

FISHERIES MANAGEMENT PLAN OF SIERRA LEONE

MARINE FISHERIES SECTOR

2020 - 2025

MINISTRY OF FISHERIES AND MARINE RESOURCES 7th Floor, Youyi Building, Brookfields, Freetown



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ABBREVIATION

AIS:	Automatic Identification System
CECAF:	Committee on Central Eastern Atlantic Fisheries
CMA:	Co Management Association
CMSY:	Catch Maximum Sustainable Yield
CPUE:	Catch Per Unit Effort
EAF:	Ecosystem Approach for Fisheries Management
EEZ:	Exclusive Economic Zone
FAD:	Fish Aggregating Device
FAO:	Food and Agriculture Organization of the United Nations
FMP:	Fisheries Management Plan
GCLME:	Guinea Current Large Marine Ecosystem
GDP:	Gross Domestic Product
GEF-AF:	Global Environment Facility-Additional Financing
GoSL:	Government of Sierra Leone
GRT:	Gross Registered Tonnage
ICCAT:	International Commission for the Conservation of Atlantic Tunas
ICLARM:	International Centre for Living Aquatic Resources
IEZ:	Inshore Exclusion Zone
IMBO:	Institute of Marine Biology and Oceanography
ISFM:	Institutional Support for Fisheries Management
JMC:	Joint Maritime Committee
KPIs	Key Performance Indicators
MDAs:	Ministries, Departments and Agencies
MFMR:	Ministry of Fisheries and Marine Resources
MAF:	Ministry of Agriculture and Forestry
MoE:	Ministry of Environment
MoFED:	Ministry of Finance and Economic Development
MPAs:	Marine Protected Areas
NPOA-IU:	National Plan of Action to Deter, Prevent and Eliminate Illegal Unreported and Unregulated
R/V:	Research Vessel
RFMO:	Regional Fisheries Management Organization
ScOP:	Scientific Observer Programme
SLAFUC	Sierra Leone Artisanal Fishermen Consortium Union
SLMA:	Sierra Leone Maritime Administration
SRFC:	Sub Regional Fisheries Commission
SETC:	Scientific Economic and Technical Committee
USSR:	Union of Soviet Socialist Republics
VMS:	Vessel Monitoring System

Executive summary

The fisheries sector is a vital component of the economy of Sierra Leone. Sierra Leone's fisheries are worth an estimated harvestable value over US\$100 million annually with a total biomass value of about US\$500 million. It provides direct employment to some 200,000 persons and indirect employment to some 600,000 persons. The sector contributes 12 % to the country's GDP.

The fisheries resources of Sierra Leone have been subjected to continued fishing pressure for decades by commercial industrial fishing vessels and the artisanal fishing fleet. Previous and current scientific estimates indicate decrease in biomass of key commercially exploited fish species with evidence of overfishing between the years of 2016-2018. This situation is due to the weak implementation of management measures coupled with inadequate enforcement capability to ensure compliance of management measures. To reverse this current trend of stock depletion, the Ministry of Fisheries and Marine Resources (MFMR) has come up with conservation and management measures that will rebuild the stocks to a sustainable level that will support the socio-economic development and food security and wealth creation for everyone.

It is against this backdrop that the MFMR in collaboration with relevant stakeholders has developed the Fisheries Management Plan (FMP) for the marine fisheries sector as stipulated in the 2018 Fisheries and Aquaculture Act. The FMP will seek to achieve the following objectives:

- i. To regulate the fishing effort by fishing fleets in both the industrial, semi-industrial and artisanal sub-sectors to a level that will ensure sustainable exploitation of fish stocks at maximum economic yield (MEY)
- ii. To improve the status of target fish stocks within biologically acceptable levels
- iii. To protect aquatic and marine habitats and biodiversity
- iv. To improve the knowledge-base on the status of the fish stocks
- v. To effectively implement the fisheries legislation and regulations
- vi. To enhance value addition and export opportunities
- vii. To strengthen stakeholder engagement in decision making process
- viii. To ensure compliance with regional and international fisheries instruments
- ix. To provide for food security through fish supply
- x. To provide for a profitable national industry

The scope of the plan is for five year (2020 – 2025) with annual workplan to be implemented every year during the 5-year period. It will cover specific targeted fish stocks/assemblages consisting the Penaeid shrimps, Sciaenid, Sparids and small pelagic (Herring) in the EEZ of Sierra Leone. However, given the fisheries resources are multi-species in nature and are exploited by diverse fisheries using multi-gear, it suggests that for effective management, the Plan should focus on measures per fleet segment (Shrimper, Demersal, Pelagic and Tuna).

1 INTRODUCTION

The provisions therein in the Fisheries and Aquaculture Act of 2018 provide the legal justification for the development of fisheries management plans for target fish stocks that will set out conservation and management measures that will restore the fish stocks and sustainably utilize the resources for wealth creation at all levels.

2 DESCRIPTION OF THE FISHERIES SECTOR

The fisheries sector is a vital component of the economy of Sierra Leone. Sierra Leone's fisheries resources have an estimated capitalised economic value of USD 735 million. Fish catches from the sector are worth an estimated first sale value of over US\$ 200 million annually. It provides direct employment to some 200,000 persons and indirect employment to some 600,000 persons (almost 10 percent of the population) along coastlines in Western Area, Kambia, Port Loko, Moyamba, Pujehun and Bonthe. More specifically, in coastal areas an estimated 25 percent of the male population of working age is reported to be involved in part-time fishing.

The sector contributes more than 10 percent to the country's GDP. The total annual production is estimated to be 228,000 tons. The marine artisanal catch is estimated to account for about 150,000 tons (MFMFR IDAS, 2019) and industrial catch production is estimated to be 78,000 tons (MFMFR IDAS, 2019). In essence, the marine artisanal subsector accounts the bulk of the total annual fish production in Sierra Leone.

The fisheries sector in Sierra Leone is organized in four broad sub sectors – industrial, semi-industrial, marine artisanal and inland and aquaculture.

2.1 Industrial fishery

The industrial fishery operates mostly in deep waters with average depth 30 meters, beyond the Inshore Exclusion Zone which ranges up to 6 nautical miles from the baseline of the EEZ of Sierra Leone and it is characterized mainly by foreign national fishing fleet which, include fish trawlers, shrimpers, tuna purse seiners, support vessels and carriers. Presently, the purse seiners, demersal fish trawlers, midwater trawlers and shrimpers dominate the industrial fishery. The gross registered tonnage (GRT) of the shrimpers is generally between 100-150 tons whilst that of the finfish trawlers is between 150-600 tons. The tuna purse seiners, carriers and supply vessels operating in Sierra Leone waters have GRTs between 1000-3000. Figure 1 below shows time series data on the evolution of licensed fishing vessels in the EEZ of the Sierra Leone from the 1980s to present. The total fishing fleet progressively increased in the 1980s reaching a peak in 1987 with a total of 300 fishing vessels constituting finfish trawlers, shrimpers, purse seiners, long liners, canoe support vessels. This was due to the lack of comprehensive legislative and management frameworks. Since then, the number started to take a downward dive, fluctuating between 80 to 100, until recently, when the total number of fishing fleet started to increase reaching 156 in 2016.



