will of both governments to ensure, firstly, the formal establishment of an inter-ministerial committee for small pelagics and, secondly, their active participation, including financial and human support, in the work of the committee whilst making use of SWIOFish opportunities to support its functioning.

Participants evoked possible priority areas for collaboration for the concerted management of Tanzania's small pelagic fishery. These included the harmonization of regulations with emphasis on licensing and technical management measures as well as the promotion of a convention on minimum conditions of access to small pelagic resources in Tanzania and a convention on minimum conditions for small pelagic fish trade.

Participants also stressed the need to promote scientific cooperation on small pelagics between all fisheries research institutes, with priority given to stock assessments. This would involve the creation of a specific and common scientific forum. Participants mentioned that such a forum could make use of opportunities offered by the South West Indian Ocean Fisheries Commission (SWIOFC) meetings during which specific side meetings on small pelagics could be organized. Participants also suggested examining the possibility to use the regional component of the SWIOFish programme to support an *ad hoc* scientific committee on small pelagics within the SWIOFC structure.

4. Working groups

Participants were divided into three working groups as follows: one composed of representatives from the private sector of mainland Tanzania and Zanzibar; one composed of representatives of Zanzibar's administration and academic institutes; and one composed of representatives from the administration and academic institutes of mainland Tanzania.

The three groups expressed their priority areas for collaboration on actions of common interest. Table 2 below summarizes the results of the different groups. The main priorities were identified by highlighting priority areas that were mentioned by at least two working groups.

Table 2. Priority areas for collaboration identified by the three working groups

Priority areas	Mainland	Zanzibar	Industry
Main Priority Areas (areas identified by at least 2 working groups)			
Harmonization of fishing regulations	X	X	
Harmonization of conditions attached to licensing	X	X	
Harmonization of regulations attached to post-harvest activities	X	X	
Development of policy documents to provide strategic orientation to support concerted management of the fishery	X	X	
Adoption of minimum terms and conditions of access to small pelagics in Tanzania	X	X	
Conducting joint MCS patrols between mainland Tanzania and Zanzibar	X	X	
Harmonization of statistical systems	X	X	
Harmonization of Fishery Management Plans	X		X
Promotion of joint research initiatives (stock assessments, promotion of protected sensitive areas/breeding, etc.)		X	X
Additional Priority Areas (areas identified by only 1 working group)			
Introduction of a single licence			X
Establishment of a national task force committee for MCS (public/private partnership)			X
Harmonization of trade (control of foreign traders)		X	
Strengthening of collaborative fisheries management	X		
Creation of a mechanism for data sharing and information exchange		X	
Field visits to exchange best practices and success stories		X	
Educate fishers on fishing regulations			X
Harmonization of BMU/VFC regulations and guidelines and strengthening of BMU/VFC (including revenue and statistics collection)			X

During the discussions that followed the presentation of the groups' results, the Permanent Secretary of Zanzibar emphasised that the development of a policy document to provide strategic orientation to support the concerted management of small pelagic fishery in Tanzania should be the main priority; no dissenting views were expressed.

5. Conclusions

5.1. The way forward for improved dialogue for the concerted management of the small pelagic fishery

Participants at the meeting agreed that a step-by-step approach would be the most preferred option regarding the institutionalization of mechanisms for the collaborative management of the small pelagic marine fishery between mainland Tanzania and Zanzibar.

Participants also agreed that the first step should be a single forum for discussion and coordination of actions of common interest. An Inter-ministerial Committee for Tanzania's Small Pelagic Fishery could be the recommended mechanism to establish this forum. The next step therefore would be to start the process to formally set up this specific inter-ministerial committee.

Participants also suggested that the SWIOFish programme, funded by the World Bank, could support the operationalization of the inter-ministerial committee given that the small pelagic fishery was identified as a priority fishery by both mainland Tanzania and Zanzibar.

Finally, participants suggested approaching both SWIOFC and SWIOFish (regional component) to support the emergence of a specific mechanism for scientific cooperation on small pelagics, possibly by using the SWIOFC structure.

5.2. Concluding remarks

Dr Omar Ali Amir, Deputy Permanent Secretary, Ministry of Livestock and Fisheries (MLF) of Zanzibar, made the closing speech at the end of the meeting on the small pelagic marine fishery in Tanzania. He expressed his appreciation that the objective of the meeting - foster collaboration and contribute to the institutionalization of a dialogue between mainland Tanzania and Zanzibar for improved governance and management of the small pelagic marine fishery in Tanzania - was reached. He also expressed his hope that the meeting had raised awareness amongst all participants on the need and potential benefits of improved governance and management of the shared fishery.

According to Dr Amir, it became apparent during the meeting that both mainland Tanzania and Zanzibar authorities need to work more closely together to address some of the main recommendations. In particular, there is a need to forge cooperation in science to generate timely and reliable information and data in support of management and to establish an institutional arrangement to facilitate the sharing of knowledge and experience and to agree on the various processes required to enhance governance of the fishery.

Before declaring the meeting officially closed, Dr Amir expressed his sincere thanks to IOC SmartFish, in collaboration with the FAO, for providing technical and financial assistance to the MLFD of mainland Tanzania and the MLF of Zanzibar for the organization of the meeting and for the sharing valuable experiences.

Annex A. List of participants

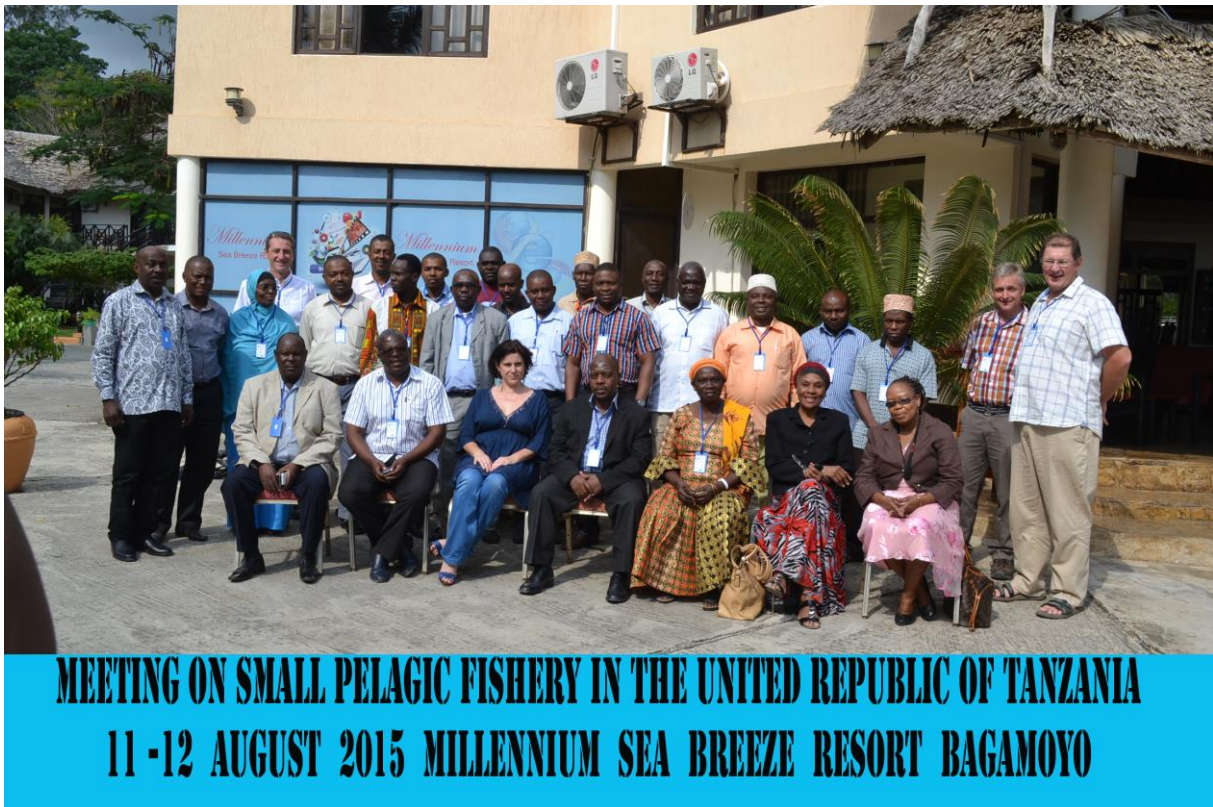
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Mainland Tanzania		
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Ms Fatma Sobo	Assistant Director of Fisheries, Fisheries Resources Development, Ministry of Livestock and Fisheries Development	fsoboster@gmail.com
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Name	Position	Email
Mr Omar Iddi Omar	Chairman, Tusiyumbishane Anchovies Cooperative, Maruhubi	Mob. 0777-849373
Mr Haji Salmin Haji	Chairman, Mangapwani (Fish processors/traders' association)	
Mr Mohamed Faki Mussa	Chairman, Village Fishing Committee (VFC) Mangapwani	
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Dr Winfried Haule	Fisheries Specialist, National Consultant (mainland Tanzania)	wvhaule@gmail.com
Mrs Bonnie Zak	Programme Assistant (FAO)	bonnie.zak@fao.org

Annex B. Meeting agenda

Tuesday 11 August 2015		
9:00	Opening ceremony	Marcel Kroese
9:15	Welcome address (FAO)	Clotilde Bodiguel
9:30	Opening speech (mainland Tanzania authorities)	Fatma Sobo on behalf of Dr Yohana L. Budeba
09:30	Coffee break	
10:00	Brief overview of the fishery in mainland Tanzania: presentation/discussion	Winfried Haule
10:45	Brief overview of the fishery in Zanzibar: presentation/discussion	Narriman Jiddawi
11:15	Plenary discussion	
12:30	Lunch	
14:00	Initiative on the licensing of small pelagic fishing units in mainland Tanzania: presentation/discussion	Tom Shipton
15:00	The Mafia Dagaa value chain analysis: questions and extrapolation	Clotilde Bodiguel
16:00	Coffee break	
16:30	Open discussions on critical issues to be addressed for improved governance and management of the small pelagic fishery in Tanzania	Clotilde Bodiguel
17:00	End of day 1	-
Wednesday 12 August 2015		
9:00	Possible mechanisms for improved and institutionalized concerted management of the small pelagic fishery in Tanzania: presentation/discussion	Christophe Breuil
10:00	Coffee break	
10:30	Plenary discussions (cntd.)	Christophe Breuil
11:30	Working groups session	-
12:30	Lunch	
14:00	Working group session: presentation of results	-
15:00	A way forward to support dialogue for improved concerted management of the small pelagic fishery: plenary discussions	Clotilde Bodiguel
16:00	Coffee break	
16:30	Closing remarks (Zanzibar authorities)	Omar Ali Amir

Annex C. Photo



Meeting participants

Annex D. Overview of the small pelagic fishery of mainland Tanzania by Dr Winfried Haule

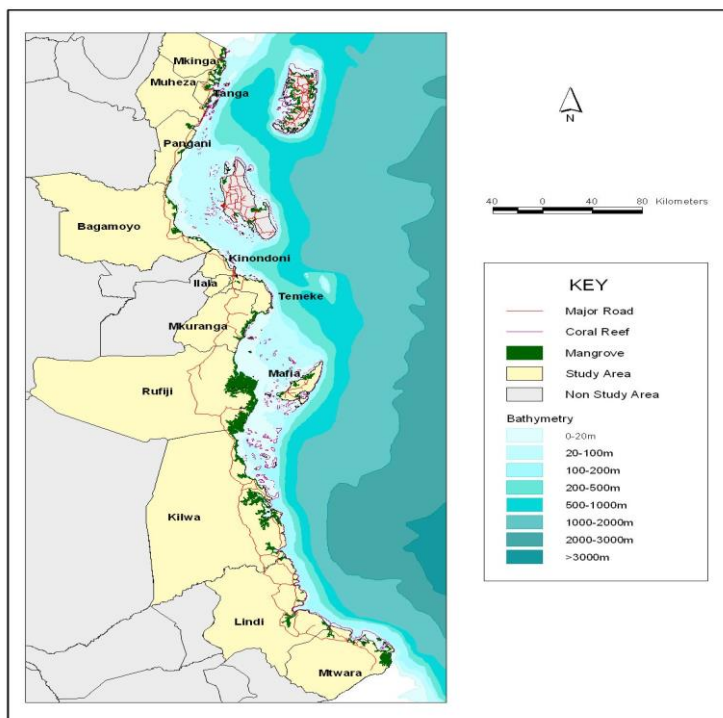
1. Brief description of the fishery

The small marine pelagic fish species of Tanzania fall under three families, namely *Clupidae* ("Saradini"), *Engraulidae* ("Dagaa mchele") and *Scrombridae* ("Vibua"). Both the *Clupidae* and *Engraulidae* are caught by using purse seines, ring nets and scoop nets. These species, as recorded by Bianchi 1985, are:

- *Clupeidae*: *Amblygaster leiogaster*, *A.sirm*, *Dussumieria acuta*, *Etrumeus teres*, *Herklotsichthys punctatus*, *H. quadrimaculatus*, *Hilsa kelee*, *Pellona ditchela*, *Sardinella melanura*, *S. albelia*, *S. gibbosa*, *S. neglecta*, *Spratelloides delicatulu* and *S. gracilis*, a total of 14 species;
- *Engraulidae*: *Engraulis japonocus*, *Stolephorus heterolobus*, *S. punctifer*, *S.indicus*, *S. comersonii*, *S. devisi*, *Thryssa baelama*, *T. setirostris* and *T. vitrirostris*, 9 species in total;
- *Scrombridae*: *Rastrelliger kanagurta*, 1 species.

The species are geographically distributed in marine waters of all the administrative coastal districts of mainland Tanzania, which are, from North to South, Mkinga, Muheza, Tanga, Pangani, Bagamoyo, Kinondoni, Ilala, Temeke, Mkuranga, Rufiji, Kilwa, Mafia, Lindi Rural, Lindi Urban, Mtwara Urban and Mtwara Mikindani (Mtwara Rural) as shown in Figure 1 below.

Figure 1: Coastal districts of Tanzania



Biological studies, however, have confirmed that sardines are migratory, forming heterogeneous (sometimes homogenous) shoals of varying sizes and densities. Such shoals are only formed during migration, but are broken off during feeding, spawning and at night (in the dark). Biological studies on mackerels have also shown that they are migratory in nature. It is therefore evident that, mackerels, sardine stocks and possibly anchovies straddle Zanzibar's waters and/or the Tanzania Exclusive Economic Zone (EEZ) and/or the EEZs of neighbouring countries, Kenya and Mozambique. The straddling nature of these stocks suggests that collaboration between mainland Tanzania and Zanzibar as well as, but to a less extent, amongst Tanzania, Kenya and Mozambique will contribute to effective management of the small pelagic fishery in Tanzania.

Large concentrations of small pelagics are reportedly fished in the near shore water areas of Tanga, Dar es Salaam, Mafia, Rufiji and Kilwa. Fishing in the offshore area, including the EEZ, has not been reported. Although information on the biomass of the stocks is not easily accessible, official data on annual catches of sardines (*Clupidae*) and anchovy (*Engraulidae*) have remained at about 15,000 MT from 2010 to 2013 despite an increase in the number of fishers from 19,000 to 30,000 during this same period.

Some fishers interviewed at landing sites claimed that catches of sardines and anchovy have not shown signs of decline over the years, but mackerel catches have been decreasing as it takes more time to harvest them than in the '70s. It was also claimed that sardines and anchovy reproduce in greater numbers in a shorter period of time than mackerels. This paper is of the opinion that catches of mackerel have exceeded the Maximum Sustainable Yield (MSY) whilst those of sardines and anchovy are nearing the MSY. Improved data collection and more research are required to confirm the status of the small pelagic fish species.

A typical fishing unit targeting small pelagics consists of a boat or dhow with 15 to 20 crew members, equipped with an outboard or inboard engine, as well as two skiff boats that carry kerosene pressure lamps to attract fish at night. The most common fishing gears used are: purse seine nets, ring nets, illegal beach seines, scoop nets and cast nets. Presently, small pelagics are still targeted by small scale fishers in near shore waters.

Methods of adding value through processing of the small pelagic fish vary according to the size and type of species. Anchovies are sun dried either raw or after boiling. The raw fish are also fried. Small sardines of a maximum size up to 8 cm are fried as well as sun dried, raw or boiled. Larger sardines, of up to 25 cm, are only fried. The large sardines are considered to have a thick flesh that cannot be sun dried. However, they are potential candidates for the fish canning industry, which currently does not exist in Tanzania. Sun dried anchovy and small sardines are packed in polythene bags and stored accordingly. Processing mackerels involves gutting, icing, freezing and frying. Salting is an additional feature in the processing of anchovies, sardines and mackerels and is intended to improve the shelf life of the product.

Fishers sell fresh fish to fishmongers at the landing site either directly or through auctioning. The fishmongers then sell the fresh fish to retailers who, in turn, sell it to consumers either raw or processed. Some fishers, at times, play the role of retailer by selling fish directly to consumers.

Fried anchovies, sardines and mackerel are sold at the local and national level in Tanzania. However, sun dried anchovies and sardines are sold in the local markets and some find their way to the regional markets of the Democratic Republic of Congo (DRC), Zambia, Rwanda, Burundi and Malawi. Some frozen mackerel is also exported to Kenya and Uganda from the Tanga region. The number of people involved in this trade could not be revealed as these traders are trying to avoid being licensed.

No marketing strategy for small pelagic fish products has yet been developed at the national or regional levels. Tanzania has not yet studied the requirements of those countries that import small pelagic fish products to identify the full potential of fish resources.

