CTA Discussion Paper

Mapping Study on the Fisheries Sector in the IOC Region

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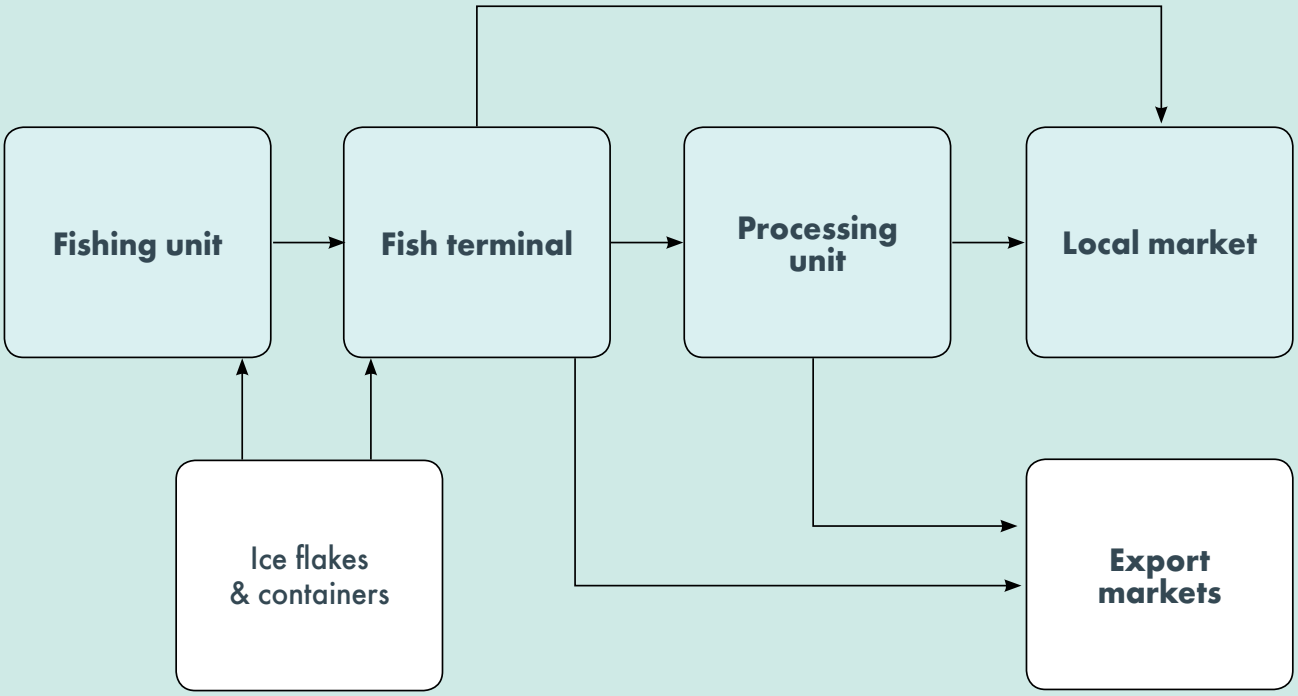

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List of acronyms

AFRC	Albion Fisheries Research Centre
AMB	Agricultural Marketing Board
AU-IBAR	African Union Interafrican Bureau for Animal Resources
CAADP	Comprehensive Africa Agriculture Development Programme
COMESA	Common Market for Eastern and Southern Africa
CTA	Technical Centre for Agricultural and Rural Cooperation
DBM	Development Bank of Mauritius
EEZ	Exclusive Economic Zone
EU	European Union
FAD	Fish Aggregating Device
FAO	Food and Agriculture Organization
FBOA	Fishing Boat Owners Association
FIT	Fishermen Investment Trust
FiTEC	Fisheries Training and Extension Centre
FLS	Fish landing stations
FPA	Fisheries Partnership Agreement
FPAOI	Fédération des Pêcheurs Artisans de l'Océan Indien (Regional Network of Artisanal Fisherfolk Organisations of the Indian Ocean)
FPS	Fisheries Protection Service
FWF	Fishermen Welfare Fund
GDP	Gross Domestic Product
IFAD	International Fund for Agricultural Development
IOC	Indian Ocean Commission
IOTC	Indian Ocean Tuna Commission
MCS	Monitoring Control and Surveillance
MFCF	Mauritius Fishermen Cooperative Federation
NAIP	National Agriculture Investment Plan
NAFP	National Agricultural and Fisheries Policy
NMTIP	National Medium-Term Investment Programme
NEA	New Economic Agenda
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental Organisation
NSB	National Statistics Bureau
RRA	Rodrigues Regional Assembly
Rs	Mauritian Rupees
SADC	Southern African Development Community
SFA	Seychelles Fishing Authority
SNDPC	Syndicat National pour le Développement de la Pêche (National Syndicate for Fisheries Development)
TCP	Technical Cooperation Programme
SR	Seychelles Rupees
UNDP	United Nations Development Programme

Rate of exchange: Feb 2016

1 Euro = 38.2 Mauritian rupees (Rs)

1 Euro = 12.6 Seychelles Rupees (SR)

1 Euro = 492 Comoros Francs (KMF)

1 Euro = 3,480.7 Madagascar Ariary (MGA)

Executive summary

Fisheries are an important source of food and nutrition security, income and employment in the Indian Ocean Commission (IOC) region (Comoros, Madagascar, Mauritius, Reunion Island and Seychelles). Approximately 200,000 people make their living directly or indirectly from the fisheries sector, already 130,000 in Madagascar alone. Fish consumption ranges from 7 kg/capita in Madagascar to 65 kg/capita in Seychelles. The gross domestic product (GDP) contribution varies from 1.5% in Mauritius to 8% in Comoros, and fish trade often represents an important pillar of the economy (tuna in Mauritius and Seychelles, shrimp in Madagascar).

The diversity of species and habitats in coastal areas provides a range of livelihoods opportunities, and the open access nature of many resources provides opportunities for the poor. However, overfishing and overcapacity within the artisanal fishery sector of the IOC is diminishing fishers' catches and reducing family incomes.

While the artisanal fisheries sector plays a key role, it faces a number of important challenges in terms of co-management of the resources, interactions with industrial fisheries, effects of climate change, limited access to credit, poor landing and storage facilities, marketing, etc. Climate change is likely to affect species distribution and ecosystem productivity may further decline in the longer term due to increase surface water temperature. Coral habitats may be affected by rising temperatures, with serious implications for both fishing and fish farming. Ocean acidification may affect the delicate reef structures and marine organisms inhabiting these habitats.

Policies and regulatory frameworks are therefore necessary to safeguard the interests of small-scale fisheries communities. While a number of national and regional initiatives are ongoing to support the development of the sector, much remains to be done, especially in terms of fisheries governance and how small-scale fisheries actors can better engage with policy-makers in the region. The recent launch of the Regional Network of Artisanal Fisherfolk Organisations of the Indian Ocean (FPAOI) is a clear step in this direction and the network offers a promising forum for ensuring that the voice of small-scale fisheries stakeholders is better heard, in particular that of women, who play a critical role.

Main findings and possible pointers for CTA involvement

Overfishing, declining fish catches and the sustainability of resources are major concerns for the region and need to be addressed.

Notions of fish quality, preservation on ice, value addition and value chains are alien to the sector. To achieve an acceptable level of fish quality, much more needs to be done with regards to quality assurance and to reduce post-harvest spoilage. Provision of basic infrastructure in some countries would greatly enhance and preserve the quality of the catch.

A value-chain approach to fisheries development is not very common in the region. There is a need to promote and encourage such an approach among actors within the sector, at the same time as improving coordination mechanisms among stakeholders and improving the gender responsiveness of fisheries value-chain initiatives.

Improvements in information, communication and knowledge management are essential for effective dialogue among stakeholders and would need to be prioritised along with capacity building, which is also a prerequisite. A good communication strategy would enable stakeholders to network among themselves, prospect for new venues, develop appropriate marketing strategies and maximise opportunities. Probably this could be done through FPAOI.

IOC countries must set up, support and strengthen coordination platforms to bring together value-chain actors across the region to discuss issues and find solutions to challenges that affect the value chain. In this context, facilitation of multistakeholder dialogue and policy engagement would certainly facilitate decision-making by authorities.

Promotion of information and communication technologies for collection and dissemination of information and networking is an urgent priority to enhance the fisheries value chain.

Intraregional trade, especially the development of niche markets, may be required to boost regional trade.

Data collection and analysis must be enhanced to facilitate good decision-making by fisheries managers.

Introduction

This study was commissioned by the Technical Centre for Agricultural and Rural Cooperation (CTA) to help guide the Centre's support to the fisheries sector in the Indian Ocean Commission (IOC) region in the context of CTA's East Africa Regional Business Plan and its work on value chains.

The study provides an overview of the fish value chains in four countries – Comoros, Madagascar, Mauritius/Rodrigues and Seychelles – together with recommendations for future action.[1] Key actors and institutions, value-chain development initiatives, policies and regulatory frameworks are presented and analysed.

The study maps out the following aspects:

- Current key fisheries value-chain development initiatives (objectives, beneficiaries, type of activities, results, challenges, gaps) at the country level, including type and magnitude of support being provided by development partners, if any;
- An overview of gender relations in fisheries value chains;
- Key institutions/actors involved;
- The extent to which fisheries value-chain development initiatives are anchored in respective Comprehensive Africa Agriculture Development Programme (CAADP) investment plans;
- Type and strength of coordination structures/multi stakeholder platforms established to facilitate value-chain activities (Who are the members? How do these structures operate? What have been the results so far including key challenges and gaps if known/identified? The gaps may include information and communication technologies (ICTs) in the fisheries value chain; issues around policy analysis and advocacy; capacity strengthening of fisheries platforms; issues around knowledge and information and communications management);
- Main policy and regulatory challenges, including trade policy issues; and
- Suggestions/pointers on possible CTA involvement – key entry points, strategic partners, type of support.

The main sources of information were desk research and a series of face-to-face and phone interviews with key people in the fisheries sector, including the private sector, parastatal bodies and the authorities. Various organisations such as the IOC/SmartFish programme, the Mauritius Federation of Cooperative Fishermen, the Fishing Boat Owners Association in Seychelles, fishers and other stakeholders from Comoros and Madagascar were also consulted and interviewed.

The latest Annual Reports available from the concerned countries and other reports on the artisanal sector in the region were consulted. Value-chain studies carried out in the region were also checked, including value-chain studies related to the artisanal fisheries in Mauritius and Rodrigues, shark and crab value-chain analysis in Madagascar, and a regional report on value-chain analysis carried out by the ACP Fish II programme. Data used come mainly from UN Food and Agriculture Organization (FAO) Stats and from the various reports consulted, including a tuna by-catch study carried out in 2013. A field visit to Seychelles enabled further collection of data and constructive discussions for this study with concerned stakeholders.

1 Reunion Island was excluded from this study because it is an overseas department of France.

Synopsis of the fisheries value chain

Fisheries in IOC countries

The IOC is comprised of five countries namely Comoros, Madagascar, Mauritius, Reunion Island and Seychelles. Some 21.4 million people live in the region, out of which about 194,000 people make a living directly or indirectly from the fisheries sector. Fisheries resources are important to the national and regional economic development, and fish trade often represents an important pillar of the economy (tuna in Mauritius and Seychelles, shrimp in Madagascar). Policies safeguarding the interests of small-scale producers are therefore necessary to enable them to contribute to food security with products which supply nutritional quality for consumers and economic benefits for the producers.

Capture fisheries consist of pelagics (swordfish and tuna species mainly), shrimp and cephalopods targeting the European market with frozen and canned fish and fish products. Demersal fisheries (groupers, emperors, snappers and breams) also exist but production has remained at low levels with some exports from Seychelles to Mauritius and Mauritius to Reunion Island. Traditional fisheries production is low except in Comoros, which produces 16,000 t of skipjack using traditional means mainly for the local market. Artisanal fishing is especially important in Madagascar for local consumption and exports.

With a healthy tourism sector, Mauritius and Seychelles are close to being industrialised countries but the economies of Comoros and Madagascar are lagging behind. Yearly per capita fish consumption is around 20 kg in the region with the exceptions of Seychelles (about 60 kg/capita) and Madagascar (less than 8 kg/capita). Trade with the African continent is marginal and hampered by the high costs of freight.

Table 1 gives the total production of fish per country and the contribution of the artisanal fishery sector. The contribution of fisheries to GDP per country is also provided.

Table 1. Fish and fish product production in the IOC region

Country	Population	Fish production	Artisanal fish production	Contribution to GDP (%)
Comoros	793,000	16,200 t (2012)	16,200 t	8.0
Madagascar	19.2 M	127,069 t	67,346 t	7.0
Mauritius	1.3 M	10,857 t (2014)[1]	4,125 t (2012)	1.5
Seychelles	84,000	115,229 t (2013)	4,143 t (2013)	7.7
1 Provisional.				

Fish landings in the IOC

Three distinct types of fisheries exist in the region:

1. Industrial fisheries, that practice seine and longliner fishing (includes distant water fishing vessels (over 24 metres) from various countries including the EU);

2. Semi-industrial fisheries, targeting mainly demersal fish and swordfish (in Seychelles) with boats between 12 to 20 metres in length, powered by inboard engines;

3. Artisanal fisheries practised within inshore waters.

Within artisanal fisheries, various types of fishing gear are used to catch fish in the region. These include basket traps, line fishing and drop lines, beach seine nets and harpoons. Each country has its own specific method of catching fish.

In Comoros, there is no industrial fishing. Over 4,500 registered fishers use traditional boats with sails to fish in the near-shore waters. The main species targeted are tuna and other pelagic fishes, which constitute about 70% of the catch landed. Catches from traditional fishing activities have increased from 6,000 t in 1985 to some 16,000 t (2013) The increase in landings is probably due to the gradual motorisation of fishing boats, better fishing techniques and incentives such as fishing gears given to develop the sector. However post-harvest losses have been estimated to range between 30% and 40%, due mainly to an energy problem (daily unforeseen interruptions in the electricity supply), and lack of infrastructure, including refrigeration.

Due to a lack of equipment and know-how for deep-sea fishing, offshore resources remain largely underexploited. Since 2011, a private sector company, ComPêche (100% Comorian shareholding), is operating in the semi-industrial fishing sector with an 18-metre fishing boat targeting mainly demersal species and some tuna. Landings average 600 t annually and ComPêche has its own cold storage facilities.