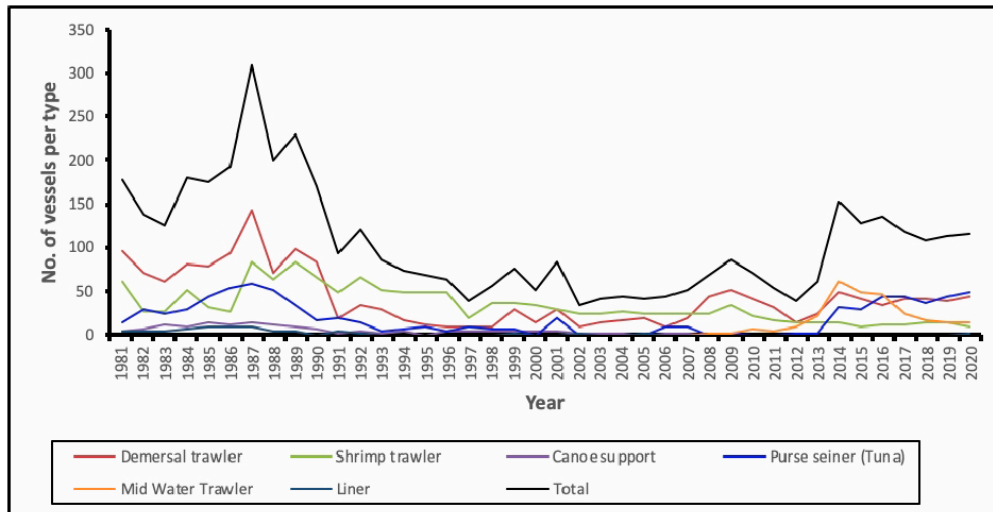


Figure 1 Evolution of industrial fishing vessels from 1981 to 2020

There are currently eleven active registered fishing companies representing a total of 137 fishing vessels. There are few foreign fish processing companies that operate fish processing facilities to export mostly high-valued species such as the yellow croakers. There are also a few fishing import businesses that are involved in fish importation mainly from Guinea, Guinea Bissau and Mauritania. This implies that the fish production and distribution in Sierra Leone need to be improved to meet the current the local market demand.

2.2 Semi-industrial fishery

This is a relatively new sub-sector that came into being in the late 2000s when some categories of fishing fleet that were broadly under the artisanal subsector were reclassified into semi-industrial based on their sizes, propulsion and catches. This subsector is characterized by locally constructed wooden and steel small trawlers by foreign investors of around 14 meters and large motorized undecked fishing canoes such as the Ghana-type planked canoes and the decked planked fishing boats. They operate mostly within the inshore waters spanning the 12nm limit from the baseline or beyond. Currently, the un-decked semi-industrial dominates the semi-industrial fishery. The GRT of the decked semi-industrial vessels is between 15-30 tons.

This semi-industrial processing subsector is equally important as it provides food, creates employment and generates revenue for fishermen, operators and the Government. Foreign fish processing companies largely operate with local artisanal boat-types under this subsector, and it provides a space for artisanal fishers to sell their catch at relatively better price, however, better profit is made by processing companies that export fish mainly to Asiatic markets.

2.3 Marine artisanal fishery

Marine artisanal fishery operates in estuaries, creeks, bays and coastal waters extending from the shoreline to a depth of 15-45m. This fishery comprises of variety of dugout and planked canoes which employs diverse ranges of fishing gears, including cast nets, ringnets, driftnets, setnets, beach seines, pots & traps, fencing and hooks & line. The marine artisanal fishery contributes significantly to the total national fish production. It serves as a social and economic engine for national development as it enhances



food security, generates revenue and create employment in the fishing communities. The recent frame survey in 2018 has recorded a total of 12,000 fishing canoes actively operating in Sierra Leone. The total artisanal fleet has increased by 2,000 since the last frame survey in 2011 which recorded 10,000 canoes. The artisanal fishery is not well regulated in terms of effort control, hence, there is a tendency for potential increase in the marine artisanal fleet in the near future if restrictive measures are not taken. The artisanal sector has not progressed significantly over the past 30 years, as fishers use the same fishing craft, engines and fishing gears and are unable to develop due to poor management and low investment in improved technology.

2.4 Inland fishery and Aquaculture

Inland fishery operates in rivers, a few lakes, floodplains and swamps. The main rivers include Great Scarcies, Little Scarcies, Rokel, Jong, Moa and Sewa. The fishery is also characterized by mostly dugout canoes of diverse sizes that are propelled largely by paddles and sails. The type of species of the freshwater systems depends on the part of the river (Head, upper reaches, middle reaches, lower reaches and estuaries). Some species include *Momyrus rume*; *M. tapirus*; *Hemichromis fasciatus*; *Talipia Beutlkoferi*; *Barbus socratus*; *Raiamis scarciensis*; *Auchenoglanis occidentalis*; *Chrysichthys jahnelsi*; *Synodontis thysi*; *Marcursenius mento*; *Byrycinus longipinis*; *Synodontis thysi*; *Claris leaviceps*; *Malapterurus electricus* and *Lates niloticus*.

There are wide range fish catching methods including nets, traps, pots, and herbal and poisons. This sector plays a pivotal role in providing cheap protein for the population in the interior as well as income for the fishers, processors and traders. In terms of fish production, it has great potential, which the Government could exploit by providing effective extension support to make it more economically viable and environmentally sustainable.

In the case of aquaculture, it is mostly practiced in inland valley swamps and wetlands and it has great potential for development because of the suitable natural environment. The Government, with support from the FAO, World Fish, research institutions and other international agencies has made some strides particularly in the culture of tilapia and catfish species; nonetheless, the immense potential for commercial fish farming is still untapped. Fish farming is still in its rudimentary stage and the enabling environment is inadequate.

3 FISHERIES RESOURCES

The Sierra Leone Territorial waters are considered to be endowed with abundant multispecies that are characteristic of marine tropical finfish, molluscs and crustaceans. Some 200 species of fish have been identified in the country's EEZ. However, about 80 species of finfish have been found to be relatively common with commercial and scientific importance, species mix is highly diversified.

The fisheries resources of Sierra Leone may be classified into four main categories: (i) pelagics, (ii) demersals (iii) crustaceans and (iv) others (mostly molluscs).

3.1 The Pelagic fish stocks

The pelagic fish stocks are classified into true pelagics, semi-pelagics and large pelagics. The clupeids (*Ethmalosa fimbriata*, *Sardinella maderensis*, *Sardinella aurita*, *Illisha Africana*, *Caranx hippos*.) are the most important of the small pelagics mainly for local consumption.