2. Key figures on the fishery

The most recent marine fisheries frame surveys carried out were in 2007 and 2009 in which the number of vessels fishing for small pelagic fishes increased from 1,432 (825 dhows and 607 boats) in 2007 (MLDF 2008) to 1,843 (1,004 dhows and 839 boats) in 2009 (MLDF 2010). The total number of outboard and inboard engines rose from 743 in 2007 to 831 in 2009. The same figures of 2009 have been used in the statistics report for 2013 (MLDF 2013), indicating a weakness in official data capturing.

Documentation on marine fish catches according to species in the annual fisheries statistics reports from 1998 to 2015 is erratic and at other periods/years unavailable. The total marine fish production in 2013 was 52,846 MT. Clupeids contributed 8,040 MT, the equivalent of 15.2 percent of the total. Mackerel contributed 4,349 MT, the equivalent of 8.2 percent. Unfortunately, the 2013 statistic report does not document the contribution of anchovies as a separate catch from the total marine fish catch. It is very possible that the so-called Clupeids also included the Engraulids (anchovies) category, which again indicates a poor level of data capturing.

It is generally assumed that small pelagic fish make up 30 to 50 percent of the annual total marine fish catch. Based on this generalization and assuming the contribution of the pelagics catch has stagnated at 40 percent, over the years, the actual contribution of pelagic fish in the total marine catch was most probably around 21,138 MT in 2013.

A comparison of the contribution of small pelagic fish to total marine fish production from 2000 to 2013, based on marine fish production data from the Annual Fisheries Statistics Report 2013, is given in Appendix 2.

However, according to expert estimates⁴, it can be argued that official statistics on the catch of small pelagics are largely underestimated. Based on several assumptions, it can be safely deduced that the annual catches of small pelagics in mainland Tanzania could be close to 715,000 MT, made up of 464,400 MT of anchovies and sardines and 250,600 MT of mackerel. This paper is of the opinion that fisheries management decisions based on official records of annual catches may not be realistic.

The sale of small pelagics is carried out by auctioning or at a fixed price. The unit measure for sardines and anchovies is the 10 or 20 lt plastic bucket, which is equivalent to 10 kg or 20 kg. Mackerel is sold per piece. On average, the unit price of small pelagics is 2,000 TZS per kg, with significant fluctuations according to the season⁵. The price is lowest during the rainy season, when catches are high and there is no opportunity for sun drying, meaning the only option for processing is frying. The establishment of a cold chain facility by the private sector would obviously enhance the utilization capacity of the pelagic fish resource.

The total value of small pelagics (ex-vessel price) in mainland Tanzania was officially estimated at approximately 78.2 billion TZS in 2013 (see Appendix 2). According to expert estimates, the total value of small pelagics could be close to 1,430.0 billion TZS (715,000 MT x 2,000 TZS per kg).

Official data indicate that the number of fishers operating in the small pelagic fishery in 2009 was 29,312. The current number of fishers involved in the small pelagic fishery is over 30,000⁶.

⁴ A report by a purse seine fisher in Mafia, a major fishing area for small pelagics, revealed that small pelagic fishing takes place over seven months, mainly from April to October. Fishers go out on moonless nights (approx. 18 nights per month). Catches of anchovy and sardines from a 9 m boat with a 40HP outboard engine operated by a 15 member crew reportedly range from 50 to 150 twenty liter plastic buckets per night. Thus the average catch per night is 100 buckets. One full bucket of small pelagics is equivalent to 20 kg. Analysis of the fishing fleet has shown that 1,843 dhows and boats fish for small pelagics. Based on these facts and figures, it can be safely deduced that annual catches of anchovy and sardines alone is 464,436 MT (1,843 vessels x 7 mths x 18 nights x 100 buckets x 20 kg).

The latest documentation on the contribution of sardines and mackerel to the total annual marine fish catches is only available for 2010, 2011 and 2013 and is given in Appendix 3. The share of mackerel in the small pelagics catch is about 54 percent. It can be deduced that, since mackerel contribute 54 percent to the sardine and anchovies catch, the annual catch of mackerel should be 250,795 MT (464,436 MT x 54 percent).

⁵ In Mafia, information from a fisher revealed that a 20 lt bucket of sardines or anchovies is sold at 20,000 TZS, the equivalent of 1,000 TZS per kg. At Ferri fish market in Dar es Salaam, a fishmonger reported that the price of one 20 lt bucket of sardines or anchovies fetches between 10,000 to 80,000 TZS; the unit price thus varies from 1,000 to 4,000 TZS per kg. Data on unit prices of small pelagic catches at Ferri Fish market in Dar es Salaam are given in Appendix 4. Records show that from January to July 2015, mackerel fetched the highest price, averaging 3,538 TZS per kg, followed by sardines, with an average of 2,112 TZS per kg, whilst the more abundant anchovy fetches the lowest price of 1,245 TZS per kg.

⁶ A boat owner in Mafia District stated that boat crewmembers number between 15 and 20. According to a boat owner at Kunduchi fish landing site in Dar es Salaam, crewmembers in a boat using a ring net during the day can number 60. A number of randomly interviewed fishers stated that boats fishing for small pelagics employ an average 18 fishers. The total number of fishers employed by the small pelagic fishery in 2009 may therefore have been around 33,000 (18 fishers x 1,843 fishing vessels). The 2009 Fisheries Frame Survey (MLFD 2010) reported that of the 36,321 fishers, 7,009 or 19 percent, were foot fishers. Foot fishers comprise women, the elderly and children, who are unable to participate in fishing for small pelagic resources. The number of small pelagic fishing gear, engines and fishers over the years is shown in Appendix 1.

Levels of employment in fishing related activities can be assessed based on the data available for fish landing sites, fishing facilities and equipment as well as the number of residents in coastal areas. It can therefore be roughly estimated that fishing related activities provide livelihoods for about 670,000 people living in coastal areas⁷. A number of people provide fish frying services to retailers and consumers directly at the landing site; the majority of such service providers are female.

The 2013 official data shows that about 280 MT of small pelagics, of which 274 MT was sardines and anchovies, were exported (see Appendix 6). Processed anchovies and sardines are exported to the DRC, Zambia, Rwanda, Burundi and Malawi. Some frozen mackerel is also exported to Kenya and Uganda, particularly from the Tanga region. Unfortunately, information on the level of exports per destination country is not available.

Total exports of marine fish and fishery products for 2013 were recorded at 1,372 MT with a FOB value of US \$7.4 million; FOB value of 12,008 million TZS and royalties of 616 million TZS (MLFD 2013). Small pelagics contributed about 20 percent of the total weight of fishery products exported (about 280 MT) and 4.4 percent of the FOB value.

This report has revealed however that the official records of annual catches of 21,140 MT are considerably lower than the estimated 715,231 MT from the present analysis. It is believed that official data on fish exports are also largely underestimated.

Based on official data, exports of small pelagics are very low. This would mean that the present level of small pelagic fish exports do not pose a threat to fish food availability for the local population and that most fishery products are available for domestic consumption. In 2010, per capita consumption was estimated at 7.8 kg/capita. Compared with Africa (9.9 kg/capita), North America (24.1 kg/capita), Latin America (9.9 kg/capita), and Asia (20.7 kg/capita), fish consumption in Tanzania is comparatively low.

⁷ The current number of fish landing sites is about 250. Each fish landing site employs no less than 60 youths who are engaged in the descaling, gutting and washing of sardines. Thus about 15,000 youths are engaged in small pelagic fish processing at any one given time of fish landings.

Analysis of the data from the 2012 Tanzania population census (Appendix 5) reveals that there are 1,637,707 households in the 16 coastal districts (see Figure 1). It is estimated that every fifth household is engaged in the frying and selling of small pelagic fish. Based on this fact, the number of households participating in the fried fish business is about 327,540. Each household participating in the fried fish business requires the service of at least 2 people, one person to buy the fish at the landing site and fry it and a second one to sell it; the number of people employed in the fried small pelagic fish business in coastal districts alone is therefore close to 655,000.

Other service providers in the small pelagic fishery include more than 1,000 fishing vessel repairers, approx. 2,000 net menders, about 100 engine repairers as well as other traders of fishing accessories. The number of service providers is based on the reported number of fishing vessels, fishing gear, as well as outboard and inboard engines in this report. Other service providers include transporters at sea and overland to domestic and regional markets; their numbers could not be assessed by this report.

3. Social and economic dynamics in fishing activities

Revenue sharing

Information provided from a Captain and a fisher of a vessel operating a purse seiner in Mafia revealed that, after the catch has been sold, the following deductions are made before any profits are shared:

- Running costs: fuel for both engines and pressure lamps, cost of spare parts and other accessories, net repairs, etc.;
- Payment of any debts of fishers to the boat owner; and
- Five percent levy to the District/Municipal/City Council.

The balance after deductions is equally (50 percent) shared between the boat owner and the fishers. Each fisher will have an equal share of the 50 percent. In addition, the boat owner will pay 10 percent of his 50 percent share to the Captain and another 10 percent to the pressure lamp operator.

Recent changes in fishing strategies

The fishing technique for purse seiners involves attracting schools of small pelagic fish to bright lights and then encircling them with a net before hauling the catch on board. Fishing is therefore carried out at night when there is no moon. Equipment for purse seine fishing comprises a boat with an outboard or inboard engine, as well as two skiff boats, which carry kerosene pressure lamps for light attraction. To enhance fish attraction, some boats are also equipped with portable electric generators. Light produced by the generator is used to scout for schools of small pelagic fish. Observation or the siting of concentrations of small pelagic fish is carried out by well-seasoned and experienced fishers. The pressure lamps, used to help attract the fish, are only switched on after confirmation that fish are concentrated in the area.

The technique of scouting for fish concentrations is reported to be economical, as kerosene for the pressure lamps is used effectively, thus reducing the cost of fishing. Fishers also report that light from the generators assists in attracting a greater quantity of fish, leading to greater catches.

Fishing with a ring net takes place during the day in near shore waters, usually on sandy grass areas devoid of corals. As the name of the gear implies, the bottom edge of the net is weighted with metallic rings that ensure that the lower part of the gear is dragged on the seabed. However, when small pelagic fish are sited over areas of coral, scuba divers facilitate the use of ring net by untangling the rings from broken corals, thus ensuring that all fish in the area are caught. By extending the use of ring nets from the sandy grass areas to coral reef areas catch size has increased significantly. However, the use of the ring net over coral reef areas is detrimental to the coral ecosystem. By law, ring nets are to be used in depths of more than 50 metres, but adherence to this regulation is difficult to enforce. Some officials of the fisheries authorities feel that ring nets should be declared illegal and therefore be banned.

A more modern tool that has been adopted by small pelagics fishers is the mobile phone. Fishers use their phones to report catches and find buyers, thus enhancing their interactive communication and marketing. According to fishers, this has helped them improve their income, feel more secure at sea, and allows them to stay in contact with their families. The use of mobile phones also enables culprits to dodge law enforcers particularly during surveillance at sea.

Migrant fishers

The small pelagics fishery is known to involve migrant fishers. For example fishers from Zanzibar acquire temporary residence in Mafia and work in Mafia's sardine fishery. Their temporary residence has at times resulted in marriage with Mafia residents. Such intermarriages have, at times, been the subject of discussions on allowing migrant fishers to have the right to be involved in the process of establishing Beach Management Units (BMUs) on Mafia, because the law does not allow non-residents to register as members of a BMU. Migrant fishers are known to be more efficient at fishing, netting greater sardine catches and are thus economically more powerful than resident fishers. This greater economic power allows migrant fishers to marry residents and influence decision-making in fisheries management at the local level.

The 2009 Fisheries Frame Survey documented what it termed, 'foreign' or migrant vessels originating from areas outside the fisheries administrative area or the administrative district. Of the 7,664 fishing vessels recorded in, 962 or 12 percent were considered 'foreign'. The interpretation of the fisheries authorities is that this number indicates the migratory level of the fishers.

Dar es Salaam reports it has an average of 58 percent migrant vessels; this can be related to its market prospects. The Banda Beach (Ferry) fish market attracts many fishers from various areas to sell their catch.

Fisheries authorities have reported that draft guidelines to deal with migrant fishers have been developed in collaboration with Sea Sense (a non-governmental organization) and the Worldwide Fund for Nature. These guidelines are to be adopted early 2016.

Safety at sea

Accidents pertaining to the small pelagic fishery seem to have been rare in the recent past. Safety equipment in place for pelagic fishers includes empty fuel containers, skiffs that can accommodate up to 7 people, as well as fishing net floats and buoys.

Pressure lamp operators are said to be the most skillful workers but they have one of the most dangerous jobs of the sardine, anchovy and mackerel fishers because they operate from small two metre skiffs, boats that are much smaller than the 12 metres or more fishing vessels. Thus the pressure lamp operators are more prone to shark attacks: it was not possible to obtain any data on shark attacks.

Fisheries legislation does not provide for safety at sea. Accidents involving fishers at sea are reported on an *ad hoc* basis. There is no structured way to report accidents and there is no response mechanism in place for rescue. This paper is of the opinion that safety at sea should be developed and implemented; this would be one way to start working with the fishers towards small pelagic fishery management.

Fishers' associations

The handling of fishing gear for sardines and mackerel requires the support of more than one fisher. As a result, the small pelagic fishery is carried out in groups of fishers. Some of the groups have transformed into fishing associations and have officially registered as such. The number of small pelagics fishing associations however is yet to be determined. These associations are potential collaborators and actors in a management plan for the small pelagic fishery.

4. Social and economic dynamics in post-harvest activities

Recent change in processor's strategies

Information on advances made in the processing of catches of small pelagic fish is hard to obtain. It appears that traditional processing methods of boiling and sun-drying sardines and anchovies, as well as gutting and freezing/icing mackerel have not changed much over time.

Verbal information indicates that some individuals have recently started smoking sardines and anchovy in an attempt to capture different consumer requirements. Additional information on the level of this activity was not available.

Some documents report that some processors who sun-dry sardines and anchovy do not like to use raised drying racks, as they are worried about losing fish powder and ending up with fish of a lesser weight. This type of attitude however, leads to low quality products.

Recent change in trader's strategies

After sun drying, the sardines and anchovies are packed in polyethylene bags, the standard weight of which is 100 kg. However, it is reported that bags are resized by adding material such that they can hold up to 180 kg of sardines and anchovies per bag. During product declarations at fisheries offices, it is assumed that each bag holds 100 kg. The owner thus pays less tax but more importantly, official records on exports are 80 percent lower than the actual weight exported. Once again, this contributes to a lack of accurate information to support decision-making in the management of the small pelagic fishery.

Infrastructure development

Some landing sites adjacent to urban areas have been provided with facilities such as platforms for the sale and auction of small pelagic catches. It is generally considered that fish landing sites in the coastal areas have inadequate facilities to receive and handle fish.

The 2009 Fisheries Frame Survey recorded a total of 257 landing sites of which 192 were permanent and 65 were temporary. The survey also showed that 149 (58 percent) of the total landing sites were accessible throughout the year by all-weather roads. Of the 257 landing sites, 135 (52 percent) had a good water supply, 117 (46 percent) had gear repair facilities and 101 (39 percent) had boat repair facilities. These data show that there is still room for improvement at the landing sites. Investment in the construction of proper fish receiving stations providing ice, freezing and cold storage facilities could be a profitable venture.

5. Regulatory framework of the small pelagic fishery

The Fisheries Act No. 22 of 2003 is the primary national legislation that makes provision for the sustainable development, protection, conservation, aquaculture development, regulation and control of fish products, aquatic flora and its products and for related matters. The Fisheries Act No. 22 of 2003 is supported by the Fisheries Regulations, 2009.

Access to resources

Access to the small pelagic fish resource is guided by the Fisheries Regulations of 2009 which specify *inter alia* the pre-requisites for the small pelagic fishery as (i) Registration of fishing vessels, (ii) Licensing of fishing vessels and (iii) Licensing of fishers and fish dealers.

Before starting any fishing activity, it is thus mandatory that fishing vessels are registered and licensed. The registration and licensing of a fishing vessel is only done once; registration fees are paid when the vessel is commissioned for the first time. Registration fees aim to keep track of how many vessels enter the industry and are a stream of revenue, whilst licence fees are seen as a means to control entry to some extent, to keep track of how many vessels are actively engaged in fishing activities each year and also as a way to collect revenue.

Fishers also have to be licensed each calendar year. Fees are applicable to vessel registration, vessel licensing and fisher licensing. A fishing license is applicable to the area of jurisdiction of the District Council/Municipal Council/City Council and fishing is open access in that particular area only. Changing fishing grounds from one jurisdiction to another requires the fisher to obtain another fishing licence from the District Council/Municipal Council/City Council in which he intends to fish.

Technical conservation measures

Existing regulations include the prohibition of damaging fishing techniques and methods (e.g. dynamite fishing, beach seining, use of poison, etc.), gear limitations, various size limitations (mesh-size of some nets, minimum size of fish species, etc.) and spatial restrictions and closures where protected areas like marine reserves have been established under the Marine Parks and Reserves Act of 1994⁸.

With regard to specific gear limitations relating to small pelagic fishery, ring nets shall be operated in deep waters targeting pelagic schooling fish species where the net shall not touch the floor of the water body and shall be operated in deep water of not less than 50 metres during the low tide.

