

WIOFISH DATABASE

***A catalogue of small-scale fisheries of the
western Indian Ocean***



ANNUAL REPORT

SEPTEMBER 2010

<p><i>Compiled For:</i></p>	<p>South West Indian Ocean Fisheries Project - SWIOFP</p>	
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INTRODUCTION AND BACKGROUND

The western Indian Ocean has a surface area of approximately 29 million km², and includes an enormous diversity of habitats such as coral reefs, seagrass beds, mangrove creeks, sandy and rocky beaches, estuaries and open ocean. It also contains some of the most dynamically varying large marine ecosystems in the world¹, yet, the total reported industrial fish catch is comparatively low at 4 million Mt. Furthermore, while globally 90%-95% of fish production is derived from coastal waters, in the WIO only 50% of landings are derived from coastal waters. Numerous speculations have been made to account for this seeming abnormality such as the relatively narrow continental shelf along the East African coast, a lack of large nutrient upwelling areas and general under-reporting of catches by the subsistence and artisanal fisheries operating in the region's coastal waters. Underreporting of catches undermines the importance of small-scale fisheries and their role; both in assuring employment and food security² for coastal people and therefore directly contributing to poverty alleviation, environmental and social protection for coastal communities. Estimates of the total artisanal fish catch are in the region of 4 million Mt, however, the *per capita* availability of fish in Sub-Saharan countries is declining at 2.6% per year and depleted resources pose an increasing threat to communities already made vulnerable by poverty, disease, climate change, and social inequality. When WIOFish was first conceived in 2000, very few of the small-scale fisheries had been formally identified and described and, accordingly, even fewer could draw potential benefits from scientific assessment and management support promoting sustainable development. The underlying rationale for WIOFish thus lies in the identification and documentation of small-scale fisheries so as to provide an annotated inventory of all fisheries of the WIO, thereby addressing some of these key issues. The objectives of WIOFish include:

- to establish a permanent regional partnership between national fishery nodes in the main WIO countries;
- to identify each unique fishery type found in the coastal zone and to describe the main features of each fishery;
- to report annually on the "status" of the fisheries, including risk profiles and management needs; and
- 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.

The main elements of the WIOFish system were created by the partnership activities of the Oceanographic Research Institute (ORI - South Africa), Kenya Marine and Fisheries Research Institute (KMFRI - Kenya), Institute of Marine Sciences (IMS - Tanzania), the Fisheries Research Institute (IIP - Mozambique) and the Seychelles Fishing Authority (SFA - Seychelles). The database has developed from an original collection of MS Word documents detailing each fishery, through an MS Access database that was distributed via CD Rom to a MySQL database that is accessible on the Internet (www.wiofish.org) to all interested parties. The partnership between countries has expanded to include Mauritius and negotiations are underway to include the Comoros. The database structure is reviewed annually to incorporate any short comings that the project partners feel need to be addressed. This provides a dynamic and expanding database that aims at being as comprehensive as possible.

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 in the western Indian Ocean. This information is collected under sections of catch, vessel type, gear type, habitats utilised, socio-economics, management and references, and includes a scoring system where various questions are posed about each fishery and answers are graded on a numbering system.

¹ FAO Marine Resources Service, Fishery Resources Division. **Review of the state of world fishery resources: marine fisheries.** *FAO Fisheries Circular*. No. 920. Rome, FAO. 1997. 173p

² De Young, C. (ed.) **Review of the state of world marine capture fisheries management: Indian Ocean.** *FAO Fisheries Technical Paper*. No. 488. Rome, FAO. 2006. 458p.

WIOFish is intended to supplement regional initiatives of the South West Indian Ocean Fisheries Commission (SWIOFC) 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 the scoring system, highlights both areas of achievement as well as gaps and topics in need of further investigation.

Initially, each of the national nodes (ORI, KMFRI, IIP, IMS, SFA and Albion Fisheries Research Centre) compiled a list of fisheries operating in their respective countries and gradually information has been added to the fields in the database. 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 ten separate sectors, ranging from simple 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 in future assessment of trends in the evolution of these fisheries.

This report describes the scheduled WIOFish activities that have been undertaken during the period from the commencement of the second year of the South West Indian Ocean Fisheries Project (SWIOFP) in October 2009 until the end of September 2010. These activities include four update workshops held at IMS (Zanzibar, Tanzania), KMFRI (Kenya), IIP (Mozambique) and SFA (Seychelles). Also included is the workshop held at Albion Fisheries Research Centre to include the Mauritian fisheries into the WIOFish database. The South African fisheries have been updated as information has been made available via staff at the ORI and at Ezemvelo KwaZulu-Natal Wildlife. A further activity reported on is the translation of the frontend of the online database from English into French.

Furthermore the report gives a summarisation of the status of the fisheries overall and per country for the year 2009.

TANZANIA UPDATE WORKSHOP

The Institute of Marine Sciences (IMS) hosted the Tanzania Update Workshop on Zanzibar. It was held from 8 to 12 March 2010 and was attended by representatives from the Department of Fisheries (Zanzibar), Tanzania Fisheries Research Institute (mainland) and the Institute of Marine Sciences (Zanzibar). Two additional collaborators from The Department of Fisheries (mainland) were invited to participate in the workshop but failed to arrive in Zanzibar.



Participants in this workshop were:

Name	Institution
Narriman Jiddawi	Institute of Marine Sciences
Salum S. Hamed	Institute of Marine Sciences
Mumin Hamadi	Institute of Marine Sciences
Daudi J. Msangameno	Institute of Marine Sciences
Saleh Yahya	Institute of Marine Sciences
Catherine Mwakosya	Tanzania Fisheries Research Institute
Hamad Khatib	Department of Fisheries and Marine Research
Omar A. Amin	Department of Fisheries and Marine Research
Sihaba Haji Vuai	Department of Environment
Bernadine Everett	Oceanographic Research Institute

The workshop at IMS was extremely successful despite some logistical problems involving the local electricity supply and the availability of Internet access. The electricity supply to Zanzibar from mainland Tanzania had been non-existent since December 2009 and initially power supply was from a generator which was unreliable. Fortunately the power supply to the island was restored on the evening of 8 March 2010 and the participants worked quickly for the remainder of the week to catch up on the time lost on the first day. Internet access was also initially also an issue since its availability was linked to the power supply. This was rectified when the power supply was restored. However, on 10 March 2010, IMS changed Internet Service Providers which left participants with no Internet connection at all while the change over took place. Fortunately the Western Indian Ocean Marine Science Association (WIOMSA) kindly consented to the workshop being moved to their conference facilities and the use of their Internet connection. Their generosity in this regard is much appreciated. A high standard of work was delivered by the participants and it is felt that the Tanzanian fisheries documented in WIOFish are comprehensively described. Actions taken during the workshop regarding each fishery are listed below.

Fisheries 2009	Action taken
Diving, gathering, sea cucumber	Updated
Diving, hand/scoop net, ornamental fish	Updated
Diving, lobster	Updated
Diving, speargun & snorkel	Updated
Hook & line, charter boat, gamefish	Updated
Hook & line, handline, fish/sharks/rays	Updated
Hook & line, handline, shore	Updated
Hook & line, longline, surface	Updated
Hook & line, small boat and motor, sport	Updated
Industrial nets, inshore, crustaceans	Updated
Industrial nets, offshore, tuna	Updated
Industrial nets, purse seine	Updated
Other, coral mining	Updated
Other, dynamite, fish	Updated
Shore gathering, brittle stars, fish bait	Updated
Shore gathering, intertidal, crabs	Updated
Shore gathering, intertidal, octopus	Updated
Shore gathering, intertidal, sea cucumbers	Updated

Shore gathering, machete (mwenge), fish/squid	Updated
Shore gathering, mangroves, whelks (suka)	Updated
Shore gathering, rocky shores, mussels	Renamed to <i>Shore gathering, rocky shores, mussels, ornamental shells</i>
Shore gathering, rocky shores, ornamental shells	Combined with <i>Shore gathering, rocky shores, mussels</i>
Shore gathering, rocky shores, oysters	Combined with <i>Shore gathering, sandy shores, gastropods/bivalves</i>
Shore gathering, sandy shores, gastropods/bivalves	Renamed to <i>Shore gathering, sandy shores & seagrass beds, gastropods/bivalves</i>
Shore gathering, sandy shores, turtles	Updated
Shore gathering, seaweed	Renamed to <i>Shore gathering, seaweed, culture</i>
Shore gathering, spear, fish	Updated
Small nets, beach seine, fish	Updated
Small nets, boat drag & seine (kavogo, kigumi)	Updated
Small nets, bottom gill net	Renamed to <i>Small and large mesh nets, bottom gill net</i>
Small nets, cast net, fish & squid	Updated
Small nets, hand/scoop net	Updated
Small nets, mosquito/chandalua/tandio/kivajo, fish/shrimps	Updated
Small nets, surface gill net, pelagics	Renamed to <i>Small nets, surface (drift) gill net, pelagics</i>
Small nets, surrounding net (Zuwio)	Updated
Traps, basket (dema), fish	Renamed to <i>Traps, basket (dema and towe), fish</i>
Traps, small bucket(towe)	Combined with <i>Traps, basket (dema), fish</i>
Traps, staked (uzio/wando), fish	Updated



The participants in the WIOFish update workshop for Tanzania hard at work updating the fisheries data.

KENYA UPDATE WORKSHOP



The Kenyan update session was held at the Kenya Marine and Fisheries Research Institute in Mombasa, Kenya from 15 to 18 March 2010 and it was attended by:

Gladys Okemwa	Kenya Marine and Fisheries Research Institute
Esther Fondo	Kenya Marine and Fisheries Research Institute
Miriam Wainaina	Kenya Marine and Fisheries Research Institute
Bernadine Everett	Oceanographic Research Institute

It was held, rather fittingly, in the SWIOFP offices at KMFRI. Due to the slow Internet connection work progressed slowly particularly in the afternoons when, at times, it was impossible to save any changes to the database as the operations timed out. Ultimately, due to the diligence of the participants coming in to work early and leaving late, the update process was completed. A review of all the fisheries profiles was undertaken on the final day and, with only a few minor adjustments, the profiles were declared a good representation of the state of Kenyan fisheries for 2009 as far as current knowledge availability allows them to be. The fisheries that were updated are listed below.

Fishery Name	Actions
Diving, gathering, Oysters	Updated
Diving, hand/hoop net, ornamental fish	Updated
Diving, snorkel, sea cucumber	Updated
Diving, speargun, fish	Updated
Diving, speargun, octopus	Updated
Diving, stick, Octopus and Squids	Updated
Hook & line (Trolling), fish/sharks/rays	Updated
Hook & line, handline, fish/sharks/rays	Updated
Hook & line, longline - surface, pelagic	Updated
Industrial nets, inshore, prawns	Updated
Industrial nets, offshore, lobsters	Updated
Industrial nets, purse seine, tuna	Updated
Large nets, reef seine, fish	Updated
- Large nets, reef seine, fish (sub-fishery)	Updated
Large nets, Ring nets, Fish	Updated
Shore gathering, intertidal, crabs	Updated
Shore gathering, intertidal, seaweed	Updated
Shore gathering, intertidal, worms	Updated
Shore gathering, mangroves, wood	Updated
Shore gathering, rocky shores, ornamental shells	Updated
Shore gathering, sandy shores, turtles/eggs	Updated
Shore gathering, spear, fish	Updated
Small nets, beach seine, fish	Updated
Small nets, bottom gill net, sharks/rays/fish	Updated
Small nets, cast nets, fish	Updated
Small nets, gillnets, crustaceans	Updated
- Small nets, gillnets, crustaceans (sub-fishery)	Updated
Small nets, lamp, fish	Updated
Small nets, Scoop nets, Crabs	Updated
Small nets, seine nets, crustacea	Updated
Small nets, surface gill net, sharks/rays/fish	Updated
Trap, Deep sea, Crabs	Updated
Traps, basket, fish (sub)	Updated
Traps, basket, fish/crabs (art)	Updated
Traps, staked (uzio), fish/crabs	Updated

- indicates a sub-fishery profile that falls within a smaller area of the national fishery profile



Esther Fondo and Miriam Wainaina updating the Kenyan fisheries information.

MOZAMBIQUE UPDATE WORKSHOP



Instituto Nacional de Investigação Pesqueira (IIP) hosted the Mozambique update workshop. It was held at the Monte Carlo Hotel in Maputo from the 22nd to the 26th of March 2010. The workshop was not held at the IIP offices as the Internet connection is too slow and unreliable that the data capture would have taken too long to complete the task in the allocated time. The Monte Carlo Hotel offers free Internet access to guests and those utilising its facilities so this is an ideal place to hold the workshop.

Participants in the workshop were:

Paula Santana Afonso	Instituto Nacional de Investigação Pesqueira	
Gilberto Ngoca	Instituto Nacional de Investigação Pesqueira	
Rui Jorge Mutombene	Instituto Nacional de Investigação Pesqueira	(All Hook & line fisheries)
Lourenço Zacharias	Instituto Nacional de Investigação Pesqueira	(Traps – Gambo & Gaiola)
Eunice Rossana Leong	Instituto Nacional de Investigação Pesqueira	(Small nets, gillnets, shrimp)
Alice Maria Augusta luácis	Instituto Nacional de Investigação Pesqueira	(Small nets, gillnets, shrimp)
Elsa Patria	Direcção Nacional de Agro-Pecuária	(Industrial nets, tuna)
Bernadine Everett	Oceanographic Research Institute	

This workshop was held in a central meeting place and the people most familiar with the various fisheries attended for the time needed to update the information pertaining to these fisheries. This provided an opportunity to expose the database to a wider range of people and also to have the pertinent people in attendance while still maintaining a cost effective workshop. This method not only benefits the project in that first-hand information from the relevant researchers and managers is entered into the database but it highlights for those participants what information is lacking about the fisheries on which they work. Since it is an aim of the database that information gaps are highlighted, it is felt that this process was most beneficial.

Fishery Name	Action
Diving, artisanal, lobster	Updated
Diving, fish, seagrass	Updated
Diving, seagrass beds, sea cucumbers	Updated
Diving, speargun, recreational	Updated
Hook & line, artisanal	Updated
Hook & line, large vessel, commercial	Updated
Hook & line, longline, artisanal	Updated
Hook & line, longline, tuna	Updated
Hook & line, shore angling	Updated
Hook & line, small motorboat, recreational	Updated
Hook & line, small motorboat, sport	Updated
Industrial nets, offshore, crustaceans	Updated
Industrial, Trawl, Shrimps	Updated
Large gillnet, artisanal small pelagic	Updated
Semi-industrial, Trawler, Shrimps	Updated
Shore gathering, clams	Updated
Shore gathering, rocky shores, mussels	Updated
Shore gathering, sandy beach, oyster	Updated
Small net, bottom gillnet, artisanal	Updated
Small nets, beach seine, fish	Updated
Small nets, Chicocota, Artisanal	Updated
Small nets, estuarine seine net	Updated
Small nets, shark net, sharks/rays/fish	Updated
Traps, artisanal, crabs	Updated

Traps, basket (gaiola)	Updated
Traps, commercial, fish	Updated
Traps, industrial, lobster	Updated
Traps, staked (gamboa)	Updated
Small nets, gillnets, shrimps	Added
Industrial, purse seine tuna	Added



Eunice Rossana Leong, Lourenço Zacharias and Gilberto Ngoca adding the gillnet shrimp fishery to the WIOFish database.

MAURITIUS DATA INCLUSION WORKSHOP

The Data Inclusion Workshop for Mauritius was hosted by the Albion Fisheries Research Centre in Albion, Mauritius from the 5th to the 9th of April 2010. The team involved in the work included:



Satish Khadun
Sanyageeta Ramkissoon
Ravi Deendayalsing Choreshwar Mohit
Bernadine Everett

The first day of the workshop was spent identifying the fisheries that operate in Mauritius, thereafter the participants were introduced to the database and the aspects that each fishery profile includes. After the introduction, work began on entering the information. A total of 20 fisheries were added for Mauritius. These included fisheries that utilise small nets, large nets, industrial nets, traps, harpoons, hook and lines and shore gathering. Two concerns regarding the Mauritian fisheries profiles exist: Firstly, the data included do not include any catches from Rodrigues as these are collected separately and only overall total catches are submitted to Albion Fisheries Research Centre. Secondly, species composition is lacking for most fisheries due to the method of data capture used. Although species information is recorded at the landing sites, when the data are entered onto the database they are aggregated into categories that were determined in the late 1970s which were, at the time, based on species of similar economic value. This dilutes the resolution of the catch data. The fisheries entered for Mauritius are listed below.

Fishery
Hook & line, chilled fish, semi-industrial
Hook & line, fish, artisanal
Hook & line, shore, amateur
Hook & line, motor, amateur
Hook & line, motor, sport
Hook & line, pelagic fish, semi-industrial
Hook & line, Surface longline, tuna
Hook & line, Vertical longline, snappers & groupers
Hook & line, vessel, shallow water banks
Industrial nets, purse seine, tuna
Industrial nets, trawl, demersal
Large net, seine, fish
Mixed gears, Harpoon and line, artisanal
Mixed gears, Traps & line, artisanal
Shore gathering, invertebrates, artisanal
Shore gathering, seagrass beds, sea cucumbers
Small nets, gillnets, fish
Small nets, Hand/dip/scoop, shrimps
Small nets, Hand/dip/scoop, ornamental fish
Traps, basket, artisanal

SEYCHELLES UPDATE WORKSHOP

The Update Workshop in the Seychelles was hosted by Seychelles Fishing Authority (SFA) in Victoria on the island of Mahé from the 12th to the 16th of April. The team involved in the workshop included:



Juliette Dorizo
 Cindy Assan
 Jan Robinson
 Danny Julie
 Maria Adras
 Claire Pierre-Louis
 Sabrina Lou-Toy
 Nanet Bristol
 Bernadine Everett

On the first morning of the workshop a single fishery profile was reviewed by the entire group to re-familiarise everyone once again with the database. Following this each participant was allocated various fisheries for which they were responsible for updating. Initially this was done on hardcopy and then each person updated the information online in the group so that consensus was reached between all as to the validity and accuracy of the data. This methodology gave all the participants hands-on experience with the database. It was suggested that a section should be included in the database that records the supplementary technology used by fishers in the fisheries e.g. GPS, fish finders and cell phones. This addition will be made in the next financial year of the project and before the next updates of the data are due. While all the fisheries' profiles were reviewed, the catches for the artisanal fisheries were not updated. There was a substantial change in the catches from previous years and an investigation into the cause behind this is underway to ascertain if it is a real change or whether it was due to problems with the data handling. These catches will be updated as soon as the investigation is complete. Furthermore, a decision was made by the group to include some historical fisheries that are no longer operating. These two fisheries are the live reef fish and mothership dory fisheries. It was felt that it will be beneficial to show fisheries that have failed and the reasons behind their closure to ensure that something can be learnt from past experiences.

Fishery Name	Comments
Diving, gathering, lobster	Updated
Diving, gathering, sea cucumber	Updated
Harpoon, small boat, rays	Updated
Hook & line, Inboard, Artisanal	Updated
Hook & line, large vessel, schooner - dropline	Updated
Hook & line, large vessel, schooner - handline	Updated
Hook & line, longline - pelagic, tuna	Updated
Hook & line, longline, sharks (art)	Updated
Hook & line, longline, sharks (si)	Updated
Hook & line, longline, swordfish & tuna (si)	Updated
Hook & line, shore, flyfishing	Updated
Hook & line, small boat & motor, fish (art)	Updated
Hook & line, small boat & motor, fish (rec)	Updated
Hook & line, small boat & motor, outer islands	Updated
Hook & line, small boat/non motor, pirogue	Updated
Hook & line, super skiboat, recreational	Updated
Hook & line, super skiboat, sport	Updated
Industrial nets, purse seine, tuna	Updated
Shore gathering, intertidal (muddy) flats	Updated
Shore gathering, rocky shores, crabs	Updated
Shore gathering, sandy shores, bivalves	Updated
Shore gathering, sandy shores, surf clam	Updated
Shore gathering, wading and snorkel, octopus	Updated

Small nets, beach seine, fish	Updated
Small nets, bottom gill net, slipper lobster	Updated
Small nets, cast net, fish	Updated
Small nets, hoop net, kona crab (<i>Ranina ranina</i>)	Updated
Small nets, pelagic gill net, mackerel	Updated
Small nets, purse seine, small pelagics	Updated
Traps, schooner, offshore	Updated
Traps, small boats, active	Updated
Traps, small boats, static	Updated
Traps, small trap, lobster	Updated
Traps, whaler, static trap	Updated
Hook & line, small boat & motor, squid	Added
Shore gathering, rocky shores, barnacles	Added



Nanet Bristol, Maria Adras, Sabrina Lou-Toy and Claire Pierre-Louis assist Cindy Assan in updating the Seychellois fisheries' data included in the WIOFish database.

SOUTH AFRICA (KWAZULU-NATAL) UPDATES

The South African (KwaZulu-Natal) fisheries have been updated on an adhoc basis through April and May 2010 as data have been made available through staff of the Oceanographic Research Institute and Ezemvelo KwaZulu-Natal Wildlife. Some fisheries have not been updated due to the unavailability of data for 2009. The relevant profiles will be updated as soon as these data become available. The Activities undertaken are as follows:

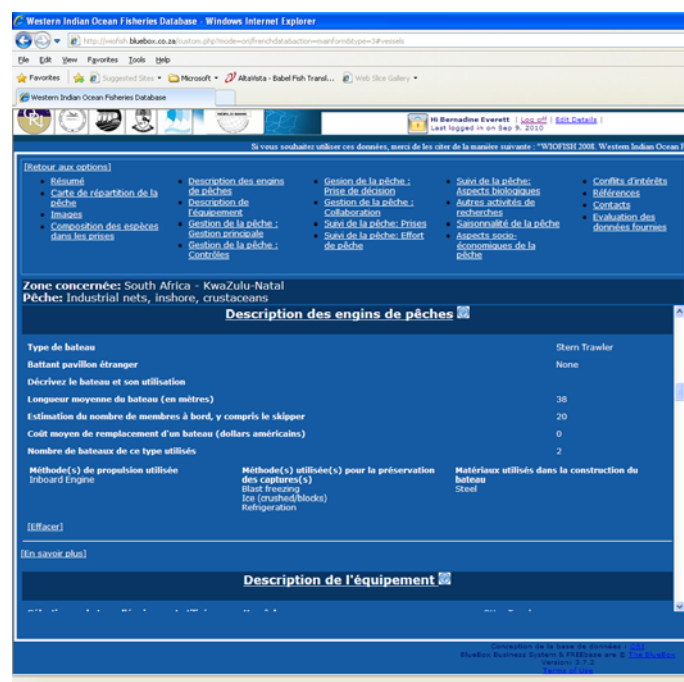
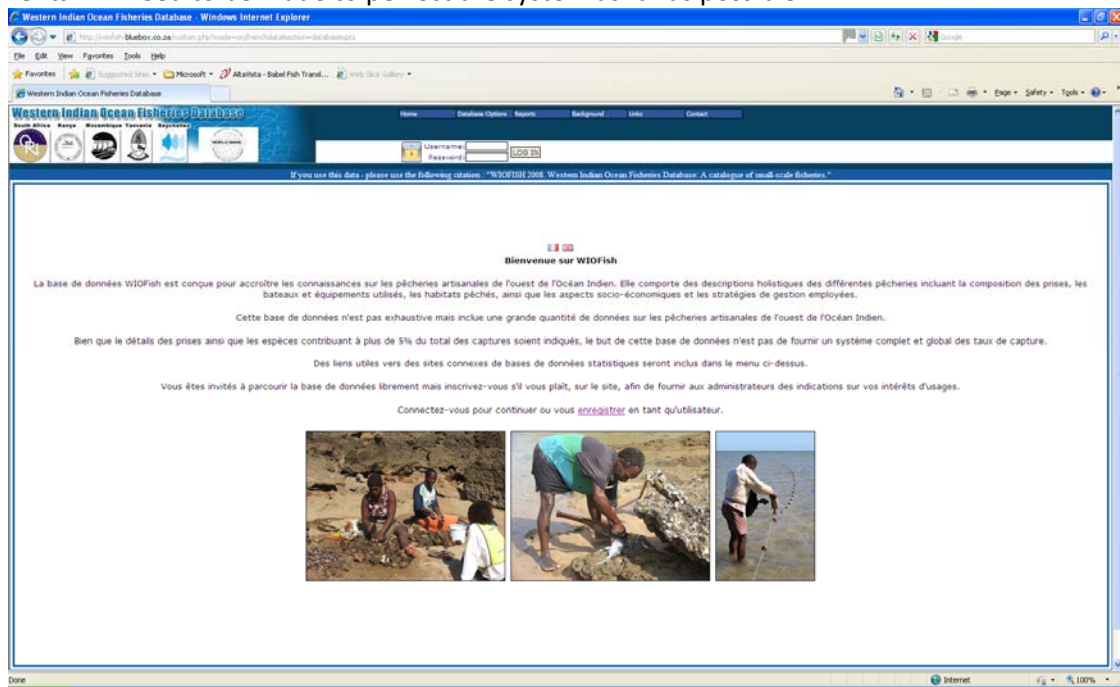
Fishery Name	Comments
Diving, gathering, lobsters (rec)	No data available
Diving, gathering, lobsters (sub)	No new data
Diving, gathering, ornamental shells	No data available
Diving, hand/hoop net, ornamental fish	No data available
Diving, speargun/no SCUBA, fish	Updated
Hand spear, fish, subsistence	Updated
Hook & line, drumline, sharks	Updated
Hook & line, jetski, fish	Updated
Hook & line, longline, tuna & swordfish	Updated
Hook & line, paddleski, fish	Updated
Hook & line, shore, estuarine (rec)	Updated
Hook & line, shore, estuarine (sub)	Updated
Hook & line, shore, lobster (rec)	No data available
Hook & line, shore, lobster (sub)	No new data
Hook & line, shore, marine (rec)	Updated
Hook & line, shore, subsistence	Updated
Hook & line, small boat & motor, charter/party	Updated
Hook & line, small boat & motor, estuarine fish (rec)	Updated
Hook & line, small boat & motor, fish (rec)	Updated
Hook & line, vessel, commercial	No data available
Industrial nets, inshore, crustaceans	Updated
Industrial nets, offshore, crustaceans	Updated
Industrial nets, purse seine, sardines	Not operating
Other, research, poisons	No data available
Shore gathering, estuarine, fish	Updated
Shore gathering, intertidal, mud crabs (rec)	No data available
Shore gathering, mangroves, mangrove crabs	Updated
Shore gathering, prawn pump, burrowing prawns (rec)	No data available
Shore gathering, prawn pump, burrowing prawns (ssc)	Updated
Shore gathering, rocky shores, invertebrates (sub)	Updated
Shore gathering, rocky shores, limpets (rec)	No data available
Shore gathering, rocky shores, mussels (rec)	No data available
Shore gathering, rocky shores, mussels (sub)	Updated
Shore gathering, rocky shores, octopus (rec)	No data available
Shore gathering, rocky shores, oysters (com)	No data available
Shore gathering, rocky shores, oysters (rec)	No data available
Shore gathering, rocky shores, red bait (rec)	No data available
Shore gathering, sandy shores, ghost crabs (rec)	No data available
Shore gathering, sandy shores, ghost crabs (sub)	Updated
Shore gathering, sandy shores, mole crabs (rec)	No data available
Shore gathering, sandy shores, mole crabs (sub)	Updated
Shore gathering, sandy shores, turtles	No data available
Small nets, beach seine, fish	No data available
Small nets, beach seine, sardines	No data available
Small nets, cast net, fish/prawns	No data available
Small nets, drag net, fish/shrimps	No longer operating
Small nets, gate net/beam trawl, shrimp/prawn	No data available

Small nets, hand/hoop net, squid & glassies	No longer operating
Small nets, purse seine, red-eye	Not yet operating
Small nets, shove net, prawns	No data available
Small nets, surface gill net, estuarine fish	No longer operating
Small nets, surface gill net, sharks	Updated
Traps, longline barrel traps, lobster	No longer operating
Traps, small trap, lobster	No data available
Traps, staked, fish	Updated

DATABASE CHANGES

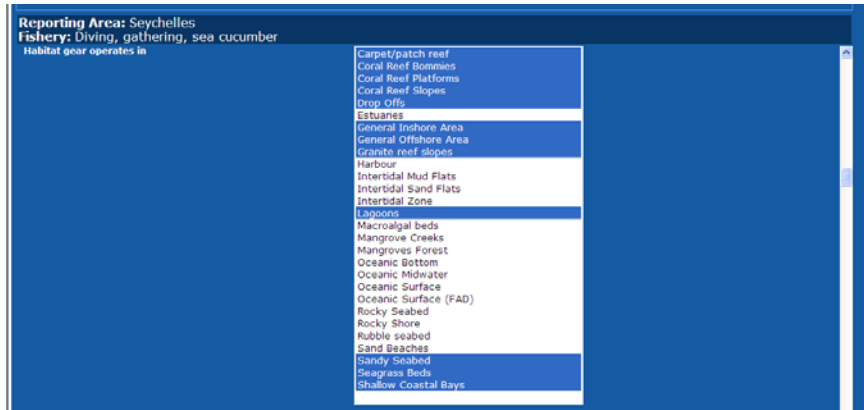
The biggest change in the database this year has been the inclusion of French interface pages to make the database more accessible to French speaking users. All the database pages were initially translated from English into French by Bernadine Everett and then handed over to two French speakers for verification. Mr Mathieu Séré had an initial look at the translation but Ms Lola Masse was responsible for undertaking most of the verification work. Both Ms Masse and Mr Séré are sincerely thanked for giving freely of their time to undertake this very important task.

Once the translation was complete, it was sent through to the software proprietors, The Blue Box, for inclusion with the English interface. This work has been accomplished and now they are finalising the login process. This should be accomplished shortly and making the database more user-friendly to many people in the western Indian Ocean region. The work has only recently been made available and some minor adjustments will need to be made to perfect the system as far as possible.



A further change to the database this year was an ammendment to the fishery report structure. The reports have been altered to resemble the fishery profile page as the previous report was considered cumbersome and it omitted some information in the profile.

Furthermore the selection boxes on the fishery profile page have been lengthened and the scrollbars eliminated so that all the options selected under a category can be seen simultaneously. The screen shot below shows the habitats in which the fishery operates. Previously only a portion of the box was visable and the user would have to scroll down to see all the habitats selected.



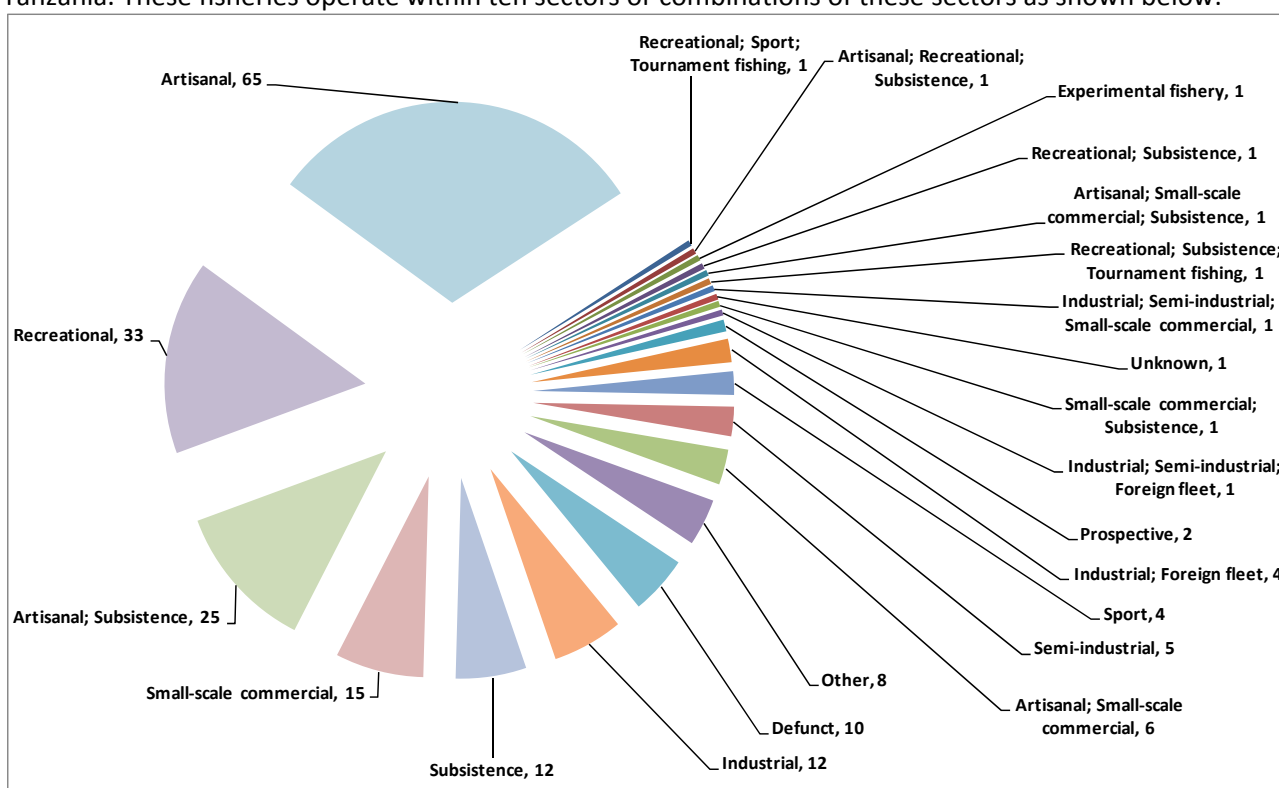
OVERALL ASSESSMENT

The following is a broad overview of results reflecting the status of fisheries at the end of 2009. The information presented is of a general nature to highlight wide-ranging issues. However, each fishery or set of fisheries can be analysed in more detail by accessing the Reporting function of WIOFish.

The tables presented here have been extracted from the database using the standard reporting options provided within the system on the *Reports* page of WIOFish. These tables are exported in csv format and then converted into MS Excel files for further analysis.

These reports allow comparisons of management, socio-economics, etc. of fisheries that operate in the waters of more than one of the six countries participating in WIOFish as well as allowing similar fisheries within one country to be compared.

A total of 211 fisheries was recorded in WIOFish by the end of May 2010, with 33 from Kenya, 20 from Mauritius, 30 from Mozambique, 38 from the Seychelles, 55 from KwaZulu-Natal, South Africa and 35 from Tanzania. These fisheries operate within ten sectors or combinations of these sectors as shown below:

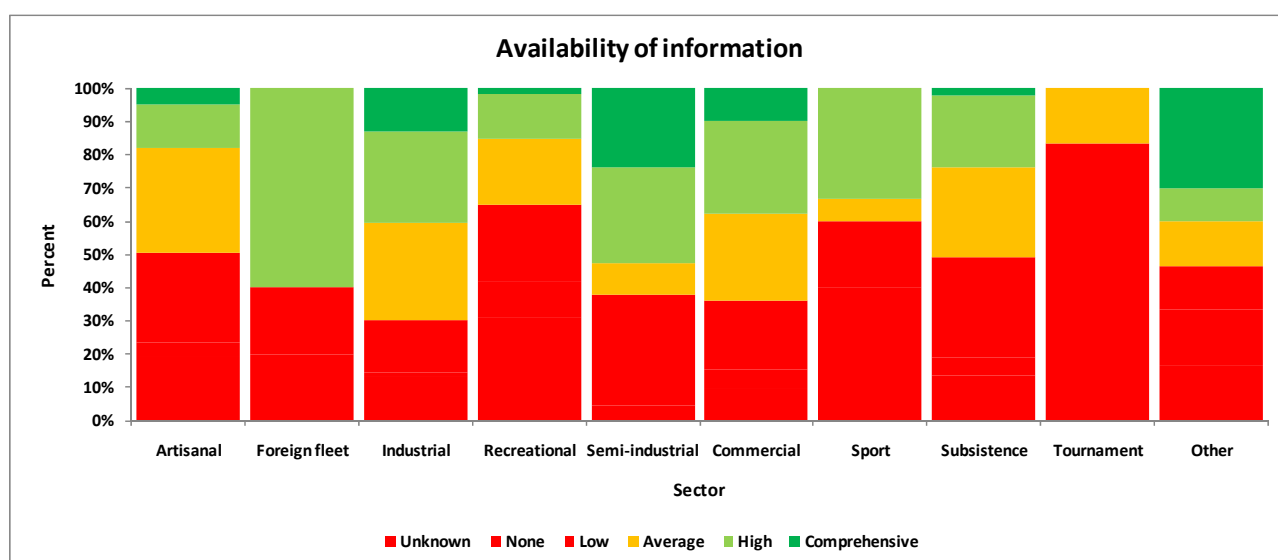


Fisheries are not only distinguished by the sector in which they operate but also by the type of gear used in the fishery. Eleven main gear types are recognised and fisheries are named according to these gear types. Below are the numbers of fisheries per country and per gear used.

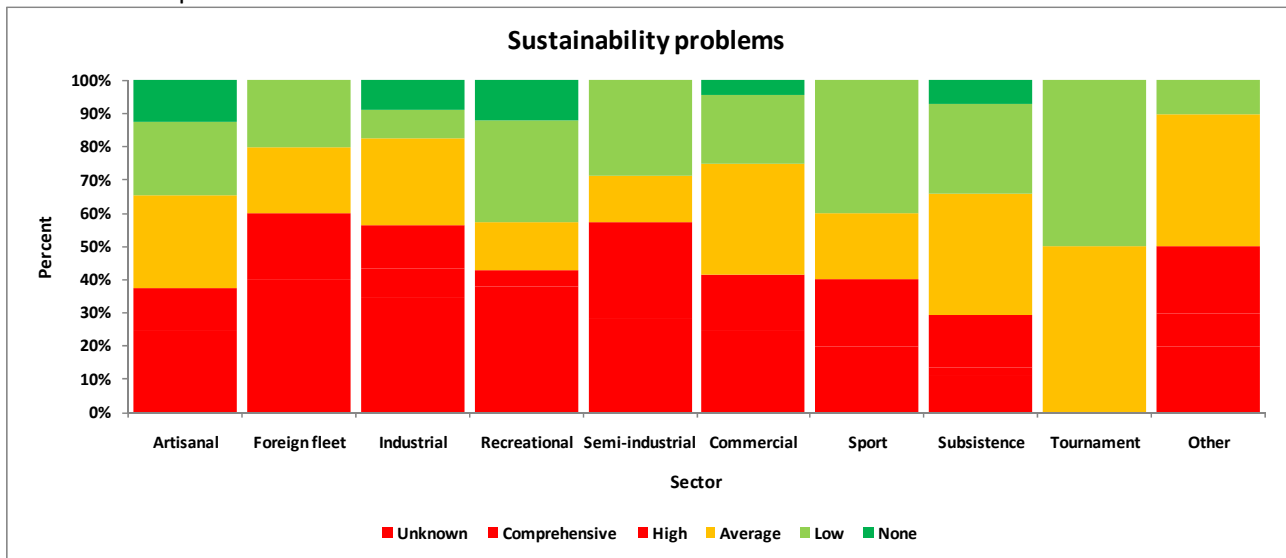
Gear	Kenya	Mauritius	Mozambique	Seychelles	South Africa	Tanzania	TOTAL
Diving	6	0	4	2	5	4	21
Harpoon	0	0	0	1	1	0	2
Hook & line	3	10	7	15	14	5	54
Industrial nets	3	1	4	1	3	3	15
Large nets	2	1	1	0	0	0	4
Mixed gears	0	2	0	0	0	0	2
Other	0	0	0	0	1	2	3
Shore gathering	7	2	3	6	18	11	47
Small nets	8	3	6	6	10	8	41
Traps	4	1	5	5	3	2	20
Unknown	0	0	0	2	0	0	2
TOTAL	33	20	30	38	55	35	211

Fisheries were analysed for the entire region based on the sector in which they operate namely Artisanal, Foreign fleet, Industrial, Recreational, Semi-industrial, Commercial, Sport, Subsistence, Tournament, Other. This method provides an indication of how the small-scale fisheries compare to the larger, better financed, industrial fisheries that are normally the focus of fisheries studies. The areas highlighted are the availability of information, whether the fisheries are sustainable, sustainability problems combined with the impacts of bycatch and juveniles in the catches, management of the fisheries through policy and management plans, the level of research conducted and published, the level of management related research required and the habitat impacts associated with the fisheries.

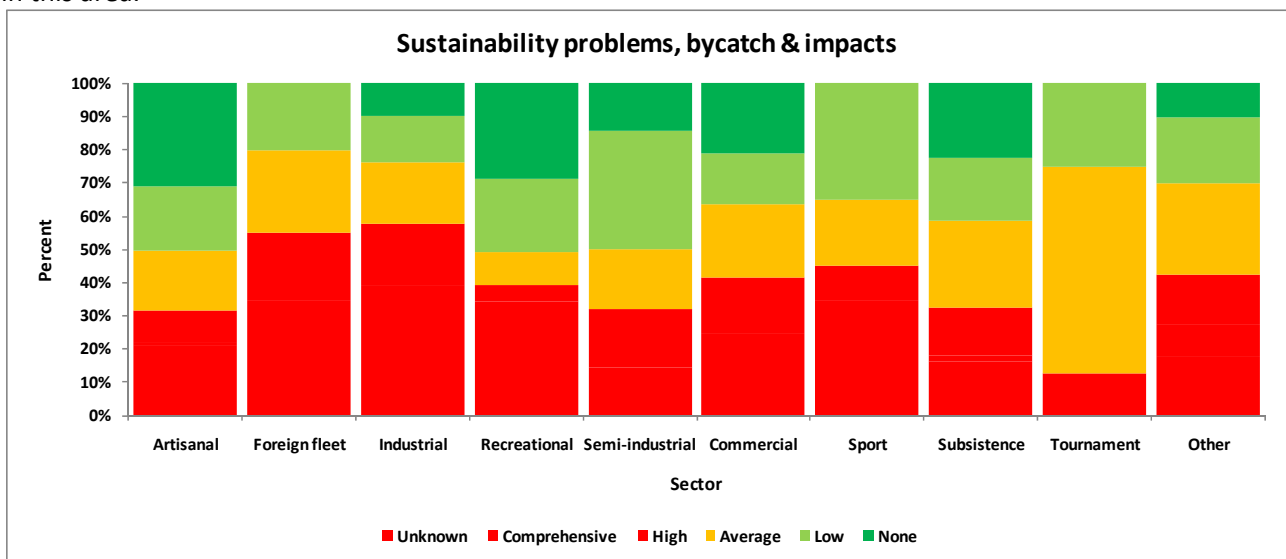
In terms of availability of information, the adequacy level of catch composition, catch rates and total catch data collected was taken into account. As expected, data availability in the small-scale fisheries is either unknown none, low or average, while the industrial fisheries have more data available.



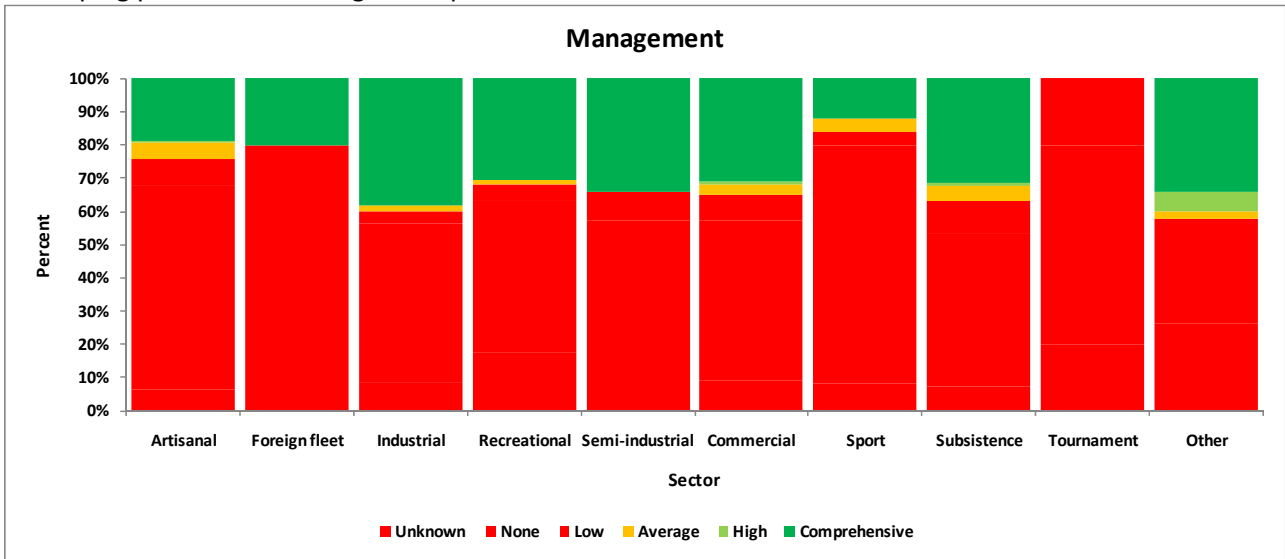
Sustainability of fisheries as perceived by the country nodes is a concern for all sectors, excluding the tournament sector, and not surprisingly it is the industrial and foreign fleet fisheries that are perceived to have the most problems.



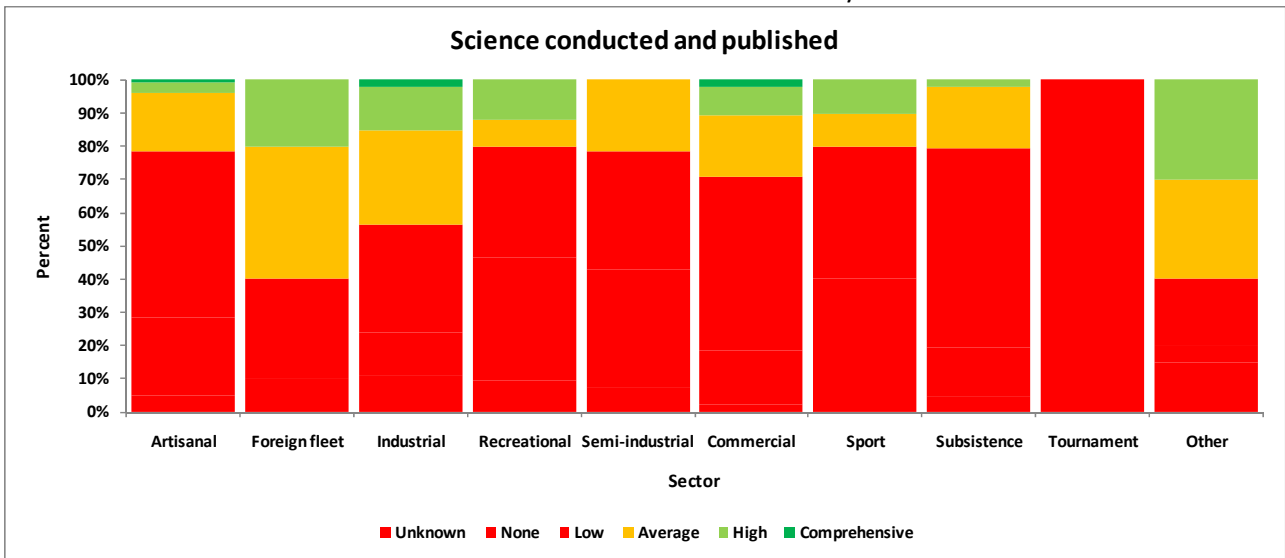
When including the issues of by-catch (discards in this context) as well as impact on juveniles and threatened species by fisheries along with general sustainability problems associated with fishing pressure and habitat impacts, the industrial and foreign fleet sectors remain of most concern. Artisanal and subsistence fisheries do not generally target as exclusively and thus in terms of by-catch, usually score low in this area.



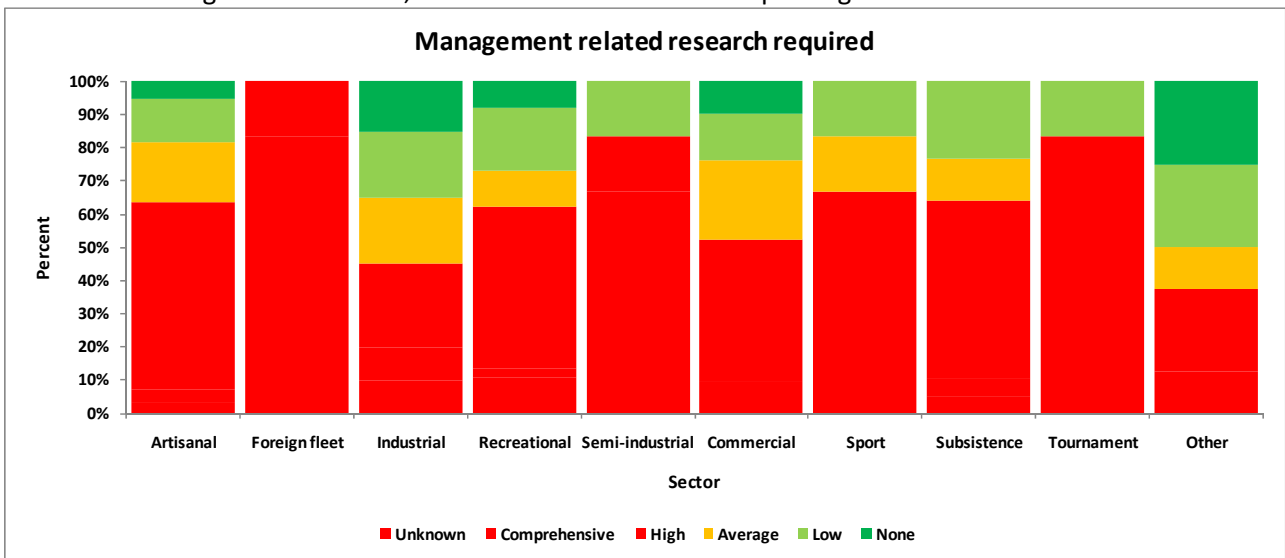
Not surprisingly, most of the fisheries show a need for improvement in management strategies such as developing policies and management plans.