The semi-pelagics include *Brachydeuterus auritus*, *Priacanthus arenatus*, *Balistes capricus*, *Ariomma bondi* and these are associated with regions of high zooplankton productivity. Large pelagics are found associated with upwelling zones and the important ones include *Thunnus albacores*, *Katsuwonus pelamis* and are mainly for international market.

3.2 The Demersal fish stocks

The most dominant demersal fish resources are broadly classified into the following families: i) Sciaenidae, which comprise of the croakers, principally *Pseudotolithus senegalensis*, *P. typus* and *P. brachynathus*; ii) Haemulidae, which comprise chiefly of the *Pomadasys jubelini*, *Pomadasys rogeri* and *Plectorhynchus macrolepis*; iii) Sparidae, these are dominated by *Sparus caeruleostictus*, *Pagellus bellotii*, *P. coupei*, *Dentex canariensis*; and iv) The Polynemidae of which the dominant species are *Galeiodes decadactylus*, *Polydactylus quadrifilis* and *Pentanemus quinquarius*.

Other important demersal fish species in Sierra Leone waters are the Lutjanids, dominated by *Lutjanus goreensis*, and *L. dentatus*. The Serranidae are also represented largely by *Epinephelus aeneus* and *E. goreensis*. Other species include *Pseudopenaeus prayensis*, *Drepane Africana*, *Cynoglossus spp*, *Arius latiscutatus* and *A. heudeloti*. Sharks and rays are the other important fish stocks in Sierra Leone Waters. The shark species are dominated by the *Carcharhinus spp*, *shyrna spp* and *Rhizoponodron spp*.

The ray species include *Rhinobatos spp*, *Dasyatis spp*, *Raja spp* etc.



(*Lutjanus fulgens* golden snapper)



Dentex canariensis (Red snapper)

The shellfish resources are dominated by the crustaceans (shrimps, crabs and lobster), cephalopods (cuttlefish) and molluscs (gastropods and bivalves).



Penaeus notialis (Pink shrimp)

3.3 Current status of the fisheries resources

The fisheries resources of Sierra Leone have been subjected to heavy fishing pressure for decades by foreign commercial industrial fishing vessels and the artisanal fishing fleet. Previous surveys in the 1980s had indicated decrease in biomass of key commercially exploited fish species. In 2006 and 2007, the Norwegian fisheries research vessel, *R/V Dr. Fridt jof Nansen* carried out surveys in Sierra Leone waters under the GCLME¹ regional project, the surveys estimated the standing stock of about 300,000 metric tons with pelagic constituting about 90% of the estimated biomass.

Similarly, in 2008 – 2011, a comprehensive fish stocks assessment surveys were carried out in Sierra Leone waters for three years by the Senegalese research vessel, *R/V Itaf Deme* under the auspices of the EU-funded project, *Institutional Support to Fisheries Management*. The results of the survey show that the standing stocks of commercially valuable demersal species are low in comparison to the actual landings, which means that the fishery is harvesting each year a major proportion of the stock at sea, which is symptomatic of a sign of over- exploitation². Also, length frequency data of the various species shows a low proportion of adult fish in the catch. The survey result also shows an increased exploitation of juvenile *sardinella* in Sierra Leone by licensed foreign industrial trawlers which has potential social and economic implications especially to the artisanal fishermen as they directly compete for the same resources.

The subsequent subsections will highlight the exploitation status of specific targeted fish stocks/assemblages that are of high commercial importance to the fisheries sector of Sierra Leone.

3.3.1 Penaeid Shrimp Fishery

The Shrimp fishery is one of the important fisheries in Sierra Leone. There are three most commercially exploited penaeid shrimps in Sierra Leone waters. They include *Penaeus notialis* (the pink shrimp), which is the most dominant species caught in Sierra Leone; followed by *Penaeus kerathurus* (Tiger shrimp) and *Parapenaeus longirostris* (Deepwater rose shrimp), which is less abundant and under exploited. Other species with market potential is the *Parapeneopsis atlantica* (white shrimp).

Both the pink and the tiger shrimps inhabit mud or muddy sand bottoms. The pink shrimp occurs in depths ranging between 10 meters and 100 meters whereas the tiger shrimp occur in depths between 5 meters and 50 meters. The life cycle of the penaeid shrimps is spent in both marine and estuarine environments based on the developmental stages. They spawn at sea and the early life stage of the shrimp later move towards the coastal zones, in bays, estuaries and in the mangrove vegetation in

¹ Gulf of Guinea Large Marine Ecosystem project which was implemented in collaboration with the FAO.

² Sierra Leone Summary Report - Resource Surveys (2008 - 2011) June 2011, Sierra Leone Institutional Support to Fisheries Management 9th EDF ACP SL 019/1

search of abundant foodstuff and ambient environmental conditions ideal for their growth. As they grow, they tend to migrate toward deeper waters, during which time they are exposed to diverse fishing gears in artisanal, semi-industrial and industrial fisheries, suffering huge juvenile mortality.

Studies conducted on the shrimp fishery in Sierra Leone by Ssentongo G. W; Ansa-Emmim M., (1986)³ et. al indicated the best shrimping season to be between April and September. This is supported by results from the analysis of time series production catch landings from the Statistics Unit of the MFMR, showing that more than half of the total shrimp catch is landed during this period. This period is rainy season marked with torrential downpour and the catches are mainly of small-sized shrimps. In addition, it is during this period when about three quarters of the recruitment into the shrimp fishery takes place with the highest peaks in April and May.

The shrimp fishery plays a critical role in the economic development of Sierra Leone. Since the late 70s when the shrimp fishery came into prominence, the penaeid shrimps have been subjected to incessant fishing intensity by the increasing number of both local and foreign shrimp trawlers that constituted the dominant fleet among the licensed fishing vessels in Sierra Leone. The dominance continued until late 2000 when the fishing capacity drastically reduced with the advent of the midwater trawl fishery. The total annual shrimp landings recorded an unprecedented 3000 tons in 1991⁴. Since then, the production has been declining, stagnating around 1,000 tons in recent time due to decrease in fishing efforts.

Despite the importance of the shrimp fishery in Sierra Leone, it has major ecological and socioeconomic problem that it is characterized by high bycatch rates (more than four-fold of the shrimp catch) mainly due to the indiscriminate use of illegal fishing gears in nursery and spawning areas. Biao, A (1996)⁵, indicated that the shrimp trawlers deliberately target finfish during the day, making bycatch a target fishery. There is an established market for the bycatch and discards from the shrimp fishery. This situation is worrisome as the composition of the bycatch is largely a mix of adult and juvenile high-valued target finfish species such as the sciaenid, sparids, lutjanids, carangids, crustaceans and cephalopods, etc. In addition, the bycatch rates in the shrimp fishery in recent times, is high resulting in some discards. This is of huge concern to fisheries managers because of its negative effects on sustainability.

