

OFFSHORE FISHERIES OF THE SOUTHWEST INDIAN OCEAN: their status and the impact on vulnerable species



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Special Publication No. 10

Rudy van der Elst and Bernadine Everett (editors)





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Rudy van der Elst and Bernadine Everett (editors)

South African Association for Marine Biological Research

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Editors:

Rudy van der Elst and Bernadine Everett

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1. INTRODUCTION

Rudy van der Elst¹ and Bernadine Everett¹

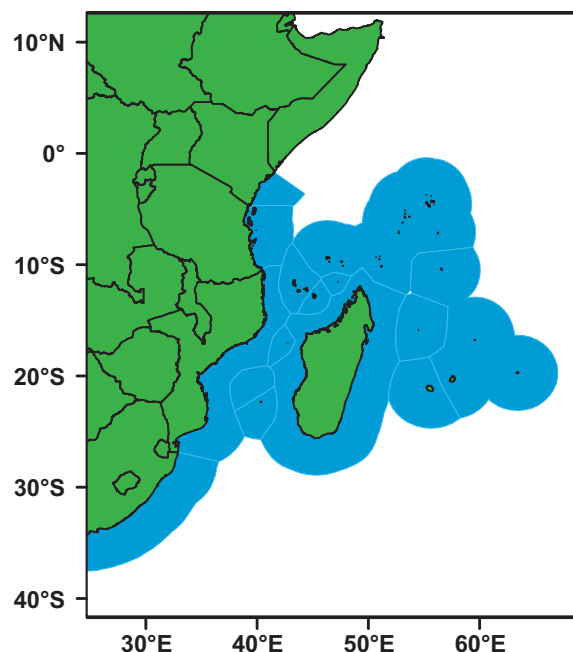
Prologue

On 4 and 5 December 2000, Dr Bill Lane of the World Bank, invited a group of scientists and fisheries' administrators from countries in the Southwest Indian Ocean (SWIO) to a meeting in Maputo. The purpose of this gathering was to explore opportunities for collaborating at a regional level in the sustainable development of shared offshore fishery resources. It was acknowledged that the enlarged EEZs of West Indian Ocean countries had not yet been translated into direct benefits for the countries concerned, nor indeed had they resulted in significant socio-economic upliftment of communities. There was also concern about overfishing, illegal harvesting and especially fisheries' impacts on the region's rich but vulnerable biodiversity. Inadequate scientific knowledge and a lack of capacity handicapped most of the SWIO countries from undertaking explorations and stock assessments in the large EEZ region of their seas. There was strong support in all countries for this regional initiative, notwithstanding the invariable complexity of dealing with an enormous diversity of fisheries, species and many countries all within a very large study area. As a result, the development of a final proposal took several years before it was generously funded and implemented in 2008. What followed was an unprecedented level of collaboration between fisheries agencies and individuals throughout the region. The Southwest Indian Ocean Fisheries Project (SWIOFP) was structured to maximise partnerships and share responsibilities in the pursuit of researching key offshore fisheries resources. Joint projects, shared research cruises, co-supervision of students and multi-stakeholder workshops all contributed to the development of a "network" of scientific collaboration between the region's fisheries agencies and individuals. This network generated a suite of technical reports, consolidated historic fisheries data, produced numerous scientific publications, supported many students and, above all, provided important information to strengthen the regional management already initiated through the Southwest Indian Ocean Fisheries Commission (SWIOFC). One of the final tasks undertaken was the development of a Retrospective Analysis which would provide a compendium of information relating to the key offshore fisheries of the Southwest Indian Ocean, together with their impact on vulnerable elements of the region's biodiversity. This book represents an edited, collated and partially updated version of these Retrospective Analyses.

Geographic scope

The physical boundaries of SWIOFP were loosely defined at the outset as being the 200 nautical mile (nm) Exclusive Economic Zones (EEZs) of the nine participant countries: Comoros, Seychelles, Mauritius, France (La Réunion and other dispersed islands), Madagascar, Kenya, Tanzania, Mozambique and eastern South Africa (KwaZulu-Natal province) as in Figure 1. Broadly, the study region's south-western boundary aligns with the boundary of the FAO fisheries statistical area 51 (Western Indian Ocean; E of 30°E); its northern boundary is a seaward extension of the border between Kenya and Somalia, and the northern extreme of the Seychelles EEZ (approximately on the equator); its eastern boundary includes the furthest extent of the Mauritian EEZ (approx. 67°E). However, because fisheries and their resources do not naturally adhere to the project-defined boundaries, neighbouring areas also partially addressed included the Agulhas Bank and some areas in international waters e.g. seamounts of the South Madagascar Ridge (Walters Shoals) and the Southwest Indian Ridge. It was also initially proposed that only those resources harvested offshore would be considered, although it was recognised that some resources co-occur in both inshore and offshore waters. Examples include prawns, demersal fishes and a number of pelagic species.

Figure 1. Geographical scope of this study showing FAO areas.