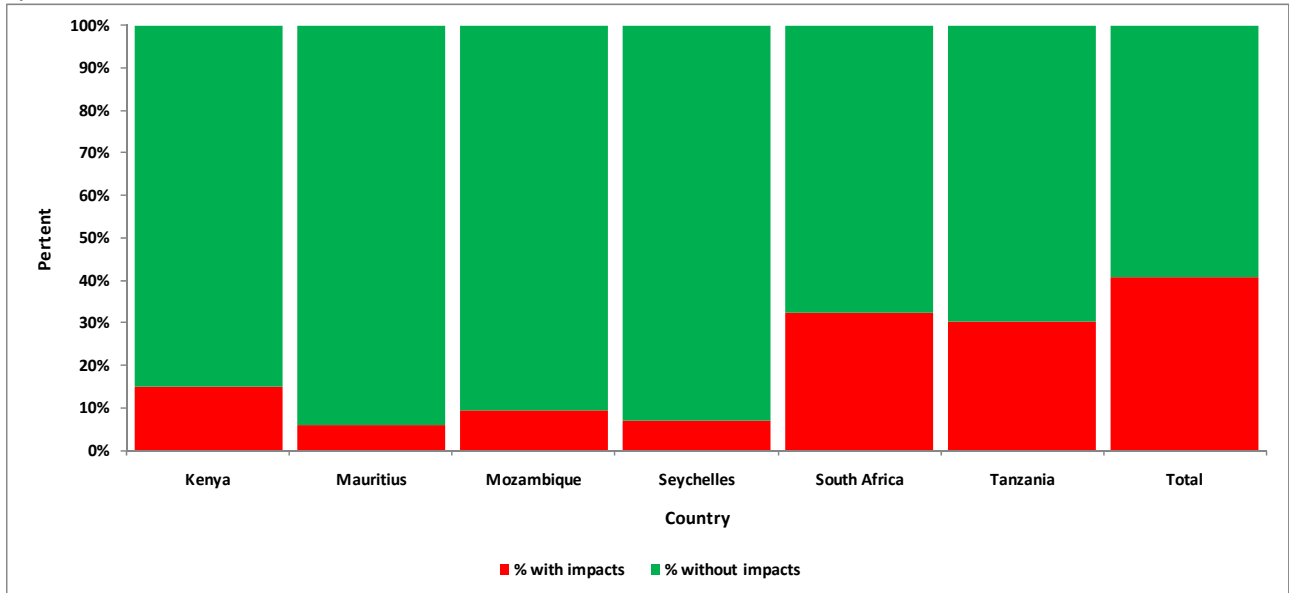
The fisheries that have had the most research conducted on them are the foreign fleets and the industrial fisheries while all other fisheries are considered in need of further study.



In terms of management research, all fisheries are in need of improving their current situation.



Besides comparing fisheries across all sectors in the region, the database also allows for comparisons of all fisheries within each country with those of other countries. This can also be further refined so that only fisheries of one type within a country are compared with similar fisheries in the other countries. The graph below indicates the percentage of fisheries within each country that have demonstrable adverse impacts on the habitats in which they operate. These impacts may be from the gear employed or from trampling of the habitat by fishers and, at its most extreme, through the use of dynamite to catch fish. This is a preliminary assessment and indications of the severity of the impacts are not included but can be obtained by further assessment of the data.



COUNTRY ASSESSMENTS

As for the overall assessment, reports were generated from the WIOFish database for each of the countries and analysis took place in MS Excel. These reports provide an overview for the fisheries of each country for the following aspects of the fisheries: Catches, Habitats, Monitoring, Research conducted, Management, Food security, Value adding activities, Markets, Alternate livelihoods, Gender, Score sheets and References.

KENYA ASSESSEMENT

As noted above, Kenya has 33 fisheries recorded in WIOFish. These fisheries utilise seven of the ten main fishing gears and operate within the sectors listed below:

Sector	Number
Artisanal	14
Artisanal; Small-scale commercial	4
Artisanal; Subsistence	3
Industrial	4
Other	2
Recreational	1
Small-scale commercial	3
Subsistence	2
Total	33

Catch

Of Kenya's 33 fisheries assessed, 32 have documented catch composition data which includes 159 different catch items as listed. As can be seen from the table below there are numerous examples where the catch is not identified to individual species beyond family level.

Scientific name	Scientific name	Scientific name
<i>Acanthocybium solandri</i>	<i>Epinephelus</i> spp	<i>Penaeus semisulcatus</i>
Acanthuridae	<i>Eretmochelys imbricata</i>	Perciformes
Ambassidae	<i>Eucheuma denticulatum</i>	Pinctada
<i>Amphiprion akallopisos</i>	<i>Euthynnus affinis</i>	<i>Pinctada margaritifera</i>
<i>Amphiprion allardi</i>	<i>Euthynnus</i> spp	<i>Plectorhinchus flavomaculatus</i>
<i>Apogon nigripes</i>	Gerreidae	<i>Plectorhinchus</i> spp
<i>Arenicola marina</i>	<i>Gerres oyena</i>	<i>Portunus pelagicus</i>
Asteroidea	Haemulidae (=Pomadasyidae)	<i>Portunus</i> spp
<i>Avicennia marina</i>	<i>Halichoeres iridis</i>	<i>Pseudanthias squamipinnis</i>
<i>Bohadschia argus</i>	Harpidae	<i>Pteria penguin</i>
<i>Bruguiera gymnorrhiza</i>	<i>Hemiramphus far</i>	<i>Puerulus angulatus</i>
Bursidae	<i>Heritiera littoralis</i>	<i>Rachycentron canadum</i>
<i>Caesio</i> spp	<i>Heterocarpus woodmasoni</i>	Rajidae
Callyodontidae	<i>Holothuria arenacava</i>	<i>Rastrelliger kanagurta</i>
<i>Calotomus carolinus</i>	<i>Holothuria fuscogilva</i>	<i>Rhizophora mucronata</i>
<i>Capitella capitata</i>	<i>Holothuria nobilis</i>	<i>Saccostrea cucullata</i>
Carangidae	<i>Holothuria scabra</i>	<i>Sardinella gibbosa</i>
<i>Carangoides gymnostethus</i>	<i>Hyporhamphus unifasciatus</i>	<i>Sardinella melanura</i>
<i>Caranx ignobilis</i>	Istiophoridae	<i>Sardinella</i> spp
<i>Caranx</i> spp	<i>Kappaphycus alvarezii</i>	Scaridae
<i>Carcharhinus albimarginatus</i>	<i>Katsuwonus pelamis</i>	<i>Scarus ghobban</i>
<i>Carcharhinus falciformis</i>	Labridae	<i>Scarus sordidus</i>
<i>Carcharhinus macloti</i>	<i>Lepidochelys olivacea</i>	<i>Scolopsis bimaculatus</i>
<i>Carcharhinus melanopterus</i>	<i>Leptoscarus vaigiensis</i>	<i>Scolopsis ghanam</i>
<i>Carcharhinus plumbeus</i>	Lethrinidae	<i>Scomberoides</i> spp
<i>Carcharhinus sealei</i>	<i>Lethrinus harak</i>	<i>Scomberomorus commerson</i>
<i>Carcharhinus wheeleri</i>	<i>Lethrinus miniatus</i>	<i>Scomberomorus</i> spp
Cassidae	<i>Lethrinus nebulosus</i>	<i>Scylla serrata</i>
<i>Centropyge acanthops</i>	<i>Loligo</i> spp	Scyllaridae
<i>Cephalopholis argus</i>	<i>Lumnitzera racemosa</i>	<i>Secutor insidiator</i>
<i>Cephalopholis boenack</i>	Lutjanidae	Selachimorpha(Pleurotremata)
<i>Cephalopholis leopardus</i>	<i>Lutjanus argentimaculatus</i>	Serranidae
<i>Cephalopholis miniata</i>	<i>Lutjanus bohar</i>	Siganidae
<i>Cephalopholis sonnerati</i>	<i>Lutjanus fulviflamma</i>	<i>Siganus canaliculatus</i>
<i>Cephalopholis taeniops</i>	<i>Lutjanus</i> spp	<i>Siganus</i> spp
<i>Cephalopholis urodeta</i>	<i>Macropharyngodon bipartitus</i>	<i>Siganus stellatus</i>
<i>Ceriops tagal</i>	<i>Makaira indica</i>	<i>Siganus sutor</i>

<i>Chanos chanos</i>	<i>Metanephrops andamanicus</i>	<i>Sipunculus nudus</i>
<i>Cheilodipterus caninus</i>	<i>Metapenaeus monoceros</i>	Soleidae
<i>Chelonia mydas</i>	Metapenaeus spp	<i>Sonneratia alba</i>
<i>Chirocentrus dorab</i>	Mitridae	<i>Sphyraena jello</i>
Conidae	Mugilidae	Strombidae
<i>Coryphaena hippurus</i>	Mullidae	<i>Terapon jarbua</i>
Cypraeidae	Muricidae	Terebridae
<i>Drepane</i> spp	<i>Nemateleotris magnifica</i>	<i>Thalamita crenata</i>
Elasmobranchii	<i>Octopus macropus</i>	Theraponidae
<i>Epinephelus caeruleopunctatus</i>	<i>Octopus vulgaris</i>	<i>Thunnus albacares</i>
<i>Epinephelus coioides</i>	<i>Oxyurichthys ophthalmonema</i>	<i>Thunnus obesus</i>
<i>Epinephelus fasciatus</i>	<i>Paracanthurus hepatus</i>	<i>Tridacna</i> spp
<i>Epinephelus fuscoguttatus</i>	<i>Parupeneus barberinus</i>	<i>Upeneus sulphureus</i>
<i>Epinephelus longispinus</i>	<i>Penaeus indicus</i>	<i>Xiphias gladius</i>
<i>Epinephelus malabaricus</i>	<i>Penaeus japonicus</i>	<i>Xylocarpus granatum</i>
<i>Epinephelus merra</i>	<i>Penaeus monodon</i>	<i>Zebрасoma veliferum</i>

Bycatch details are recorded in 15 of the 33 fisheries with the trawl fisheries recording the most number of species in their catches.

Fishery name	Number of species
Large nets, reef seine, fish	13
Industrial nets, inshore, prawns	8
Small nets, beach seine, fish	3
Industrial nets, offshore, lobsters	2
Large nets, Ring nets, Fish	2
Shore gathering, sandy shores, turtles/eggs	2
Hook & line, longline - surface, pelagic	1
Industrial nets, purse seine, tuna	1
Small nets, cast nets, fish	1
Small nets, gillnets, crustaceans	1
Small nets, Scoop nets, Crabs	1
Small nets, surface gill net, sharks/rays/fish	1
Traps, basket, fish (sub)	1
Traps, basket, fish/crabs (art)	1
Traps, staked (uzio), fish/crabs	1
Total	39

In terms of threatened species recorded in the catch, no species were marked as being threatened but it should not be inferred from this that no threatened species are caught. The industrial trawl fisheries certainly do catch turtles among other species.

Habitats

Kenya's fisheries operate in a multitude of habitats and each fishery may operate in more than one type of habitat. As would be expected from small-scale fisheries, most operate in inshore habitats or areas.

Habitat	Number of fisheries
General Inshore Area	17
Shallow Coastal Bays	12
Seagrass Beds	11
Lagoons	10
Intertidal Zone	9
Coral Reef Platforms	8
Mangrove Creeks	8
Coral Reef Slopes	7
Intertidal Mud Flats	5
Intertidal Sand Flats	5

Macroalgal beds	5
Coral Reef Bommies	3
General Offshore Area	3
Mangroves Forest	3
Rocky Shore	3
Sandy Seabed	3
Estuaries	2
Rocky Seabed	2
Sand Beaches	2
Carpet/patch reef	1
Oceanic Bottom	1
Oceanic Surface	1
Oceanic Surface (FAD)	1

There are 11 fisheries which cause physical damage or have the potential to cause damage to the habitats in which they operate. This ranges from damage by anchors from the vessels used, to trampling of the habitat by gatherers. Below are the fisheries that have some form of impacts associated with them and the habitats within which these impacts occur.

Fishery Name	Habitat	Threat Description
Diving, hand/hoop net, ornamental fish	Coral Reef Platforms	There are concerns on the habitat impacts of fishery through breakage of coral when catching cryptic species that like to hide in the corals.
	Coral Reef Slopes	
Diving, speargun, fish	Coral Reef Bommies	Anchors may cause damage to substrates and there may be physical damage from the speargun hitting corals instead of the targeted fish .
	Coral Reef Platforms	
	Coral Reef Slopes	
	Estuaries	
	Lagoons	
Diving, speargun, octopus	Shallow Coastal Bays	Gear damage to corals
	Coral Reef Bommies	
	Coral Reef Platforms	
	Coral Reef Slopes	
	General Inshore Area	
Industrial nets, inshore, prawns	Rocky Seabed	The trawl removes sedentary invertebrates living on or in the substratum and many other mobile organisms are also indiscriminately caught in the trawl and killed. Incidence of juvenile fishes.
	General Inshore Area	
Industrial nets, offshore, lobsters	Shallow Coastal Bays	The trawl removes sedentary invertebrates living on or in the substratum and many species of more mobile organisms are indiscriminately caught in the trawl and killed. This is an area of high biodiversity and persistent trawling over limited grounds can be environmentally damaging.
	General Offshore Area	
Large nets, Ring nets, Fish	Oceanic Bottom	Snagging of corals by the gear when fishing is done within coral reef environment
	Coral Reef Slopes	
Shore gathering, mangroves, wood	General Inshore Area	Over-exploitation leads to erosion of beaches and disruption in the cycles of organisms that take refuge in the habitat.
	Mangrove Creeks	
	Mangroves Forest	

Shore gathering, rocky shores, ornamental shells	General Inshore Area	Adults have limited habitat niches. The collection/ habitat destruction may compromise future recruitment and settlement of larvae. Unknown in detail, probably not excessive. The excessive removal of some species in specific areas may have ecological implications. Walking on fragile coral reefs is likely to cause some damage. In some cases reef damage may also occur when collecting requires extraction of shells from crevices or underneath rock that are turned over. This may have ecological consequences. Collection of shells is totally illegal within the MPAs.
	Intertidal Sand Flats	
	Intertidal Zone	
	Lagoons	
	Rocky Shore	
	Seagrass Beds	
Shore gathering, spear, fish	Coral Reef Platforms	Trampling of inter-tidal areas during harvesting can cause damage. Operations over coral may damage reefs. However, damage generally thought to be low.
	General Inshore Area	
	Lagoons	
	Rocky Shore	
	Shallow Coastal Bays	
Small nets, beach seine, fish	General Inshore Area	Destruction of corals, seagrass beds, through dragging of nets
	Intertidal Zone	
	Sand Beaches	
	Seagrass Beds	
	Shallow Coastal Bays	
Small nets, surface gill net, sharks/rays/fish	General Inshore Area	Destruction to corals through anchoring

Monitoring

Most of the Kenyan fisheries (91%) have some form of catch and effort monitoring taking place. Monitoring methods include using Catch Returns/Logbooks, Creel (Sample at Landing Site), Frame Survey, Interviews, Observers and Voluntary Monitoring.

Biological monitoring takes place in 20 fisheries with a range of biological data being collected including Gender, Lengths, Number, Reproductive state, Size frequency, Species and Weights.

Research conducted

Low levels of research have been conducted on 64% of the fisheries and 30% have a medium amount of research conducted but no fisheries have been comprehensively investigated. Stock assessments of target species have not been comprehensively conducted but 30% of fisheries have had some species' stock assessments concluded. These values may, however, change since there was uncertainty on whether stock assessments had been conducted on 36% of the fisheries. This needs further investigation and collaboration between organisations within Kenya to minimise the uncertainties expressed.

Management

Co-management of fisheries occurs, to some level in 76% of fisheries with 6% having high levels of co-management. Those fisheries that have some co-management are listed with the level of co-management that occurs:

Fishery Name	Level of Co-management
Shore gathering, mangroves, wood	High
Shore gathering, sandy shores, turtles/eggs	High
Diving, speargun, octopus	Average
Hook & line, handline, fish/sharks/rays	Average
Shore gathering, intertidal, crabs	Average
Shore gathering, intertidal, seaweed	Average

Small nets, beach seine, fish	Average
Small nets, gillnets, crustaceans	Average
Small nets, lamp, fish	Average
Small nets, Scoop nets, Crabs	Average
Small nets, surface gill net, sharks/rays/fish	Average
Traps, staked (uzio), fish/crabs	Average
Diving, gathering, Oysters	Low
Diving, snorkel, sea cucumber	Low
Diving, speargun, fish	Low
Diving, stick, Octopus and Squids	Low
Large nets, reef seine, fish	Low
Shore gathering, intertidal, worms	Low
Shore gathering, rocky shores, ornamental shells	Low
Shore gathering, spear, fish	Low
Small nets, bottom gill net, sharks/rays/fish	Low
Small nets, cast nets, fish	Low
Small nets, seine nets, crustacea	Low
Traps, basket, fish (sub)	Low
Traps, basket, fish/crabs (art)	Low
Diving, hand/hoop net, ornamental fish	None
Hook & line (Trolling), fish/sharks/rays	None
Hook & line, longline - surface, pelagic	None
Industrial nets, inshore, prawns	None
Industrial nets, offshore, lobsters	None
Industrial nets, purse seine, tuna	None
Trap, Deep sea, Crabs	None
Large nets, Ring nets, Fish	Unknown

Only one fishery in Kenya has an operational management plan in place and that is the *Industrial nets: inshore, prawn* fishery.

Most fisheries are technically open access. Licences are required but anyone can apply for a licence. Few of the fisheries have limits, although there is one fishery where access is controlled through group decisions, five fisheries are illegal, but some practise still takes place, and there is one fishery where no licensing is required. These are tabulated below.

Fishery Name	Access control
Shore gathering, intertidal, seaweed	Group decision
Diving, gathering, Oysters	Licensing
Diving, hand/hoop net, ornamental fish	Licensing
Diving, snorkel, sea cucumber	Licensing
Diving, stick, Octopus and Squids	Licensing
Hook & line (Trolling), fish/sharks/rays	Licensing
Hook & line, handline, fish/sharks/rays	Licensing
Hook & line, longline - surface, pelagic	Licensing
Industrial nets, inshore, prawns	Licensing
Industrial nets, offshore, lobsters	Licensing
Industrial nets, purse seine, tuna	Licensing
Large nets, reef seine, fish	Licensing
Large nets, Ring nets, Fish	Licensing
Shore gathering, intertidal, crabs	Licensing
Shore gathering, mangroves, wood	Licensing
Shore gathering, rocky shores, ornamental shells	Licensing
Small nets, bottom gill net, sharks/rays/fish	Licensing
Small nets, cast nets, fish	Licensing
Small nets, gillnets, crustaceans	Licensing
Small nets, lamp, fish	Licensing
Small nets, Scoop nets, Crabs	Licensing

Small nets, seine nets, crustacea	Licensing
Small nets, surface gill net, sharks/rays/fish	Licensing
Trap, Deep sea, Crabs	Licensing
Traps, basket, fish (sub)	Licensing
Traps, basket, fish/crabs (art)	Licensing
Traps, staked (uzio), fish/crabs	Licensing
Shore gathering, intertidal, worms	None
Diving, speargun, fish	Prohibited
Diving, speargun, octopus	Prohibited
Shore gathering, sandy shores, turtles/eggs	Prohibited
Shore gathering, spear, fish	Prohibited
Small nets, beach seine, fish	Prohibited

There are a number of fishing controls used in Kenyan fisheries: berried females are not permitted to be retained in the crustacean fisheries, closed seasons for some fisheries and species are in place as well as size restrictions. Effort is restricted and quotas are in place for the larger industrial fisheries and gear restrictions are used, including mesh sizes for the net fisheries. Marine reserves, where limited harvesting is allowed, have been proclaimed, reserve areas that are used by fish as nursery areas have been set aside and harvesting is limited and marine protected areas have been proclaimed where no harvesting is allowed. Some fisheries use rotational harvesting strategies to provide recovery time for habitats, and traditional restrictions are also in place for some of the subsistence and artisanal fisheries.

Conflicts

Twenty-seven fisheries have some form of conflict either with other fishers, fisheries managers or other developers. These are listed below.

Fishery Name	Conflict with other fishers	Conflict with management	Conflict with development
Diving, hand/hoop net, ornamental fish	Yes	Yes	Yes
Diving, snorkel, sea cucumber	Yes	Yes	
Diving, speargun, fish	Yes	Yes	
Diving, speargun, octopus	Yes	Yes	
Diving, stick, Octopus and Squids		Yes	
Hook & line (Trolling), fish/sharks/rays	Yes	Yes	
Hook & line, handline, fish/sharks/rays	Yes	Yes	
Hook & line, longline - surface, pelagic		Yes	
Industrial nets, inshore, prawns	Yes	Yes	Yes
Industrial nets, offshore, lobsters	Yes	Yes	
Industrial nets, purse seine, tuna		Yes	
Large nets, reef seine, fish		Yes	
Large nets, Ring nets, Fish	Yes	Yes	
Shore gathering, intertidal, crabs		Yes	
Shore gathering, intertidal, seaweed	Yes		Yes
Shore gathering, mangroves, wood	Yes	Yes	Yes
Shore gathering, rocky shores, ornamental shells		Yes	
Shore gathering, sandy shores, turtles/eggs	Yes	Yes	Yes
Shore gathering, spear, fish	Yes	Yes	Yes
Small nets, beach seine, fish	Yes	Yes	Yes
Small nets, bottom gill net, sharks/rays/fish		Yes	Yes
Small nets, lamp, fish	Yes	Yes	Yes
Small nets, Scoop nets, Crabs	Yes	Yes	Yes
Small nets, surface gill net, sharks/rays/fish	Yes	Yes	
Traps, basket, fish (sub)	Yes	Yes	
Traps, basket, fish/crabs (art)	Yes	Yes	Yes
Traps, staked (uzio), fish/crabs	Yes	Yes	Yes
Total	20	26	12

Food security

Fishers rely on their catch to provide food for own consumption in 17 of the 33 (52%) fisheries as well as making the catch available for sale while the catch from 15 fisheries is only available for sale and not used in household consumption. Mangrove wood is sold and used by the collectors for a variety of purposes such as construction, boat building, firewood, medicinal purposes and colour dyes. Below are the fisheries that provide food for own consumption as well as sale.

Fishery Name	Food security
Diving, speargun, octopus	Yes
Hook & line, handline, fish/sharks/rays	Yes
Large nets, reef seine, fish	Yes
Shore gathering, intertidal, crabs	Yes
Shore gathering, intertidal, seaweed	Yes
Shore gathering, rocky shores, ornamental shells	Yes
Shore gathering, sandy shores, turtles/eggs	Yes
Small nets, beach seine, fish	Yes
Small nets, bottom gill net, sharks/rays/fish	Yes
Small nets, cast nets, fish	Yes
Small nets, gillnets, crustaceans	Yes
Small nets, lamp, fish	Yes
Small nets, seine nets, crustacea	Yes
Trap, Deep sea, Crabs	Yes
Traps, basket, fish (sub)	Yes
Traps, basket, fish/crabs (art)	Yes
Traps, staked (uzio), fish/crabs	Yes

Value adding activities

Ten fisheries have no post-harvest value adding activities associated with them. Most fisheries have some processing such as freezing, heading and gutting of the catch or drying and salting. The value adding activities associated with each fishery are listed below.

Fishery Name	Value adding
Diving, gathering, Oysters	None
Diving, stick, Octopus and Squids	None
Large nets, Ring nets, Fish	None
Shore gathering, intertidal, crabs	None
Shore gathering, intertidal, worms	None
Shore gathering, mangroves, wood	None
Shore gathering, rocky shores, ornamental shells	None
Small nets, gillnets, crustaceans	None
Small nets, Scoop nets, Crabs	None
Small nets, seine nets, crustacea	None
Diving, snorkel, sea cucumber	Boiled, Sun-dried
Industrial nets, purse seine, tuna	Boiled, Whole frozen, Whole gutted
Hook & line, longline - surface, pelagic	Canning, Pack, Processed & packed, Whole frozen
Small nets, surface gill net, sharks/rays/fish	Filleting, Finning, Salted, Whole frozen, Whole gutted
Small nets, beach seine, fish	Headed & gutted, Salted, Sun-dries, Whole gutted
Industrial nets, inshore, prawns	Processed & Packed, Headed & gutted, Whole frozen
Industrial nets, offshore, lobsters	Processed & packed, Whole frozen
Shore gathering, sandy shores, turtles/eggs	Salted
Hook & line, handline, fish/sharks/rays	Salted, Sun-dried, Whole frozen
Shore gathering, spear, fish	Salted, Sun-dried, Whole frozen, Whole gutted
Traps, basket, fish/crabs (art)	Salted, Sun-dried, Whole frozen, Whole gutted
Traps, basket, fish (sub)	Salted, Sun-dried, Whole gutted
Small nets, bottom gill net, sharks/rays/fish	Salted, Whole frozen, Whole gutted
Shore gathering, intertidal, seaweed	Sun-dried
Small nets, lamp, fish	Sun-dried
Diving, hand/hoop net, ornamental fish	Unknown
Diving, speargun, octopus	Whole frozen

Trap, Deep sea, Crabs	Whole frozen
Large nets, reef seine, fish	Whole frozen, Whole gutted
Diving, speargun, fish	Whole gutted
Hook & line (Trolling), fish/sharks/rays	Whole gutted
Small nets, cast nets, fish	Whole gutted
Traps, staked (uzio), fish/crabs	Whole gutted

Markets

Catches are sold to a variety of markets for all fisheries except for the *Shore gathering: intertidal, worms*. The markets utilised for by each fishery are listed below:

Fishery Name	Domestic	Restaurants	Hotels	Middleman trader	Fish processor	Industrial	Export
Diving, gathering, Oysters		Yes	Yes				
Diving, hand/hoop net, ornamental fish			Yes				Yes
Diving, snorkel, sea cucumber							Yes
Diving, speargun, fish	Yes	Yes	Yes	Yes	Yes		
Diving, speargun, octopus	Yes		Yes				Yes
Diving, stick, Octopus and Squids			Yes		Yes		
Hook & line (Trolling), fish/sharks/rays	Yes		Yes				
Hook & line, handline, fish/sharks/rays	Yes	Yes	Yes	Yes			
Hook & line, longline - surface, pelagic							Yes
Industrial nets, inshore, prawns		Yes	Yes				Yes
Industrial nets, offshore, lobsters		Yes	Yes				Yes
Industrial nets, purse seine, tuna					Yes		
Large nets, reef seine, fish	Yes	Yes	Yes	Yes	Yes		
Large nets, Ring nets, Fish	Yes	Yes	Yes	Yes			
Shore gathering, intertidal, crabs	Yes	Yes	Yes	Yes			
Shore gathering, intertidal, seaweed				Yes			Yes
Shore gathering, intertidal, worms	None						
Shore gathering, mangroves, wood	Yes	Yes	Yes	Yes		Yes	
Shore gathering, rocky shores, ornamental shells	Yes		Yes				Yes
Shore gathering, sandy shores, turtles/eggs	Yes						
Shore gathering, spear, fish	Yes	Yes		Yes			
Small nets, beach seine, fish	Yes			Yes			
Small nets, bottom gill net, sharks/rays/fish	Yes			Yes			
Small nets, cast nets, fish	Yes		Yes	Yes			
Small nets, gillnets, crustaceans	Yes			Yes			
Small nets, lamp, fish	Yes			Yes			
Small nets, Scoop nets, Crabs	Yes	Yes	Yes	Yes			Yes
Small nets, seine nets, crustacea	Yes	Yes	Yes	Yes			

Small nets, surface gill net, sharks/rays/fish	Yes					Yes
Trap, Deep sea, Crabs						Yes
Traps, basket, fish (sub)	Yes		Yes	Yes		
Traps, basket, fish/crabs (art)	Yes	Yes	Yes	Yes		
Traps, staked (uzio), fish/crabs	Yes			Yes		

Alternate livelihoods

It has been recorded that fishers in five fisheries have alternate incomes from other fishing activities, while 19 fisheries record that fishers have alternate incomes from other fisheries as well as non-fisheries related activities. Eleven fisheries have no alternate sources of income listed. The fisheries and the sources of alternate income are provided below:

Fishery Name	Alternative incomes
Diving, hand/hoop net, ornamental fish	Fisheries
Diving, snorkel, sea cucumber	Fisheries
Diving, speargun, octopus	Fisheries
Diving, stick, Octopus and Squids	Fisheries
Large nets, Ring nets, Fish	Fisheries
Large nets, reef seine, fish	Fisheries & Non-fisheries
Shore gathering, intertidal, crabs	Fisheries & Non-fisheries
Shore gathering, intertidal, seaweed	Fisheries & Non-fisheries
Shore gathering, intertidal, worms	Fisheries & Non-fisheries
Shore gathering, mangroves, wood	Fisheries & Non-fisheries
Shore gathering, rocky shores, ornamental shells	Fisheries & Non-fisheries
Shore gathering, sandy shores, turtles/eggs	Fisheries & Non-fisheries
Shore gathering, spear, fish	Fisheries & Non-fisheries
Small nets, beach seine, fish	Fisheries & Non-fisheries
Small nets, bottom gill net, sharks/rays/fish	Fisheries & Non-fisheries
Small nets, cast nets, fish	Fisheries & Non-fisheries
Small nets, gillnets, crustaceans	Fisheries & Non-fisheries
Small nets, lamp, fish	Fisheries & Non-fisheries
Small nets, Scoop nets, Crabs	Fisheries & Non-fisheries
Small nets, seine nets, crustacea	Fisheries & Non-fisheries
Small nets, surface gill net, sharks/rays/fish	Fisheries & Non-fisheries
Traps, basket, fish (sub)	Fisheries & Non-fisheries
Traps, basket, fish/crabs (art)	Fisheries & Non-fisheries
Traps, staked (uzio), fish/crabs	Fisheries & Non-fisheries
Diving, gathering, Oysters	Unknown
Diving, speargun, fish	Unknown
Hook & line (Trolling), fish/sharks/rays	Unknown
Hook & line, handline, fish/sharks/rays	Unknown
Hook & line, longline - surface, pelagic	Unknown
Industrial nets, inshore, prawns	Unknown
Industrial nets, offshore, lobsters	Unknown
Industrial nets, purse seine, tuna	Unknown
Trap, Deep sea, Crabs	Unknown

Gender

Only one fishery currently provides information that women participate significantly in the fisheries. In a further 20 fisheries there is no participation by women in fishing activities and in the remaining 12 fisheries it is unknown what contribution, if any, women make.

Fishery Name	Women involved in fisheries
Shore gathering, intertidal, seaweed	Women outnumber men 2:1
Diving, gathering, Oysters	None
Diving, hand/hoop net, ornamental fish	None
Diving, snorkel, sea cucumber	None
Diving, speargun, fish	None

Diving, speargun, octopus	None
Hook & line, handline, fish/sharks/rays	None
Industrial nets, inshore, prawns	None
Industrial nets, offshore, lobsters	None
Industrial nets, purse seine, tuna	None
Large nets, reef seine, fish	None
Large nets, Ring nets, Fish	None
Shore gathering, rocky shores, ornamental shells	None
Shore gathering, sandy shores, turtles/eggs	None
Shore gathering, spear, fish	None
Small nets, beach seine, fish	None
Small nets, bottom gill net, sharks/rays/fish	None
Small nets, lamp, fish	None
Small nets, surface gill net, sharks/rays/fish	None
Traps, basket, fish (sub)	None
Traps, basket, fish/crabs (art)	None
Diving, stick, Octopus and Squids	Unknown
Hook & line (Trolling), fish/sharks/rays	Unknown
Hook & line, longline - surface, pelagic	Unknown
Shore gathering, intertidal, crabs	Unknown
Shore gathering, intertidal, worms	Unknown
Shore gathering, mangroves, wood	Unknown
Small nets, cast nets, fish	Unknown
Small nets, gillnets, crustaceans	Unknown
Small nets, Scoop nets, Crabs	Unknown
Small nets, seine nets, crustacea	Unknown
Trap, Deep sea, Crabs	Unknown
Traps, staked (uzio), fish/crabs	Unknown

Score sheet

The score sheets for all 33 Kenyan fisheries have been combined and the contribution of each fishery's score (Unknown, No/None/Nil, Few/Poor, Average/Medium, High/Good, Yes/Comprehensive) according to the individual fishery aspects covered by the score sheet has been graphically produced as a percentage of the total. For example, for catch composition data 6% of fisheries had Unknown, 0% had No/None/Nil, 52% had Few/Poor, 27% had Average/Medium, 15% had High/Good and 0% had Yes/Comprehensive as their answers to the question of *How reliable is species composition data?* The graphs display the most common response to the questions associated with each aspect of the fisheries under enquiry.

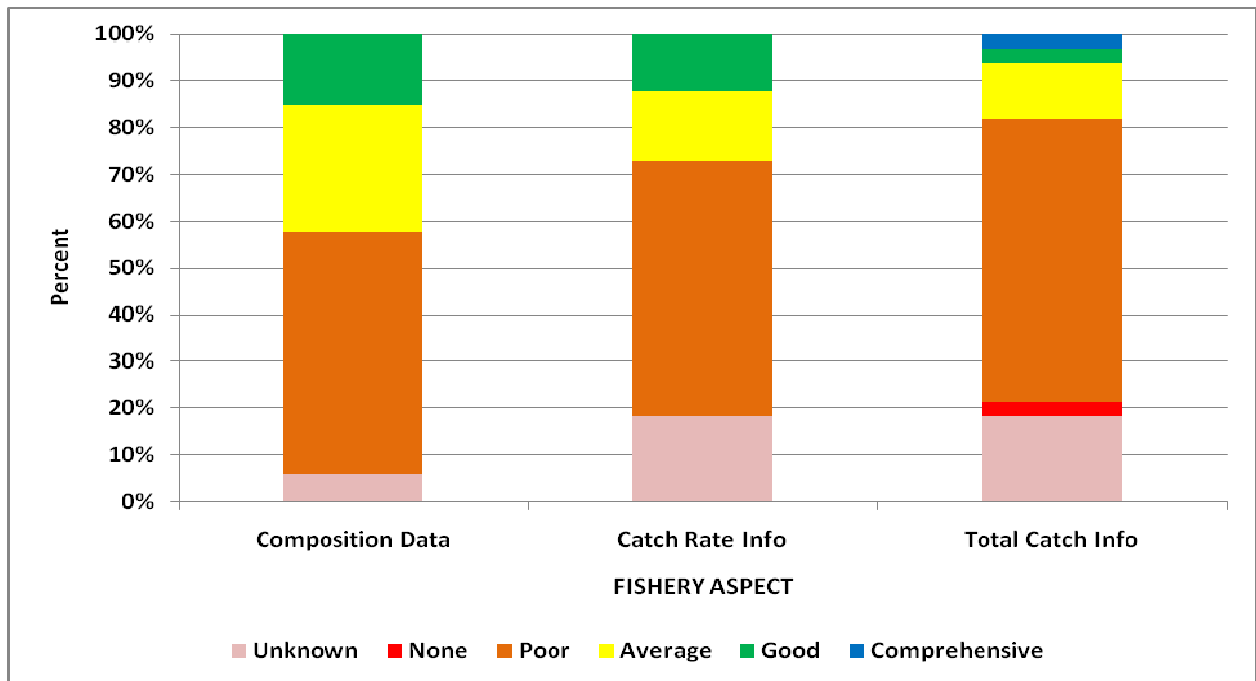
Catch information

Questions asked in this section were:

How reliable is species composition data?

How adequate is catch rate information?

How adequate is total catch information?



Bycatch, seasonality and sustainability

These questions include:

What is the overall level of bycatch?

Rate the bycatch problem?

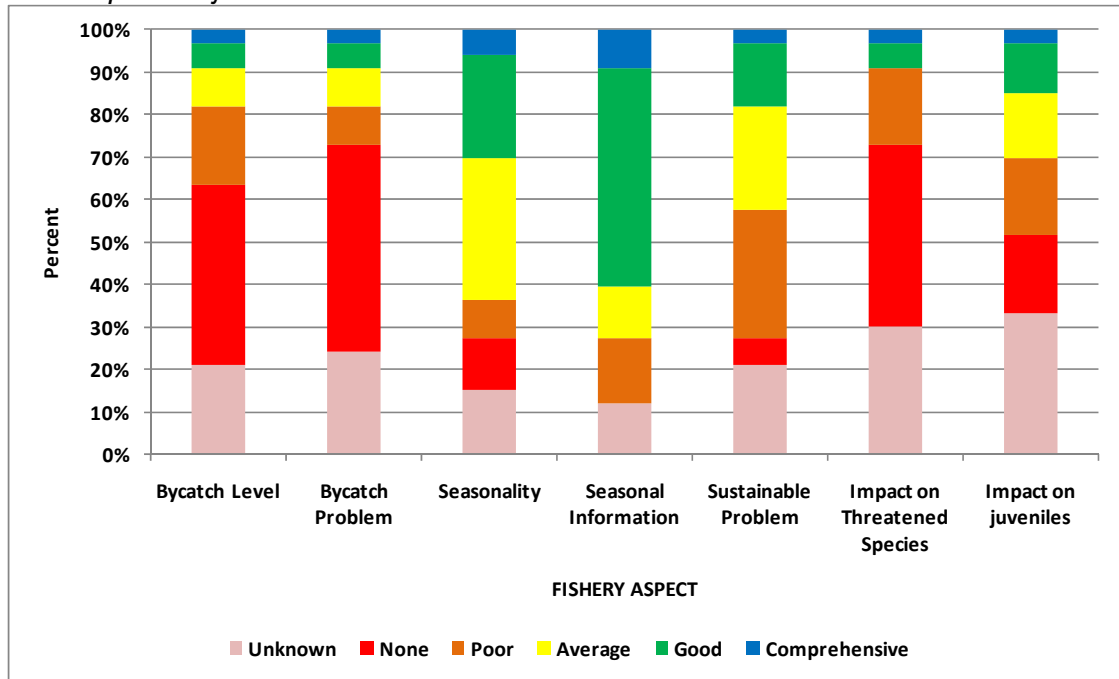
How seasonal is the fishery?

How adequate is seasonal information?

Rate the sustainability problem.

What is the impact on threatened species?

What is the impact on juveniles?



Management (Part 1)

This includes:

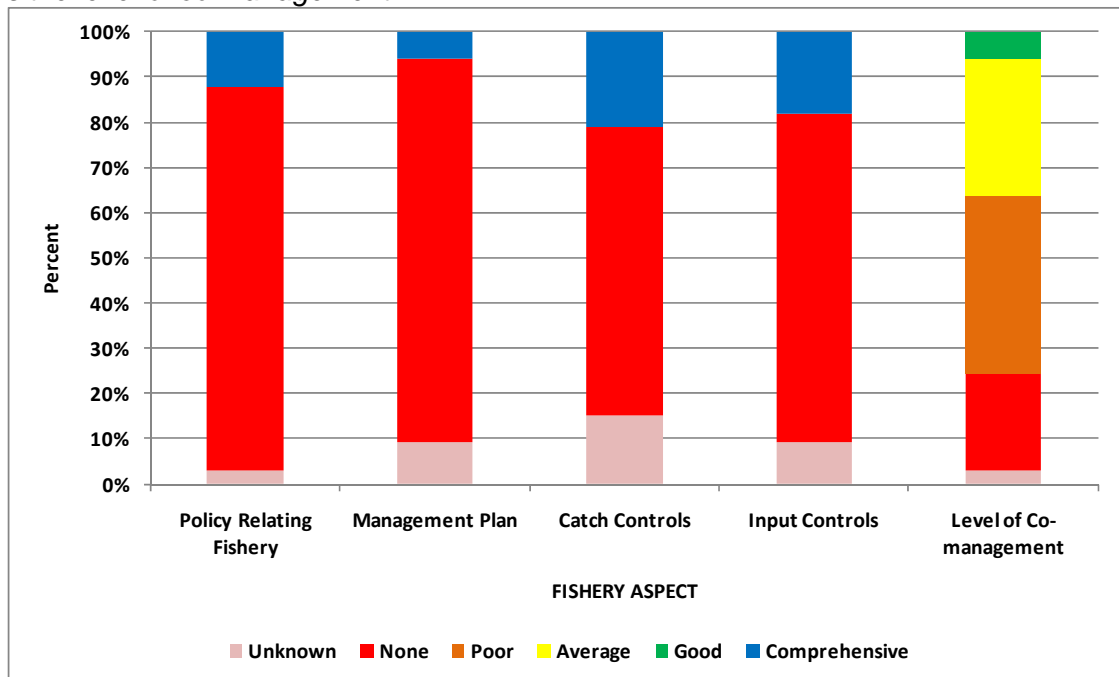
Is there a specific policy relating to this fishery?

Is there a specific management plan for this fishery?

Are there any catch controls?

Are there any input controls?

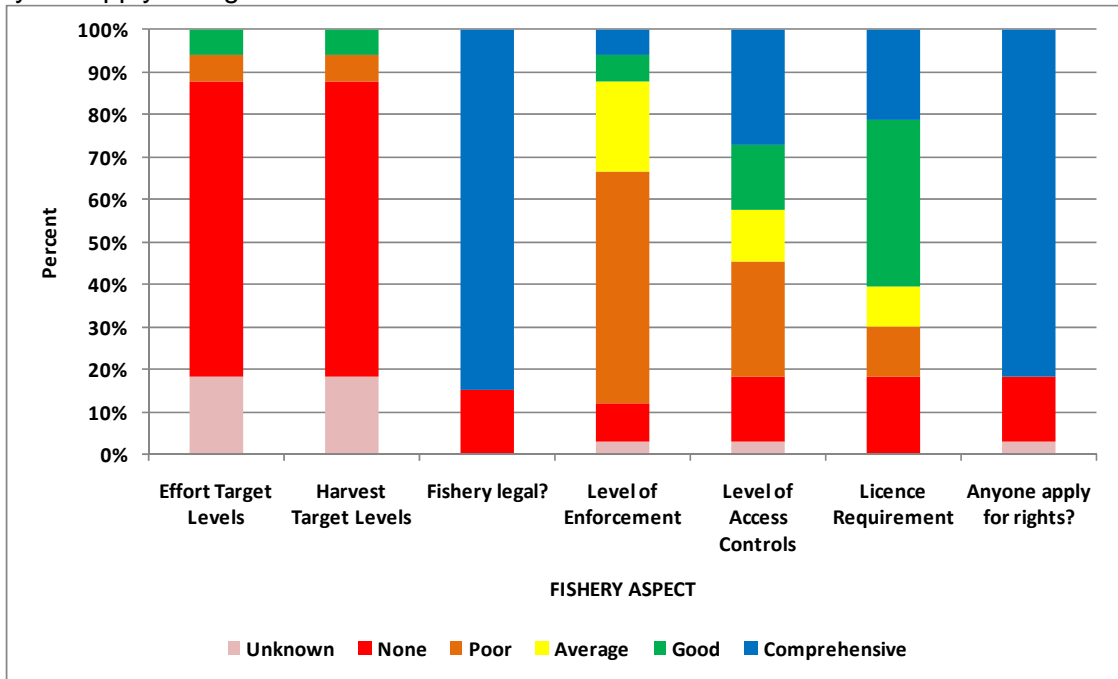
What is the level of co-management?



Management (Part 2)

This includes:

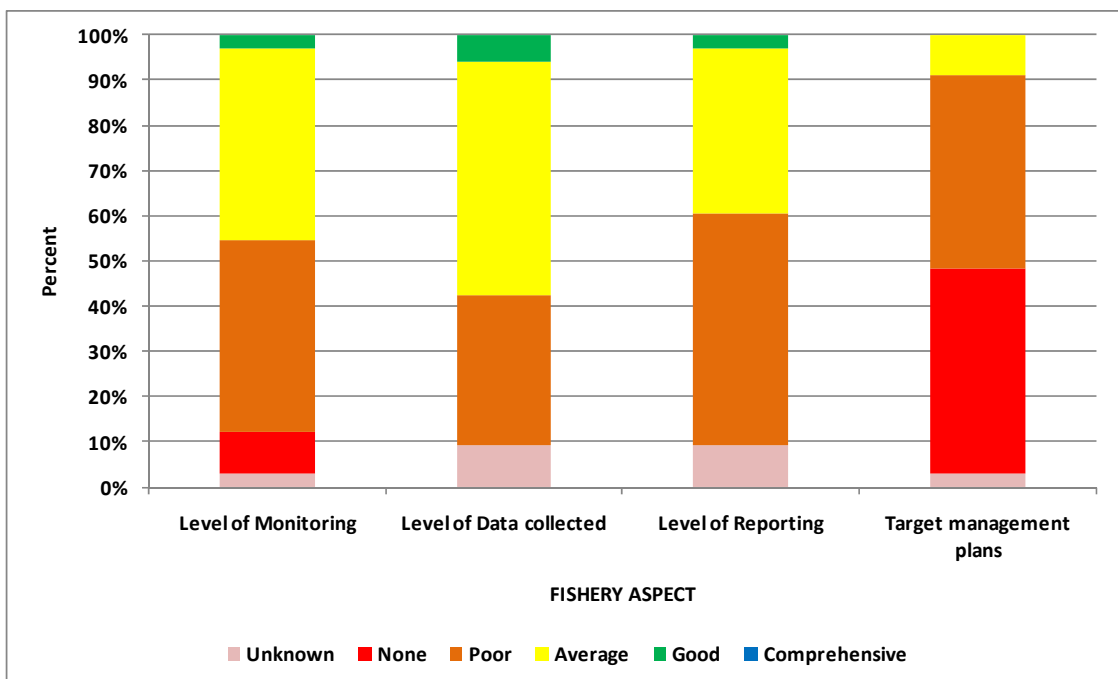
- Is there any setting of effort target levels?
- Is there any setting of harvest target levels?
- Is this fishery legal?
- What is the level of enforcement?
- What is the level of access control?
- What is the level of licence requirements?
- Can anyone apply for rights?



Monitoring

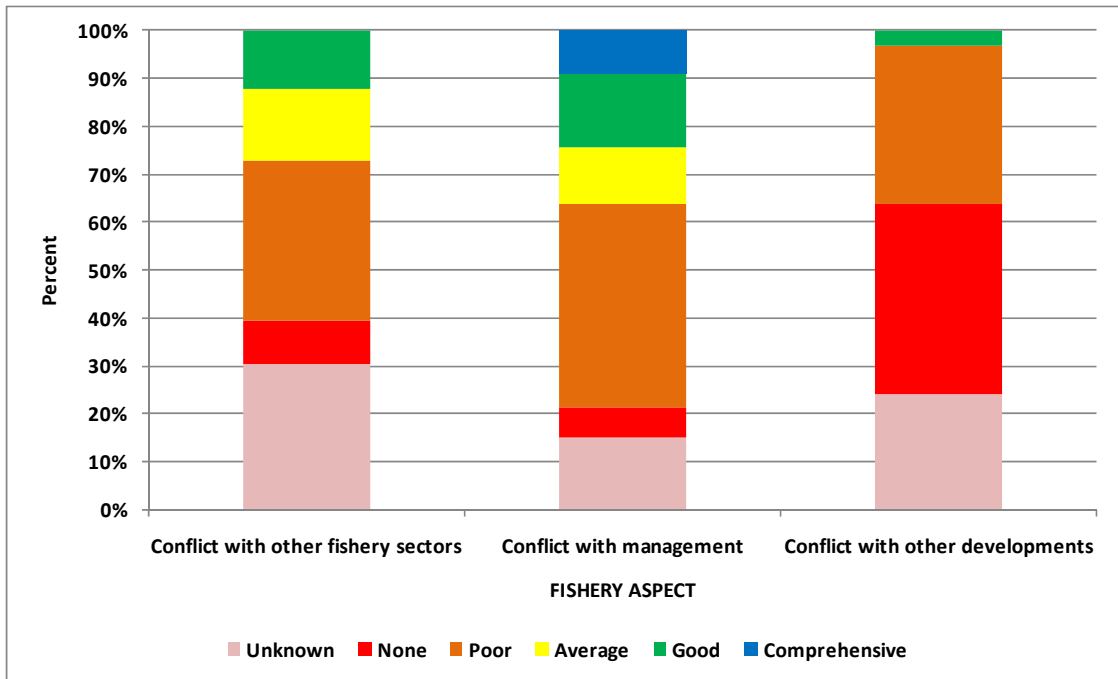
Options are:

- What is the level of monitoring?
- What is the level of data collected?
- What is the level of reporting?
- To what extent are data used to set target management plans?



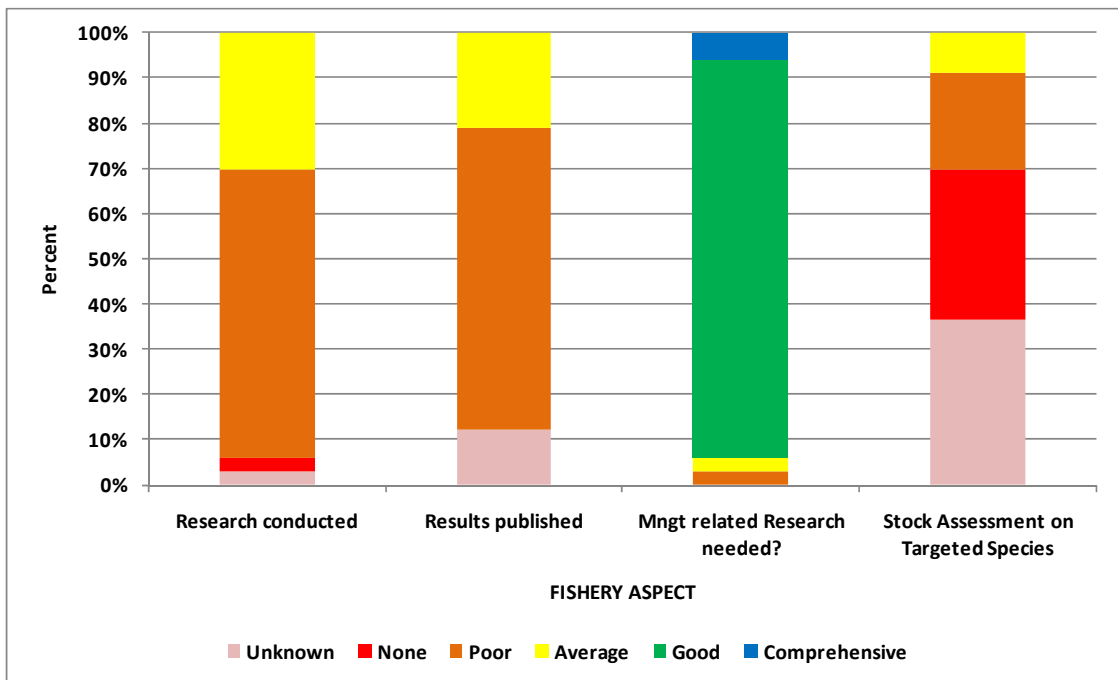
Conflicts

This section requires the following questions answered:
What is the level of conflict with other fisheries?
What is the level of conflict with management?
What is the level of conflict with other developments?



Research

These questions are:
What is the level of research conducted into this fishery?
What is the level of research results published?
What is the current need for management related research?
To what extent have stock assessments been conducted on target species?



References

A list of authors and titles are provided below with the fisheries that utilised these references. For more complete bibliographic details please refer to the fisheries and references on the WIOFish database at www.wiofish.org.za.