Independent analyses conducted by Chaytor and Ndomahina (1991), Showers P.A.T (1999)⁶, ISFM project (2010) and Biao *et al* indicated that the harvest capacity had surpassed a sustainable exploitation level. In other words, the shrimp resources are either fully exploited or overexploited. The recent assessment done by the Scientific Observer Program using a ten-year time series (2008-2018) datasets of shrimp catch in Sierra Leone also indicated the shrimp stock to be overexploited⁷. The various assessments recommended a reduction in the fishing intensity.

In view of the current state of the shrimp fishery and considering the ecological, biodiversity and economic importance of the fishery, the MFMR has developed a management framework in Table 4 that will seek to rebuild the shrimp fishery by sustainably exploiting the resource. The

³ Ssentongo G. W; Ansa-Emmim M., 1986 FAO

⁴ Showers, P.A.T, 1999. Escalation in Shrimp Production in the Sierra Leone Industrial Fishery. Naga, The ICLARM Quarterly (Vol. 22, No.3) July-September 1999

⁵ Baio, A (1996). Bycatch and Selectivity Studies in the Shallow Water Shrimp Trawl Fisheries off Freetown, Sierra Leone. MPhil., Thesis, University of Bergen, Norway.

⁶ Showers, P.A.T, 1991. Status of the shrimp stocks of Sierra Leone. Paper presented at the National Seminar on Fisheries Industries Development, 25-29 November 1991, Freetown, Sierra Leone. (mimeo)

⁷ Annual Report of the Scientific Observer Program, December, 2019, P.49

management measures will focus on i) to regulate the fishing effort, ii) reduce the volume of by-catch, ii) preserve habitat and environment.

3.3.2 Demersal Fishery

The demersal fishery plays a pivotal role in the fisheries sector of Sierra Leone. This fishery targets high valued demersal fish resources such as the sparids, sciaenids, albulids, haemulids serranids, polynimids, ariids, etc. These demersal resources have been subjected to increasing exploitation pressure for decades now. The status of some of these demersal resources is highlighted below.

3.3.2.1 Sciaenid (Croakers) Fishery

The Sciaenid family constitutes a high percentage in catch landings in Sierra Leone and it plays an important role in the socio-economic development of the fisheries sector as well as contributes to food security and revenue drive.

This family includes species of *Pseudotolithus senegalensis* (Lady), *Pseudotolithus typus* (Lady long-neck), *Pseudotolithus elongatus* (Bobo Croaker, Gwangwan), *Pseudotolithus brachygnatus* (Whiting), *Pseudotolithus epipercus* (Guinea Croaker). These species are inshore demersal resources and largely distributed inshore and can occur in estuaries and brackish waters with muddy and sandy bottoms. They thrive in a wide range of salinity. The *Pseudotolithus senegalensis* (Lady), *Pseudotolithus typus* (Lady long-neck) have a wider distribution and grow faster than *Pseudotolithus elongatus*. The species can grow to about 30 cm in total length.

In Sierra Leone, the croakers which are predominant in coastal inshore waters are commercially exploited mainly by both artisanal fishing vessels in inshore coastal areas. Few industrial fishing vessels sometimes target the croakers outside the inshore exclusion zone. Croakers also constitute a critical portion of the demersal catch landings and the shrimp trawlers take a large proportion of them as by-catch. Over the past decades, the juvenile mortality of these species has been increasing as a result of increase in the by-catch rate in the shrimp fishery. This situation is aggravated by the indiscriminate use of illegal fishing gears in spawning and nursery habitats, thereby causing possible stock recruitment failure or disturbance in stock recruitment. Time-series data on catch landings from the MFMR has shown a declining trend since in the mid-2000. Recent estimates by the CECAF Scientific Sub-Committee Demersal Working Group (South) have concluded that the croakers are either fully exploited or overexploited and recommended to reduce the fishing effort.

Despite the decreasing trend in catch landings, fishing intensity continues to increase unabated as the croaker fishing has become a lucrative fishery in recent years, supporting an export oriented onshore processing outfit that exclusively targets croakers. Both decked semi-industrial trawlers and the undecked semi-industrial canoes exclusively target the croakers to supply the ever-growing demand of the processing facilities. The decked semi-industrial trawlers are currently without VMS or AIS transponders and there are frequent reports of them fishing in the IEZ illegally destroying spawning and nursery areas and at the same time competing with small fishing canoes for the coastal resources. This illegal activity, most times lead to destruction of fishing gears of fishermen in the IEZ. The Ministry has plans to install class B AIS transponders on all decked semi-industrial fishing vessels in the near future. The artisanal fishermen that also target the croakers in the IEZ are using under-meshed monofilament fishing nets to harvest the croakers, crustaceans and other fish species in the spawning areas up the rivers that empty into the estuaries, bays, etc.

In view of the above and giving the importance of the sciaenid stock to the socio-economic development of Sierra Leone, the MFMR is proposing management framework for demersal trawlers in Table 4 with a view to rebuilding the demersal stocks including the scianids to a level that will be sustainably exploited and utilized for the benefit of everyone. The management measures will seek to address the following: i) improve the status of the Sciaenid fish stocks, ii) enhance the wellbeing of the ecosystem.

3.3.2.2 Sparid Fishery

The Sparid family forms an important component in the demersal catch landings in Sierra Leone. They constitute *Pagrus caeruleosticus*, *Pagellus bellottii*, *Dentex angolensis*, *Dentex congoensis*, *Dentex canariensis*, *Dentex macrophthalmus* and most of them spawn in coastal waters and spend their adult lives in deep waters. Some of the sparids are multiple spawners and are deep water dwellers. They are high-valued export species and are largely exploited by industrial trawlers and motorized hook and line artisanal canoes with insulated boxes. The bulk of the species are caught as by-catch in the shrimp fishery and in the midwater trawl fishery that targets a mixture of small pelagic and coastal demersal finfish resources.

The sparids have been under high fishing intensity for decades and estimates from several CECAF demersal Working Groups held from late 1990s to recent indicate that the species are either fully exploited or overexploited.

In view of the foregoing and considering the importance of the sparids to the socio-economic development of the country, the Ministry has proposed specific management measures with a view to rebuilding the stock and its ecosystem. The proposed measures are found in Table 5 of section 9 of this document.

3.3.3 Small Pelagic Fishery

The exploitable species of the small pelagic include Herring (*Sardinella spp*), Bongo (*Ethmalosa fimbriata*), Lati (*Illisha Africana*), Carangids – Mackerels (e.g., *Decapterus spp.*). However, the *Sardinella spp.* constitutes the bulk of the small pelagic catches.