Fishing plays an important role in Comoros by providing nutrition to a population where 33% are in absolute poverty. Fish consumption is usually around 29 kg/capita.

The artisanal fisheries sector in Mauritius and Seychelles is more advanced than in Comoros. Artisanal fishing boats are motorised, usually 6 to 12 metres in length and mostly equipped with outboard engines. The artisanal fishing sub-sector is the preserved domain of local fishermen. The fleet is made up of about 400 fishing boats and the total landed catch from the artisanal sector was 4,143 t in 2013, mainly targeting the local market. The most important species groups landed are trevally (*Carangoides* spp), emperors (*Luthjanus* spp), jobfish (*Aprion virescens*), red snapper (*Lethrinus* spp), mackerel (*Rastrelliger* spp) and grouper (*Epinephelus* spp). On average about 90% of the artisanal catch is consumed locally.

Seychelles is rich in both pelagic and demersal fish resources. The Seychelles plateau and island groups have important stocks of tropical snappers and groupers. The most important targeted species are demersal: carangids (30% of total), tuna, swordfish groupers and snappers. The fisheries sector of Seychelles includes industrial, semi-industrial, artisanal, fish-processing, ancillary services and aquaculture.

Port Victoria, in Seychelles, is the main tuna purse seine transhipment port in the West Indian Ocean, not only because of its strategic position but also due to significant investment in infrastructure and capacity building by Seychelles to provide services to the fleet. About 400 metres of quays are reserved for industrial fishing activities. Further expansion is ongoing.

Yellow fin and skipjack tuna, the principal industrial species, are processed by the Indian Ocean Tuna Company, the second largest tuna canning factory worldwide, for export mainly to Europe and Asia. Canned tuna production accounts for almost 90% of total production (36,826 t in 2013) while cooked tuna loins account for about 7%. Fish meal (7,337 t) and fish oil (691 t) production in 2013, mainly from the canning industry and fish unfit for human consumption, were also important by-products. Oceana and Sea Harvest are two companies producing a variety of fish products for the local and export market. Smoked fish, dried sea cucumbers, shark fins and salted fish account for a minimal percentage of total production.

In Mauritius, total fish production in 2014 from the artisanal sector was about 1,483 t. Frozen fish landed from the banks of Saya de Malha, Nazareth and St. Brandon amounted to 2,189 t. In Rodrigues, 2,000 to 3,000 t are landed annually. About 2,200 fishers are registered as professional artisanal fishermen in Mauritius and 2,000 in Rodrigues. The inshore artisanal fisheries sub-sector in Mauritius has been declining over the years due to overfishing and overcapacity in the sub-sector. Only 833 t (excluding catch from bank fishing, fish aggregating devices (FAD[2]) and sport fishery) was landed in 2014 by artisanal fishers. The main species are snappers, groupers, jobfish, spangled emperor, thumbprint emperor, shoemaker spinefoot and other reef fishes. About 600 t of tuna and other pelagics are also fished using FADs placed within reach of the artisanal fishers (<10 km away at sea).

In Madagascar, the fisheries sector provides direct employment for 130,000 people, including 33,365 as fish farmers, and 3,000 indirect jobs. There are basically two types of fisheries in Madagascar: the industrial fisheries, which target offshore tuna, billfish, and sharks; and near-shore shrimp fisheries. Traditional fisheries are carried out from dugout canoes using oars and sails, and exploit marine mammals, sea turtles, fish, sharks and rays, echinoderms, molluscs, crustaceans and some seaweeds. Artisanal fisheries, though underdeveloped, are better organised and technically more advanced than traditional fisheries, and operates at different fishing grounds. Coastal marine resources have been estimated at 180,000 t and the EEZ resources at 140,000 t. Industrial fishing units catch about 15,800 t of fish and 5,400 t of shrimp, mainly from coastal resources. At a national level, the traditional fishing sector is responsible for 53% of the total marine fish catch, while the industrial shrimp and deep-water fisheries accounts for 8.8% of the total catch.

Marine capture fisheries account for more than 80% of total fish production. The total production of shrimp fisheries has decreased from 8,652 t in 2002 to 3,143 t in 2010. The by-catch from the industrial fisheries amounts to 3,175 t and is sold entirely on the local market, while tuna production is 10,000 t and is mainly caught by the EU fishing fleet.

The economic importance of the fisheries sector and fish trade in the IOC region

Seychelles

Apart from tourism, Seychelles has limited opportunities for land-based development. As a result, the fisheries sector is critically important for both food security, and income generation from fish and fish products and exports from industrial tuna fishing activities. GDP growth rate for the fisheries sector was estimated at 7.7% in 2008 (NSB, 2010). The contribution from the small-scale fishing sector is on average between 1 and 2% of GDP, with an estimated 5,000 people directly employed. Local fish consumption is around 65 kg per person.

Exports of fish and fish products amounted to SR 4.4 billion (€349.2 million), representing 95% of Seychelles' total merchandise exports which highlights the importance of the fisheries sector. Total imports amounted to SR 2.2 billion (€174.6 million). The European market is the main export destination (France, Germany, Italy, the Netherlands, Spain and the UK). Some commodities are also exported to Japan, Mauritius, Reunion (France), South-east Asian markets and the US.

Mauritius

In Mauritius, fish is an important source of protein in the local diet. The per capita consumption of fish stands at 23 kg (representing one-quarter of animal protein intake). The fisheries sector has undergone fundamental changes and development in terms of technological advance and innovation. It accounts for 1.5% of GDP and employs some 12,000 people. The marine fisheries sector alone contributes approximately 1.5% of GDP, about €519 million.[3] The sector provides direct employment to 12,000 people, which represent approximately 2% of the active population.

2 FADs are devices set out at sea to aggregate fish, particularly pelagic fishes such as tuna.
3 Exchange rate February 2016: €1 = Rs 38.2 (Mauritian Rupees)

Comoros

Though there is no industrial fishing in Comoros, fisheries play an important role in providing nutrition to a population where 33% are in absolute poverty. Fish consumption is usually around 29kg/capita. There is no export of fish and fish products from Comoros, though some fishermen do land their catches in Mayotte sometimes where better prices are obtained.

Madagascar

In Madagascar, the fisheries sector is one of the pillars of the Malagasy economy along with mining and tourism. Production from the shrimp sector constitutes Madagascar's major fisheries exports. Since 2004 the sector has experienced difficulties due to: low profitability, climate change, low prices due to increased Asian and South American production, and an increase in price of petroleum products. The capture fisheries sector, including aquaculture, contribute 7% to GDP. Fish consumption is a major source of protein for the coastal population and stands at about 7 kg per capita per year.

Integration of fisheries value chain into CAADP's NAIP

Fisheries and aquaculture were not mentioned in the initial CAADP document. It was only in 2006 that fisheries and aquaculture were expressed in the CAADP Companion document. The New Partnership for Africa's Development (NEPAD) fisheries development programme recognises the potential contribution of fisheries and aquaculture to the socio-economic development of the continent through an integrated, structured and targeted approach to sector investment. NEPAD also recognises that the fisheries sector makes contributions across all of the main elements of CAADP and other NEPAD programmes.

Six main areas – human and institutional capacity, management tools and implementation, sustaining and increasing production, developing and adding value, sharing benefits and learning and exchanging knowledge – were identified by NEPAD for intervention in the fisheries and aquaculture sector.

As part of CAADP requirements, Mauritius prepared its National Medium-Term Investment Programme (NMTIP) in 2005 with assistance from FAO (NEPAD-CAADP/FAO, 2005). The CAADP Compact was signed in July 2015. It focuses on the process of strengthening and adding value to the strategy for agricultural transformation under the ongoing economic development strategy of the country as outlined in the government's programme (2015–2019) (President of the Republic of Mauritius, 2015). For the fisheries sector the government programme aims to focus on:

- A new Fisheries and Marine Resources Bill incorporating international norms and practices for modernising the fisheries sector
- Putting the fisherfolk community at the centre of development and ensuring their capacity building and training for improved livelihoods
- A Marine Pollution Bill in line with the International Maritime Organization Convention.

In the process of preparing the NMTIP document, participation was sought from major stakeholders including the government, development partners, farmer organisations, the private sector and civil society. The main areas of focus with regards to the fisheries sector are:

- *Coastal zone management*, including the protection of lagoons, control of overfishing, reduction in water pollution from agro-chemical run-off, industrial waste and sewage seepage, information and awareness campaigns and the strengthening of the Integrated Coastal Zone Management Unit. In Rodrigues, interventions also focus on alternative coastal livelihoods and erosion control;
- *Sustainable management of fisheries* with consideration given to the environmental pressures from fishing activities. These include:
  - Protecting lagoons from unsustainable fishing
  - Building capacity of fishermen to fish outside lagoons (FADs, demersal,

banks)[4] and providing training and financial support to access larger/ safer vessels
- Building institutional capacity and coherence of fishery associations (group dynamics and management, financial management, savings and credit etc.)
- Reviewing/revising FAD operations, ensuring that specifications fit Rodrigues' context
- Value addition of fisheries products
- Development of Aquaculture within the lagoons.

- *Promotion of Port Louis as a seafood hub* including improved facilities for foreign flag fishing vessels, investments in processing, and strengthening of information delivery on regional fisheries to improve the management of fisheries in the Indian Ocean.

Mauritius is currently contributing 4.7% of its budget to the implementation of CAADP.

In Seychelles, the government is implementing CAADP through the NAIP. Capacity building, as well as efforts to ensure effective participation by farmers and the private sector, is also being supported through continuous dialogue between stakeholders.

The Seychelles CAADP Compact (Republic of Seychelles, 2011) sets the necessary parameters for stakeholder cooperation towards sustainable long-term development of the agricultural sector and highlights the commitment of the government, national stakeholders and development partners to this important agenda.

The Seychelles Government and key stakeholders have identified five priority areas for national development. All five will reduce Seychelles' vulnerability to external shocks, build resilience of the national economy and provide the basis for long-term sustainable development. These include: climate change, renewable energy and water; human resource development; economic infrastructure including transport and ICT; food security, trade and diversification; and development of national statistics.

The Seychelles CAADP Compact Document reflects five key intervention areas:

- Pillar I: Protection and Sustainable Use of Agricultural Land and Infrastructure
- Pillar II: Agricultural Research, Irrigation and Extension
- Pillar III: Sustainable Fisheries Development
- Pillar IV: Marketing and Trade of Agricultural Produce
- Pillar V: Food and Nutrition Security

The government: (i) promotes sustainable and responsible fisheries development and optimises the benefits from this sector for present and future generations; (ii) grants licences to foreign fishing vessels until such time that Seychelles is capable of harvesting its own tuna resources; and (iii) implements a policy of free trade in fish products in accordance with international laws, taking measures to ensure resource sustainability and protect human health.

4 FAD means Fish Aggregating Devices; demersal refers to fish living at a depth of 150 metres or more; banks relates to the Nazareth and Saya de Malha banks in the North of Mauritius.

Through the Seychelles Fishing Authority (SFA), The government's vision is outlined in the National Agricultural and Fisheries Policy 2003–2013 (NAFP) (Republic of Seychelles, 2003). The main focus is to achieve food security through sustainable agricultural production and development. For the fisheries sector, the NAFP prioritises:

- The development of ancillary industries and services to provide inputs to the fishing industry to contribute to the development and integration of other sectors of the economy, such as manufacturing, tourism and agriculture
- Enhancement of food supply and food security
- The promotion of safety at sea.

In this context, a new Fisheries Act was enacted in 2014, laying the foundation for further improvement within the sector, including enhancing value addition and modernising the sector. Furthermore, with assistance from the United Nations Development Programme (UNDP), Seychelles is implementing a biodiversity project with the ultimate aim of preserving its marine resources.

Seychelles is currently contributing 6.8% of its budget to the implementation of CAADP.

In Comoros fisheries play an important role in providing nutrition to a population where 33% are in absolute poverty. Fish is particularly important, as virtually all meat is imported and more expensive than fish. Unfortunately, at times of low output, the price of fish also increases, making it expensive for the poorest people.

The Union of the Comoros officially launched the CAADP implementation process in September 2011. A steering committee has been set up and consultants hired to undertake stocktaking and growth analysis, a prerequisite to informing the Comoros National CAADP Compact. Comoros has not yet met CAADP's agricultural growth target of 6%.

The Madagascar National CAADP Compact was signed in Antananarivo on 21 October 2013. The Malagasy Compact envisions a competitive, sustainable and integrated agriculture sector that ensures food security.

The overall objective is to improve food security, incomes of producers, growth of the rural economy and sustainable utilisation of natural resources.

The Compact has five specific objectives:

- Ensure food security by increasing and diversifying agricultural production
- Promote sustainable agricultural production systems and natural resources management
- Develop commercial value chains that the country has comparative advantages in
- Create employment in agriculture and related sectors
- Improve governance of the agriculture sector.

It is unfortunate to note that despite the good intentions of governments within the region, no major development has taken place in the fisheries sector over the last decade, with the exception of the seafood hub led by the private sector in Mauritius and some projects in Seychelles (including the overhaul of the port sector and construction of a hub for value addition to fish in Providence). In Comoros the fisheries sector is also receiving some assistance from the Government of Qatar, in addition to EU funding under the Fisheries Partnership Agreement (FPA). However, the use of these funds within the fisheries sector remains low. There is much to be done with regards to value-chain, logistics, quality assurance and marketing in Comoros. Madagascar despite its significant potential has lacked investments in the sector and still needs to settle its internal political conflicts and seriously consider the development of fisheries to create wealth for its population.

Institutions & actors in the value chain

This chapter presents the main actors and institutions involved in the fisheries value chain in the IOC region. Key constraints/gaps have been identified and presented as information for any future interventions.

Actors and institutions in the IOC region

Table 2 gives an overview of the actors directly involved in the IOC fisheries value chain as well as the institutions that enable its development. The local actors form an important link within the value chain and strengthening their capacities is essential for ensuring that stronger value chains are developed. Ensuring a proper distribution of the wealth generated is also essential to provide a boost within the sector.

The role of governments and government agencies/authorities cannot be overstated as they play a crucial role within the value chain and they safeguard the population's health by ensuring only good quality products are sold. They also provide incentives and create the necessary conducive policy and regulatory environment for the expansion of the sector. The support of development partners and other regional and international actors are also crucial and complement development efforts within the value chain.