Author	Title	Fishery Name
Abuodha, P.	Situation and trends in Kenya recreational marine fisheries. Evaluating the benefits of recreational fisheries.	Hook & line (Trolling), fish/sharks/rays
Agembe, S.W.	Reproductive biology of the orange-spotted grouper <i>Epinephelus coioides</i> in southern coast of Kenya.	Diving, speargun, fish
Agembe, S.W.	Some aspects of the biology and fishery of groupers (Teleostei: Serranidae) in the inshore waters of south coast, Kenya.	Hook & line, handline, fish/sharks/rays Diving, speargun, fish
Anonymous	Kenya fisheries report. (1990 to 2000). Marine and coastal fish landing report.	Hook & line, longline - surface, pelagic Shore gathering, rocky shores, ornamental shells Hook & line, handline, fish/sharks/rays Industrial nets, offshore, lobsters Traps, basket, fish (sub) Shore gathering, spear, fish Traps, basket, fish/crabs (art) Traps, staked (uzio), fish/crabs
Anonymous	Kipepeo Project Report on Mangrove stem borer research.	Shore gathering, mangroves, wood
Ardill, J.D.	Tuna fisheries in South West Indian Ocean.	Hook & line, longline - surface, pelagic Hook & line (Trolling), fish/sharks/rays
Capolla S.R.	Aerial frame survey along the coast of Kenya.	Small nets, bottom gill net, sharks/rays/fish Hook & line, handline, fish/sharks/rays Shore gathering, rocky shores, ornamental shells Shore gathering, spear, fish Traps, basket, fish/crabs (art) Traps, staked (uzio), fish/crabs
de Sousa, T.	Summary of the fisheries and resources information for Kenya.	Small nets, bottom gill net, sharks/rays/fish Hook & line, handline, fish/sharks/rays Traps, basket, fish/crabs (art)
Doute, R.N., Ochanda, N. & Epp, H.	A forest inventory of Kenya using remote sensing technique.	Shore gathering, mangroves, wood
Evans, L.S.	Governing resilience: inclusion, knowledge and complexity in marine social-ecological systems in Kenya.	Large nets, Ring nets, Fish
FAO	Report of the catch assessment survey for marine waters of Kenya in 1985.	Small nets, bottom gill net, sharks/rays/fish Hook & line, handline, fish/sharks/rays Hook & line (Trolling), fish/sharks/rays
FAO	Report of the catch assessment survey for marine waters of Kenya.	Traps, staked (uzio), fish/crabs

FAO/ UNDP	The stock assessment of the Kenyan demersal offshore resources surveyed in the period 1979-1980-1981.	Industrial nets, offshore, lobsters Industrial nets, inshore, prawns
FAO/UNDP	Kenya: Project findings and recommendations.	Industrial nets, offshore, lobsters Industrial nets, inshore, prawns
FAO/UNDP	Line fishing during the survey period 1979-1981.	Hook & line, longline - surface, pelagic
Ferguson, W.	A landscape ecological survey of the mangrove resources of Kenya.	Shore gathering, mangroves, wood
Fisheries Department	Marine waters frame survey, 2006 report.	Small nets, bottom gill net, sharks/rays/fish
		Small nets, beach seine, fish
		Small nets, cast nets, fish
		Large nets, reef seine, fish
		Large nets, reef seine, fish
Fisheries Department	Marine waters frame surveys 2008 report	Small nets, bottom gill net, sharks/rays/fish
		Small nets, beach seine, fish
		Small nets, cast nets, fish
		Large nets, reef seine, fish
		Large nets, reef seine, fish
Fondo, E.N.	Assessment of the Kenyan Marine fisheries from selected fishing areas.	Large nets, Ring nets, Fish
Fondo, E.N.	Cephalopod fishery in the southcoast of Kenya	Diving, speargun, octopus
		Diving, stick, Octopus and Squids
Fondo, E.N.	Evaluation of crabs as discards from the prawn trawlers	Shore gathering, intertidal, crabs
Fondo, E.N.	The effects of mangrove deforestation on the mangrove mud crab fishery.	Small nets, Scoop nets, Crabs
		Shore gathering, intertidal, crabs
Hemphill, S.	The Ecology and Exploitation of Yellowfin Tuna, <i>Thunnus albacares</i> (Bonnaterree 1788) in the Pemba Channel, Kenya.	Hook & line (Trolling), fish/sharks/rays
Iversen, S.A.	Kenya marine fish resources in waters deeper than 10 meters investigated by R/V Dr. Fridtjof Nansen.	Hook & line, longline - surface, pelagic
		Industrial nets, offshore, lobsters
		Industrial nets, inshore, prawns
Kairo, J.	Ecology and restoration of mangrove systems in Kenya.	Shore gathering, mangroves, wood
Kairo, J.	Management plan for the Kiunga mangrove system.	Shore gathering, mangroves, wood
Kairo, J.G. & Gwada, P.O.	The mangrove forest of Mida creek, Kenya.	Shore gathering, mangroves, wood
Kaly, U.L. & Jones, G.P.	Mangrove restoration: a potential tool for coastal management in tropical developing countries.	Shore gathering, mangroves, wood
Kamanyi, J.R.	A note on the commercial and sport fishing of the major scombroid fishes and wahoo on the Kenya Coast.	Hook & line (Trolling), fish/sharks/rays
Kamau, F.K.	Ecological studies of mangrove forests along the tidal flats and lagoons, Ngomeni, Ugwana Bay in Kenya.	Shore gathering, mangroves, wood
Kaunda-Arara, B.	Analysis of fish catch data from 1985 to 1994 in the Kenyan inshore marine waters.	Small nets, beach seine, fish
Kaunda-Arara, B., Rose, G.A., Muchiri, M.S. & Kaka, R.	Long-term trends in coral reef fish yields and exploitation rates of commercial species from coastal Kenya.	Hook & line, handline, fish/sharks/rays
Kenya Department of Fisheries	Kenya fisheries report: Marine and coastal fish landing report.	Small nets, bottom gill net, sharks/rays/fish

Kenya Marine and Fisheries Research Institute	A workshop report on improving seaweed production at Kibuyuni area, South coast Kenya. 4th December 2008	Shore gathering, intertidal, seaweed
Kimani E.N., Mavuti, K.M. & Mukiama, T.	The reproductive activity of pearl oyster <i>Pinctada imbricate</i> Roding 1978 (Pteriidae) in Gazi Bay.	Diving, gathering, Oysters Shore gathering, rocky shores, ornamental shells
Kimani, E. & Moragwa, G.	The recreational fishery of Kenya.	Hook & line (Trolling), fish/sharks/rays
Kimani, E.N.	Coral reef resources of East Africa: Kenya and the Seychelles.	Shore gathering, spear, fish
		Traps, basket, fish/crabs (art)
		Diving, hand/hoop net, ornamental fish
		Shore gathering, rocky shores, ornamental shells
Kimani, E.N. & Mavuti, K.M.	Abundance and population structure of the blacklip pearl oyster, <i>Pinctada margaritifera</i> L. 1758 (Bivalvia: Pteridae), in Coastal Kenya	Diving, gathering, Oysters
Kimani, E.N., Mwatha, G.K., Wakwabi, E.O., Ntiba, J.M. and Okoth, B.K.	Fishes of a shallow tropical mangrove estuary. Gazi, Kenya.	Traps, staked (uzio), fish/crabs
Kulmiye A.G	Some aspects of the reproductive biology of the Thumbprint Emperor, <i>Lethrinus harak</i> (Forsskal 1775) in Kenyan coastal waters.	Small nets, beach seine, fish
Kulmiye, A.J.	The ecology and biology of lobsters in Kenya.	Shore gathering, spear, fish
Little, M.C., Reay, P.J. & Grove, S.J.	The fish community of an East African mangrove creek.	Traps, basket, fish/crabs (art)
		Small nets, beach seine, fish
Mangi S.C and C.M. Roberts	Factors influencing fish catch levels on Kenya's coral reefs.	Hook & line, handline, fish/sharks/rays
Marshall, N.T.	Shark products in Kenyan waters.	Small nets, surface gill net, sharks/rays/fish
Marshall, N.T.	Sharks in Kenyan waters.	Small nets, bottom gill net, sharks/rays/fish
Marshall, N.T., Milledge, S.A.H. & Afonso, P.S.	Stormy seas. Trade in sea cucumbers, sea shells and lobsters in Kenya, Tanzania and Mozambique.	Shore gathering, rocky shores, ornamental shells
		Diving, snorkel, sea cucumber
McClanahan T.R. , C. Ruiz Sebastián, J. Cinner, J. Maina, S. Wilson, N. A. J. Graham	Managing fishing gear to encourage ecosystem-based management of coral reefs fisheries.	Hook & line, handline, fish/sharks/rays
McClanahan, T.R.	Effects of fishing and reef structure on East Africa coral reefs.	Shore gathering, spear, fish
		Diving, hand/hoop net, ornamental fish
McClanahan, T.R.	Kenya coral reef lagoon fish: effects of fishing, substrate complexity, and sea urchins.	Traps, basket, fish/crabs (art)
McClanahan, T.R.	Overfishing and coral reef degradation: A preliminary report from East Africa.	Hook & line, handline, fish/sharks/rays
		Traps, basket, fish/crabs (art)
		Traps, staked (uzio), fish/crabs
McClanahan, T.R.	Recovery of fish populations from heavy fishing: Does time heal?	Hook & line, handline, fish/sharks/rays
		Traps, basket, fish/crabs (art)
		Traps, staked (uzio), fish/crabs
McClanahan, T.R. & Mangi, S.	Gear-based management of a tropical artisanal fishery based on species selectivity and capture size.	Diving, speargun, fish
		Hook & line, handline, fish/sharks/rays
McClanahan, T.R. & Mangi, S.	Spillover. Spill over of exploitable fishes from a marine park and its effect on the adjacent fishery.	Traps, basket, fish/crabs (art)
		Traps, staked (uzio), fish/crabs

McClanahan, T.R. & Mangi, S.	The effect of closed area and beach seine exclusion on coral reef fish catches.	Traps, basket, fish (sub)
		Traps, basket, fish/crabs (art)
McClanahan, T.R., Glaesel, H., Rubens, J., Kiambo, R.	The effects of traditional fisheries management on fisheries yields on the coral-reef ecosystems of southern Kenya.	Traps, basket, fish (sub)
		Traps, basket, fish/crabs (art)
		Traps, staked (uzio), fish/crabs
McClanahan, T.R., Maina, J. & Davies, J.	Perceptions of resource users and managers towards fisheries management options in Kenyan coral reefs.	Diving, speargun, fish
McClanahan, T.R., Rubens, J., Glaesel, H. and Kiambo, R.	The Diana-kinondo coral reefs: Fisheries and traditional management.	Traps, basket, fish/crabs (art)
		Diving, hand/hoop net, ornamental fish
Ministry of fisheries development	Task force findings and recommendations on ring net fishing at the Kenya coast	Large nets, Ring nets, Fish
Mueni E. & Mwangi J.	A survey of the use of the Turtle Excluded Device (TED) in trawlers along the Kenya Coast.	Industrial nets, inshore, prawns
		Shore gathering, sandy shores, turtles/eggs
Mueni, E., Nzuki, S. & Okemwa, G.	Conservation and Management of Sea Turtles in Kenya.	Shore gathering, sandy shores, turtles/eggs
Munga C.N. and Odongo D.	Development of a demonstration/experimental seaweed nursery for <i>Kappaphycus alvarezii</i> and <i>Euchema denticulatum</i> in the south coast of Kenya: Findings of fisheries information for impact analysis of the proposed seaweed project	Shore gathering, intertidal, seaweed
Munga C.N. and Odongo D.	Kipini part of the Malindi-Ungwana Bay artisanal fishery assessment	Small nets, gillnets, crustaceans
		Small nets, gillnets, crustaceans
Mutagya W.B.	On <i>Thenus orientalis</i> and <i>Metanephrops</i> and <i>Manicus</i> (macrura, scyllandae and nephropidae) off Kenya Coast.	Industrial nets, offshore, lobsters
Mutagya W. B.	Some observations on the Kenya lobster fishery.	Shore gathering, spear, fish
Mwatha G. K.,	The bycatch problem in the prawn fishery of Malindi- Ungwana bay	Shore gathering, sandy shores, turtles/eggs
Mwatha G	Stock assessment and population dynamics of penaeid prawns in Malindi - Ungwana Bay Kenya	Industrial nets, inshore, prawns
Mwatha G. K.,	The reproductive biology and Fishery of <i>Leptoscarus vaigiensis</i> in the inshore waters of Kenya	Hook & line, handline, fish/sharks/rays
		Small nets, beach seine, fish
Mwatha G.,	Assesment of the discard and bycatch issue in the Malindi - Ungwana bay area	Industrial nets, inshore, prawns
Mwatha G.k	The prawn fishery of the Malindi - Ungwana bay	Small nets, seine nets, crustacea
Mwatha GK , Fondo E , Uku J , Kithaka J. M	Biodiversity of Mida Creek, Kenya. Kenya Marine and Fisheries Research Institute and Kenya Wildlife Service, Mombasa, Kenya	Traps, basket, fish (sub)
		Shore gathering, spear, fish
		Traps, basket, fish/crabs (art)
Ntiba M. J.	<i>Siganus sutor</i>	Small nets, beach seine, fish
Nzioka R. M.	Population characteristics of King fish <i>Scomberomorus commerson</i> in inshore waters of Kenya (TWS/90/43).	Hook & line (Trolling), fish/sharks/rays
Nzioka R.M	Aspects of the biology of the reef fish <i>Scolopsis bimaculatus</i> (Ruppel 1828) in Kenya : Age and growth studies	Small nets, beach seine, fish
Nzioka R.M	Observation of the spawning seasons of East African reef fishes	Small nets, beach seine, fish
Nzioka R.M	The evaluation of marine fisheries resources in Kenya.	Small nets, beach seine, fish
Nzioka R.M.	Artisanal fisheries of coral reefs.	Shore gathering, spear, fish

Nzioka R.M.	Fish yields in Kilifi.	Small nets, bottom gill net, sharks/rays/fish
		Shore gathering, spear, fish
Nzioka, R.M.	The status of artisanal tuna fishery in Kenya (TWS/90/92).	Hook & line (Trolling), fish/sharks/rays
Nzuki, S.K.	Integral Use of Multi-temporal Remotely Sensed Data and GIS Techniques for Sustainable Management of Kiunga Marine National Reserve (KMNR) Mangroves, Lamu Archipelago, Kenya.	Shore gathering, mangroves, wood
Obura D.O.	Participatory monitoring of shallow tropical marine fisheries by artisanal fishers in Diani, Kenya	Diving, speargun, fish
		Hook & line, handline, fish/sharks/rays
Ochiewo, J.	Changing fisheries practices and their socioeconomic implications in south coast Kenya.	Large nets, Ring nets, Fish
Ochumba, P.B.O.	The distribution of skates and rays along the Kenyan Coast.	Small nets, bottom gill net, sharks/rays/fish
		Hook & line, longline - surface, pelagic
		Hook & line, handline, fish/sharks/rays
		Small nets, surface gill net, sharks/rays/fish
Okechi J. K.	The spiny lobster fishery of Kenya. In: Spiny lobster management.	Industrial nets, offshore, lobsters
		Shore gathering, spear, fish
Okemwa G. M, B. Fulanda, E.N. Kimani & J. Ochiewo	Exploitation of marine aquarium reef fisheries at the Kenyan Coast	Diving, hand/hoop net, ornamental fish
Okemwa, G.	Nesting and mortality of sea turtles along the Kenya coast.	Shore gathering, sandy shores, turtles/eggs
Okemwa, G.M, N. Muthiga and E. M. Mueni eds.	Proceedings of the WIO Marine Turtle Conservation Workshop. 16th – 17th September 2004. Mombasa, Kenya	Shore gathering, sandy shores, turtles/eggs
Okemwa, G.M.	The Kenya Tuna Industry: A pre-analysis profile.	Industrial nets, purse seine, tuna
		Hook & line, longline - surface, pelagic
		Hook & line (Trolling), fish/sharks/rays
Okemwa, G.M. & Kimani, E.	Assessment of Shimoni-Vanga artisanal fisheries.	Large nets, Ring nets, Fish
Okemwa, G.M., S. Nzuki & E. Mueni	The Status and Conservation of Sea Turtles at the Kenyan Coast.	Shore gathering, sandy shores, turtles/eggs
Orwa P.	Population aspects of sea cucumbers (Echinodermata: Holothuroidea) in protected and unprotected reefs along the southern Kenya coast	Diving, snorkel, sea cucumber
Pinault M., Conand C.	Field Survey Report: Sea cucumber fisheries in WIO:	Diving, snorkel, sea cucumber
Pye, S.	The distribution and zonation of marine molluscs in the mangrove ecosystem around Kiwayu Island, Kenya.	Shore gathering, mangroves, wood
Ruwa et al.	Resource assessment of the Tsunza mangrove system.	Shore gathering, mangroves, wood
Ruwa R. K.	Macrofaunal composition and zonation on sandy beaches at Gazi, Kanamai and Malindi bay, Kenya.	Small nets, Scoop nets, Crabs
		Shore gathering, intertidal, crabs
Ruwa R. K.	Reef ecology studies at KMFRI.	Shore gathering, intertidal, crabs

Ruwa R.K.	The effects of habitat complexities created by mangroves on macrofaunal composition in brackishwater intertidal zones at the Kenyan coast.	Shore gathering, intertidal, crabs
Ruwa, R.K.	Mangrove wetlands in Kenya.	Shore gathering, mangroves, wood
Ruwa, R.K.	Marine botanical resources of Kenya Coast.	Shore gathering, mangroves, wood
Samyn Y and Tallon I.	Zoogeography of the shallow-water holothuroids of the western Indian Ocean.	Diving, snorkel, sea cucumber
Sanders M. J , Gichere S. G., and Nzioka R.,	Report on Kenya Marine fisheries sub-sector study. FAO report RAF/87/008/ODR/65/E	Industrial nets, offshore, lobsters Traps, staked (uzio), fish/crabs
Sigana, D. O.	Breeding cycle of <i>Thalamita crenata</i> (Latreille, 1829) at Gazi Creek (Maftaha Bay), Kenya	Small nets, Scoop nets, Crabs Shore gathering, intertidal, crabs
UNEP	Fisheries and aquaculture:	Diving, hand/hoop net, ornamental fish
Venema S. C	Review of marine resource surveys in Kenya waters.	Industrial nets, offshore, lobsters Hook & line, longline - surface, pelagic Industrial nets, inshore, prawns
Wamukoya G.M., Kaloki F.P and Mbendo J.R.	Sea Turtle Recovery Action Plan for Kenya (STRAP)	Shore gathering, sandy shores, turtles/eggs Industrial nets, inshore, prawns
Wamukoya G.M; and Salm R.V., (eds)	Proceedings of the Western Indian Ocean Turtle Excluder Device (TED) training workshop.	Industrial nets, inshore, prawns
Wamukoya, G.	Kenya to minimize turtle mortality in shrimp fishery.	Shore gathering, sandy shores, turtles/eggs Industrial nets, inshore, prawns
Watson, M., Ormond, M.W. and Holliday, L.	The role of Kenyas MPAs in artisanal fisheries management.	Shore gathering, spear, fish Traps, basket, fish/crabs (art) Diving, hand/hoop net, ornamental fish
William E.,	The sport fishery for sailfish at Malindi, Kenya. 1958-1968, with some biological notes	Hook & line (Trolling), fish/sharks/rays
Zanhre, R.	Report on Watamu Turtle Watch's Sea Turtle Bycatch Programme, Watamu Kenya	Shore gathering, sandy shores, turtles/eggs

MAURITIUS ASSESSMENT

Mauritius has 20 fisheries, most of which are artisanal fisheries. There are no subsistence fisheries and only one industrial fishery but 3 semi-industrial fisheries and 2 small-scale commercial fisheries.

Sector	Number
Artisanal	8
Recreational	3
Semi-industrial	3
Industrial; Foreign fleet	2
Small-scale commercial	2
Industrial	1
Defunct	1
Total	20

Catch

Recorded from the catch of the 14 fisheries there are 53 unique catch items, some reported at species level and other more generically.

Scientific name	Scientific name
Acanthuridae	<i>Panulirus</i> spp
<i>Actinopyga mauritiana</i>	<i>Penaeus canaliculatus</i>
<i>Bohadschia argus</i>	<i>Penaeus indicus</i>
<i>Caranx</i> spp	<i>Penaeus latisulcatus</i>
Carcharhiniformes	<i>Penaeus monodon</i>
<i>Cheilinus trilobatus</i>	<i>Plectropomus maculatus</i>
<i>Epinephelus fasciatus</i>	<i>Polysteganus baissaci</i>
<i>Epinephelus merra</i>	<i>Pristipomoides filamentosus</i>
<i>Epinephelus morrhua</i>	<i>Pristipomoides zonatus</i>
<i>Etelis carbunculus</i>	<i>Rhabdosargus sarba</i>
<i>Euthynnus affinis</i>	Scaridae
<i>Gerres oyena</i>	<i>Scarus ghobban</i>
<i>Gnathodentex aureolineatus</i>	<i>Scarus sordidus</i>
<i>Holothuria atra</i>	<i>Scylla</i> spp
<i>Holothuria edulis</i>	Serranidae
<i>Holothuria leucospilota</i>	<i>Siganus sutor</i>
Istiophoridae	<i>Sphyræna obtusata</i>
<i>Istiophorus albicans</i>	<i>Stichopus chloronotus</i>
<i>Katsuwonus pelamis</i>	Thunnini
Lethrinidae	<i>Thunnus alalunga</i>
<i>Lethrinus nebulosus</i>	<i>Thunnus albacares</i>
Lutjanidae & Serranidae	<i>Thunnus maccoyii</i>
<i>Metapenaeus monoceros</i>	<i>Thunnus obesus</i>
Mullidae	<i>Valamugil seheli</i>
<i>Myripristis chryseres</i>	<i>Variola albimarginata</i>
<i>Naso unicornis</i>	<i>Xiphias gladius</i>
<i>Octopus vulgaris</i>	

Two fisheries have by-catch species identified in their catches. These are as follows:

Fishery name	Number of species
Hook and Line, surface longline, semi industrial	4
Hook & line, longline, tuna	2
Total	6

No species have been identified in the catches as being threatened.

Habitats

Mauritian fisheries operate in numerous habitats however, most operate on in lagoons, seagrass beds, macro algal beds and mangrove creeks. A full list of the habitats fished and the number of fisheries operating in each is provided below.

Habitat	Number of fisheries
Lagoons	10
General Inshore Area	9
Seagrass Beds	8
Macroalgal beds	7
Mangrove Creeks	7
General Offshore Area	6
Coral Reef Platforms	5
Coral Reef Slopes	5
Carpet/patch reef	4
Estuaries	4
Shallow Coastal Bays	4
Drop Offs	3
Intertidal Zone	3
Oceanic Surface	3
Sandy Seabed	3
Intertidal Sand Flats	2
Rocky Seabed	2
Rocky Shore	2
Sand Beaches	2
Intertidal Mud Flats	1
Mangroves Forest	1
Oceanic Surface (FAD)	1

Mauritius seems to have low levels of physical impact on habitats that are attributable to fishing. Only five of the 20 fisheries are considered harmful to the habitats in which they operate. The damage or impacts are caused mostly by trampling and indiscriminate removal of species by non-targeting gear.

Fishery Name	Habitat	Threat Description
Large net, seine, fish,	Shallow Coastal Bays	The seine net catches indiscriminately removing all species
	Lagoons	
	General Inshore Area	
Mixed gears, harpoon and line, artisanal	Seagrass Beds	Trampling of substrates
	Rocky Seabed	
	Mangrove Creeks	
	Macroalgal beds	
	Lagoons	
	General Inshore Area	
	Coral Reef Platforms	
Shore gathering, invertebrates, artisanal	Seagrass Beds	Trampling over coral reefs; damage to young mangroves saplings
	Sand Beaches	
	Rocky Shore	
	Mangroves Forest	
	Intertidal Sand Flats	
	Intertidal Mud Flats	
	Carpet/patch reef	

Shore gathering, sea grass beds, sea cucumbers	Seagrass Beds	Trampling, overexploitation
	Sandy Seabed	
	Rocky Seabed	
	Macroalgal beds	
	Lagoons	
	Intertidal Zone	
	Intertidal Sand Flats	
	General Inshore Area	
	Coral Reef Slopes	
	Coral Reef Platforms	
Small nets, hoop nets, ornamental fish	Seagrass Beds	Damage to coral reef by divers
	Macroalgal beds	
	Lagoons	
	Intertidal Zone	
	General Inshore Area	
	Drop Offs	
	Coral Reef Slopes	
	Coral Reef Platforms	
	Carpet/patch reef	

Monitoring

Seventy-five percent of fisheries have some form of catch and effort monitoring in place. Monitoring is undertaken by observers and through the required submission of catch returns.

Biology of target species is monitored in 6 fisheries. Species composition, sex, reproductive state, lengths and weights are collected.

Research conducted

In terms of research conducted on the Mauritian fisheries, none have been comprehensively (i.e. adequately) studied. Five percent have had a high level of investigation but 40% have not been studied at all and 40% have had few studies conducted on them. Of those fisheries that have been studied, few results have been published (10%). Management related research was considered a high priority for 75% of fisheries and a further 15% have an average need for this research. Stock assessments on target species have only been conducted to some extent in 65% of fisheries but none have had their target species assessed comprehensively.

Management

Low levels of co-management are practiced in nine fisheries and there is no co-management in any of the other fisheries.

Fishery Name	Level of Co-management
Hook and line, Fish, Artisanal	Low
Hook and Line, surface longline, semi industrial	Low
Hook and Line, vertical longline, snapper and groupers	Low
Hook and line, vessel, shallow water banks	Low
Large net, seine, fish,	Low
Mixed gears, harpoon and line, artisanal	Low
Mixed gears, Traps and lines, Artisanal	Low
Small net, gill net, Fish	Low
Small nets, hoop nets, ornamental fish	Low

No operational management plans have been developed for the Mauritian fisheries.

Access to most fisheries is through licencing but one fishery is controlled additionally through group decisions and fisher registration and a further fishery through licencing and fisher registration. One fishery is prohibited. Three fisheries are completely open access with no limitations to fishers.

Fishery Name	Access control
Hook & line, longline, tuna	Licensing
Hook & line, purse seine, tuna	Licensing
Hook and line, Fish, Artisanal	Licensing
Hook and Line, small boat and motor, sport	Licensing
Hook and Line, surface longline, semi industrial	Licensing
Hook and Line, vertical longline, snapper and groupers	Licensing
Hook and line, vessel, shallow water banks	Licensing
industrial nets, trawl, demersal	Licensing
Large net, seine, fish,	Licensing
Mixed gears, Traps and lines, Artisanal	Licensing
Semi-Industrial Chilled fish	Licensing
Shore gathering, sea grass beds, sea cucumbers	Licensing
Small nets, hoop nets, ornamental fish	Licensing
Traps, Basket, Artisanal	Licensing
Mixed gears, harpoon and line, artisanal	Licensing, Fisher registration
Small net, gill net, Fish	Licensing, Group decision, Fisher registration
Small nets, hoop net, shrimp	Prohibited
Hook and line, shore, amateur	None
Hook and line, small boat and motor, amateur	None
Shore gathering, invertebrates, artisanal	None

Fishery controls that are used include the the following: closed seasons, effort controls, night fishing prohibited, species controls, size restrictions, mesh sizes restricted, restriction on use of artificial attracting devices e.g. light, quota/bag limit, gear restrictions, marine parks (no fishing/extractive use), marine reserves (limited fishing allowed), reserve areas (e.g. nursery areas) and berried females prohibited.

Conflicts

Eleven fisheries have some form of conflict with other fishers, fisheries managers or and/or developers. These are listed below.

Fishery Name	Conflict with other fishers	Conflict with management	Conflict with development
Hook and line, Fish, Artisanal			Yes
Hook and line, small boat and motor, amateur		Yes	
Hook and Line, small boat and motor, sport		Yes	
Hook and Line, vertical longline, snapper and groupers		Yes	
Large net, seine, fish,	Yes		Yes
Mixed gears, harpoon and line, artisanal			Yes
Mixed gears, Traps and lines, Artisanal			Yes
Semi-Industrial Chilled fish		Yes	
Shore gathering, sea grass beds, sea cucumbers	Yes		
small nets, hoop net, shrimp		Yes	
Traps, Basket, Artisanal	Yes	Yes	Yes
Total	3	6	5

Food security

Fisheries from only three fisheries rely on the catches for basic food security. All other fisheries harvest only for sale to markets.

Fishery Name	Food security
Hook and line, shore, amateur	Yes
Hook and line, small boat and motor, amateur	Yes
Shore gathering, invertebrates, artisanal	Yes

Value adding activities

Half of the fisheries have no value adding activities applied to the catch. The others apply the following post-harvest processing: canning, filleting, fish meal, on ice, salting, smoking, whole frozen, whole gutted, etc. The full list of activities associated with each fishery is provided below.

Fishery Name	Value adding
Hook and Line, surface longline, semi industrial	Canning, Filleting
Hook & line, longline, tuna	Canning, Filleting, Finning, Fish meal, On ice, Whole frozen, Whole gutted
Hook & line, purse seine, tuna	Canning, Filleting, Fish meal, On ice, Whole frozen, Whole gutted
Hook and line, vessel, shallow water banks	Filleting, Headed & gutted, Packed, Whole frozen, Whole gutted
Hook and Line, small boat and motor, sport	Filleting, On ice, Smoking
Semi-Industrial Chilled fish	On ice
Shore gathering, sea grass beds, sea cucumbers	Salted, Whole cooked, Whole gutted
Industrial nets, trawl, demersal	Whole gutted
Hook and line, Fish, Artisanal	Unknown
Small nets, hoop net, shrimp	Unknown
Hook and line, shore, amateur	None
Hook and line, small boat and motor, amateur	None
Hook and Line, vertical longline, snapper and groupers	None
Large net, seine, fish,	None
Mixed gears, harpoon and line, artisanal	None
Mixed gears, Traps and lines, Artisanal	None
Shore gathering, invertebrates, artisanal	None
Small net, gill net, Fish	None
Small nets, hoop nets, ornamental fish	None
Traps, Basket, Artisanal	None

Markets

Most fisheries supply to local markets and five supply both local and export markets. Only one fishery supplies solely to export markets. Three fisheries do not sell to any markets.

Fishery Name	Middleman Fish						
	Domestic	Restaurants	Hotels	trader	processor	Industrial	Export
Hook & line, longline, tuna	Yes						Yes
Hook & line, purse seine, tuna	Yes						Yes
Hook and line, Fish, Artisanal							
Hook and line, shore, amateur	None						
Hook and line, small boat and motor, amateur	None						
Hook and Line, small boat and motor, sport	Yes	Yes	Yes	Yes	Yes		Yes
Hook and Line, surface longline, semi industrial	Yes				Yes		Yes
Hook and Line, vertical longline, snapper and groupers	Yes	Yes	Yes				

Hook and line, vessel, shallow water banks	Yes			Yes			
Industrial nets, trawl, demersal							Yes
Large net, seine, fish,	Yes	Yes	Yes	Yes			
Mixed gears, harpoon and line, artisanal	Yes			Yes			
Mixed gears, Traps and lines, Artisanal	Yes	Yes	Yes	Yes			
Semi-Industrial Chilled fish	Yes	Yes	Yes	Yes			
Shore gathering, invertebrates, artisanal	Yes						
Shore gathering, sea grass beds, sea cucumbers	Yes						Yes
Small net, gill net, Fish	Yes			Yes			
Small nets, hoop net, shrimp	None						
Small nets, hoop nets, ornamental fish	Yes						Yes
Traps, Basket, Artisanal	Yes			Yes			

Alternate livelihoods

Fishers from twelve fisheries derive income from activities from other fisheries and from non-fishery sources. Three fisheries' fishers have alternate incomes from non-fisheries activities. The remaining fisheries need further investigation regarding alternate incomes.

Fishery Name	Alternative incomes
Hook and line, Fish, Artisanal	Fisheries & Non-fisheries
Hook and line, shore, amateur	Fisheries & Non-fisheries
Hook and line, small boat and motor, amateur	Fisheries & Non-fisheries
Hook and Line, surface longline, semi industrial	Fisheries & Non-fisheries
Hook and Line, vertical longline, snapper and groupers	Fisheries & Non-fisheries
Hook and line, vessel, shallow water banks	Fisheries & Non-fisheries
Large net, seine, fish,	Fisheries & Non-fisheries
Mixed gears, harpoon and line, artisanal	Fisheries & Non-fisheries
Mixed gears, Traps and lines, Artisanal	Fisheries & Non-fisheries
Shore gathering, sea grass beds, sea cucumbers	Fisheries & Non-fisheries
Small net, gill net, Fish	Fisheries & Non-fisheries
Traps, Basket, Artisanal	Fisheries & Non-fisheries
Hook and Line, small boat and motor, sport	Non-fisheries
Semi-Industrial Chilled fish	Non-fisheries
Shore gathering, invertebrates, artisanal	Non-fisheries
Hook & line, longline, tuna	Unknown
Hook & line, purse seine, tuna	Unknown
industrial nets, trawl, demersal	Unknown
small nets, hoop net, shrimp	Unknown
Small nets, hoop nets, ornamental fish	Unknown

Gender

Of the 20 Mauritian fisheries listed in the database, three have no participation by women and for the rest there is no information.

Fishery Name	Women involved in fisheries
Hook and Line, surface longline, semi industrial	None
Hook and Line, vertical longline, snapper and groupers	None
Hook and line, vessel, shallow water banks	None
Semi-Industrial Chilled fish	None
Hook & line, longline, tuna	Unknown
Hook & line, purse seine, tuna	Unknown
Hook and line, Fish, Artisanal	Unknown

Hook and line, shore, amateur	Unknown
Hook and line, small boat and motor, amateur	Unknown
Hook and Line, small boat and motor, sport	Unknown
industrial nets, trawl, demersal	Unknown
Large net, seine, fish,	Unknown
Mixed gears, harpoon and line, artisanal	Unknown
Mixed gears, Traps and lines, Artisanal	Unknown
Shore gathering, invertebrates, artisanal	Unknown
Shore gathering, sea grass beds, sea cucumbers	Unknown
Small net, gill net, Fish	Unknown
small nets, hoop net, shrimp	Unknown
Small nets, hoop nets, ornamental fish	Unknown
Traps, Basket, Artisanal	Unknown

Score sheet

The score sheets for all 20 fisheries have been combined and the contribution of each fishery's score (Unknown, No/None/Nil, Few/Poor, Average/Medium, High/Good, Yes/Comprehensive) according to the individual fishery aspects covered by the score sheet has been graphically produced as a percentage of the total. For example, for Catch composition data 20% of fisheries had Unknown, 0% had No/None/Nil, 15% had Few/Poor, 35% had Average/Medium, 30% had High/Good and 0% had Yes/Comprehensive as their answers to the question of *How reliable is species composition data?*

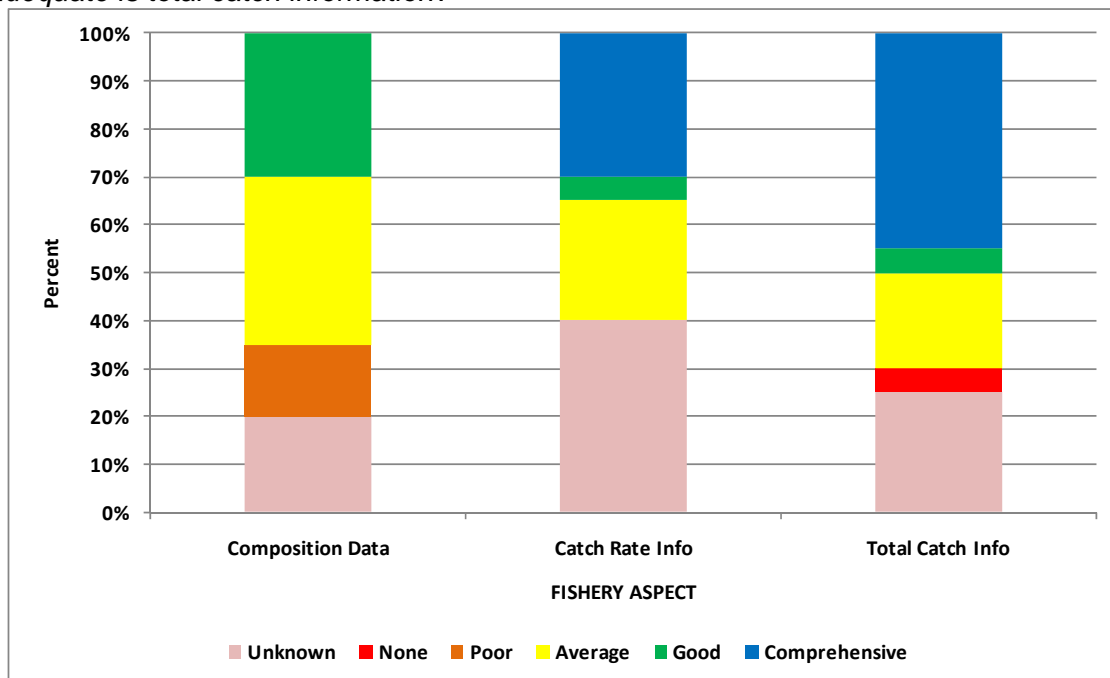
Catch information

Questions asked in this section were:

How reliable is species composition data?

How adequate is catch rate information?

How adequate is total catch information?



Bycatch, seasonality and sustainability

These questions include:

What is the overall level of bycatch?

Rate the bycatch problem?

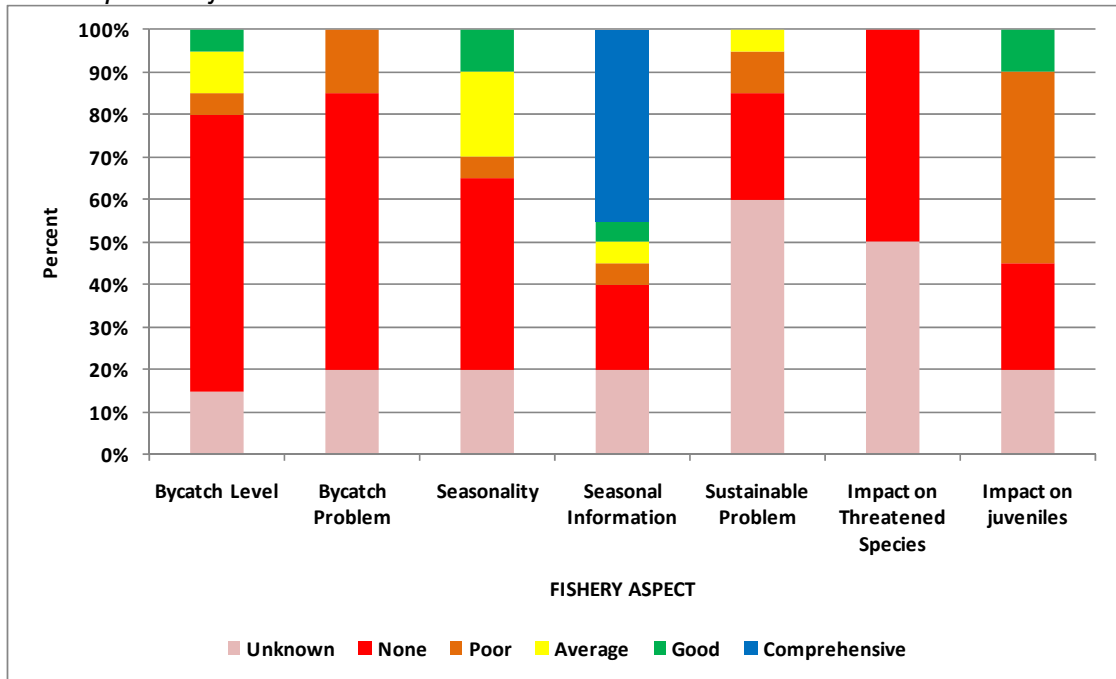
How seasonal is the fishery?

How adequate is seasonal information?

Rate the sustainability problem.

What is the impact on threatened species?

What is the impact on juveniles?



Management (Part 1)

This includes:

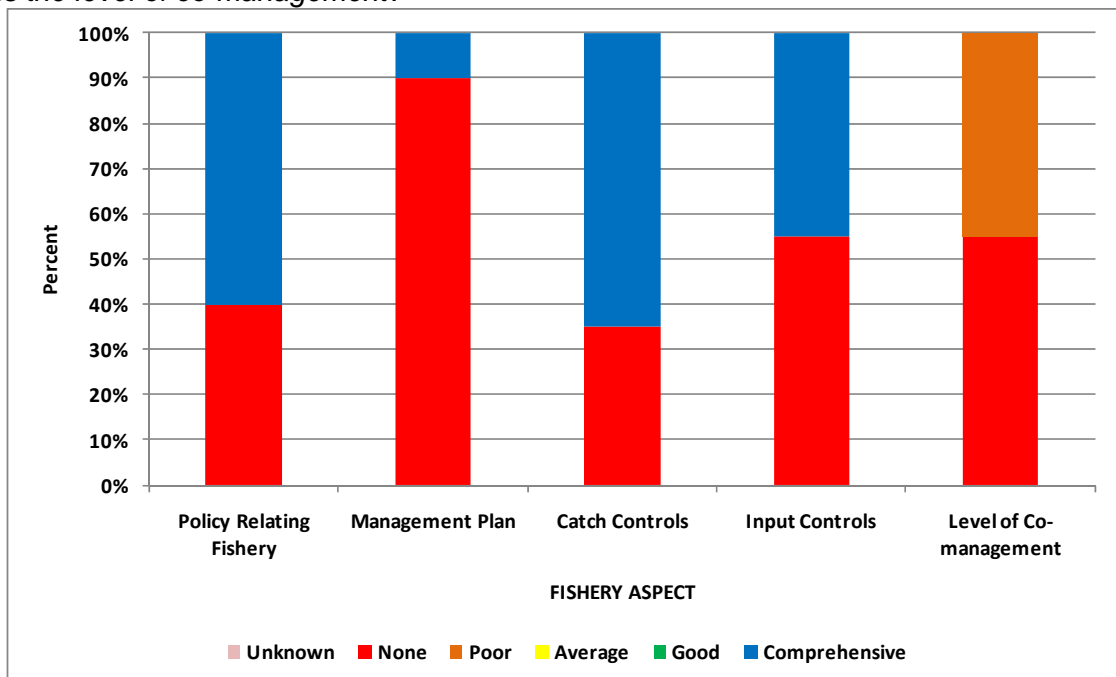
Is there a specific policy relating to this fishery?

Is there a specific management plan for this fishery?

Are there any catch controls?

Are there any input controls?

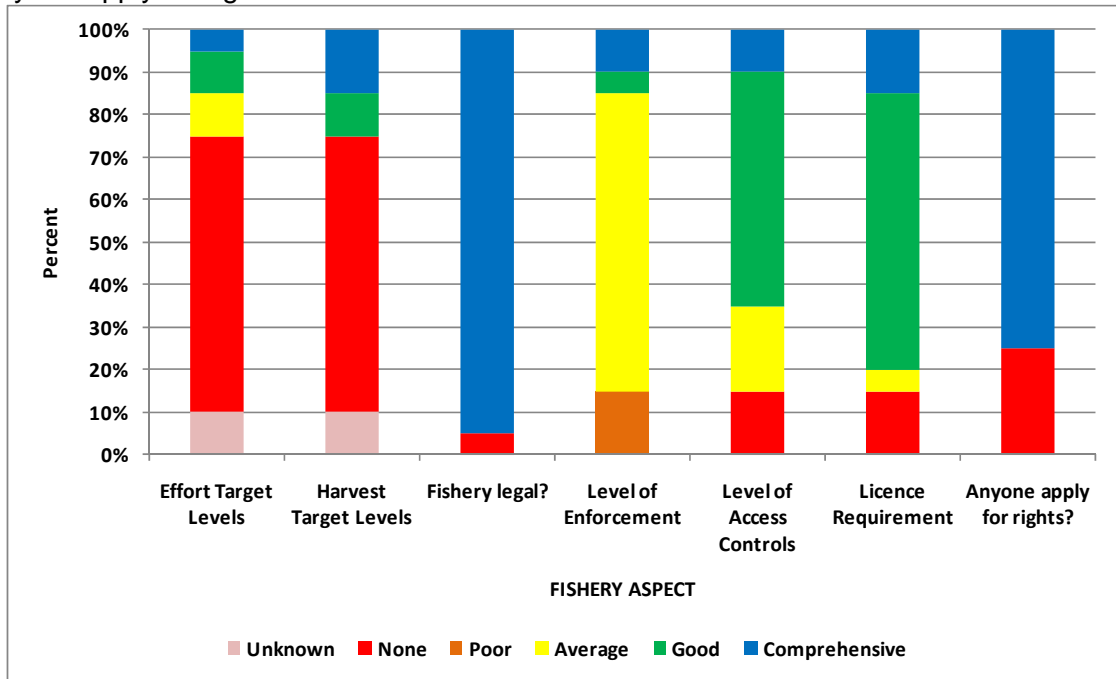
What is the level of co-management?



Management (Part 2)

This includes:

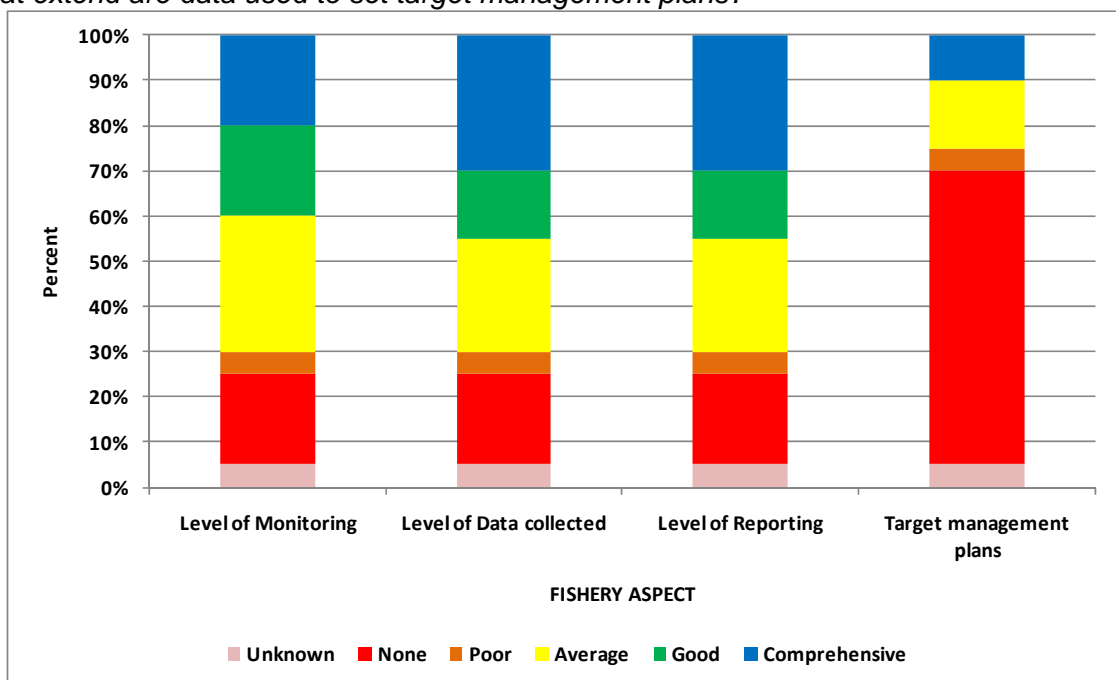
- Is there any setting of effort target levels?
- Is there any setting of harvest target levels?
- Is this fishery legal?
- What is the level of enforcement?
- What is the level of access control?
- What is the level of licence requirements?
- Can anyone apply for rights?



Monitoring

Options are:

- What is the level of monitoring?
- What is the level of data collected?
- What is the level of reporting?
- To what extent are data used to set target management plans?



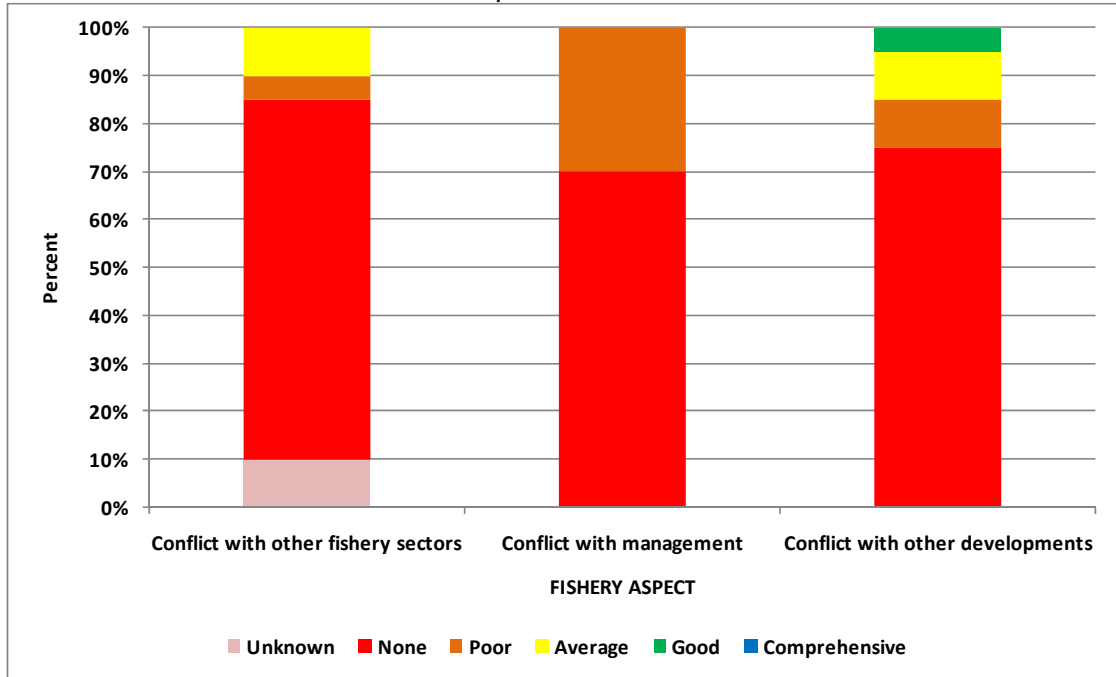
Conflicts

This section requires the following questions answered:

What is the level of conflict with other fisheries?

What is the level of conflict with management?

What is the level of conflict with other developments?