6. Main public institutions concerned by the governance and management of the small pelagic fishery

The main public institutions concerned by the governance and management of the small pelagic fishery are the Ministry of Livestock and Fisheries Development (MLFD), the Fisheries Development Division, Local Government Authorities (LGAs), the Tanzania Fisheries Research Institute (TAFIRI) and the Fisheries Education and Training Agency (FETA).

The MLFD of mainland Tanzania has the mandate for the overall sustainable management and development of fisheries under its jurisdiction including the small pelagic marine fishery. The vision of the Fisheries (Development) Division of the MLFD is "by 2025 to have a progressive fisheries sector contributing significantly to socio-economic development through the sustainable utilization of fisheries resources while conserving the environment". The mission of the Division is "to ensure that fishery resources including small pelagics are developed, managed, conserved, and utilized sustainably for economic growth and improved human livelihood".

The roles of the Fisheries Division are, amongst others, to ensure that vessel registration, licensing, statistics, research, quality control, training, MCS, and prosecutions are carried out effectively in collaboration with LGAs, TAFIRI and FETA as appropriate. In practice, the work of the Division is much more visible in terms of its regulatory functions than promotion of investments for the development of the sector.

⁸ The zoning plan of Mafia Island Marine Park (MIMP) has categorized the park area into three zones:

- The core zone, in which no resource, (including small pelagic fishes) extraction is allowed, but where diving (snorkeling) for tourism purposes and research is permitted.
- The specified use zone, where permissible fishing gear is specified, and fishing (including sport fishing) by non-residents is prohibited; and
- The general-use zone, where fishing is allowed, but where non-residents require a permit to fish. Dragnets and fishing nets with a mesh size of less than 2.5 inches are not permitted.

The function of the Fisheries Division is setting policies, and drawing up acts, regulations and guidelines. The function of LGAs is implementation of such policies, acts, regulations and guidelines.

Vessel registration and licensing

According to Fisheries Regulations 2009, the registration of fishing vessels measuring up to 11 metres is mandated to LGAs; boats greater than 11 metres fall under the responsibility of the Fisheries Division. The total number of registered vessels recorded during the 2009 Fisheries Frame Survey was 2,055 whilst the number of unregistered vessels was 5,609, the equivalent of 73.2 percent. This paper is of the opinion that, fishing vessel registration carried out at LGA level has not been very effective.

The 2009 Fisheries Frame Survey recorded 29,312 fishers. Given that 73.2 percent of the fishing vessels were not registered, it is highly likely that some fishers operating unregistered vessels were not licensed. Fisheries officials were not able to license all fishers and hence licensing activities have been ineffective.

Statistics

Effective registration and licensing are some of the contributing elements for the production of quality statistical information. This report has shown that the official records of annual pelagic fish catches are much lower than reality. Fisheries management decisions based on inaccurate figures may not be realistic. It can be deduced that both the Fisheries Division and LGAs are not effective in producing quality statistical information.

The Fisheries Division is the custodian of fisheries statistics for mainland Tanzania. The Division is responsible for the collection, analysis and dissemination of national fisheries information. Data collection, storage, analysis, information synthesis and dissemination for the small pelagic fishery is inadequate. There is no systematic information available on small pelagics. Fisheries Frame Surveys describing fishing, landing, processing and marketing patterns were undertaken in 1995, 1998, 2001, 2005, 2007 and more recently in 2009, however, these surveys lack specific data on small pelagics.

The challenges faced by the Fisheries Division are reportedly due to the administrative structure. At the time of the centralized administration system (1980s), there was a strong formal link between the Fisheries Division and regional/district administrations. Regional/district fisheries officers and their subordinates were answerable to the Fisheries Division. Every landing site had Field Officers, employed at the district level, as data enumerators. Apart from other fishery related activities, data collection was the Field Officer's main activity. From 1997 onwards, national annual fisheries statistics reports, specifically for the artisanal sector, could no longer be produced. This was due to a lack of manpower and financial resources that limited the collection of the basic data from landing sites as well as a lack of human capacity to analyze data entered at the Fisheries Division.

Some restructuring of the present decentralized framework of administration is required to develop an adequate fisheries data collection system.

Some local and regional initiatives for data collection are currently being developed using simple contemporary mobile technology; this will help with the management of fisheries statistics.

At present there is no coordination of fisheries data collection for the small pelagic fish species between mainland Tanzania and Zanzibar, such that each side of the country has its own data collection system.

Research

The Tanzanian Fisheries Research Institute (TAFIRI) is the primary marine research facility undertaking research on behalf of the Fisheries Department. TAFIRI's role is to promote, conduct and manage fisheries research and consultancies for the sustainable development of fisheries in Tanzania, including small pelagic marine fisheries. Research work on small pelagic fish species is, however, poorly developed due to the lack of adequate data. The MSY of sardines, anchovies and mackerel has yet to be assessed. TAFIRI confirmed that so far, no assessment of small pelagic fish species has been carried out.

Quality control

The Fisheries Division is the competent authority responsible for the quality control of small pelagic fish. According to Fisheries Regulations 2009, Scombridae, Clupeidae and Engraulidae fishery products shall be tested for histamine content. The regulations also provide the conditions for the sun drying of small pelagics⁹. However, some fishers reported that most of the sardines and anchovies are sun dried directly on the sand. End products therefore contain a lot of sand particles, rendering them poor in quality. Efforts by the Fisheries Division to ensure sardines and anchovies processed products have not been sufficient and food safety for small pelagic products is far from adequate. For example, sardines exported to the DRC are not good quality; even if low quality dried sardines are acceptable in the DRC.

Training

The function of FETA is to carry out quality education and training as well as disseminate appropriate technologies to fisheries stakeholders including those of the small pelagic fishery. Relevant thematic areas contained in FETA's training programmes are: Fishing gear and methods; Survival at sea; Fisheries management practice; Fish processing techniques; Boat maintenance and repair; and Swimming. A number of fishers interviewed stated that, they were aware of the existence of a fisheries training institute whose main focus was marine fisheries. The fishers claimed that they had not benefited from the institute in any way as training was given to youth aspiring for employment in government and public institutions. They had not been given the opportunity to attend tailor-made training relevant to the small pelagic fishery.

⁹ According to Fisheries Regulation 2009: Fish and fishery products shall be placed on raised platforms or racks away from any potentially harmful contaminants; Fishery products shall be protected from vermin, contamination by birds, animal droppings, dust and any other extraneous material and; The environment shall be kept in a hygienic and sanitary condition at all times to prevent cross contamination.

Efforts to obtain information from the Fisheries Division and FETA on tailor-made training pertaining to the small pelagic fishery were not successful. This paper is therefore of the opinion that training of stakeholders of the small pelagic fishery has been ineffective.

Monitoring, control & surveillance and enforcement

Monitoring, control & surveillance (MCS) is carried out by fisheries Control Officers, marine protected area staff, the navy and police, and local BMUs. MCS activities mainly involve sea patrols. Activities are carried out in collaboration with fisheries officials, marine police officials and BMU members.

However, MCS activities are hampered by ineffective collaboration, and a low level of commitment of participating members. Other major reasons for inadequate MCS include ineffective investigations and prosecutions of punishable fishing cases resulting in a relatively low level of significant penalties meted out¹⁰.

Regional MCS efforts among Tanzania, Mozambique and South Africa under the umbrella of the Southern Africa Development Cooperation (SADC) have centered mainly on the large pelagic fish species. No emphasis has been put on the small pelagic fishery. It should be noted however, that several initiatives have been recently taken by the IOC-SmartFish programme to strengthen MCS activities in Tanzania.

As such pelagic fish resources continue to be prone to destructive fishing methods. Outside marine parks and reserve areas, it is well known that beach seine nets and ring nets are being used in areas less than 50 metres deeps including areas of coral. More seriously, dynamite fishing remains a critical issue¹¹. Whereas it is not easy to ascertain incidences of small pelagic fish killed through destructive fishing practices, it is widely known that the main victims of blasting activities are sardines, anchovies and mackerel.

It is the opinion of this paper that implementation and enforcement of fisheries regulations is highly unsatisfactory.

Safety at sea

At the national level the Surface and Marine Transport Regulatory Authority (SUMATRA) under the Ministry of Transport is responsible for safety at sea. SUMATRA carries out inspections of water vessels, including small-scale fishing vessels, to assure seaworthiness at a fee set by the Authority. It appears that inspections are more geared towards revenue collection than the intended aspect of ensuring vessels are seaworthy. Records of inspection exercises undertaken by SUMATRA are not accessible. It also appears that collaboration between SUMATRA and the Fisheries Development Division is almost non-existent. As a result, the Fisheries Development Division has no data on fisher casualties at sea. Safety at sea therefore remains a subject for consideration.

¹⁰ A review of administrative records of dynamite fishing cases between 2000 and 2012 revealed that of the 122 cases heard, only 52 (43 percent) resulted in any form of conviction. Of the 52 convictions, 17 (33 percent) resulted in jail sentences, 19 (37 percent) resulted in fines, 10 (19 percent) were conditionally discharged and 6 (11 percent) received no penalty at all. It is thought that the effectiveness of prosecution has been low due to poor investigative processes.

¹¹ The rate of blasting has reached very high levels. For example *in-situ* monitoring by WWF TCO in the Songosongo area over 15 continuous months recorded an average of 22 blasts per day; the maximum number of blasts per day was 90.

7. Role of the community and fishery stakeholders in the co-management of the small pelagic fishery

Beach Management Units

In Tanzania, members of Beach Management Units (BMUs) and village government members are the major stakeholders in the co-management of the small-scale fishery. The Government of Tanzania established BMUs as mechanisms for a collaborative and participatory fisheries management approach. Their legal involvement in the management in fisheries is spelt out in Section 18 of Fisheries Act No 22 of 2003 and their roles are spelt out in the Fisheries Regulations of 2009. BMUs are supposed to work to minimize conflicts of fishery resource use, reduce costs of government patrols and surveillance, and support Village Environmental Committees on marine environmental protection.

Tanzania has also developed national guidelines for BMUs, applicable to freshwater bodies as well as marine waters. The guidelines are intended to steer the empowerment of local communities in fisheries planning, management and development and provide a clear outline for community participation in these processes. The guidelines define how, through the formation and operation of BMUs, local fisheries communities will become active partners in fisheries co-management with Local Government Authorities and the central government. To date, 47 BMUs have been registered and 75 are in various stages of the registration process.

One of the key challenges of the BMUs is their relationship with the Village Councils (at the district level) and the Fisheries Division. The mandate for the establishment of BMUs is the Fisheries Act 2003 and Fisheries Regulations 2009 in collaboration with the organs of the Local Government Authorities, the Village Councils in particular. The registrar of the BMUs is the Director of Fisheries. As a result, reporting lines and obligations are not clear. BMUs should be seen as organs of the districts and not the MLFD to foster effective fishery (co)management.

In practice, however, BMUs lack sustainable funding mechanisms. As a result, most of the fisheries patrol and surveillance activities have ceased or are dependent on donor-funded projects and hence are sporadic in nature. Fisheries data collection activities are not carried out. BMU members also lack the capacity to carry out other obligations¹².

UWAWADA

Umoja wa Wavuvi Wadogowadogo, Dar es Salaam (UWAWADA) or Association of Small-Scale Fishers of Dar es Salaam, is a non-governmental organization composed of small-scale fishermen from Dar-es-Salaam.

¹² The BMUs' other obligations include: The preparation of by-laws to supplement implementation of the Fisheries Act and Regulations; Ensuring beach sanitation and hygiene; Educating other fishers on the negative impact of illegal fishing practices and other environmental issues that affect fishery resources and the general environment; Preparation and implementation of economic sub-projects and; Ensuring the security of the local population and property.

The daily activities of UWAWADA are fishing. All UWAWADA fishers were reported to be fishing for small pelagic fish species. UWAWADA's mission is to improve the economic and social wellbeing of small-scale fishermen and to maintain a sustainable marine environment. The leadership of UWAWADA reported that its members adhered to environmentally friendly fishing practices, and hence contribute to the sustainable management of small pelagic fish resources.

Tanzania Industrial Fishing and Processors Association

The Tanzania Industrial Fishing and Processors Association (TIFPA) aims to provide a forum to deliberate on issues related to industrial fishing and processing. TIFPA has not been processing small pelagic fish but has the potential to positively influence the processing and marketing of small pelagic fish resources, particularly sardines.

8. Initiatives for improving the planning and management of the small pelagic fishery

Specific Fishery Management Plan

The Fisheries Development Division of the MLFD has been promoting the development and adoption of the 'Management Plan for the Tanzanian Artisanal Fishery for Small and Medium Pelagic Fish Species' since early 2013 with assistance from the FAO's Ecosystem Approach to Fisheries (EAF) Nansen Project. The scope of this Fishery Management Plan (FMP) includes fishing activities that involve both licensed and unlicensed artisanal fishers targeting small pelagic fish in marine waters under mainland Tanzania's jurisdiction. Implementation of the management plan has not yet commenced due to lack of funds.

It is unfortunate that the application of the FMP does not include Zanzibar's marine waters, as medium and small pelagic fish species are known to straddle mainland Tanzania's and Zanzibar's marine waters. Unilateral management of the small pelagic fish species will not effectively contribute to the sustainability of the resource. This paper is of the opinion that development of a fisheries management plan should take into consideration the fact that pelagic stock straddle both mainland Tanzania's and Zanzibar's waters and therefore the Fisheries Development Divisions of both sides should opt to develop a single fisheries management plan.

Tanzania – World Bank SWIOFish Programme

The United Republic of Tanzania, which includes mainland Tanzania and Zanzibar, is preparing a fisheries project as part of the First South West Indian Ocean Fisheries Governance and Shared Growth Programme (SWIOFish 1). The project's primary beneficiaries are the coastal artisanal fishing communities on the mainland and islands of Tanzania and Zanzibar. These communities include small-scale commercial fishers, (fish and seaweed farmers), households where fishing makes up a substantial part of their livelihoods and subsistence fishers.

In addition, producer and professional organizations, industry or fisher organizations and local co-management fisher groups, including BMUs on mainland Tanzania and Shehia Fishing Committees (SFCs) are also targeted by this project.

SWIOFish project planning envisages working with a number of target coastal communities on mainland Tanzania and in Zanzibar, to strengthen their co-management of fisheries. In mainland Tanzania, co-management efforts will focus on, amongst others, the small pelagic fishery (sardines, anchovies and small mackerel): the project is still in the early stage of development.

9. Strengths and weaknesses of the small pelagic fishery

The small pelagic fishery has a number of factors that could be considered as strengths but which are also countered by a number of weaknesses. These strengths and weaknesses are given below.

Major strengths

The small pelagic species form a vast, valuable and accessible resource for local fishers and there is demand for fish and fishery products from both foreign and domestic markets.

The governance framework is relatively favourable with the existence of fisheries policies and regulations, a specific fishery management plan, public institutions at both central and local levels that support development and management initiatives and BMU members and fishing communities empowered to enforce fisheries legislation.

The presence of development partners and NGO's that support sustainable conservation and the development of natural resources including small pelagics should also be underlined.

Major weaknesses

Major weaknesses of the small pelagic fishery include:

- Persistence of an open access regime and weak implementation of measures aimed at regulating access to resources (e.g. registration, licensing);
- Poor compliance with existing regulations aimed at conserving fishery resources such as the banning of ring nets in depths of less than 50 metres and dynamite fishing (the main aim of dynamite fisher is to kill fish however, sardines are often not collected after explosions as they do not fetch a good price compared to mackerel);
- Lack of accurate data and scientific information on the small pelagic fishery to support fisheries management;
- Concentration of fishing efforts in near shore waters and absence of fishing fleets in the offshore areas including the EEZ;
- Inadequacy and weak functioning of BMUs and fishers organizations/associations to influence decision-making and support the effectiveness of management measures;

- Potential value added to small pelagic fish and fishery products not fully expressed;
- Inadequate human, financial and institutional capacity to manage the small pelagic fishery – this concerns the ineffectiveness or inefficiency of the existing administrative set-up for the management of fishery resources (central government and local authorities), the lack of funding to support the delivery of management services at both local and central levels¹³ and the lack of collaboration between the Fisheries Division, LGAs, police and judiciary;
- Poor implementation of the small and medium pelagic FMP;
- Poor collaborative mechanisms between mainland Tanzania and Zanzibar for the management of the 'shared' small pelagic fishery.

10. Priority areas for improved governance and management of the small pelagic fishery

The following priority areas have been identified and therefore constitute the key areas to be addressed for improved governance and management of the small pelagic fishery at local and national levels:

- Progressively put an end to the open access regime of the small pelagic fishery, possibly by promoting the adoption and implementation of specific fishery management plans;
- Strengthen collaboration between the Fisheries Development Department of Zanzibar and the Fisheries Development Division of mainland Tanzania for the management of the small pelagic marine fishery. This could include several areas of collaboration such as harmonization of fishing regulations and conditions attached to licensing and the strengthening of management services such as statistics, research and MCS;
- Improve fisheries data collection, analysis and dissemination and strengthen research work on small pelagics (including stock assessments) to support adequate decision-making for the management of the fishery;
- Examine the possibility of installing sustainable funding mechanisms to enable BMUs to carry out their roles including law enforcement and fisheries data collection;
- Promote value addition in the small pelagic fishery by improving quality handling, processing and marketing of fish and fishery products, installing and improving the marketing system, and promoting the canning of sardines in Tanzania (to efficiently make use of the sardine catch which is lost, particularly during the rainy season when sun drying is not possible and there are no alternative processing methods);

¹³ Local authorities, District/Municipal/City Councils, obtain 5 percent as a levy from the sale of fresh catches at landing sites. Taxes from the export of dried small pelagic fish products go to the central government via the Fisheries Development Division. LGAs are required by the Prime Minister's Office to plough back 15 percent of fisheries levies collected into fisheries management and other related activities in their administrative area. However, in many cases it appears that fisheries officials at the local level do not have the capacity to take advantage of these funds to improve fisheries management in their areas of jurisdiction.