The *Sardinella* fish stock exploited in Sierra Leone waters comprises of two species, *Sardinella Maderensis* (flat herring) and *Sardinella aurita* (round herring). *Sardinella aurita* is a Northern fish stock shared among countries in the Eastern Central Atlantic, including Guinea Bissau, Guinea, Sierra Leone and Liberia. The *Sardinella* resources are transboundary stocks and make significant socio-economic contributions to these countries. The stock is exploited by both artisanal fishery and industrial fishery. In Sierra Leone, the flat herring (*Sardinella maderensis*) contributes significantly to food security and socio-economic development of the artisanal fishermen.

The *Sardinella* fish stock is currently being subjected to high fishing pressure, with the juvenile herring (normally called Mina) exclusively being exploited for an existing thriving market due to societal preference for the juvenile herring. The “Mina” fishing is now a fishery in its own right. Several assessments have indicated that the herring stock is fully exploited. Baio (2010)⁸ observed

⁸ Ssentongo G. W; Ansa-Emmim M., 1986 FAO

the decline of the contribution of herring to the artisanal catch from 60.1% in 1973 to only 12.6% in 2006 and suspected growth overfishing may be the cause due to the intensification of the Mina fishery.

Recent analysis of CPUE trends from IFDAS datasets already identified signs of stock instability under very high fishing intensity on the Sierra Leone shelf (see Table 1 below). The 2019 *Fridtjof Nansen* acoustic survey under the EAF Nansen project recorded a total biomass of 130,800 tons for the *Sardinella* spp. (*Sardinella maderensis* = 37,500 ton; *Sardinella aurita* = 93,300 tons).

Table 1 Catch statistics for *Sardinella* spp.

Year	Catch (t)	CPUE (t/d)
2015	28,744.43	4.853
2016	36,001.30	4.864
2017	52,351.88	5.772
2018	38,023.01	4.116

The comparative analysis in Table 2 below illustrates a decline in biomass estimates for *Sardinella* spp. in trawl surveys dating from the 1990s to 2019.

Table 2 Comparison of biomass estimates for *Sardinella* spp. from 1991 – 2019.

Survey	Biomass (Mainly (<i>Sardinella</i>) (Tonnes)
GoSL/USSR/FAO, 1982-1991	513,400
GCLME R/V Fridtjof Nansen, April to May 2006	269,000
GCLME Fridtjof Nansen, May –June 2007	100,000
ISFM Project, R/V ITAf Deme, May-June 2008	227,000
R/V Itaf Deme, May to June ,2009	282,100
R/V Itaf Deme, Nov. to Dec., 2010	231,400
R/V Fridtjof Nansen, Aug. to Sept., 2019	130,800 (<i>S. aurita</i> ,93,300, <i>S. maderensis</i> , 37,500)
Biomass (2018)	112,000
MSY =7940; Catch =38,023 (P.A.T. Showers (2020). ScOP report (biomass?))	

Also, recent hike in the fishing intensity due to increase in the number of midwater trawlers has also exerted excessive pressure on the health of the stock. In view of the above and considering the socio-economic importance of the *Sardinella* stock to Sierra Leone, the MFMR is proposing management framework that will prevent further overfishing and possible collapse of the fishery. The management objectives will seek to achieve the following: restore biomass of fully and overexploitation coastal fisheries resources; enhance ecosystem well-being by preserving and minimizing adverse impacts on the ecosystem and improve governance of the marine artisanal fishery sector. The management measures are found in Table 5 below.

3.3.4 Tuna Fishery

Sierra Leone is geographically located along the West Coast of Africa in the Eastern Central Atlantic, where there is an abundance of Tuna and tuna-like species as well as other large pelagic species. Sierra Leone has been known as a country with enormous potential for tuna fishery from the late 1950s and since then distant water tuna fishing vessels have been exploiting the tuna and tuna-like resources in the EEZ. The nationalities of tuna fleet currently licensed in Sierra Leone

⁸ Showers, P.A.T, 1999. Escalation in Shrimp Production in the Sierra Leone Industrial Fishery. Naga, The ICLARM Quarterly

largely include Spain, France, Belize, Ghana, Senegal, Panama, Italy, etc. The species exploited are mainly Yellowfin (*Thunnus albacares*), Bigeye tuna (*Thunnus obesus*), Skipjack (*Katsuwonus pelamis*), Bluefin tuna (*Thunnus thynnus*). The catches also constitute Billfishes and other large pelagic species such as the Atlantic white marlin (*Kajika thazard*), Atlantic sailfish (*Istiophorus albicans*), and swordfish (*Xiphias gladius*) that are fished directly or are incidental to the tuna catch. Other tuna species occurring in the catch are frigate tuna (*Auxis thazard*), Atlantic bonito (*Sarda sarda*) and the mackerels (Scomberomorus species).

The exploitation of the Atlantic tunas in Sierra Leone by distant water tuna fishing vessels has been increasing since early 2010 contributing about close to 50% of the total annual revenue accrued from the license fees. Despite this increase, the fishery is associated with increased incidental catches (by-catch) due to the increasing use of fish aggregating device (FAD) fishing. The by-catch caught by purse seiners are discarded at sea or conserved for consumption on board or sold on the West Africa's markets. The juvenile tunas which largely constitute Skipjack are mainly landed for use by tuna canneries in the region. This existing market is somehow serving to incentivize purse seiners and long liners operating in the region to catch juvenile tunas.

There are 33% licensed tuna fleet operating in Sierra Leone that are fitted with the national vessel monitoring system (VMS), and there are plans underway to install VMS on all the fleet. In addition, fisheries observers have still not been assigned on board licensed tuna fleet. This situation has led to ineffective monitoring of activities of licensed tuna fleet operating offshore of the EEZ of Sierra Leone.

In as much as Sierra Leone is a member of the International Commission for the Conservation of Atlantic Tunas (ICCAT), the MFMR has proposed specific management measures that will compliment ICCAT regulations that geared towards effective management of the tuna fishery.

With insights on the status of some key fish stocks from the preceding subsections, the Ministry with support from the World Bank GEF-AF project, has instituted a fish stock assessment through the Scientific observer Program which IMBO is currently implementing. The preliminary report of the scientific observer program carried out by IMBO in collaboration with the MFMR has also indicated that the landings of industrial fishing vessels is predominantly pelagic species in recent time, and this is of concern.

The encoding of data from the industrial fisheries including the backlogs has provided 10-years' time-series catch-and-effort data that has enabled the initial estimation of the essential parameters for indicator species and taxonomic groups to obtain estimates of the reference points needed for management.

The Catch Maximum Sustainable Yield (CMSY) model was applied to this decade-long set of fisheries statistical data in the newly created database holdings of the ministry, and the following management parameters were estimated: MSY, Biomass, Bmsy, Fmsy, M, B/Bmsy, F/Fmsy.