Research

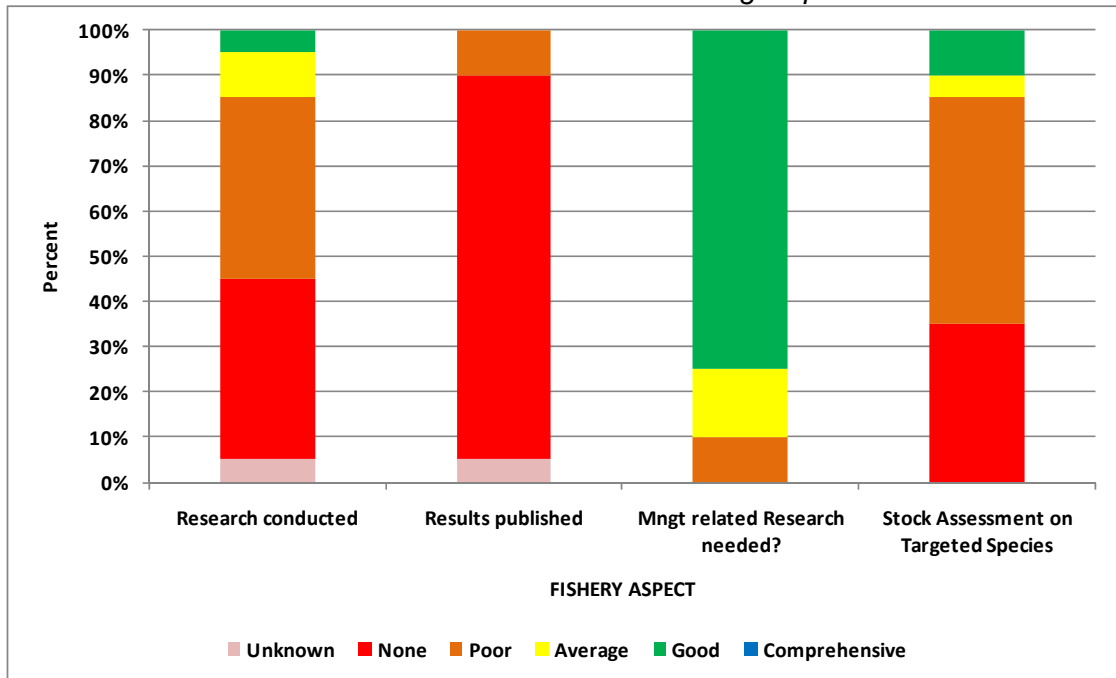
These questions are:

What is the level of research conducted into this fishery?

What is the level of research results published?

What is the current need for management related research?

To what extent have stock assessments been conducted on target species?



References

A list of authors and titles are provided below with the fisheries that utilised these references. For more complete bibliographic details please refer to the fisheries and references on the WIOFish database at www.wiofish.org.za.

Author	Title	Fishery Name
Ministry of Agro Industry, Food Production and Security	Annual Report 2007: Fisheries Division.	Hook & line, longline, tuna
		Hook & line, purse seine, tuna
		Hook and line, Fish, Artisanal
		Hook and Line, surface longline, semi industrial
		Hook and Line, vertical longline, snapper and groupers
		Hook and line, vessel, shallow water banks
		industrial nets, trawl, demersal
		Large net, seine, fish,
		Mixed gears, harpoon and line, artisanal
		Mixed gears, Traps and lines, Artisanal
		Semi-Industrial Chilled fish
		Small net, gill net, Fish
		Small nets, hoop nets, ornamental fish
Ministry of Fisheries and Marine Resources	Annual Report 1995.	Traps, Basket, Artisanal
		Hook & line, longline, tuna
		Hook & line, purse seine, tuna

MOZAMBIQUE ASSESSMENT

Mozambique has a total of 30 fisheries included in WIOFish. The artisanal/traditional fisheries account for most of these fisheries.

Sector	Number
Artisanal	15
Industrial	4
Recreational	3
Small-scale commercial	2
Subsistence	2
Defunct	2
Sport	1
Unknown	1
Total	30

Catch

All the fisheries have catch information associated with them and there are 102 unique catch items listed. Just over one quarter of these catch items are not identified to species level.

Scientific name	Scientific name	Scientific name
<i>Acanthopagrus berda</i>	<i>Holothuria atra</i>	<i>Penaeus indicus</i>
<i>Actinopyga echinites</i>	<i>Holothuria fuscogilva</i>	<i>Penaeus monodon</i>
<i>Actinopyga mauritiana</i>	<i>Holothuria nobilis</i>	<i>Penaeus semisulcatus</i>
<i>Actinopyga miliaris</i>	<i>Holothuria scabra</i>	<i>Perna perna</i>
Ariidae	Istiophoridae	<i>Pinctada imbricata</i>
<i>Aristaeomorpha foliacea</i>	<i>Johnius dussumieri</i>	<i>Platycephalus indicus</i>
<i>Bohadschia marmorata</i>	<i>Katsuwonus pelamis</i>	<i>Plectorhinchus flavomaculatus</i>
<i>Calotomus spinidens</i>	Leiognathidae	Polynemidae
Carangidae	<i>Leiognathus equulus</i>	<i>Polysteganus coeruleopunctatus</i>
<i>Caranx spp</i>	<i>Leptoscarus vaigiensis</i>	<i>Pomadasys commersonii</i>
Carcharhinidae	Lethrinidae	<i>Pomadasys kaakan</i>
<i>Carcharhinus leucas</i>	<i>Lethrinus lentjan</i>	<i>Pomadasys maculatus</i>
<i>Chaceon macphersoni</i>	<i>Lethrinus mahsena</i>	<i>Scarus ghobban</i>
<i>Cheilio inermis</i>	<i>Liza alata</i>	Sciaenidae
<i>Cheimerius nufar</i>	Loliginidae	<i>Scomberomorus commerson</i>
<i>Chrysoblephus puniceus</i>	<i>Lutjanus fulviflamma</i>	Scombridae
Clupeidae	<i>Lutjanus russelli</i>	<i>Scylla serrata</i>
<i>Crenidens crenidens</i>	<i>Mactra ovalina</i>	<i>Scyllarides elisabethae</i>
<i>Cynoglossus lida</i>	<i>Makaira indica</i>	Sergestidae
Dasyatidae	<i>Meretrix meretrix</i>	Serranidae
<i>Diagramma pictum</i>	<i>Metanephrops mozambicus</i>	<i>Siganus sutor</i>
<i>Donax incarnatus</i>	<i>Metapenaeus monoceros</i>	<i>Sillago sihama</i>
Engraulidae	<i>Metapenaeus stebbingi</i>	Sparidae
<i>Epinephelus albomarginatus</i>	<i>Mugil cephalus</i>	<i>Sphyraena spp</i>
<i>Epinephelus malabaricus</i>	Mugilidae	<i>Stichopus chloronotus</i>
<i>Epinephelus spp</i>	<i>Muraenesox bagio</i>	<i>Stichopus hermanni</i>
<i>Epinephelus tauvina</i>	<i>Otolithes ruber</i>	<i>Thelenota ananas</i>
<i>Euthynnus affinis</i>	Palinuridae	Thunnini
<i>Galeocerdo cuvier</i>	<i>Palinurus delagoae</i>	<i>Thunnus alalunga</i>
<i>Gazza minuta</i>	<i>Panulirus ornatus</i>	<i>Thunnus albacares</i>
Haemulidae (=Pomadasyidae)	<i>Panulirus spp</i>	<i>Thunnus obesus</i>
<i>Halichoeres spp</i>	<i>Parupeneus barberinus</i>	<i>Thunnus spp</i>
<i>Haliporoides triarthrus</i>	<i>Pellona ditchela</i>	Trichiuridae
<i>Hilsa kelee</i>	Penaeidae	<i>Xiphias gladius</i>

By-catch species are recorded in 10 fisheries with the most species found in the semi-industrial shrimp trawl fishery.

Fishery name	Number of species
Semi-industrial, Trawler, Shrimps	9
Small nets, gillnet, shrimp	7
Diving, artisanal, lobster	4
Industrial nets, offshore, crustaceans	3
Small nets, bottom gillnet, artisanal	2
Traps, commercial, fish	2
Diving, Fish, seagrass	1
Hook & line, large vessel, commercial	1
Large nets, gillnet, small pelagic	1
Small nets, Chicocota, Artisanal	1
Total	31

No threatened species were recorded in any of the catches.

Habitats

Seven fisheries operate in the productive but sensitive seagrass beds and coral reefs are also popular fishing habitats. The number of fisheries operating in the various habitats are listed below.

Habitat	Number of fisheries
General Offshore Area	7
Seagrass Beds	7
Coral Reef Platforms	6
Estuaries	6
General Inshore Area	5
Oceanic Surface	4
Intertidal Zone	3
Rocky Seabed	3
Sandy Seabed	2
Shallow Coastal Bays	2
Carpet/patch reef	1
Coral Reef Slopes	1
Intertidal Mud Flats	1
Intertidal Sand Flats	1
Mangrove Creeks	1
Oceanic Bottom	1
Rocky Shore	1
Sand Beaches	1

Impacts on the habitats in which they operate are recorded in nine fishery profiles. These impacts include damage by gear and vessels and excessive harvesting among others. These impacts, the habitats they affect and the fishery causing them are listed below.

Fishery Name	Habitat	Threat Description
Diving, speargun, recreational	Removing the largest of resident predators will impact on the surrounding ecology	Coral Reef Platforms
Hook & line, large vessel, commercial	Habitats impacts are limited and include damage to reefs from anchors and fishing lines which get entangled and discarded on reefs.	Rocky Seabed
		Oceanic Surface
		Coral Reef Slopes
Semi-industrial, Trawler, Shrimps	damage bottom habitat needs to be investigated	Shallow Coastal Bays
		Seagrass Beds
		Sandy Seabed

Small nets, beach seine, fish	Persistent dragging of the foot rope and sinkers may displace or crush sessile organisms. The benthic in-fauna may also be damaged from the constantly changing sediment disturbance.	Sand Beaches
Small nets, bottom gillnet, artisanal	Indiscriminate fishing	General Offshore Area
Small nets, estuarine seine net	Persistent dragging of the foot rope and sinkers may displace or crush sessile organisms. The benthic in-fauna may also be damaged from the constantly changing sediment disturbance	Estuaries
Traps, commercial, fish	Extensive dropping of heavy traps and anchors on coral reefs could lead to damage	Oceanic Bottom
Traps, staked (gamboa)	Excessive trapping interferes with estuarine hydrodynamics and associated ecology. This may impede the recruitment of small fishes etc. Siltation and sanding	Intertidal Zone

Monitoring

Catch and effort monitoring occurs in 67% of the fisheries in the form of observer monitoring, submission of catch returns, creel surveys and voluntary monitoring.

The biology of catches is monitored in 17 fisheries mostly by recording species, lengths and weights of the catch but some sex of species and reproductive states are also recorded. For some species otoliths and scales are also collected for aging purposes. Bycatch composition is monitored in the trawl fisheries.

Research conducted

Thirty-three percent of fisheries have had no research conducted on them at all while a further 23% have had little scientific investigation. Only 7% are considered to be comprehensively studied. In terms of stock assessments, 63% have had none of their target species investigated and only 10% have had stock assessments carried out for all their target species.

Management

Co-management with fishers occurs in 15 fisheries and varies from low levels through to comprehensive for 3 fisheries. The fisheries that have co-management and the level of co-management associated with them are listed below.

Fishery Name	Level of Co-management
Diving, artisanal, lobster	Comprehensive
Hook & line, shore angling	Comprehensive
Industrial, Trawl, Shrimps	Comprehensive
Diving, Fish, seagrass	Average
Hook & line, artisanal	Average
Shore gathering, sandy beach, oyster	Average
Small nets, beach seine, fish	Average
Small nets, Chicocota, Artisanal	Average
Small nets, estuarine seine net	Average
Hook & line, large vessel, commercial	Low
Hook & line, longline, artisanal	Low
Large nets, gillnet, small pelagic	Low
Semi-industrial, Trawler, Shrimps	Low
Small nets, bottom gillnet, artisanal	Low
Traps, industrial, lobster	Low

Most of Mozambique's fisheries are open access. Although permits are required, anyone may apply for them. Five fisheries have no access controls at all and three are prohibited. These are listed below.

Fishery Name	Access control
Diving, artisanal, lobster	Licensing
Diving, Fish, seagrass	Licensing
Diving, seagrass beds, sea cucumbers	Licensing
Diving, speargun, recreational	Licensing
Hook & line, artisanal	Licensing
Hook & line, large vessel, commercial	Licensing
Hook & line, longline, artisanal	Licensing
Hook & line, longline, tuna	Licensing
Hook & line, shore angling	Licensing
Hook & line, small motorboat, recreational	Licensing
Hook & line, small motorboat, sport	Licensing
Industrial nets, offshore, crustaceans	Licensing
Industrial nets, purse seine, tuna	Licensing
Industrial, Trawl, Shrimps	Licensing
Large nets, gillnet, small pelagic	Licensing
Semi-industrial, Trawler, Shrimps	Licensing
Small nets, beach seine, fish	Licensing
Small nets, bottom gillnet, artisanal	Licensing
Small nets, estuarine seine net	Licensing
Small nets, gillnet, shrimp	Licensing
Small nets, shark net, sharks/rays/fish	Licensing
Traps, staked (gamboa)	Licensing
Shore gathering, clams	None
Shore gathering, rocky shores, mussels	None
Shore gathering, sandy beach, oyster	None
Traps, artisanal, crabs	None
Traps, basket (gaiola)	None
Small nets, Chicocota, Artisanal	Prohibited
Traps, commercial, fish	Prohibited
Traps, industrial, lobster	Prohibited

Fishery management controls utilised in Mozambique include restrictions on the capture of certain species, closed seasons for specific species, size restrictions, quotas and effort restrictions. There are gear stipulations which include mesh sizes for nets and some fisheries use rotational harvesting areas to allow stock recovery. Marine protected areas have also been proclaimed specifying no-take areas. Traditional controls are employed in some of the artisanal and subsistence fisheries.

Conflicts

Twenty fisheries experience conflict which may be with other fishers, management or developers. The industrial shrimp trawl fishery has conflict with all three but most conflict is with other fishers.

Fishery Name	Conflict with other fishers	Conflict with management	Conflict with development
Diving, artisanal, lobster	Yes	Yes	Yes
Diving, Fish, seagrass		Yes	Yes
Diving, seagrass beds, sea cucumbers		Yes	Yes
Diving, speargun, recreational	Yes	Yes	
Hook & line, large vessel, commercial	Yes	Yes	Yes
Hook & line, longline, artisanal	Yes		Yes
Hook & line, longline, tuna		Yes	
Hook & line, small motorboat, recreational	Yes		
Hook & line, small motorboat, sport	Yes	Yes	
Industrial, Trawl, Shrimps	Yes	Yes	Yes

Semi-industrial, Trawler, Shrimps	Yes		
Small nets, beach seine, fish	Yes	Yes	Yes
Small nets, bottom gillnet, artisanal	Yes	Yes	Yes
Small nets, Chicocota, Artisanal	Yes	Yes	
Small nets, estuarine seine net	Yes	Yes	Yes
Small nets, gillnet, shrimp	Yes	Yes	
Small nets, shark net, sharks/rays/fish	Yes	Yes	Yes
Traps, commercial, fish	Yes	Yes	
Traps, industrial, lobster		Yes	
Traps, staked (gamboa)	Yes	Yes	Yes
Total	16	17	11

Food security

The fishers of 13 fisheries rely on their catches for personal food security and the remaining 17 fisheries sell all of their catch. Those fisheries which provide food are listed.

Fishery Name	Food security
Diving, artisanal, lobster	Yes
Diving, Fish, seagrass	Yes
Hook & line, artisanal	Yes
Hook & line, large vessel, commercial	Yes
Hook & line, longline, artisanal	Yes
Hook & line, small motorboat, recreational	Yes
Hook & line, small motorboat, sport	Yes
Large nets, gillnet, small pelagic	Yes
Shore gathering, rocky shores, mussels	Yes
Shore gathering, sandy beach, oyster	Yes
Small nets, beach seine, fish	Yes
Small nets, Chicocota, Artisanal	Yes
Traps, artisanal, crabs	Yes

Value adding activities

Most fisheries' catches have some value adding activities associated with them with only 6 fisheries not applying any post-harvest processing. These value adding activities include icing, freezing, salting, drying, filleting and packing. The activities are tabulated with the associated fisheries below.

Fishery Name	Value adding
Diving, seagrass beds, sea cucumbers	Boiled, Sun-dried
Shore gathering, sandy beach, oyster	Boiled, Sun-dried
Diving, speargun, recreational	Filleting, Whole frozen
Hook & line, small motorboat, sport	Filleting, Whole frozen
Diving, artisanal, lobster	Headed, Headed & gutted, Whole frozen
Hook & line, large vessel, commercial	On-ice
Large nets, gillnet, small pelagic	On-ice
Semi-industrial, Trawler, Shrimps	On-ice
Hook & line, artisanal	On-ice, None
Small nets, gillnet, shrimp	On-ice, Whole frozen
Traps, commercial, fish	On-ice, Whole gutted
Industrial, Trawl, Shrimps	Processed & packed
Traps, industrial, lobster	Processed & packed
Industrial nets, offshore, crustaceans	Processed & packed, Whole frozen
Small nets, bottom gillnet, artisanal	Salted
Small nets, Chicocota, Artisanal	Salted, Sun-dried
Small nets, shark net, sharks/rays/fish	Salted, Sun-dried
Traps, basket (gaiola)	Salted, Sun-dried
Traps, staked (gamboa)	Salted, Sun-dried
Shore gathering, rocky shores, mussels	Sun-dried
Hook & line, longline, tuna	Whole frozen

Industrial nets, purse seine, tuna	Whole frozen
Diving, Fish, seagrass	None
Hook & line, shore angling	None
Hook & line, small motorboat, recreational	None
Shore gathering, clams	None
Small nets, beach seine, fish	None
Small nets, estuarine seine net	None
Hook & line, longline, artisanal	Unknown
Traps, artisanal, crabs	Unknown

Markets

Only 4 fisheries have no markets included in their fishery profiles and one has no market information included. Domestic markets are supplied by 19 fisheries and there are 5 fisheries that only supply to export markets.

Fishery Name	Domestic	Restaurants	Hotels	Middleman trader	Fish processor	Industrial	Export
Diving, artisanal, lobster		Yes	Yes				Yes
Diving, Fish, seagrass	Yes	Yes	Yes				
Diving, seagrass beds, sea cucumbers							Yes
Diving, speargun, recreational	Unknown						
Hook & line, artisanal	Yes						
Hook & line, large vessel, commercial	Yes	Yes	Yes	Yes			Yes
Hook & line, longline, artisanal	Yes	Yes	Yes				
Hook & line, longline, tuna							Yes
Hook & line, shore angling	None						
Hook & line, small motorboat, recreational	None						
Hook & line, small motorboat, sport	None						
Industrial nets, offshore, crustaceans	Yes						Yes
Industrial nets, purse seine, tuna							Yes
Industrial, Trawl, Shrimps	Yes	Yes	Yes	Yes		Yes	Yes
Large nets, gillnet, small pelagic	Yes						
Semi-industrial, Trawler, Shrimps	Yes	Yes	Yes				Yes
Shore gathering, clams	Yes		Yes				
Shore gathering, rocky shores, mussels	None						
Shore gathering, sandy beach, oyster	Yes						
Small nets, beach seine, fish	Yes	Yes	Yes				
Small nets, bottom gillnet, artisanal	Yes						
Small nets, Chicocota, Artisanal	Yes						
Small nets, estuarine seine net	Yes						
Small nets, gillnet, shrimp	Yes						
Small nets, shark net, sharks/rays/fish	Yes						Yes
Traps, artisanal, crabs	Yes						Yes
Traps, basket (gaiola)	Yes						
Traps, commercial, fish							Yes
Traps, industrial, lobster							Yes
Traps, staked (gamboa)	Yes						

Alternate livelihoods

Fishers from one fishery have alternate incomes from other fisheries while fishers from eight fisheries receive income through other fisheries and non-fisheries activities and fishers from a further three fisheries receive alternate incomes from non-fisheries activities. Further investigation should be undertaken to assess the remaining 18 fisheries.

Fishery Name	Alternative incomes
Semi-industrial, Trawler, Shrimps	Fisheries
Diving, artisanal, lobster	Fisheries & non-fisheries
Hook & line, artisanal	Fisheries & non-fisheries
Hook & line, longline, artisanal	Fisheries & non-fisheries
Industrial, Trawl, Shrimps	Fisheries & non-fisheries
Large nets, gillnet, small pelagic	Fisheries & non-fisheries
Shore gathering, clams	Fisheries & non-fisheries
Small nets, beach seine, fish	Fisheries & non-fisheries
Small nets, Chicocota, Artisanal	Fisheries & non-fisheries
Diving, Fish, seagrass	Non-fisheries
Hook & line, small motorboat, sport	Non-fisheries
Shore gathering, sandy beach, oyster	Non-fisheries

Gender

Gender composition of harvesters is unknown for 7 fisheries. Of the remaining 23 fisheries, women are completely responsible for harvesting in 3 fisheries and some participate with men in the *Hook & line: small motorboat, sport* fishery. All other fisheries are the domain of male fishers.

Fishery Name	Women involved in fisheries
Shore gathering, clams	Women only
Shore gathering, rocky shores, mussels	Women only
Shore gathering, sandy beach, oyster	Women only
Hook & line, small motorboat, sport	Women participate in a ratio of 1 to 16 men
Diving, seagrass beds, sea cucumbers	Unknown
Diving, speargun, recreational	Unknown
Hook & line, longline, artisanal	Unknown
Hook & line, shore angling	Unknown
Hook & line, small motorboat, recreational	Unknown
Traps, artisanal, crabs	Unknown
Traps, industrial, lobster	Unknown
Diving, artisanal, lobster	None
Diving, Fish, seagrass	None
Hook & line, artisanal	None
Hook & line, large vessel, commercial	None
Hook & line, longline, tuna	None
Industrial nets, offshore, crustaceans	None
Industrial nets, purse seine, tuna	None
Industrial, Trawl, Shrimps	None
Large nets, gillnet, small pelagic	None
Semi-industrial, Trawler, Shrimps	None
Small nets, beach seine, fish	None
Small nets, bottom gillnet, artisanal	None
Small nets, Chicocota, Artisanal	None
Small nets, estuarine seine net	None
Small nets, gillnet, shrimp	None
Small nets, shark net, sharks/rays/fish	None
Traps, basket (gaiola)	None
Traps, commercial, fish	None
Traps, staked (gamboa)	None

Score sheet

The score sheets for all 30 fisheries have been combined and the contribution of each fishery's score (Unknown, No/None/Nil, Few/Poor, Average/Medium, High/Good, Yes/Comprehensive) according to the individual fishery aspects covered by the score sheet has been graphically produced as a percentage of the total. For example, for Catch composition data 3% of fisheries had Unknown, 3% had No/None/Nil, 23% had Few/Poor, 37% had Average/Medium, 20% had High/Good and 13% had Yes/Comprehensive as their answers to the question of *How reliable is species composition data?*

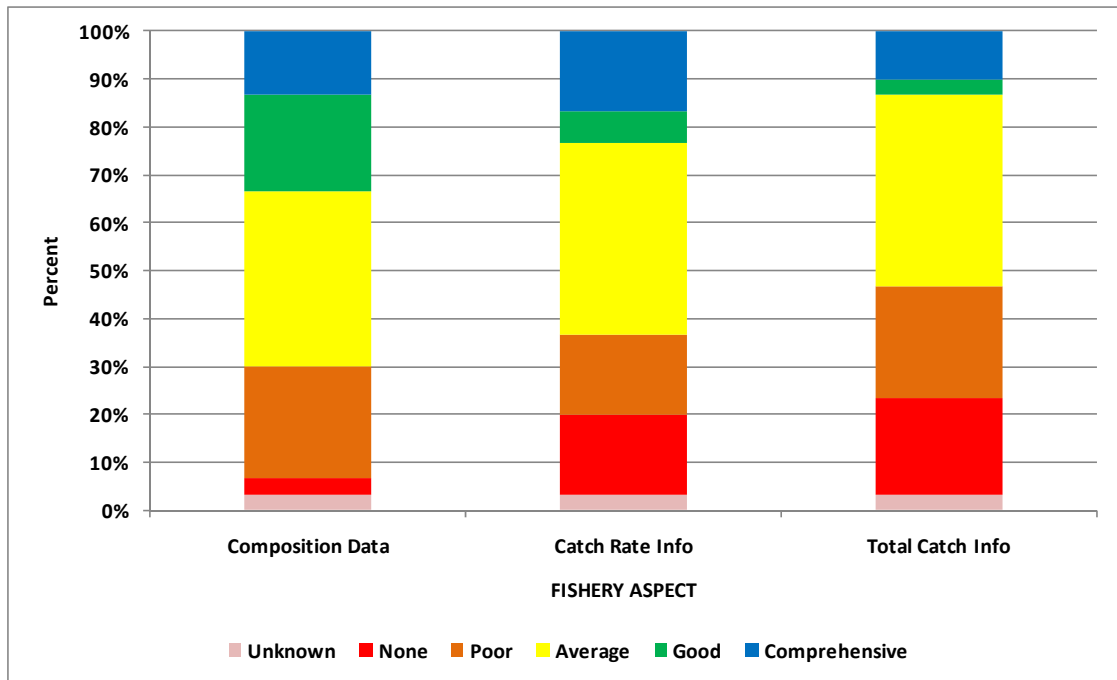
Catch information

Questions asked in this section were:

How reliable is species composition data?

How adequate is catch rate information?

How adequate is total catch information?



Bycatch, seasonality and sustainability

These questions include:

What is the overall level of bycatch?

Rate the bycatch problem?

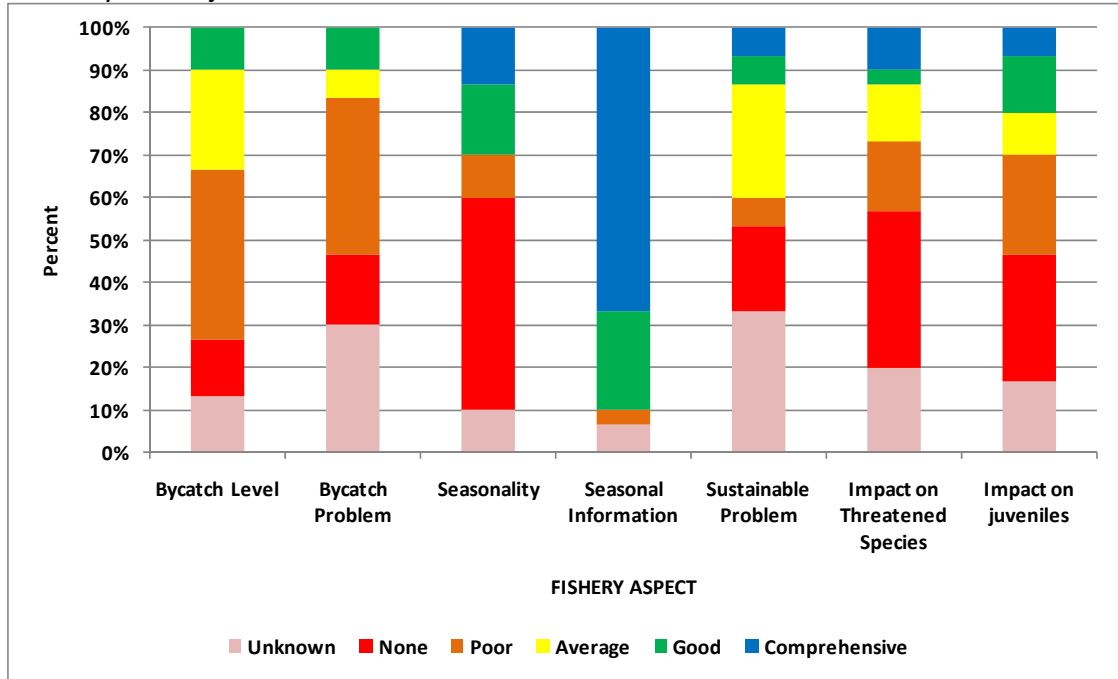
How seasonal is the fishery?

How adequate is seasonal information?

Rate the sustainability problem.

What is the impact on threatened species?

What is the impact on juveniles?



Management (Part 1)

This includes:

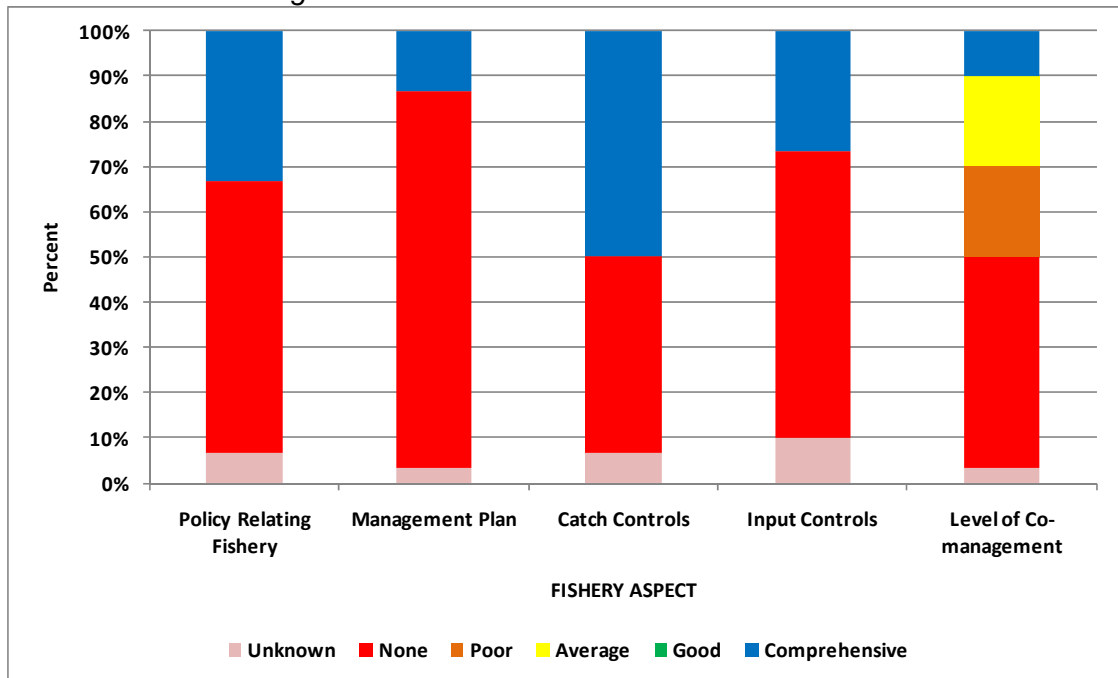
Is there a specific policy relating to this fishery?

Is there a specific management plan for this fishery?

Are there any catch controls?

Are there any input controls?

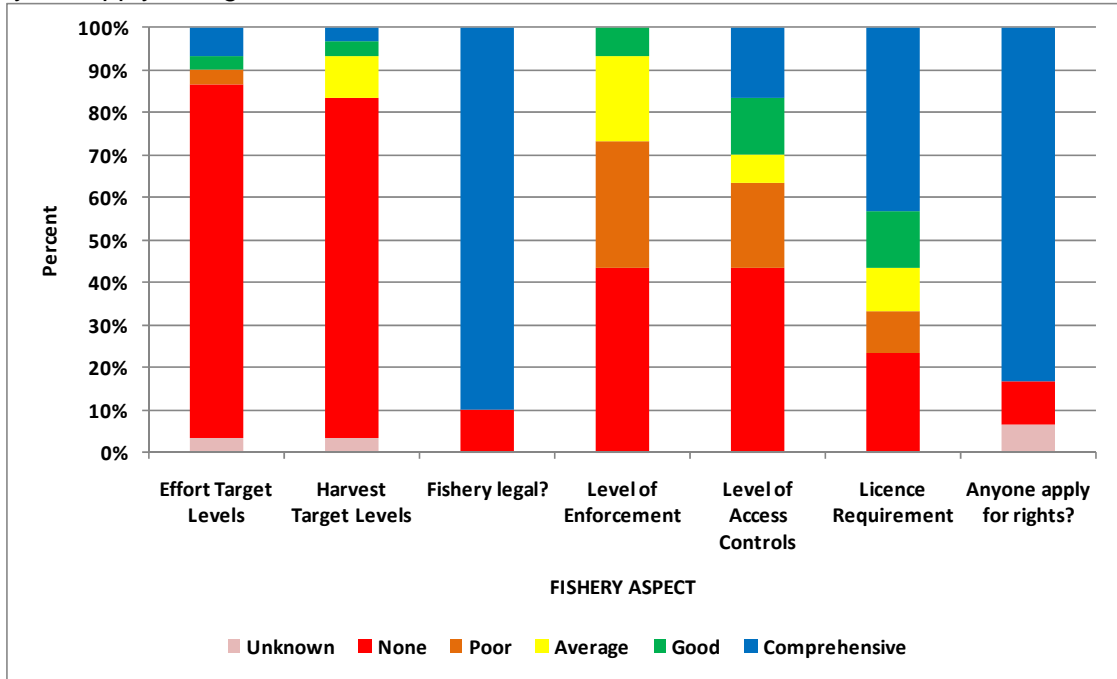
What is the level of co-management?



Management (Part 2)

This includes:

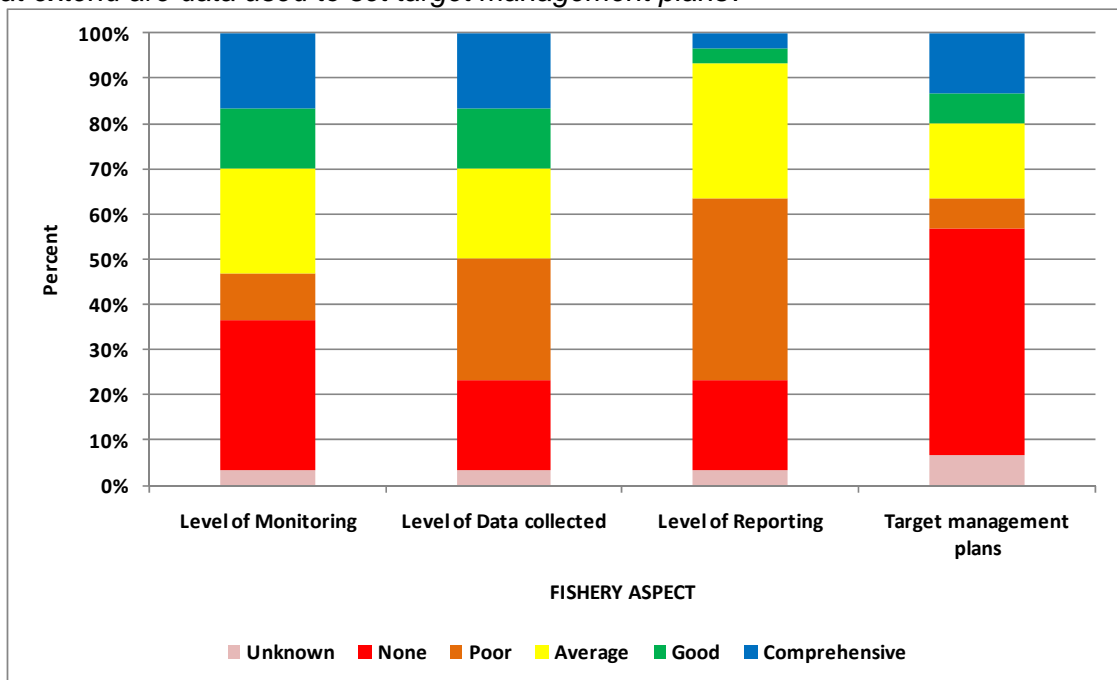
- Is there any setting of effort target levels?
- Is there any setting of harvest target levels?
- Is this fishery legal?
- What is the level of enforcement?
- What is the level of access control?
- What is the level of licence requirements?
- Can anyone apply for rights?



Monitoring

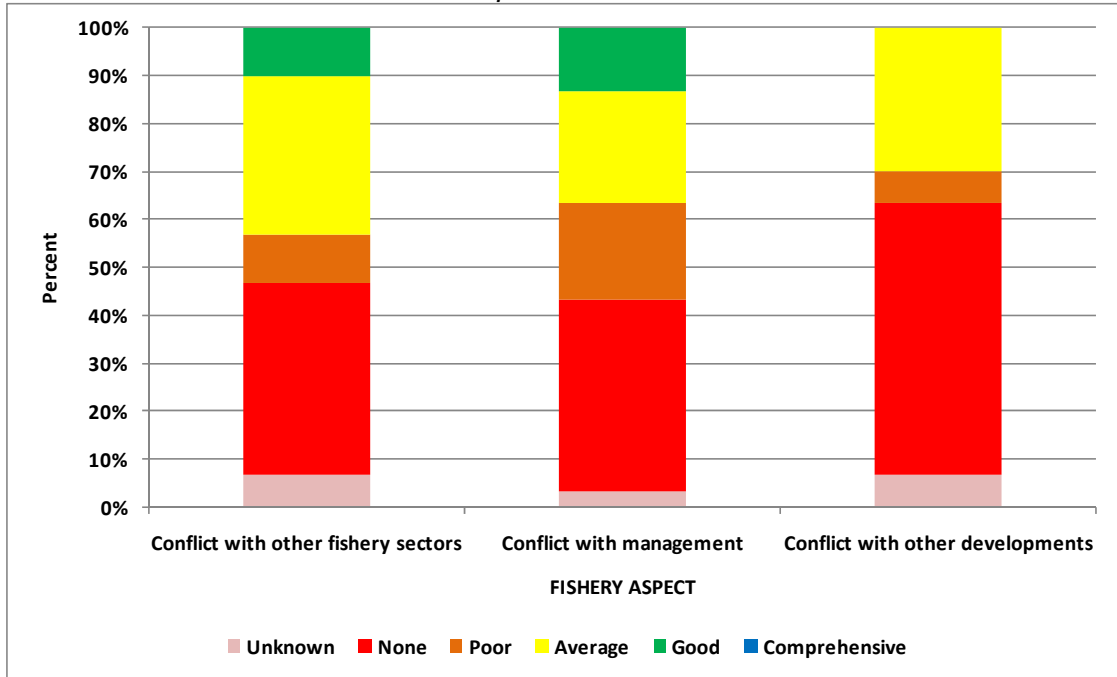
Options are:

- What is the level of monitoring?
- What is the level of data collected?
- What is the level of reporting?
- To what extent are data used to set target management plans?



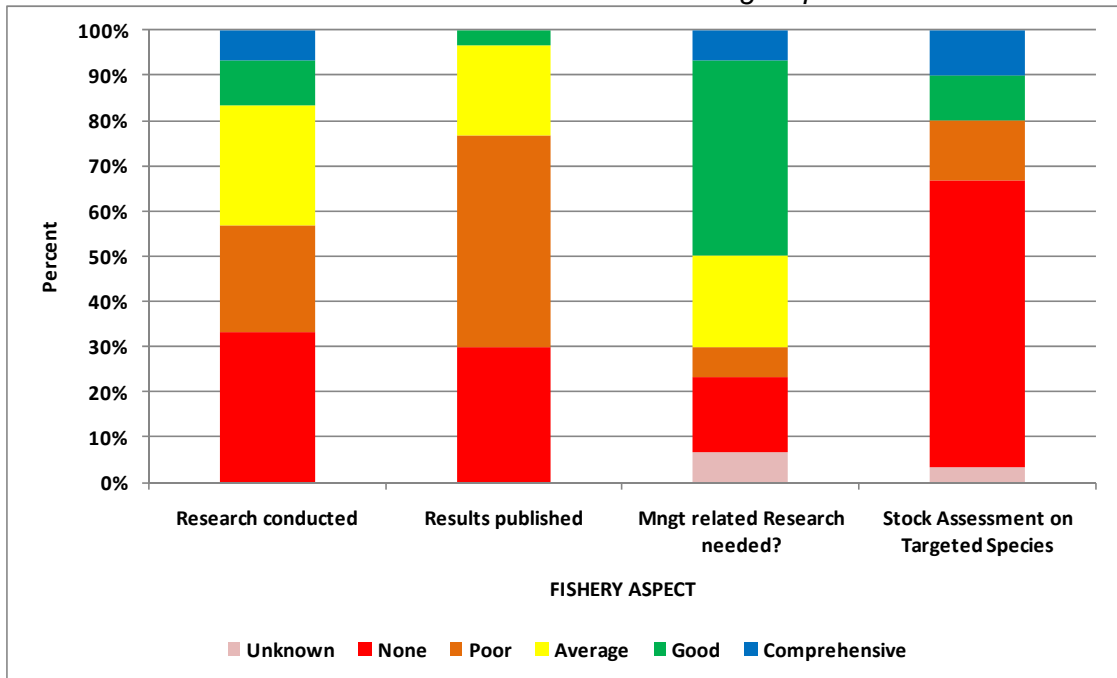
Conflicts

This section requires the following questions answered:
What is the level of conflict with other fisheries?
What is the level of conflict with management?
What is the level of conflict with other developments?



Research

These questions are:
What is the level of research conducted into this fishery?
What is the level of research results published?
What is the current need for management related research?
To what extent have stock assessments been conducted on target species?



References

A list of authors and titles are provided below with the fisheries that utilised these references. For more complete bibliographic details please refer to the fisheries and references on the WIOFish database at www.wiofish.org.za.

Author	Title	Fishery Name
Abdula, R.G.	A Summary about holothurians in Mozambique	Diving, seagrass beds, sea cucumbers
Abdula, R.G. & Lichucha, I.	Analise de dados colhidos a bordo da embarcacao cassiopeia de 7 a 15 de Maio de 1999.	Traps, commercial, fish
Abdula, R.G., van der Elst, R.P., Lichucha, I.D.L.T., Govender, A., and Cuco, C	The industrial trapfishery of southern Mozambique. Results of experimental phase 1997-1999. Instituto de Investigação Pesqueira. Maputo.	Traps, commercial, fish
Afonso P.S.	Pesca artesanal na Baía de Inhambane em 1997. IIP-unpublished report.	Traps, basket (gaiola)
Afonso, P.S.	Indicadores de Monitoria para a Gestao da Pesca Artesanal em Mozambique: O Caso Estudo de Inhassoro.	Diving, artisanal, lobster Hook & line, artisanal
Afonso, P.S.	Pesca artesanal na Baía de Inhambane em 1997. IIP-unpublished report.	Traps, staked (gamboa)
Afonso, P.S.	Pesca de Inhambane.	Small nets, beach seine, fish
Afonso, P.S.	Pesca de Inhambane. Boletim Divulgacao No 35.	Small nets, estuarine seine net
Afonso, P.S., Halare, A. & Mafuca, J.	Pesca artesanal na Baía de Inhambane (in prep): 1999-2000.	Traps, staked (gamboa) Traps, basket (gaiola)
Afonso. P.S.	Pesca artesanal na Baía de Inhambane em 1997. IIP	Small nets, estuarine seine net Small nets, beach seine, fish
Anon	Descricao das pescarias de linha e com covos no sul de Mozambique. Seminario sobre as pescarias semi-industriais a linha e com covos no sul Mozambique.	Traps, commercial, fish
Anon	Spearfishing guide/ dive guides etc/	Diving, speargun, recreational
Baloi, A.P., de Premegi, N., Masquine, Z. & Sulemane, N.B.	Pesca artesanal nos ditricτος de Mongicual, Angoche, Moma e Pebane: 1997 GÇô 2001.	Small nets, beach seine, fish
Baloi, A.P., de Premegi, N., van der Elst, R.P and Govender, A	Towards sustainable development: The artisanal fisheries of the southern part of Nampula Province. Part 1: overall programme description, Part 2: Results for 1997. Instituto de Investiga+o+áo Pesqueira. Maputo.	Small nets, estuarine seine net Small nets, beach seine, fish Small nets, estuarine seine net
Beckley, L.E. & van der Elst, R.P.	Recreational fishing consultancy - southern Mozambique world bank project	Diving, speargun, recreational
Brito, A. & Perreira, T.	A Pesca de Chicocota na Provincia de Sofala	Small nets, Chicocota, Artisanal
Chauca, I., Inacio, A., Sousa, L. & Caramelo, A.	Analise dos principais recursos de camarao na baía de Maputo.	Semi-industrial, Trawler, Shrimps
Conselho de Ministros	Decreto No 51/99. Regulamento da pesca recreativa e desportiva.	Hook & line, small motorboat, sport Hook & line, large vessel, commercial Hook & line, shore angling
de Boer, W.F.	Between the Tides. The impact of human exploitation on an intertidal ecosystem, Mozambique. Univ Groningen and Eduardo Mondlane.	Shore gathering, clams
Dias, N. & Caramelo, A.M.	Avaliacao do Estado dos Stocks de Gamba em Mozambique	Industrial nets, offshore, crustaceans
DNAP	Relatorio anual 2007	Industrial, Trawl, Shrimps

DNAP	Relatorio Anual 2008	Semi-industrial, Trawler, Shrimps
FAO	Mozambique: Artisanal fisheries development project	Diving, artisanal, lobster
		Shore gathering, clams
Fischer, W., Sousa, I., Silva, C., de Freitas, A., Poutiers, J.M., Schneider. W., Borges, T.C., Feral, J.P. & Massinga, A.	Guia de Campo das Especies comerciais marinhas e de aguas salobras de Mocambique.	Shore gathering, clams
Fisheries Ministry	Ministry of fisheries, 1990. Lei dos Pescas number 3/90. art 1103	Diving, artisanal, lobster
Gell, F.R.	Fish and fisheries in the seagrass beds of the quirimba archipelago, northern Mozambique. D.phil thesis. Univ York.	Traps, staked (gamboa)
IDPPE	Retorio do Censo Nacional da Pesca Artesanal	Diving, artisanal, lobster
		Diving, Fish, seagrass
IIP	Aspectos da Pesca e a Biologia do caranguejo de Manga, Scylla serrata (Forsk, 1775), na costa da Beira, Mozambique	Traps, artisanal, crabs
IIP	Linefish resource: Annual report for the year 2000	Hook & line, small motorboat, sport Hook & line, large vessel, commercial
IIP	Relatorio Anual 2008	Small nets, estuarine seine net
		Hook & line, small motorboat, sport
		Industrial nets, offshore, crustaceans
		Hook & line, large vessel, commercial
		Small nets, beach seine, fish
		Small nets, bottom gillnet, artisanal
		Semi-industrial, Trawler, Shrimps
IIP	Relatorio Anual 2009	Small nets, beach seine, fish
		Hook & line, small motorboat, recreational
IIP	Relatorio Anual de 2008	Hook & line, shore angling
		Hook & line, small motorboat, sport
		Hook & line, small motorboat, recreational
		Hook & line, artisanal
IIP	Relatorio Anual, 2006	Hook & line, artisanal
		Small nets, estuarine seine net
		Semi-industrial, Trawler, Shrimps
		Small nets, Chicocota, Artisanal
		Hook & line, longline, artisanal
		Small nets, bottom gillnet, artisanal
		Small nets, beach seine, fish
Industrial nets, offshore, crustaceans		
IIP	Relatorio Anual, 2007	Small nets, estuarine seine net
		Small nets, Chicocota, Artisanal
		Hook & line, longline, artisanal
		Hook & line, artisanal
		Hook & line, small motorboat, recreational
		Small nets, beach seine, fish
		Industrial nets, offshore, crustaceans
		Semi-industrial, Trawler, Shrimps
		Small nets, bottom gillnet, artisanal
		Hook & line, small motorboat, sport
Inacio, A., K. Samucidine, E. Leong e Z. Masquine	Relatorio sobre o estudo da arte de emalhe de fundo na Baia de Maputo	Small nets, gillnet, shrimp

Kalk, M.	A natural history of Inhaca Island, Mozambique.	Shore gathering, clams
Leite, L.D.	A pescaria artesanal de peixe com mergulho em Inhassoro, Provincia de Inhambane, Mozambique	Diving, artisanal, lobster
		Diving, Fish, seagrass
Lichucha, I., Govender, A., van der Elst, R.P., and Abdula, R.G	The linefishery of Mozambique: Annual Report for the years 1998-1999. Instituto de Investigação Pesqueira.	Hook & line, small motorboat, sport
		Hook & line, large vessel, commercial
Lichucha, I., van der Elst, R.P., Govender, A., I., Abdula, R.G. and Cuco, C.A	The linefishery of Mozambique: report for the year 1997.	Hook & line, small motorboat, sport
		Hook & line, large vessel, commercial
Marshall, N.T., Milledge, S.A.H. & Afonso, P.S.	Stormy seas. Trade in sea cucumbers, sea shells and lobsters in Kenya, Tanzania and Mozambique.	Diving, artisanal, lobster
		Diving, seagrass beds, sea cucumbers
		Traps, industrial, lobster
Massinga, A. & Hatton, J.	Status of the coastal zone of Mozambique.	Hook & line, small motorboat, sport
		Hook & line, shore angling
		Diving, speargun, recreational
Ministerio das Pescas	Relatorio do balanço PES 2007	Hook & line, longline, tuna
MITUR	Plano de manejo do Arquipelago Bazaruto, Estudos especializado, Pesca	Shore gathering, sandy beach, oyster
Morais, R.	Reconhecimento preliminary da pesca do caranguejo. In: Relatorio científico- 1969. Junta de Investigacao do ultramar (IIP). Maputo:	Traps, artisanal, crabs
Mualeque, D and A. Uetimane	Dados Da Pesca Artesanal Nos Distritos De Mogincual, Angoche E Moma, 2005	Small nets, bottom gillnet, artisanal
OCTAVIO MASSAMBO BAT	ESTUDO PRELIMINAR D EXPLORACAO DE BIVALVE NO DISTRITO DA BEIRA	Shore gathering, clams
Oliviera, J.C.	Reconhecimento preliminary da pesca de moluscos.in Relatorio científico: 1969. Junta de Investigações do ultramar. Lourenço Marques	Shore gathering, clams
Palha de Sousa, B	Lagosta de profundidade. In Relatorio annual 2000. IIP-12-13Caputi, N. and Palha de Sousa. B. Review of the spiny lobster fishery (Palinurus delagoae) in Mozambique. Consultancy report GÇô not freely available	Traps, industrial, lobster
Palha de Sousa, B	Stock assessment of the deep water spiny lobster Palinurus delagoae. MSc thesis, University of Natal, (ORI) Durban, South Africa	Traps, industrial, lobster
Palha de Sousa, L.; A.Brito;S.Abdula; J.Penne; D.Howell	Camarao do Banco de Sofala, 2008	Industrial, Trawl, Shrimps
Palha de Sousa,L;A.Brito;S. Abdula,J.Penn;D.Howell	Camarao do Banco de Sofala, 2009	Industrial, Trawl, Shrimps
Pereira, M.A.M., Abrantes, K.G.S. & Videira, E.J.S.	Características, participação e atitudes dos pescadores recreativos de margem da cidade de Maputo, técnicas usadas e suas capturas	Hook & line, shore angling
SADC	SADC. 2001. SADC Marine Fisheries and Resources Sector <http:// (Accessed 30/04/2002).	Industrial nets, offshore, crustaceans
		Hook & line, longline, tuna
Silva, C., and Sousa, M.I.	Summary description of the marine fisheries and resources for Mozambique	Industrial nets, offshore, crustaceans

Sousa, M.I., Marshall, N.T., and Smale, M.J	The shark trade in Mozambique. In: The world trade in sharks: a compendium of traffics regional studies. Vol 1.	Hook & line, small motorboat, sport
		Small nets, shark net, sharks/rays/fish
		Hook & line, large vessel, commercial
Torres, R.G.A	Possiveis relacoes entre a area de pesca, profundidade e tempo de imersao nas actividades da pesca com covos	Traps, commercial, fish
Van der Elst, R.P., Beckley, L.E., Govender, A., Fennessy, S.T., Lichucha, I., David, B. and Pacule, H.	Interim progress report for optimal development and management of tourist angling in southerern Mozambique.	Hook & line, small motorboat, sport
Van der Elst, R.P., David, B., and Govender, A.	The marine linefish resources of Mozambique (status, developments and future research). Revista de Investiga+º+áo Pesqueira. Maputo (22): 3-35.	Hook & line, small motorboat, sport
		Hook & line, large vessel, commercial
Van der Elst, R.P., Lichucha, I.D., Fennessy, S., Abdula, R.G. and Cuco. C.A	The trap fishery. In: Linefish Resource: annual report for the year 2000.	Traps, commercial, fish

SEYCHELLES ASSESSMENT

Seychelles has 38 fisheries, most of which are artisanal fisheries. There is only one subsistence fishery, two industrial fisheries, two semi-industrial fisheries and 4 recreational fisheries.