Constraints faced by various actors in the value chain

Table 3 summarises the key constraints faced by various actors within the fisheries sector. The small-scale sector faces more constraints compared with the large-scale sector, particularly with regard to access to finance. It is important to note that in Mauritius and Seychelles the governments offer various incentives, including subsidised safety equipment, low interest loans for purchase of a boat and engine, and subsidised petrol. The occurrence and severity of constraints within the region vary. This could be due to different levels of development in each country and their fishing sectors. Climatic conditions are affecting every country within the region.

Table 2. Various actors involved in the region at various levels within the fisheries sector

Value-chain direct actors	Local/National	Regional	International
Fishers, aquaculture producers, small-scale actors	x		
Semi-industrial fishers, operators	x		
Industrial operators, buyers	x	x	x
Local dealers, sellers, retailers	x		
Small-scale processors	x		
Middlemen, fish shops, markets, supermarkets	x	x	x
Large-scale processors	x	x	x
Distributors, freight, logistics	x	x	x
Fishers associations, fisher cooperatives	x	x	
Service providers	x	x	x
Value-chain enablers			
Competent authority, vet services	x		
Research and training institutions	x	x	
Government authorities/Ministries	x	x	
NGOs	x	x	x

Table 3. Actors and key constraints

Actors	Key constraints
Fishers, aquaculture producers, small-scale actors	Lack of collateral has been a limiting factor for investment by the small-scale sector. In the aquaculture sector, the high cost of feed, technical assistance and construction materials has discouraged small-scale actors from venturing into aquaculture production. The small-scale sector needs technical inputs initially to ensure success.
Semi-industrial fishers, operators	Climatic conditions do not permit year-round fishing operations, which affects profit margins. Cost of fishing gear is high and the cost of bait is increasing.
Large-scale operators, buyers	High cost of operations (logistics, labour, repairs and maintenance). In the banks fishery in Mauritius fishing vessels are old (>25 years) and need to be replaced to operate efficiently. Additional constraints include high interest rates in some countries and climatic conditions; fishing activities cease in the winter.
Local dealers, sellers, retailers, small-scale processors	The enforcement of quality control and standards is limited. Seasonality of production limits investments.
Middlemen, fish shops, markets, supermarkets	High cost of support factors (electricity, water, packing materials etc.)
Large-scale processors	The processing sector has to purchase its raw materials from the EU distant fleet fishing in the region to qualify for export to the EU (e.g. tuna). The cost of freight, both for import and export of fish, is high.
Distributors, freight, logistics, service providers	High cost of operations and other inputs.
Fishers associations, cooperatives	Beach net fishing is seasonal.
Value-chain enablers	
Competent authority, vet services, research and training institutions, government authorities/ministries	Funding for the fisheries sector is limited and inadequate. Data collection in some countries, such as Comoros and Madagascar, has to be reviewed and enhanced. Capacity to control fish diseases for aquaculture projects is limited. Control and surveillance for illegal fishing in Exclusive Economic Zones (EEZ) has improved, however Comoros is still lagging behind. In lagoons much still needs to be done: monitoring and evaluation is lacking; institutional coordination mechanisms among actors are inadequate; management of fisheries and fish stocks needs improving to allow fish to replenish the lagoons; in Mauritius signs of overfishing are evident; and there is a lack of coordination among various actors within the sector.
NGOs	Limited capacity and lack of coordination among actors. Funding mechanisms are inadequate and need to be revisited. Capacity building of staff is lacking.
Development partners/UN Agencies (UNDP, FAO)	Inadequate funding for fisheries research, training and development.
Regional economic communities (IOC, IOTC, SADC, NEPAD, AU/IBAR etc.), regional development partners	Funding and coordination mechanisms are inadequate. Need more coordination between organisations and countries with regards to the needs of individual countries.

Source: Compiled by author

Current value-chain initiatives in fisheries (IOC countries)

Fisheries value-chain developments within the region are summarised in Table 4.

Table 4. Characterisation of some initiatives

	Comoros			Mauritius			Madagascar			Seychelles		
Characterisation of recent initiatives	***L***	***M***	***H***	***L***	***M***	***H***	***L***	***M***	***H***	***L***	***M***	***H***
Access to finance small-scale	x			x			x				x	
Access to finance semi-industrial	x				x		x				x	
Access to finance large-scale (commercial banks)		x			x		x				x	
Control of fish diseases	x			x				x		x		
Fisheries and aquaculture extension	x			x				x			x	
Fishers training/capacity building	x				x			x			x	
Efficiency of small-scale production unit	x			x			x			x		
Efficiency of small-scale processors	x				x		x				x	
Efficiency of large-scale operators		x				x		x			x	
Promotion of fisheries and aquaculture	x			x			x			x		
Technical support to operators/ private sector	x			x			x			x		
Other support (ice, equipment etc.)	x				x		x				x	
Support to cooperatives/fishers associations	x				x		x				x	
Co-management	x			x				x			x	
Infrastructure for small-scale	x			x			x					x
Infrastructure for semi-industrial fisheries	x			x			x					x
Infrastructure for large-scale	x				x		x					x
Conflicts among users of the lagoon	x					x	x			x		
Efficiency of fish marketing		x			x			x		x		
Value-added initiatives	x				x			x			x	
Lagoon restocking	x				x		x			x		
Cost of boat insurance			x			x			x			x
Aquaculture insurance	x					x			x			x
Quality assurance	x				x			x			x	
Port facilities	x				x			x				x

L-Low, M-Medium, H-High government priorities. Source: Construction by author

The bulk of the initiatives outlined in Table 4 focused on production. These targeted small-scale fisheries and aquaculture. Table 5 provides a summary of the value-chain nodes targeted and types of interventions.

Table 5. An overview of value-chain interventions

Value chain node	Type of interventions
Input supply	• Training of fishers • Support for purchase of a small boat (loan package from the Development Bank of Mauritius (DBM)) • Capacity building
Production	• Limited access to finance for boat purchase • Capacity building of fishers • Encourage small-scale aquaculture production • Distribution of aquaculture cages • Support for fingerlings • Provision of equipment through the IOC/SmartFish programme • Publication of a manual for small-scale aquaculture • Training in cage construction • Promotion of value addition • Construction of infrastructure (Comoros) • Dredging activities (Seychelles) • Construction of processing infrastructure • Expansion of quay facilities • Encourage small-scale fishers to use ice • Production of juveniles and free distribution for aquaculture
Processing	• Opening of the third largest processing factory in Mauritius • Advice from competent authority on various aspects of processing to stakeholders • Refurbishing of processing lab • Value addition to fish
Marketing	• Trade and marketing both locally and at the international level • Participation at the SEAFEX seafood exhibition in Dubai • Capacity building and development of business-to-business linkages of stakeholders • Market intelligence and promotion of exports • Strengthening small and medium enterprises • Supportive policies and institutional mechanisms to promote fish trade
Others	• Creation of a closed season for octopus to sustain the resource • Sustainability of the mangrove crab in Madagascar: Publications to illustrate the life cycle of the mangrove crabs and why the fishery has to be sustainably managed • Investments in infrastructure

The main source of financing for these initiatives was government budgets, donor agencies (FAO, IOC/SmartFish, UNDP/GEF, Qatar Government, Japan International Cooperation Agency, Norwegian Agency for Development Cooperation). However, the quantity of investments is not documented.

Types of projects and implementation arrangements

The following projects were implemented with assistance from donor agencies or from government funds.

Table 6. Project implementation and budget

Funding sources	Amount (US$)	Projects
IOC/SmartFish	65,000	Small-scale aquaculture in Mauritius
IOC/SmartFish	n.a.	Octopus enhancement in Rodrigues
IOC/SmartFish	n.a.	Octopus enhancement in Mauritius
UNDP/GEF	3.6 M	Mainstreaming biodiversity management
UNDP/GEF	450,000	Climate change report
UNDP/GEF	2.1 M	Strengthening the Seychelles protected area system
IOC/SmartFish	n.a.	Supply chain of the mangrove crab (Madagascar)
	n.a.	Seychelles Ocean Temperature Network (SOTN)
	n.a.	Ocean Data and Information Network for AFRICA (ODINAFRICA)
	n.a.	Recovery dynamics of inner Seychelles coral and fish communities
The Western Indian Ocean Marine Science Association (WIOMSA) Marine and Coastal Science for Management (MASMA)	n.a.	The spatial behaviour of artisanal fishers. Implications for fisheries management and development
	n.a.	Indian Ocean Swordfish Stock Structure (IOSSS)
WIOMSA MASMA	n.a.	Incorporating reef fish spawning aggregations into optimal designs for no-take fishery reserves
Source: Author's construction		

Gender relations in the value chain

Women are not often involved in fishing activities within the artisanal fisheries sector, but they play a major role in fish trade in Comoros and Madagascar. The majority of women find employment in commercial processing industries such as the tuna industry (Mauritius and Seychelles employ 5,000 and 3,500 women respectively). In the artisanal fisheries sector in Mauritius only 35 women are directly involved in fishing activities out of a total of 1,800 active fishers. In Rodrigues 154 women are directly involved in octopus collection. They are known as the *piqueuses d'ourites*.[5] Many women are also involved in the purchase of fish/octopus for processing and sale at a local market or to exporters.

The resale of fish and fishery products by women entrepreneurs is also quite common in Comoros. Within Comoros there are great differences in marketing practices between islands, even if the trend towards production has helped create the profession of 'dealer.' On Great Comoros women known as *watchouzi*[6] almost exclusively carry out this work. The fishermen either sell to a woman within his family (wife, mother or sister) or to another woman who does not live in his village. In Anjouan, fishers sell a portion of their production to consumers, but increasing production has caused resellers to appear (mostly men), which has enabled a more diverse flow to satisfy a broader market. Fishermen using outboard motors for their boats go to Great Comoros where they receive better prices for their catch. The fishermen carry their fish themselves because of slow shipping, and a lack of refrigeration facilities on their boats. On Moheli, there are also dealers, both men and women, but the fishermen often sell directly to consumers.

The same trends are observed in Madagascar where women play an active role in processing along the value chain. In fishing villages (CEEDS, 2012), women's traditional method of earning their livelihoods—fishing by foot—was being restricted by various marine conservation projects, and as a result, the women's economic contribution and societal status decreased compared with men's. To prohibit discrimination and promote equality of opportunity in the work place, the Government of Mauritius introduced the Equal Opportunities Act in 2008 (Republic of Mauritius, 2008). An earlier Action Plan for Poverty Alleviation (2001) had noted a growing feminisation of poverty with an important proportion of very poor households headed by single women. According to a study conducted by a local consulting firm, female-headed households earn significantly less than male-headed households, with the average monthly income being Rs 4,700 (€123) compared with Rs 8,500 (€222) for men. With decreasing job opportunities in the agricultural and export processing sectors, there is a serious threat that poorly educated women might be marginalised on the labour market according to IFAD (IFAD, 2013).

Previous capacity building for women has mainly focused on crafts and more recently on value addition of agricultural products (Rodrigues). Capacity building (including access to finance) for women involved in artisanal fisheries has been lacking in most of the government initiatives to develop the sector. The importance of gender-sensitive indicators still needs to be established and participation of young people in capacity building in the artisanal sector needs to be addressed.

5 *Piqueuses d'ourites* are women involved in collecting octopus using a spear.
6 *Watchouzi* are women in Comoros involved in the sale and resale of fish purchased directly from fishermen.

Value-chain coordination structures

From a value-chain perspective, coordination can be viewed as the ability to provide direction and enforce rules among the various stakeholders within the value chain.

Coordination is necessary because of:

- the interdependencies among the various actors;
- the increasing complexity of market requirements;
- risk management and unforeseen circumstances.

In the fisheries value chain, the output of each participant is an input for the next one. A change at any point will therefore directly affect the rest of the chain. This highlights the importance of a coordination mechanism, using joint decision-making and problem-solving, to organise individual activities.

Multi-stakeholder platforms

A multi-stakeholder platform (defined as a decision-making body) – made up of different stakeholders within the value chain – is important to discuss and agree on actions to solve problems and minimise economic liabilities. This type of platform can play an important role as a focal point for policy dialogue with governments but also has many other functions. These include arbitration and regulation, setting or advising on grades and standards, promotion of trademarks or quality signs/logo, support to research, export and domestic market promotion, and provision of information and statistics.

These structures in the fisheries sector in the IOC region are very limited for now. In Mauritius, the Agricultural Marketing Board (AMB) deals with agricultural products such as potatoes and onions but an agreement was recently signed between the Rodrigues Regional Assembly (RRA) and the AMB for the marketing of dried octopus.

Most of the larger export-oriented companies have their own sales and marketing departments and deal mostly business-to-business. Therefore, it is fisher associations and cooperatives, which most act like a commodity platform when it comes to dialogue with the authorities. Some of the villages in Madagascar do regulate their fisheries in terms of the size of fish allowed and nets, in conformity with established rules and regulations.

Fisher associations and fisher cooperatives in the IOC region

In Comoros, three types of organisation characterise the structure of professionals involved in the fisheries sector. These include grassroots groups (cooperatives, associations), regional unions (Moheli, Anjouan and Grande Comore) and the National Syndicate for Fisheries Development (SNDPC) in Comoros. The three hierarchical levels are characterised by serious malfunctions and extremely limited organisational capabilities. At the institutional level, a study highlighted the difficulties these organisations have in asserting themselves as leaders and responsible actors through finding solutions to their own problems, being open to the larger contexts, and effectively involving in decision-making related to fisheries management, both at the local and regional levels. Other difficulties constraining their growth include confusion over their respective organisation statutes overlapping, and incompetent managers who are struggling to create a framework for more structured and efficient work to strengthen their businesses and ultimately improve the sharing and use of information. At the operational level, the inability of associations to translate the ambitions of their statutes into concrete activities for various reasons, and offer a vision of what could be achieved in the medium and long-term, expresses the state of paralysis that associations find themselves in. These professional organisations are vulnerable.

In Madagascar, only a third of traditional fishermen belong to an organisation. The reluctance of fishermen to come together is mainly due to their individualistic nature and lack of confidence in other fishermen or associations. Support for traditional fishermen whose level of education is generally low is lacking, and because their involvement and participation in organisation is generally low they do not influence government decision-making (though they land about 70% of the national production). Cooperatives for traditional fishermen exist mainly in large villages and include several fishing associations (either called fisher cooperatives or fishermen unions). Professional organisations in Madagascar are non-profit making, governed by the Ordinance 60-133 of 3 October 1960 and are under the supervision of the Ministry of Decentralization and Territorial Administration.