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The SWIOFP programme

Following the initial meeting in 2000 and additional deliberations relating to SWIOFP, it was agreed to secure a World Bank PDF-b grant in support of developing a full programme proposal with its attendant structures. This development phase was hosted by Mozambique and successfully resulted in a well-defined programme as reflected in the Project Advisory Document – PAD (www.swiofp.net). Significantly, the somewhat lengthy development phase created stronger linkages and positive collaboration between countries of the region. During this development phase it was noted that several other large research programmes were simultaneously being developed in the region, notably the WIOLab (West Indian Ocean Land-based Activities and Sources of Pollution) (www.unep.org/nairobiconvention/) and the ASCLME (Agulhas Somali Current Large Marine Ecosystem program) (www.asclme.org), hosted by UNEP and UNDP respectively. Discussions between the three programmes recognised the merits of closer collaboration within the framework of a Large Marine Ecosystem approach, with the Somali and Agulhas Currents as well as the Mascarene Plateau serving as the primary underlying ecosystems. Furthermore, this trio of programmes would then generate a single overarching Transboundary Diagnostic Analysis (TDA) and a subsequent Strategic Action Programme (SAP) comprising of fisheries, biodiversity, land-based sources of pollution and large marine ecosystem dynamics (van der Elst *et al.* 2009).

The final PAD was completed and signed on October 9th 2007, became effective on 16th April 2008, and was intended to run for 4-5 years. The fledgling Southwest Indian Ocean Fisheries Project (SWIOFP) was launched with the overall objective:

“To promote the environmentally sustainable use of fish resources through adoption by countries riparian to the Southwest Indian Ocean of a Large Marine Ecosystem (LME)-based approach to fisheries management in the Agulhas and Somali LMEs that recognizes the importance of preserving biodiversity.”

Within this overall global objective three project-specific objectives were identified:

- To identify and study exploitable offshore fish stocks within the SWIO, more specifically, to determine existing fishing pressure on these stocks and to investigate the role of environmental influences on the life histories, seasonal variability and health of stocks in order to differentiate between environmental and anthropogenic impacts;
- To develop institutional and human capacity through training and career opportunities; and
- To develop a regional fisheries management structure and associated harmonized legislation in collaboration with the Southwest Indian Ocean Fisheries Commission (SWIOFC).

The implementation phase of SWIOFP was hosted by Kenya on behalf of the nine participating countries. Funding of US\$22.65 M was made available by the International Bank for Reconstruction and Development (on behalf of the GEF) with additional contributions from Norway, French GEF, FAO, and counterpart finance from participating countries.

Countries participating in, and contributing to SWIOFP were: Comoros, France (by virtue of its islands in the region), Kenya, Madagascar, Mauritius, Mozambique, Seychelles, South Africa (east coast only), the United Republic of Tanzania and, as an observer, Somalia. Each country established a national SWIOFP committee which was represented at the regional SWIOFP steering committee by senior government officials. In addition, each of the project's six Components was represented by a committee drawn from each country and facilitated by selected countries as tabulated.

Table 1. SWIOFP Components and sub-components.

Component	Sub-components	Responsible country
Component 1: Data GAP analysis, data archiving and information technology.	Fisheries data collection and evaluation. Compiling of a data atlas for SWIOFP. Establishment of Information Technology, data handling and communications systems.	Kenya
Component 2: Assessment and sustainable utilization of crustaceans.	Deep-water crustaceans. Shallow-water crustaceans.	South Africa
Component 3: Assessment and sustainable utilization of demersal fishes.	Deep-water demersal fish. Shallower water demersal fish.	Tanzania
Component 4: Assessment and sustainable utilization of pelagic fishes.	Large pelagic fish. Small pelagic fish.	Seychelles
Component 5: Mainstreaming biodiversity in national and regional fisheries management.	State of knowledge of non-consumptive resources and marine biodiversity. Key biodiversity indicators and values. Interactions with fisheries including bycatch. Bio-indicators of ecosystem health.	Mauritius
Component 6: Strengthening regional and national fisheries management.	National and international legislation and other instruments relevant to SWIOFP's goal. Harmonization of legislation between countries. Development of regional resource management structures and capacity.	Kenya

Terms of reference for this study

The various SWIOFP Component working groups each undertook a detailed Gap Analysis of the fisheries within their component. This multinational expert exercise identified the main gaps in data and information and played an important role in directing the activities of each component during the implementation phase of SWIOFP. As a result of the Gap Analyses and subsequent research activities, a number of important data sources were identified, additional information generated and a number of publications produced. These activities in turn underpinned one of SWIOFP's key primary tasks, which was to identify and interpret all available information relating to offshore fisheries and to assess the adequacy of such information in the management and possibly future development of new fisheries. Moreover, the impact of these fisheries on the biodiversity and vulnerable organisms of the SWIO was to form an integral part of the programme. This final activity involved a comprehensive Retrospective Analysis of the available information for each of the region's main fisheries as well as biodiversity related themes:

Fisheries	Biodiversity
Crustacean shallow-water trawl	Marine mammals
Crustacean deep-water trawl	Sea turtles
Crustacean deep-water trapping	Seabirds
Pelagic fisheries	Elasmobranchs
Demersal fisheries	Vulnerable teleost fishes
Bycatch update	Biodiversity hotspots

The task of conducting the Retrospective Analyses was contracted out to specialist scientists in the field relevant to the topic. More specifically, the following activities were envisaged as part of the Terms of Reference for fisheries:

- Assess the status and quality of existing databases, their present use, and their potential use for the development of long-term indices for fisheries management.
- Where existing databases have previously been analysed and relevant trends of fishing effort, catches and catch rates have already been determined, these should be illustrated and discussed.
- Where databases have not previously been analysed, a basic analysis of selected data to show long-term trends in fishing effort, catches by species (or species group), and catch rates relative to area, season and gear types should be undertaken. The limitations of the data and analyses to be highlighted.
- Wherever possible, biological data available on selected databases should be explored so as to calculate basic biological parameters of priority species, such as trends in length composition, sex ratios, length at sexual maturity, growth rates, mortality rates and reproductive seasonality.
- Identification of key biological reference points based on past stock assessment studies.
- Provide metadata information on all the datasets used in the study.