The results of stock assessment analyses and graphical trends indicate that the Sierra Leone fisheries was indeed under very heavy exploitation particularly during the period 2015-2017. The results did not identify signs of overfishing between the years of 2008-2014; negative estimates started to appear in 2015 until the peak in 2016-17. Signs of overfishing were so evident that the MFMR was obliged to act promptly and impose some very strong management measures to arrest the negative trend. These measures included the limiting the number of licensed vessels, increasing the licensing fees and the imposition of a 1-month closed season on industrial fishing during the month of April, 2019.

4 KEY ISSUES AND PROBLEMS IN THE FISHERIES

As mentioned in the preceding section, the excessive exploitation of the fish species closed to the coast as a result of increasing pressure of fishing effort in the capture fisheries has considerably increased the fishing mortality over the years. Although the total number of the industrial fishing fleet is gradually decreasing due to the moratorium that was instituted for new entrants since 2018, the artisanal fishing fleet currently operating in the EEZ of Sierra Leone is 12,000 units according to the 2018 frame survey report. There is likely indication that the increasing trend of the artisanal fleet will continue if mitigating actions are not taken now. Over the past decades, juvenile mortality of these fish species has been increasing in the by-catch and discards in the industrial trawl fishery, particularly in the shrimp fishery. Significant quantities of the by-catch are juveniles of targeted high-valued species. This situation is largely due to the indiscriminate use of destructive fishing methods and illegal fishing nets in spawning and nursery areas by industrial, semi-industrial and artisanal fishing fleets.

Additionally, the average active trawling hours in the industrial fishery have been increasing progressively in recent time. In 2016, the VMS data recorded 188,000 active trawling hours for all licensed industrial trawlers, whilst in 2017, an average of 254,106 active fishing hours for all trawlers was recorded by the VMS, which is about 26% increase in just one year. (See table below)

Table 3 Trend in trawling hours by vessel/gear type between 2016 and 2017

Fisheries industrial statistics based on records for 2016 and 2017 compared

Trawl gear type	Trawling hours
2017	
Pelagic trawlers	29,868
Demersal	157,571
Cephalopod	23,289
Shrimp Trawlers	43,378
	254,106
2016 Total	188,000
increase	66,106
% Increase	26%

The above issues have largely contributed to the overexploitation of most valuable fish stocks. The fish stocks are undergoing both recruitment and growth overfishing. Recent estimates by the CECAF Scientific Sub-Committees Demersal Working Group (South) in 2017 have recommended an overall reduction of fishing effort and catch as most of the commercially exploited species in the region are either fully exploited or over-exploited.

The economic analysis of the industrial fishery shows that the fishery does not deliver the expected benefit to the national economy. The payment of license fees, royalties, transshipment and landing fees even at the increased rates imposed in the past year does not make up for the costs of overfishing and the prevention of profitability by the national industry.

The fisheries also faced with another threat mainly caused by anthropogenic activities that have negative implication to the health of the aquatic and marine ecosystem. The indiscriminate removal of the vegetation cover such as the mangrove plant as wood for fish smoking, boat building, rice farming, salt mining, housing etc. has degraded spawning and nursey habitats, thereby causing

possible stock recruitment failure or disturbance in stock recruitment. The continuous pollution of the marine environment with plastics, heavy metal chemicals from runoffs, etc. can have long lasting negative impact on the flora and fauna of the breeding and nursery areas.

Another threat to the sustainable management of the fisheries resources is limited knowledge of the current fish stocks status. There is inadequate reliable information on the exploitation status of both the demersal and pelagic resources. The last comprehensive fish stocks assessment was conducted in 2007 with the support from the EU. Although there is an ongoing effort to evaluate the fish stocks using the Scientific Fisheries Observer program through the World Bank funded project, GEF-AF, it is crucial that a comprehensive fish stock appraisal is conducted to ascertain the current biomass (standing stock) vis-à-vis the potential yield and fishing effort per fishery. The recent fish stock assessment conducted by the Norwegian Research Vessel, *Fridtjof Nansen* and the ongoing fishery survey funded by the Chinese Government will provide insight on the current status of the fish stocks and inform management on the measures to take to effectively manage the fisheries resources. However, in the absence of the required data and stock assessment results, the Ministry is implementing a precautionary approach through the measures mentioned above.

In addition, the Statistics Unit of the Ministry that monitors the performance of both the input and output of the fisheries by collecting and analyzing daily catch and effort data needs a considerable support in order to improve the fisheries data collection system that will generate quality and reliable fisheries and socioeconomic data. Data collection in the artisanal sub-sector has not been comprehensive for the past nine years. Although data collection was done in some landing sites, the Ministry needs to urgently improve data collection and analysis with a view to providing benchmarks for informed management decisions.

Effective enforcement of the Fisheries Acts and the Regulations has been a challenge due to inadequate subvention from the central Government. Also, there is need for institutional reform for the Ministry to improve on its performance.

Sierra Leone cannot export fish and fisheries products to the European Union due to lack of functioning Competent Authority that is able to demonstrate compliance with sanitary and hygiene standards and adhering to regulations. This is a disincentive to potential investors to invest into export-oriented processing facilities.

5 PURPOSE/OVERALL OBJECTIVE

The overall objective of this fisheries management plan is to create a profitable fisheries sector that contributes significantly to socio-economic development through sustainable management and utilization of fisheries resources while also conserving the environment. In the medium term, the management plan will set levels of sustainable exploitation for targeted fisheries and create rights and allocation mechanisms for such fisheries.

6 MANAGEMENT OBJECTIVES

This management plan seeks to achieve the following management objectives:

- i. To regulate the fishing effort by fishing fleets in both the industrial, semi-industrial and artisanal sub-sectors to a level that will ensure sustainable exploitation of fish stocks at maximum economic yield (MEY)
- ii. To improve the status of target fish stocks within biologically acceptable levels
- iii. To protect aquatic and marine habitats and biodiversity

- iv. To improve the knowledge-base on the status of the fish stocks
- v. To effectively implement the fisheries legislation and regulations
- vi. To enhance value addition and export opportunities
- vii. To strengthen stakeholder engagement in decision making process
- viii. To ensure compliance with regional and international fisheries instruments
- ix. To provide for food security through fish supply
- x. To provide for a profitable national industry
- xi. To ensure effective service delivery of the MFMR

7 SCOPE AND OPERATION OF THE MANAGEMENT PLAN

The plan will cover a period of five years, from September 2020 to August 2025. In order to successfully implement the plan, an annual work plan will be hived out every year during the 5-year duration. They will be subjected to review by the MFMR in collaboration with the Scientific, Economic and Technical Committee (SETC) and research institutions including IMBO based on any major changes in the exploitation state of the fish resources. During the period in question, an effective data collection system will be established, and relevant data collected will be analysed by the Statistics Unit of the MFMR in collaboration with IMBO. The Ministry of Fisheries and Marine Resources will prepare annual report on the status of the resources and progress on the key performance indicators (KPIs) of Management Plan, which will be presented to the SETC for discussion and approval and thereafter shared to relevant stakeholders.