In Mauritius there is no national structure or legitimate representative so the Mauritius Fishermen Cooperative Federation (MFCF) plays this role by 'default' and represents about one-third of the target population, namely fishers and resellers. Cooperatives are autonomous enterprises and compete with other firms, including other cooperatives. A large number of fishing cooperatives were initially created to benefit from subsidies and tax exemptions or help from financial donors. Often they are put on hold when the benefits stop and members then pursue their individual activity outside of the cooperative. A lack of information and training about the benefits of cooperatives means that most fishers are wary of working together. In the case of beach seine fishery, fishermen are forced to join cooperatives to access fishing licences which are given exclusively to cooperatives.

In Seychelles, professional and social associations are well structured. They have to be registered and operational to access state grants and the Corporate Social Responsibility Fund. The enthusiasm of fishermen to form associations is a recent phenomenon, though there had been several unsuccessful attempts in the past. The fishing community has become more aware of the need for recognition of their trade, human rights and an integrated and synergetic approach to combat degradation of marine environments. The main association is the Fishing Boat Owners Association (FBOA), which was created in 2003 and is the oldest organisation of professional fishermen in Mahé. The organisation caters for all actors working within the artisanal fisheries value chain on an equal basis, including boat owners, fishermen, fishmongers, processors and service providers. FBOA's office is located in the Victoria fishing dock. The association receives a grant from the SFA and has about 500 members, but only about 30 regularly pay their annual contribution of 500 SR. An FBOA representative is a member of the SFA board, liaising between the fishers and the SFA administration.

At the regional level, a new network of fisherfolk organisations has recently been set up (Fédération des Pêcheurs Artisans de l'Océan Indien) with support from the IOC/SmartFish programme. In a context where most of the IOC countries (Comoros, Madagascar, Mauritius, Reunion and Seychelles) have to face very similar fisheries development challenges, fisher folks from this region have indeed realised the importance to start sharing knowledge and experiences and network within a strong and efficient regional organisation with a view to directly influence fisheries policy decision processes at both the national and regional levels. It is worth noting that FPAOI partly mirrors what happened few years ago in the Caribbean with the set-up of the Caribbean Network of Fisherfolk Organisations facilitated by CTA and other partners.

Policy and regulatory challenges

For the development of the fisheries sector, various policies, programmes and projects are being implemented at country and regional levels, focusing on increasing production and ensuring quality assurance. These policies/ regulatory challenges differ from country to country depending on the priorities of the particular country. A few key policy areas for each country are explored below.

Mauritius

The New Economic Agenda

The New Economic Agenda (NEA) of the Government of Mauritius (World Bank, 2004) identifies the reorientation of the fisheries sector as a key priority. The governing principle is to restructure and consolidate, with a view towards exploiting new profitable opportunities, and venturing into the exploration of new technological avenues to engender economic growth, and by implication reduce poverty. Thus, although the manufacturing, tourism, services and ICT sectors have gained important ground in the Mauritian economy, fisheries/ ocean development (covering 2.3 million km^2) nonetheless remains a strategic priority. Presently fisheries contribute 1.5% to GDP.

In this context, the NEA stresses sustainable fisheries management:

- Reducing the pressure on overfished lagoon resources and encouraging fishermen to benefit from off-lagoon fisheries, thus protecting lagoons from unsustainable fishing;
- Building capacity of fishermen to fish outside lagoons – e.g in the FAD fishery demersal (>150 metres depth) fishery and the banks fishery (e.g. Nazareth and Saya de Malha Banks) and providing training and financial support to access larger/safe vessels;
- Building institutional capacity and coherence of fishermen through associations (group dynamics and management, financial management, savings and credit etc.);
- Value addition of fisheries products;
- Development of aquaculture in the lagoons.

The 10-year development plan

As part of the government's strategy for the fishing sector, a 10-year plan for development of the fisheries sector was introduced in June 1997. The plan concluded that there was limited potential for further exploitation of marine capture fisheries and that Mauritius should aim to maximise returns from existing fisheries through transformation of the catch landed and value addition along the value chain. The plan also suggested more sustainable management of marine resources.

The importance of functioning marine life as an attraction for tourism is being increasingly recognised. In view of the limited potential for growth of the fishing industry, efforts and investments have been concentrated on the development of a seafood hub in Mauritius. The seafood hub provides a one-stop-shop to facilitate imports and export of fish and fishery products, transhipment, processing, storage, distribution and re-exportation of value-added seafood products. In 2014, the seafood industry was the fastest growing sector with a turnover in excess of Rs 25 billion.

The Economic Mission Statement

The new Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands was set up to bring innovations within the sector and maximise benefits from the vast EEZ (2.3 million km^2).
The government's objective, as detailed in the Economic Mission Statement, is to transform Mauritius into an environmentally sustainable, economically vibrant, technologically advanced and innovative country with modern infrastructure, global connectivity and a highly skilled workforce.

The following priorities have been identified:

- Ocean economy as an important industry to sustain economic diversification, job creation and wealth generation;
- Pooling of all ocean-related activities under the new Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands;
- A new legal framework to license, supervise, monitor and regulate the activities of ocean-related economic operators;
- A new Fisheries and Marine Resources Bill incorporating international norms and practices for modernising the fisheries sector;
- Capacity building and training to improve the livelihood of fishermen.

The development of small-scale and commercial aquaculture remains the focus of the Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands. In this context, the Albion Fisheries Research Centre (AFRC) is being enlisted to provide technical support, provide juveniles and assist fish farmers to maximise production.

Legal frameworks

The Fisheries and Marine Resources Act 2007 constitutes the legal and institutional framework governing fishing in Mauritius, and incorporates international provisions that apply to the sector.

The Ministry of Fisheries is mandated to implement the strategy and manage fisheries development (detailed in five-year plans). The Ministry is assisted in this task by the AFRC with research, the Fisheries Protection Service with the enforcement of laws and regulations, and the Fisheries Training and Extension Centre with capacity building. Access to resources, by the semi-industrial, bank fishery and industrial (tuna) subsectors, is regulated by a licensing system. Artisanal fisheries are under an open access regime (with the exception of seine fishing, which requires a special permit). Seine fishing is also subject to some restrictions (no-take zones, annual closures of net fishing, etc.).

Seychelles

Goals

The main objective for the fisheries sector in Seychelles may be defined as the reinforcement of frameworks, processes and capacities and its operationalisation in both the public and private sectors and in the civil society, to facilitate the planning, design and implementation of appropriate fisheries development and management policies – as the basis of a new governance framework for the sector.

The achievement of the above goal requires:

- Establishment of a fisheries co-management process;
- Development of skill and capacity for stakeholders;
- Coherent fisheries policy that is in line with other ministries.

Policy coherence

Policy coherence is a major challenge for the fisheries sector. There are three main issues:

1. Lack of agreement on fisheries policy

This requires a clearer understanding of the functions and objectives of the institutions with responsibility for the sector, including delivering government expectations and overcoming national macro-economic constraints.

2. Management issues between commercial and recreational fishers

The conflict between commercial and recreational fishers concerns the management plans for pelagic and inshore demersal species. This issue would require a convergence of diverging interests and operational aspects of the two fisheries.

3. Management issues between coastal states (e.g. quota allocation – lack of agreement for bordering states)

There is a need to reinforce regional agreements between Indian Ocean states through international organisations that have responsibility for fisheries management, and in particular, that monitor tuna fisheries. National objectives must acknowledge these regional obligations and rationally manage their fish stock. There is also a need to strengthen specialised organisations and improve communication strategies.

A renewed policy dialogue to reach a consensus on improved fisheries development is warranted (Catanzano and de Lestang, 2013).

Compliance to legal framework

In compliance with national fisheries policy, Seychelles allocates fishing licences to several distant water fishing fleets, exclusively for offshore migratory species (tuna and tuna-like species). The main agreement in financial terms is the EU agreement (40 seiners and 12 long liners are authorised to be licensed). Other agreements with Japan, South Korea and Taiwan also exist, as well as agreements with vessels flying various flags of convenience. The Ministry of Natural Resources and Industry sets fisheries policy guidelines and the SFA is the executive arm of the Ministry responsible for all fishery-related matters.

Legal framework

A new Fisheries Act (2014) governs all aspects of the fisheries sector in Seychelles. Fisheries Amendment Acts regulate the fishing conditions for Seychelles and for foreign fishing vessels. The Licenses (Fisheries) Regulations (Ed. 1991), which complete this Act, define practical conditions of fishing licences issued for all vessels.

The 2014 Fisheries Act calls for more efficient and effective provisions for the management and sustainable development of fisheries in accordance with international recognised norms, standards and best practice, recognising the importance of an overarching ecosystem approach for fisheries. The Act: a) outlines licensing requirements for foreign fishing vessels, joint venture tuna fishing vessels, and local fishing vessels; b) regulates sport fishing, sport fishing competitions, recreational fishing, fishing activities and fishing-related activities beyond Seychelles' waters; and c) gives authorised fishery officers the power to categorise criminal offences on the basis of their seriousness and impose higher penalties for the most serious offences.

Madagascar

Sustaining the fishing industry [7]

The Government of Madagascar has listed a number of priorities for the fishery industry.

These are:

- Increase fisheries contribution to food and dietary security;
- Provide ongoing support to traditional and non-industrial fishing;
- Enhance existing regulation and enforcement of control measures to curb overexploitation and non-discriminatory use of gears in the sector;
- Support the establishment of land-based activities such as cold storage and processing, and/or rehabilitate facilities for the seafood industry;
- Develop industrial and inland fisheries.

No current official document specifies the government's fisheries policy (WAVES, 2013). Key fisheries are not expanding, exports and products in local markets are declining, overexploitation and environmental damage continues, and basic supporting infrastructure is missing.

The Agricultural Sector Plan

The Agricultural Sector Plan (2008) included fisheries, outlining a vision to move from a subsistence to a market economy. The Plan aimed to ensure food security, improve producer revenues, increase rural employment, increase commercialisation and ensure that future generations have access to plentiful water and soil resources and a rich biodiversity. How this will be achieved in the fisheries sector is unclear (WAVES, 2013).

Strategic Plan (FAO)

A strategic plan for the sustainable development of the aquaculture sector was prepared with support from FAO in 2005. The strategy – which covers fresh and marine waters, and commercial and non-commercial enterprises – aimed to improve production systems, promote aquaculture through awareness raising, research and commercialisation and improve management through regulation and control, monitoring and evaluation systems.

Madagascar/EU FPA

Madagascar signed the current FPA protocol between the EU and Madagascar on 19 December 2014 covering the period 1 January 2015 to 31 December 2018 with a financial contribution of €6,107,500, out of which €2,800,000 is dedicated to supporting Madagascar's fisheries policy.

Legal frameworks

The legal frameworks governing the fisheries sector are:

- Ordinance No. 93-022 of 4 May 1993, on fisheries and aquaculture regulation;
- Decree No. 94-112 of 18 February 1994, on the general organisation of marine fishing activities;
- Decree No. 2007-957 of 31 October 2007, defining fishing conditions for the coastal shrimp fishery.

7 Based on the IOC/SmartFish programme (2013).

Currently, no official document specifically and clearly defines Madagascar's fisheries policy. In three successive master plans for the fisheries and aquaculture sector, the government has more or less retained the same overall objectives, namely: the increase of foreign exchange earnings for the state, securing food for the population, improving socio-economic conditions of villagers, and job creation for small-scale farmers and fishermen. To achieve these objectives, the latest plan (2004–2007) has identified four strategic areas: (i) management for the sustainable use and preservation of the environment, (ii) development of the fish production sector and the export services, (iii) increase in fish production for the local market, and (iv) increase the availability of basic infrastructure such as fully equipped landing stations for fishermen and fish farmers. These could also be used for social activities. The 12 programmes planned to achieve this plan have yet to be completed due to a lack of resources.

Source: IOC/SmartFish Programme (2012; p. 33).

Other regulations governing the management of various traditional fisheries are outlined in local laws or *Dinas* (Malagasy social contracts) approved by village conventions. A Dina gives legal authority to village boards to apply their own rules. Examples include the implementation of bans, establishment of permanent or temporary reserves (for octopus) with openings and closures decided by the communities, and limits on the size of fish, crabs, lobsters and sea cucumbers. Cases of non-respect of Dinas have been noted.

Comoros

All fisheries development projects and programmes in Comoros – financed and supported technically by donors – are controlled by the Fisheries Directorate, which coordinates implementation measures and resource management. The Directorate conceives projects and seeks government approval. The Fisheries Directorate has a Fisheries Development Fund financed by industrial tuna fishing licences given to foreign fishing vessels operating within the EEZ of Comoros. However, the Fisheries Directorate lacks human, financial and material resources to adequately manage the sector and relies heavily on foreign aid for developments in the sector.

Comoros has fish resources estimated at 33,000 t annually, of which only 64% is currently exploited. Fish catches are used mainly for domestic purposes, mainly sold at landing sites and the main market in Moroni. Value addition is very limited to smoking, salting and drying of fish. Fishermen are organised in national and island fishing syndicates, and village fishing associations. The sector employs 6% of the population and contributes significantly to reducing unemployment and improving the income of poor families. The contribution to national GDP is estimated at 8%.

Policy framework

Until recently, Comoros did not have a proper fisheries policy and sectoral issues were addressed by agricultural policy department (ACP Fish II, n.d.). The lack of an appropriate framework for integrated planning of sectoral policy guidelines led the country to seek assistance from FAO for the implementation of a Technical Cooperation Programme (TCP) 2902 (2003–2004), which provided a fisheries law framework and national development strategy.

In August 2007, the fisheries sector was given a specific policy and legal framework through the enactment of Law No. 07-011/AT concerning fisheries and aquaculture for the Union of Comoros. Various consultations were held with the fishing community. The law is general in nature and was developed in line with usual practice in other south-western Indian Ocean countries where fishing activities are more developed. Nevertheless, the law provides for future development in the sector.

Comoros/EU FPA

The FPA concluded between the EU and Comoros covered the period 1 January 2005 to 31 December 2011 but was tacitly renewed for a period of seven years. The renewed FPA covers the period 1 January 2014 to 30 December 2016. Comoros receives an amount of €600,000, out of which €300,000 has been earmarked for the support of Comoros fisheries policy in order to promote fish sustainability in its waters under the FPA (EC, 2017).

Common key policy issues within the region

Some of the common key policy issues faced by countries within the region are listed below:

Conservation, management and sustainability of fishery resources

Declining catches in the artisanal sector has been noted over the last few years. The same areas have been fished for centuries, however increasing capacity within the same areas over the last decade has led to overfishing and declining catches. Addressing capacity and infrastructure is a priority.