- Wherever possible prepare maps for each of the priority resources or species' fishing zones by gear and fishery sector.

Additional terms of reference for biodiversity:

- Assess the state of knowledge and status of vulnerable non-target species (such as seabirds, turtles and marine mammals) and their interaction with industrial fisheries.
- Assess regional bycatch in all fishery types; including potential impacts of changes in fishing technology.
- Identify critical habitats, biodiversity "hotspot" issues, such as spawning aggregations and nursery areas;
- Concurrent mapping of sensitive areas and zones under formal protection.

Considering that information and long-term databases are mostly held by the governments of SWIOFP member countries, NGOs and private researchers, the task included extensive consultation with relevant stakeholders in the region. In addition, detailed literature surveys, compilation of metadata, identification of fishing grounds, and analysis of biological data as well as temporal trends were important tasks. It was envisaged that these Retrospective Analyses would contribute to the Transboundary Diagnostic Analysis (TDA) and Strategic Action Plan (SAP) required as an end-of-project output from SWIOFP.

Primary data sources

National data

Each of the National Component 1 coordinators provided a list of all available datasets from their countries at the onset of the SWIOFP programme. A total of 170 datasets (Figure 2.) was identified and described in varying detail. Comoros declared that little formal collection of national fisheries data had taken place. The datasets were in various formats: paper data sheets and digitized versions, which in turn were stored in numerous formats from basic text files to MS Excel spreadsheets, MS Access databases and commercially sourced databases. Based on the accompanying metadata provided by the Component Coordinators, datasets were prioritised for their inclusion into StatBase.

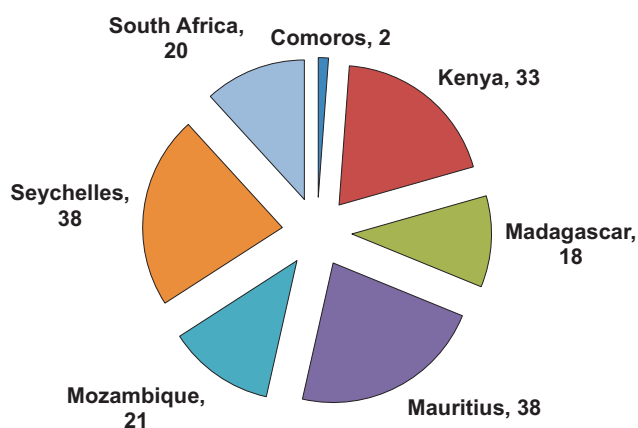


Figure 2. Number of datasets for which metadata was supplied by the National Component 1 coordinators. The number of datasets follows the country name.

Literature/EndNote

Much of the literature on fisheries of the western Indian Ocean is “grey literature” that is poorly available to the wider community of interested parties. One of the activities under Component 1 was, therefore, to develop a central database housing as many relevant publications, reports, etc. that could be easily accessed from anywhere in the region. After considerable deliberation it was decided to use the commercial package EndNote as the system to inventorise the many references. References were collected by each National Component Coordinator and forwarded to the Data Component Coordinator at KMFRI for inclusion in a central all-inclusive set. The complete set of 4,137 references is currently kept at KMFRI in Mombasa, Kenya and should be available online (Figure 3).



Figure 3. Composition of the 4137 scientific documents archived in EndNote.

StatBase

StatBase is an archival software system for fisheries statistics developed by Institut de recherche pour le développement (IRD) in West Africa. The database system was modified from the West African system to address the idiosyncrasies and needs of the East African context under SWIOFP. The aim of this database is to facilitate archiving and integration of existing fisheries statistics from national datasets for region-wide interpretation using software that is freely available and thereby minimising costs to developing countries. It also aimed at providing a mechanism for data gap analysis.

Data are organised in hierarchies (Annex 1) commencing with countries that have subdivisions under each category to provide statistics for the various fishing sectors. Each sector is then further divided to provide tables of catch, effort and vessel registers. The development of a comprehensive dataset for the WIO was hampered by numerous constraints encountered (e.g. highly variable time series of statistics, missing catch data, uncertain status of length measurements, some species breakdown missing). While clearly of value, the database remains to be fully validated and still has incomplete categories, some duplicate datasets for several fisheries and units for catch and effort are not specified. StatBase is maintained by Kenya Marine and Fisheries Research (KMFRI) in Mombasa, Kenya. The database can be accessed online at: http://statbase1.smartfish.d4science.org/statbase/StartPage.action?request_locale=en

WIOFish

WIOFish is a web-based inventory of fisheries and their characteristics in the SWIO region. When it was first conceived in 2000, very few of the small-scale fisheries of the western Indian Ocean (WIO) had been formally identified and described and, accordingly, even fewer could draw potential benefits from scientific assessment and management support promoting sustainable development. This lack of information regarding the fisheries was the driving force behind the development of the WIOFish project. Thus, the underlying rationale for WIOFish lies in the identification

and documentation of small-scale fisheries to provide an annotated inventory of all fisheries of the WIO, thereby addressing some of these key issues. The objectives of WIOFish include:

- to identify each unique fishery type found in coastal waters and to describe the main features of each fishery;
- to maintain an up-to-date database of annotated fishery profiles for all fisheries of the region;
- to report annually on the “status” of the fisheries, including risk profiles and management needs;
- to establish a permanent regional partnership between national fishery nodes in SWIO countries;
- to foster development of small-scale fisheries co-management systems through establishment of an electronically and physically linked network of collaborators focusing around an interactive web-based system that allows for comprehensive public access and reporting.