- Promote the fishing of small pelagic fish in the offshore waters including the EEZ, which fishers are currently unable to harvest due to poor fishing vessels. This would also involve improving collaboration between the Fisheries Authority and SUMATRA to ensure safety at sea.

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Appendices

Appendix 1: Number of fishing gears, engines and fishers over the years

Type of gear	Year					
	1995	1998	2001	2005	2007	2009
Cast nets	49	0	173	73	169	229
Ring nets	221	128	224	370	1,076	1,241
Beach seine	350	319	485	453	615	768
Purse seine		15	68	0	363	0
Scoop nets	75	256	252	710	306	40
Total	695	718	1,202	1,606	2,529	2,278
Fishers	13,822	20,625	19,071	29,754	28,010	29,312
Fishing vessels for small pelagics (dhows and boats)					1,432	1,843
Outboard and inboard engines					743	831

Source: Fisheries Development Division

Appendix 2: Comparison of extrapolated small pelagic fish attributes to the total marine fish production from 2000 to 2013

Year	Weight of total marine fish caught (MT)	Value of fish ('000 TZS)	Weight of small pelagic caught (MT - 40 percent of total)	Value of small pelagic caught ('000 TZS - 40 percent of total)
2000	49,900	32,180,000	19,960	12,872,000
2001	52,934	34,113,717	21,174	13,645,487
2002	49,674	33,372,136	19,870	13,348,854
2003	49,270	34,489,000	19,708	13,795,600
2004	50,470	40,376,000	20,188	16,150,400
2005	54,968	82,452,900	21,988	32,981,160
2006	48,590	72,885,750	19,436	29,154,300
2007	43,498	39,239,352	17,399	15,695,741
2008	43,130	51,756,216	17,252	20,702,486
2009	47,615	67,930,599	19,046	27,172,240
2010	52,683	89,639,934	21,073	35,855,974
2011	50,592	166,954,953	20,237	66,781,981
2012	50,079	177,781,799	20,032	71,112,720
2013	52,846	195,529,127	21,138	78,211,651

Source: Ministry of Livestock and Fisheries Development, 2013. Fisheries Annual Statistics Report, 2013

Appendix 3: Contribution of sardines and mackerel to the total annual marine fish catches for 2010, 2011 and 2013

Year	Total annual fish catch (MT)	Sardine contribution (MT)	Mackerel contribution (MT)	Ratio of mackerel to sardine catch (%)
2013	52,846.0	8,039.7	4,348.6	54
2011	50,592.41	7,696.87	4,163.16	54
2010	52,683.38	8,014.98	4,335.22	54

Source: Ministry of Livestock and Fisheries Development, Fisheries Development Division Annual Statistics Reports, 2010, 2011 & 2013

Appendix 4: Fish prices at Ferri Fish market over some months

Type of fish	Catch (Kg)	Value (TZS)	Unit Price (TZS per Kg)
July 2015			
Sardine	23,048	47,540,000	2,062
Anchovy	122,323	155,824,000	1,273
Mackerel	32,785	122,785,000	3,745
May 2015			
Sardine	22,427	40,790,000	1,818
Anchovy	102,782	113,010,000	1,099
Mackerel	78,813	283,756,500	3,600
April 2015			
Sardine	2,406	53,100,000	2,202
Anchovy	87,216	104,280,000	1,195
Mackerel	14,085	49,330,000	3,502
March 2015			
Sardine	46,356	101,370,000	2,186
Anchovy	136,660	156,320,000	1,143
Mackerel	28,102	101,460,000	3,610
January 2015			
Sardine	16,276	37,360,000	2,295
Anchovy	140,311	212,980,000	1,517
Mackerel	6,085	19,700,000	3,236

Source: Ilala Municipal Council, Ferri Fish Market daily fish catch records

Appendix 5: Population of Coastal Districts by Sex, Average Household Size and Number of Households

District/Council	Total	Male	Female	Average household size	Number of households
Muheza District Council	204,461	100,843	103,618	4.3	47,549
Tanga City Council	273,332	130,920	142,412	4.4	62,120
Pangani District Council	54,025	26,870	27,155	4.1	13,176
Mkinga District Council	118,065	57,760	60,305	4.6	25,666
Bagamoyo District Council	311,740	154,198	157,542	4.4	70,850
Kinondoni Municipal Council	1,775,049	860,802	914,247	4.0	443,762
Ilala Municipal Council	1,220,611	595,928	624,683	4.0	305,152
Temeke Municipal Council	1,368,881	669,056	699,825	3.9	350,995
Mkuranga District Council	222,921	108,024	114,897	4.3	51,842
Rufiji District Council	217,274	104,851	112,423	4.4	49,380
Mafia District Council	46,438	22,954	23,484	3.9	11,907
Kilwa District Council	190,744	91,661	99,083	4.4	43,350
Lindi District Council	194,143	91,647	102,496	3.7	52,471
Lindi Municipal Council	78,841	37,525	41,316	3.5	22,526
Mtwara District Council	228,003	107,922	120,081	3.9	58,462
Mtwara Municipal Council	108,299	51,062	57,237	3.8	28,499
Total	6,612,827	3,212,023	3,400,804	-	1,637,707
Average				4.1	

Source: United Republic of Tanzania 2013. Population and Housing Census 2012: Population distribution by administrative area

Appendix 6: Export of small pelagic fish products in 2013

Fish product	Weight (KG)	FOB value (USD)	FOB value ('000 TZS)	Royalties ('000 TZS)
Dried Dagaa/Sardine	273,960	325,043	572,588.8	18,358.4
Frozen Mackerel/Vibua	6,000	4,800	7,641.6	1,710.8
Total	279,960	329,843	580,230.4	20,069,2

Source: Ministry of Livestock and Fisheries Development, 2013. Fisheries Annual Statistics Report, 2013

Annex E. An overview of the small pelagic fishery in Zanzibar, Dr Narriman S. Jiddawi

1. Brief description of the fishery

The small pelagic fishery in Zanzibar, locally known as '*Uvuviwa Dagua*', is an important fishery especially for local communities as it is a source of food security, nutrition, income and livelihood support. The government also benefits from contributions to foreign exchange earnings from the export of anchovies.

The small pelagic fish are referred to as a diverse group of small sized fishes that are found in the pelagic zone and move in schools, usually above the continental shelf. This group of small pelagics includes the most common species belonging to the families *Clupeidae*, *Engraulidae*, *Carangidae* and *Scombridae*. Some of the more common small pelagic fish caught in Zanzibar are listed in Appendix 1. Their size ranges from 4 to 25 cm.

The small pelagic fish stocks in Zanzibar are shared with mainland Tanzania especially on the western part of the island. The fishery is concentrated in near shore waters including bays and deep lagoons with turbid plankton-rich waters. This is also due to the narrow continental shelf, which typically extends to about 4 km offshore, with the exception of the Zanzibar and Mafia channels, where the shelf extends to some 60 km. According to Wijkstrom et al. (1988), the area of the shelf to the 200 m depth contour, for both mainland Tanzania and Zanzibar combined, is about 30,000 km² and this is mostly where the small pelagic fishery occurs.

The small pelagics are usually found in areas where the water temperature is between 18 and 29°C. The peak spawning period of the Indian Mackerel is in October during the short rains (*Vuli*) (Jiddawi, 2000). However, with the effects of climate change and warming of sea temperatures in the water column, it is not yet known how small pelagics in Zanzibar will be affected.

This fishery is largely artisanal using traditional vessels and gears. Fishing is usually done with purse seine nets on moonless nights and lamps are used to attract schools of fish to the net. The purse seine net was introduced to Zanzibar by Greek fishermen in 1961 (Jiddawi, 2000). Seine nets, ring nets, scoop nets, beach seines (illegal) are also commonly used. An overview of fishing gears used to catch small pelagic fish by district is given in Appendix 2. Most of the Dagua is caught with the use of motorized boats or *mashua* with a large crew; some boats can have up to 20 fishers.

The number of fishing days per fisher is highly dependent on the type of gear used. For example purse seiners are used on moonless nights, approximately 19 nights a month (Jiddawi, 2012). However, the majority of fishers do not fish on Fridays or during the month of Ramadhan, although this is gradually changing nowadays due increased demands.

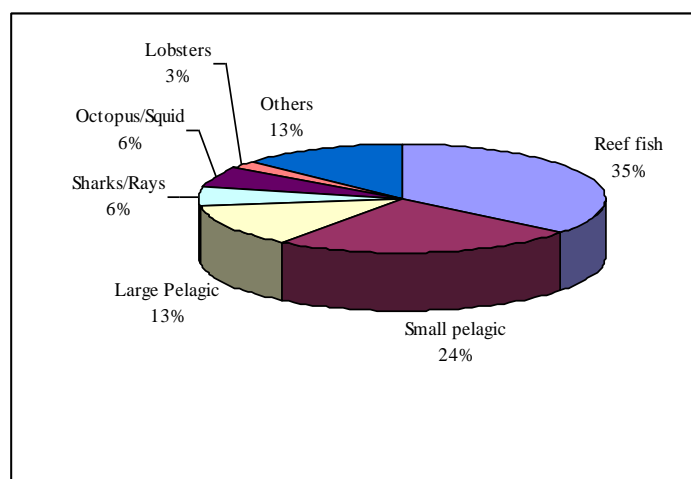
Most fishing units involved in small pelagic fishing operate vessels with engines. However, most of these vessels lack cooling and/or freezing facilities so fishing is limited by both time and distance, thus fishers continue to fish the same grounds as were fished by earlier generations.

The fishery sector plays an important role in the Zanzibar economy and is recognized as a strategic sector for the economic and social development of Zanzibar.

The fishing industry generates revenue for the government through export licenses, fish exports and entrance fees for conservation areas. Between 2000 and 2004, revenue collected from fish exports averaged 41.7 million TSZ including local revenue (BoT, 2006).

The fishery also supports people processing and selling the fish, thus it makes a significant contribution to poverty reduction endeavors. The current contribution of the marine fishery to Zanzibar's GDP is estimated at 7.2 percent with pelagic fish contributing 24 percent of the total in terms of catch weight (see Figure 2 below).

Figure 2: Composition of the different groups of fish caught in Zanzibar



Statistics Section, DFD, 2012

Dagaa are landed in many areas of both Unguja and Pemba. However the majority of fish in Zanzibar are landed and processed on the western parts of the islands for example in Maruhubi, Mangapwani, Fungurefu (Mkokotoni) and Potoa (Bwekunduni) on Unguja and Ndagoni, Weshu and Tumbe on Pemba.

Once landed, the small pelagic fish are sold fresh to buyers or processed using various techniques such as sun drying, salting and boiling. Anchovies, for the most part, are processed for sale on the local market or export markets (the DRC in particular) via middlemen. However, according to fish traders, once the fish is purchased it is sorted into categories: mackerel, sardines and anchovies. Most of the sardines and mackerel are sold fresh whereas about 90% of the anchovies are processed.

The value chain of this small pelagic fishery includes porters who take the fish from the boat to processing areas, processors, driers, primary traders, secondary traders, agents and the DRC traders themselves.

Other service providers include firewood suppliers, restaurant owners, suppliers of salt and packaging bags, transporters and food vendors. It is estimated that there could be more than 15,000 people directly or indirectly engaged in the small pelagic fishery in Zanzibar.

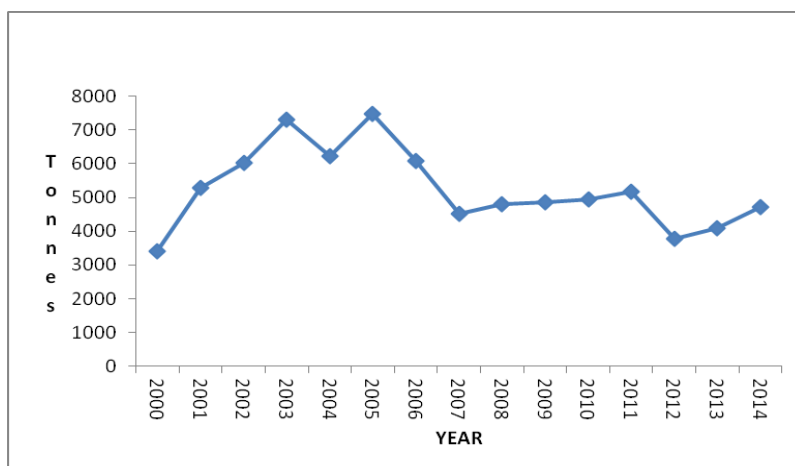
2. Key figures on the fishery

The number of boats used specifically for small pelagic fish is not known as most boats are used for other fisheries as well. According to the 2010 Census Survey, approximately 1,780 fishing vessels (668 boats, 742 dhows and 368 *mashua*) and 1,349 engines were involved in the small pelagic fishery.

According to official data, the total quantity of fish landed in Zanzibar is currently around 34,500 MT (DFD, 2014). Of this, the Dagaa fishery dominates with a yearly average of 5,000 MT. Catches from this fishery fluctuate, as they are dependent on the tides and winds. According to most of the fishers interviewed at Mangapwani and Maruhubi, catches are higher during the southeast monsoon winds (*Kusi*) from June to October and lower during the northeast monsoon (*Kaskazi*) from November to March. However, this differs from the reef fishers who net the largest catches during *Kaskazi* when the ocean is calmer. During rough weather they migrate to other sites (*dago*). They claim catches are higher during this period as most fishers concentrate on fishing reef fish. However, during the Southeast monsoon purse seiners offer the opportunity to fish for small pelagics.

These results comply with the findings of Kharousy and Grayson (2012) who found the same seasonality trend with artisanal catches of *Scombridae* being higher during the southeast monsoon when water temperatures decrease and rainfall increases and lower during the northeast monsoon season when temperatures increase and rainfall decreases, ultimately affecting the nutrient levels, which become lower.

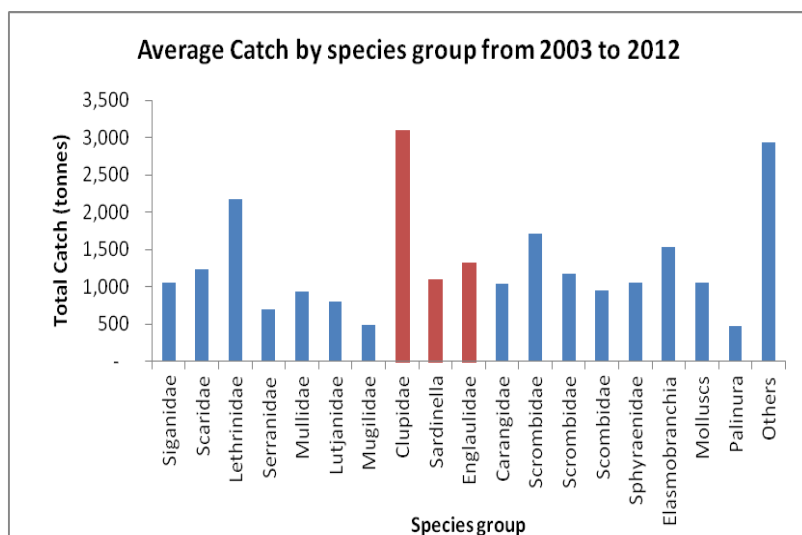
Figure 3: Trends of the small pelagics catch 2000-2014



Statistics Section, DFD

The catch of *Clupeidae* alone is around 3,000 MT and the *Engraulidae* catch is around 1,200 MT (see Figure 4 below). According to the perception of fishery stakeholders on the status of small pelagic resources over the last 10 years, about half of them said stocks had increased whereas the rest said stocks had decreased and a few said they did not know.

Figure 4: Average catch per species, 2003 to 2012



Statistics Section, DFD

According to Wijkstrom (1988), the Zanzibar Fisheries Cooperation's aluminum boats, which were twice as big as the boats used nowadays by artisanal fishers, averaged catch rates of between 200 and 300 kg per trip. However, according to Jiddawi and Ohman (2002) fishers caught up to 112.8 kg/day of fish including small pelagics. Therefore, assuming that there are 1,500 boats and half of these boats fish for 19 days a month for 8 months, the total annual catch of small pelagics could be estimated to be 12,860 MT. This estimate is twice the amount currently being reported.

The total value (ex-vessel price) of small pelagics, including *Clupeidae*, *Sardinella* and *Engraulidae*, in Zanzibar was officially estimated at approximately 8.1 billion TZS in 2012. However, based on the above calculation this could have been around 25.7 billion TZS, which is almost three times what is currently being reported.

The fisheries sector is a significant source of employment in Zanzibar. The sector directly employs some 34,571 fishers (many more have occasional involvement in fishing) and at least another 4,000 are processors, distributors, fishing gear manufacturers and fish sellers (DFD, 2013).

According to official data, about 121.7 MT of anchovies were exported in 2014 with a FOB value of 333.2 million TZS and royalties of 5.2 million TZS (see Appendix 3). However, this amount seems to be lower than figures reported by exporters.

Based on investigations conducted by a consultant¹⁴, the volume of dried small pelagic fishery products could exceed 3,200 MT per year. If the price of one kilogram of dried anchovy is around US \$1.25, the total turnover of this export-oriented value chain could be close to US \$4 million a year.