Enhancing capacity at various levels of the public sector to improve food safety and facilitate regional trade

This would lead to a pool of well-trained staff, competent to tackle problems related to quality, norms and standards and other issues related to fish handling and marketing, thus reducing post-harvest losses. Additionally, product development and innovation for the artisanal fisheries sector in the region could be enhanced.

Establishing better conditions for knowledge transfer and networking within the IOC

The recently launched Federation of Artisanal Fishers of the Indian Ocean could be tasked with building capacity for fishers and creating a network for increased communication and knowledge transfer between fishers.

Encouraging improvements along the value chain and boosting innovation

Encouraging further developments along the value chain is a logical step towards boosting regional exports and intraregional trade.

Harmonising data-collection methodologies and analysis

This is a prerequisite for good decision-making at management level. Communicating reliable data to international organisations such as FAO is very important for further analysis and feedback.

Conclusions and possible pointers for CTA involvement

The artisanal sector in the region faces some common issues:

- Overfishing, declining fish catches and the sustainability of resources is a major concern for the region and needs to be addressed.
- Notions of fish quality, preservation on ice, value addition and value chains are alien to the sector. To achieve an acceptable level of fish quality, much more needs to be done with regards to quality assurance and post-harvest losses. Provision of basic infrastructure in some countries would greatly enhance and preserve the quality of the catch.
- A value-chain approach to fisheries development is not very common in the region. There is a need to promote and encourage a value-chain approach among actors within the sector, at the same time as improving coordination mechanisms among stakeholders and improving the gender responsiveness of fisheries value-chain initiatives.
- Information, communication and knowledge management are key factors for effective dialogue among stakeholders and would need to be prioritised along with capacity building, which is a prerequisite. A good communication strategy would enable stakeholders to network among themselves, prospect for new venues, develop appropriate marketing strategies and maximise opportunities. Probably this could be done through FPAOI.
- Countries within the region must set up, support and strengthen coordination platforms to bring together value-chain actors across the region to discuss issues and find solutions to challenges that affect the value chain. In this context facilitation of multistakeholder dialogue and policy engagement would certainly facilitate decision-making by concerned authorities.
- Promotion of ICTs as tools for collection and dissemination of information and networking is an urgent priority to enhance the fisheries value chain.
- Intraregional trade, especially the development of niche markets, may be required to boost regional trade.
- Addressing the issue of data collection and analysis to enable good decision-making at management level is vital across the region.

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ANNEX 1:

Key institutions and other coordinating structures

Mauritius

Institutions	Key relevance to fisheries
The Albion Fisheries Research Centre (AFRC)	The AFRC operates under the aegis of the Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Island. Its main responsibilities are to: (i) carry out research, monitoring surveys and studies needed for the sustainable development and management of marine living resources (fish stocks, coral reef etc.); (ii) provide support services to stakeholders of the fishing industry (including those involved in aquaculture development); (iii) provide advice to policy-makers on matters related to the management and development of marine resources and the conservation of marine environments including the creation of marine parks and reserves in accordance with the provisions of the Fisheries and Marine Resources Act and the Environmental Protection Act; and (iv) act as a focal point for collaborative research and management with regards to regional and international fisheries and marine resources.
Development Bank of Mauritius (DBM)	The DBM is the financing arm of the government in the implementation of socio-economic programmes. Initially a parastatal body in 1964, it is now a private bank providing loan schemes in various sectors of the economy such as agriculture, large-scale manufacturing and tourism, small and medium enterprises and industrial estates. The main areas of intervention for the agricultural sector are sugar cane, vegetables, livestock and miscellaneous agricultural products, where loans are provided on concessionary terms.
University of Mauritius (Faculty of Agriculture)	Originally founded as the School of Agriculture in 1914, the Faculty of Agriculture plays an important role in training and fostering intellectual development and research in the agricultural and food sectors. In addition to offering courses and training to students in the agricultural field, the faculty carries out research in various areas of agriculture, fisheries and aquaculture. It also provides in-service training to the staff of institutions in the agricultural and agro-industrial sectors.
The Fishermen Investment Trust (FIT) and the Fishermen Welfare Fund (FWF)	Both FIT and FWF operate under the aegis of the Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands. The main objective is to empower fishermen and look after the welfare of fishers and their families. Annually, various scholarships are offered to the children of fishers to pursue studies at secondary and university levels.
Mauritius Ports Authority	The Mauritius Ports Authority is responsible for port management.
Fisheries Training and Extension Centre (FiTEC)	FiTEC builds capacity of fishers in fishing gears, fishing methods, safety at sea, etc.
Coast Guards	The Coast Guards work in collaboration with the Fisheries Protection Service (FPS) to enforce fisheries laws and assist fishers in distress. They also carry out Monitoring, Control and Surveillance (MCS) activities in Mauritian waters.
Ministry of Fisheries	The Ministry of Fisheries is in charge of ensuring the sustainable development and management of fisheries resources, conservation and protection of living aquatic resources and the marine environment in the waters of, and of interest to, Mauritius and continued socio-economic benefits to stakeholders.

Ministry of Environment	The Ministry of Environment is responsible for the protection and management of the environment – so that its capacity to sustain society and its development remains unimpaired – and enhance quality of life of the population, environmental protection and sustainable development for present and future generations.
Ministry of Rodrigues (MoR)	The MoR represents the interests of the island of Rodrigues and is responsible for its administration and development. Together with the RRA, it is responsible for the formulation of policies for the development of Rodrigues, coordination with other ministries and NGOs to ensure timely implementation of all government policies, and the supervision of the Rodrigues Administration.
Ministry of Finance and Economic Development (MFED)	The MFED, as the principal instrument of policy, is responsible for the financial soundness of the government's economic policy and for the proper control of revenue and expenditure.
Mauritius Chamber of Agriculture (MCA)	The MCA groups agricultural producers and other persons or firms connected with sugar and other agricultural crops and industries. Its basic objective is to promote and safeguard the interests of the agricultural community. In this respect, it provides a necessary forum where agricultural problems are debated and recommendations are made concerning the development of agriculture and agricultural industries.
The Mauritius Council of Social Service (MACOSS)	MACOSS is the umbrella organisation for NGOs seeking to promote social and community development. As of August 2003, 169 organisations were affiliated to the council in various areas such as education, community development, poverty alleviation and environmental and sustainable development.
Mauritius Fishermen Cooperative Federation (MFCF)	The MFCF caters for 33 fishers' associations. The MFCF is part-financed by the Ministry of Cooperatives.
Fisher associations	Fisher associations cater for all fishers on the island, however, not all the fishers are members of an association.

Seychelles

Institutions	Key relevance to fisheries
Ministry for Natural Resources and Industry (MNRI)	MNRI is responsible for fisheries, including all aspects of policy specification and the Seychelles Bureau of Standards which is the Competent Authority (created in 2010).
Seychelles Fishing Authority (SFA)	Created in 1984, the SFA is the agency mandated to promote and develop fisheries. It is the executive arm of the government in all fisheries-related matters and employs over 120 staff.
Seychelles Ports Authority (SPA)	Created in 2004, the SPA is responsible for port management. It generates 80% of its fees from the fisheries sector and employs 100 staff.
Seychelles Maritime and Safety Administration	Created in 2004, the Administration sets and monitors rules on vessel safety and safety equipment in accordance with international norms and standards.
Seychelles Licensing Authority (SLA)	The SLA is responsible for issuing all fishing licences based on recommendations from SFA and was created in 1986.
Coast Guards	Created in 1994, the Coast Guards are responsible for MCS.
Islands Development Company (IDC)	IDC has a plane for hire and this is used for aerial surveillance.
Ministry of Foreign Affairs	The Ministry of Foreign Affairs leads negotiations for the Economic Partnership Agreement with the EU, is responsible for international relations, and deals with aid donors and international and regional organisations (IOC, COMESA, SADC etc.).
Maritime Training Centre (MTC), Ministry of Education	MTC is responsible for capacity development, focusing primarily on vocational training. The board includes fisheries stakeholders, including the managing director of SFA.
Development Bank of Seychelles	The Development Bank of Seychelles provides loans to the fisheries sector.
Seychelles Investment Bureau (SIB)	SIB is intended to be a one-stop-shop for foreign and local investors.
Seychelles International Business Authority (SIBA)	SIBA is responsible for offshore investment, and for granting Seychelles Investment Trade Zone status.
Seychelles Trading Company (STC)	STC is responsible for the import of basic commodities.
Fishing communities	There are no distinct fishing communities. The FBOA has 27 members and is trying to regroup other fishing associations under its umbrella. They coordinate with the SFA and discuss matters of concern for fishers. In total there are eight fishers associations in Seychelles.

Comoros

Institutions	Key relevance to fisheries
Ministry for Production, Environment Energy, and the Crafts Industry	The Fisheries Department falls under the aegis of this Ministry, which also caters for agricultural products, the environment, energy, industry and the small-scale cottage industries.
Customs Department	The Customs Department caters for all imports and exports from Comoros. All items are classified under the respective Harmonised System code.
Compêche	Compêche is a private fishing company operating an 18-metre-long fishing boat. The company has its own cold storage facility, ice making machine and distribution network. It operates outside the lagoon targeting demersal fish.
Fisheries Department	The Fisheries Department encompasses the statistics service, the inspectorate and the fisheries headquarters.
Village associations and cooperatives	There are 73 associations and cooperatives in Comoros at the village level, however they are not recognised by the authorities. The SNDPC is supposed to be an umbrella organisation regrouping all associations and cooperatives. The associations are supposed to solve their own development problems but they lack capacity, leadership and negotiation skills.

Madagascar

Institutions	Key relevance to fisheries
Ministry of Agriculture and Fisheries (MAEP)	This Ministry is responsible for the management of fishing through the Directorate of Fishing and Fish Resources.
Regional Directorate for Rural Development and the Regional Services for Fishing and Fish Production	These directorates are responsible for implementation of projects and providing services at a regional level. They work in collaboration with the councils for fishing and agriculture.
The Malagasy Fisheries and Aquaculture Agency (AMPA)	AMPA is a public-private entity, assisting the authorities in financing, monitoring, and evaluating external fisheries and aquaculture projects, ensuring their sustainability and preservation of resources.
The Marine Sanitary Authority (ASH)	ASH is responsible for ensuring the sanitary security of fisheries and aquaculture products, and controlling production conditions.
The Statistical Service (SStat)	SStat is responsible for the collection and management of data related to fisheries activities in Madagascar.
Regional Directorates	Regional Directorates are responsible for raising awareness of fisheries regulations, granting and renewing (and maintaining a registry of) fisher and fishmonger licences and permits, issuing certificates of origin and collecting statistics on fishmongers, collectors and exporters.
The National Centre for Oceanographic Research (CNRO) and the Institute of Marine Science (IHSM)	CNRO, currently unfunded, and IHSM, based in Tulear, are the key state research entities.
Fishers associations/ cooperatives	Only 33% of fishers are members of a fisher association. There are aquaculture associations, exporters associations, artisanal boat builders' associations, traditional fishers associations, fisher cooperatives and fisher unions.

ANNEX 2:

Structure of the fisheries value chain in the IOC region

The fisheries value chain may be defined as the full range of activities required to bring the fish to the consumer's plate, undergoing various processes such as production, primary and secondary processing, distribution, wholesale retail sales and finally consumption.

The support/logistics include input supply, financial services, transport, packaging and labelling, market research and advertising. Value is added at each step along the chain until the final product reaches the customer. Each step is geared to meeting the needs of the market. Value addition may take various forms such as innovation in production units or better processing equipment and improved packaging.

The following sections provide value chain analysis carried out in the region, mainly with regards to artisanal fisheries.

Value chain analysis of shark fisheries in Madagascar

This study implemented by the IOC/SmartFish programme and national authorities, and funded by the EU, aimed to assess existing markets for both traditional and artisanal shark fisheries in Madagascar to better understand the nature of relationships and linkages among buyers, suppliers, exporters and other market actors. In doing so, this analysis provided information that will help to quantify the financial benefits brought to Madagascar as a result of trade and export in these two fisheries.

Despite the significant pressures on Madagascar's shark fishery and the enormous socio-ecological and economic value of the trade, the country has no coherent or functioning shark conservation strategy or legislation. The lack of a national strategy is largely due to deficiencies in data on fishing effort, catches, landings and discards in all commercial fisheries for shark. This is compounded by a paucity of information on shark ecology, fisheries status and the socio-economic value of the trade throughout Madagascar.

Overfishing is causing dramatic declines in shark populations throughout Madagascar. The rapid decline of sharks is likely to have several negative socio-economic and ecological impacts, including the loss of livelihoods and protein for people who rely on them, and potentially altering the trophic structure of marine and coastal ecosystems. However, putting in place conservation measures and enforcing regulations remains a formidable challenge. Much of Madagascar's fishery takes place at remote fishing grounds scattered over thousands of kilometres of coastline; the fishers are highly mobile and move great distances to seek productive fishing grounds; the government lacks the means to monitor these fisheries and enforce regulations.

Supply chain and market structure

There are different supply chains for shark fins and shark meat, the two main products of traditional shark fisheries in Madagascar. Both are quite complex and rather fluid with trading routes within the chains altering according to location (proximity to urban centres), price, buyer availability, personal contacts or know-how of the individual fisherman, demand and product condition.