8 KEY POLICY DRIVERS

The management plan will be consistent with the guiding principles for the sustainable exploitation and development of the resources such as the FAO Code of Conduct for Responsible Fisheries, Ecosystem Approach to Fisheries Management; the Principle of Precautionary Approach, the Fisheries Policy, 2016, Fisheries and Aquaculture Act, 2018, the Fisheries and Aquaculture Regulations, 2019 and the Medium-Term National Development of Sierra Leone

9 MANAGEMENT MEASURES AND ALTERNATIVES

As mentioned earlier, this section will focus on instituting frameworks for management of the following fleet segment targeting shrimp species, demersal species, small pelagic and tuna species respectively. The measures and recommendations in this section will seek to restore the stocks as a whole and the ecosystem wellbeing of the marine environment.

9.1 Framework for Management Measures for Shrimp Trawlers

Table 4 Management Measures for Shrimp Trawlers

Strategic Actions	Performance Indicators	Indicator to monitor	to institutions	Timeline
Objective 1: to regulate fishing efforts to a level that will ensure sustainable exploitation of the shrimp stocks				
1. Reduction of fishing effort	a. Moratorium on licensing of additional fishing vessels implemented***	No. of Fishing license	MFMR, JMC, SLMA	Jan 2020
	b. Seasonal Closed Season implemented every year	No fishing period	MFMR, JMC, CMA	2021
	c. Shrimp fishing restricted to 15 nm during day and from 6pm -6am) at night by June 2022	VMS data	MFMR, JMC	June 2022
	d. Trawling hours restricted to 4 hrs. per trawl.	VMS trawl data	MFMR, JMC	December 2022

	e. Reduction of illegal fishing in the artisanal sector	Number of legal fishing nets		
	h. Capping of shrimp trawlers			
Objective 2: To reduce volume of by-catch to specified levels				
1. Introduction of selective devices	a. Reduced volume of by-catch by 40% during the life of the plan	By-catch data	MFMR, JMC	Jan 2025
	b. The mesh size of the Cod-end of the trawl net increased to 45mm	Size of fish landed	MFMR, JMC	Dec 2020
	c. Square mesh panels in shrimp trawl gear for juvenile escape implemented	By-catch data	MFMR, JMC	June 2023
2. Protection of breeding grounds and other hotspot areas	a. All Shrimp and Cephalopod trawlers are fitted with satellite-based VMS that is functional	VMS data	MFMR, JMC	Sept 2020
3. Fisheries observer program	a. 100% coverage of Fisheries Observers on board licensed shrimp trawlers	Fisheries Observer report	MFMR, JMC	ongoing
Objective 3: Preservation of habitat and environment in the Artisanal Sector				
1. Introduction of closed areas and Closed season	a. All four MPAs operationalized and enforced	Number of marker buoys installed	MFMR, JMC, Consortium	June 2022
	b. Inshore exclusion zones (IEZ) enforced	VMS data and Logbook	MFMR, JMC	Sept 2020
2. Reduce pressure on mangrove and other fragile habitats	a. Mangrove vegetation cover is improved during the life of the plan	Percentage of mangrove cover preserved	MFMR, MoAF, MoE	Jan 2025
	b. Improved fuel-efficient smoked ovens widely used by fish processors within the 5 th year of the plan	No. of improved smoked ovens	MFMR, MoA, MoE	2025
	c. Reduce Conflict between industrial and Artisanal sector			ongoing
Objective 4: To improve the knowledge-base on the status of the fish stocks				
1. Conduct comprehensive fish stocks assessment	a. Biomass of principal fish stocks determined	Assessment reports with Biomass	MFMR, JMC	Dec 2023
	b. Regular catch and effort and biological data on shrimp fishery collected and analyzed	Records of updated catch and effort data	MFMR, JMC	Jan 2021

*** The cumulative number of licensed fishing trawlers (shrimp, cephalopods, pelagic and demersal) is fixed at a maximum of 70 vessels as a precautionary measure. The number will be reviewed after the completion of a comprehensive fish stock assessment which is ongoing.

9.2 Framework for Management Measures for Demersal Trawlers

Table 5 Management measures for the Demersal Trawlers

Strategic Actions	Performance Indicators	Indicator to monitor	institutions	Timeline
Objective 1: improve the status of the Sciaenid fish stock				
1. Reduction of fishing effort	a. Moratorium on licensing of additional fishing vessels implemented***	No. of vessels licensed	MFMR, JMC	Jan 2020
	b. Restriction of vessel size limitation implemented	Vessel size	MFMR, JMC	Sept 2020
	c. Total number of active trawling hours reduced to 4hrs per trawl	Trawling time	MFMR, JMC	Jun 2021
	d. Seasonal Closure implemented every year	No fishing	MFMR, JMC	2021
2. Reduction of by-catch and discards	a. Reduced volume of by-catch by 20% during the life of the plan	Volume of by-catch	MFMR, JMC	Jan 2025
	b. The mesh size of the Cod-end of the trawl net increased to 70 mm	Average size of fish landed	MFMR, JMC	Dec 2022
	c. Ban on the use of monofilament nets enforced	No. of legal fishing net used	MFMR, JMC	June 2021
3. Prohibition of fishing in spawning and breeding grounds	a. All demersal and mid-water trawlers fitted with satellite-based VMS that is functional	VMS data	MFMR, JMC	Sept 2020
	b. All decked semi-industrial trawlers fitted with AIS Class-B transponders	AIS data	MFMR, JMC	June 2021
4. Fisheries observer program	a. 100% coverage of Fisheries Observers on board licensed industrial trawlers	Observer Report Radio report	MFMR, JMC	Sept 2020
5. Strengthen control and enforcement	b. Frequent fisheries patrols conducted	No. of patrols	MFMR, JMC	Ongoing
	c. Frequent community surveillance patrols conducted by CMAs	No. of patrols	MFMR, JMC	Ongoing
	d. Frequent spot-check on fishing vessels during discharge, landings and transshipment	No. of spot checks conducted	MFMR, JMC	Ongoing
Objective 2: Preservation of habitat and environment				
1. Introduction of closed areas and Closed season	a. All four MPAs operationalized and enforced		MFMR, JMC	Mid 2022
	b. Inshore exclusion zones restriction enforced		MFMR, JMC	Ongoing
2. Reduce pressure on mangrove vegetation and other fragile habitats	c. Mangrove vegetation cover in fragile habitats is improved during the life of the plan		MFMR, MoAF, MoE	Jan 2025
Objective 3: Improve the livelihoods of fisheries communities				
1. Create alternative livelihood by facilitating access to credit	a. Micro-credit project granted and implemented	No. of Micro-credit projects implemented	MoFED, MFMR, other MDAs	Sept 2024
Objective 4: To improve the knowledge-base on the status of the fish stocks				
1. Conduct comprehensive fish stocks assessment	a. Biomass of principal fish stocks determined	Survey reports with update biomass	MFMR, JMC	Dec 2022
	b. Regular catch and effort and biological data on key fish stocks collected,	Updates catch and effort data report	MFMR	Jan 2021

	collated and analysed			
	c. Fisheries Observers and enumerators frequently trained	number of personnel trained, and quality of data improved	MFMR	Sept 2020

*** The cumulative number of licensed fishing trawlers (shrimp, cephalopods, pelagic and demersal) is fixed at a maximum of 70 vessels as a precautionary measure. The number will be reviewed after the completion of a comprehensive fish stock assessment which is ongoing.