Sector	Number
Artisanal	19
Recreational	4
Industrial; Foreign fleet	2
Semi-industrial	2
Sport	2
Experimental fishery	1
Recreational; Subsistence	1
Small-scale commercial	1
Small-scale commercial; Subsistence	1
Subsistence	1
Defunct	4
Total	38

Catch

Recorded from the catch of the 28 fisheries there are 59 unique catch items, some reported at species level and others more generically.

Scientific name	Scientific name	Scientific name
<i>Acanthocybium solandri</i>	<i>Decapterus punctatus</i>	<i>Octopus vulgaris</i>
<i>Actinopyga mauritiana</i>	<i>Epinephelus multinotatus</i>	<i>Panulirus longipes</i>
<i>Aetobatus narinari</i>	<i>Epinephelus</i> spp	<i>Panulirus ornatus</i>
<i>Albula vulpes</i>	<i>Euthynnus affinis</i>	<i>Panulirus penicillatus</i>
<i>Aphareus rutilans</i>	<i>Galeocerdo cuvier</i>	<i>Panulirus versicolor</i>
<i>Aprion virescens</i>	<i>Herklotsichthys punctatus</i>	<i>Ranina ranina</i>
<i>Caesio</i> spp	<i>Holothuria fuscogilva</i>	<i>Rastrelliger kanagurta</i>
Carangidae	<i>Holothuria</i> undescribed species	<i>Scomber</i> spp
<i>Carangoides fulvoguttatus</i>	Holothurioidea	Scombridae
<i>Carangoides gymnostethus</i>	Istiophoridae	<i>Scylla serrata</i>
<i>Caranx ignobilis</i>	<i>Istiophorus platypterus</i>	<i>Selar crumenophthalmus</i>
<i>Caranx</i> spp	<i>Katsuwonus pelamis</i>	<i>Siganus</i> spp
Carcharhiniformes	Lethrinidae	<i>Sphyrnaena</i> spp
<i>Carcharhinus albimarginatus</i>	<i>Lethrinus nebulosus</i>	Thunnini
<i>Carcharhinus amblyrhynchos</i>	<i>Loligo duvauceli</i>	<i>Thunnus albacares</i>
<i>Carcharhinus brevipinna</i>	<i>Lutjanus bohar</i>	<i>Thunnus obesus</i>
<i>Carcharhinus longimanus</i>	<i>Lutjanus sebae</i>	<i>Triaenodon obesus</i>
<i>Carcharhinus melanopterus</i>	Mactridae	<i>Venerupis</i> spp
<i>Cardisoma carnifex</i>	<i>Makaira indica</i>	<i>Xiphias gladius</i>
Dasyatidae	Myliobatidae	

Only the *Hook & line, longline, swordfish & tuna (si)* fishery has any bycatch species recorded in the catches.

Fishery name	Number of species
Hook & line, longline, swordfish & tuna (si)	2
Total	2

Only two species have been identified in the catches as being threatened. These are the yellowfin tuna (*Thunnus albacares*) and the bigeye tuna (*Thunnus obesus*). Both species are caught in the *Industrial nets, purse seine, tuna* fishery and the *Hook & line, longline, swordfish & tuna (si)* fishery.

Habitats

Seychellois fisheries operate in numerous habitats with most operating in the general inshore area, in lagoons, on coral reef platforms and in shallow coastal bays. A full list of the habitats fished and the number of fisheries operating in each is provided below.

Habitat	Number of fisheries
General Inshore Area	13
Lagoons	11
Coral Reef Platforms	10
Shallow Coastal Bays	10
General Offshore Area	9
Coral Reef Slopes	8
Rocky Seabed	7
Oceanic Surface	6
Seagrass Beds	6
Coral Reef Bommies	5
Granite reef slopes	5
Sandy Seabed	5
Carpet/patch reef	4
Rocky Shore	3
Drop Offs	2
Intertidal Mud Flats	2
Intertidal Zone	2
Macroalgal beds	2
Oceanic Midwater	2
Oceanic Surface (FAD)	2
Rubble seabed	2
Sand Beaches	2
Mangrove Creeks	1

Seychelles appears to have a lower level of physical impact attributable to fishing than most other countries. Only six of the 38 fisheries are considered harmful to the habitats in which they operate. The damage or impacts are caused by trampling and abandonment of traps.

Fishery Name	Habitat	Threat Description
Hook & line, longline, swordfish & tuna (si)	Oceanic Surface	From purse seiners
	Oceanic Midwater	
Hook & line, shore, flyfishing	Sandy Seabed	Trampling of reef organisms by fly fishers. Damage to bottom habitats by boats/skiboats.
	Coral Reef Platforms	
Small nets, cast net, fish	Shallow Coastal Bays	Trampling of marine organisms and habitat (e.g. shells and sea grass beds)
	Mangrove Creeks	
	Lagoons	
	Intertidal Zone	
	Intertidal Mud Flats	
	General Inshore Area	
Traps, small boats, active	Seagrass Beds	Abandoned fish traps may cause damage to coral reefs
	Rocky Seabed	
	Lagoons	
	General Inshore Area	
Traps, small boats, static	Seagrass Beds	Abandoned fish traps may cause damage to coral reefs
	Rocky Seabed	
	Lagoons	
	General Inshore Area	

Traps, whaler, static trap	Shallow Coastal Bays	Traps can damage corals and other benthic organisms but impacts are not quantified.
	Seagrass Beds	
	Lagoons	
	General Inshore Area	
	Coral Reef Slopes	
	Coral Reef Platforms	
	Carpet/patch reef	

Monitoring

More than half of the fisheries have catch and effort monitoring in place. Monitoring is undertaken through creel surveys and the required submission of catch returns.

Biology of target species is monitored in 12 fisheries. Species composition, sex, reproductive state, lengths and weights are collected as well as the otoliths and vertebrae of some species for aging studies.

Research conducted

In terms of research conducted on the Seychelles fisheries, none have been comprehensively (i.e. adequately) studied. Three percent have had a high level of investigation but 55% have not been studied at all. Of those fisheries that have been studied, few results have been published. Management related research was considered a high priority for 18% of fisheries and a further 24% have an average need for this research. Stock assessments on target species have only been conducted to some extent in 32% of fisheries and none has had all their target species assessed.

Management

There is comprehensive co-management between fishers and managers in the *Small nets, purse seine, small pelagic* fishery, average levels in three other fisheries and low levels in five fisheries. The remaining fisheries have no co-management.

Fishery Name	Level of Co-management
Small nets, purse seine, small pelagics	Comprehensive
Harpoon, small boat, rays	Average
Hook & line, longline, sharks (art)	Average
Hook & line, small boat & motor, fish (art)	Average
Diving, gathering, lobster	Low
Diving, gathering, sea cucumber	Low
Traps, small boats, active	Low
Traps, small boats, static	Low
Traps, small trap, lobster	Low

Operational management plans have been developed for five fisheries but none of these plans have been implemented.

Fishery Name	OMP	Implemented
Diving, gathering, sea cucumber	Yes	No
Hook & line, longline - pelagic, tuna	Yes	No
Hook & line, longline, sharks (si)	Yes	No
Hook & line, longline, swordfish & tuna (si)	Yes	No
Traps, small trap, lobster	Yes	No

Access to most fisheries is through licencing but one fishery also requires the registration of fishers. Fourteen fisheries are completely open access with no limitations to fishers.

Fishery Name	Access control
Diving, gathering, sea cucumber	Licensing
Hook & line, large vessel, schooner - dropline	Licensing
Hook & line, large vessel, schooner - handline	Licensing
Hook & line, longline - pelagic, tuna	Licensing
Hook & line, longline, sharks (si)	Licensing
Hook & line, longline, swordfish & tuna (si)	Licensing

Hook & line, super skiboat, sport	Licensing
Hook & Line, small boat & motor, squid	Licensing
Industrial nets, purse seine, tuna	Licensing
Shore gathering, wading and snorkel, octopus	Licensing
Small nets, beach seine, fish	Licensing
Small nets, bottom gill net, slipper lobster	Licensing
Small nets, hoop net, kona crab (<i>Ranina ranina</i>)	Licensing
Small nets, pelagic gill net, mackerel	Licensing
Traps, schooner, offshore	Licensing
Traps, small boats, active	Licensing
Traps, small boats, static	Licensing
Traps, small trap, lobster	Licensing
Traps, whaler, static trap	Licensing
Hook & line, small boat & motor, fish (art)	Licensing, Fisher registration
Harpoon, small boat, rays	None
Hook & line, Inboard, Artisanal	None
Hook & line, longline, sharks (art)	None
Hook & line, shore, flyfishing	None
Hook & line, small boat & motor, fish (rec)	None
Hook & line, small boat & motor, outer islands	None
Hook & line, super skiboat, recreational	None
Shore gathering, intertidal (muddy) flats	None
Shore gathering, Rocky shores, Barnacles	None
Shore gathering, rocky shores, crabs	None
Shore gathering, sandy shores, bivalves	None
Shore gathering, sandy shores, surf clam	None
Small nets, cast net, fish	None
Small nets, purse seine, small pelagics	None
Diving, gathering, lobster	Not operating
Hook & line, small boat/non motor, pirogue	Not operating
Live reef fish	Not operating
Mothership dorries	Not operating

Fishery controls that are used include the proclamation of marine protected areas and reserves where harvesting is prohibited or limited. There are restrictions on gear (e.g. mesh sizes) and effort. Closed seasons are in place for some species as well as size restrictions on others. Berried female crustaceans may also not be harvested. Night fishing is prohibited in some fisheries.

Conflicts

Twenty-four fisheries have some form of conflict with other fishers, fisheries managers and/or developers. These are listed below.

Fishery Name	Conflict with other fishers	Conflict with management	Conflict with development
Diving, gathering, lobster	Yes	Yes	Yes
Harpoon, small boat, rays			Yes
Hook & line, Inboard, Artisanal	Yes		
Hook & line, longline - pelagic, tuna	Yes	Yes	
Hook & line, longline, sharks (art)			Yes
Hook & line, longline, sharks (si)		Yes	Yes
Hook & line, longline, swordfish & tuna (si)	Yes		
Hook & line, shore, flyfishing			Yes
Hook & line, small boat & motor, fish (art)	Yes	Yes	Yes
Hook & line, small boat & motor, outer islands	Yes		
Hook & line, super skiboat, sport	Yes	Yes	
Industrial nets, purse seine, tuna	Yes	Yes	
Shore gathering, rocky shores, crabs			Yes

Shore gathering, sandy shores, bivalves			Yes
Shore gathering, sandy shores, surf clam			Yes
Shore gathering, wading and snorkel, octopus			Yes
Small nets, cast net, fish		Yes	
Small nets, pelagic gill net, mackerel		Yes	Yes
Small nets, purse seine, small pelagics	Yes		Yes
Traps, schooner, offshore	Yes		
Traps, small boats, active	Yes	Yes	Yes
Traps, small boats, static	Yes	Yes	Yes
Traps, small trap, lobster	Yes	Yes	Yes
Traps, whaler, static trap	Yes	Yes	Yes
Total	14	12	16

Food security

Some portion of most fisheries' catches is retained for personal consumption providing personal food security. Nine fisheries harvest only for sale to markets.

Fishery Name	Food security
Hook & line, Inboard, Artisanal	Yes
Hook & line, large vessel, schooner - dropline	Yes
Hook & line, large vessel, schooner - handline	Yes
Hook & line, longline - pelagic, tuna	Yes
Hook & line, longline, sharks (art)	Yes
Hook & line, small boat & motor, fish (art)	Yes
Hook & line, small boat & motor, fish (rec)	Yes
Hook & line, small boat & motor, outer islands	Yes
Hook & line, super skiboat, recreational	Yes
Hook & line, super skiboat, sport	Yes
Hook & Line, small boat & motor, squid	Yes
Shore gathering, intertidal (muddy) flats	Yes
Shore gathering, Rocky shores, Barnacles	Yes
Shore gathering, rocky shores, crabs	Yes
Shore gathering, sandy shores, bivalves	Yes
Shore gathering, sandy shores, surf clam	Yes
Shore gathering, wading and snorkel, octopus	Yes
Small nets, beach seine, fish	Yes
Small nets, cast net, fish	Yes
Small nets, hoop net, kona crab (Ranina ranina)	Yes
Small nets, pelagic gill net, mackerel	Yes
Traps, schooner, offshore	Yes
Traps, small boats, active	Yes
Traps, small boats, static	Yes
Traps, whaler, static trap	Yes
Diving, gathering, sea cucumber	No
Harpoon, small boat, rays	No
Hook & line, longline, sharks (si)	No
Hook & line, longline, swordfish & tuna (si)	No
Hook & line, shore, flyfishing	No
Industrial nets, purse seine, tuna	No
Small nets, bottom gill net, slipper lobster	No
Small nets, purse seine, small pelagics	No
Traps, small trap, lobster	No

Value adding activities

There are only 9 fisheries that do not have any post-harvest processing at all. The others chill or freeze the catch, head and gut it or salt it among others. The full list of activities associated with each fishery is provided below.

Fishery Name	Value adding
Industrial nets, purse seine, tuna	Canning, Filleting, Fish meal, Whole frozen
Hook & line, longline - pelagic, tuna	Headed & gutted
Hook & line, longline, sharks (si)	Headed & gutted
Hook & line, longline, swordfish & tuna (si)	Headed & gutted, On-ice, Whole gutted
Small nets, hoop net, kona crab (Ranina ranina)	On-ice
Small nets, pelagic gill net, mackerel	On-ice
Traps, schooner, offshore	On-ice
Traps, whaler, static trap	On-ice
Small nets, purse seine, small pelagics	On-ice, Whole frozen
Hook & line, Inboard, Artisanal	On-ice, Whole gutted
Hook & line, large vessel, schooner - handline	On-ice, Whole gutted
Hook & line, super skiboat, sport	On-ice, Whole gutted
Diving, gathering, sea cucumber	Salted
Hook & line, small boat & motor, outer islands	Salted, Sun-dried, Whole frozen, Whole gutted
Harpoon, small boat, rays	Salted, Whole gutted
Shore gathering, Rocky shores, Barnacles	Whole frozen
Shore gathering, rocky shores, crabs	Whole frozen
Shore gathering, sandy shores, bivalves	Whole frozen
Shore gathering, sandy shores, surf clam	Whole frozen
Traps, small trap, lobster	Whole frozen
Hook & Line, small boat & motor, squid	Whole frozen, None
Hook & line, large vessel, schooner - dropline	Whole gutted
Hook & line, longline, sharks (art)	Whole gutted
Hook & line, small boat & motor, fish (art)	Whole gutted
Hook & line, small boat & motor, fish (rec)	Whole gutted
Hook & line, shore, flyfishing	None
Hook & line, super skiboat, recreational	None
Shore gathering, intertidal (muddy) flats	None
Shore gathering, wading and snorkel, octopus	None
Small nets, beach seine, fish	None
Small nets, bottom gill net, slipper lobster	None
Small nets, cast net, fish	None
Traps, small boats, active	None
Traps, small boats, static	None

Markets

Most fisheries supply to local markets and eight supply both local and export markets.

Fishery Name	Middleman			Fish			
	Domestic	Restaurants	Hotels	trader	processor	Industrial	Export
Diving, gathering, sea cucumber	Yes	Yes	Yes				
Harpoon, small boat, rays	Yes						
Hook & line, Inboard, Artisanal	Yes	Yes	Yes		Yes		Yes
Hook & line, large vessel, schooner - dropline	Yes				Yes		Yes
Hook & line, large vessel, schooner - handline	Yes	Yes	Yes		Yes		Yes
Hook & line, longline - pelagic, tuna						Yes	

Hook & line, longline, sharks (art)	Yes						Yes
Hook & line, longline, sharks (si)	Yes						Yes
Hook & line, longline, swordfish & tuna (si)					Yes		Yes
Hook & line, shore, flyfishing	None						
Hook & line, small boat & motor, fish (art)	Yes	Yes	Yes	Yes	Yes		Yes
Hook & line, small boat & motor, fish (rec)	Yes						
Hook & line, small boat & motor, outer islands	Yes		Yes				
Hook & line, super skiboat, recreational	None						
Hook & line, super skiboat, sport	Yes	Yes	Yes				
Hook & Line, small boat & motor, squid	Yes	Yes	Yes				
Industrial nets, purse seine, tuna					Yes		Yes
Shore gathering, intertidal (muddy) flats	Yes	Yes	Yes				
Shore gathering, Rocky shores, Barnacles	Yes	Yes	Yes				
Shore gathering, rocky shores, crabs	Yes	Yes					
Shore gathering, sandy shores, bivalves	Yes	Yes	Yes				
Shore gathering, sandy shores, surf clam	Yes	Yes	Yes				
Shore gathering, wading and snorkel, octopus	Yes	Yes	Yes		Yes		Yes
Small nets, beach seine, fish	Yes						
Small nets, bottom gill net, slipper lobster	Yes	Yes	Yes				
Small nets, cast net, fish	None						
Small nets, hoop net, kona crab (Ranina ranina)	Yes	Yes	Yes		Yes		Yes
Small nets, pelagic gill net, mackerel	Yes						
Small nets, purse seine, small pelagics	Yes				Yes		
Traps, schooner, offshore	Yes	Yes	Yes				
Traps, small boats, active	Yes	Yes	Yes				
Traps, small boats, static	Yes	Yes	Yes				
Traps, small trap, lobster		Yes					
Traps, whaler, static trap	Yes	Yes	Yes				

Alternate livelihoods

Just over half of the Seychellois fisheries have information regarding sources of alternate income for fishers. These are listed below.

Fishery Name	Alternative incomes
Hook & Line, small boat & motor, squid	Fisheries
Small nets, hoop net, kona crab (<i>Ranina ranina</i>)	Fisheries
Traps, schooner, offshore	Fisheries
Traps, small boats, active	Fisheries
Traps, small boats, static	Fisheries
Traps, whaler, static trap	Fisheries
Hook & line, small boat & motor, fish (art)	Fisheries & non-fisheries
Hook & line, small boat & motor, fish (rec)	Fisheries & non-fisheries
Hook & line, super skiboat, recreational	Fisheries & non-fisheries
Hook & line, super skiboat, sport	Fisheries & non-fisheries
Shore gathering, Rocky shores, Barnacles	Fisheries & non-fisheries
Shore gathering, rocky shores, crabs	Fisheries & non-fisheries
Shore gathering, sandy shores, bivalves	Fisheries & non-fisheries
Shore gathering, sandy shores, surf clam	Fisheries & non-fisheries
Shore gathering, wading and snorkel, octopus	Fisheries & non-fisheries
Small nets, beach seine, fish	Fisheries & non-fisheries
Small nets, pelagic gill net, mackerel	Fisheries & non-fisheries
Small nets, purse seine, small pelagics	Fisheries & non-fisheries
Traps, small trap, lobster	Fisheries & non-fisheries
Small nets, cast net, fish	Non-fisheries
Diving, gathering, sea cucumber	Unknown
Harpoon, small boat, rays	Unknown
Hook & line, Inboard, Artisanal	Unknown
Hook & line, large vessel, schooner - dropline	Unknown
Hook & line, large vessel, schooner - handline	Unknown
Hook & line, longline - pelagic, tuna	Unknown
Hook & line, longline, sharks (art)	Unknown
Hook & line, longline, sharks (si)	Unknown
Hook & line, longline, swordfish & tuna (si)	Unknown
Hook & line, shore, flyfishing	Unknown
Hook & line, small boat & motor, outer islands	Unknown
Industrial nets, purse seine, tuna	Unknown
Shore gathering, intertidal (muddy) flats	Unknown
Small nets, bottom gill net, slipper lobster	Unknown

Gender

Men are the sole participants in 20 fisheries. It is unknown what the gender ratios are in the remaining 18 fisheries.

Fishery Name	Women involved in fisheries
Diving, gathering, sea cucumber	None
Harpoon, small boat, rays	None
Hook & line, Inboard, Artisanal	None
Hook & line, large vessel, schooner - dropline	None
Hook & line, large vessel, schooner - handline	None
Hook & line, longline - pelagic, tuna	None
Hook & line, longline, sharks (art)	None
Hook & line, longline, sharks (si)	None
Hook & line, longline, swordfish & tuna (si)	None
Hook & line, small boat & motor, fish (art)	None
Hook & line, small boat & motor, outer islands	None
Hook & line, super skiboat, recreational	None
Hook & line, super skiboat, sport	None
Industrial nets, purse seine, tuna	None

Small nets, beach seine, fish	None
Small nets, hoop net, kona crab (<i>Ranina ranina</i>)	None
Small nets, pelagic gill net, mackerel	None
Small nets, purse seine, small pelagics	None
Traps, schooner, offshore	None
Traps, small trap, lobster	None
Hook & line, shore, flyfishing	Unknown
Hook & line, small boat & motor, fish (rec)	Unknown
Hook & Line, small boat & motor, squid	Unknown
Shore gathering, intertidal (muddy) flats	Unknown
Shore gathering, Rocky shores, Barnacles	Unknown
Shore gathering, rocky shores, crabs	Unknown
Shore gathering, sandy shores, bivalves	Unknown
Shore gathering, sandy shores, surf clam	Unknown
Shore gathering, wading and snorkel, octopus	Unknown
Small nets, bottom gill net, slipper lobster	Unknown
Small nets, cast net, fish	Unknown
Traps, small boats, active	Unknown
Traps, small boats, static	Unknown
Traps, whaler, static trap	Unknown

Score sheet

The score sheets for all 38 fisheries have been combined and the contribution of each fishery's score (Unknown, No/None/Nil, Few/Poor, Average/Medium, High/Good, Yes/Comprehensive) according to the individual fishery aspects covered by the score sheet has been graphically produced as a percentage of the total. For example, for Catch composition data 53% of fisheries had Unknown, 5% had No/None/Nil, 21% had Few/Poor, 3% had Average/Medium, 18% had High/Good and 0% had Yes/Comprehensive as their answers to the question of *How reliable is species composition data?*

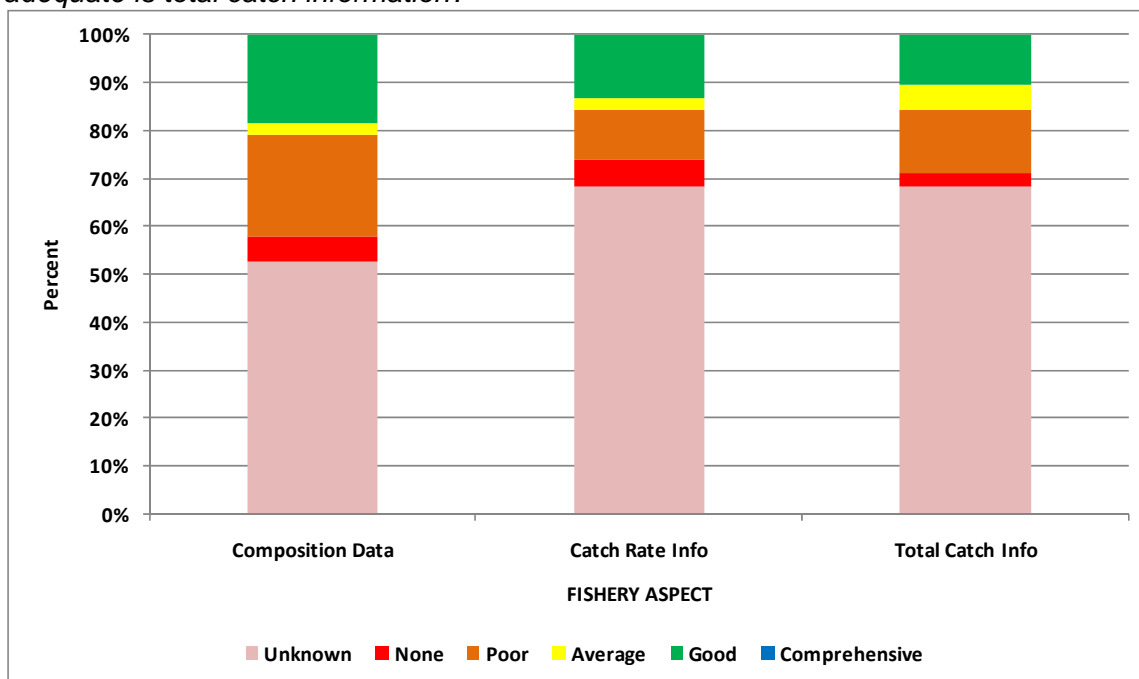
Catch information

Questions asked in this section were:

How reliable is species composition data?

How adequate is catch rate information?

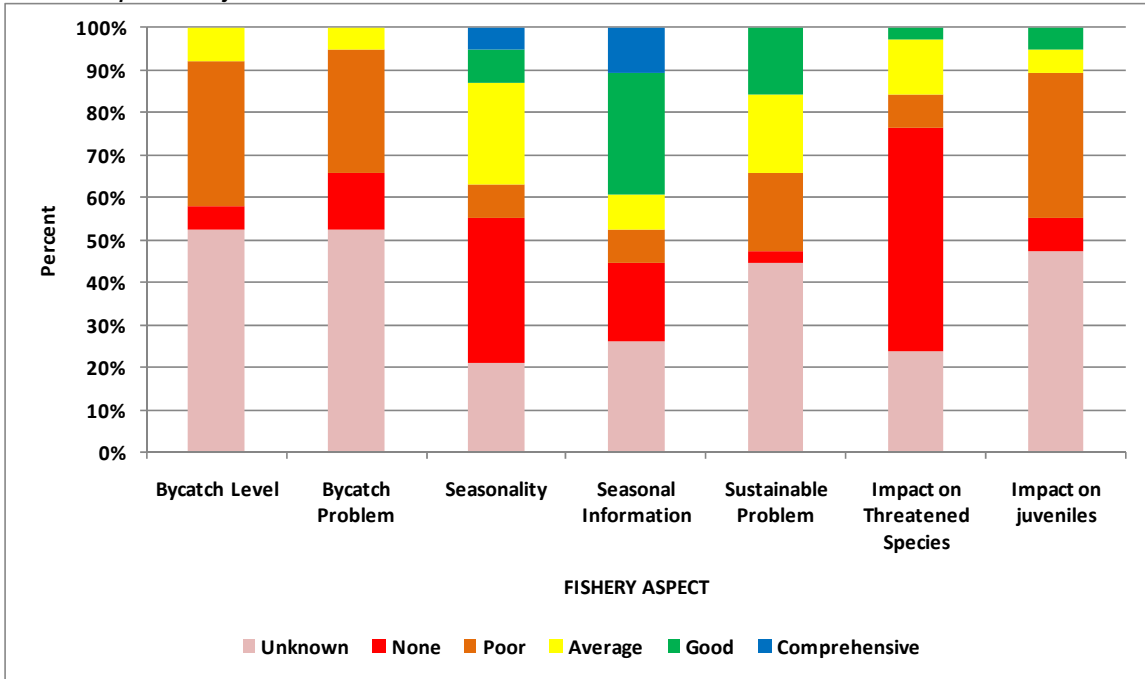
How adequate is total catch information?



Bycatch, seasonality and sustainability

These questions include:

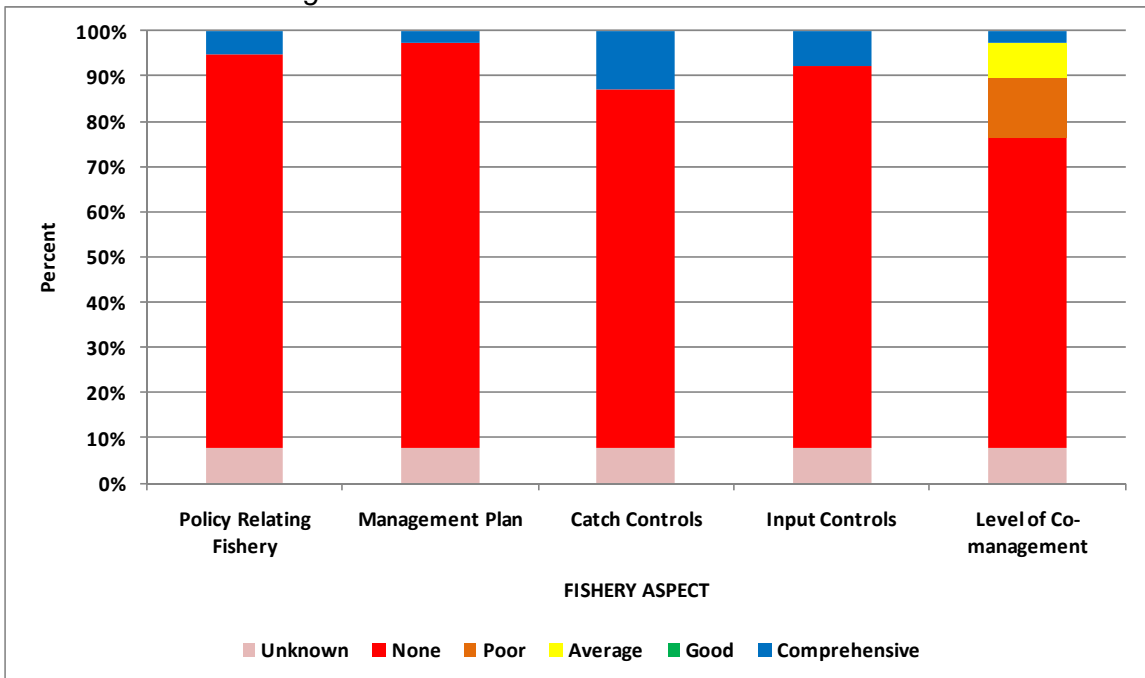
- What is the overall level of bycatch?*
- Rate the bycatch problem?*
- How seasonal is the fishery?*
- How adequate is seasonal information?*
- Rate the sustainability problem.*
- What is the impact on threatened species?*
- What is the impact on juveniles?*



Management (Part 1)

This includes:

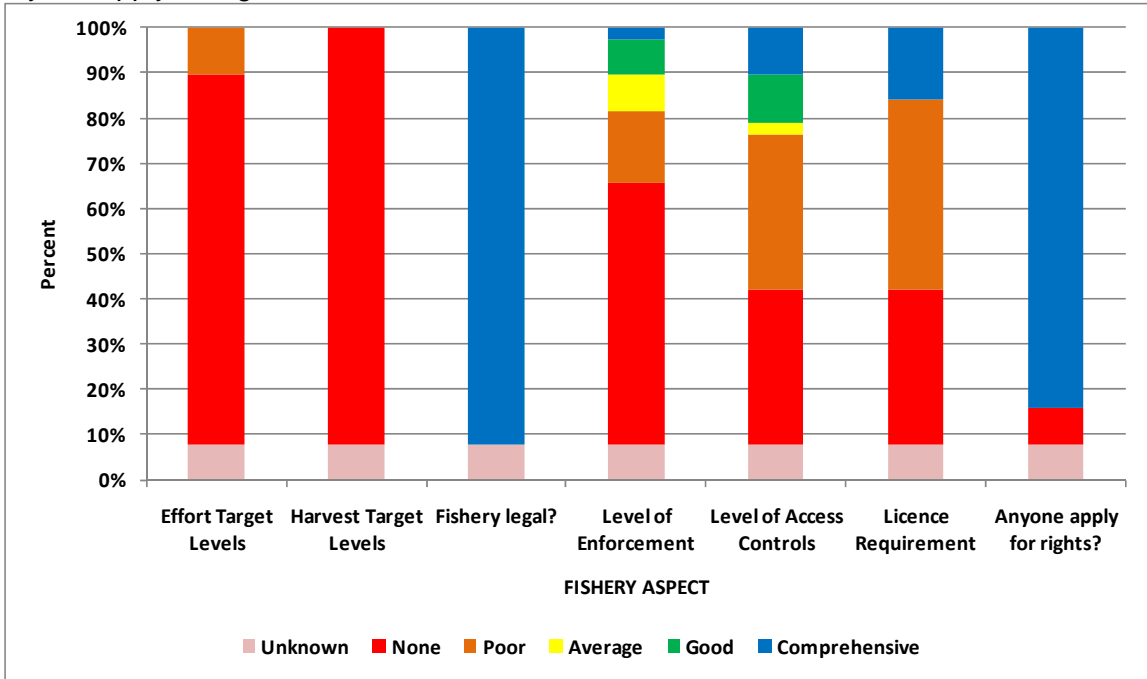
- Is there a specific policy relating to this fishery?*
- Is there a specific management plan for this fishery?*
- Are there any catch controls?*
- Are there any input controls*
- What is the level of co-management?*



Management (Part 2)

This includes:

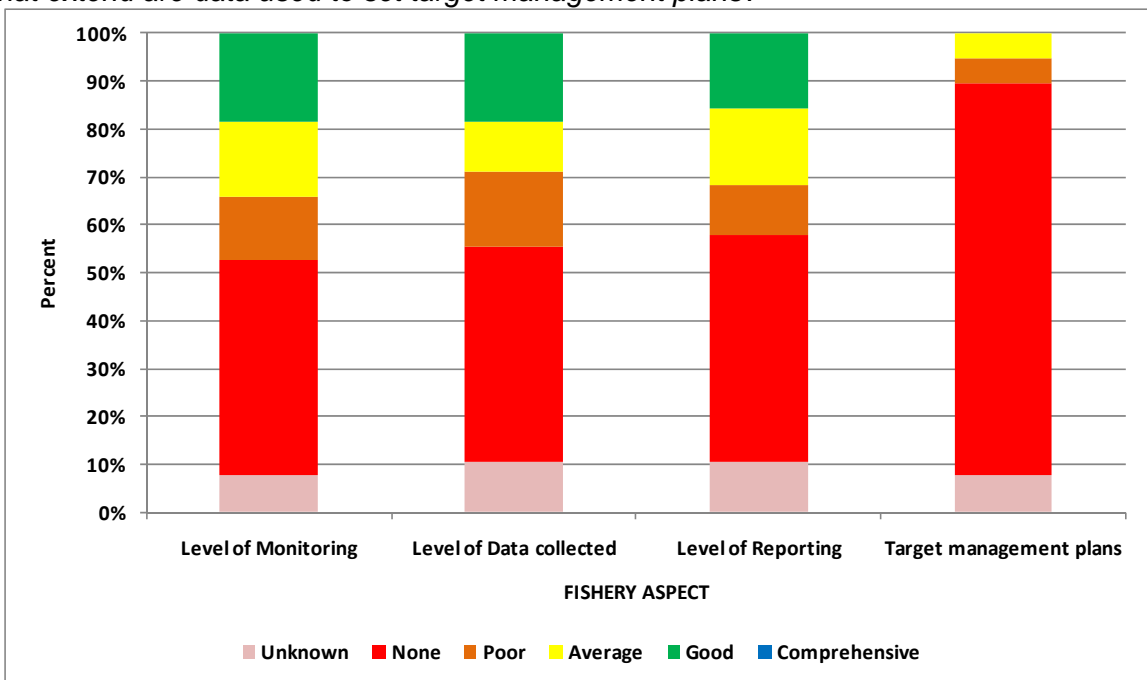
- Is there any setting of effort target levels?
- Is there any setting of harvest target levels?
- Is this fishery legal?
- What is the level of enforcement?
- What is the level of access control?
- What is the level of licence requirements?
- Can anyone apply for rights?



Monitoring

Options are:

- What is the level of monitoring?
- What is the level of data collected?
- What is the level of reporting?
- To what extent are data used to set target management plans?



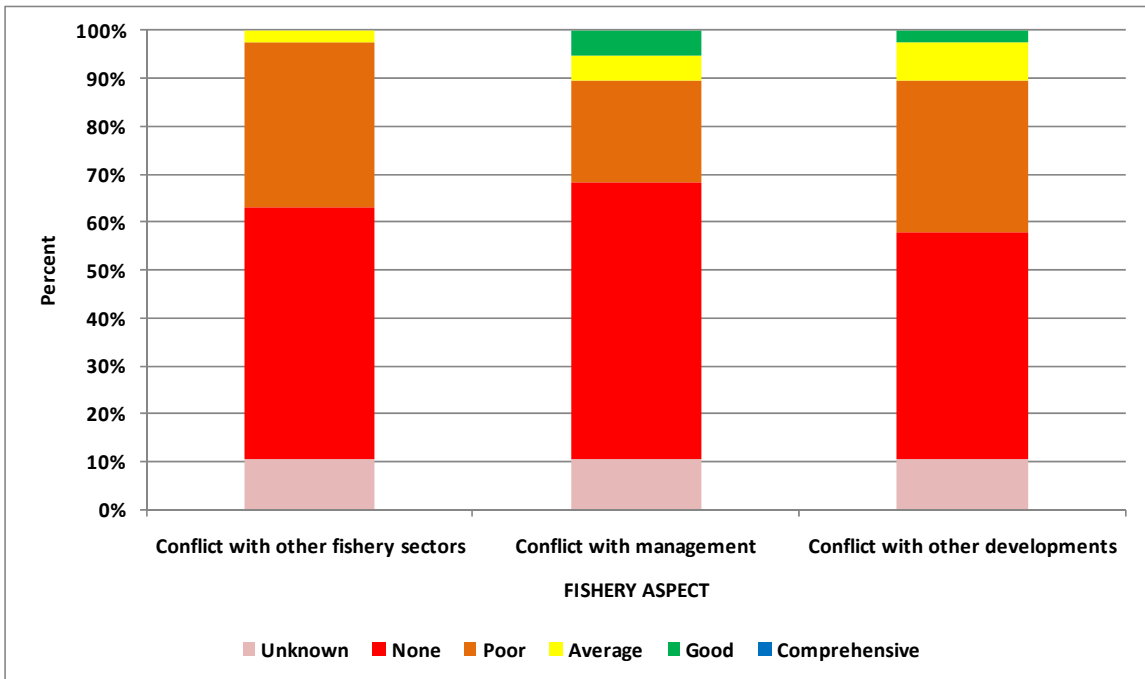
Conflicts

This section requires the following questions answered:

What is the level of conflict with other fisheries?

What is the level of conflict with management?

What is the level of conflict with other developments?



Research

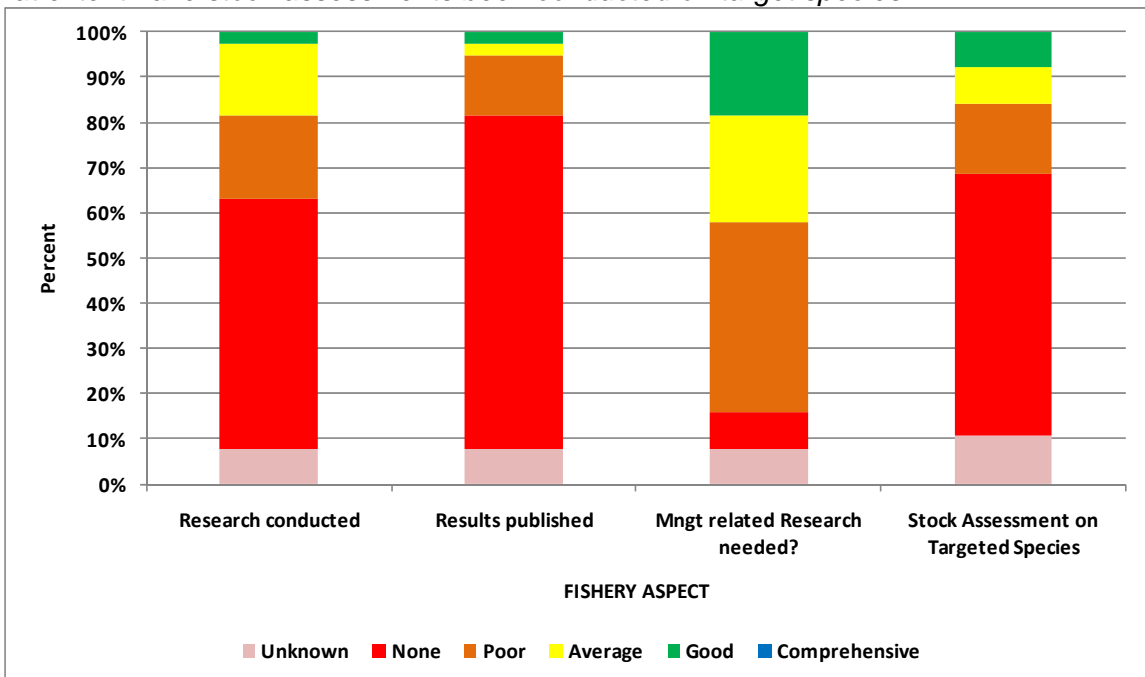
These questions are:

What is the level of research conducted into this fishery?

What is the level of research results published?

What is the current need for management related research?

To what extent have stock assessments been conducted on target species?



References

A list of authors and titles are provided below with the fisheries that utilised these references. For more complete bibliographic details please refer to the fisheries and references on the WIOFish database at www.wiofish.org.za.

Author	Title	Fishery Name
Aumeerudy, R. & Payet, R.	Management of the Seychelles sea cucumber fishery: status and prospects. Advances in sea cucumber aquaculture and management.	Diving, gathering, sea cucumber
Azemia, R.T. & Robinson, J.	Seychelles Artisanal statistical Technical Report	Small nets, pelagic gill net, mackerel
		Traps, whaler, static trap
		Harpoon, small boat, rays
		Hook & line, Inboard, Artisanal
Azemia, R.T., Assan, C.N. & Dorizo, J.L.	Seychelles Artisanal Technical Report 2006	Hook & line, super skiboat, sport
		Hook & line, small boat & motor, fish (art)
		Shore gathering, sandy shores, bivalves
		Traps, small boats, static
		Traps, small boats, active
		Hook & line, small boat & motor, outer islands
		Diving, gathering, lobster
		Small nets, cast net, fish
		Hook & line, large vessel, schooner - dropline
		Harpoon, small boat, rays
		Shore gathering, sandy shores, surf clam
		Small nets, beach seine, fish
Azemia, R.T. & Robinson, J.	Seychelles Fishing Authority statistics for 2000.	Small nets, pelagic gill net, mackerel
		Hook & line, small boat & motor, fish (art)
Azemia, R.T. & Robinson, J.	Seychelles Fishing Authority statistics for 2003.	Hook & line, large vessel, schooner - handline
		Small nets, hoop net, kona crab (Ranina ranina)
Boulle, D.P.	Biomass/Maximum Sustainable Yield Estimations of Selected Demersal Fished Stocks around the Seychelles Granitic Islands Using Fisheries Surplus Production Modelling. M.Sc. thesis, Plymouth University.	Shore gathering, wading and snorkel, octopus
		Hook & line, Inboard, Artisanal
Boulle, D.P.	Seychelles Krab Ziraf (Ranina ranina) Fishery: The Status of the Stock.	Small nets, hoop net, kona crab (Ranina ranina)
Grandcourt, E.M.	The potential for the culture of Scylla serrata on Mahe, Seychelles. BSc. Thesis. University of Plymouth.	Shore gathering, intertidal (muddy) flats
Grandcourt, E.M.	Trap Fisheries Stock Assessment Project. SFA Technical Report. 14p.	Traps, whaler, static trap
		Traps, small boats, active
Grandcourt, E.M. & Cesar, H.S.J.	The bio-economic impact of mass coral mortality on the coastal reef fisheries of the Seychelles.	Hook & line, small boat & motor, fish (art)
Lablache, G., de Moussac, G.A. & Shah, N.J.	Summary description of the artisanal fisheries and resources for the Seychelles.	Shore gathering, wading and snorkel, octopus

Mees, C.C.	Management of Multi-species Tropical Marine Fisheries. Republic of Seychelles. Management of Demersal Banks and Deep Slope Fisheries.	Traps, small boats, static
		Hook & line, large vessel, schooner - handline
Mees, C.C.	Management of Demersal Fisheries. Overseas Development Administration, Fish management Science Programme.	Traps, whaler, static trap
Mees, C.C.	Seychelles Demersal Fishery: an analysis of data relating to four key demersal species.	Hook & line, Inboard, Artisanal
Mees, C.C.	The Status of Seychelles Demersal Fishery. A report to the Govt. of Seychelles. MRAG Ltd.	Hook & line, Inboard, Artisanal
		Hook & line, small boat & motor, fish (art)
Mees, C.C.	The Status of Seychelles Demersal Fishery. Overseas Development Administration, Fish Management Science Programme.	Traps, small boats, static
Mees, C.C., Shotton, R., Marguerite, M.	An inshore fisheries management strategy for the Seychelles.	Small nets, pelagic gill net, mackerel
		Small nets, hoop net, kona crab (Ranina ranina)
		Hook & line, small boat & motor, fish (art)
		Small nets, beach seine, fish
Mees, C.C.	Management of Multi-species Tropical Marine Fisheries. Republic of Seychelles Fishing Authority. MRAG Ltd.	Traps, whaler, static trap
Nageon de Lestang, J.	Management of Shark Fisheries in Seychelles.	Hook & line, longline, sharks (art)
Nevill, J., Robinson, J., Giroux, F. & Isidore, M.	Seychelles national plan of action for the conservation and management of sharks.	Hook & line, longline, sharks (art)
Payet, R.	Fisheries Reserves Management Areas: Administration and Fisheries Management Guidance Documentation. SFA Document for Council of Ministers.	Hook & line, Inboard, Artisanal
Seret, B	Shark fisheries and conservation in Seychelles.	Hook & line, longline, sharks (art)
Seychelles Fishing Authority	Seychelles Fishing Authority:Tuna Bulletin 2003	Industrial nets, purse seine, tuna
Seychelles Fishing Authority	Annual Report 2002	Industrial nets, purse seine, tuna
Seychelles Fishing Authority	Seychelles Fishing Authority: Annual Report 2003.	Hook & line, longline - pelagic, tuna
Wakeford, R.C.	Management of the Seychelles Artisanal Fishery.	Small nets, beach seine, fish
		Small nets, pelagic gill net, mackerel
		Hook & line, small boat & motor, fish (art)

SOUTH AFRICA - KWAZULU-NATAL ASSESSMENT

There are 55 fisheries recorded for KwaZulu-Natal (KZN), South Africa and the most numerous are the recreational fisheries.

Sector	Number
Recreational	22
Small-scale commercial	7
Artisanal; Subsistence	6
Subsistence	5
Artisanal	3
Industrial	3
Other	3
Sport	1
Prospective	2
Defunct	3
Total	55

Catch

A total of 164 unique catch items are recorded in the KZN fisheries and most are identified to species level.

Scientific name	Scientific name	Scientific name
<i>Acanthocybium solandri</i>	Istiophoridae	<i>Pomadasys commersonii</i>
<i>Acanthopagrus berda</i>	<i>Istiophorus platypterus</i>	<i>Pomadasys furcatum</i>
<i>Alopias</i> spp	<i>Isurus oxyrinchus</i>	<i>Pomadasys kaakan</i>
<i>Aprion virescens</i>	<i>Katsuwonus pelamis</i>	<i>Pomadasys olivaceus</i>
<i>Argyrosomus japonicus</i>	<i>Labroides dimidiatus</i>	<i>Pomadasys</i> spp
<i>Argyrosomus</i> spp	Leiognathidae	<i>Pomatomus saltatrix</i>
<i>Argyrosomus thorpei</i>	Lethrinidae	<i>Portunus sanguinolentus</i>
<i>Aristaeomorpha foliacea</i>	<i>Lichia amia</i>	<i>Prionace glauca</i>
<i>Atractoscion aequidens</i>	<i>Loligo duvauceli</i>	<i>Pristipomoides filamentosus</i>
<i>Atrobucca nibe</i>	<i>Macrobrachium</i> spp	<i>Pseudanthias squamipinnis</i>
Blenniidae	<i>Makaira indica</i>	<i>Pteromylaeus bovinus</i>
<i>Callianassa kraussi</i>	<i>Makaira mazara</i>	<i>Pyura stolonifera</i>
Carangidae	<i>Makaira nigricans</i>	<i>Rachycentron canadum</i>
<i>Carcharhinus brachyurus</i>	<i>Merluccius paradoxus</i>	<i>Rhabdosargus holubi</i>
<i>Carcharhinus brevipinna</i>	<i>Metanephrops mozambicus</i>	<i>Rhabdosargus sarba</i>
<i>Carcharhinus leucas</i>	<i>Metapenaeus monoceros</i>	<i>Rhabdosargus</i> spp
<i>Carcharhinus limbatus</i>	<i>Metasesarma meinerti</i>	<i>Rhina ancylostoma</i>
<i>Carcharhinus obscurus</i>	Mollusca	<i>Rhinoptera javanica</i>
<i>Carcharhinus sealei</i>	<i>Monodactylus falciformis</i>	<i>Rhynchobatus djiddensis</i>
<i>Carcharias taurus</i>	Mugilidae	<i>Saccostrea cucullata</i>
<i>Carcharodon carcharias</i>	Mullidae	<i>Sardinops sagax</i>
<i>Cardisoma carnifex</i>	<i>Muraenesox bagio</i>	<i>Sarpa salpa</i>
<i>Caretta caretta</i>	<i>Mustelus mustelus</i>	<i>Scomber japonicus</i>
<i>Chaceon macphersoni</i>	<i>Neoscorpis lithophilus</i>	<i>Scomberoides</i> spp
<i>Chaetodon lunula</i>	<i>Nephropsis stewarti</i>	<i>Scomberomorus commerson</i>
<i>Cheimerius nufar</i>	<i>Octopus vulgaris</i>	<i>Scomberomorus plurilineatus</i>
<i>Chelidonichthys</i> spp	<i>Ocyrode ceratophthalmus</i>	<i>Scylla serrata</i>
<i>Chelonia mydas</i>	<i>Ocyrode madagascariensis</i>	<i>Scyllarides elisabethae</i>
<i>Chirocentrus dorab</i>	<i>Ocyrode ryderi</i>	<i>Scylliogaleus queketti</i>
<i>Chrysoblephus anglicus</i>	<i>Ocyrode</i> spp	<i>Sepia</i> spp
<i>Chrysoblephus puniceus</i>	<i>Oreochromis mossambicus</i>	Sepiidae, Sepiolidae
<i>Coryphaena hippurus</i>	Ostreidae	<i>Seriola rivoliana</i>
<i>Cubiceps whiteleggii</i>	<i>Otolithes ruber</i>	Serranidae
<i>Cymatoceps nasutus</i>	<i>Pachymetopon aeneum</i>	<i>Sousa chinensis</i>
Cynoglossidae	<i>Pachymetopon grande</i>	<i>Sphyrna lewini</i>

<i>Cynoglossus</i> spp	<i>Pagellus bellottii natalensis</i>	<i>Sphyrna</i> spp
<i>Delphinus delphis</i>	<i>Palinurus delagoae</i>	<i>Striostrea margaritacea</i>
<i>Dermochelys coriacea</i>	<i>Panulirus homarus</i>	<i>Strongylura leiura</i>
<i>Diplodus sargus</i>	<i>Panulirus longipes</i>	<i>Terapon jarbua</i>
<i>Diplodus sargus capensis</i>	<i>Panulirus ornatus</i>	<i>Thryssa baelama</i>
Echinoidea	<i>Panulirus penicillatus</i>	<i>Thunnus alalunga</i>
<i>Elops machnata</i>	<i>Panulirus versicolor</i>	<i>Thunnus albacares</i>
<i>Emerita austroafricana</i>	<i>Paracaesio xanthura</i>	<i>Thunnus maccoyii</i>
<i>Epinephelus albomarginatus</i>	<i>Patella</i> spp	<i>Thunnus obesus</i>
<i>Epinephelus andersoni</i>	Penaeidae	<i>Trachinotus botla</i>
<i>Epinephelus rivulatus</i>	<i>Penaeus indicus</i>	<i>Trachurus delagoa</i>
<i>Euthynnus affinis</i>	<i>Penaeus indicus/Metapenaeus monoceros</i>	<i>Trichiurus lepturus</i>
<i>Fissurella</i> spp.	<i>Penaeus japonicus</i>	<i>Tursiops aduncus</i>
<i>Galeocerdo cuvier</i>	<i>Penaeus monodon</i>	<i>Umbrina</i> spp
<i>Gerres methueni</i>	<i>Perna perna</i>	<i>Upogebia capensis</i>
<i>Haliporoides triarthrus</i>	<i>Platycephalus indicus</i>	<i>Velodona togata</i>
<i>Helicolenus dactylopterus</i>	<i>Polyamblyodon germanum</i>	<i>Xiphias gladius</i>
<i>Hemiramphus</i> spp	<i>Polysteganus coeruleopunctatus</i>	<i>Zeus</i> spp
<i>Hilsa kelee</i>	<i>Polysteganus praeorbitalis</i>	
<i>Hippa ovalis</i>	<i>Pomacanthus semicirculatus</i>	

By-catch species have been reported in six fisheries and the industrial trawl fisheries record the most species.