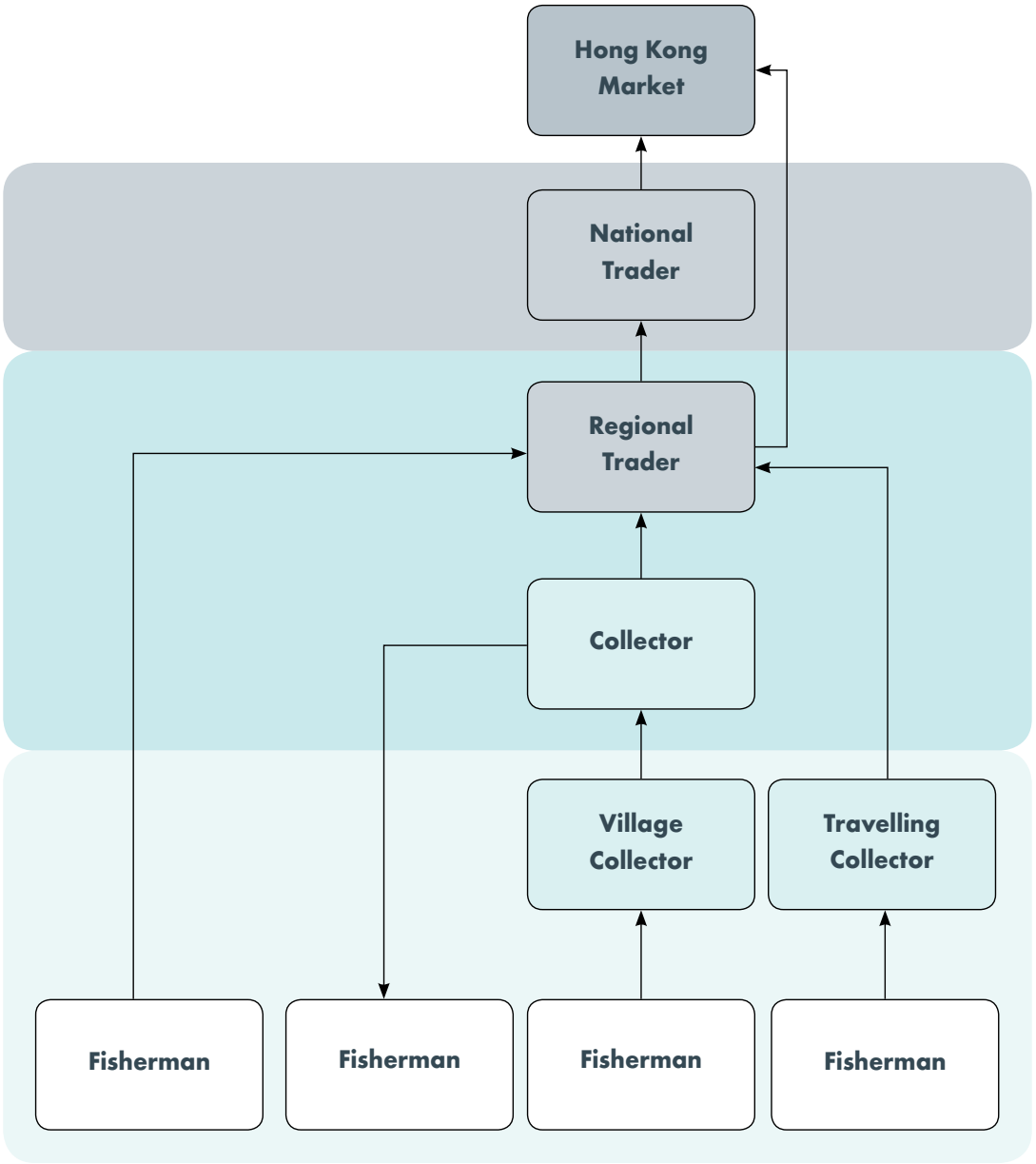
The final destination for the vast majority of Madagascan shark fins is overseas markets such as Hong Kong. The price paid for fins depends on fin quality and processing (i.e. whether sold fresh or dried). The price also fluctuates substantially depending on the status of the export market. The data collected in 2012 indicates that there is a considerable mark-up in price as you move up the supply chain, although reliable information was only collected for the first two links in the chain. The data revealed that if fishers sold their

fins directly to the main collectors rather than to local buyers they could increase their income by almost 40% for first quality fins, which in 2012 were equivalent to just under €18 and €26/kg for wet and dried fins respectively. Higher values can also be obtained for other fin grades (generally 50–60% increase) with the greatest percentage increase recorded for dried fourth quality fins (136%). There are no data for the costs to fishers of transporting fins to the main buyers or for the time spent drying and sorting fins. Sales are mainly to local collectors and main collectors in town.

Table A2.1. Average shark fin prices based on quality, processing and supply chain (€/kg)

Fisher selling to local buyers				
Quality	**Wet fins (n=4)**	**(n=5)**	**Dried fins (n=4)**	**(n=6)**
First	27.3	38.5	42.7	49.8
Second	14.4	17.8	21.5	27.8
Third	5.0	8.6	7.2	14.8
Fourth	1.9	3.4	2.2	5.3
Fisher or local collector selling to main collector in towns				
Quality	**Wet fins (n=3)**	**(n=3)**	**Dried fins (n=4)**	**(n=6)**
First	41.2	48.8	58.4	69.5
Second	23.0	28.7	33.0	39.6
Third	9.6	14.4	15.8	21.5
Fourth	2.9	6.0	5.7	10.8

Figure 1. Shark-fin supply chain



The supply chain for the trade of shark meat is also quite complex (Figure 2). Traditional fishers in the south-west returning daily to their home villages may keep fresh shark meat to feed their families, give it away for free to other members of the community (e.g. the poor or old), or sell any excess to other villagers or buyers for the local market. Fishers in more remote locations will dry and salt the meat before sale. Meat is sold as fresh or dried/salted in local and nearby urban markets. Generally fresh meat is sold and consumed locally while dried meat is bought by collectors and transported to inland urban markets in Madagascar. Some dried shark meat is also exported. The annual estimate of shark fin collection in Madagascar in 2012 fluctuated between €3.88 and €4.76 per kg for dried shark fin.

Figure 2. Shark-meat supply chain

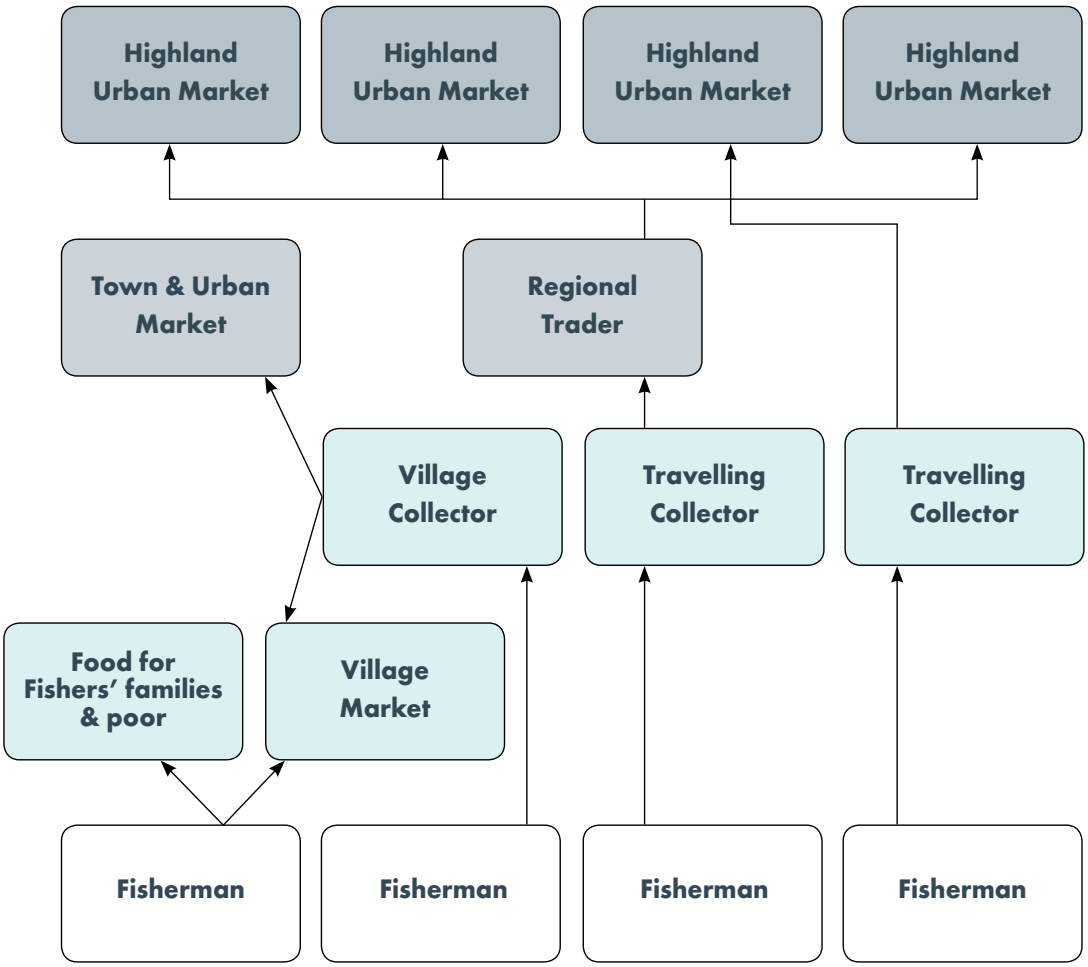


Table A2.2. Shark meat prices according to processing and supply chain (€/kg)

Transaction	Fresh meat Maximum	Minimum	Dried Meat Maximum	Minimum
Fisher to villagers/Local collector	0.30 (7)	016 (10)	0.47 (6)	0.39 (7)
Coastal market sale	0.57 (1)	0.46 (1)	n.d.	n.d.
Local collector to main Collector	n.a.	n.a.	0.52 (1)	0.40 (1)
Main collector to regional trader	n.a.	n.a.	0.63 (1)	0.57 (1)
Highland market sale	n.a.	n.a.	n.d.	n.d.

Figures in brackets indicate number of replicates; n.d. = no data; n.a. = not applicable.

Note: Dried meat sold to local collector only (not villagers)

Industrial fisheries

The vast majority of fins collected by industrial fisheries, whether legally or illegally, do not enter the national fin trade. Data was not available from large-scale commercial vessels fishing offshore within the Madagascan EEZ. Almost none of the sharks caught by industrial trawlers are landed in Madagascar. The exception to this are some illegal shark fins sold to buyers in Antsiranana by tuna seiners when they land there. These fins would enter the same supply chain described for traditional and artisanal fisheries. Available production figures show that shark fisheries in Madagascar are now overexploited with overall shark production falling from 50 t in 1997 to 15 t in 2002 (Soumy, 2004). Legal exports of shark fins peaked in 1994 at almost 65 t, corresponding roughly to 6,500 t of live sharks. In 2010, shark fin exports were of 32 t, which was a 50% drop in exports over 16 years.

Challenges and recommendations

The main challenges may be summarised as follows:

- Ecological: Sharks have a relatively low productivity and therefore require careful management and monitoring if they are to be utilised sustainably. Some species have critical habitats such as a nursery, mating area and migration lane, which need special protection.
- Due to paucity of data in the small-scale sector, assessment, monitoring and management are quite often inadequate. Management is also often poorly enforced or lacking. This particular gap needs to be urgently addressed.
- Illegal, unreported and unregulated fishing in offshore Malagasy waters is a matter of concern. Establishing an effective MCS could address the situation to some extent.
- There is a need to address the low income received by the traditional sector when selling shark fins to local collectors.

Value chain analysis of artisanal fisheries (Mauritius)

The Ministry of Fisheries and Rodrigues commissioned a value chain analysis of artisanal fisheries in Mauritius and Rodrigues. This study was executed by the IOC/SmartFish programme and funded by the EU. Its principal objective was to assess the economic performance, production and marketing channels of the sector.

A major concern for artisanal fisheries is the absence of a food safety and quality standard along the supply chain, from capture to consumption. Preservation of fish on board boats is rudimentary or non-existent. Flake ice is not always available around the island, particularly at fish landing sites. Traditional boats are not equipped with fish holds and iceboxes are simply not used.

For the value chain assessment, artisanal fisheries were classified into five typical fishing units or enterprises using fishing gears and operational strategies as key determinants:

- Handline fishery (HL)
- Basket and Trap fishery (BT)
- Large Net fishing fishery (LN)
- Non-motorised handline fishery (N/M HL)
- On-foot handline and harpoon fishery (On/FT)

Data on costs and revenues were collected by secondary and primary surveys on each of the selected fishing enterprises in different regions of the country. Economic efficiencies/ profitability of these fishing units were determined by calculating the cost of production and profit margin. The break-even quantity fish that needed to be caught was determined by assuming a minimum salary of Rs 10,000 per month as the cost for fishing labour.

Supply chain and market structure

Currently there are 2,066 fishers registered as artisanal fishers. They land their catch at 60 prescribed landing stations. Various species are caught by fishers and are sold fresh at landing sites. Since 2004, the catch from the artisanal fisheries has been declining due to overfishing and overcapacity within the sub-sector. Table A2.3 gives data on the catch over the last five years. The estimated catch of 650 t from sports fishery and landings from the banks has been excluded.

Table A2.3. Supply of fresh fish from the artisanal sector

Type of fishery	2010	2011	2012	2013[1]	2014[2]
Artisanal fishery - Mauritius	831	892	705	559	460
Amateur fishery*	300	300	300	300	300
Barachois	-	1	2	2	2
Ponds (prawn and fish)	66	60	75	78	71
Marine aquaculture (cage)	498	460	432	340	n.a.
Fish Aggregating Device	330	258	233	240	n.a.
Total	2,025	1,971	1,747	1,519	833
1. Estimates 2. Provisional					

The fresh fish market is supply driven and the market price is quite volatile. In fact, there are 400 active fishmongers chasing 830 t of fresh fish annually. An increasing number of fishmongers are owners of fishing boats as a business strategy to secure a regular supply of fish. Some others act as indigenous bankers to fishing enterprises to get priority in purchasing their catch. An increasingly large number of fishing enterprises in the coastal areas have also diversified into roadside fish retailing as a household business.

The following fish marketing channels were surveyed:

- Roadside fish vendor (supplied by a handline fishing enterprise)
- Roadside fish vendor (supplied by a basket-trap fishing enterprise)
- Supermarket fish stall (supplied by handline fishing enterprises)
- Institutional fish market (supplied by a wholesaler)
- Non-motorised fishing enterprise selling directly to end-consumers
- On-foot fisher selling directly to end-consumers.

The distribution of value-added fish and fish products between the fishing and sales people is equitable. The stakeholders in the value chain are dynamic, efficient and adaptive to uncertainties and high risks common to artisanal fisheries. Distribution of profit margin between production and marketing is also fair.

Market channels for fresh fish in Mauritius

The domestic markets of fresh fish are supply driven and the suppliers dictate the price. The market is highly flexible and adapts itself constantly to supply. The main marketing players are the fishmongers, commonly called "Banyan". The primary sale takes place at the fish landing stations (FLSs). There are about 400 fishmongers chasing about 830 t of fresh fish annually for the consumption of the local population and foreign visitors. The per capita consumption of fish and fish products in Mauritius was 23.1 kg in 2013 while the contribution of the artisanal fisheries to fish consumption is less than 1 kg. There is no VAT on fish and fish products.