Fishers usually work for about 10 hours per day and sell their catch to fishmongers or middlemen located on the beach. Some of the fishers have agreements with the fishmongers to sell all their fish to a particular fishmonger. Some fishers sell directly to the Dagaa dryers who they have agreements with. According to some fishers at Maruhubi, daily income averages US\$ 22.83 when fish is sold to the fishmonger dried, and ready for export. The small pelagic fishery thus offers employment opportunities to many stakeholders through fishing and other related activities.

3. Social and economic dynamics in fishing activities

The importance of small pelagic fish in coastal communities as a source of food and economic activity makes it a major determinant of social economic structure. The key actors are the fishers; mainly men in the formal fishing sectors and women in the processing part. However, women's involvement in fisheries activities in Zanzibar is much lower than that of men as it is considered a male activity given its risky nature (Jiddawi, 2012).

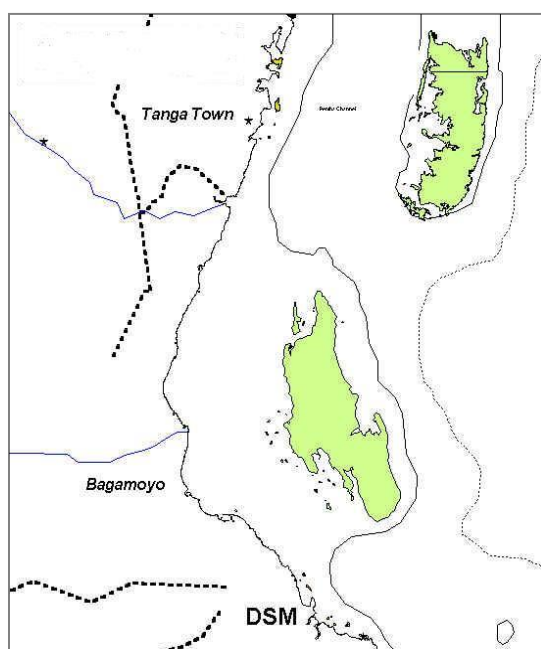
However, women are very much involved in the processing of small pelagic fish. They buy fish to fry or dry, especially anchovies, and they cook for fishers especially at the landing sites (*mama ntilie*). After processing the fish, the women sell them on for local consumption, or to fish wholesalers.

The importance of small pelagic fish has increased over time with increased amounts being used for animal feed production and exported. The small fish, especially anchovies, are almost the only animal protein available to lower income groups. It is estimated that anchovies and sardines have a protein content ranging between 14.5g/100g and 19.8 g/100g respectively.

When the fishery initially started in the early 1960s fishing was mostly carried out in areas close to Stone Town and landed at Malindi. However, over the last 10 years fishing has expanded to many parts of the island but mainly to the western parts of the islands in areas such as Mwamba kuni, Bawe, Changu, Mkokotoni, Tumbatu, Fawatu, etc. The estimated size of artisanal fishing grounds in Zanzibar waters is about 6,720 km² of which 4,000 km² (59.5 percent) are around Unguja and 2,720 km² (40.5 percent) are around Pemba (BoT, 2006).

¹⁴ According to interviews with the Apex association, JUWADAZA, involved in the small pelagic fishery, exports of anchovies are around 800 to 1,000 bags per month with one bag weighing no less than 200 kg. This gives a total of 200 MT exported per month by one company only. If this is done for 8 months/year it would give a total of 1,600 MT per year for just one company operating at one site. Currently there are 7 sites actively involved in this fishery.

Figure 5: Map showing fishing areas for small pelagics in Zanzibar waters



There have been not many changes in the type of gears used in the small pelagic fishery over the last decade except for some modifications in the size and areas where fishing takes place. However, there are indicators that show a steady increase of fishing capacity and effort due to increased numbers of fishing units and technological innovations (e.g. increased average length of fishing vessels) and extended fishing areas.

Zanzibar fishing units targeting small pelagics also operate along the coast of mainland Tanzania in areas such as Songosongo, Bagamoyo, Sadani, Kigamboni, Kunduchi, etc.

Interaction of the small pelagic fishery with other fisheries is seen in the case of the use of beach seine and ring nets, which target demersal fish but also catch small pelagic fish. Conflicts between fishers using beach seine nets and other gears have been reported as such nets tend to move basket traps which have been set on the sea bed. These nets can also catch a lot of juvenile fish.

There is also a gear conflict with fishers using surrounding nets to catch pelagic fish at Kizimkazi (locally known as *Kijumba*) as these nets also accidentally catch dolphins. Conflicts are also increasing between tourism operators and fishers especially in areas where fishers using ring nets damage coral reefs or catch endangered species, such as sea turtles and dolphins.

Overfishing and IUU fishing are fisheries management challenges facing Zanzibar's small pelagic fishery. The issue of migrant fishers from mainland Tanzania following seasonal currents contributes to overfishing as head to areas that already have too many fishers. Many migrant fishers move around to avoid paying license fees; given the scarcity of monitoring and surveillance activities they continue to fish illegally.

There are currently seven cooperatives five of which are located in Unguja and two are in Pemba. They were formed by the Fisheries Authority with support from the IOC SmartFish project. Cooperatives are involved in managing the small pelagic fishery, including exports and overseeing quality fish processing. There is one Apex fish trader association responsible for anchovies (a cooperative for Daga), *Jumuiya ya Wauzaji Daga Zanzibar* (JUWADAZA), giving the fishers one voice when it comes to decision-making. There are no boat-owner associations yet.

With regards to safety at sea, most fishing boats do not even carry lifejackets. The Zanzibar Maritime Authority (ZMA), which was established under Act No. 3 of 2009, is however charged with the responsibility of monitoring, regulating and coordinating activities of the maritime industry. The ZMA also deals with matters pertaining to maritime search and rescue operations in collaboration with the navy.

4. Social and economic dynamics in post-harvest activities

Once caught, fish are highly susceptible to deterioration if not processed or preserved. They spoil more rapidly than almost any other food and can quickly become unacceptable for human consumption.

Rapid preservation is necessary to extend the shelf life and reduce post-harvest losses. This may allow the fish to be available throughout the year and distributed on a worldwide basis. Other reasons for preservation are meeting consumer preferences and choices, also responding to market demands and increasing utilization options by diversifying the product (Kimani, 2015). Poor fish quality and improper handling practices are not only a barrier to effective local fish trade, but are also a risk to human health and make it difficult to promote safe fish for sale at the regional level.

Sun drying is one of the fish preservation methods used in Zanzibar as the final product can be kept up to about six months. This method requires large spaces to spread the fish out to dry; fish can spoil during the rainy season. Post-harvest losses, particularly during the rainy season, are a major challenge in this industry.

Another commonly used method is smoking and salting. Salted fish are then dried in the sun and the final product can last without decaying for about nine months to a year if they are stored well. This activity is usually done at the landing site.

When there is a large catch the price of small pelagic fish fluctuates, however, losses can be substantial due to a lack of proper handling and storage facilities. Most of the landing sites in Unguja and Pemba have permanent buildings (51) and other landing sites have temporary ones. However, there are only two cold rooms to preserve fish: one in Stonetown and one in Mkokotoni. Sardines and anchovies are usually sun dried or smoked to increase their shelf life.

Some fish processors have received training through the IOC SmartFish project on the best practices of fish drying techniques aimed at reducing post-harvest losses ¹⁵.

There have been recent changes to the organization of the post-harvest activities in the small pelagic fishery. Exporters or associations involved in fish exports have to contribute 6,000 TZS (approx. US \$3) to the ministry responsible for fisheries for each bag of small pelagics exported (one bag weighs 160kg). This amount is divided as follows: 3,000 TZS for the Ministry and 3,000 TZS remains with the association. It should be noted that of this amount, the association will reallocate 500 TZS to the Village Chief, 500 TZS to the Apex association, JUWADAZA, 1,000 TZS to the District Fisheries Office (*Halmshauri*) and 500 TZS to the association exporting the fish. The previous rule was that they were charged 5% of the total export costs, which they did not agree with.

About 30 buyers from the DRC go to Zanzibar to buy anchovies. However, they are only allowed to purchase anchovies from JUWADAZA personnel. About 10 traders from Zanzibar go to the DRC where they fetch a higher price despite having to pay a levy of US \$30 per bag to their agent whilst there. DRC traders and any anchovy exporters also must have a licence that costs US \$10 per year.

5. Regulatory framework of the small pelagic fishery

Fishing activities are regulated by the Fisheries Act of 2010 and its principal regulations of 1993. The fisheries of Zanzibar are open access; everyone has the right to fish wherever they like if they are in possession of a fishing license. Under the new Act, the obligation for all fishing crafts/vessels operating in Zanzibar waters to be licensed constitutes a major improvement with regard to the management of the fishing capacity (Breuil, 2014).

Access to resources

As stated above, the artisanal fishery, including Zanzibar's small pelagic fishery works under an open access regime. Every citizen in Zanzibar has the right to fish provided they fulfill minimum conditions (fishing craft licence and/or fishing licence). Fishing craft licences are issued by the District Fisheries Office. Fees range from 1,500 to 3,000 TZS (US \$1 to 2) for a fishing craft licence and 2,000 TZS for an individual fisher licence. However, due to poor patrol systems many boats still fish without a licence.

Technical conservation measures

Currently, fishing restrictions vary from prohibiting the use of under sized mesh nets in conservation areas to catching under sized fish in all areas including the no-take zone in marine reserves (Jiddawi *et al.*, 2010).

¹⁵ A Fish Quality, Handling and Hygiene training course was conducted in Unguja in May 2015 for 50 people involved in the small pelagic fish trade. The objective of the training was to share skills with *Dagaa* processors and traders on fish handling, quality and hygiene. The areas targeted by this training were Maruhubi, Mangapwani and Potoa Bwekundu in Zanzibar. After the training the raised platform drying racks for anchovies became increasingly more popular (Stanek, 2015). This is due to consumer preference for fish dried; consumers viewed it to be more hygienic, with less potential for contamination from micro-bacteria in the dirt. However, many processors claim that these structures are expensive to build and maintain, and less fish can be dried in the same area.

The Fisheries Act (2010) allows for the creation of local closed areas and there is some acceptance from villages on this issue as they recognize that some areas are particularly rich or are nursery grounds. The Act it has also introduced provisions for the management and development of fisheries in the internal and territorial waters of Zanzibar.

According to the Fisheries Act (2010), ring nets are banned from all marine conservation areas especially those with a mesh size of less than 2 inches. However, as they are allowed in other places, this is difficult to control.

It is also prohibited for any person to use or attempt to use beach seine nets in Zanzibar.

6. Main public institutions concerned by the governance and management of the small pelagic fishery

Three departments of the Ministry of Livestock and Fisheries are directly involved in fisheries management, namely: the Department of Policy, Planning and Research; the Department of Fisheries Development (DFD); and the Department of Marine Resources (DMR). Each department has its own Director.

The mandate of the DFD covers a large spectrum of fisheries governance and management functions including fisheries planning, licensing of vessels, licensing of fishermen, statistics, monitoring, control and surveillance (MCS), legal aspects, management of Marine Conservation Areas (MCAs), and extension work.

The DMR is the institution responsible for the promotion of post-harvest activities, the quality control of fish and fishery products and aquaculture development.

Several plans and strategies have been developed that serve as guides for fisheries development, management and planning. These are:

- Zanzibar Development Vision, 2020, which recognizes the key role played by the fishery sector in the social and economic development of the country but also aims at eradicating poverty;
- Zanzibar Strategy for Growth and Reduction of Poverty 2010-2015 (MKUZAI) which recognizes that fisheries are of great importance to the economy of Zanzibar;
- Zanzibar Fisheries Governance Strategy (2014), which emphasizes that good governance in fisheries, is a condition for achieving the goal of sustainable and responsible fisheries. The strategy establishes an enabling environment for unlocking the potential of Zanzibar coastal fisheries in a sustainable way. More specifically, the strategy addresses governance challenges such as inadequate policy and regulatory frameworks, inadequate resources to support research and MCS. The strategy also addresses the problem of limited consultation and institutional collaboration with the public and private sector;
- Revised Zanzibar Fisheries Policy of 2000 (2014), which aims to promote, protect, develop and sustainably utilize fish and other living aquatic resources.

There are other policies that are used, in one way or another, in fisheries governance such as the National Environmental Policy of 1992, the Forestry Policy of 1999, the Tourism Policy of 1992, and the National Land Policy of 1982 and National Land Use of 1995.

Statistics

Fisheries data collection is undertaken by the Statistics Unit within the DFD: 19 groups of fish are recorded including *Engraulidae* and *Clupidae*. Data on fisheries are routinely collected through sample surveys carried out by beach recorders, to generate the overall production figures for Zanzibar. Data is collected over 16 days per month. Data is recorded without looking at the gear or vessel used to land the fish.

Research

Fishery research in Zanzibar is mostly carried out by the Institute of Marine Sciences (IMS) of the University of Dar es Salaam and the State University of Zanzibar (SUZA). Sometimes the Tanzania Fisheries Research Institute (TAFIRI), the main fisheries research institute in Tanzania, also cooperates with the DFD to conduct research in Zanzibar.

More recently, SUZA has set up a new unit involved in marine studies known as the Tropical Research Centre for Oceanography, Environment and Natural Resources (TROCEN) but it has a low capacity to conduct research.

Research in marine fisheries and conservation also involves some international institutes on a case-by-case basis through projects financed by external aid, governmental or non-governmental.

Some NGOs such as the Zanzibar Farmers and Fisheries Development Association (ZAFFIDE) and Community Development & Environmental Conservation in Zanzibar (CODECOZ) also conduct activities related to community development issues including fisheries. The West Indian Ocean Marine Sciences Association (WIOMSA), based in Zanzibar, provides financial support to various projects related to the marine environment in the region.

Despite the existence of research systems in Zanzibar, there is a lack of stock assessments. The last fish stock assessment was conducted in the early 1980's with support from the FAO. Efforts to assess and manage the fisheries efficiently have been a problem as a result of inadequate manpower and financial or technical capacity to carry out the scientific research needed to properly manage the small pelagic fishery.

Monitoring, Control & Surveillance

Monitoring, control & surveillance (MCS) in Zanzibar is limited to the 12 nautical mile radius of territorial waters. The main work of the MCS section of the DFD is sea patrols including the rescue of artisanal fishers as well as training fishers on life-saving/rescue etc. There is some coordination with other institutions working at sea such as the Zanzibar Navy (KMKM) for security and surveillance of illegal activities related to fisheries and smuggling.

The MCS section receives information from fishermen's committees and Beach Recorders who report when they see unusual activities at sea. Village Fisheries Committees (VFCs) are also involved in the participatory management of fisheries resources and landing sites.

Other institutions indirectly involved in MCS include: the Forestry Department for the conservation of mangrove forests which are fish breeding and feeding grounds; the Department of Environment whose role it is to oversee that the environment is used in a sustainable manner; and the Zanzibar Environmental Management Authority (ZEMA) whose role is to oversee that any approved projects in Zanzibar do not destroy the environment.

Overall, there is a lack of human, logistical and financial means for the MCS section to carry out their role effectively, especially in offshore waters. Penalties for infringements are so minor that fishers are not scared to do more or less what they want.

7. The role of community and fishery stakeholders in the co-management of the small pelagic fishery

Fisheries governance is shifting from the centralized, top-down approach to the fishers themselves through community-based and co-management approaches or Village Fisheries Committees (VFC). This allows local communities to formulate appropriate regulations regarding access to fisheries and penalize those who do not adhere to them. This arrangement is popular amongst fishers because it gives them more control over their fisheries.

Communities are also active participants in the implementation of management strategies. However, there are still big challenges to overcome concerning democracy, participation and resource management (de la Torre Castro and Lindstrom 2010).

Fisheries co-management efforts in the new SWIOFP project supported by the World Bank is expected to focus on small pelagic fisheries and moreover on the fishers themselves, many of whom are migrant fishers from Zanzibar, Dar es Salaam and Mtwara.

8. Initiatives for improving the planning and management of the small pelagic fishery

The small pelagic fisheries in Zanzibar has various strengths such as:

- Opportunities to increase the contribution of the fisheries sector to the national economy and household food security if properly exploited;
- A rapidly growing tourism industry and thus domestic demand for fish is likely to increase;

- Zanzibar fishers have shown their fishing capabilities by providing training to fishermen from Mozambique on best ways to operate a small fishery using purse seiners and light fishing. Fishers from Mozambique came to Zanzibar and the training was given by fishers of Malindi fish landing site in Stone Town;
- Private enterprises have the potential to develop strategic partnerships between small scale fishers and entrepreneurs;
- Training on environmentally friendly drying techniques under the SmartFish project (Kimani, 2014). Some community members have started to adopt new techniques learnt on a small scale;
- Policy and legal instruments exists which can assist in the better management of the fishery, e.g the Fisheries Policy of Zanzibar (2014), Marine Conservation Unit (MCU) Regulations, local village by-laws, the Fisheries Act of 2010, etc.;
- The small pelagic fishery is a priority fishery of the SWIOFish project; it is hoped that some activities, including research work, may be done with the support of this project;
- National military service department (*Jeshi la Kujenga Uchumi*) have created a unit that has a two-year course to train youth on how to properly conduct a fishery. This could assist with capacity building on fisheries issues.