WIOFish is intended to supplement regional initiatives of the Southwest Indian Ocean Fisheries Commission (SWIOFC) and other organisations/institutes operating in the western Indian Ocean by providing an information service to fishery resource managers, donors, researchers, including those with specific environmental concerns. The system provides a systematic overview of fishing activities in the WIO region and, based on a scoring system, highlights areas of fisheries that are either data-rich or data-poor. The purpose behind this is to provide a platform where interested parties can access the available data for the fisheries and also formulate informed decisions on where further research should be conducted.

WIOFish is managed by the Oceanographic Research Institute (ORI) in partnership with the Kenya Marine and Fisheries Research Institute (KMFRI – Kenya), Institute of Marine Sciences (IMS – Tanzania), Instituto Nacional de Investigação Pesqueira (IIP – Mozambique), the Seychelles Fishing Authority (SFA – Seychelles), Albion Fisheries Research Centre (Mauritius), Ministère de la Production Direction Regionale de la Peche Mohéli (Comoros) and the Ministère de la Pêche et des Ressources Halieutiques

(Madagascar). At this stage France is not a participant in WIOFish.

The WIOFish database is not a statistical fisheries database but instead is a repository for as much descriptive information as possible about each fishery that is currently operating or has operated in the western Indian Ocean. The information is collected under sections on catch, vessel type, gear type, habitats utilised, socio-economics, management and references, and includes a scoring system in which various questions are posed about each fishery with answers graded on a numeric scoring system to allow further analysis. The database structure is reviewed annually to incorporate any additional fishery aspects that the project partners feel need to be included. This provides a dynamic and expanding database that aims at being as comprehensive as possible.

A “fishery” is broadly defined on the basis of representing a “management unit” that involved specific species, gear types, habitats and geographic locations. The fisheries have been grouped into 12 separate sectors (Figure 4), ranging from subsistence shore gathering to full scale industrial operations. Each of these fisheries is comprehensively reviewed on an annual basis by the national nodes to ensure records are up to date and populated with the latest available catch and other information. Each year the full set of information is archived so as to provide a reference point for future assessment of trends in the evolution of these fisheries.

Food and Agriculture Organization of the United Nations (FAO)

Each year the FAO collects and collates fisheries statistics from individual countries and regions around the world. This extensive fifty-year time series reflects inter-alia capture production by species, country and statistical region. This valuable repository for fisheries information is accessible through various formats, tools and information products available at: <http://www.fao.org/fishery/statistics/en>.

Accordingly, capture data is available for the nine countries included in this study and are examined in this Retrospective Analysis. It should be noted that the statistical region relevant to this study is Area of 51: western Indian

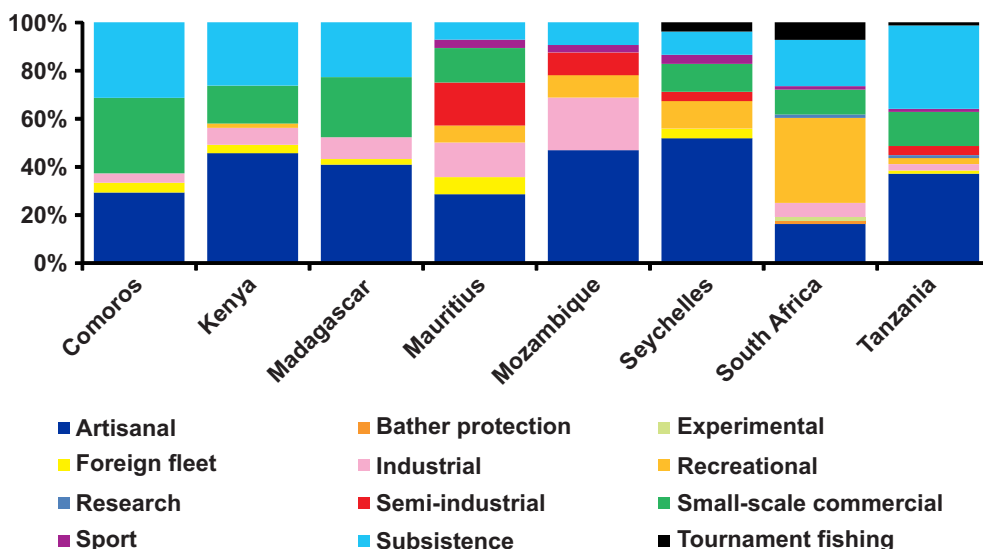


Figure 4. The various fisheries sectors operating in each SWIOFP country.

Ocean, which is considerably larger than the geographic extent of the SWIOFP study area.