The marketing strategy of a fishing enterprise depends on the species targeted and the level of catch that fluctuates intra-annually and from year to year. Generally, a large net fishing unit harvests a relatively larger quantity of fish in a single fishing trip and requires a more significant distribution and marketing network. Hook and Line (HL) fishing enterprises target high-value demersal fish such as groupers, snappers and sea breams, which are sold directly to end consumers and restaurants at a premium price. The use of mobile phones is also becoming an increasingly important marketing tool for HL fishing units as they start marketing their catch at sea, before returning to shore.

Table A2.4. Distribution of value added between fishing and marketing segments

Items (€/kg)	CSP	COP	MC	COS	TP	FP	MP
	6.37	4.13	0.53	4.60	1.77	0.91	0.86
BT/Roadside retailer	4.21	2.26	0.60	2.86	1.35	1.03	0.33
HL/Supermarket retailer	8.93	4.08	2.19	6.27	2.66	0.91	1.74
LN/Inst. market retailer	4.27	2.26	0.33	2.60	1.67	1.09	0.58
O&S Boat - HL/Direct sales	6.37	3.40	0.53	3.92	2.45	1.60	0.86
On foot/Direct sales	3.97	0.84	0.26	1.10	2.87	2.59	0.28
Mean (€/kg)	5.69	2.82	0.74	3.56	2.13	1.36	0.77
Mean (%)		50%	13%	63%	37%	24%	13%

CSP - Consumer Sale Price; COP - Cost of Production; MC - Marketing Cost; TP - Total Profit; COS - Cost of Sales; FP - Fishing Profit; MP - Marketing Profit HL- Handline; BT-Basket Trap; LN- Line; O&S - Oars and Sail

Market structures and marketing channels in artisanal fisheries are dynamic and adaptive. The main strategy is to sell unloaded fish as soon as possible to avoid spoilage. A single fishmonger may act as a wholesaler and retailer to better cope with changing supplies and their sale capacity. It is noted that there is a serious problem of overcapitalisation in the artisanal fisheries.

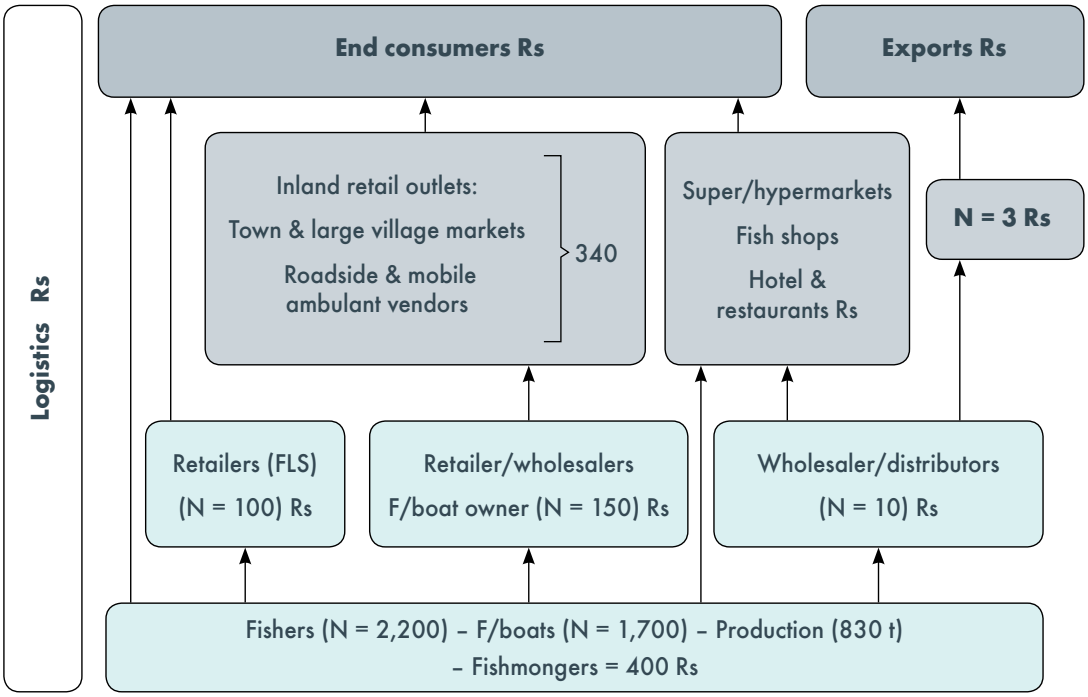
The industrial fishery

Some 236 foreign fishing vessels call at Port Louis for transhipment activities annually. The majority of the vessels are tuna longliners coming from Asian countries for transhipment and other activities including loading/unloading of fish and fish products, bunkering, change of crew, provisions, repairs and other ancillary activities. In 2012, albacore tuna constituted some 40.3% of total catch transhipped and licence fees obtained from foreign fishing vessels amounted to €1.18 million.

There were two main tuna processing plants on the island, but in early 2015 the two factories merged. The local cannery (the Princes Tuna Canning Factory) and the Thon des Mascareignes engaged in the production of tuna loins, imported 147,000 t of raw tuna from European vessels operating in the Indian Ocean and exported 102,000 t of canned tuna and tuna loins to the EU and other markets. Fish oil is produced mainly from the waste of tuna canning and tuna loin factories. Some 1,016 t was produced out of which 869 t was exported to Madagascar, Hong Kong and Korea in 2011.

Mauritius is also emerging as a world-class seafood hub for trading, warehousing, processing, distributing and re-export of fresh, chilled and frozen raw fish as well as value-added seafood products. It has attracted international seafood players from countries like France, Japan, Malaysia, Spain, Sri Lanka and the US. The seafood sector generated a turnover of Rs 22.28 billion (€583.2 million) in 2012. Revenue for the national budget in the form of foreign licence fees, import permit licence fees and sale of produce in 2012 amounted to Rs 39.7 million (€1.03 million). In 2012, 236 fishing vessels were licensed and 851 foreign fishing vessels called into port for transhipment, bunkering, repairs and maintenance and dry-docking. This generates significant revenue for the country. Mauritius is an attractive platform for transhipment, mainly for longliners and for value-added seafood activities.

Figure 3. Flow chart of the market channels of fresh fish in Mauritius



Challenges and recommendations

The study made the following recommendations:

- There is a potential risk of overfishing in artisanal fisheries because the active fishing capacities significantly exceed the sustainable level. There is an urgent need to undertake a risk assessment of fish stocks harvested in the lagoons and off-lagoon.

- The coastal ecosystem is under more intense pressure from an increasingly large number of (non-registered) professional, amateur and sport fishers. To curb the prevailing open access environment, a survey on the activities of these fisheries should be conducted, leading to the implementation of an appropriate regulatory framework to manage and monitor these fisheries, the same way artisanal fisheries are.

- The current fisheries statistical model, including sampling and data-collection strategies, has outlived its purpose and should be replaced. A new system must be capable of integrating the activities of amateur and sport fisheries.

- An appropriate bioeconomic[8] model for artisanal fisheries has to be developed to serve as a management tool.

- There should be no compromise regarding safety and quality of fresh fish placed on local markets.

- Prospects for the development of micro- and small-scale processing and value addition activities will grow progressively with an increase in the supply of fresh fish. FiTEC will have to adopt a pro-active and one-stop-shop approach to assist potential investors through project facilitation, and training in technical and entrepreneurial skills and mentoring.

- To strengthen the management and extension capacities of AFRC, an Economic Observatory headed by a fisheries economist should be created. It will be responsible for all socio-economic issues related to the fisheries sector, including cost-benefit analysis of policy decisions, socio-economic surveys and technical support to FiTEC.

- A pilot project is necessary to empower local fisher communities in local governance, leadership, participatory management, to lead to a shared commitment and responsibility in policy formulation and voluntary compliance. It is also important to improve infrastructure to co-manage local fisheries, such as through FLS.

Analysis of the value chain of the artisanal sector in Rodrigues

The Rodrigues study complements the study carried out for Mauritius in the artisanal fisheries sector. The objectives were to allow for objective planning for potential interventions, to assist in the move towards a more market driven and sustainable fishery that would enhance and contribute to the growing demand for fish in the country, and investigate and enhance exports from Rodrigues to markets in the region, namely Mauritius and Reunion island.

This report also looked at the different types of fishing methods within the artisanal sub-sector, such as the handline (motorised and non-motorised), basket trap, large net and on-foot fishery. It provides a detailed analysis and assessment of performance with respect to catch potential and capacity/overcapacity vs. stocks. The impact on local fishing communities, as well as the broader issues of increasing demand in the region is highlighted, and recommendations for short-term interventions are presented.

8 Bioeconomic modelling is widely advocated as the paradigm to support integrated environmental management. The term 'bioeconomic' is broadly used to indicate that a model has both economic and biophysical components (Knowler, 2002).

Supply chain and market structure

Rodrigues is located 650 km east of Mauritius in the West Indian Ocean and has a population of approximately 40,000. About 40% of the island's population live below the poverty line. There is no major agriculture export or industry in Rodrigues and the few existing small-scale industries mainly supply the local market. Most households are rural and depend on subsistence agriculture, livestock rearing, artisanal fishing in lagoons and microenterprises for food and income.

The fisheries sector of Rodrigues comprises 1,410 registered fishers and 821 fishing boats while the total fish production is approximately 1,600 t. The gross annual revenue generated by the various types of fishing activities (excluding sport fishery) is estimated at Rs 174 million (€4.6 million) on the basis of a mean producer sale price of Rs 109/kg (€2.8). Seventy per cent of the artisanal fishing boats are traditional wooden boats with oars and sails about seven metres long. Other boats include eight-metre-long fibreglass boats using 15 horsepower outboard engines. The price of a new fishing unit costs approximately Rs 300,000 (€7,853), Rs 200,000 (€5,235) for an eight-metre fibreglass fishing boat and Rs 100,000 (€2,617) for an outboard engine. An increasing number of wooden canoes use outboard engines and sails to reduce fuel consumption. The artisanal sector thus provides an annual income of Rs 123,404 (€3,230) per registered fisher, i.e. Rs 10,283 (€269.2) per month.

Marketing

Marketing infrastructure is virtually non-existent on the island. Raw fish is sold on the beach (at FLSs) or on the roadside. There are no sheltered FLSs that can be used for handling, sorting and grading of fish prior to sale. Simply improving landing facilities (better sorting and grading of raw fish by commercial category) will increase the revenue of a fishing enterprise by 5 to 10%.

The use of isotherm boxes, flexible containers and ice flakes is necessary to enhance the value chain of high-value fish species on local and export markets. The implementation of world-class food safety, quality and traceability standards in the seafood sector is a pre-condition for export-oriented market development. These are presently non-existent in Rodrigues.

Efficient downstream logistics have to be developed. A refrigerated supply chain is more appropriate for industrial or large-scale fisheries due to the high initial investment. In artisanal fisheries, refrigeration is more important for preserving unsold fish.

Leadership and management

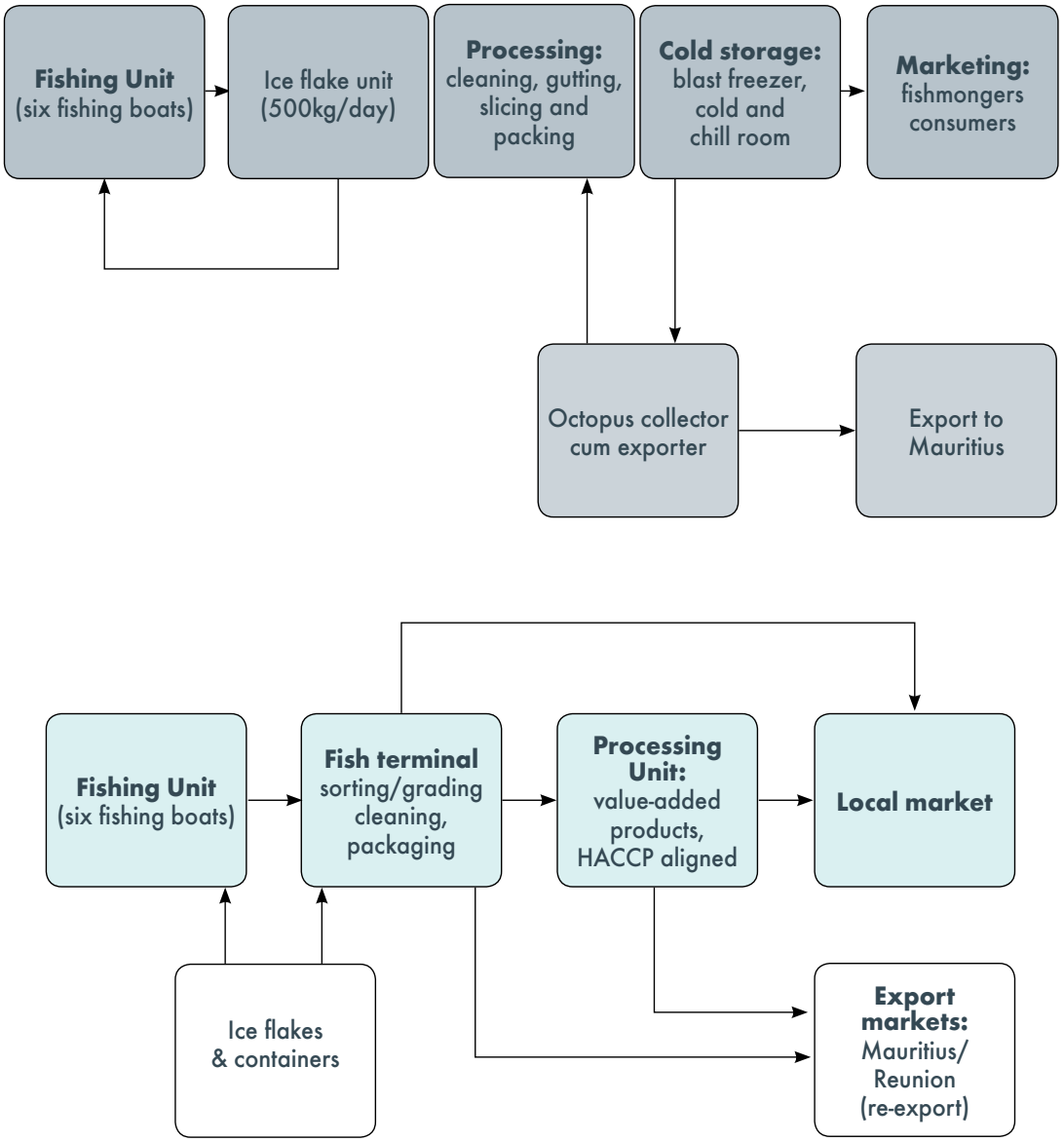
Local leadership and community-based management capabilities have to be developed within the community to ascertain their active participation in voluntary MCS compliance with regards to coastal fisheries, fish handling, preservation practices and shared management of fisheries infrastructure[9] by the fishing community. There is a strong political determination to create an enabling business environment in Rodrigues. These efforts must result in the development of crucial infrastructure facilities such as FLSs, an integrated fishing terminal, export logistics for chilled fish and fish products, promotion of export market development, private local and foreign investments, joint venture/ strategic alliances with interested parties and domestication of foreign fishing and processing companies.