Fishery name	Number of species
Industrial nets, offshore, crustaceans	18
Industrial nets, inshore, crustaceans	17
Small nets, surface gill net, sharks	8
Hook & line, longline, tuna & swordfish	5
Hook & line, drumline, sharks	2
Small nets, beach seine, fish	2
Total	52

Threatened species have been reported in eight fisheries. These are listed below.

Fishery Name	Scientific Name
Diving, speargun/no SCUBA, fish	<i>Pachymetopon grande</i>
Hook & line, drumline, sharks	<i>Carcharodon carcharias</i>
Hook & line, small boat & motor, charter/party	<i>Chrysolephus puniceus</i>
Hook & line, small boat & motor, fish (rec)	<i>Chrysolephus puniceus</i>
Industrial nets, inshore, crustaceans	<i>Scylliogaleus queckettii</i>
	<i>Dermochelys coriacea</i>
	<i>Chelonia mydas</i>
	<i>Carcharius taurus</i>
	<i>Rhina ancylostoma</i>
	<i>Rhinoptera javanica</i>
	<i>Rhynchobatus djiddensis</i>
Shore gathering, rocky shores, mussels (rec)	<i>Perna perna</i>
Shore gathering, sandy shores, turtles	<i>Dermochelys coriacea</i>
	<i>Caretta caretta</i>
Small nets, surface gill net, sharks	<i>Sousa chinensis</i>
	<i>Dermochelys coriacea</i>
	<i>Delphinus delphis</i>
	<i>Chelonia mydas</i>
	<i>Tursiops aduncus</i>
	<i>Carcharodon carcharias</i>

Habitats

Most of the KZN fisheries occur in the inshore areas, on the rocky shore and within the protection of estuaries. The habitats utilised and the number of fisheries operating within these habitats is listed below.

Habitat	Number of fisheries
General Inshore Area	16
Rocky Shore	15
Estuaries	13
Intertidal Zone	9
Shallow Coastal Bays	9
General Offshore Area	8
Rocky Seabed	8
Coral Reef Slopes	7
Sandy Seabed	7
Coral Reef Platforms	6
Intertidal Sand Flats	6
Oceanic Bottom	6
Oceanic Surface	6
Sand Beaches	6
Drop Offs	5
Oceanic Midwater	5
Carpet/patch reef	4
Intertidal Mud Flats	3
Lagoons	3
Coral Reef Bommies	2
Mangrove Creeks	2
Mangroves Forest	1
Seagrass Beds	1

Twenty-nine fisheries have impacts on the habitats in which they operate. These impacts include removal of apex predators, fouling by fishing gear, physical damage by the vessels used and over-harvesting among others. The full list of fisheries with habitat impacts and the habitats they operate in are listed below.

Fishery Name	Habitat	Threat Description
Diving, gathering, ornamental shells	Rocky Shore	Possible diver damage on reefs.
	Intertidal Zone	
	General Inshore Area	
	Shallow Coastal Bays	
	Sandy Seabed	
	Sand Beaches	
	Rocky Shore	
Hook & line, drumline, sharks	Rocky Seabed	Sharks are apex predators, which have a large impact on the marine ecosystem, as yet it is not known what the ecological effects are of the removal of large sharks by the drumlines.

Hook & line, jetski, fish	Intertidal Zone	There is some damage caused to benthic communities by the underside of the jetski scraping across the bottom and impacts are also associated with increased turbidity particularly in estuaries from the jetski motor.
	Intertidal Sand Flats	
	General Inshore Area	
	General Inshore Area	
	General Inshore Area	
	Shallow Coastal Bays	
	Sandy Seabed	
	Rocky Seabed	
	Oceanic Surface	
	Oceanic Midwater	
	Oceanic Bottom	
	General Offshore Area	
	General Inshore Area	
	Drop Offs	
	Coral Reef Slopes	
Coral Reef Platforms		
Carpet/patch reef		
Hook & line, longline, tuna & swordfish	Estuaries	Most of the species caught are apex predators, which have a potentially large impact on the marine ecosystem. As yet it is not known what the ecological effects are of the removal of these animals.
	General Inshore Area	
Hook & line, shore, marine (rec)	Shallow Coastal Bays	Litter, nylon lines and impacts associated with bait collection.
	Sandy Seabed	
	Rocky Seabed	
	Oceanic Surface	
	Oceanic Midwater	
	Oceanic Bottom	
	Lagoons	
	Intertidal Zone	
	Intertidal Sand Flats	
	Intertidal Mud Flats	
	Hook & line, shore, subsistence	
General Inshore Area		
Hook & line, small boat & motor, charter/party	Estuaries	Habitat impacts are limited and include damage to reefs from anchors and fishing lines which get entangled on reefs and damage to launching sites.
	Drop Offs	
	Coral Reef Slopes	
	Coral Reef Platforms	
	Coral Reef Bommies	
	Oceanic Surface	
	General Offshore Area	
	Shallow Coastal Bays	
	Sandy Seabed	
	Rocky Seabed	
	Oceanic Surface	
	Oceanic Midwater	
	Hook & line, small boat & motor, estuarine fish (rec)	
Lagoons		
Intertidal Zone		
Intertidal Sand Flats		
Intertidal Mud Flats		
General Offshore Area		

Hook & line, small boat & motor, fish (rec)	General Inshore Area	Habitat impacts are limited and include damage to reefs from anchors and fishing lines, which get entangled on reefs and damage to launching sites. Trophic cascading from removal of top predators in reef communities has also resulted in impacts but has not been studied in detail. Impacts occur on the habitats at launch sites.
	Estuaries	
	Drop Offs	
	Coral Reef Slopes	
	Coral Reef Platforms	
	Coral Reef Bommies	
	Estuaries	
	Estuaries	
	Rocky Shore	
	Shallow Coastal Bays	
Sandy Seabed		
Hook & line, vessel, commercial	Sand Beaches	Habitat impacts are limited and include damage to reefs from anchors, fishing lines which get entangled on reefs, and damage to launch sites.
Industrial nets, inshore, crustaceans	Rocky Shore	The trawl removes sedentary invertebrates living on or in the substratum and many species of more mobile organisms are indiscriminately caught in the trawl and killed.
Industrial nets, offshore, crustaceans	Rocky Seabed	The trawl removes sedentary invertebrates living on or in the substratum and many species of more mobile organisms are indiscriminately caught in the trawl and killed.
Other, research, poisons	Intertidal Sand Flats	Rotenone used in large concentrated doses kills all the fishes that come into contact with it, leading to fishes that are not required for collection being incidentally killed. Rotenone affects all animals that have gills so nudibranchs as well as some polychaete will die during the collection. Some species of zooplankton are as sensitive to Rotenone as finfish and thus when Rotenone is used some of the food content in the water is removed.
	General Inshore Area	
	Coral Reef Slopes	
	Coral Reef Platforms	
	Sand Beaches	
Rocky Shore		
Shore gathering, estuarine, fish	Sand Beaches	Over-use of the habitat for fishing is a problem.
Shore gathering, mangroves, mangrove crabs	Rocky Shore	Mangrove crabs form an important link between primary producers and predators as their consumption of leaf litter prevents loss of nutrients from the ecosystem. Removal of the crabs in large quantities can thus seriously impact on ecosystem function within mangrove forests. The harvesting method is destructive because the harvesters hack through the mangrove trees' roots. While this fishing method is considered destructive to some mangroves, the cutting of mangroves for fishtraps is considered a greater threat.
	Sand Beaches	
	Rocky Shore	
Shore gathering, prawn pump, burrowing prawns (rec)	Shallow Coastal Bays	Possible dredging of harbours and removal of habitat by developers.
	Sandy Seabed	
Shore gathering, prawn pump, burrowing prawns (ssc)	Rocky Seabed	Over harvesting is a threat to the habitat.
Shore gathering, rocky shores, invertebrates (sub)	Oceanic Surface	Over-exploitation can result in changes in community structure on rock surfaces and total denudification of the rock surface leads to algal growth which inhibits juvenile settlement.
Shore gathering, rocky shores, limpets (rec)	Oceanic Midwater	Over-exploitation can result in changes in community structure on rock surfaces and total denudification of the rock surface leads to algal growth which inhibits juvenile settlement.

Shore gathering, rocky shores, mussels (rec)	Oceanic Bottom	Over-exploitation can result in changes in community structure on rock surfaces and total denudification of the rock surface leads to algal growth which inhibits juvenile settlement. Heavy seas and sanding over of rocks may threaten these animals.
	General Offshore Area	
	General Inshore Area	
	Drop Offs	
Shore gathering, rocky shores, mussels (sub)	Coral Reef Slopes	Over-exploitation can result in changes in community structure on rock surfaces and total denudification of the rock surface leads to algal growth which inhibits juvenile settlement.
Shore gathering, rocky shores, octopus (rec)	Coral Reef Platforms	Sanding over and heavy seas may impact on the availability of their food sources (mussels and rock lobster) that may lead to octopus numbers declining or changing distribution patterns going further offshore.
	Carpet/patch reef	
Shore gathering, rocky shores, red bait (rec)	Mangrove Creeks	Recolonization of cleared patches of red bait is extremely slow and there is a resultant serious impact on secondary production in the ecosystem.
Small nets, beach seine, fish	Lagoons	The non-selective nature of the seine nets sometimes results in large catches of small fish (particularly Pomatomus saltatrix) which die from scale loss and trauma from being dragged up the beach.
Small nets, beach seine, sardines	Intertidal Sand Flats	The irresponsible use of off-road vehicles and boat trailers can have a harmful impact on the beach ecosystem.
Small nets, gate net/beam trawl, shrimp/prawn	Intertidal Mud Flats	Damage to estuarine substrata by the net.
Small nets, surface gill net, estuarine fish	Estuaries	Broken off pieces of gill net may continue 'ghost fishing' and cause environmental damage. Over-use of the habitat for fishing is a problem.
Small nets, surface gill net, sharks	Estuaries	Sharks are apex predators, which have a large impact on the marine ecosystem, as yet it is not known what the ecological effects are of the removal of large sharks by the nets.
Traps, staked, fish	Shallow Coastal Bays	There is over-use of the habitats. Mangrove trees are often used in the construction of the fish traps and this is impacting on mangrove abundance.

Monitoring

Catch and effort is monitored in 88% of fisheries through telephone surveys, mail surveys, observers, catch returns/logbooks, creel (sample at landing site), voluntary monitoring and observers (onboard).

Twelve fisheries have regular biological monitoring in place and information that is recorded includes species composition, lengths, weights, sex and reproductive state. Otoliths are collected for aging studies of some species. Percentage cover is recorded for sessile organisms and by-catch composition is collected for trawl fisheries.

Research conducted

Most (76%) KZN fisheries have had some research conducted on them and results have been published for 73% of those investigated. The need for management research is still fairly high with 87% of the fisheries listed as needing some level of study. Four percent are listed as needing urgent attention. Stock assessments have been conducted on some of the target species of 71% of fisheries and 9% have had all their target species assessed.

Management

Thirty-two fisheries have some level of co-management and there is some uncertainty about any involvement of fishers in the management of seven fisheries. The fisheries and their respective level of co-management are listed below.

Fishery Name	Level of Co-management
Shore gathering, rocky shores, oysters (com)	High
Traps, longline barrel traps, lobster	High
Hook & line, small boat & motor, charter/party	Average
Industrial nets, inshore, crustaceans	Average
Industrial nets, offshore, crustaceans	Average
Shore gathering, rocky shores, limpets (rec)	Average
Shore gathering, rocky shores, mussels (sub)	Average
Shore gathering, sandy shores, ghost crabs (rec)	Average
Shore gathering, sandy shores, mole crabs (rec)	Average
Small nets, beach seine, fish	Average
Small nets, surface gill net, estuarine fish	Average
Diving, gathering, lobsters (sub)	Low
Diving, speargun/no SCUBA, fish	Low
Hand spear, fish, subsistence	Low
Hook & line, jetski, fish	Low
Hook & line, longline, tuna & swordfish	Low
Hook & line, paddleski, fish	Low
Hook & line, shore, estuarine (sub)	Low
Hook & line, shore, lobster (sub)	Low
Hook & line, shore, marine (rec)	Low
Hook & line, shore, subsistence	Low
Hook & line, small boat & motor, estuarine fish (rec)	Low
Hook & line, small boat & motor, fish (rec)	Low
Shore gathering, estuarine, fish	Low
Shore gathering, intertidal, mud crabs (rec)	Low
Shore gathering, mangroves, mangrove crabs	Low
Shore gathering, prawn pump, burrowing prawns (ssc)	Low
Shore gathering, rocky shores, invertebrates (sub)	Low
Shore gathering, rocky shores, red bait (rec)	Low
Shore gathering, sandy shores, ghost crabs (sub)	Low
Shore gathering, sandy shores, mole crabs (sub)	Low
Traps, staked, fish	Low
Diving, gathering, lobsters (rec)	None
Diving, gathering, ornamental shells	None
Diving, hand/hoop net, ornamental fish	None
Hook & line, drumline, sharks	None
Hook & line, shore, lobster (rec)	None
Hook & line, vessel, commercial	None
Shore gathering, prawn pump, burrowing prawns (rec)	None
Shore gathering, rocky shores, mussels (rec)	None
Shore gathering, rocky shores, octopus (rec)	None
Shore gathering, rocky shores, oysters (rec)	None
Shore gathering, sandy shores, turtles	None
Small nets, beach seine, sardines	None
Small nets, drag net, fish/shrimps	None
Small nets, hand/hoop net, squid & glassies	None
Small nets, surface gill net, sharks	None
Traps, small trap, lobster	None
Hook & line, shore, estuarine (rec)	Unknown
Industrial nets, purse seine, sardines	Unknown
Other, research, poisons	Unknown
Small nets, cast net, fish/prawns	Unknown

Small nets, gate net/beam trawl, shrimp/prawn	Unknown
Small nets, purse seine, red-eye	Unknown
Small nets, shove net, prawns	Unknown

Operational management plans have been developed and implemented in 5 fisheries and OMPs have been developed but not yet implemented in 19 fisheries.

Fishery Name	OMP	Implemented
Hook & line, shore, subsistence	Yes	Yes
Shore gathering, rocky shores, mussels (sub)	Yes	Yes
Small nets, surface gill net, estuarine fish	Yes	Yes
Traps, longline barrel traps, lobster	Yes	Yes
Traps, staked, fish	Yes	Yes
Diving, gathering, lobsters (rec)	Yes	No
Diving, gathering, lobsters (sub)	Yes	No
Hand spear, fish, subsistence	Yes	No
Hook & line, shore, estuarine (sub)	Yes	No
Hook & line, shore, lobster (rec)	Yes	No
Hook & line, shore, lobster (sub)	Yes	No
Hook & line, vessel, commercial	Yes	No
Shore gathering, estuarine, fish	Yes	No
Shore gathering, mangroves, mangrove crabs	Yes	No
Shore gathering, prawn pump, burrowing prawns (rec)	Yes	No
Shore gathering, prawn pump, burrowing prawns (ssc)	Yes	No
Shore gathering, rocky shores, invertebrates (sub)	Yes	No
Shore gathering, rocky shores, mussels (rec)	Yes	No
Shore gathering, rocky shores, oysters (com)	Yes	No
Shore gathering, rocky shores, oysters (rec)	Yes	No
Shore gathering, sandy shores, ghost crabs (sub)	Yes	No
Shore gathering, sandy shores, mole crabs (sub)	Yes	No
Small nets, surface gill net, sharks	Yes	No
Traps, small trap, lobster	Yes	No

Licenses are required to participate in most of KZN's fisheries but rights associated with some of the subsistence fisheries are completely open access.

Fishery Name	Access control
Shore gathering, estuarine, fish	Group decision
Diving, gathering, lobsters (rec)	Licensing
Diving, gathering, lobsters (sub)	Licensing
Diving, gathering, ornamental shells	Licensing
Diving, hand/hoop net, ornamental fish	Licensing
Diving, speargun/no SCUBA, fish	Licensing
Hook & line, drumline, sharks	Licensing
Hook & line, jetski, fish	Licensing
Hook & line, longline, tuna & swordfish	Licensing
Hook & line, paddleski, fish	Licensing
Hook & line, shore, estuarine (rec)	Licensing
Hook & line, shore, lobster (rec)	Licensing
Hook & line, shore, lobster (sub)	Licensing
Hook & line, shore, marine (rec)	Licensing
Hook & line, small boat & motor, charter/party	Licensing
Hook & line, small boat & motor, estuarine fish (rec)	Licensing
Hook & line, small boat & motor, fish (rec)	Licensing
Hook & line, vessel, commercial	Licensing
Industrial nets, inshore, crustaceans	Licensing
Industrial nets, offshore, crustaceans	Licensing
Industrial nets, purse seine, sardines	Licensing
Other, research, poisons	Licensing

Shore gathering, intertidal, mud crabs (rec)	Licensing
Shore gathering, prawn pump, burrowing prawns (rec)	Licensing
Shore gathering, rocky shores, limpets (rec)	Licensing
Shore gathering, rocky shores, mussels (rec)	Licensing
Shore gathering, rocky shores, octopus (rec)	Licensing
Shore gathering, rocky shores, oysters (com)	Licensing
Shore gathering, rocky shores, oysters (rec)	Licensing
Shore gathering, rocky shores, red bait (rec)	Licensing
Shore gathering, sandy shores, ghost crabs (rec)	Licensing
Shore gathering, sandy shores, mole crabs (rec)	Licensing
Small nets, beach seine, fish	Licensing
Small nets, beach seine, sardines	Licensing
Small nets, cast net, fish/prawns	Licensing
Small nets, gate net/beam trawl, shrimp/prawn	Licensing
Small nets, shove net, prawns	Licensing
Small nets, surface gill net, estuarine fish	Licensing
Small nets, surface gill net, sharks	Licensing
Traps, small trap, lobster	Licensing
Hook & line, shore, subsistence	Licensing, Group decision, None
Hand spear, fish, subsistence	None
Hook & line, shore, estuarine (sub)	None
Shore gathering, mangroves, mangrove crabs	None
Shore gathering, prawn pump, burrowing prawns (ssc)	None
Shore gathering, rocky shores, invertebrates (sub)	None
Shore gathering, rocky shores, mussels (sub)	None
Shore gathering, sandy shores, ghost crabs (sub)	None
Shore gathering, sandy shores, mole crabs (sub)	None
Traps, staked, fish	None
Shore gathering, sandy shores, turtles	Prohibited
Small nets, purse seine, red-eye	Prospective fishery
Small nets, drag net, fish/shrimps	Defunct
Small nets, hand/hoop net, squid & glassies	Defunct
Traps, longline barrel traps, lobster	Defunct

Fishing controls used in KZN include effort restrictions, closed seasons, daily quotas and sizes for certain species, there are gear restrictions, including mesh sizes for nets and some marine protected areas that have been proclaimed as no-take zones. There are reserves where limited harvesting is permitted and some areas are harvested on a rotational basis to allow stock recovery. It is prohibited to harvest some overexploited or highly vulnerable species and berried crustaceans. Traditional controls are used in some of the artisanal and subsistence fisheries.

Conflicts

Forty-one fisheries experience conflict with other fishers, managers, developers or a combination of these sectors.

Fishery Name	Conflict with other fishers	Conflict with management	Conflict with development
Diving, gathering, lobsters (rec)		Yes	
Diving, gathering, lobsters (sub)		Yes	
Diving, hand/hoop net, ornamental fish		Yes	
Diving, speargun/no SCUBA, fish		Yes	
Hand spear, fish, subsistence	Yes	Yes	Yes
Hook & line, longline, tuna & swordfish	Yes	Yes	Yes
Hook & line, paddleski, fish		Yes	
Hook & line, shore, estuarine (sub)	Yes	Yes	Yes
Hook & line, shore, lobster (rec)		Yes	
Hook & line, shore, lobster (sub)		Yes	

Hook & line, shore, marine (rec)	Yes	Yes	Yes
Hook & line, shore, subsistence	Yes	Yes	
Hook & line, small boat & motor, charter/party	Yes	Yes	Yes
Hook & line, small boat & motor, estuarine fish (rec)	Yes	Yes	Yes
Hook & line, small boat & motor, fish (rec)	Yes	Yes	Yes
Hook & line, vessel, commercial	Yes	Yes	
Industrial nets, inshore, crustaceans	Yes		Yes
Industrial nets, offshore, crustaceans			Yes
Shore gathering, intertidal, mud crabs (rec)		Yes	
Shore gathering, prawn pump, burrowing prawns (rec)			Yes
Shore gathering, prawn pump, burrowing prawns (ssc)		Yes	Yes
Shore gathering, rocky shores, invertebrates (sub)	Yes	Yes	
Shore gathering, rocky shores, limpets (rec)		Yes	Yes
Shore gathering, rocky shores, mussels (rec)	Yes		Yes
Shore gathering, rocky shores, mussels (sub)	Yes	Yes	
Shore gathering, rocky shores, oysters (com)	Yes	Yes	Yes
Shore gathering, rocky shores, oysters (rec)	Yes		
Shore gathering, rocky shores, red bait (rec)		Yes	Yes
Shore gathering, sandy shores, ghost crabs (rec)		Yes	
Shore gathering, sandy shores, mole crabs (rec)		Yes	
Shore gathering, sandy shores, turtles		Yes	
Small nets, beach seine, fish	Yes	Yes	Yes
Small nets, beach seine, sardines		Yes	Yes
Small nets, cast net, fish/prawns		Yes	
Small nets, drag net, fish/shrimps		Yes	
Small nets, gate net/beam trawl, shrimp/prawn		Yes	
Small nets, shove net, prawns		Yes	
Small nets, surface gill net, estuarine fish	Yes	Yes	
Traps, longline barrel traps, lobster	Yes		
Traps, small trap, lobster		Yes	
Traps, staked, fish	Yes	Yes	Yes
Total	19	35	18

Food security

Only 17 fisheries are listed as providing food security to fishers and their families. These fisheries are listed below.

Fishery Name	Food security
Diving, gathering, lobsters (sub)	Yes
Hand spear, fish, subsistence	Yes
Hook & line, shore, estuarine (sub)	Yes
Hook & line, shore, lobster (sub)	Yes
Hook & line, shore, subsistence	Yes
Shore gathering, estuarine, fish	Yes
Shore gathering, mangroves, mangrove crabs	Yes
Shore gathering, prawn pump, burrowing prawns (ssc)	Yes
Shore gathering, rocky shores, invertebrates (sub)	Yes
Shore gathering, rocky shores, mussels (sub)	Yes
Shore gathering, sandy shores, ghost crabs (sub)	Yes
Shore gathering, sandy shores, mole crabs (sub)	Yes
Shore gathering, sandy shores, turtles	Yes
Small nets, beach seine, fish	Yes
Small nets, beach seine, sardines	Yes
Small nets, surface gill net, estuarine fish	Yes
Traps, staked, fish	Yes

Value adding activities

Most fisheries do not have any value adding activities associated with them. Post-harvest processing, for those few that do, includes drying, freezing, heading and gutting or just gutting, etc. The fishery for tuna and swordfish does the most post-harvest processing.

Fishery Name	Value adding
Hook & line, longline, tuna & swordfish	Canning, Filleting, Fish meal, Headed, Headed & gutted, Processed & packed, Whole frozen, Whole gutted
Industrial nets, offshore, crustaceans	Headed & gutted, Whole frozen
Industrial nets, inshore, crustaceans	Headed, Headed & gutted, Whole frozen
Shore gathering, rocky shores, oysters (com)	Packed, Whole frozen
Shore gathering, rocky shores, invertebrates (sub)	Sun-dried, None
Traps, staked, fish	Sun-dried, None
Shore gathering, mangroves, mangrove crabs	Whole cooked, None
Small nets, gate net/beam trawl, shrimp/prawn	Whole frozen
Hook & line, vessel, commercial	Whole gutted
Diving, gathering, lobsters (sub)	Unknown
Hook & line, shore, lobster (sub)	Unknown
Small nets, shove net, prawns	Unknown
Small nets, surface gill net, estuarine fish	Unknown

Markets

Twenty-one fisheries list markets to which they sell their catch. All of these fisheries sell to domestic markets and three also supply export markets. Recreational fishers are not permitted to sell their catch and are therefore not included, this does not, however, infer that no selling takes place.

Fishery Name	Middleman				Fish		
	Domestic	Restaurants	Hotels	trader	processor	Industrial	Export
Hand spear, fish, subsistence	Yes						
Hook & line, longline, tuna & swordfish	Yes	Yes					Yes
Hook & line, shore, estuarine (sub)	Yes						
Hook & line, shore, lobster (sub)	Yes						
Hook & line, shore, subsistence	Yes						
Hook & line, vessel, commercial	Yes						
Industrial nets, inshore, crustaceans	Yes						
Industrial nets, offshore, crustaceans	Yes						Yes
Shore gathering, estuarine, fish	Yes						
Shore gathering, mangroves, mangrove crabs	Yes						
Shore gathering, prawn pump, burrowing prawns (ssc)	Yes						
Shore gathering, rocky shores, invertebrates (sub)	Yes						
Shore gathering, rocky shores, mussels (sub)	Yes						

Shore gathering, rocky shores, oysters (com)	Yes	Yes	Yes				
Shore gathering, sandy shores, ghost crabs (sub)	Yes						
Shore gathering, sandy shores, mole crabs (sub)	Yes						
Small nets, beach seine, fish	Yes						
Small nets, beach seine, sardines	Yes						
Small nets, gate net/beam trawl, shrimp/prawn	Yes						
Small nets, surface gill net, estuarine fish	Yes		Yes				Yes
Traps, staked, fish	Yes		Yes	Yes			

Alternate livelihoods

Only three fisheries do not have alternate incomes listed but both the shark fisheries are government fisheries aimed at ensuring bather protection and do not rely on the fisheries at all for income. Ten fisheries need further investigation to ascertain if alternate incomes are necessary for fishers. All fisheries with information on this aspect are tabulated below.

Fishery Name	Alternative incomes
Hook & line, longline, tuna & swordfish	None
Hook & line, drumline, sharks	None
Small nets, surface gill net, sharks	None
Hand spear, fish, subsistence	Fisheries & non-fisheries
Hook & line, shore, estuarine (sub)	Fisheries & non-fisheries
Hook & line, shore, subsistence	Fisheries & non-fisheries
Industrial nets, inshore, crustaceans	Fisheries & non-fisheries
Industrial nets, offshore, crustaceans	Fisheries & non-fisheries
Shore gathering, mangroves, mangrove crabs	Fisheries & non-fisheries
Shore gathering, prawn pump, burrowing prawns (ssc)	Fisheries & non-fisheries
Shore gathering, rocky shores, invertebrates (sub)	Fisheries & non-fisheries
Shore gathering, rocky shores, mussels (sub)	Fisheries & non-fisheries
Shore gathering, sandy shores, ghost crabs (sub)	Fisheries & non-fisheries
Shore gathering, sandy shores, mole crabs (sub)	Fisheries & non-fisheries
Small nets, beach seine, fish	Fisheries & non-fisheries
Small nets, beach seine, sardines	Fisheries & non-fisheries
Traps, staked, fish	Fisheries & non-fisheries
Diving, gathering, lobsters (rec)	Non-fisheries
Diving, gathering, ornamental shells	Non-fisheries
Diving, hand/hoop net, ornamental fish	Non-fisheries
Diving, speargun/no SCUBA, fish	Non-fisheries
Hook & line, jetski, fish	Non-fisheries
Hook & line, paddleski, fish	Non-fisheries
Hook & line, shore, estuarine (rec)	Non-fisheries
Hook & line, shore, lobster (rec)	Non-fisheries
Hook & line, shore, marine (rec)	Non-fisheries
Hook & line, small boat & motor, charter/party	Non-fisheries
Hook & line, small boat & motor, estuarine fish (rec)	Non-fisheries
Hook & line, small boat & motor, fish (rec)	Non-fisheries
Other, research, poisons	Non-fisheries
Shore gathering, intertidal, mud crabs (rec)	Non-fisheries
Shore gathering, rocky shores, limpets (rec)	Non-fisheries
Shore gathering, rocky shores, mussels (rec)	Non-fisheries
Shore gathering, rocky shores, octopus (rec)	Non-fisheries
Shore gathering, rocky shores, oysters (rec)	Non-fisheries

Shore gathering, rocky shores, red bait (rec)	Non-fisheries
Shore gathering, sandy shores, ghost crabs (rec)	Non-fisheries
Shore gathering, sandy shores, mole crabs (rec)	Non-fisheries
Small nets, cast net, fish/prawns	Non-fisheries
Traps, small trap, lobster	Non-fisheries

Gender

Five fisheries are operated exclusively by women, four have both men and women but the men outnumber the women and 17 fisheries have only male fishers. There is no information on gender participation for the remaining 24 fisheries.

Fishery Name	Women involved in fisheries
Shore gathering, mangroves, mangrove crabs	Women only
Shore gathering, rocky shores, invertebrates (sub)	Women only
Shore gathering, rocky shores, mussels (sub)	Women only
Shore gathering, sandy shores, ghost crabs (sub)	Women only
Shore gathering, sandy shores, mole crabs (sub)	Women only
Shore gathering, rocky shores, oysters (com)	Women are out-numbered by men by 3:2
Hook & line, small boat & motor, charter/party	Women are out-numbered by men 23:2
Hook & line, small boat & motor, fish (rec)	Women are out-numbered by men 20:1
Hook & line, paddleski, fish	Women are out-numbered by men 100:1
Diving, speargun/no SCUBA, fish	None
Hand spear, fish, subsistence	None
Hook & line, drumline, sharks	None
Hook & line, longline, tuna & swordfish	None
Hook & line, shore, estuarine (sub)	None
Hook & line, shore, subsistence	None
Hook & line, vessel, commercial	None
Industrial nets, inshore, crustaceans	None
Industrial nets, offshore, crustaceans	None
Shore gathering, estuarine, fish	None
Shore gathering, prawn pump, burrowing prawns (ssc)	None
Small nets, beach seine, fish	None
Small nets, beach seine, sardines	None
Small nets, gate net/beam trawl, shrimp/prawn	None
Small nets, surface gill net, estuarine fish	None
Small nets, surface gill net, sharks	None
Traps, staked, fish	None

Score sheet

The score sheets for all 52 fisheries have been combined and the contribution of each fishery's score (Unknown, No/None/Nil, Few/Poor, Average/Medium, High/Good, Yes/Comprehensive) according to the individual fishery aspects covered by the score sheet has been graphically produced as a percentage of the total. For example, for Catch composition data 11% of fisheries had Unknown, 7% had No/None/Nil, 18% had Few/Poor, 4% had Average/Medium, 47% had High/Good and 13% had Yes/Comprehensive as their answers to the question of *How reliable is species composition data?*

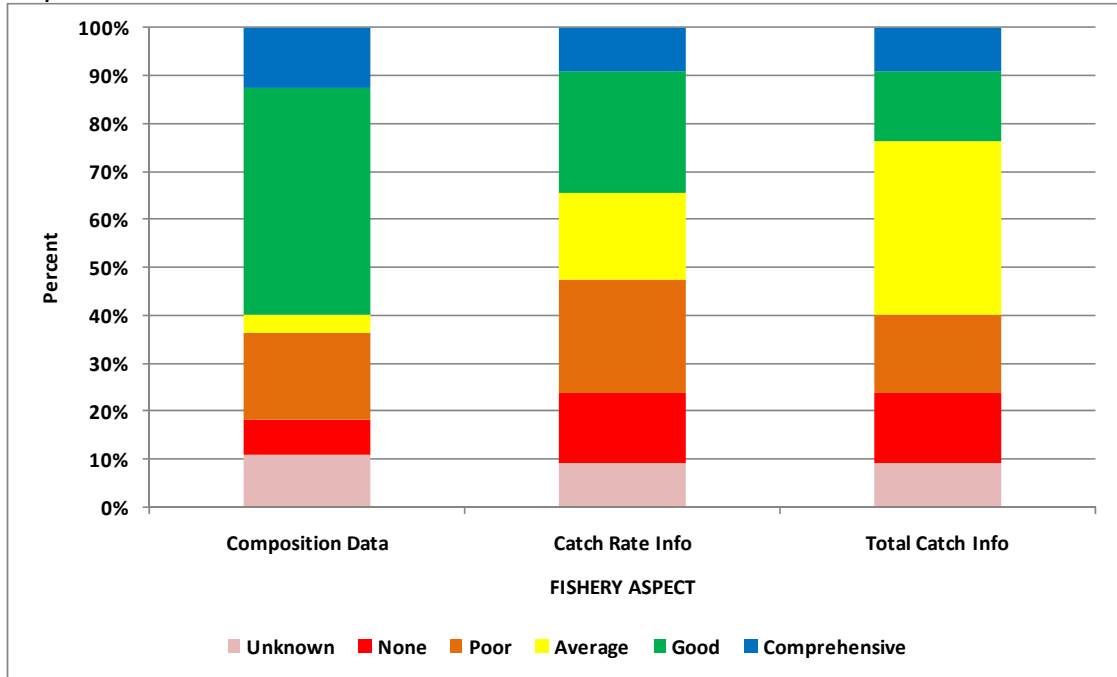
Catch information

Questions asked in this section were:

How reliable is species composition data?

How adequate is catch rate information?

How adequate is total catch information?



Bycatch, seasonality and sustainability

These questions include:

What is the overall level of bycatch?

Rate the bycatch problem?

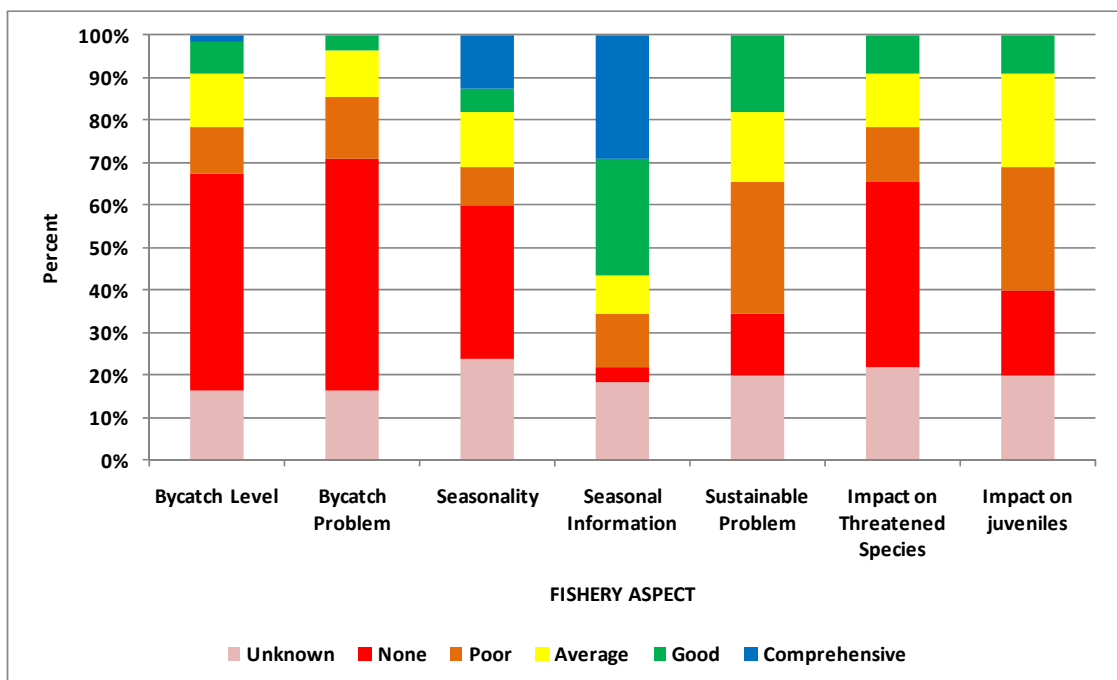
How seasonal is the fishery?

How adequate is seasonal information?

Rate the sustainability problem.

What is the impact on threatened species?

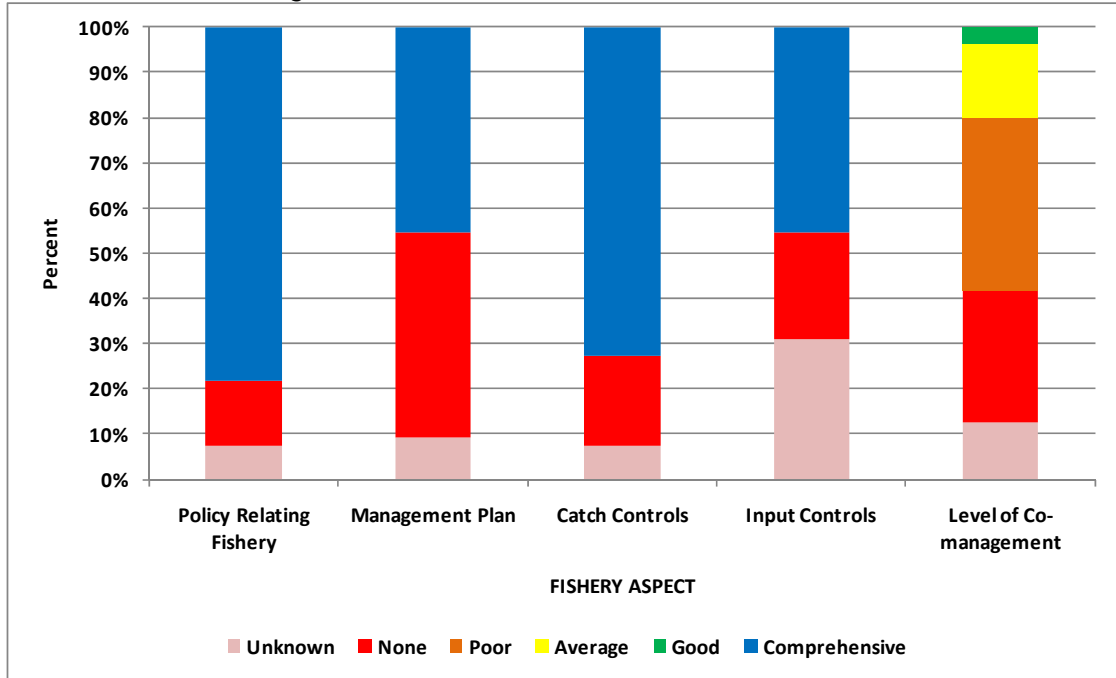
What is the impact on juveniles?



Management (Part 1)

This includes:

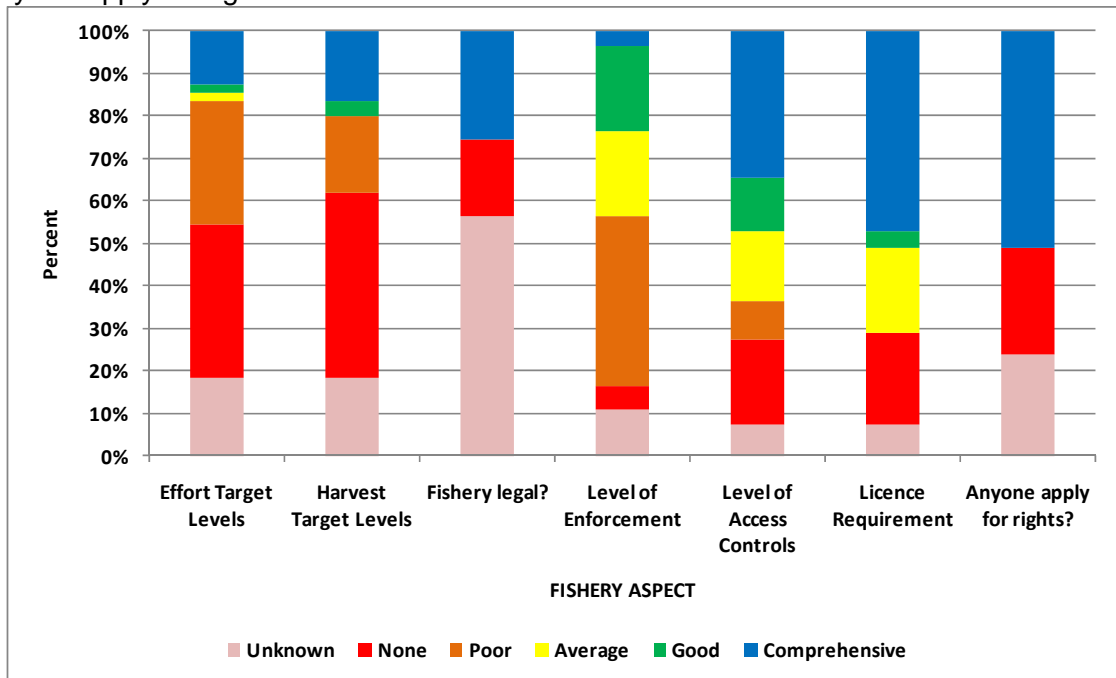
- Is there a specific policy relating to this fishery?
- Is there a specific management plan for this fishery?
- Are there any catch controls?
- Are there any input controls?
- What is the level of co-management?



Management (Part 2)

This includes:

- Is there any setting of effort target levels?
- Is there any setting of harvest target levels?
- Is this fishery legal?
- What is the level of enforcement?
- What is the level of access control?
- What is the level of licence requirements?
- Can anyone apply for rights?



Monitoring

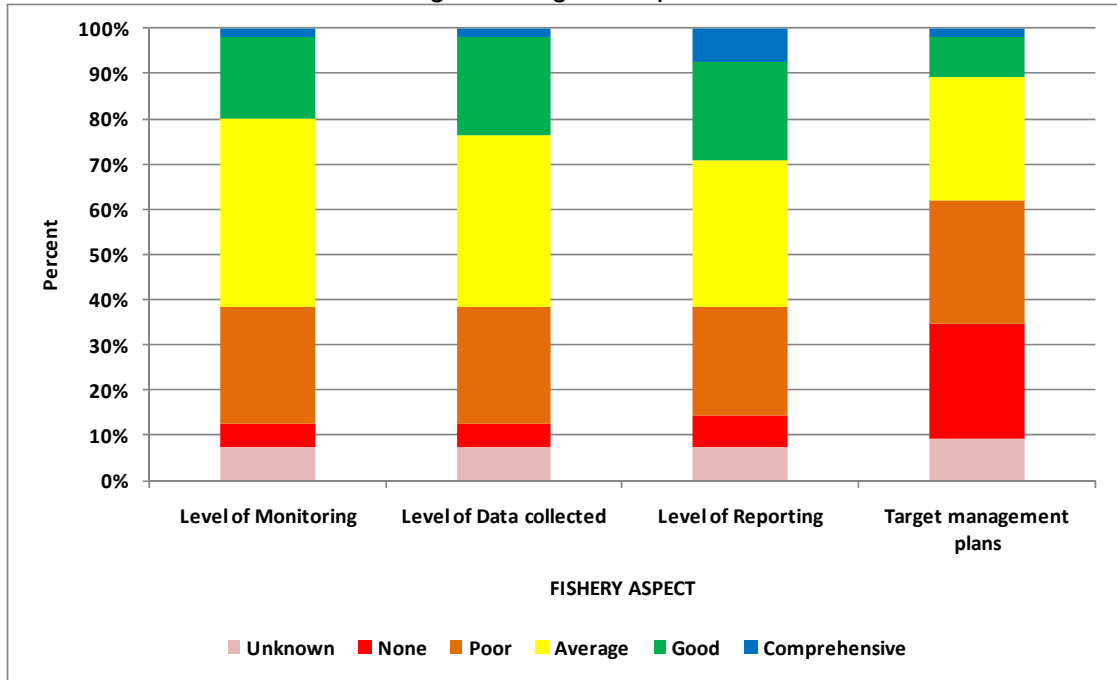
Options are:

What is the level of monitoring?

What is the level of data collected?

What is the level of reporting?

To what extent are data used to set target management plans?



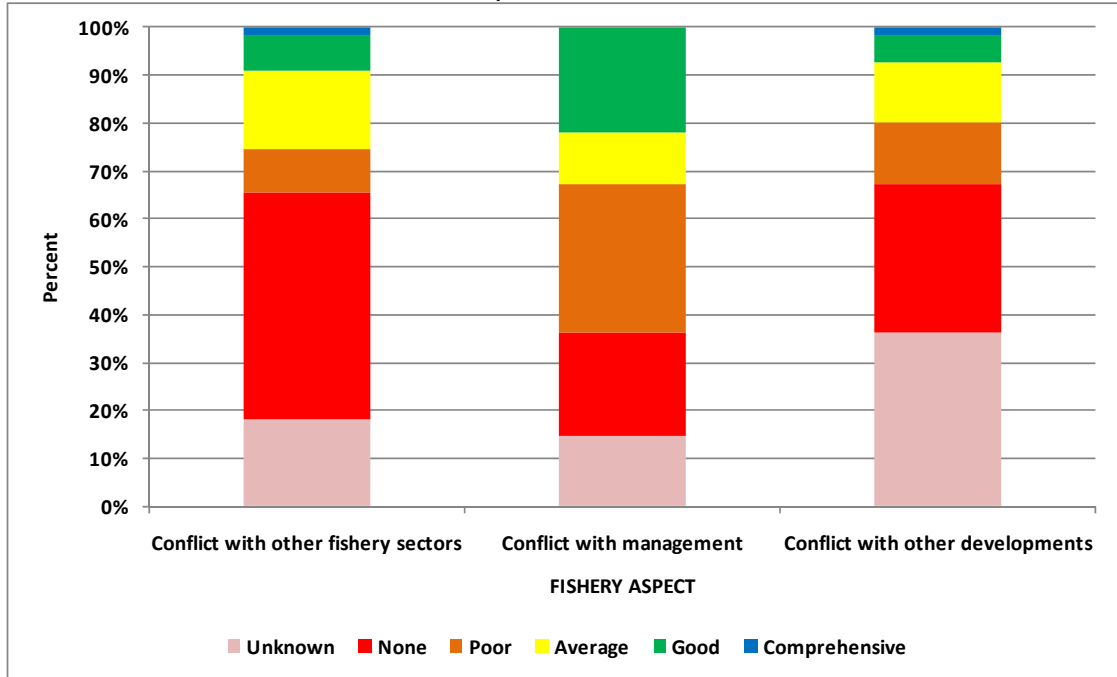
Conflicts

This section requires the following questions answered:

What is the level of conflict with other fisheries?

What is the level of conflict with management?

What is the level of conflict with other developments?



Research

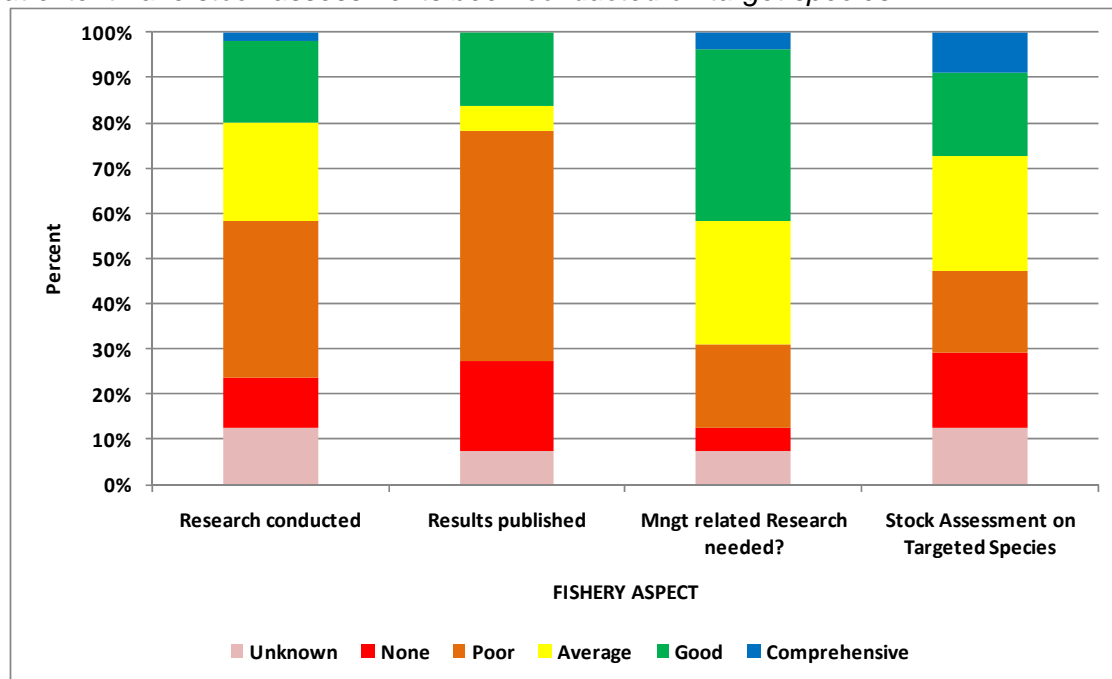
These questions are:

What is the level of research conducted into this fishery?