Fishbase

Fishbase is a global information system that provides key information on the biology and critical life history parameters of most of the world's fish species. It was first developed in 1992 at the WorldFish Center in collaboration with the FAO and many other partners, and with support from the European Commission. It is available online at www.fishbase.org. Scientists throughout the western Indian Ocean use FishBase to access basic biological data. It has been used extensively in this book to describe the species that are of importance to the region.

Research cruises

One of the aims of SWIOFP was to gather as much information as possible about the region's marine resources and store this information in a central system accessible to all. This included the sourcing of historical research surveys and the acquisition of new data from commissioned research surveys during the project's lifespan. Early on in the project, the EAF-Nansen Project provided all the data from historical research surveys conducted by the Norwegian research vessel, Dr Fridtjof Nansen, in the western Indian Ocean. These data are stored using the Nansis software that the Institute for Marine Research (Norway) developed to capture the data on board the vessel. A copy of this dataset is lodged at KMFRI to be kept with all other datasets collected during SWIOFP. Other historical survey data are known to exist but were not repatriated during SWIOFP due to the high costs associated with such repatriation. During SWIOFP a total of 40 surveys were planned to collect new data for the region and 34 of these surveys were completed. These surveys covered aspects such as biodiversity, productivity, biomass estimates, migration, genetic sampling, etc. A full list of surveys is provided in Annex 2.

Harmonization of data sets

In order to provide regional consistency between datasets, a Memorandum of Understanding between SWIOFP and the participant countries was compiled in which the format and descriptors of existing and future metadata is standardised according to those used for StatBase, with the following fields: Database identifier; Dataset name; Country or regional body; Responsible agency; Source of information; Jurisdictional scale; Nature of the data; Gear type; Target Species; Biological data; Physical data; Type of dataset; Status of data; Data medium; Digital medium; Operating system; Database software; Digital format; Temporal coverage; Temporal resolution; Spatial coverage; Spatial resolution; Spatial extent; Locality; Language; Comments.

The regional management environment

Historically, there has been poor collaboration in the management of fisheries between nations of the region, despite the apparent and clear features that are common and shared between SWIOFP countries. In time, several initiatives evolved which recognised the need for greater collaboration in the management of shared, straddling and transboundary fish stocks. These have given rise to more formal management structures which at this stage remain only advisory. However, their growing success could well lead to more formal and legally binding management structures in the SWIO region in years to come. Some of the key structures that support management of fisheries and associated biota in the region are discussed.

Southwest Indian Ocean Fisheries Commission

– <http://www.fao.org/fishery/rfb/swiofc>

The Southwest Indian Ocean Fisheries Commission (SWIOFC) is a regional body established in 2004 under the auspices of FAO to promote the sustainable utilization of the living marine resources of the SWIO region. Its regions of competence are the national waters of its member states: Comoros, France, Kenya, Madagascar, Maldives, Mauritius, Mozambique, Seychelles, Somalia, South Africa, United Republic of Tanzania, and Yemen. It does not collate or host databases but its Scientific Committee does report regularly on the status of fishery resources and advises members of the Commission on a scientific basis for possible regulatory measures. Reports of the countries to the Scientific Committee and reports of the Scientific Committee to the Commission have been used as sources of information for this Retrospective Analysis. The SWIOFC promotes the application of the provisions of the FAO Code of Conduct on Responsible Fisheries, including the precautionary approach and the ecosystem approach to fisheries management. The Commission achieves its objectives through the following activities:

- assist fishery managers in the development and implementation of fishery management systems that take due account of environmental, social and economic concerns;
- keep under review the state of the fishery resources in the area and the industries based on them;
- promote, encourage and coordinate research related to the living marine resources in the area and draw up programmes required for this purpose;
- promote the collection, exchange, dissemination and analysis or study of statistical, biological, environmental and socio-economic data and other marine fishery information;
- provide a scientific basis to assist fisheries management decisions;
- provide advice on management measures and to promote co-operation on monitoring, control and surveillance of a regional or sub-regional nature;
- encourage, recommend and coordinate training in the areas of interest of the Commission;
- promote and encourage the utilization of the most appropriate fishing craft, gear, fishing techniques and post harvesting technologies.

Indian Ocean Tuna Commission

– <http://www.iotc.org>

The Indian Ocean Tuna Commission (IOTC) is an intergovernmental organization established in 1993 under the FAO constitution with the mandate to provide management decision support relating to tuna and tuna-like species and their environment. Its operations extend beyond the SWIOFP region to cover the entire Indian Ocean and adjacent seas, promoting cooperation among its 32 members in support of conservation and optimum utilization of stocks falling under its mandate. With the exception of South Africa, all SWIOFP members are full contracting parties to IOTC. The Commission has several substructures including scientific and compliance committees and working parties on statistics, billfish, ecosystems, bycatch and more. These structures facilitate the collection of statistics which are curated in a number of databases, a list of which can be found at <http://www.iotc.org/data-and-statistics>. Data are provided by the flag states of member countries fishing for tunas in the Indian Ocean. IOTC undertakes regular, comprehensive stock assessments of most of the key resources of tuna and tuna-like species, which are summarised in Executive Summaries on each species and reported to the Commission. For surface fisheries, catch weight by species is provided by 1° grid area and month strata, for longline fisheries these data are provided by 5° grid area and month strata, while for coastal fisheries data may be provided using an alternative geographical area if it represents the fishery concerned better than the grid areas.