Octopus fishery

Some 524 octopus fishers are registered with the FPS, out of which about a third (182) are women (known as *piqueuses d'ourites*).[10] Fishers aged between 41 and 50 years make up 46.7% of fishers. Octopus fishers work on foot and trampling destroys the delicate coral structures and the algal matting which form both a habitat and primary food source for many marine animals. Fishing is done at low tide when fishers equipped with iron rods/harpoons, pace up and down the coral barrier in search of holes where octopuses nest. This has led to a decline in the octopus population (the single most important species for Rodriguan fisheries) and landings have declined considerably.

9 Presently there is a tendency to leave the management/maintenance of the infrastructures with the authorities.
10 Women octopus collectors.

Figure 4. Value chain of chilled fish



Fishers are aware of the problems affecting the octopus fishery and fully understand the connection between high fishing pressure and dwindling stocks and that poor fishing practices result in habitat degradation and a decline in the fishery.

Close season, value addition and marketing

In July 2012, the RRA, working in collaboration with the SmartFish programme, adopted the closure of the octopus fishery for two months from August 2012 to October 2012. This has continued. The impact of this voluntary closure has been positive and larger-sized octopuses are being caught just after the closures, representing an overall greater annual catch as a result. Successive closures in 2013/14 have increased production and landings of octopus in Rodrigues (IOC, 2014).

Middlemen (see Figure 5) may be defined as those collectors of octopus for further processing or for resale.

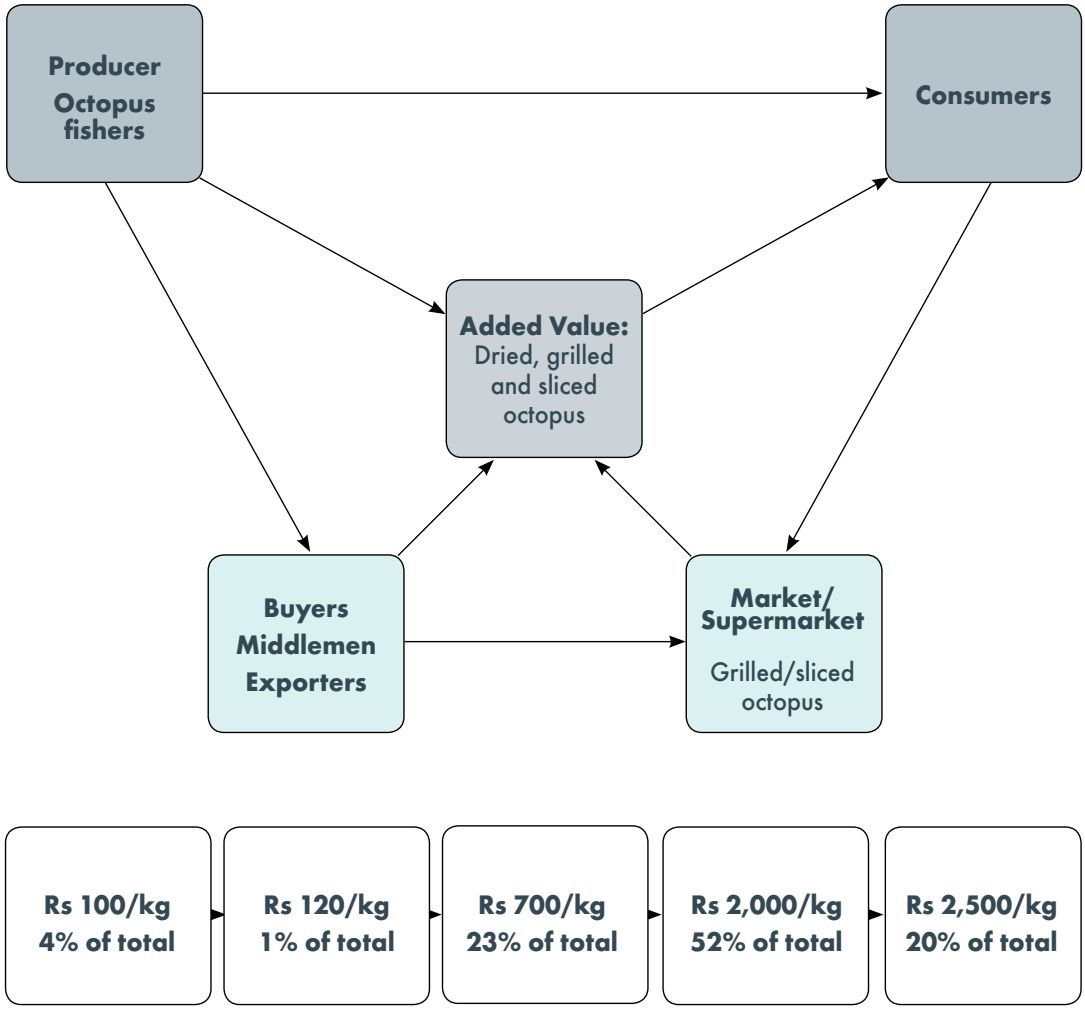
As a further step to its commitments for Rodrigues, the SmartFish programme initiated a project to improve value addition for dried octopus, producing grilled and sliced octopus for eventual marketing in Rodrigues and Mauritius.

Challenges and recommendations

Various recommendations have been made to enhance the value chain in Rodrigues.

- Two major hurdles have to be removed in order to link local chilled fish value chains to the Mauritian seafood hub, namely cost-effective transportation (sea and air), logistics and compliance to international sanitary and health standards and Hazard Analysis Critical Control Point (HACCP) alignment. Reunion Island has to be targeted as a prospective market for raw fish and fish products.
- Establish coastal fisheries management to encompass effective MCS measures.
- Enforce food safety and quality practices for fish and fish products sold in local markets and for export.
- Develop refrigeration systems such as cold stores.
- Extend activity of the competent authority to Rodrigues to build capacity in food safety, quality standards and HACCP alignment in the local seafood sector.
- Regulate and monitor the activities of amateur, leisure and game fishers (including on-foot fishers) in coastal fishing zones.
- Extend extension and facilitation services: training, re-skilling and mentoring.
- Improve transfer of technology and capacity building in quality assurance.
- Increase fisheries exploration and testing of more efficient fishing technologies.
- Provide suitable loans for asset and working capital finance for fisher folk, artisanal processors and traders.
- Promote a banking and saving culture.
- Provide financial literacy, entrepreneurial skills (pricing and costing) and business management training.
- Implement strategic alliance/partnership for partial processing of local catch and final processing in other markets.
- Promote second and third cycle of processing activities (ready-to-cook and ready to eat products).
- Improve product research and development.
- Opening more export markets.
- Increase market intelligence to obtain real-time market information.

Figure 5. The existing octopus value chain



Supply chain for the mangrove crab in Madagascar

The IOC/SmartFish programme (funded by the EU) conducted a study in 2012 in collaboration with the local authorities on the supply chain of the mangrove crab (*Scylla serrata*). The exploitation of the crab in Madagascar is an exclusively traditional fishery, conducted on foot or with small non-motorised fishing boats, using very simple and inexpensive fishing techniques. In their marketing network, live crabs are usually handled with mud for preservation. Collectors, deputy collectors, as well as fish merchants and vendors at the local market, act as informal sector operators. They use few employees and have little capital. Their investments in collection processes are small, with most made using their own funds, often supplemented by their family. Access to credit is often non-existent. On the other hand, exporting collection companies have: i) inland infrastructure (processing plants) which meet European standards in most cases; and ii) modern collection equipment.

Production and supply chain for crabs (Madagascar)

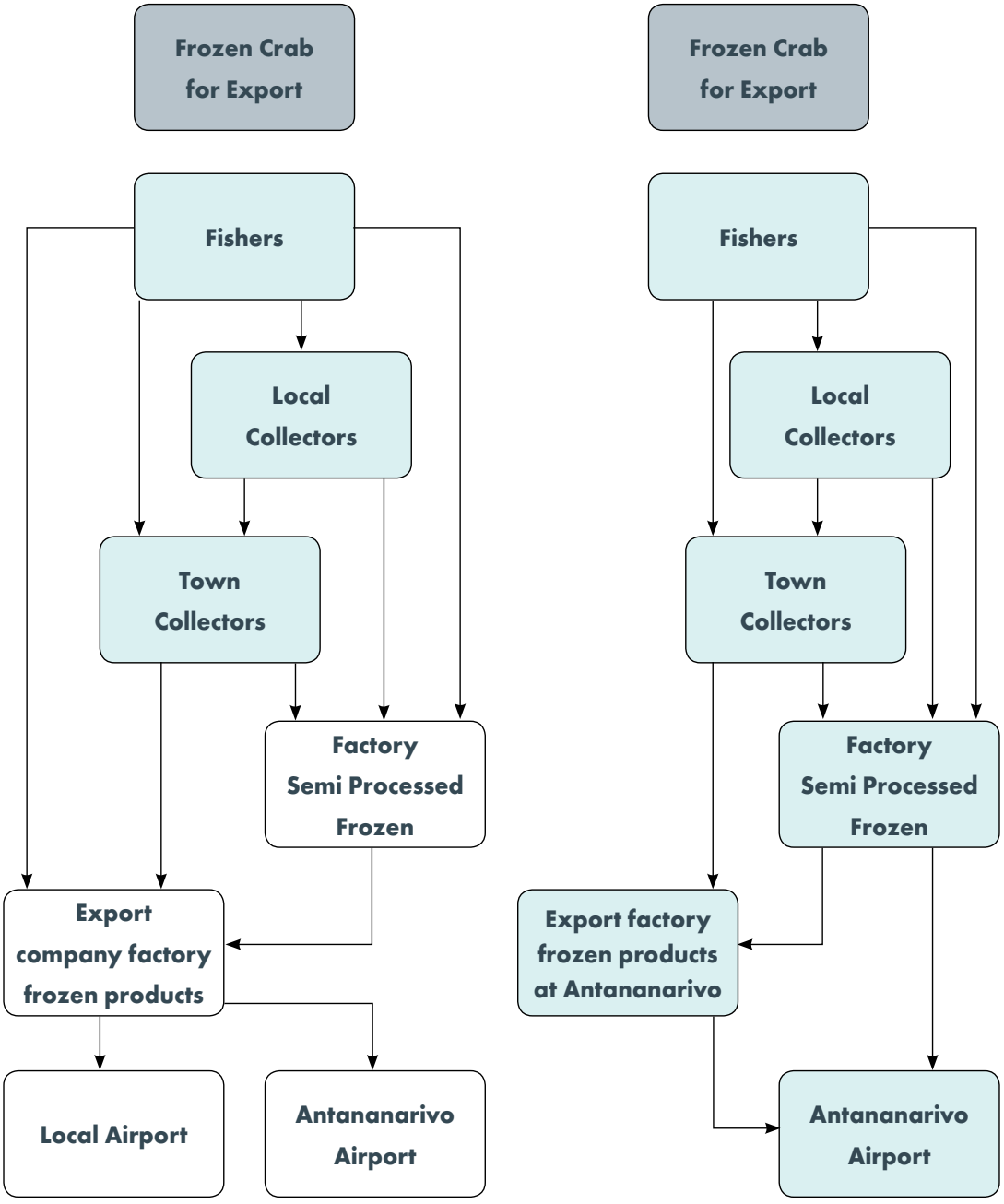
Between 1985 and 2010, according to official statistics (which are greatly underestimated), crab fishing more than quadrupled. Its growth has accelerated markedly over the last three years, reaching 2,500 t/year.

The main reasons for this growth include:

- Strong demand accompanied by rising prices on the international market (75% of the total catch of Malagasy crabs are exported);
- Underutilised potential in crab production (7,500 t/year);
- Profitability of the sector, enabling export companies to pay fishermen, fish wholesalers and sub-collectors more.

The value of the catch must be improved because of the following issues: a very high post-capture mortality rate (22% on average, but up to 50% or more during heavy rains); the predominance of some types of under-valued products (crab pieces: 93% in weight and 73.2% in value of total exports) exported; and few geographic destination of exports (over 80% to France).

Figure 6. Chain for crabs scheduled for export



Marketing and trade

For the same year, the sale of crabs to IOC countries (Mauritius and Reunion/France) constituted 20.2% of the total export of Malagasy products. Taking into consideration the size of these two islands this is relatively high, which confirms the tradition of regional collaboration.

On the other hand, the export of live crabs still presents a challenge. As a consequence, several companies abandoned this activity. In this context, it seems necessary to carry out a specific consultation specifically oriented towards the export of live crabs, both to Asian countries as well as within the region (Mauritius, Reunion and Mayotte). It may be associated with some pilot projects for the enlargement of crab production at village level (carried out by fishermen's wives, in collaboration with one or more export companies).

Recommendations

To further develop the crab sector, a range of actions would be required that would be relevant for both fishing authorities and economic operators. The most urgent actions – excluding the export of live crabs – are:

- The application and enforcement of existing legislation on the exploitation of mangrove crabs with regards to compliance with the regulated minimum size;
- Amendments to this legislation (increased minimum size and/or introduction of closed fishing periods) should be preceded by a biostatistics study, carried out over 12 months;
- Implementation of a programme to reduce the rate of post-capture mortality, estimated at 22%, to 15% within two to three years;
- Revision of the system for estimating catches of crabs, including post-capture mortality, and review of the conversion coefficients (live weight to finished products).

The Technical Centre for Agricultural and Rural Cooperation (CTA) is a joint international institution of the African, Caribbean and Pacific (ACP) Group of States and the European Union (EU). Its mission is to advance food security, resilience and inclusive economic growth in Africa, the Caribbean and the Pacific through innovations in sustainable agriculture. CTA operates under the framework of the Cotonou Agreement and is funded by the EU.

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