What is the level of research results published?

What is the current need for management related research?

To what extent have stock assessments been conducted on target species?



References

A list of authors and titles are provided below with the fisheries that utilised these references. For more complete bibliographic details please refer to the fisheries and references on the WIOFish database at www.wiofish.org.za.

Author	Title	Fishery Name
Allen, B.R. and Cliff, G.	Sharks caught in the protective gill nets off KwaZulu- Natal, South Africa. 9. The spinner shark <i>Carcharhinus brevipinna</i> (Müller and Henle).	Small nets, surface gill net, sharks
Beckley, L.E.	Capture of marine aquarium fishes in Natal and comments on mariculture potential based on early life history patterns.	Diving, hand/hoop net, ornamental fish
Beckley, L.E. & Everett, B.I.	A synthesis of information on sardines and the KwaZulu-Natal sardine run.	Industrial nets, purse seine, sardines
Beckley, L.E. & Fennessy, S.T.	The beach-seine fishery off Durban, KwaZulu-Natal.	Small nets, beach seine, sardines
Beckley, L.E., Fennessy, S.T., Fielding, P.J., Robertson, W.D., Tomalin, B.J. & van der Elst, R.P.	Informal fisheries on the east coast of South Africa (HSRC Project).	Small nets, beach seine, fish
Beckley, L.E., Mann, B.Q., Robertson, W.D. & Fielding, P.J.	Subsistence fisheries: assessment of resource availability and sustainability in KwaZulu-Natal.	Shore gathering, prawn pump, burrowing prawns (ssc)
		Diving, gathering, lobsters (rec)
		Hook & line, shore, lobster (rec)
Begg, G.	The estuaries of Natal.	Hook & line, shore, subsistence
Brash, J.M. & Fennessy, S.T.	A preliminary investigation of age and growth of <i>Otolithes ruber</i> from KwaZulu-Natal, South Africa.	Industrial nets, inshore, crustaceans

Brouwer, S.L., Mann, B.Q., Lamberth, S.J., Sauer, W.H.H. & Erasmus, C.	A survey of the South African shore-angling fishery.	Hook & line, shore, subsistence
		Hook & line, shore, marine (rec)
Cliff, G.	Sharks caught in the protective gill nets off KwaZulu-Natal, South Africa. 8. The great hammerhead shark <i>Sphyrna mokarran</i> (Ruppell).	Small nets, surface gill net, sharks
Cliff, G. and Dudley, S.F.J.	Protection against shark attack in South Africa, 1952 to 1990.	Small nets, surface gill net, sharks
Cliff, G. and Dudley, S.F.J.	Sharks caught in the protective nets off Natal, South Africa. 4. The bull shark <i>Carcharhinus leucas</i> Valenciennes.	Small nets, surface gill net, sharks
Cliff, G. and Dudley, S.F.J.	Sharks caught in the protective nets off Natal, South Africa. 5. The Java shark <i>Carcharhinus amboinensis</i> (Müller and Henle).	Small nets, surface gill net, sharks
Cliff, G. and Dudley, S.F.J.	Sharks caught in the protective nets off Natal, South Africa. 6. The copper shark <i>Carcharhinus brachyurus</i> (Günther).	Small nets, surface gill net, sharks
Cliff, G.; Dudley, S.F.J. and Davis, B.	An overview of shark catches in Natal's shark nets: 1966 to 1986.	Small nets, surface gill net, sharks
Cliff, G.; Dudley, S.F.J. and Davis, B.	Sharks caught in the protective nets off Natal, South Africa. 1. The sandbar shark <i>Carcharhinus plumbeus</i> (Nardo).	Small nets, surface gill net, sharks
Cliff, G.; Dudley, S.F.J. and Davis, B.	Sharks caught in the protective nets off Natal, South Africa. 2. The great white shark <i>Carcharodon carcharias</i> (Linnaeus).	Small nets, surface gill net, sharks
Cliff, G.; Dudley, S.F.J. and Davis, B.	Sharks caught in the protective nets off Natal, South Africa. 3. The shortfin mako shark <i>Isurus oxyrinchus</i> Rafinesque.	Small nets, surface gill net, sharks
Cliff, G.; Dudley, S.F.J. and Jury, M.R.	Catches of white sharks in KwaZulu-Natal, South Africa and environmental influences.	Small nets, surface gill net, sharks
Cockcroft, A.C., Groeneveld, J.C. & Cruywagen, G.C.	The influence of depth, latitude and width of the continental slope on the size distribution and availability of spiny lobster <i>Palinurus delagoae</i> off the East Coast of South Africa.	Traps, longline barrel traps, lobster
Davis, B., Cliff, G. & Dudley, S.	Sharks and the Natal Sharks Board: Part 2 The Natal Sharks Board.	Small nets, surface gill net, sharks
De Bruyn, P.; Dudley, S.F.J.; Cliff, G. and Smale, M.J.	Sharks caught in the protective gill nets off KwaZulu-Natal, South Africa. 11. The scalloped hammerhead shark <i>Sphyrna lewini</i> (Griffith and Smith).	Small nets, surface gill net, sharks
de Bruyn, P.A.	A novel application of operational management procedures in the fisheries management of the oyster (<i>Striostrea margaritacea</i>) in KwaZulu-Natal, South Africa.	Shore gathering, rocky shores, oysters (com)
		Shore gathering, rocky shores, oysters (rec)
de Freitas, A.J.	Shrimps and prawns.	Industrial nets, inshore, crustaceans
Dudley, S.F.J., Haestier, R.C., Cox, K.R. & Murray, M.	Shark control: experimental fishing with baited drumlines.	Hook & line, drumline, sharks
Dudley, S.F.J.	A comparison of the shark control programs of New South Wales and Queensland (Australia) and KwaZulu-Natal (South Africa).	Small nets, surface gill net, sharks

Dudley, S.F.J.	Shark catch trends and effort reduction in the beach protection program, KwaZulu-Natal, South Africa.	Small nets, surface gill net, sharks
Dudley, S.F.J.	Shark nets in KwaZulu-Natal - an evaluation of catches and alternatives.	Small nets, surface gill net, sharks
Dudley, S.F.J.	Shark netting in KwaZulu Natal: An update, and a personal perspective on shark control.	Small nets, surface gill net, sharks
Dudley, S.F.J. & Simpfendorfer, C.A.	Population status of 14 shark species caught in the protective gillnets off KwaZulu-Natal beaches, South Africa, 1978-2003.	Small nets, surface gill net, sharks
Dudley, S.F.J. and Cliff, G.	Shark Control: Methods, efficacy, and ecological impact.	Hook & line, drumline, sharks
		Small nets, surface gill net, sharks
Dudley, S.F.J. and Cliff, G.	Sharks caught in the protective nets off Natal, South Africa. 7. The blacktip shark <i>Carcharhinus limbatus</i> (Valenciennes).	Small nets, surface gill net, sharks
Dudley, S.F.J. and Cliff, G.	Some effects of shark nets in the Natal nearshore environment.	Small nets, surface gill net, sharks
Dudley, S.F.J. and Cliff, G.	The shark net fishery: past misconceptions, present policies and future plans.	Small nets, surface gill net, sharks
Dudley, S.F.J. and Cliff, G.	Trends in catch rates of large sharks in the Natal meshing program.	Small nets, surface gill net, sharks
Dudley, S.F.J. and Gribble, N.A.	Management of shark control programs.	Small nets, surface gill net, sharks
Dudley, S.F.J.; Cliff, G.; Zungu, M.P. and Smale, M.J.	Sharks caught in the protective gill nets off KwaZulu-Natal, South Africa. 10. The dusky shark <i>Carcharhinus obscurus</i> (Lesueur 1818).	Small nets, surface gill net, sharks
Dunlop, S.	A regional assessment of the KwaZulu-Natal linefishery, South Africa.	Hook & line, shore, marine (rec)
Emmerson, W.D.	Seasonal breeding cycles and sex ratios of eight species of crabs from Mgazana, a mangrove estuary in Transkei, southern Africa.	Shore gathering, mangroves, mangrove crabs
Emmerson, W.D. & Mcgwynne, L.E.	Feeding and assimilation of mangrove leaves by the crab <i>Sesarma meinerti</i> de Man in relation to leaf-litter production in Mgazana, a warm-temperate southern African mangrove swamp.	Shore gathering, mangroves, mangrove crabs
Enviro-fish Africa.	The economic and sectoral study of the South African Fishing Industry: The tuna fishery.	Hook & line, longline, tuna & swordfish
Fennessy, S.T.	A report on KwaZulu-Natal crustacean trawling for the economics and sectoral study of the South African Fishing Industry.	Industrial nets, offshore, crustaceans
Fennessy, S.T.	An investigation of the ichthyofaunal by-catch of the Tugela Bank prawn trawlers.	Industrial nets, inshore, crustaceans
Fennessy, S.T.	Incidental capture of elasmobranchs by commercial prawn trawlers on the Tugela Bank, Natal, South Africa.	Industrial nets, inshore, crustaceans

Fennessy, S.T.	Prawn (crustacean) trawl fisheries in South Africa. In: Eds. Ranavaison, E., Andriantsoa, M.H., Vincent, X. & Kasprzyk, Z. L'actes de l'atelier sur l'aménagement de la pêcheries crevetière. Antananarivo, Madagascar 11-13 October 2005.	Industrial nets, inshore, crustaceans
Fennessy, S.T.	Regional and international experiences in implementing TEDs: South Africa. In: Report of the workshop on managing interactions between sea turtles and shrimp trawl fisheries in the South West Indian Ocean. Mahajunga, Madagascar, 11-14 June 2007.	Industrial nets, inshore, crustaceans
Fennessy, S.T.	Relative abundances of non-commercial crustaceans in the bycatch of Tugela Bank prawn trawlers off KwaZulu-Natal, South Africa.	Industrial nets, inshore, crustaceans
Fennessy, S.T.	The impact of commercial prawn trawlers on linefish catches off the North coast of Natal.	Industrial nets, inshore, crustaceans
Fennessy, S.T. & Isaksen, B.	Can bycatch reduction devices be implemented successfully on prawn trawlers in the Western Indian Ocean? – results of a BRD experiment in Mozambique.	Industrial nets, inshore, crustaceans
Fennessy, S.T., Mwatha, G.K. & Thiele, W. (eds.)	Report of the regional workshop on approaches to reducing shrimp trawl bycatch in the Western Indian Ocean, Mombasa, Kenya, 13-15 April 2003.	Industrial nets, inshore, crustaceans
Fennessy, S.T., Villacastin, C. & Field, J.G.	Distribution and seasonality of ichthyofauna associated with commercial prawn trawl catches on the Tugela Bank of Natal, South Africa.	Industrial nets, inshore, crustaceans
Fielding, P.J. & Robertson, W.D.	Resource utilization at Kosi Bay.	Shore gathering, sandy shores, ghost crabs (sub)
Fielding, P.J., Robertson, W.D. & Lambert, G.	Stock assessment of some intertidal organisms in the Kosi Bay area.	Shore gathering, rocky shores, invertebrates (sub)
		Shore gathering, rocky shores, red bait (rec)
Fielding, P.J., Robertson, W.D., Dye, A.H., Tomalin, B.J., van der Elst, R.P., Beckley, L.E., Mann, B.Q., Birnie, S., Schleyer, M.H. & Lasiak, T.A.	Transkei coastal fisheries resources.	Shore gathering, rocky shores, mussels (sub)
Fielding, P.J., Weerts, K.A. & Forbes, A.T.	Macroinvertebrate communities associated with intertidal and subtidal beds of <i>Pyura stolonifera</i> (Heller) (Tunicata: Ascidiacea) on the Natal coast.	Shore gathering, rocky shores, red bait (rec)
Gopal, K., Tolley, K.A., Groeneveld, J.C. & Matthee, C.A.	Mitochondrial DNA variation in spiny lobster <i>Palinurus delagoae</i> suggests genetically structured populations in the southwestern Indian Ocean.	Traps, longline barrel traps, lobster
Groeneveld, J.C.	Biology and ecology of the deep-water rock lobsters <i>Palinurus gilchristi</i> and <i>Palinurus delagoae</i> in relation to their fisheries.	Traps, longline barrel traps, lobster

Groeneveld, J.C.	Long-distance migration of the rock lobster <i>Palinurus delagoae</i> off South Africa and Mozambique.	Traps, longline barrel traps, lobster
Groeneveld, J.C.	Stock assessment, ecology and economics as criteria for choosing between trap and trawl fisheries for spiny lobster <i>Palinurus delagoae</i> .	Traps, longline barrel traps, lobster
Groeneveld, J.C. & Cockcroft, A.C.	Potential of a trap-fishery for deep-water rock lobster <i>Palinurus delagoae</i> off South Africa.	Traps, longline barrel traps, lobster
Groeneveld, J.C. & Goosen, P.C.	Morphometric relationships of palinurid lobsters <i>Palinurus delagoae</i> and <i>P. gilchristi</i> and a scyllarid lobster <i>Scyllarides elisabethae</i> caught in traps off the south and east coasts of South Africa.	Traps, longline barrel traps, lobster
Groeneveld, J.C., Cockcroft, A.C. & Cruywagen, G.C.	Relative abundances of spiny lobster <i>Palinurus delagoae</i> and slipper lobster <i>Scyllarides elisabethae</i> off the East Coast of South Africa.	Traps, longline barrel traps, lobster
Groeneveld, J.C., Greengrass, C.L., Branch, G.M. & McCue, S.	Fecundity of the deep-water spiny lobster <i>Palinurus delagoae</i> off eastern South Africa.	Traps, longline barrel traps, lobster
Groeneveld, J.C., Japp, D.W. & Wissema, J.	Experimental fishing for spiny lobster <i>Palinurus delagoae</i> off South Africa. E) Report on the fourth year of the experiment: June – November 2007.	Traps, longline barrel traps, lobster
Hughes, G.R.	Sea Turtles.	Shore gathering, sandy shores, turtles
James, N.C.	The status of the riverbream <i>Acanthopagrus berda</i> (Sparidae), in estuaries of northern KwaZulu-Natal, South Africa.	Traps, staked, fish
Kirkman, S.P. & Groeneveld, J.C.	Experimental fishing for spiny lobster <i>Palinurus delagoae</i> off South Africa and Mozambique. a) Report on the South African leg: May - December 2004.	Traps, longline barrel traps, lobster
Kirkman, S.P. & Groeneveld, J.C.	Experimental fishing for spiny lobster <i>Palinurus delagoae</i> off South Africa. C) Report on the second year of the experiment: July-October 2005.	Traps, longline barrel traps, lobster
Kirkman, S.P., Groeneveld, J.C. & Palha de Sousa, B.	Experimental fishing for spiny lobster <i>Palinurus delagoae</i> off South Africa and Mozambique. B) Report on the Mozambican leg: January-February 2005.	Traps, longline barrel traps, lobster
Kruger, A.	A telephone survey of marine invertebrate permit-holders 2000 report.	Shore gathering, rocky shores, oysters (rec)
		Shore gathering, rocky shores, mussels (rec)
		Shore gathering, prawn pump, burrowing prawns (ssc)
Kruger, A. & Schleyer, M.H.	Mail and telephone surveys of permit-holders to obtain recreational invertebrate fisheries catch statistics: 2005.	Shore gathering, rocky shores, mussels (rec)
		Traps, small trap, lobster
		Diving, gathering, lobsters (rec)
Kruger, A. & Schleyer, M.H.	Marine invertebrate catches recorded during estuarine and marine patrols conducted by Ezemvelo KwaZulu-Natal Wildlife: 2005.	Shore gathering, rocky shores, mussels (rec)
		Traps, small trap, lobster
		Diving, gathering, lobsters (rec)

Kruger, A. & Schleyer, M.H.	Marine invertebrate catches recorded during the Ezemvelo KwaZulu-Natal Wildlife estuarine and marine patrols: 1995 - 2004.	Traps, small trap, lobster
Kruger, A. 2001.	A telephone survey of marine invertebrate permit-holders 2000 report.	Shore gathering, rocky shores, mussels (sub) Diving, gathering, lobsters (rec)
Kyle, R.	Accommodating traditional, recreational and subsistence fishing at Kosi Bay, a protected estuarine lakes system in South Africa.	Hook & line, shore, subsistence
Kyle, R.	Aspects of the ecology and exploitation of the fishes of the Kosi system, KwaZulu, South Africa.	Hook & line, shore, subsistence
Kyle, R.	Factsheet on resource utilization during 1999 in the Kosi Bay Nature Reserve.	Small nets, surface gill net, estuarine fish
Kyle, R.	Gillnetting in nature reserves: a case study from the Kosi Lakes, South Africa.	Small nets, surface gill net, estuarine fish
Kyle, R.	The fish kraals of the Kosi system.	Traps, staked, fish
Kyle, R.	Towards the wise use of the fishes of the Kosi Bay nature reserve.	Traps, staked, fish
Kyle, R., Pearson, B., Fielding, P.J., Robertson, W.D. & Birnie, S. L.	Subsistence shellfish harvesting in the Maputaland Marine Reserve in northern KwaZulu-Natal, South Africa: rocky shore organisms.	Shore gathering, rocky shores, limpets (rec) Diving, gathering, lobsters (rec)
Kyle, R., Robertson, W.D. & Birnie, S. L.	Subsistence shellfish harvesting in the Maputaland Marine Reserve in northern KwaZulu-Natal, South Africa: sandy beach organisms.	Shore gathering, sandy shores, mole crabs (rec)
Lamberth, S.J., Sauer, W.H.H., Mann, B.Q., Brouwer, S.L., Clark, B.M. & Erasmus, C.	The status of the South African beach-seine and gill-net fisheries.	Small nets, surface gill net, estuarine fish
Lindenberg, E.G.	Growth and mortality of the mole crab <i>Emerita austroafricana</i> along the KwaZulu-Natal coast.	Shore gathering, sandy shores, mole crabs (rec)
Mann, B.Q.	Fish by-catch in the St Lucia bait prawn fishery.	Small nets, gate net/beam trawl, shrimp/prawn
Mann, B.Q.	Implementation and assessment of the Lake St Lucia gill net fishery: A case study.	Small nets, surface gill net, estuarine fish
Mann, B.Q.	Quantification of illicit fish harvesting in the Lake St Lucia game reserve, South Africa.	Small nets, surface gill net, estuarine fish
Mann, B.Q. & Beckley, L.E.	Evaluation of linefishery participation and management along the KwaZulu-Natal coast.	Hook & line, shore, marine (rec) Hook & line, vessel, commercial
Mann, B.Q., Scott, G.M., Mann-Lang, J.B., Brouwer, S.L., Lamberth, S.J., Sauer, W.H.H. & Erasmus, C.	An evaluation of participation and management of the South African spearfishery.	Diving, speargun/no SCUBA, fish
Mann-Lang, J.B., van der Elst, R.P. & Penney, A.J.	An analysis of the KwaZulu-Natal commercial and recreational reef fisheries.	Hook & line, small boat & motor, fish (rec)
Mast, R.B., Bailey, L.M. & Hutchinson, B.J.	A global glimpse of loggerhead nesting.	Shore gathering, sandy shores, turtles
Mast, R.B., Bailey, L.M. & Hutchinson, B.J.	Burning issues in conservation ... leatherback sea turtles of the world.	Shore gathering, sandy shores, turtles

Mast, R.B., Bailey, L.M. & Hutchinson, B.J.	Where the hawksbills are.	Shore gathering, sandy shores, turtles
Mast, R.B., Hutchinson, B.J., Villegas, P.E., Wallace, B. & Yarnell, L.	Discovering the flatback, Australia's own sea turtle.	Shore gathering, sandy shores, turtles
McGrath, M.D., Horner, C.C.M., Brouwer, S.L., Lamberth, S.J., Mann, B.Q., Sauer, W.H.H. & Erasmus, C.	An economic valuation of the South African linefishery.	Hook & line, vessel, commercial
Micheli, F., Gherardi, F. & Vannini, M.	Feeding and burrowing ecology of two East African mangrove crabs.	Shore gathering, mangroves, mangrove crabs
Mkhize, M., Fennessy, S.T., Persad, R.S. & Groeneveld, J.C.	Tugela Bank prawn trawler bycatch: what has changed after ten years?	Industrial nets, inshore, crustaceans
Morgan, D.	The response of mobile intertidal invertebrates to subsistence harvesting in northern KwaZulu-Natal.	Shore gathering, rocky shores, limpets (rec)
Mwanyama, N.C., Taylor, R.H. & Mann, B.Q.	Lake St Lucia subsistence gill net fishery.	Small nets, surface gill net, estuarine fish
Nel, R. & Jager, J.	Annual Research Report of the Tongaland Sea Turtle Project 1 April 2002 - 31 March 2003.	Shore gathering, sandy shores, turtles
Nel, R., Sawyers, R.P. & Morty, K.	Turtle monitoring and community development in Tongaland and southern Mozambique 01 April 2005 - 31 March 2007.	Shore gathering, sandy shores, turtles
NSB	Natal Sharks Board annual report for the year ended 31 March 2000.	Small nets, surface gill net, sharks Hook & line, drumline, sharks
Oceanographic Research Institute	Report on research during the period April 1997 to March 1998.	Industrial nets, inshore, crustaceans
Olbers, J.M. & Fennessy, S.T.	A retrospective assessment of the stock status of <i>Otolithes ruber</i> (Pisces: Sciaenidae) as bycatch on prawn trawlers from KwaZulu-Natal, South Africa.	Industrial nets, inshore, crustaceans
Peddemors, V.M. and Cockcroft, V.G.	Dolphin capture in Natal shark nets.	Small nets, surface gill net, sharks
Peddemors, V.M.; Cockcroft, V.G. and R.B. Wilson.	Incidental dolphin mortality in the Natal shark nets: a preliminary report on prevention methods.	Small nets, surface gill net, sharks
Pedersen, C., Everett, B.I., Fielding, P.J., Robertson, W.D. & R. Kyle.	Subsistence utilization of <i>Neosarmatium meinerti</i> in the Kosi Lakes ecosystem, KwaZulu-Natal, South Africa.	Shore gathering, mangroves, mangrove crabs
Penney, A.J., Mann-Lang, J.B., van der Elst, R.P. & Wilke, C.G.	Long-term trends in catch and effort in the KwaZulu-Natal nearshore linefisheries.	Hook & line, small boat & motor, charter/party
Persad, R.S., Fennessy, S.T., Mkhize, M. & Groeneveld, J.C.	An in-depth look at the by-catch of the crustacean trawl fishery on the KZN continental shelf.	Industrial nets, offshore, crustaceans
Pilfold, S.J.	Natal Sardine Annual Report No 10.	Small nets, beach seine, sardines
Pradervand, P. & van der Elst, R.P.	Assessment of the charter-boat fishery in KwaZulu-Natal, South Africa.	Hook & line, small boat & motor, charter/party
PRADERVAND, P., GOVENDER, R.D., KUNENE, P., ELS, M. and MANN, B.Q.	Recreational Angling Data Collection by Ezemvelo KZN Wildlife: 2006 Annual Report.	Diving, speargun/no SCUBA, fish Hook & line, small boat & motor, estuarine fish (rec) Hook & line, small boat & motor, fish (rec) Hook & line, shore, marine (rec)

PRADERVAND, P., KHUMALO, M., KUNENE, P., MANN, B. Q. and M. ELS	Boat Launch Site Monitoring System: 2006 Annual Report.	Diving, speargun/no SCUBA, fish
Pradervand, P.; Mann, B.Q.	An investigation of the developing paddleski fishery in KwaZulu-Natal, South Africa	Hook & line, paddleski, fish
Sauer, W.H.H., Penney, A.J., Erasmus, C., Mann, B.Q., Brouwer, S.L., Lamberth, S.L. & Stewart, T.J	An evaluation of attitudes and responses to monitoring and management measures for the South African boat-based linefishery.	Hook & line, small boat & motor, fish (rec)
		Hook & line, vessel, commercial
Schleyer, M.H. & Kruger, A.	A study of the oyster <i>Striostrea margaritacea</i> (Lamarck).	Shore gathering, rocky shores, oysters (rec)
Shelmerdine, R.L. and Cliff, G.	Sharks caught in the protective gill nets off KwaZulu-Natal, South Africa. 12. The African angel shark <i>Squatina africana</i> (Regan).	Small nets, surface gill net, sharks
Skov, M.W.	The influence of methodology, tidal phases, season and animal sex on density estimates of <i>Neosarmatium meinerti</i> (De Man).	Shore gathering, mangroves, mangrove crabs
Steinke, T.D., Rajh, A. & Holland, A.J.	The feeding behaviour of the red mangrove crab <i>Sesarma meinerti</i> de Man, 1887 (Crustacea: Decapoda: Grapsidae) and its effect on the degradation of mangrove leaf litter.	Shore gathering, mangroves, mangrove crabs
Tinley, K.L.	Fishing methods of the Thonga tribe in north-eastern Zululand and southern Mozambique.	Traps, staked, fish
		Hook & line, shore, subsistence
Tomalin, B.J.	Exploitation of the burrowing prawn, <i>Callinassa kraussi</i> , in KwaZulu-Natal: final report.	Shore gathering, prawn pump, burrowing prawns (rec)
Tomalin, B.J.	Invertebrates harvested in KwaZulu-Natal: Their ecology, fishery and management.	Small nets, hand/hoop net, squid & glassies
Tomalin, B.J. & Kruger, A.	Estimated landings of coastal invertebrates by recreational collectors in KwaZulu-Natal, 1964-1998.	Hook & line, shore, lobster (rec)
		Diving, gathering, lobsters (rec)
Walley, A.M.	Aspects of the biology of the Hippidae of Natal, South Africa.	Shore gathering, sandy shores, mole crabs (rec)

TANZANIA ASSESSMENT

Tanzania has 35 fisheries in the WIOFish database, most of which are artisanal fisheries.

Sector	Number
Artisanal; Subsistence	16
Artisanal	6
Other	3
Artisanal; Small-scale commercial	2
Subsistence	2
Artisanal; Recreational; Subsistence	1
Artisanal; Small-scale commercial; Subsistence	1
Industrial; Semi-industrial; Foreign fleet	1
Industrial; Semi-industrial; Small-scale commercial	1
Recreational; Sport; Tournament fishing	1
Recreational; Subsistence; Tournament fishing	1
Total	35

Catch

There are 139 unique catch items listed for the Tanzanian fisheries and as can be seen from the table below, there are numerous examples where the catch is not identified to species level.

Scientific name	Scientific name	Scientific name
<i>Acanthocybium solandri</i>	<i>Istiophorus albicans</i>	<i>Portunus pelagicus</i>
<i>Acanthurus bleekeri</i>	<i>Istiophorus platypterus</i>	<i>Pseudanthias squamipinnis</i>
<i>Acetes erythaeus</i>	<i>Katsuwonus pelamis</i>	<i>Pteria avicular</i>
Ambassidae	Labridae	<i>Pteria penguin</i>
<i>Amblygaster sirm</i>	<i>Leptoscarus vaigiensis</i>	<i>Pterocaesio capricornis</i>
<i>Anadara antiquata</i>	Lethrinidae	<i>Pterois miles</i>
Atherinidae	Loliginidae	Rajidae
<i>Atrina vexillum</i>	Lutjanidae	<i>Rastrelliger kanagurta</i>
<i>Barbatia barbata</i>	<i>Lutjanus fulviflammus</i>	<i>Rastrelliger spp</i>
<i>Birgus latro</i>	<i>Lutjanus sebae</i>	<i>Sardinella albella</i>
<i>Buccinum undatum</i>	<i>Lutjanus spp</i>	<i>Sardinella brachysoma</i>
<i>Caesio caerulea</i>	<i>Makaira indica</i>	<i>Sardinella gibbosa</i>
<i>Capitella capitata</i>	<i>Megaptera novaeangliae</i>	Scaridae
Carangidae	<i>Metapenaeus monoceros</i>	<i>Scomberoides spp</i>
<i>Caranx ignobilis</i>	<i>Modiolus auriculatus</i>	<i>Scomberomorus commerson</i>
<i>Cephalopholis aurantia</i>	<i>Modiolus modiolus</i>	<i>Scomberomorus plurilineatus</i>
<i>Cephalopholis miniata</i>	<i>Modiolus philippinarum</i>	<i>Scomberomorus spp</i>
<i>Cetoscarus bicolor</i>	<i>Mugil cephalus</i>	Scombridae
Chaetodontidae	Mugilidae	<i>Scylla serrata</i>
<i>Chelonia mydas</i>	Muraenidae	<i>Selar crumenophthalmus</i>
<i>Clupeonella engrauliformis</i>	<i>Notomastus latericeus</i>	Sepiidae, Sepiolidae
<i>Coryphaena hippurus</i>	Octopodidae	<i>Sepioteuthis lessoniana</i>
<i>Decapterus spp</i>	<i>Octopus aegina</i>	<i>Septifer bilocularis</i>
Echinodermata	<i>Octopus cyanea</i>	<i>Serpula sp.</i>
Elasmobranchii	<i>Octopus macropus</i>	Serranidae
<i>Engraulis spp</i>	<i>Octopus vulgaris</i>	<i>Siganus canaliculatus</i>
<i>Epinephelus spp</i>	Ommastrephidae	<i>Siganus spp</i>
<i>Eretmochelys imbricata</i>	<i>Panulirus albiflagellum</i>	<i>Sipunculus nudus</i>
<i>Eucaema cottonii</i>	<i>Panulirus homarus</i>	<i>Sousa chinensis</i>
<i>Eucaema spp</i>	<i>Panulirus longipes</i>	<i>Stenella attenuata</i>
<i>Euthynnus affinis</i>	<i>Panulirus ornatus</i>	<i>Stenella longirostris</i>
Gerreidae	<i>Panulirus penicillatus</i>	<i>Stichopus hermanni</i>
<i>Gerres oyena</i>	Penaeidae	<i>Terapon spp</i>
<i>Gerres spp</i>	<i>Penaeus indicus</i>	<i>Terebralia palustris</i>

<i>Grampus griseus</i>	<i>Penaeus japonicus</i>	<i>Terebralia sulcata</i>
Haemulidae (=Pomadasyidae)	<i>Penaeus monodon</i>	Testudinata
<i>Hemiramphus</i> spp	<i>Penaeus semisulcatus</i>	<i>Thelenota ananas</i>
<i>Hippocampus</i> spp	<i>Perna picta</i>	Thunnini
<i>Hipposcarus harid</i>	<i>Pinctada margaritifera</i>	<i>Thunnus albacares</i>
<i>Holothuria atra</i>	<i>Pinna muricata</i>	<i>Thunnus obesus</i>
<i>Holothuria edulis</i>	<i>Pleuroploca trapezium</i>	<i>Tridacna maxima</i>
<i>Holothuria nobilis</i>	<i>Plotosus papuensis</i>	<i>Tursiops aduncus</i>
<i>Holothuria scabra</i>	<i>Plotosus</i> spp	<i>Tursiops truncatus</i>
<i>Holothuria tubulosa</i>	Pomacanthidae	<i>Tylosurus</i> spp
Holothurioidea	<i>Porites lobata</i>	<i>Xiphias gladius</i>
<i>Isognomon isognomum</i>	<i>Porites panamensis</i>	
Istiophoridae	Portunidae	

There are eight fisheries that have species marked as by-catch in the catch composition. These fisheries are listed below with the number of by-catch species for each.

Fishery name	Number of species
Small nets, surface (drift) gill net, pelagics	7
Small and large mesh nets, bottom gill net	3
Traps, staked (uzio/wando), fish	3
Shore gathering, rocky shores, mussels, ornamental shells	2
Shore gathering, sandy shores, seagrass beds & gastropods/bivalves	2
Industrial nets, purse seine	1
Shore gathering, machete (mwenge), fish/squid	1
Small nets, hand/scoop net	1
Total	20

Eight fisheries have threatened species in their catches. Species can be globally or locally threatened for them to be marked as such in WIOFish.

Fishery Name	Scientific Name
Diving, gathering, sea cucumber	<i>Holothuria atra</i>
	<i>Holothuria edulis</i>
	Holothurioidea
	<i>Holothuria nobilis</i>
Diving, lobster	<i>Panulirus penicillatus</i>
	<i>Panulirus ornatus</i>
Industrial nets, inshore, crustaceans	Penaeidae
	<i>Penaeus japonicus</i>
	<i>Penaeus semisulcatus</i>
	<i>Penaeus monodon</i>
	<i>Penaeus indicus</i>
<i>Metapenaeus monoceros</i>	
Shore gathering, intertidal, sea cucumbers	<i>Stichopus hermanni</i>
	<i>Holothuria nobilis</i>
	<i>Thelenota ananas</i>
	<i>Holothuria scabra</i>
<i>Holothurioidea</i>	
Shore gathering, machete (mwenge), fish/squid	Gerreidae
Shore gathering, sandy shores, turtles	<i>Eretmochelys imbricata</i>
Small and large mesh nets, bottom gill net	<i>Tursiops truncatus</i>
	<i>Sousa chinensis</i>
Small nets, surface (drift) gill net, pelagics	<i>Tursiops aduncus</i>
	<i>Megaptera novaeangliae</i>
	<i>Stenella attenuata</i>

Habitats

Tanzanian fisheries operate in a diversity of habitats. The most utilised habitats are the coral reef platforms and intertidal zones. Below is a list of the habitats in which the fisheries predominantly operate and the number of fisheries that operate in each.

Habitat	Number of fisheries
Coral Reef Platforms	10
Intertidal Zone	9
General Inshore Area	8
Seagrass Beds	8
Intertidal Mud Flats	6
Intertidal Sand Flats	6
Mangrove Creeks	6
Coral Reef Slopes	5
Oceanic Surface	5
Coral Reef Bommies	4
Drop Offs	4
Estuaries	4
Lagoons	4
Sand Beaches	4
Mangroves Forest	3
Oceanic Midwater	3
Sandy Seabed	3
Shallow Coastal Bays	3
Carpet/patch reef	2
General Offshore Area	2
Macroalgal beds	2
Oceanic Bottom	2
Rocky Shore	2
Harbour	1
Rocky Seabed	1

Twenty five fisheries list impacts on the habitats within which they operate. These impacts vary from trampling in the intertidal zone to destructive fishing methods such as dynamite fishing.

Fishery Name	Habitat	Threat Description
Diving, hand/scoop net, ornamental fish	Lagoons	Breaking up of corals during fishing activities which eliminates fish habitats.
	Coral Reef Slopes	
	Carpet/patch reef	
Diving, lobster	Coral Reef Platforms	Damage to coral reefs may occur during harvesting.
Diving, speargun & snorkel	Drop Offs	Trampling of habitat by fishers, physical damage to the reefs by the speargun when the target is missed.
	Coral Reef Slopes	
	Coral Reef Platforms	
	Coral Reef Bommies	
Hook & line, handline, fish/sharks/rays	Seagrass Beds	Anchors may cause some damage to coral reefs.
	General Inshore Area	
	Coral Reef Slopes	
	Coral Reef Platforms	
	Coral Reef Bommies	
Hook & line, handline, shore	Intertidal Zone	Fishers dig up intertidal mudflat areas for bait, causing sedimentation.
	Intertidal Sand Flats	
Industrial nets, inshore, crustaceans	Oceanic Bottom	Seagrasses and corals are under threat
	General Inshore Area	
Industrial nets, purse seine	Oceanic Midwater	Distraction of corals and seagrasses

Other, coral mining	Coral Reef Platforms	Occurs in the coastal zone where living and fossil reefs exist. Very common in the southern parts of Tanzania. The coral is either crushed and burnt to make lime or is cut into building blocks. However, the activity is strictly prohibited by Fisheries Department.
Other, dynamite, fish	Drop Offs	It affects the corals and seagrass. It causes breakage, death and sediment disturbance in coral reefs.
	Coral Reef Slopes	
	Coral Reef Platforms	
	Coral Reef Bommies	
	Carpet/patch reef	
Shore gathering, brittle stars, fish bait	Seagrass Beds	Through trampling, digging and causing sedimentation.
	Intertidal Zone	
Shore gathering, intertidal, octopus	Rocky Shore	Low impact except walking on fragile coral reefs and damage induced by spears etc.
	Intertidal Zone	
	Coral Reef Bommies	
Shore gathering, intertidal, sea cucumbers	General Inshore Area	Excessive trampling in limited areas can cause damage to the substratum and associated biota.
Shore gathering, machete (mwenge), fish/squid	Seagrass Beds	Through trampling on the intertidal areas
	Mangrove Creeks	
	Intertidal Zone	
	Intertidal Mud Flats	
Shore gathering, mangroves, whelks (suka)	Mangroves Forest	Possible disturbance to fragile mangrove areas.
	Mangrove Creeks	
Shore gathering, rocky shores, mussels, ornamental shells	Rocky Shore	Large area stripping may interfere with mussel bed succession and limit recruitment.
	Rocky Seabed	
	Intertidal Zone	
Shore gathering, sandy shores, seagrass beds & gastropods/bivalves	Intertidal Zone	Trampling during collection
Shore gathering, sandy shores, turtles	Sand Beaches	There is overdevelopment of hotels in the areas where the turtle breed or nest
Shore gathering, seaweed, culture	Intertidal Zone	Trampling of reefs may occur during seaweed harvesting. At sites where seaweed farming occurs, there may be changes due to the extensive environmental modification brought about by the monoculture of seaweed. Sea grasses are mostly affected by trampling and some macro organisms such as urchins are excluded from farming sites.
Shore gathering, spear, fish	Coral Reef Platforms	Sticks with sharp objects in front are used and when they miss the targeted fish may cause coral damage.
Small nets, beach seine, fish	Shallow Coastal Bays	destruct Seagrass beds
	Seagrass Beds	
	Sandy Seabed	
	Sand Beaches	
	Mangrove Creeks	
	Macroalgal beds	
	Lagoons	
	Intertidal Zone	
	Intertidal Sand Flats	
	Intertidal Mud Flats	
	General Inshore Area	
	Estuaries	

Small nets, boat drag & seine (kavogo, kigumi)	General Inshore Area	Destruction of Coral reef and seagrass bed habitats
Small nets, mosquito/chandalua/tandio/kivajo, fish/shrimps	Seagrass Beds	Destruction of habitat through trampling on the sea bed
	Sand Beaches	
	Intertidal Zone	
Small nets, surrounding net (Zuwio)	Coral Reef Platforms	Coral reef destruction
Traps, basket (dema and towe), fish	Shallow Coastal Bays	Damage is done to the substrate by anchors and poles used to propel the vessel. Traps inhibit growth of seagrasses. Ghost fishing occurs when traps are abandoned or lost. Destruction of coral reefs to provide anchorage for the traps.
	Seagrass Beds	
	Sandy Seabed	
	Intertidal Sand Flats	
	Intertidal Mud Flats	
	Coral Reef Platforms	
	Shallow Coastal Bays	
	Seagrass Beds	
	Sandy Seabed	
	Intertidal Sand Flats	
	Intertidal Mud Flats	
	Coral Reef Platforms	
Traps, staked (uzio/wando), fish	Seagrass Beds	Use of mangrove wood for trap making especially <i>Rhizophora</i> sp
	Sand Beaches	
	Mangrove Creeks	
	Intertidal Zone	
	Intertidal Sand Flats	
	Intertidal Mud Flats	
	Estuaries	

Monitoring

Most of the Tanzanian fisheries (86%) are monitored for catch and effort. Methods used are catch returns, creel surveys, voluntary monitoring, interviews, observers and frame surveys.

Biology of species is monitored in 29 fisheries and data collected includes species compositions, lengths and weights, size composition, reproductive states, otoliths for some species for aging studies and percentage cover for some sessile organisms.

Research conducted

The majority of fisheries (66%) have low levels of research conducted on them and only 9 have been highly studied. No fisheries have been comprehensively studied. There is a high need for management related research for 83% of fisheries. Stock assessments for some target species have been completed for only 49% of fisheries, no fisheries have had stock assessments done for all the target species.

Management

Twenty-four fisheries have co-management strategies of low to high levels. These fisheries are listed below.

Fishery Name	Level of Co-management
Other, coral mining	High
Small nets, beach seine, fish	High
Hook & line, handline, fish/sharks/rays	Average
Other, dynamite, fish	Average
Shore gathering, sandy shores, seagrass beds & gastropods/bivalves	Average
Shore gathering, sandy shores, turtles	Average
Shore gathering, spear, fish	Average
Traps, basket (dema and towe), fish	Average
Diving, gathering, sea cucumber	Low
Diving, lobster	Low
Hook & line, charter boat, gamefish	Low
Hook & line, small boat and motor, sport	Low

Industrial nets, inshore, crustaceans	Low
Shore gathering, intertidal, crabs	Low
Shore gathering, intertidal, octopus	Low
Shore gathering, intertidal, sea cucumbers	Low
Shore gathering, machete (mwenge), fish/squid	Low
Shore gathering, mangroves, whelks (suka)	Low
Small and large mesh nets, bottom gill net	Low
Small nets, cast net, fish & squid	Low
Small nets, hand/scoop net	Low
Small nets, mosquito/chandalua/tandio/kivajo, fish/shrimps	Low
Small nets, surface (drift) gill net, pelagics	Low
Small nets, surrounding net (Zuwio)	Low
Diving, hand/scoop net, ornamental fish	None
Hook & line, longline, surface	None
Industrial nets, offshore, tuna	None
Industrial nets, purse seine	None
Shore gathering, brittle stars, fish bait	None
Shore gathering, rocky shores, mussels, ornamental shells	None
Shore gathering, seaweed, culture	None
Small nets, boat drag & seine (kavogo, kigumi)	None
Traps, staked (uzio/wando), fish	None
Diving, speargun & snorkel	Unknown
Hook & line, handline, shore	Unknown

Operational management plans have been developed and implemented for 11 fisheries and developed but yet to be implemented for a further 12 fisheries.

Developed and implemented	Developed but not implemented
Diving, gathering, sea cucumber	Diving, hand/scoop net, ornamental fish
Hook & line, handline, fish/sharks/rays	Hook & line, charter boat, gamefish
Industrial nets, inshore, crustaceans	Hook & line, handline, shore
Industrial nets, offshore, tuna	Hook & line, longline, surface
Shore gathering, rocky shores, mussels, ornamental shells	Hook & line, small boat and motor, sport
Shore gathering, sandy shores, seagrass beds & gastropods/bivalves	Shore gathering, intertidal, crabs
Shore gathering, sandy shores, turtles	Small and large mesh nets, bottom gill net
Shore gathering, spear, fish	Small nets, boat drag & seine (kavogo, kigumi)
Small nets, beach seine, fish	Small nets, hand/scoop net
Small nets, cast net, fish & squid	Small nets, mosquito; chandalua; tandio; kivajo, fish/shrimps
Small nets, surface (drift) gill net, pelagics	Traps, basket (dema and towe), fish
	Traps, staked (uzio/wando), fish

There are 9 fisheries that are completely open access to fishers and 19 that require licenses for entry into the fishery. A further fishery's access is controlled by group decisions in the community. The remaining fisheries are illegal.

Fishery Name	Access control
Shore gathering, sandy shores, seagrass beds & gastropods/bivalves	Group decision
Shore gathering, rocky shores, mussels, ornamental shells	Licensing, None
Traps, staked (uzio/wando), fish	Licensing, None
Diving, gathering, sea cucumber	Licensing
Diving, hand/scoop net, ornamental fish	Licensing
Diving, lobster	Licensing
Hook & line, charter boat, gamefish	Licensing
Hook & line, handline, fish/sharks/rays	Licensing
Hook & line, longline, surface	Licensing
Hook & line, small boat and motor, sport	Licensing

Industrial nets, inshore, crustaceans	Licensing
Industrial nets, offshore, tuna	Licensing
Industrial nets, purse seine	Licensing
Shore gathering, intertidal, octopus	Licensing
Shore gathering, intertidal, sea cucumbers	Licensing
Small and large mesh nets, bottom gill net	Licensing
Small nets, hand/scoop net	Licensing
Small nets, surface (drift) gill net, pelagics	Licensing
Small nets, surrounding net (Zuwio)	Licensing
Traps, basket (dema and towe), fish	Licensing
Hook & line, handline, shore	None
Shore gathering, brittle stars, fish bait	None
Shore gathering, intertidal, crabs	None
Shore gathering, intertidal, sea cucumbers	None
Shore gathering, machete (mwenge), fish/squid	None
Shore gathering, mangroves, whelks (suka)	None
Shore gathering, seaweed, culture	None
Small nets, cast net, fish & squid	None
Small nets, mosquito/chandalua/tandio/kivajo, fish/shrimps	None
Diving, speargun & snorkel	Prohibition
Other, coral mining	Prohibition
Other, dynamite, fish	Prohibition
Shore gathering, sandy shores, turtles	Prohibition
Shore gathering, spear, fish	Prohibition
Small nets, beach seine, fish	Prohibition
Small nets, boat drag & seine (kavogo, kigumi)	Prohibition

There are a number of different types of fishing controls used in Tanzania including effort and gear restrictions (mesh sizes for nets), closed seasons, size limits and restrictions on harvesting of specific species, as well as the proclamation of no-take marine protected areas and limited take reserves. Traditional controls are used in the subsistence and artisanal fisheries.

Conflicts

Twenty-nine fisheries have some form of conflict, mostly with other fishers but also with managers and with developers.

Fishery Name	Conflict with other fishers	Conflict with management	Conflict with development
Diving, gathering, sea cucumber	Yes	Yes	Yes
Diving, lobster	Yes	Yes	Yes
Diving, speargun & snorkel	Yes	Yes	
Hook & line, handline, fish/sharks/rays	Yes		Yes
Hook & line, longline, surface	Yes	Yes	Yes
Industrial nets, inshore, crustaceans	Yes	Yes	Yes
Industrial nets, offshore, tuna	Yes	Yes	
Industrial nets, purse seine	Yes		Yes
Other, coral mining	Yes	Yes	Yes
Other, dynamite, fish	Yes	Yes	Yes
Shore gathering, brittle stars, fish bait	Yes	Yes	Yes
Shore gathering, intertidal, octopus	Yes	Yes	Yes
Shore gathering, intertidal, sea cucumbers	Yes	Yes	Yes
Shore gathering, machete (mwenge), fish/squid	Yes	Yes	Yes
Shore gathering, mangroves, whelks (suka)	Yes	Yes	Yes
Shore gathering, rocky shores, mussels, ornamental shells	Yes	Yes	Yes
Shore gathering, sandy shores, seagrass beds & gastropods/bivalves	Yes	Yes	Yes
Shore gathering, sandy shores, turtles	Yes	Yes	Yes
Shore gathering, seaweed, culture	Yes	Yes	Yes

Shore gathering, spear, fish	Yes	Yes	Yes
Small and large mesh nets, bottom gill net	Yes	Yes	
Small nets, beach seine, fish	Yes	Yes	Yes
Small nets, boat drag & seine (kavogo, kigumi)	Yes	Yes	Yes
Small nets, cast net, fish & squid	Yes	Yes	Yes
Small nets, mosquito/chandalua/tandio/kivajo, fish/shrimps	Yes	Yes	Yes
Small nets, surface (drift) gill net, pelagics	Yes	Yes	Yes
Small nets, surrounding net (Zuwio)	Yes	Yes	Yes
Traps, basket (dema and towe), fish	Yes	Yes	Yes
Traps, staked (uzio/wando), fish	Yes	Yes	Yes
Total	29	27	26

Food security

Most fishers in Tanzania rely on their fisheries for personal food security and parts of the catch are retained for consumption by them and their families.

Fishery Name	Food security
Diving, gathering, sea cucumber	Yes
Diving, speargun & snorkel	Yes
Hook & line, handline, fish/sharks/rays	Yes
Hook & line, handline, shore	Yes
Hook & line, longline, surface	Yes
Hook & line, small boat and motor, sport	Yes
Industrial nets, inshore, crustaceans	Yes
Industrial nets, purse seine	Yes
Other, dynamite, fish	Yes
Shore gathering, intertidal, crabs	Yes
Shore gathering, intertidal, octopus	Yes
Shore gathering, intertidal, sea cucumbers	Yes
Shore gathering, machete (mwenge), fish/squid	Yes
Shore gathering, mangroves, whelks (suka)	Yes
Shore gathering, rocky shores, mussels, ornamental shells	Yes
Shore gathering, sandy shores, seagrass beds & gastropods/bivalves	Yes
Shore gathering, spear, fish	Yes
Small and large mesh nets, bottom gill net	Yes
Small nets, beach seine, fish	Yes
Small nets, boat drag & seine (kavogo, kigumi)	Yes
Small nets, cast net, fish & squid	Yes
Small nets, hand/scoop net	Yes
Small nets, mosquito/chandalua/tandio/kivajo, fish/shrimps	Yes
Small nets, surface (drift) gill net, pelagics	Yes
Small nets, surrounding net (Zuwio)	Yes
Traps, basket (dema and towe), fish	Yes
Traps, staked (uzio/wando), fish	Yes
Diving, hand/scoop net, ornamental fish	No
Diving, lobster	No
Hook & line, charter boat, gamefish	No
Industrial nets, offshore, tuna	No
Other, coral mining	No
Shore gathering, brittle stars, fish bait	No
Shore gathering, sandy shores, turtles	No
Shore gathering, seaweed, culture	No

Value adding activities

Post-harvest processing is carried out on the catch of 21 fisheries and this processing includes salting and drying, chilling, freezing, gutting and packing among others. Ten fisheries have no post-harvest processing and four fisheries remain to be investigated.