9. Main issues in the small pelagic fishery

Despite various strengths, the small pelagic fishery in Zanzibar has several weaknesses:

- Persistence of an open access regime;
- The fisheries legislative and regulatory framework is incomplete. It currently gives excessive discretionary powers to the Minister and does not encourage the application of key good governance principles including participation and transparency, and is not fully supportive of some policy orientations that seem to be promoted by the fisheries administration in relation to co-management and development of MCAs;
- The research system has no proper research agenda for the small pelagic fishery;
- Deficiencies in the MCS and enforcement system results in a lot of IUU fishing by migrant fishers especially since mainland Tanzania and Zanzibar are each undertaking their own MCS exercises;
- An inadequate statistical system: it is mostly of an administrative nature and cannot support sound decision-making in fisheries management;
- Inefficient VFCs and little consideration of field level participation in fisheries management and governance in general, particularly outside MCAs;

- The absence of a specific management plan for the small pelagic fishery in Zanzibar;
- The existence of various environmental impacts associated with small pelagic fish processing techniques including excessive firewood, the absence of clean water and latrines, and the disposal of the hot fish soup which is a by-product of boiling anchovies (Mataba, 2015).

10. Priority areas for improved governance and management of the small pelagic fishery

In order for the small pelagic fisheries to meet the main objectives of providing sustainable fish production and income for fishermen and other people working in the industry, specific changes are required. These include having reliable information on the status of the fishery. To get this information, it is essential that scientists be provided with the correct data on harvests, numbers of fishers, gear types and vessels, fishing effort, sustainable levels or harvests (maximum sustainable yield) and fishing locations, to come up with better management measures. The improvement of the statistical system that is currently managed by the DFD should therefore be seen as a priority. To this end, a common mechanism for conducting frame surveys and reporting catch data should also be established with mainland Tanzania given that some small pelagic are caught in Zanzibar but landed on the mainland and vice versa. Collaborative mechanisms for data exchange should also be developed with other institutions such as the Ministry of Trade in Zanzibar, which has data on fish exports.

The following priority actions are also required:

- The development of a mechanism to manage the inshore fishing zones due to the open access issue;
- A review of how migrant fishers could be controlled when they move from place to place; the issue of buying licences should fall under a common system;
- The development of a joint mechanism to manage the fishery for both mainland Tanzania and Zanzibar as it is currently being managed independently despite the straddling nature of the fish stocks. As a start, a joint task force comprising members from mainland Tanzania and Zanzibar could be set up;
- The development a specific small pelagic fishery management plan and ensure its coherency with that of mainland Tanzania;
- Improvement of the mechanism of licensing revenue collection to make it more effective and transparent;

- Establishment of a mechanism to control the use of ring nets. Currently some fishers close the ring net at the bottom with a small mesh size net to collect more species than those intended. However, this technique is very damaging to the coral reef in depths of less than 50 metres;
- The development of specific fishing regulations in MCAs such as a ban on the use of nets with a mesh size of less than 2 inches (allowed for Daga), as they catch small pelagic fish which attract big fish according to the food web;
- Penalties for those using ring nets around coral reefs to reduce conflicts between tour operators and fishers. The use of ring nets should also be banned during day time and in water less than 50 metres deep;
- Enhancement of MCS of the fishery to reduce IUU fishing with specific reference to licensing. This could involve the use of mobile phones to assist in patrols;
- A review of the licensing system since licensing is done separately and at different rates; it would be better to have a common national license acceptable in both areas and which is transferrable;
- A review of processing methods, currently a lot of space is used for drying and the environment is being destroyed for wood. Certain methods need to be changed;
- Quality control standards need to be introduced and enforced especially for the export market;
- The government, in collaboration with private entrepreneurs and fishermen's committees, should cooperate in the establishment of cold storage facilities in rural fishing villages.

If concrete actions are undertaken in these priority areas, the promotion of the small pelagic fishery in Zanzibar will be greatly enhanced in a sustainable and profitable manner.

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Appendices

Appendix 1: Some of the common small pelagic fish caught in Zanzibar

Family	FAO name/English name	Scientific name	Swahili name
Clupeidae	Spotted sardinella	<i>Amblygaster sirm</i>	Dagaa
Clupeidae	White sardinella	<i>Sardinella albella</i>	Dagaa
Clupeidae	Gold stripe sardinella	<i>Sardinella gibbossa</i>	Dagaa
Clupeidae	East African sardinella	<i>Sardinella neglecta</i>	Dagaa
Clupeidae	Indian oil sardinella	<i>Sardinella longiceps</i>	Dagaa
Clupeidae	Black lip sardinella	<i>Sardinella malanura</i>	Dagaa
Carangidae	Mackerel scad	<i>Decapterus macarellus</i>	Ngulangula
Carangidae	Shortfin scad	<i>Decapterus macrosoma</i>	Ngulangula
Carangidae	Indian scad	<i>Decapterus russelli</i>	Ngulangula
Carangidae	Roughear scad	<i>Decaptrusabi</i>	Ngulangula
Carangidae	Big eye scad	<i>Selar crum nophthalmus</i>	Kibua macho
Atherinidae	Silverside	<i>Hypoatherina teminskii</i>	Dagaa/Kuzi
Dussumieridae	Rainbow sardine	<i>Dussumieria acuta</i>	Dagaa
Scombridae	Indian mackerel	<i>Rastrelliger kanagurta</i>	Kibua
Engraulidae	Devils anchovy	<i>Stoloporous commersonni</i>	Dagaamchele, tongekwatonge
Engraulidae	Indian anchovy	<i>Stoloporous indicus</i>	Dagaamchele, tongekwatonge
Engraulidae	Shorthead anchovy	<i>Stolephorus heterolobus</i>	Dagaamchele, tongekwatonge
Engraulidae	Hardenberg anchovy	<i>Stoloporous insularis</i>	Dagaamchele, tongekwatonge

Appendix 2: Overview of fishing gears commonly used to catch small pelagic fish per district

District	Gear Types				
	Seine Net	Beach Seine	Purse Seine	Scoop Net	Ring Net
Urban	35	0	69	132	42
West	195	15	67	84	115
North A	725	25	26	18	35
North B	16	3	15	20	5
South	136	2	8	7	3
Central	425	1	22	27	0
Micheweni	56	815	29	13	4
Wete	184	87	14	14	0
Chake	24	4	12	11	5
Mkoani	65	29	3	3	0
TOTAL	1861	981	265	239	156

Statistics Section, Department of Fisheries Development, Zanzibar

Appendix 3: Anchovy export data for Zanzibar, 2014

Month	Metric Tonnes	Value (TZS)	Royalties (TZS)
January	7.52	3,760,000	188,000
February	8.40	4,200,000	210,000
March	19.60	10,400,000	490,000
April	3.60	1,800,000	90,000
May	2.40	1,200,000	60,000
June	25.40	253,400,000	1,270,000
July	20.50	24,057,000	1,202,850
August	9.35	9,350,000	467,500
September	11.80	11,800,000	590,000
October	6.40	6,400,000	320,000
November	3.60	3,600,000	180,000
December	3.20	3,243,200	162,160
TOTAL	121.77	333,210,200	5,230,510

Department of Fisheries Development, Zanzibar

Appendix 4: Photos related to the small pelagic fishery



Fishing boat with outboard motor commonly used in the small pelagic fishery



Women drying anchovies



Fishers drying and repairing ring nets used for fishing small pelagic fish

Annex F. Initiative on the licensing of small pelagic fishing units for mainland Tanzania: preliminary results by Tom Shipton

Since 2013, IOC SmartFish has been supporting a pilot vessel registration and licensing programme in mainland Tanzania. The rationale for the intervention was to address the low level of compliance to vessel registration and licensing which significantly impacts both local and national government revenue streams accruing from the fisheries sector. This insufficient funding is in turn prejudicial to effective fisheries management at District Fisheries Offices (DFOs) and Beach Management Units (BMUs) levels.

Indeed, in 2009 it was estimated that only 26 percent of the 7,399 vessels operating in the small pelagic marine fishery were compliant with registration and licensing regulations. In 2009 alone, this low level of compliance resulted in an estimated loss of US \$128,200 in revenue.

Table 1: Registration and licence fees for fishing vessels according to size

Fin Fish Vessel Registration and Licensing		
	Registration fee/vessel (US\$)	Licence fee/vessel (US\$)
Up to 11mt		
Artisanal	10	10
Semi-artisanal	0	10
Semi-commercial	15	10
11.1 to 15 mt		
Semi-commercial	50	50
Commercial	50	65
15.1 to 20 mt	105	100

Fisheries Regulations (For QA/APP/09-11, pp 137-139)

The majority of the vessels (>95 percent) in operation in the small pelagic marine fishery are under 11 metres in length: according to the Fisheries Regulations (2009), responsibility for the collection of the vessel licence and registration fees falls under the DFOs, with collected revenues allocated to Local Government Authorities (LGA). In turn, the LGAs are tasked with financially supporting DFO's activities within their respective districts.

An initial survey of the financial support provided by the LGAs to the DFOs suggested that whilst DFO operational expenses are included in the annual LGA operational budgets, funding was rarely forthcoming. Indeed, in 2013 only 8 – 53 percent of the proposed annual budgets initially allocated to fisheries management were actually given to the DFOs.

The rationale for the intervention was therefore to demonstrate to the LGAs that revenue streams derived from fisheries could be significantly increased through improved levels of vessel registration and licensing. Furthermore, a case was made to allocate some of the additional funding generated by compliance activities to the under-resourced DFOs, with a view to improving their capacity to manage the fishery, notably their MCS operations.

An initial feasibility study was undertaken to establish whether a telephonic vessel licensing and registration system, based on an Unstructured Supplementary Service Data System (USSD) linked to an Airtel payment platform, could be developed. Once accessed, the USSD menu enables the subscriber to execute the follow six actions:

1. Register themselves as a vessel owner on the system (personal verification code);
2. Register a new vessel;
3. Register an existing vessel;
4. De-register a vessel;
5. Payment - registration fee;
6. Payment - licence fee.

Whilst technically feasible, the cost and practicality of rolling out this type of automated telephonic system in rural areas would have proved problematic, and as a result, a more simple and cost effective solution was sought. Inexpensive, non-transferable, coloured plastic security tags (US \$0.07 per tag) were deemed an appropriate alternative.

The tags - similar to security cable ties used to prevent unauthorised access to goods whilst in transport - can be individually alphanumerically marked conforming to standards required for vessel registration in the Fisheries Regulations (2009). The tag markings ensure that vessel owners can be individually identified. Based on the current licensing and registration procedures, two tags are required. The first tag denotes vessel registration, with the second tag being used to show that the vessel is compliant with annual licensing procedures. The tags are located in conspicuous places on the vessel, making it easy for compliance officers to identify which vessels have been registered and licensed for the year. The colour of the licence tag can be changed annually, enabling compliance officers to rapidly establish which vessels have been licensed for a particular year.

During 2014, the tag system was piloted in seven districts in Dar es Salaam and Tanga regions. The pilot tagging programme involved 2,376 vessels, i.e. about 31 percent of the total marine fishing fleet in mainland Tanzania. It should be noted that according to the last frame survey, three quarters of total fleet were unregistered.

The approach consisted of: (i) Developing a harmonised action plan for government offices (district and central) to increase registration/licensing rates in the small pelagic fishery; (ii) Assisting government to implement the plan in Tanga and Dar es Salaam (pilot implementation); and (iii) Assisting in the development of tamper proof vessel marking (registration and annual licensing).

It was established that the system works well and compliance rates could be increased significantly. For example, in Kinondoni District, vessel registration and licensing revenues increased from 1.05 million TZS in 2013 to 9.00 million TZS in 2014, an increase of 88 percent.

Whilst the pilot tagging programme has yet to be completed, initial results suggest that a simple tagging system, using resources currently available to the DFOs, can prove effective in increasing compliance levels as well as increasing revenue streams for the LGAs.

Key success factors include support from compliance officers (marine police) to ensure that vessel owners understand that failure to register and license their vessels will result in fines or confiscation of their vessels. Key success factors also include returning to landing sites on a regular basis to ensure that all vessels have been registered, community education, and ensuring a high level of DFO motivation.

Annex G. Possible mechanisms for the concerted management of Tanzania's small pelagic marine fishery, Christophe Breuil

1. Introduction

The United Republic of Tanzania (Tanzania) is composed of mainland Tanzania and Zanzibar. Within the Union framework, mainland Tanzania and Zanzibar have full mandate over the management of the marine fisheries located in their territorial waters (12 nautical miles from the shorelines) and internal waters (waters extending out from their respective territorial waters to the equidistance line between the mainland and Zanzibar). The fisheries operating in the territorial and internal waters of mainland Tanzania and Zanzibar are respectively managed by the Ministry of Livestock and Fisheries Development (MLFD) of mainland Tanzania and the Ministry of Livestock and Fisheries (MLF) of Zanzibar.

The small pelagic marine fishery plays a significant role in the coastal economies of both mainland Tanzania and Zanzibar in terms of employment, wealth generation and food and nutritional security. It involves artisanal fishing units only. It could play an even greater role if the fishery was better managed by diminishing the level of overfishing and by reducing physical and economic post-harvest losses along the value chain.

Small pelagic species are mostly referred to as Dagaa and may include many different species of sardines (*Clupeidae*) such as *Sardinella neglecta* and *Dussumieria acuta* and anchovies (*Engraulidae*) such as *Stolephorus commersonii*. Small pelagic species also include mackerel (*Scombridae*) such as *Decapterus macarellus*. Fish stocks essentially extend over the territorial and internal waters of both mainland Tanzania and Zanzibar. Indeed, there is little evidence that small pelagic resources harvested in Tanzania cross the waters of other neighbouring coastal states (Kenya, Mozambique) and there is very little fishing (artisanal or industrial) in Tanzania's EEZ.

Harvesting of small pelagics is seasonal as it is mostly reliant on the moon's cycle (purse seine nets and seine nets). The monsoon winds also have a pronounced influence on the fish catch. Due to this monsoon effect, fishers have a migratory pattern, locally known as *dago*, where fishermen travel and camp to fish away from home during various seasons. A migratory pattern of fishers from mainland Tanzania to Zanzibar and vice-versa can also be highlighted as a consequence of seasonal variations in fish abundance and fish prices at landing sites.

The governance and management of the small pelagic marine fishery in Tanzania are known to be inadequate. This includes the weaknesses of certain key fisheries management services such as vessel registration, fishing licensing, statistics, research, MCS (monitoring, control & surveillance), which results in poor levels of compliance with existing regulations, and fish quality control. The youth of the decentralization process and related institutions at community and local government levels is also believed to have impacted the delivery of satisfactory management services.

However, various recent initiatives aimed at improving the management system of the small pelagic fishery should be underlined. These include the adoption, by mainland Tanzania in 2012, of a management plan for the Tanzanian artisanal fishery for small and medium pelagic fish.

The management system of Tanzania's small pelagic fishery also faces a critical shortcoming which relates to the lack of permanent collaborative/concerted mechanisms between mainland Tanzania and Zanzibar in a context where the fishery can, *de facto*, be considered as a 'shared' fishery, even if legally speaking this fishery cannot be considered as shared fishery¹⁶. On the other hand, the term, 'shared' fishery, can be applied to this fishery since it refers to the same fish stocks which are found and move in the waters under the jurisdiction of both mainland Tanzania and Zanzibar and which are managed by two separate political and administrative entities, the MLFD of mainland Tanzania and the MLF of Zanzibar. Moreover, it can be argued that since small pelagic fish stocks straddle jurisdictional boundaries of mainland Tanzania and Zanzibar, it is not desirable to have separate and possible incompatible management arrangements applying to the same fish stock across the two jurisdictions.

Therefore, two key questions have to be raised: (i) What could be the most adequate institutional framework or arrangement to ensure the optimal and sustainable use of the 'shared' small pelagic fishery in Tanzania for the mutual benefit of mainland Tanzania and Zanzibar; and (ii) Which areas of cooperation should be developed as a priority?

Whilst addressing these questions, the specificity of the governance framework of the small pelagic marine fishery in Tanzania should evidently be considered. Political and administrative organisation pertaining to the management of coastal fishery resources is indeed quiet particular under the Union framework.

This refers to the sharing of political and legal competence between mainland Tanzania and Zanzibar for the management of inshore fisheries as well as to the absence of a Union fisheries administration¹⁷ that could possibly facilitate collaboration between the two entities. This means identifying a similar situation in the world that could be considered a possible model is not easy. This is to say that the framework/institutional arrangement to be possibly developed for the concerted management of the Tanzania small pelagic marine fishery between mainland Tanzania and Zanzibar might be relatively original.

In the present paper, the first chapter provides a brief overview of fisheries management.

The second chapter presents general principles emanating from international law and practices regarding the management of shared fisheries. It is believed that some of these principles are relevant, although adaptable, when addressing the management of the small pelagic fishery in Tanzania.

¹⁶ With regard to the Law of the Sea, a shared fishery either refers to fishery resources crossing the EEZ boundary of one coastal state into the EEZs of one or more other coastal state, or to fishery resources found, both within the coastal state's EEZ and within the adjacent high sea. The FAO Code of Conduct for Responsible Fisheries also refers to "migrating stocks" with an emphasis on the unit of stocks in the whole distribution area.

¹⁷ The only Union fisheries administration is the Deep Sea Fishing Authority (DSFA) whose legal competence however only applies in the Tanzania EEZ.

The third chapter presents some case studies of mechanisms that have been developed at national or international levels to support cooperative management of shared fisheries amongst different legal/administrative entities. The objective of this chapter is to capture some lessons learnt with a view to feeding discussions of the meeting.

2. Overview of fisheries management

This section was developed based on the author's recent contribution to the preparation of a specific lake fishery management plan in the region (Breuil, 2015).