Based on the information collected, the IOTC issues conservation and management measures accordingly. Whilst adherence to such measures is technically voluntary, a Compliance Committee is in place to monitor the compliance with respect to such management proposals. In this way the IOTC plays an important role in regional fisheries statistics and management.

SADC Fisheries Protocol

– http://www.nda.agric.za/doaDev/sideMenu/fisheries/03_areasofwork/Aquaculture/AquaDocumentation/SADC_ProtocolFisheries.pdf

In 2001, fourteen member countries of the Southern African Development Community (SADC) signed an agreement that recognises the important role of fisheries in the social and economic well-being and livelihood of the people of the region, in ensuring food security and alleviating poverty. Known as the SADC Protocol on Fisheries, it sets out agreed rules and principles dealing with national and international responsibilities, management of shared stocks, harmonisation of legislation, law enforcement, IUU fisheries, access to stocks, artisanal fisheries, environmental protection, scientific and institutional development amongst others. Whilst the Protocol has not enjoyed the high level of prominence and implementation that was originally envisaged, it nevertheless provides the basic building block for a regional fisheries management strategy that can command the highest level of political support necessary to implement operations.

The Nairobi Convention

– <http://unep.org/NairobiConvention/about>

As part of UNEP's Regional Seas programme the Nairobi Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region was signed in 1985 and came into force in 1996. As all SWIOFP countries are Contracting Parties, the Convention provides a mechanism for regional cooperation, coordination and collaborative actions in the region's marine and coastal environmental protection, especially critical national and transboundary issues. The primary mechanism underlying the Convention is the development of protocols and their region-wide application. Examples include protocols on the protection of wildlife and flora, protection from land-based sources and activities as well as combating marine pollution. The Convention offers a regional legal framework and coordinates the efforts of the member states to plan and develop programmes that strengthen their capacity to protect, manage and develop their coastal and marine environment sustainably. Closer collaboration with fisheries agencies would substantially improve regional management and biodiversity protection.

Literature cited

van der Elst RP, Groeneveld, JC, Baloi AP, Marsac F, Katonda KI, Ruwa RK, Lane WL. 2009. Nine nations, one ocean: A benchmark appraisal of the South Western Indian Ocean Fisheries Project (2008-2012). *Ocean & Coastal Management*. 52 (5): 258-267.



Tuna purse seiner, Seychelles. (Photo: Ross Wanless)

Annex 1:

The StatBase structure and data that are currently available for public access on the Internet.

Level 1	Level 2	Level 3	Data type	Period	Comments
IOTC					No data
Tanzania	Artisanal fishery	Artisanal Fishery Landings by both weight and values	Catch	1990-1996	
		Artisanal Fishery Landings by both weight and values	Catch	1990-1996	
	Artisanal landings in both weight and values	Weight in tonnes			No data
	INDUSTRIAL REGISTER	INDUSTRIAL REGISTER	Register of vessels	1990-2008	
	Industrial fishery	Industrial catch			
SWIOFP	INDUSTRIAL FISHERY				No data
	ARTISANAL FISHERY_2	catch and value			No data
		Fishing Gears Effort	Effort	2004-2008	Provides Year, Gear type and No. of gears but no country allocation
	SEMI INDUSTRIAL FISHERY				No data
	SPORT FISHERY				No data
Zanzibar	Z 100 AA		Effort	1994	
SWIOFC					No data
Seychelles	Semi industrial longline	Effort - number of hooks per gear	Effort	1995-2008	
		Catch by species and gear in Kgs	Catch	1995-2008	
		Catch by species in Kgs	Catch		No data
	Sea Cucumber Fishery	Catch by species by numbers	Catch	2000-2008	
	Lobster	Catch by species and gear in Kgs	Catch	2001-2008	
		effort - number of trips per gear	Effort	2001-2008	
	Artisanal Fishery	Catch by gears	Catch	2000-2008	
		Fishing Effort	Effort	2000-2010	
	Industrial Longline Fishery	Catch by species	Catch	2000-2008	
		Number of hooks per semester	Effort	1999-2008	
FAO	FAO data	Catches			No data
Mauritius	coastal fishery	catch			No data
		Coastal Fishery			No data
	effort	MUS3-coastal-Effort			No data
	Costal fishery	EFFORT IN DAYS	Effort	2003-2008	
		BOATS IN NUMBER	Register of vessels	2003-2008	
		CATCH PER FISHERMAN DAY IN KG	CPUE	2003-2008	
		Catches by gears	Catch	2003-2008	
	effort	MUS3-coastal-Effort			No data
	Mauritiusdata				No data
	Mauritiuscoastalfishery				No data
	MUS-Bank fishery	CPUE in Kg	CPUE	1989-2007	
		CATCH PER FISHERMEN DAY IN KG	CPUE	1997-2010	
		Catch in Tons			No data
		Catches in tons			No data
		CATCH IN TONS	Catch	1996-2010	
		Effort in fishermen days			No data
		EFFORT IN FISHERMEN DAYS	Effort	1997-2010	
Effort in days		Effort	1989-2007		
Catches by zone		Catch	1989-2008		
Mauritius Fisheries	Coastal Fishery			No data	
MUS-1	catch			No data	
MUS-1				No data	