Fishery Name	Value adding
Shore gathering, intertidal, sea cucumbers	Boiled
Shore gathering, mangroves, whelks (suka)	Boiled
Diving, gathering, sea cucumber	Boiled, Sun-dried, Whole gutted
Industrial nets, offshore, tuna	Filleting
Hook & line, charter boat, gamefish	On-ice, None
Industrial nets, purse seine	On-ice, Whole frozen
Industrial nets, inshore, crustaceans	Processed & packed, Whole frozen
Shore gathering, spear, fish	Salted, Sun-dried
Small nets, mosquito/chandalua/tandio/kivajo, fish/shrimps	Salted, Sun-dried
Traps, basket (dema and tow), fish	Salted, Sun-dried
Traps, staked (uzio/wando), fish	Salted, Sun-dried
Shore gathering, seaweed, culture	Sun-dried
Diving, lobster	Whole frozen
Hook & line, longline, surface	Whole frozen
Shore gathering, intertidal, octopus	Whole frozen
Shore gathering, rocky shores, mussels, ornamental shells	Whole frozen
Shore gathering, sandy shores, seagrass beds & gastropods/bivalves	Whole frozen
Small nets, hand/scoop net	Whole frozen
Shore gathering, intertidal, crabs	Whole frozen, None
Hook & line, handline, fish/sharks/rays	Whole gutted
Small nets, beach seine, fish	Whole gutted
Diving, hand/scoop net, ornamental fish	None
Hook & line, small boat and motor, sport	None
Other, coral mining	None
Other, dynamite, fish	None
Shore gathering, brittle stars, fish bait	None
Small and large mesh nets, bottom gill net	None
Small nets, boat drag & seine (kavogo, kigumi)	None
Small nets, cast net, fish & squid	None
Small nets, surface (drift) gill net, pelagics	None
Small nets, surrounding net (Zuwio)	None
Diving, speargun & snorkel	Unknown
Hook & line, handline, shore	Unknown
Shore gathering, machete (mwenge), fish/squid	Unknown
Shore gathering, sandy shores, turtles	Unknown

Markets

Thirty fisheries supply their catches to various markets. Most supply local markets, restaurants and hotels while others supply to export markets as well as the domestic markets. Three fisheries provide their catches solely for the export markets.

Fishery Name	Middleman				Fish		
	Domestic	Restaurants	Hotels	trader	processor	Industrial	Export
Diving, gathering, sea cucumber							Yes
Diving, hand/scoop net, ornamental fish			Yes				Yes
Diving, lobster		Yes	Yes	Yes			
Diving, speargun & snorkel		Yes	Yes	Yes			
Hook & line, handline, fish/sharks/rays	Yes	Yes	Yes	Yes			
Hook & line, longline, surface	Yes	Yes	Yes				Yes
Industrial nets, inshore, crustaceans	Yes	Yes	Yes	Yes	Yes		Yes

Industrial nets, offshore, tuna		Yes					
Industrial nets, purse seine	Yes	Yes	Yes	Yes			
Other, coral mining	Yes						
Other, dynamite, fish	Yes						
Shore gathering, intertidal, crabs	Yes		Yes	Yes			Yes
Shore gathering, intertidal, octopus	Yes	Yes	Yes	Yes			Yes
Shore gathering, intertidal, sea cucumbers							Yes
Shore gathering, machete (mwenge), fish/squid	Yes						
Shore gathering, mangroves, whelks (suka)	Yes						
Shore gathering, rocky shores, mussels, ornamental shells	Yes	Yes	Yes				
Shore gathering, sandy shores, seagrass beds & gastropods/bivalves	Yes	Yes	Yes				
Shore gathering, seaweed, culture							Yes
Shore gathering, spear, fish	Yes	Yes	Yes				
Small and large mesh nets, bottom gill net	Yes	Yes	Yes				
Small nets, beach seine, fish	Yes	Yes	Yes				
Small nets, boat drag & seine (kavogo, kigumi)	Yes	Yes		Yes			
Small nets, cast net, fish & squid	Yes	Yes	Yes	Yes			
Small nets, hand/scoop net	Yes						
Small nets, mosquito/chandalua/tandio/kiv ajo, fish/shrimps	Yes						
Small nets, surface (drift) gill net, pelagics	Yes	Yes	Yes				
Small nets, surrounding net (Zuwio)	Yes	Yes	Yes	Yes			
Traps, basket (dema and towe), fish					Yes		
Traps, staked (uzio/wando), fish	Yes						

Alternate livelihoods

All fishers have more than one source of income except for three where this information is unavailable.

Fishery Name	Alternative incomes
Industrial nets, offshore, tuna	Fisheries
Shore gathering, seaweed, culture	Fisheries
Diving, gathering, sea cucumber	Fisheries & non-fisheries
Diving, lobster	Fisheries & non-fisheries
Diving, speargun & snorkel	Fisheries & non-fisheries
Hook & line, handline, fish/sharks/rays	Fisheries & non-fisheries
Hook & line, handline, shore	Fisheries & non-fisheries
Hook & line, longline, surface	Fisheries & non-fisheries
Industrial nets, purse seine	Fisheries & non-fisheries
Other, coral mining	Fisheries & non-fisheries
Other, dynamite, fish	Fisheries & non-fisheries
Shore gathering, brittle stars, fish bait	Fisheries & non-fisheries
Shore gathering, intertidal, crabs	Fisheries & non-fisheries

Shore gathering, intertidal, octopus	Fisheries & non-fisheries
Shore gathering, intertidal, sea cucumbers	Fisheries & non-fisheries
Shore gathering, machete (mwenge), fish/squid	Fisheries & non-fisheries
Shore gathering, mangroves, whelks (suka)	Fisheries & non-fisheries
Shore gathering, rocky shores, mussels, ornamental shells	Fisheries & non-fisheries
Shore gathering, sandy shores, seagrass beds & gastropods/bivalves	Fisheries & non-fisheries
Shore gathering, spear, fish	Fisheries & non-fisheries
Small and large mesh nets, bottom gill net	Fisheries & non-fisheries
Small nets, beach seine, fish	Fisheries & non-fisheries
Small nets, boat drag & seine (kavogo, kigumi)	Fisheries & non-fisheries
Small nets, cast net, fish & squid	Fisheries & non-fisheries
Small nets, hand/scoop net	Fisheries & non-fisheries
Small nets, surface (drift) gill net, pelagics	Fisheries & non-fisheries
Small nets, surrounding net (Zuwio)	Fisheries & non-fisheries
Traps, basket (dema and towe), fish	Fisheries & non-fisheries
Traps, staked (uzio/wando), fish	Fisheries & non-fisheries
Hook & line, small boat and motor, sport	Non-fisheries
Industrial nets, inshore, crustaceans	Non-fisheries
Small nets, mosquito/chandalua/tandio/kivajo, fish/shrimps	Non-fisheries
Diving, hand/scoop net, ornamental fish	Unknown
Hook & line, charter boat, gamefish	Unknown
Shore gathering, sandy shores, turtles	Unknown

Gender

Women are the sole participants in two fisheries and outnumber men in another four fisheries. Their participation equals that of men in four fisheries. All remaining fisheries are operated by men only.

Fishery Name	Women involved in fisheries
Shore gathering, mangroves, whelks (suka)	Women only
Small nets, mosquito/chandalua/tandio/kivajo, fish/shrimps	Women only
Shore gathering, seaweed, culture	Women outnumber men 9 to 1
Shore gathering, intertidal, sea cucumbers	Women outnumber men 3 to 1
Shore gathering, rocky shores, mussels, ornamental shells	Women outnumber men 3 to 1
Shore gathering, sandy shores, seagrass beds & gastropods/bivalves	Women outnumber men 3 to 1
Hook & line, charter boat, gamefish	Equal numbers of women and men
Shore gathering, brittle stars, fish bait	Equal numbers of women and men
Shore gathering, intertidal, crabs	Equal numbers of women and men
Shore gathering, intertidal, octopus	Equal numbers of women and men
Diving, gathering, sea cucumber	None
Diving, hand/scoop net, ornamental fish	None
Diving, lobster	None
Diving, speargun & snorkel	None
Hook & line, handline, fish/sharks/rays	None
Hook & line, handline, shore	None
Hook & line, longline, surface	None
Hook & line, small boat and motor, sport	None
Industrial nets, inshore, crustaceans	None
Industrial nets, offshore, tuna	None
Industrial nets, purse seine	None
Other, coral mining	None
Other, dynamite, fish	None
Shore gathering, machete (mwenge), fish/squid	None
Shore gathering, sandy shores, turtles	None
Shore gathering, spear, fish	None
Small and large mesh nets, bottom gill net	None
Small nets, beach seine, fish	None
Small nets, boat drag & seine (kavogo, kigumi)	None

Small nets, cast net, fish & squid	None
Small nets, hand/scoop net	None
Small nets, surface (drift) gill net, pelagics	None
Small nets, surrounding net (Zuwio)	None
Traps, basket (dema and towe), fish	None
Traps, staked (uzio/wando), fish	None

Score sheet

The score sheets for all 35 fisheries have been combined and the contribution of each fishery's score (Unknown, No/None/Nil, Few/Poor, Average/Medium, High/Good, Yes/Comprehensive) according to the individual fishery aspects covered by the score sheet has been graphically produced as a percentage of the total. For example, for Catch composition data 3% of fisheries had Unknown, 0% had No/None/Nil, 11% had Few/Poor, 46% had Average/Medium, 37% had High/Good and 3% had Yes/Comprehensive as their answers to the question of *How reliable is species composition data?*

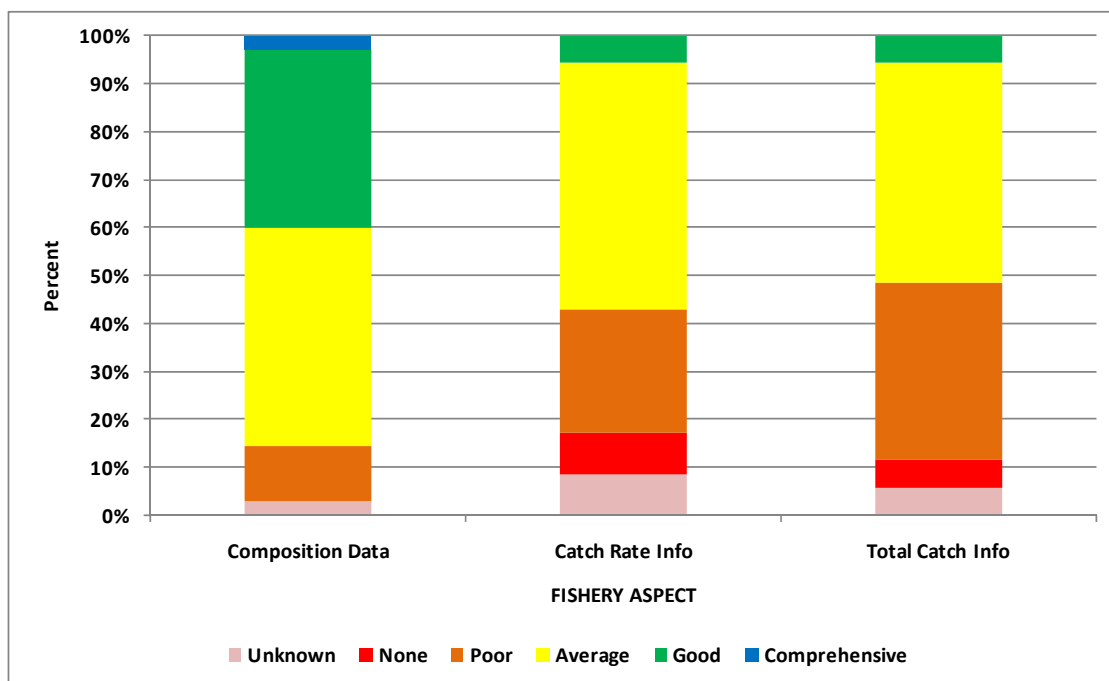
Catch information

Questions asked in this section were:

How reliable is species composition data?

How adequate is catch rate information?

How adequate is total catch information?



Bycatch, seasonality and sustainability

These questions include:

What is the overall level of bycatch?

Rate the bycatch problem?

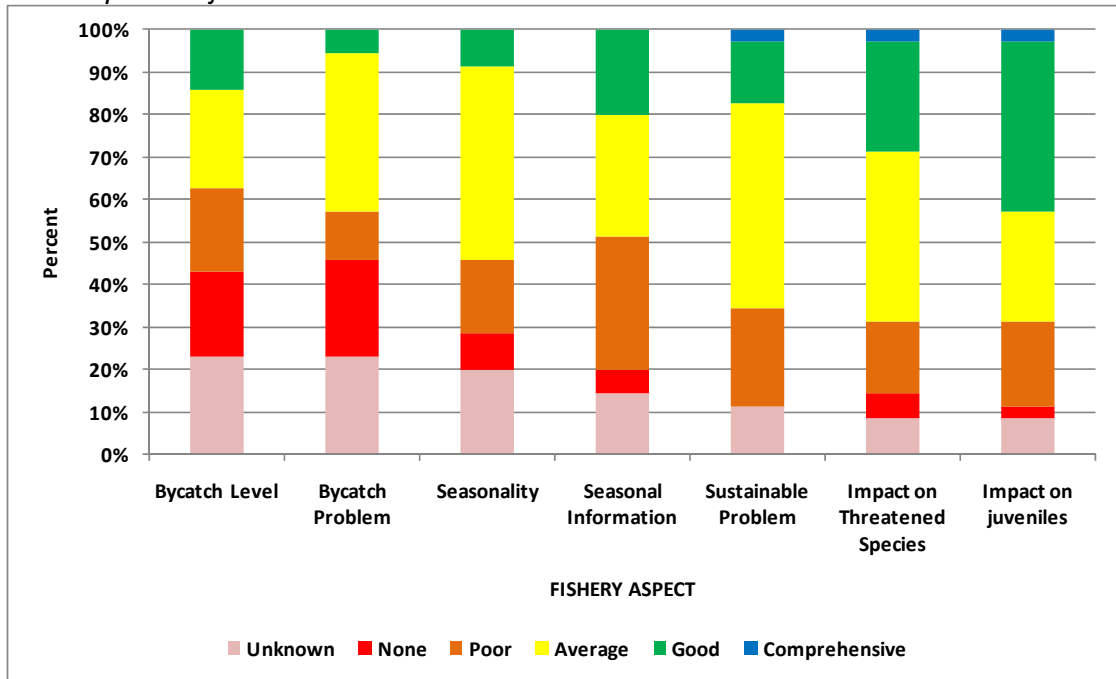
How seasonal is the fishery?

How adequate is seasonal information?

Rate the sustainability problem.

What is the impact on threatened species?

What is the impact on juveniles?



Management (Part 1)

This includes:

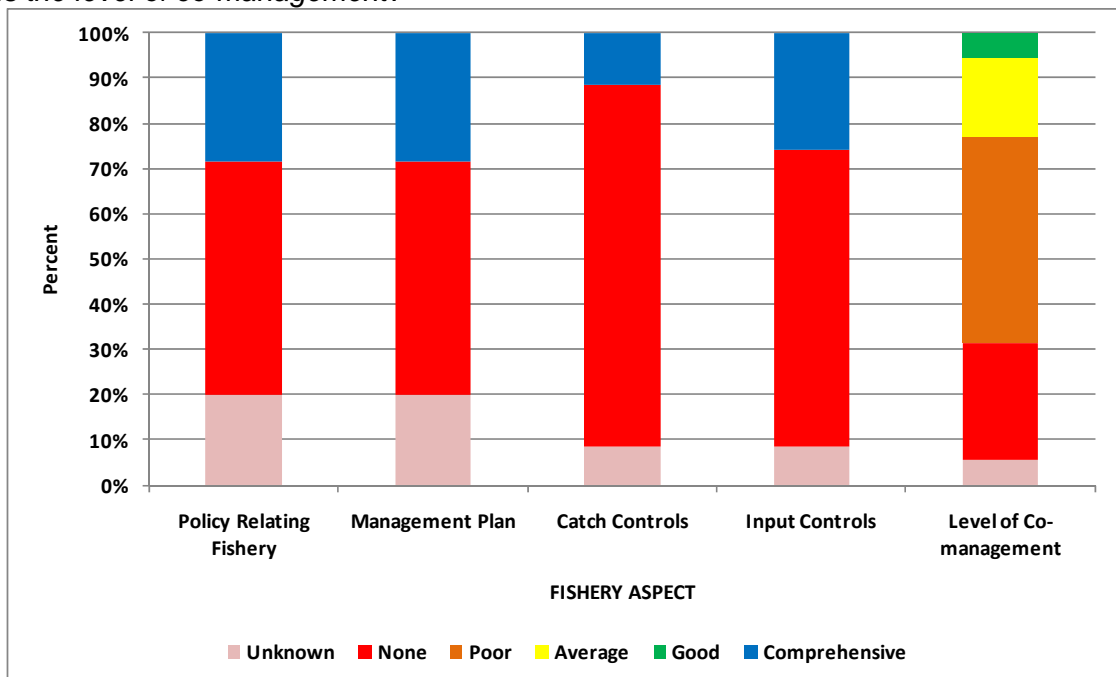
Is there a specific policy relating to this fishery?

Is there a specific management plan for this fishery?

Are there any catch controls?

Are there any input controls?

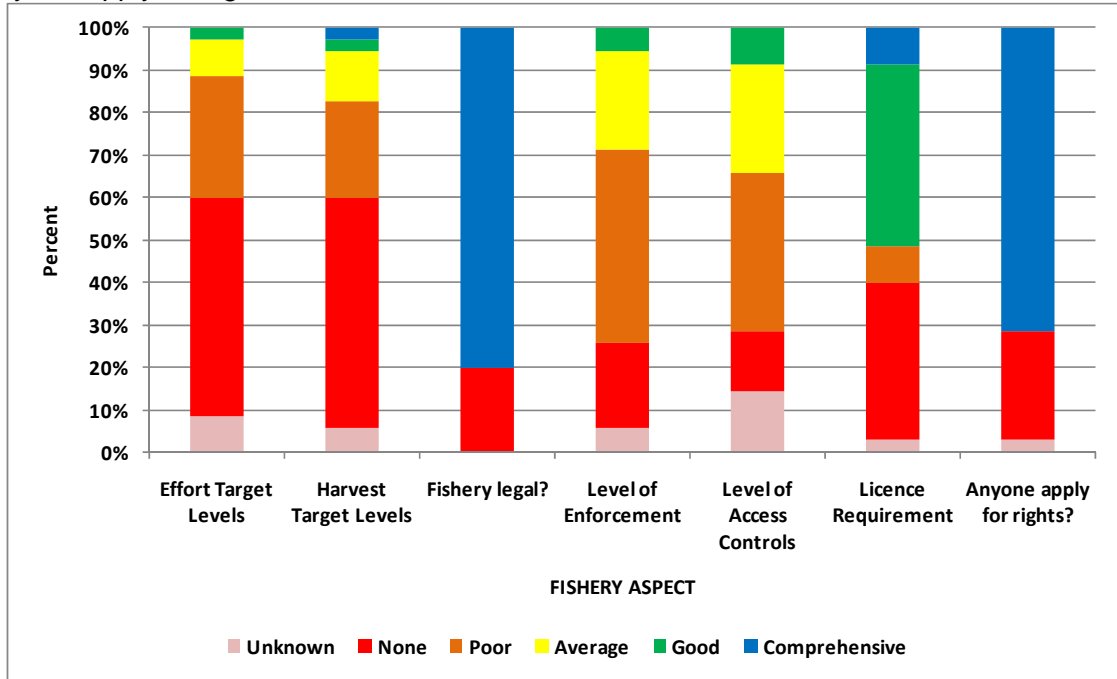
What is the level of co-management?



Management (Part 2)

This includes:

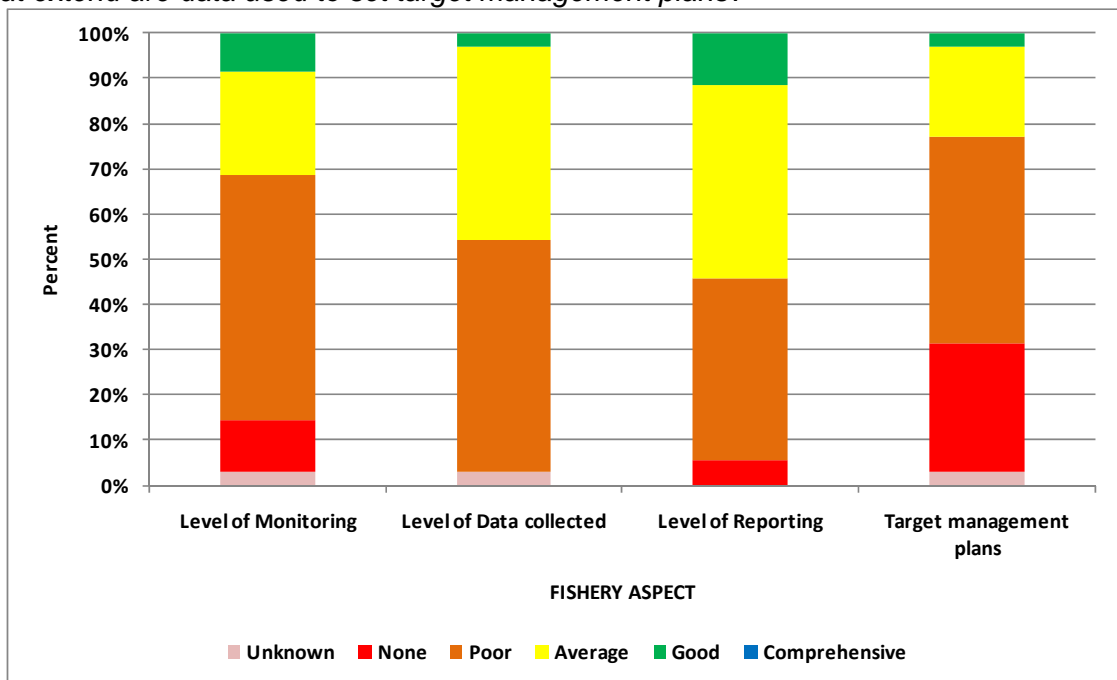
- Is there any setting of effort target levels?
- Is there any setting of harvest target levels?
- Is this fishery legal?
- What is the level of enforcement?
- What is the level of access control?
- What is the level of licence requirements?
- Can anyone apply for rights?



Monitoring

Options are:

- What is the level of monitoring?
- What is the level of data collected?
- What is the level of reporting?
- To what extent are data used to set target management plans?



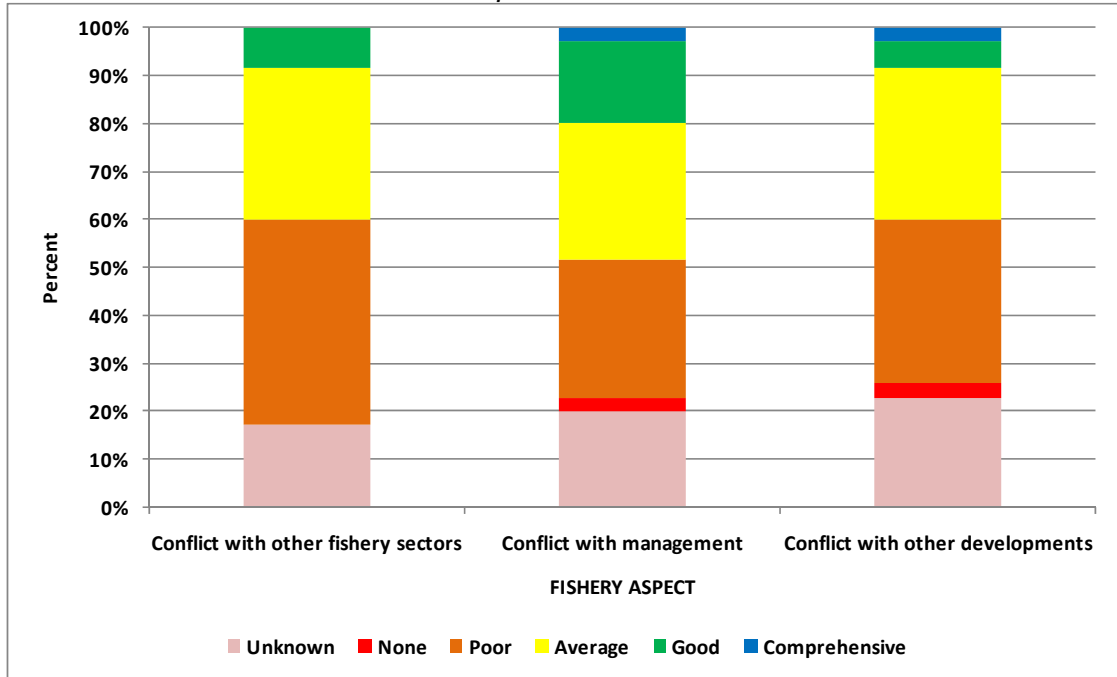
Conflicts

This section requires the following questions answered:

What is the level of conflict with other fisheries?

What is the level of conflict with management?

What is the level of conflict with other developments?



Research

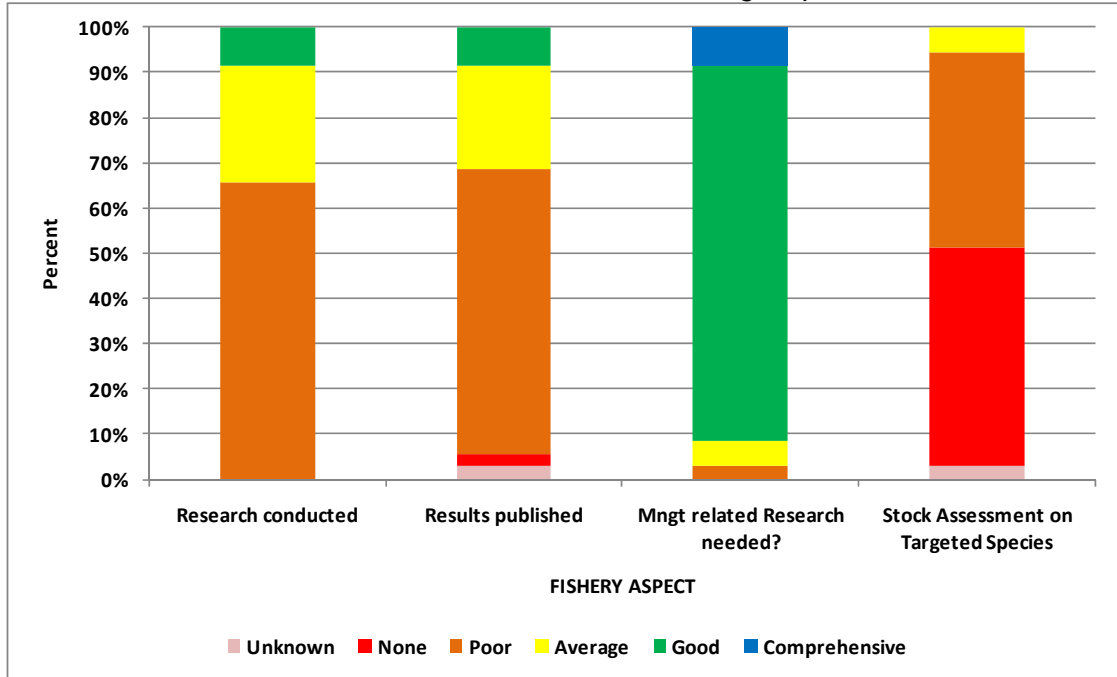
These questions are:

What is the level of research conducted into this fishery?

What is the level of research results published?

What is the current need for management related research?

To what extent have stock assessments been conducted on target species?



References

A list of authors and titles are provided below with the fisheries that utilised these references. For more complete bibliographic details please refer to the fisheries and references on the WIOFish database at www.wiofish.org.za.

Author	Title	Fishery Name
Abdallah, A.M	Managment of the Commercial Prawn Fishery in Tanzania	Industrial nets, inshore, crustaceans
ACDI/VOCA SEEGAAD	Sub sector and value chain analysis for mud crabs, Tanga coastal belt	Shore gathering, intertidal, crabs
Akil, J. & Jiddawi, N.S.	Preliminary observation of flora and fauna of Jozani pete mangrove creek in Zanzibar., Tanzania.	Shore gathering, mangroves, whelks (suka)
Amir, O. A.	Biology, ecology and anthropogenic threats of Indo-Pacific bottlenose dolphins in east Africa	Small nets, surface (drift) gill net, pelagics
		Small and large mesh nets, bottom gill net
Amir, O. A., Berggren, P. and Jiddawi, N. S.	The Incidental Catch of Dolphins in Gillnet Fisheries in Zanzibar, Tanzania	Small nets, surface (drift) gill net, pelagics
		Small and large mesh nets, bottom gill net
Amir, O.A.	The length weight relationships of selected fish species caught along Mizingani coast and Mapopwe creek in Chwaka Bay, Zanzibar.	Small nets, beach seine, fish
Barnett, R.	The shark trade in mainland Tanzania and Zanzibar. : The world trade in sharks: a compendium of traffics regional studies. Vol 1.	Industrial nets, offshore, tuna
		Small nets, surface (drift) gill net, pelagics
		Hook & line, charter boat, gamefish
		Hook & line, small boat and motor, sport
Benno, B.L.	Some features of the beach seine fishery along the coast of Dar es Salaam, Tanzania.	Small nets, beach seine, fish
Berachi, I.G.	Bio-economic analysis of artisanal marine fisheries of Tanzania (mainland).MSc thesis	Industrial nets, inshore, crustaceans
Bwathondi, P.O.J. & Mwaya	The fishery of crustacea and molluscs in Tanzania	Diving, lobster
Bwathondi, P.O.J., Bayona, J.D.R. & Makwaia, E.D.S.	Assessment of the current status of the coral reef fishery and the impact of dynamite to the resources along the Dar es Salaam coast. In: Investigations related to the Protection and Conservation of Coastal Marine Resources in the Dar es Salaam Area.	Other, coral mining
Bwathondi, P.O.J., Chande, A.I., Bayona, J.D.R., Mhitu, H.A., Mwakosya, C.A., Shayo, D., Kulekana, J.	Investigation of prawn abundance and distribution in Bagomoyo and Rufiji areas.	Industrial nets, inshore, crustaceans
Chan, T.T.C. & Sadovy, Y.	Profile of the marine aquarium fish trade in Hong Kong.	Diving, hand/scoop net, ornamental fish
Chande, A. Nikundiwe, A. & Kyomo, A.	The status of the crab fishery at Mzinga Creek, Dar es Salaam.	Shore gathering, intertidal, crabs
Chando, D.B.	Gear modification to reduce by-catch in the Tanzanian shrimp fishery.	Industrial nets, inshore, crustaceans
Clark, F. & Khatib, A.S.A.	Sea turtles in Zanzibar. A preliminary study.	Shore gathering, sandy shores, turtles
Clelland, B.E.	Sardine Investigations.	Small nets, surrounding net (Zuwio)
		Small nets, hand/scoop net

Coleman, E.	Women of Nungwi and their contribution to economic development. Independent study project report. SIT Coastal ecology. IMS/SIT reports.	Small nets, mosquito/chandalua/tandio/kivajo, fish/shrimps
		Shore gathering, sandy shores, seagrass beds & gastropods/bivalves
Coleson, J. & Jiddawi, N.S.	The Sea cucumbers of Zanzibar.	Shore gathering, intertidal, sea cucumbers
Conand, C., Muthiga, N., Aumeeruddy, R., De la Torre Castro, M., Frouin, P., Mgaya, Y., Mirault, E., Ochiewo, J., Rasolofonirina, R.,	A three-year project on sea cucumbers in the southwestern Indian Ocean: National and regional analyses to improve management.	Shore gathering, intertidal, sea cucumbers
		Diving, gathering, sea cucumber
Darwall, W.R.T.	Island. Marine Biology and Resource Use Surveys in the Songo Songo Archipelago. Frontier-Tanzania Marine Research Programme.	Diving, gathering, sea cucumber
Darwall, W.R.T.	The Mafia Island Marine Park Shark and Ray Project: current status and associated problems.	Small nets, surface (drift) gill net, pelagics
Drake-Lee, V.	An analysis of the data collected for the two shark fisheries in the proposed Mafia Island Marine Park, Tanzania, with regard to its importance to management within the proposed park area.	Small nets, surface (drift) gill net, pelagics
Dulvy, N.K., Stanwell-Smith, D., Darwall, W.R.T and Horrill, C.J.	Coral mining at Mafia Island, Tanzania: A management dilemma	Other, coral mining
Fisheries Division	Fisheries Frame survey for Tanzania (Mainland), 2007	Hook & line, longline, surface
Fisheries Division	The frame survey report Tanzania (Mainland).	Traps, basket (dema and towe), fish
Frazier, J.	Sea turtle in Tanzania.	Shore gathering, sandy shores, turtles
Gorman, M.	Report on Socio-Economic Study / Participatory Rural Appraisal.	Hook & line, handline, fish/sharks/rays
Guard, M. & Mgaya, Y.	The artisanal fishery for octopus <i>Cyanea gray</i> in Tanzania.	Shore gathering, intertidal, octopus
Hall, D.N.F.	A note on the Zanzibar rock lobster fishery. Ann. Rep. EAMFRO 32-8.	Diving, lobster
Hatchell, G.W.	Sea fishing on the Tanganyika coast.	Hook & line, handline, shore
Hatchell, G.W.	Some notes on fishing near Tanga.	Hook & line, handline, shore
Horrill, J.C., Darwall, W.R.T. & Ngoile, M.	Development of a marine protected area: Mafia Island, Tanzania.	Diving, gathering, sea cucumber
		Hook & line, handline, fish/sharks/rays
		Hook & line, small boat and motor, sport
		Small nets, boat drag & seine (kavogo, kigumi)
Horrill, J.C., Seif, I., Ameir, O.A., Omar, S.H., Machano, H., Khatib, A.A., Omar, M. & Kibwana, I.	Baseline monitoring survey of the coral reefs and fisheries of the Fumba peninsula, Zanzibar.	Other, coral mining
Horst, N.	The status of Madema (basket trap fishing) on Tumbatu island, Zanzibar	Traps, basket (dema and towe), fish
Institute of Marine Sciences	Mafia Island Marine Park: general management plan. Compiled for the Department of fisheries by IMS, Zanzibar in conjunction with WWF (UK):	Small nets, mosquito/chandalua/tandio/kivajo, fish/shrimps
Jiddawi, N.S and M.S. Shehe,	Status of shark fishery in Zanzibar, East Africa: a case study.	Small nets, surface (drift) gill net, pelagics

Jiddawi, N.S. and R. Stanley	A study of the traditional fishery sector of two villages, Matemwe and Mkokotoni, Zanzibar, Tanzania	Traps, staked (uzio/wando), fish
Jiddawi, N.S.	A peaceful struggle. Women involvement in fishing activities. Production. Producer, Research and Script.	Small nets, mosquito/chandalua/tandio/kivajo, fish/shrimps
Jiddawi, N.S.	Age, growth, reproductive biology and fishery of <i>Rastrelliger kanagurta</i> in Zanzibar, East Africa.	Industrial nets, purse seine
		Small nets, surrounding net (Zuwio)
		Small nets, hand/scoop net
Jiddawi, N.S.	Spat settlement of the oyster, <i>Crassostrea cucullata</i> (Bonn 1778) in Zanzibar.	Shore gathering, sandy shores, seagrass beds & gastropods/bivalves
Jiddawi, N.S.	Status of the fishery resources of Chwaka bay. In The ecology and socio economy of Chwaka bay.	Small nets, cast net, fish & squid
Jiddawi, N.S.	The purse seine fishery of Zanzibar.	Small nets, surrounding net (Zuwio)
Jiddawi, N.S.	The reef-dependent fisheries of Zanzibar.	Other, coral mining
		Small nets, boat drag & seine (kavogo, kigumi)
Jiddawi, N.S. & Khatib, H.	The fisheries frame survey of Zanzibar.	Traps, basket (dema and towe), fish
Jiddawi, N.S. & Muhando, C.	Summary of marine resources in Zanzibar.	Shore gathering, rocky shores, mussels, ornamental shells
Jiddawi, N.S. & Ngazy, Y.	A gift from the ocean. The impact of seaweed farming to the livelihood of the people of Zanzibar.	Shore gathering, seaweed, culture
Jiddawi, N.S. & Stanley, R.D. eds	Fisheries stock assessment in the traditional fishery sector: The information needs.	Diving, gathering, sea cucumber
		Traps, staked (uzio/wando), fish
		Hook & line, handline, shore
		Shore gathering, spear, fish
Jiddawi, N.S., Yahya S.A.S. and S. Aniyar	A PARFish assessment of the handline, basket trap and mangrove crab fishery of Chwaka Bay	Shore gathering, intertidal, crabs
Kamukuru, A.T.	Trap fishery with notes on Reproductive biology of a white spotted rabbitfish, <i>Siganus sutor</i> (Siganidae) in Dar es Salaam Reserves, Tanzania	Traps, basket (dema and towe), fish
Kayombo, N.A. & Mainoya, J.R.	Cockles harvesting on the Dar es Salaam coast: A fishery relegated to women and children.	Shore gathering, sandy shores, seagrass beds & gastropods/bivalves
Kiszka J, Muir C, Poonian C, Cox TM, Amir OA, Bourjea J, Razafindrakoto R, Wambiji N, Bristol N.	Marine mammal bycatch in the Southwest Indian Ocean: Review and need for a comprehensive status assessment	Small nets, surface (drift) gill net, pelagics
		Small and large mesh nets, bottom gill net
Kithakeni, T.M.	The ecology and distribution of holothuria along the coast of Dar es salaam.	Diving, gathering, sea cucumber
Knox, D.	The status of the large pelagic fisheries in Nungwi. SIT Coastal ecology.	Hook & line, longline, surface
		Small nets, surface (drift) gill net, pelagics
Lawley, S.L.	The status of Madema fishery operating from Juani Island, and the marine impacts resulting as a consequence of the Mafia Island Marine Protected Area.	Traps, basket (dema and towe), fish
Losse, G.F.	Fishes taken by pulse-seine and dipnet in the Zanzibar Channel.	Small nets, hand/scoop net
Mahange, J. & Machum, E.	Co management of sea turtle in Manzi Bay Marine Park.	Shore gathering, sandy shores, turtles
Mahika,C.G., Mhitu, H. & Kuboja, B.	Rapid assessment of abundance and biomass of the mangrove crab (<i>Scylla serrata</i> L.) and its mariculture development on the Tanga Coast.	Shore gathering, intertidal, crabs
Makwaia, E.D.S. & Nhwani, L.B.	Population parameters of <i>Sardinella</i> species in the coastal waters of Dar es Salaam, Tanzania.	Industrial nets, purse seine

Marshall, N.T., Milledge, S.A.H & Afonso, P.S. (eds)	Stormy seas for marine invertebrates. Trade in Sea cucumbers and lobsters in Kenya, Tanzania and Mozambique.	Shore gathering, intertidal, sea cucumbers
		Diving, lobster
		Diving, gathering, sea cucumber
McClanahan, T.R. & Obura, D.	Coral reefs and nearshore fisheries. In (McClanahan, T.R. & Young, T.P. eds.) 1996.	Other, coral mining
Mckittrick, E.	Finfish, mollusc and crustacean fisheries in the mangrove intertidal zone of a small Zanzibari Village.	Shore gathering, machete (mwenge), fish/squid
Mgaya, Y.D	Experimental spat collecting of the edible oyster, <i>Saccostrea cucullata</i> Born (Bivalvia) in the Kunduchi Creek, Dar es Salaam	Shore gathering, sandy shores, seagrass beds & gastropods/bivalves
Mgimwa, F.,Y.D. Mgaya and M.A.K. Ngoile	Dynamics of dema trap finfish in the coastal waters of Zanzibar.	Traps, basket (dema and towe), fish
Mhitu, H. and Jiddawi, N.S.	The octopus fishery in Matemwe and Mkokotoni, Zanzibar.	Shore gathering, intertidal, octopus
Ministry of Livestock Development and Fisheries	Annual statistics Report	Hook & line, handline, fish/sharks/rays
		Traps, basket (dema and towe), fish
		Shore gathering, intertidal, octopus
		Diving, speargun & snorkel
		Hook & line, longline, surface
Mmochi, A.J; Tobey, J; Jiddawi, N; Masalu, DCP:	Establishing the status of the environment and environmental change in Tanzania coastal waters	Other, coral mining
Morgan, J. F	Ecological aspects of demersal tropical fishes off East Africa.	Small and large mesh nets, bottom gill net
Morris, R.E	Demersal fisheries investigations. 1972, pp. 17-19.	Small and large mesh nets, bottom gill net
Morris, R.E.	Discussions on demersal fisheries.	Small and large mesh nets, bottom gill net
Msumi, G.D	Changes in relative abundance of demersal fishes in the Zanzibar Channel, Tanzania.	Small and large mesh nets, bottom gill net
Msumi, G.D	Estimating relative abundances of demersal fishes in the Zanzibar Channel, March-December 1984. .	Small and large mesh nets, bottom gill net
Msuya, F., Ngoile, M. and Shunula, J.P.	Environmental impact of seaweed farming in Zanzibar.	Shore gathering, seaweed, culture
Muhando, C. A. and Jiddawi, N.S.	Fisheries resources of Zanzibar. Problems and recommendations.	Shore gathering, rocky shores, mussels, ornamental shells
		Small nets, beach seine, fish
Mutagyera, W.B.	A preliminary report on the rock lobster fishery of Zanzibar	Diving, lobster
Mwaiseje, B.,	The potential for non-conventional fisheries in Tanzania.	Shore gathering, sandy shores, seagrass beds & gastropods/bivalves
Mwakosya C.A.	Assessment of Tanzanian prawn fishery resources	Industrial nets, inshore, crustaceans
Myers, A.,	Artisanal fishing in the mangrove intertidal. Two methods in a rural village on Unguja. SIT Coastal ecology.	Shore gathering, mangroves, whelks (suka)
		Shore gathering, machete (mwenge), fish/squid
		Traps, staked (uzio/wando), fish
Ndawula, L.M	Food and feeding habits of <i>Rastrelliger kanagurta</i> in East Africa.	Industrial nets, purse seine
Ngoile, M.A.K	A review of the demersal fishery of Tanzania.	Small and large mesh nets, bottom gill net
Ngoile, M.A.K. & J.P. Shunula,	Status and exploitation of the mangrove and associated fishery resources in Zanzibar.	Shore gathering, mangroves, whelks (suka)
Ngowo R	Population status of <i>Anadara antiquata</i> in no take zones in Zanzibar	Shore gathering, sandy shores, seagrass beds & gastropods/bivalves

Ngowo, R., Jiddawi, N., Crawford, B. and Mmochi A. J.	Management Plan for the Cockle Fishery on the Fumba Peninsular	Shore gathering, sandy shores, seagrass beds & gastropods/bivalves
Nhwani, L.B.	Pelagic fish resources of East Africa.	Hook & line, small boat and motor, sport
Nhwani, L.B. & D.B.R. Chitamwebw	Surveys of exploitable stocks of small pelagic fishes in the Tanzania waters of Lake Tanganyika and the Indian Ocean.	Small nets, hand/scoop net
Nhwani, L.B.,	The exploitation of sardines in Zanzibar.	Industrial nets, purse seine
Nhwani, L.B., Mwaiko, S.P., Chande, A.I., Mwamsojo, G.U. and H.A. Mhithu	Crustacea resource assessment in Rufiji and by-catch studies of prawn trawlers.	Industrial nets, inshore, crustaceans
		Shore gathering, intertidal, crabs
Nhwani, L.B. and E.D. Makwai	The biology and fishery potential of small pelagic fishes of Tanzania.	Small nets, hand/scoop net
Okera, W	An analysis of the features of <i>Sardinella gibbosa</i> (Bleeker) scales with special reference to the problem of age determination.	Small nets, hand/scoop net
Richmond, M.D.	A guide to the sea shores of Africa and the western Indian ocean islands	Shore gathering, rocky shores, mussels, ornamental shells
		Shore gathering, brittle stars, fish bait
		Shore gathering, sandy shores, seagrass beds & gastropods/bivalves
Richmond, M.D. and G.R. Mganwa	Matemwe fishing cooperatives monitoring programme.	Small nets, surface (drift) gill net, pelagics
		Hook & line, longline, surface
Scheinman, D. & Mabrook, A.	The traditional management of coastal resources. Tanga Coastal Zone Conservation and Development Programme, Tanga, Tanzania:	Shore gathering, spear, fish
Scullion, J.	Assessment of the coastal pelagic fish resources of Lindi and Mtwara regions, Tanzania, 1983-1988. Final report to ODA	Hook & line, small boat and motor, sport
Semesi, A.K., Mgaya, Y.D., Muruke, M.H.S., Msumi, G, Francis, J. and Mtolera, M.	Coastal Resource Utilization and Conservation Issues in Bagamoyo, Tanzania.	Diving, gathering, sea cucumber
		Small nets, mosquito/chandalua/tandio/kivajo, fish/shrimps
Semesi, A.	Developing a management plan for the mangrove ecosystem reserves of Tanzania.	Shore gathering, mangroves, whelks (suka)
Siegel, P.R.,	The exploitation of crustacean resources of Tanzanian mangrove habitats.	Shore gathering, intertidal, crabs
Smith, J.	Matemwe fishing cooperatives Report No.2 Analysis of the operation at sea.	Small nets, surface (drift) gill net, pelagics
Steinhof, H.	Womens fishing activities in Nungwi, Zanzibar.	Shore gathering, intertidal, octopus
		Small nets, mosquito/chandalua/tandio/kivajo, fish/shrimps
Subramaniam, S	Chwaka bay (Zanzibar, East Africa) as a nursery ground for Penaeid prawns.	Small nets, cast net, fish & squid
SWIOP (ed)	Proceedings of the workshop on the management of the shallow water shrimp fishery of Tanzania	Traps, staked (uzio/wando), fish
		Industrial nets, inshore, crustaceans
Teikwa, E. D and Mgaya, Y. D.	Abundance and Reproductive biology of Penaeid prawns of Bagamoyo Coastal waters, Tanzania	Industrial nets, inshore, crustaceans
Van Nierop, M. and L.B. Nhwani,	Growth parameters of the gold stripe sardinella (<i>Sardinella gibbosa</i>), the spotted sardinella (<i>Amblygaster sirm</i>) and the Indian mackerel (<i>Rastrelliger kanarguta</i>) from Zanzibar waters.	Small nets, hand/scoop net

von Bonde, C.	A collection of marine fishes from Zanzibar Island.	Hook & line, handline, shore
Wenban-Smith, H.B.	The coastal fisheries near Dar Es Salaam.	Shore gathering, spear, fish
Williams, F	Deepwater fishing off the Kenya Coast. EAMFRO	Hook & line, charter boat, gamefish
Williams, F.	A preliminary report on deepwater fishing off the North Kenya coast.	Hook & line, charter boat, gamefish
Williams, F.	Fishes of the family Carangidae in British East African waters.	Hook & line, small boat and motor, sport
		Industrial nets, purse seine
Williams, F.	Preliminary survey of the pelagic fishes of East Africa.	Hook & line, longline, surface
		Hook & line, charter boat, gamefish
Williams, F.,	The scombroid fishes of East Africa. Proceedings of the symposium on scombroid fishes.	Hook & line, charter boat, gamefish
Williams,F.	The barracudas (genus <i>Sphyraena</i>) in British East African waters.	Hook & line, charter boat, gamefish
Yahya, S.	Reproductive biology and some aspects of the ecology of the octopus <i>Cyanea</i> (Gray, 1849) in Zanzibar.	Shore gathering, intertidal, octopus

DISCUSSION

This document merely provides an overview of information that is available from the WIOFish Database system. Much greater detail, various permutations and analyses can be made using the system online. The underlying descriptions and definitions of each parameter and fishery are also best sourced from the website.

One of the objectives of WIOFish is to highlight areas where gaps occur in the available information about the various fisheries. This provides managers and researchers with the opportunity to develop targeted research strategies to fill such gaps. It also assists funders and donors to make informed decisions about whether and where there is a need to support research and management interventions. These gaps can be seen clearly on the graphs produced from the score sheets.

It is noticeable from the graphs on catch information that the reliability and adequacy of this information is generally poor and at best average. These small-scale WIO fisheries harvest a large variety of species and catch reporting is often done at a family level instead of species level. Furthermore, catches are more comprehensively collected at easily accessible landing sites while the remote sites are either infrequently monitored or no monitoring takes place at all. This may partly explain the statement that WIO coastal fisheries have low productivity due to under-reporting rather than due to any other natural/physical characteristics of the region.

Socio-economic data is poorly documented and the WIOFish database is gradually accumulating such information on the fisheries already described. In many cases, this aspect requires investigation to ascertain if such data exist and are merely in the custody of other organisations not previously consulted or whether there is indeed a need to research this aspect of the fisheries more fully. The encouragement of the national nodes to source these data fulfils another aim of the database to widen the network of collaboration between researchers in the various countries and the region as a whole, bringing many varied disciplines together to ensure the sustainability of these fisheries.

One of the most important aspects of WIOFish is the assessment of trends over time, and especially changes over the baseline established in 2000 during its first year of data assessment. There are many targets and goals that rely on long-term data systems. One of the most important, links to the Millennium Development Goals (MDGs), specifically for fisheries. Based on the WIOFish system the following indicators can be tracked over time.

Sustainability	Socio-economic	Management	IUU	Science
Stock status Bycatch Species Destructive gear	Levels of subsidy Gender levels Food security	Policy in place Management plan Access Enforcement	Levels of reporting Illegal fisheries?	Level of science Application of data Publications

Based on the first nine years of WIOFish, some positive conclusions can already be drawn with respect to the MDGs. The following results indicate the state of some parameters by the end of 2009, in comparison to the baseline of 2000 (in brackets):

- 211 (163) fishery profiles captured by the National nodes
- 445 catch items – from species to family
- 48% (12%) of fisheries have been subjected to some stock assessment –4% fully assessed
- 21% (16%) have an adequate management plan in place
- 39% (83%) show no evidence of co-management
- 45% (53%) have below average levels of reporting.
- 42% (41%) have below average data collection
- 46% (44%) have below average data monitoring

Some of these results are very encouraging and reveal, at least to some extent, an improved situation and an approach to the MDGs. However, some concern has to be expressed at the lowering of levels of monitoring and data collection.

WIOFish offers excellent opportunities for regional collaboration and improvements to fisheries monitoring and management. Expansion of WIOFish to other countries of the region is underway, as is the modest expansion of certain data types.

CONCLUSION

The period covered in this report, 01 October 2009 – 30 September 2010, has been very productive for WIOFish. Constructive time was spent by the Regional Node representative (Bernadine Everett) at each institute working with the National Nodes in updating their fisheries information and answering any questions that occurred during the update workshops.

Personal interaction between the nodes from the different institutes has aided in further strengthening and sustaining the network of collaboration between fisheries researchers that has grown during the development of the WIOFish project. It is hoped that this collaboration will continue to develop along with some transboundary projects that may arise from the results produced during the analysis of the WIOFish database.

ACKNOWLEDGEMENTS

WIOFish is a team effort supported by the enthusiasm of the participants and the senior officials in their respective departments and governments. The funding support received from the South West Indian Ocean Fisheries Project (SWIOFP) is gratefully acknowledged and it is hoped that participants in the SWIOFP will make good use of the data available to them on WIOFish.