The term fishery refers to an economic activity based on the exploitation and valorization of a given fishery resource or group of species, such as the small pelagic marine species in Tanzania. Fishery resources have four main characteristics:

- They are natural renewable resources, produced by the ecosystem, which means that the economic cost of fish harvesting is relatively low since it is limited to the costs of catching the resource;
- Fishery production depends on environmental parameters and is limited by the carrying capacity of the ecosystem. This means that social and economic returns derived from fishing can only be achieved within the biological limits imposed by the productivity of the target fish stocks and their environment;
- Most fishery resources are publicly-owned which means that, in practice, access to the fishery is essentially open;
- The price of the fish often steadily increases as a result of the scarcity of the resource and increased demand of domestic, regional and international markets.

These four main characteristics explain the 'usual' trend of many fisheries: a continuous increased number of fishers and boats, combined with improved efficiency of fishing in terms of the number and size of gears by boat, motorization of boats, etc.

In any fishery, the application of a steady increase of fishing effort will result, in the beginning of the fishery, in an increased fish production until a maximum is reached (Maximum Sustainable Yield - MSY). If fishing effort continues to increase, the total fish production will more or less stagnate around the MSY level for a certain time before starting to decline. However, during this period, the abundance (biomass) of the resource will continue to decrease to the detriment of the sustainability of the resource. The catch rate, expressed in terms of catch per unit of effort (CPUE), will also continue to decrease. This means that fishers will have to spend more time and/or money to catch the same quantity of fish, resulting in net economic losses for the fishers in terms of profitability. This may also lead an increasing number of fishers to low compliance with regulations to compensate for the decreased profitability of fishing activities and hence a high occurrence of illegal, unreported and unregulated (IUU) fishing.

This will also result in a decrease of the intrinsic value of the fishery resource with reference to the notion of resource rent, which corresponds to the economic surplus that can be extracted when normal fishing costs have been covered. This means that people in general (represented by the State, which is the owner of the resource) cannot benefit from the wealth that could be potentially and sustainably generated by the fishery. In theory, higher levels of wealth generation can be reached at the Maximum Economic Yield (MEY) level, which is below the MSY.

Finally, if nothing is done to prevent such a situations occurring, the fishery may collapse, resulting in an ecological, social, economic and political crisis.

In order to prevent such an undesirable scenario, there is a crucial need for public and private stakeholders to adequately manage the fishery. This should consist of developing conditions, incentives and rules that would firstly, ensure the sustainability of the resource (through aligning fishing effort with the natural productive capacity of the resource) and secondly, optimize the social and economic returns that can be derived from fishing and related activities in line with governmental objectives.

It should be stressed however that when the level of fishing effort is above the level where MSY can be reached, it does not mean that the fishery cannot be sustainable. It means that the fishery is overfished to the detriment of certain objectives such as the maximization of both production (MSY) and wealth generation (MEY), but this may be to the advantage of other objectives, including maximizing employment (which is generally the case in an open access fishery). However, if fishing levels are steadily increasing, the stock size (abundance) will gradually decline and the resource will become more and more vulnerable until it may collapse.

Fisheries management therefore mostly consists of identifying the desired level of fishing effort so as to satisfy the objectives assigned to the fishery and then deciding how to reach this required level through the implementation of a set of measures aimed at regulating fishing pressure and conserving the resource. To this end, two sets of complementary measures are generally distinguished:

- Regulation of access to resources through fishing effort control (e.g. limited number of fishing licences) or fish harvesting controls (e.g. quota);
- Conservation of the fish resource by imposing a certain number of technical regulations such as minimum mesh size, minimum fish size, closed areas (sensitive areas), banning of harmful or destructive fishing gear or practices (e.g. beach seines).

Fisheries management should also include policies and actions aimed at improving the economic dynamics of fishing and related activities, including fish processing and marketing activities (value chain), to make sure that the fishery will better contribute to the social and economic development of the country.

In order to support the management process, several management functions and services have to be developed, including the general administration of the sector (e.g. registration, licensing, fish quality control), regular data collection on catch and effort, research on the status of the stocks, training and sensitization, MCS, and prosecution in cases of infringement. Another key management service has to be highlighted in the case of Tanzania's 'shared' small pelagic marine fishery, which is the development of collaborative/concerted mechanisms amongst mainland Tanzania and Zanzibar. Evidently, these functions and services will only be effective if legislative and institutional frameworks are adequate and if the different public and private stakeholders provide sufficient resources.

3. General principles emanating from international law and practices for the management of shared fisheries

Some general principles emanating from international law and practice regarding the management of shared fisheries can be highlighted. These include the following:

1) There is strong evidence that **efficiency in the management of a shared fishery should involve adequate cooperative mechanisms** between/amongst states/entities concerned.

In 2004, an FAO paper explored both the legal and the economic aspects of shared fish stocks (Munro et al., 2004). The economics of the issue points to the conclusion that, with few exceptions, effective cooperation between/amongst states sharing a given fishery is a fundamental prerequisite for the management of resources.

Non-cooperative management of shared fisheries almost invariably leads to overexploitation with potentially negative impacts on the countries concerned.

Using game theoretical reasoning, the same FAO paper underlines that a number of requirements need to be fulfilled to arrive at a stable and robust cooperative/concerted management regime. These include:

- It is not possible to find an alternative management arrangement that is capable of making all players better off;
- All parties/countries are better off with the cooperative arrangement than without it;
- The arrangement must be 'time consistent', i.e. flexible enough to withstand the shocks of unexpected and unpredictable changes through time – this is of particular relevance in the case of small pelagic species whose abundance and geographical distribution can be subject to large variability.

2) The **identification of a proper legal framework** represents a first step towards the definition of a permanent dialogue mechanism for the management of a shared fishery.

3) The most common instrument to address cooperative/concerted management involves the creation of **Regional Fishery Bodies (RFBs)**.

RFBs are a mechanism through which states or organizations, that are parties to an international fishery agreement or arrangement, work together towards the conservation, management and/or development of fisheries.

The mandates of RFBs can vary. Three categories can be distinguished as follows:

- Some RFBs are used for information exchange amongst the different parties by providing a forum for discussions;
- Some RFBs have an advisory mandate, and provide advice, decisions or coordinating mechanisms that are not binding on their members (advisory RFB) – for example the South West Indian Ocean Fishery Commission (SWIOFC) which is an FAO RFB established by the FAO Conference under Article VI of the FAO Constitution;
- Some RFBs have a management mandate; these are known as Regional Fisheries Management Organizations (RFMOs) or regulatory RFBs - such as the Indian Ocean Tuna Commission (IOTC), which is an FAO RFB established by the FAO Conference under Article XIV of the FAO Constitution. They have the power to adopt fisheries conservation and management measures that are potentially binding on their members and are involved in their implementation.

The functions of RFBs also can vary. They can include: collecting, analysing and disseminating data and information; coordinating fisheries management through joint schemes and mechanisms including support for the harmonization of the governance framework; serving as a technical and policy forum; promoting transfer of methodologies and scientific cooperation; and taking decisions relating to the conservation, management, development and responsible use of the resources.

4) In some cases, states or organizations would prefer the option of promoting a **Regional Fishery Arrangement (RFA)**, such as in the case of the management of the shared Lake Kariba fisheries between Zambia and Zimbabwe. The difference between an RFB and an RFA is that the former has an established Secretariat that operates under a governing body of members and the latter does not. The rationale behind an RFA option is that it would be more cost-effective.

5) The effectiveness of RFBs and RFAs depends entirely on the **political will** of their members to implement management measures as well as their active participation, including financial and human support, in the work of these bodies (FAO, 1997).

6) Experience has shown **different levels of cooperation in the management process** of shared fisheries. According to Gulland, 1980, there are two levels of cooperation:

- The primary level of cooperation is in the management-oriented research on stock abundance and exploitation levels, migration and biological characteristics of the shared species. Cooperation in research is often seen, in retrospect, to have been the precursor to cooperation in active joint/concerted management;

- The secondary level of cooperation is much more demanding as it would usually involve: (i) determination of an optimal management strategy through time; (ii) allocation of harvest shares amongst participating coastal states; and (iii) implementation and enforcement of coordinated management agreements. This level would also involve the adoption of measures to control of fishing capacity and effort.

7) “The development of a cooperative resource management regime is necessarily a **process of negotiation and bargaining**” (Munro et al., FAO 2004, op.cit.).

4. Case studies on mechanisms for the cooperative/concerted management of shared fisheries

4.1. Management of a shared small pelagic fishery in West Africa

Small pelagic fisheries in the Canary Current Large Marine Ecosystem (CCLME) area are very important and strategic fisheries for the countries involved (The Gambia, Mauritania, Morocco and Senegal). Production is estimated to be around 2 million MT per year and involves both artisanal and industrial fishing units.

The countries involved have already made a lot of progress with the primary level of cooperation, that is in management-oriented research on stock abundance and exploitation levels, migration and biological characteristics of the various small pelagic species (FAO, 2002). The secondary level of cooperation is not yet fully operational even if significant progress has been made towards this goal.

Different advisory RFBs are involved in the cooperative management of small pelagic species in the CCLME area:

- Committee for the Eastern Central Atlantic Fisheries (CECAF): An FAO RFB under Article VI mostly involved in data exchange and scientific cooperation, www.fao.org/fishery/rfb/cecaf;
- Sub-Regional Fisheries Commission (SRFC): An intergovernmental body created by a Convention in 1985 whose objectives are to reinforce cooperation between Member States, and the coordination of policies in terms of: (i) conservation and exploitation of fisheries resources in the sub-region; (ii) adoption of international best practices; (iii) development of sub-regional cooperation with regard to tracing, controls and surveillance; (iv) development of Members' research capacities in fisheries sciences at the sub-regional level, www.spcsrp.org;
- Ministerial Conference on Fisheries Cooperation among African States Bordering the Atlantic (ATLAFCO): An intergovernmental organization created by a Convention in 1989 whose main objectives are the promotion and strengthening of regional cooperation on fisheries development and the coordination and harmonization of efforts and capacities of stakeholders for the conservation and exploitation of fisheries resources, www.comhafat.org

Several initiatives have been promoted regarding the shared management of small pelagics (see Box 1 below). The complexity of institutional arrangements is however, believed to have slowed down the process of collaborative management. In particular, this refers to the fact that Morocco is not a member of SRFC, and that SRFC with CECAF are the two key institutions involved in the development of fisheries cooperation in the CCLME area.

In order to overcome institutional constraints generated by some gaps and overlaps in the mandates and functions of the RFBs involved, the need for a new instrument for the management of the shared small pelagic stocks in the CCLME area was discussed at an FAO workshop (FAO, 2002, op.cit). It was also pointed out that a new arrangement such as this could eventually be integrated in an existing RFB. A proposal for a simple structure, articulated around a scientific working group and a management meeting (high level representation), was put forward. The scope of the mechanism would be limited to the small pelagic stocks that are shared amongst the four countries.

The scientific working group would issue recommendations on status of catch, Total Allowable Catch (TAC), management options, etc. to the management meeting which in turn would consider and possibly endorse proposed management measures by consensus.

Furthermore, with regard to the sharing of costs, it was noted that there were principally two approaches, one of which was to agree that each country would cover its own management costs (e.g. for research, management plan preparation, MCS, attendance of joint working group meetings, etc.), whilst the other approach could be that each country would make a certain contribution into a common fund. Obviously, a third option would be a combination of the two. Difficulties with these options could come from the fact that resources and capacities available in the different countries varies, as well as the costs involved in, for example, monitoring and enforcing harvesting limits due to differences in fleet structures.

Box 1. Initiatives for supporting the concerted management of shared small pelagics in West Africa (CCLME area) until 2013Development of a sub-regional policy for the small pelagic fisheries in North West Africa

A first draft policy document entitled 'Strategic Orientation to Support a Sustainable Exploitation and Concerted Management of the Small Pelagics in North West Africa' was prepared by SRFC in 2012. By the end of 2013, the policy document had yet to be validated by all states concerned by the shared small pelagic fisheries (four countries in total: 3 SRFC members and 1 non-member).

Elaboration of a regional management plan for the small pelagic species

This approach was supported by some development partners. The approach was that an overall regional FMP with clear goals and objectives be first developed, and then the four countries develop national implementation/operational plans to achieve the goals and objectives.

Promotion of harmonized national FMP on small pelagics

The approach first consisted of setting-up a National Technical Commission on small pelagics. Countries were then assisted in the preparation of draft FMP on selected small pelagic species (e.g. Sardinella in Senegal). In the meantime, the SRFC was to establish a Regional Consultative Commission on small pelagics bringing together representatives from administration, research and producers and making the link with the National Technical Commissions. The final step would be to assist the countries concerned to ensure that FMPs in preparation are in line with the strategic orientations agreed on at the sub-regional level (ref. policy document).

Promotion of a Convention on Minimum Conditions of Access to small pelagic resources in CCLME

Considering that the adoption of a policy document may pose some problems for Morocco (a non-member to SRFC), the following possibility was examined: (i) develop a Convention on Minimum Conditions of Access to small pelagic resources in the CCLME (in line with the recently adopted SRFC Convention on Minimal Conditions for Access to fishery resources in general), and (ii) assist the four countries in integrating its provisions in their national fisheries legislation.

4.2. Management of shared small pelagic (Kapenta) fishery on Lake Kariba

Lake Kariba is a large man-made lake that was created by damming the Zambezi River at the Kariba Gorge at the end of the 1950's. It is situated on the border between Zimbabwe and Zambia and is shared by the two countries. The lake is 280 km long and up to 20 km wide with a surface area of approximately 5,400km². The lake also includes several islands in Zimbabwe (190) and in Zambia (103) covering a surface area of about 147 km² and forming a shoreline of about 604 km (Wikipedia).

Lake Kariba supports an important open water semi-industrial fishery that exploits *Limnothrissa miodon* (locally known as Kapenta). *L. miodon* was introduced in Lake Kariba from Lake Tanganyika in 1967, where it now supports a large and viable lake-sardine fishery. The Kapenta fishery is a capital-intensive fishery and is operated by big companies and some cooperatives using lift nets on rigs¹⁸.

The 5th FAO Technical Consultation on Lake Kariba Fisheries, 2012, stated that there has been a notable decline in catches since 1989 when the fishery peaked at 30,942 MT in both Zimbabwe (21,758 tonnes) and Zambia (9,185 tonnes). In 2011, the production of Kapenta was estimated at about 17,800 MT (9,300 MT in Zimbabwe and 8,500 MT in Zambia). Declines in catch and CPUE could be an indicator of an overfished resource where the level of effort is above the MSY.

The productivity of the Kapenta stock is primarily influenced by environmental factors. In addition, it is recognized that the risk of recruitment overfishing is very low when considering the bio-ecological characteristics of the species (very high fecundity, rapid growth and short life, and the capacity to colonize the whole lake from a very limited parental stock). The combination of a steady decline of both total catch and catch rate and a steady increase of fishing effort over the last decade, suggest however that although abiotic factors are known to play a major role in the productivity of Kapenta stock, fishing effort has probably an incidence in the dynamic of the stock (Kinadjian, 2012).

The current Kapenta fisheries management system in Zambia and Zimbabwe mainly consists of a fishing licensing system aimed at regulating access to the fishery, the obligation for fishing companies to submit data on catch and effort on a monthly basis, and two technical conservation measures: prohibition of nets with mesh sizes less than 8 mm; and prohibition of fishing in shallow waters (less than 20 m deep) close to holiday resorts (minimum distance 3 km) and in river mouths (minimum distance 2 km). Both countries are also currently examining the possibility of introducing a fishing closure during the lunar period (full moon) as a means of reducing fishing pressure.

Both countries have engaged in fisheries cooperation since the mid-1990 to adequately address the issue of management of the shared Kapenta fishery. A Protocol between Zimbabwe and Zambia on fisheries management on Lake Kariba was signed in 1999. The Protocol provides the overarching institutional mechanism for the joint management of the lake system between the two countries, and in particular the shared Kapenta fishery (see Box 2). The Lake Kariba system can be classified as an RFA, i.e. a fishery body that is not supported by any permanent technical secretariat.

¹⁸ Kapenta fishing gear has developed over time from purse seine nets to dip nets. Nowadays, operators use fishing rigs that mainly consist of a platform mounted on two cylindrical pontoons; each rig is mounted with a generator, a lighting plant, a winch (mechanical, hydraulic or manual) and a dip net with a circumference of up to 9 m.

Box 2. Protocol between Zambia and Zimbabwe on the management and development of fisheries on Lake Kariba (1999)

The Protocol establishes a Technical Committee on Fisheries Management with objectives that include *inter alia*: the management and regulation of fisheries; research and data exchange; and technical cooperation on fisheries matters in general.

The Technical Committee is composed of three members from each country (other experts can be invited from time to time by mutual consent) and it should meet at least once per year. The Technical Committee is empowered to make decisions, including decisions on the control of fishing effort, provided that measures are approved unanimously.

Countries are invited to implement decisions provided however that they are in accordance with the laws and regulations in force. This means that the Protocol for Lake Kariba can be interpreted either as an advisory or a regulatory mechanism for the joint management of shared fisheries.

The Technical Committee is also empowered to recommend projects and programmes of mutual benefit to each country including those covering areas relating to cooperation or collaboration in scientific information and services, research and monitoring, fishing technology, surveillance and law enforcement, review and revision of fisheries regulations and social and economic initiatives for the benefit of local communities.