Level 1	Level 2	Level 3	Data type	Period	Comments
Other	MOZ1	TABLE 180			No data
	MOZ 1				No data
Comoros	Artisanal fisheries	Effort	Effort	1994	
		TABLE 278	Catch	1994	
		Cencus	Register of vessels	1993-1994	
Somalia					No data
Mozambique	Artisanal Fishery	CATCH	Catch	2003-2009	
		CENSUS	Register of vessels	2002-2007	
	Moz Sport Fish	Moz Sport Fish	Catch	2000-2009	
	Semi-Industrial Fishery	FLEET	Register of vessels	2000-2009	
		CATCH	Catch	2000-2009	
		EFFORT	Effort	2000-2009	
	Industrial Fishery	EFFORT	Register of vessels	2000-2009	
		CATCH	Catch	2000-2009	
		FLEET	Effort	2000-2009	
Kenya	Industrial register	Number of boats	Register of vessels	2004-2009	
	Semi industrial	Effort	Register of vessels	2001-2006	
	Ken-1	Ken-1 Industrial Purse seiners & Long liners			No data
	Artisanal fishery	Landings by species	Catch	1990-2008	
		Number of gears	Effort	2004-2008	
	Spot fishing	Catch and effort	Catch and Register of vessels	1987-2006	
South Africa	KwaZulu-Natal Industrial fisheries	Industrial fishery catches	Catch	1985-2011	
		Industrial fishery vessel register	Register of vessels	1985-2011	
		Industrial fishing effort	Effort	1985-2011	
Madagascar	PECHE TRADITIONNELLE AUX CREVETTES	EFFORT	Effort	1998-2000	
		CATCH	Catch	1998-2004	
	PECHE CREVETTIERE	EFFORT	Effort	2004-2010	
		FLOTTILLE	Register of vessels	1995-2010	
		CATCH	Catch	1995-2010	
	PECHE AUX POISSONS	CAPTURE	Catch	2005-2008	
	NOTE CONJONCTURELLE	FLOTTILLE	Register of vessels	2004-2008	
		CATCH	Catch	2004-2008	
		EFFORT	Effort	2004-2008	
France (Réunion)	Réunion	EFFORT 2005-2009	Register of vessels + fishers	2005-2009	
		TABLE 394	Catch	2005-2009	
		registre 2008	Register of vessels	2008	

Annex 2:

Research surveys completed during the lifespan of the South West Indian Ocean Fisheries Project.

<i>Year</i>	<i>Component</i>	<i>Countries</i>	<i>Survey Title</i>	<i>Dates</i>	<i>No of days</i>	<i>Survey Objectives</i>
2008	C2, C3, C4	South Africa, Madagascar	East Madagascar Current Ecosystem Survey	23 Aug -1 Oct	38	To establish the productivity, biodiversity and biomass of the pelagic ecosystem using the RV Dr Fridtjof Nansen.
	C3, C4, C5	Mauritius	Mauritius Ecosystem survey	4 - 7 Oct	4	To do preliminary investigations on species diversity on the demersal fish fauna over the Mascarene Plateau section using the RV Dr Fridtjof Nansen.
	C3, C4	Mauritius, Seychelles	Mascarene and Seychelles- Pemba survey	8 Oct -27 Nov	50	Use the RV Dr Fridtjof Nansen to investigate demersal and pelagic productivity, biodiversity and biomass.
	C4	International waters, French Territories, Madagascar	Mesoscale eddies pelagic and mesopelagic Survey of the Mozambique Channel	28 Nov -17 Dec	20	To establish, as far as possible, the productivity, diversity and biomass of the pelagic and mesopelagic ecosystem using the RV Dr Fridtjof Nansen.
	C4, C5	Mozambique Channel	Mesoscale eddies and large pelagic fish (swordfish & large tuna) in the Mozambique Channel Survey	27 Nov -18 Dec	22	Analyze role of eddies in the increase of biological production of the pelagic ecosystem and catchability of large pelagic fishes. Analyse interactions between the longline and the marine megafauna.
2009	C3, C4	Mozambique	Survey of the living marine resources of North Mozambique	6-20 Aug	15	To establish, as far as possible, the productivity, diversity and biomass of the pelagic and mesopelagic ecosystem using the RV Dr Fridtjof Nansen.
	C2, C3, C4	Madagascar	West Madagascar Pelagic Ecosystem Survey	25 Aug -3 Oct	40	To investigate demersal and small pelagic fish species diversity and abundance using the RV Dr Fridtjof Nansen.
	C3, C4	Comoros	Survey of the Comoros Gyre	5 Oct -3 Nov	29	To establish the productivity, diversity and biomass of the demersal, pelagic and mesopelagic ecosystem using the RV Dr Fridtjof Nansen.
2010	C3, C4, C5	Mauritius and Southern Mascarene Plateau Survey	Mauritius and Southern Mascarene Pelagic Ecosystem Survey	7-21 Dec	16	To establish the productivity, diversity and biomass of the demersal, pelagic and mesopelagic ecosystem using the RV Dr Fridtjof Nansen.
	C4, C5	South Africa	South Africa Large pelagics (swordfish & large tuna) Survey	22 Oct -10 Nov	20	With the use of the RV Ellen Khuzwayo, understand the distribution and movement of swordfish, big eye and yellowfin tuna within the SWIO region.
	C4, C5	Mozambique	SW Moz Channel Large pelagics (swordfish & large tuna) Survey	19 Oct -1 Nov	15	With the use of the RV Ellen Khuzwayo, understand the distribution and movement of swordfish, big eye and yellowfin tuna within the SWIO region.
2011	C2, C3, C5	Tanzania	Tanzania Shallow-water Crustacean Trawl Survey	5-20 Jan	15	Using a commercial vessel, establish the distribution and composition of crustacean species during the North West monsoon, collect biological and genetic samples of priority shallow water prawns.
	C2, C3, C5	Kenya	Kenya Shallow-water Crustacean Trawl Survey	21 Jan -4 Feb	15	Using a commercial vessel, establish the distribution and composition of crustacean species during the North West monsoon, collect biological and genetic samples of priority shallow water prawns.
	C4	Reunion (France)	Instrumented Longline Training survey on (Large pelagics)	27 Feb -3 March	7	Provide practical experience in instrumented longline data acquisition and analysis through participation in an at sea training cruise using the RV La Curieuse.
	C2, C3, C5	Kenya	Kenya Shallow-water Crustacean Trawl Survey	21 May -4 June	15	Using a commercial vessel, establish the distribution and composition of crustacean species during the South East monsoon, collect biological and genetic samples of priority shallow water prawns.
	C2, C3, C5	Tanzania	Tanzania Shallow-water Crustacean Trawl Survey	5-19 June	15	Using a commercial vessel, establish the distribution and composition of crustacean species during the South East monsoon, collect biological and genetic samples of priority shallow water prawns.