9.3 Framework for the Management of the Small pelagic

Table 6 Management measures for Pelagic Trawlers

Strategic Actions	Performance Indicators	Indicator to monitor	institutions	Timeline
Objective 1: improve the status of the pelagic fish stock				
1. Reduction of fishing the effort	a. Moratorium on licensing of additional fishing vessels implemented***	No. of licensed vessels	MFMR, JMC	Jan 2020
	b. Restriction of vessel size limitation implemented	Size of vessel	MFMR, JMC, SLMA, Navy	Sept 2020
	c. Total number of active trawling hours reduced to 4hrs	Trawling time	MFMR, JMC	June 2021
	d. Seasonal Closure implemented every year	No fishing	MFMR	2021
	e. Regulate the entrants of new artisanal fishing fleet to the fishery	Number of artisanal fishing vessel capped	MFMR, JMC, Consortium	
2. Reduction of by-catch and discards	a. Regulate the fishing of Juvenile herring (Minah)		MFMR, JMC, Navy	June 2022
	b. The mesh size of the Cod-end of the trawl net increased from 60 mm to 70 mm	Size of fish	MFMR, JMC	Dec 2022
	c. Ban on the use of monofilament nets and other illegal fishing gears and methods enforced	No. of illegal fishing nets seized	MFMR, JMC	June 2022
3. Prohibition of fishing in spawning and breeding grounds	a. All industrial trawlers fitted with satellite-based VMS that is functional	VMS data	MFMR, JMC, Navy	June 2021
	b. All decked semi-industrial trawlers fitted with AIS Class-B transponders	AIS data	MFMR, JMC, Navy	Dec 2021
4. Fisheries observer program	a. 100% coverage of Fisheries Observers on board licensed trawlers	Observer Report Radio report	MFMR, JMC, Navy	Sept 2020
5. Strengthen control and enforcement	a. Regular fisheries patrols conducted	No. of patrols	MFMR, JMC, Navy	Sept 2020
	b. Regular community surveillance patrols conducted by CMAs and Consortium	No. of patrols	MFMR, JMC, Navy, CMA	Sept 2020
	c. Regular patrols conducted in the MPAs by the CMAs	No. of patrols	MFMR, JMC, Navy, CMA	Sept 2020
	d. Regular spot-check on fishing vessels during discharge, landings and transshipment	No. of spot checks conducted	MFMR, JMC, Navy	Sept 2020
Objective 2: To improve the knowledge-base on the status of the fish stocks				
1. Conduct comprehensive	a. Biomass of pelagic fish stocks determined	Quantity of catch	MFMR, IMBO	Dec 2022
	b. Regular catch and effort and	Catch and effort	MFMR, IMBO	Jan 2021

fish stocks assessment	biological data on pelagic fishery collected	data		
	c. Biological sampling system in fish landing sites implemented	Length Frequency, Maturity, Growth	MFMR, IMBO	Jun 2021
2. Harmonization of fisheries regulations (prevent excessive fishing effort)	a. Regulations and international conventions applied	Regional management measures	MFMR, MDAs, SRFC, RFMO	Jan 2021
	b. Exchange views and information on fishing access agreements targeting pelagic resources	National fisheries data	MFMR, MDAs, SRFC, RFMO	2021
	c. Regional cooperation on sustainable management enforced		MFMR, MDAs, SRFC, RFMO	2021

*** The cumulative number of licensed fishing trawlers (shrimp, cephalopods, pelagic and demersal) is fixed at a maximum of 70 vessels as a precautionary measure. The number will be reviewed after the completion of a comprehensive fish stock assessment which is ongoing.

9.4 Framework for the management of Tuna species

Table 7 Management Measures for Tuna Fishing Vessels

Strategic Actions	Performance Indicators	Indicator to monitor	institutions	Timeline
Objective 1: to regulate the status of the Tuna fish stock				
1. Reduction of fishing the effort	a. Quota per species implemented	Catch per species	MFMR, JMC, ICCAT	Sept 2024
2. Development of FAD Management Plan	a. FAD management plan developed by operators and approved by MFMR	MFMR, Tuna Vessels Operators	MFMR, JMC, Navy, SLMA	Jan 2022
3. Reduction of by-catch and discards	a. By-catch mitigation measures implemented	Volume of by-catch	MFMR, JMC	Jan 2024
4. Prohibition of illegal fishing	a. Tuna vessels fitted with satellite-based VMS that is functional	VMS data	MFMR, JMC	ongoing
5. Fisheries observer program	a. 10% coverage of Fisheries Observers on board licensed Tuna vessels	Observer Report Radio report	MFMR, JMC	Sept 2023
6. Strengthen control and enforcement	a. Regular fisheries patrols conducted	No. of patrols	MFMR, JMC	Sept 2020
	b. All Tuna vessels monitored with AIS transponders 24/7	AIS data	MFMR, JMC	Jan 2021
	b. Complied with ICCAT recommendation to monitor transship at sea	No. of transshipment at sea	MFMR, JMC	Jan 2023
Objective 4: To improve the knowledge-base on the status of the fish stocks				
1. Improve reporting system for ICCAT data	a. ICCAT recommendation complied with reporting system	Update data sets	MFMR, JMC, ICCAT	Short term
	b. Data collection and submission to ICCAT improved	Updates catch and effort data report	MFMR	Jun 2021
2. Develop a data collection regulation	a. More trained staff recruited to improve data collection regime	No. of trained staff		Jan 2021
	b. Frequent capacity building program for all technical and scientific staff involved in data collection conducted	No. of trained staff	MFMR, JMC	Jan 2021
3. improve the implementation and use of fishing	c. Logbook information updated consistent with regional data needs	Logbook	MFMR	Jan 2021

10 RELATED MANAGEMENT JURISDICTIONS, LAWS AND POLICIES

The provisions and measures in this plan are consistent with the following:

- i. The 2016 National Fisheries and Aquaculture Policy
- ii. Fisheries and Aquaculture Act 2018
- iii. Fisheries and Aquaculture Regulations 2019,

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