Before the 1999 Protocol, a collaborative mechanism was established with the support of a Zimbabwe/Zambia SADC project. This mechanism consisted of a Technical Committee composed of people who could analyse data and make recommendations and a Steering (Management) Committee who could ensure follow-up of recommendations. The two countries agreed that the management of the Kapenta fishery should be based on limited harvest levels. In particular, it was based on the findings of a bio-economic study undertaken in 1997 which concluded that the MSY of the Kapenta stood at 25,000 MT. The two countries agreed that a total of 500 fishing rigs should be allowed to fish; this number being shared amongst Zimbabwean and Zambian Kapenta fishing companies proportionally to the share of the lake between the two countries. It should be noted however that the current number of rigs recorded on the lake largely exceeds the agreed number of units allowed to fish Kapenta¹⁹.

As indicated in the Report of the 5th FAO Technical Consultation on Lake Kariba Fisheries, 2012, whilst formal Technical Committee meetings as spelt out under the Protocol had not taken place, FAO supported the organisation of five FAO Technical Consultations. These consultations provided a forum for the discussion and agreement of technical issues for the management and development of the fisheries of Lake Kariba, as envisaged under the Protocol.

¹⁹ Although there is a licensing system in both countries and a joint agreement on the need to control fishing capacity, the Kapenta fishery is nowadays in a quasi-open access situation and the fishing capacity (of both registered and illegal fishing units) seems to be steadily increasing. Furthermore, it is reported that compliance with existing regulations is not sufficient. The consequences of such a situation are increased vulnerability and an overcapitalization of the fishery.

4.3. Management of the shared Nile Perch fishery on Lake Victoria

The Lake Victoria Fisheries Organization (LVFO) is a specialized institution of the East African Community (EAC) with a mandate to coordinate the management of the fisheries resources of Lake Victoria for sustainable development and utilization, and to spearhead aquaculture development in the Basin. The LVFO was established through the LVFO Convention signed in 1994 by the three countries sharing Lake Victoria, i.e. Kenya, Tanzania and Uganda www.lvfo.org.

The objective of the LVFO is to foster cooperation among the three EAC partner states by harmonizing national measures and developing and adopting conservation and management measures for the sustainable utilization of the living resources of the lake and maximum socio-economic benefits. Its functions are to:

- Promote the proper management and optimum utilization of fisheries and other resources of the lake;
- Enhance the capacity of existing fisheries institutions;
- Provide a forum for discussion of the impacts of initiatives on the lake;
- Enable research to be carried out on living resources of the lake and its environment;
- Coordinate and undertake training and extension in all aspects of fisheries;
- Consider and advise on the impacts of introductions of non-indigenous organisms into the lake;
- Serve as a clearing-house and a data bank for information on fisheries of the lake;
- Promote information dissemination.

The LVFO can be considered an advisory RFB. Its highest statutory body is the LVFO-Council of Ministers (LVFO-CoM) who can adopt decisions. The three partner states have operational Fisheries Acts for the management and development of fisheries resources and lower level legislation governing fisheries within national territories. Decisions made by the LVFO-CoM are taken up at the national level and legislation is developed where needed.

The LVFO Secretariat is the executive body of the LVFO. Its functions are to coordinate the activities and functions of the LVFO, provide technical fisheries resource monitoring and economic guidance to the LVFO, and coordinate and maintain regional data storage and management systems for the benefit and use of the LVFO.

A specific management and planning exercise for the shared Lake Victoria Nile Perch Fishery has been promoted by the LVFO since 2008. This example confirms the validity of involving an advisory RFB for the concerted management of a shared fishery, which is a process where the harmonization of fisheries governance frameworks amongst different parties is essential (see Box 3).

Box 3. Fishery management plan of the shared Lake Victoria Nile Perch Fishery

The Lake Victoria Nile Perch (*Lates niloticus*) Fishery is the most valuable freshwater fishery in Africa and since the 1990s has supported an extremely valuable export-orientated fishery that generates a significant source of revenue for the population of the three riparian countries. The fishery has attracted migrants and catches have declined since their peak in 1990 in response to increasing fishing pressure and changes in fishing practices. A specific Fishery Management Plan for the Nile Perch (NPFMP1), covering the period 2009-2014, was developed in 2008 as part of a revision of the first Regional Fisheries Management Plan for Lake Victoria conducted under the aegis of the LVFO. The NPFMP1 was developed as a means to specifically manage the NP fishery, and was adopted by LVFO-CoM in June 2009.

Since the end of 2013, the LVFO has engaged in the revision of NPFMP1. A final draft of NPFMP2, covering the period 2015-2019, was presented and consolidated at a regional LVFO stakeholder's workshop in March 2015, with the support of IOC SmartFish. The consolidated document was approved, in principle, by the Permanent/Principal Secretaries of the three partner states who expressed their intention to support its adoption at the next LVFO-CoM meeting. They also expressed their wish that each country could, at a later stage, develop specific action plans and budgets at the national level to facilitate the overall implementation of the NPFMP2 when it is formally adopted.

Both the FMP2 Strategy and the Action Plan emphasise the need to harmonize key elements of the governance system of the Nile Perch Fishery in each of the three partner states. This includes the development of harmonized national and LVFO vessel registers and fishing licence registers, the harmonization of procedures and conditions attached to licensing, harmonization of fishing regulations (to ensure that illegal fishers do not simply move in response to enforcement operations in one partner state to another), the revision of penalties for increased deterrence of existing regulations whilst ensuring harmonization between the three countries, etc.

In the meantime, other collaborative initiatives aimed at reversing the stock decline have developed including private initiatives. This refers in particular to the "self-monitoring and control" initiative led by the fish processing industry associations, started in Uganda in 2007 and later applied in Kenya and Tanzania. This also refers to the "zero-tolerance" compliance policy of the harvested Nile perch slot size of not less than 50 cm total length by the industry in 2009 with a view to stopping the trade of undersized fish and to contribute to the reduction of illegal fishing. This example illustrates that the economic actors can develop complementary initiatives in parallel to government-led mechanisms for the concerted management of a shared fishery.

4.4. The management of shared fishery resources in the USA

The Magnuson-Stevens Fishery Conservation and Management Act, 2006 (MSA), is the principal law governing marine fisheries in the United States. US State and Federal Governments are responsible for the management of US fisheries within their relevant jurisdictions. The Federal Government's jurisdiction extends from the 3-mile limit to the 200-mile limit of the US EEZ, whilst waters under State jurisdiction are usually within 3 miles of the coast.

The MSA authorizes the creation of eight Regional Fishery Management Councils (Councils) to manage the living marine resources within the waters that are shared between the Federal State and one or several federated states.

Each Council is composed of voting and non-voting members representing federal and state agencies as well as recreational, commercial, and in some cases tribal fishing interests. Voting members include the Regional Administrator of NOAA Fisheries (central fisheries administration), officials representing the adjacent state and/or US territorial agencies with authority or expertise in marine fisheries management, and fishing interests appointed by the Secretary of Commerce. Non-voting members are limited to representatives of the US Coast Guard, the US Fish and Wildlife Service, the US Department of State, and the Executive Director of the relevant interstate marine fisheries commission.

Each Council must prepare fishery management plans (FMPs) and implementing regulations for the fisheries in waters under its jurisdiction. It is important to note that the Councils have no independent regulatory authority. Rather, they function as quasi-regulatory bodies, engaging stakeholders, developing FMPs and plan amendments, and providing management recommendations to NOAA Fisheries who retains delegated regulatory authority under the MSA. Conservation and management measures developed by the Councils are forwarded for approval to the Secretary of Commerce, who delegates review authority to NOAA Fisheries to ensure consistency with the requirements of the MSA and other applicable laws. Authority for the final approval of FMPs and associated regulations rests with the Secretary of Commerce (Meghan, 2011).

Whilst Councils are advisory in nature, with no direct regulatory authority, they do serve an obligatory function under the MSA. The MSA confers direct authority to the Councils to develop (albeit not approve, implement or enforce) conservation and management measures for fishery resources. The Councils also have indirect and discretionary authority to influence federal agency actions pursuant to the MSA and other statutory and regulatory provisions.

The US Council model should not however be considered in-depth in the Tanzania context for two main reasons:

- Fisheries management in territorial and internal waters is not a Union matter. Meaning that the management of small pelagics in coastal areas should only involve mainland Tanzania and/or Zanzibar authorities and not any possible Union agency.
- There is not any Union fisheries administration as such in Tanzania, whilst the DSFA is only competent with the management of fisheries in Tanzania's EEZ.

4.5. The management of shared fishery resources in Australia

Australian State and Territory Governments are responsible for the management of Australian fisheries within their relevant jurisdictions. Except where agreements are reached to the contrary, the Australian Government's jurisdiction extends from the 3-mile limit to the 200-mile limit of the Australian Fishing Zone, whilst State jurisdiction is from the coastline to the 3-mile limit.

Fisheries management within the States is generally centralised within the relevant departments responsible for fisheries. At the Federal level, responsibility for domestic commonwealth fisheries management has been passed to a statutory authority, the Australian Fisheries Management Authority (AFMA). State managed fisheries account for about three quarters of the total economic value of fisheries in the country (*OECD Country Note on Fisheries Management, Australia*).

In several cases, fish stocks cross the boundaries of State and Australian Government jurisdiction and there is a need to harmonize regulations for the management of shared fishery resources. Many fishers also operate in state or territory fisheries and the efficiency of their operations can be significantly impeded by the requirements of each jurisdiction. This can include different size limits for the same fish species, only being able to fish in one jurisdiction per trip, different fishing gear requirements, different reporting requirements and different minimum standards to meet different legislative requirements between jurisdictions (AFMA, 2008).

To address the need to promote collaborative management, there are agreements between the State and Australian Governments under the Offshore Constitutional Settlement (OCS). In accordance with these arrangements, management of a 'shared' fishery can be transferred to a single jurisdiction or managed in partnership under a joint authority arrangement. Under this kind of arrangement, the Australian Government and one or more States can form a single legal entity, which manages a fishery under a single law, either Commonwealth or State.

The joint authorities consist of the Commonwealth and the State Ministers responsible for fisheries, who collectively oversee the strategic direction of the fisheries. At present, there are three joint authorities consisting of the Commonwealth and one other State, and all fisheries concerned are managed under State law (www.afma.org.au). Routine management of fisheries under joint authority jurisdiction is therefore carried out by the relevant State management in accordance with its relevant fisheries legislation. Management, research, compliance and financial resources to service the needs of the joint authorities are provided by the relevant State fisheries departments.

OCS arrangements have the practical objective of providing a sound legal and administrative basis for a functional approach under which a particular fishery can be regulated by one authority under one set of laws, without regard to jurisdictional lines (Borthwick, 2012).

As is the case with the US Council model, the Australian mechanism for the collaborative management of shared fisheries can hardly be considered in the Tanzania context for the same two main reasons:

- Fisheries management in territorial and internal waters is not a Union matter. Hence, the management of small pelagics which are distributed in coastal areas should only involve mainland Tanzania and/or Zanzibar authorities and not any possible Union agency;
- There is not any Union fisheries administration as such in Tanzania, whilst the DSFA is only competent with the management of fisheries in Tanzania's EEZ

Moreover, the option that would consist of transferring routine management of the Tanzania small pelagic fishery to one or the other entity is not realistic.

However, some lessons learnt from Australia can be highlighted with regard to the setting-up of advisory bodies for the management, in partnership, of specific fisheries that are under the jurisdictional responsibility of the Federal State (Commonwealth fisheries). Whilst responsibility for determining management arrangements lies directly with AFMA, Management Advisory Committees (MAC) have been established to assist AFMA "in the performance of its functions and the exercise of its powers in relation to a fishery" (see Box 4).

Box 4. Management in partnership of Commonwealth specific fisheries

Each Management Advisory Committee (MAC) has a maximum of nine members, comprising: a Chairperson; an AFMA member; up to seven other members, who may be drawn from the commercial industry, government agencies, environmental organizations, research scientists, or recreational interests; and permanent observers who may be appointed to provide additional expertise.

The MAC provides a forum where issues relating to a specific fishery are discussed, problems are identified and possible solutions are developed. The Terms of Reference of MACs are, *inter alia*:

- 1) To provide a forum for the discussion of matters relevant to the management of the fishery and to act as a medium for the flow of information between all stakeholders.
- 2) To provide advice and make recommendations to the AFMA Board with respect to:
 - a. management of the fishery;
 - b. development of fishery management plans;
 - c. ongoing measures required to manage the fishery in accordance with the provisions of the management plan; and
 - d. amendments to the management plan as required.
- 3) To provide advice and make recommendations to AFMA on research priorities and projects for the fishery.
- 4) To establish sub-committees as required to ensure that the range of management issues is given proper attention.
- 5) To liaise with AFMA staff and provide assistance as necessary to ensure approved management measures are implemented.

In coming to a decision about the recommendations received, the AFMA must balance advice received from the MACs with other sources of advice. In trying to balance the range of competing interests, it is sometimes necessary for the AFMA to make decisions that are not supported by the MAC's advice.

OECD Country Note on Fisheries Management, Australia

5. Elements for discussion in view of the concerted management of small pelagic fishery in Tanzania amongst mainland Tanzania and Zanzibar

The purpose of the Meeting on the Small Pelagic Marine Fishery in Tanzania, held in Bagamoyo on 11-12 August 2015, is to, *inter alia*, explore possible future mechanisms for the concerted management of the 'shared' fishery between mainland Tanzania and Zanzibar. The objective of the present paper is to feed discussions in light of the possible establishment of an adequate platform to serve this purpose, through presenting general principles from international law and practices for the management of shared fisheries as well as case studies on different types of mechanisms that could serve as possible models.

The specificity of the governance framework of the marine coastal fisheries in Tanzania under the Union framework should however encourage participants to envisage a relatively original arrangement in view of the institutionalization of collaborative mechanisms for the management of the shared small pelagic marine fishery.

Based on the above, two key questions should be raised during the meeting:

- What would be the mandate for a possible future mechanism?
 - a single forum for discussion and coordination of actions of common interest?
 - an advisory joint body?
 - a regulatory joint body?
- Which (realistic and cost-effective) possible mechanism?
 - RFB model?
 - RFA model?
 - Inter-ministerial committee (such as those models that are frequently used for integrated coastal zone management within the same country) between the MLFD of the mainland and the MLF of Zanzibar, as a start to initiate a permanent dialogue for the concerted management of the fishery?

Moreover, in the case of Tanzania's shared small pelagic marine fishery, the primary level of cooperation - that is in management-oriented research - has yet to be developed. This may imply that research including data exchange (such as catch and effort statistics) be one of the priority areas for cooperation. Does this mean that other areas for cooperation dealing more specifically with 'actions' in fisheries management should be postponed *sine die*? Or would it be preferable to promote different complementary initiatives to support the process at the same time?

More action-oriented initiatives, based on a rapid diagnosis-analysis of the fishery, could include:

- Harmonization of fishing regulations;
- Harmonization of conditions attached to licensing;
- Harmonization of regulations governing post-harvest activities;
- Development of a joint policy document to provide strategic orientations for the concerted management of the fishery;
- Adoption of 'minimum terms and condition of access' to small pelagic species in Tanzania;
- Joint MCS patrols.

Furthermore, experience in the region has shown that cooperation should not be limited to the institutional public sphere. Indeed, there have been some areas of success with regard to the identification and implementation of measures of common interest under the leadership of private actors (with reference to the Lake Victoria Nile Perch Fishery). This means that private fishery stakeholders from mainland Tanzania and Zanzibar may wish to enter into cooperative arrangements for the improved management of fishing activities and/or related value chains.

Finally, whatever the preferred mechanism that may be identified for the concerted management of small pelagics in Tanzania – from setting-up a single forum for discussion to establishing an advisory or regulatory joint body - there will be a need to consider the existing and complementary two levels of fisheries governance in mainland Tanzania and Zanzibar which are: Local Government Authorities and community-based organizations at the local level (Beach Management Units and Collaborative Fisheries Management Areas in mainland Tanzania, and Village Fishing Committee in Zanzibar); and the central level which involves fisheries administrations (the MLFD of the mainland and the MLF of Zanzibar). Experience in the region, with reference to the Lake Victoria Nile Perch Fishery, has shown that management arrangements should not only be based on community participatory mechanisms but should also involve actual (commercial) actors including fishers, boat-owners, processors and traders. This is to say that interactions between the public and private sectors should be given particular attention in the process of developing the collaborative management of Tanzania's shared small pelagic marine fishery.

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IOC-SmartFish is a regional fisheries programme managed by the Indian Ocean Commission, funded by the European Union and co-implemented by the Food and Agriculture Organization of the United Nations. SmartFish, which operates in 20 countries throughout the East and Southern Africa - Indian Ocean region, focuses on fisheries governance, management, monitoring, control and surveillance, trade, and food security.

Marine fisheries play a significant role in the development of coastal economies. In Tanzania, the small pelagic fishery is an important component of this sector, both for the mainland and Zanzibar. The governance and management system of the small pelagic fishery in Tanzania faces various weaknesses and shortcomings, including the absence of any institutional mechanism to support collaboration between the mainland and Zanzibar. Given the migratory nature of fish stocks, Tanzania's small pelagic fishery is de facto a shared fishery, however, it is currently being managed by two separate political and administrative entities.

This report provides details of a meeting on Tanzania's small pelagic marine fishery that was held in Bagamoyo, Tanzania, in August 2015. The aim of this meeting was to foster collaboration and contribute to the institutionalization of a dialogue between the two parties for improved governance and management of the small pelagic marine fishery.



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