<i>Year</i>	<i>Component</i>	<i>Countries</i>	<i>Survey Title</i>	<i>Dates</i>	<i>No of days</i>	<i>Survey Objectives</i>
2011 -cont.	C2, C3, C5	Tanzania	Tanzania Acoustic and Demersal Trawl Survey	3-22 Aug	20	Using a commercial vessel, undertake trawl and acoustic methods to assess relative abundances of demersal fish stocks.
	C2, C3, C5	Mozambique	Mozambique Deep-water Crustacean Trawl Survey	21 Oct -11 Nov	23	Using a commercial vessel, establish the distribution and composition of crustacean species, collect biological and genetic samples of priority deep water crustaceans.
	C4, C5	South Africa	SW Moz Channel Large pelagics (swordfish & large tuna) Survey	11 Oct -2 Nov	23	Use the RV Ellen Khuzwayo to tag and release swordfish and collect biological and species distribution data. Collect information on orcas and seabirds.
	C2, C3, C5	Madagascar	Madagascar Deep-water Crustacean Trawl Survey	20 Nov -7 Dec	25	Using a commercial vessel, establish the distribution and composition of crustacean species, collect biological and genetic samples of priority deep water crustaceans.
2012	C2, C3, C5	Tanzania	Tanzania Deep-water Crustacean Trawl Survey	29 Jan -13 Feb	15	Using a commercial vessel, establish the distribution and composition of crustacean species, collect biological and genetic samples of priority deep water crustaceans.
	C2, C3, C5	Kenya	Kenya Deep-water Crustacean Trawl Survey	23 Feb -7 Mar	15	Using a commercial vessel, establish the distribution and composition of crustacean species, collect biological and genetic samples of priority deep water crustaceans.
	C2, C3, C5	Tanzania	Tanzania Deepwater Crustacean Trap survey	11-25 April	15	Using a commercial vessel, establish the distribution and composition of crustacean species, collect biological and genetic samples of priority deep water crustaceans.
	C2, C3, C5	Kenya	Kenya Deepwater Crustacean Trap survey	1-15 May	15	Using a commercial vessel, establish the distribution and composition of crustacean species, collect biological and genetic samples of priority deep water crustaceans.
	C2, C3, C5	Mozambique	Mozambique Deepwater Crustacean Trap survey	15 May -8 Jun	25	Using a commercial vessel, establish the distribution and composition of crustacean species, collect biological and genetic samples of priority deep water crustaceans.
	C2, C3, C5	Kenya	Kenya Demersal Trawl Survey	31 Oct -14 Nov	15	Using a commercial vessel, establish the distribution and composition of crustacean species, collect biological and genetic samples of priority crustaceans.
	C3, C5	Madagascar	Madagascar Acoustic and Dropline Survey	2-13 July	12	Using a commercial vessel, investigate the species composition and biology of deep slope demersal fish resources.
	C3, C5	Mauritius	Mauritius Acoustic and Dropline Survey	14-29 July	16	Using a commercial vessel, investigate the species composition and biology of deep slope demersal fish resources.
	C3, C5	Mozambique	Mozambique Acoustic and Dropline Survey	20 Oct -8 Nov	20	Using a commercial vessel, investigate the species composition and biology of deep slope demersal fish resources.
	C3, C5	Kenya	Kenya Acoustic and Dropline Survey	22-26 Nov	5	Using a commercial vessel, investigate the species composition and biology of deep slope demersal fish resources.
	C3, C5	Tanzania	Tanzania Acoustic and Dropline Survey	11-15 Nov	5	Using a commercial vessel, investigate the species composition and biology of deep slope demersal fish resources.
	C4, C5	Reunion (France), Madagascar	South-East Madagascar and South Reunion Large pelagics (swordfish & large tuna) Survey	9-22 Nov	15	Use the RV La Curieuse to tag and release swordfish and collect biological and species distribution data. Collect information on orcas and seabirds.