South Africa's National Plan of Action for the Conservation and Management of Sharks 2012

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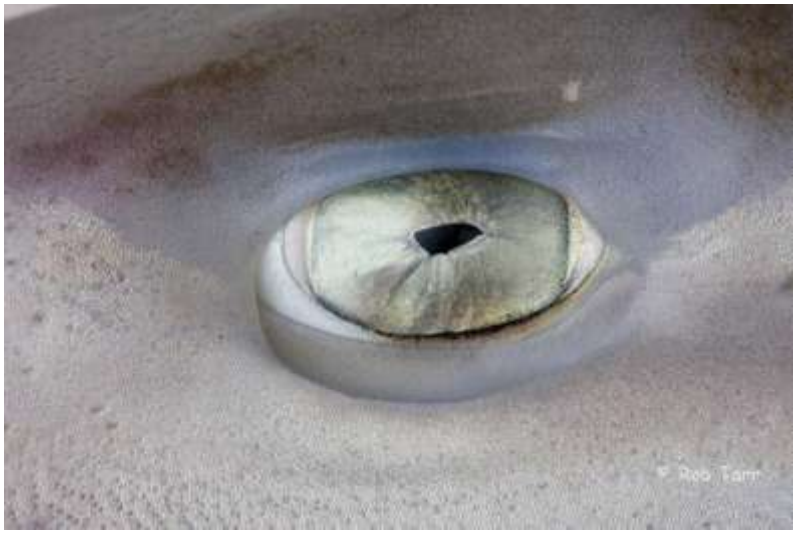

agriculture,
forestry & fisheries

Department:
Agriculture, Forestry and Fisheries
REPUBLIC OF SOUTH AFRICA

SOUTH AFRICA

NATIONAL PLAN OF ACTION for the Conservation and Management of Sharks (NPOA-Sharks)

1 EXECUTIVE SUMMARY

The global increase of shark catches raises concern about the sustainability of these resources. Sharks share live history characteristics that make them susceptible to overexploitation. Not only are sharks often caught as by-catch in fisheries that are managed for species that can sustain a higher fishing pressure, sharks form a large part of the unwanted by-catch that is discarded at sea, much of which is unrecorded and unregulated, which complicates the management of these resources. Taking cognisance of these concerns, the FAO committee on Fisheries held a number of expert meetings in 1998 and developed an International Plan of Action for Conservation and Management of Sharks (IPOA sharks). The guideline is to promote the conservation and management of sharks and their long term sustainable use, and is based on principles of the Code of Conduct for Responsible Fisheries, to which South Africa is a signatory. To achieve this goal the IPOA-Sharks recommended that member states of the FAO should develop a voluntary National Plan of Action for the Conservation and Management of Sharks (NPOA-Sharks). South Africa has one of the most diverse shark faunas in the world and many species are caught in appreciable quantities in directed and non-directed shark fisheries. South Africa has well developed fisheries management systems for most of its fisheries and many challenges with regard to the sustainable management and conservation of sharks have already been indentified and addressed in individual fisheries policies and management measures. The South African National Plan of Action for sharks (NPOA-Sharks) provides information on the status of chondrichthyans in South Africa and examines structure, mechanisms and regulatory framework related to research, management, monitoring, and enforcement associated with shark fishing and trade of shark product in the South African context. This information is then used to identify, group and prioritize issues particular to the South African chondrichthyan resources that require intervention in the form of specific actions with associated responsibilities and time frames. Once adopted, this voluntary guideline will provide a mechanism for identifying and resolving the outstanding issues around management and conservation of sharks to ensure their optimal, long-term, sustainable use for the benefit of all South Africans.

2 ACRONYMS

CCAMLR:	Commission for the Conservation of Antarctic Marine Living Resources
CCSBT:	Commission for the Conservation of Southern Bluefin Tuna
COFI:	FAO Committee on Fisheries
DAFF:	Department of Agriculture, Forestry and Fisheries
EAF WG:	Ecosystem Approach to Fisheries Working Group
EEZ:	Exclusive Economic Zone
FAO:	Food and Agriculture Organisation
ICCAT:	International Commission for the Conservation of Atlantic Tunas
IOTC:	Indian Ocean Tuna Commission
IPOA-Sharks:	International Plan of Action for the Conservation and Management of Sharks
IUU Fishing:	Illegal, Unregulated and Unreported Fishing
MCS:	Monitoring, Compliance and Surveillance
MLRA	Marine Living Resources Act
MLRF:	Marine Living Resources Fund
MRM:	Marine Resources Management
MSC:	Marine Stewardship Council
NPOA-Sharks:	National Plan of Action for Sharks
PEI:	Prince Edward Islands
RR:	Resources Research
SABS:	South African Bureau of Standards
SAR:	Shark Assessment Report
TAC:	Total Allowable Catch
TAE:	Total Allowable Effort
VMS:	Vessel Monitoring System

3 GLOSSARY

ABUNDANCE: Degree of plentifulness. The total number of fish in a population or a stock.

BIODIVERSITY: the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. [Convention on Biological Diversity].

BIOMASS: or standing stock. The total weight of a group or stock of living organisms, or of some defined fraction of it, in an area at a particular time.

BY-CATCH: Part of a catch of a fishing unit taken incidentally in addition to the target species towards which fishing effort is directed. Catch may be retained or returned to the ocean as discards, usually dead or dying.

CATCH: The total number (or weight) of fish caught by fishing operations. Catch should include all fish killed by the act of fishing, not just those landed.

COLLAPSE: Reduction of a stock abundance by fishing and / or other causes to levels at which the production is negligible compared to historical levels.

CONSERVATION: Of natural resources. The protection, improvement, and use of natural resources according to principles that will assure their highest economic or social benefits for man and his environment now and into the future.

DEMERSAL: Living in close relation with the bottom and depending on it. Example: Cods, Groupers and lobsters are demersal resources. The term "demersal fish" usually refers to the living mode of the adult.

DIRECTED FISHERY: Fishing that is directed at a certain species or group of species. This applies to both sport fishing and commercial fishing.

DISCARD: To release or return fish to the sea, dead or alive, whether or not such fish are brought fully on board a fishing vessel.

ECOTOURISM: Travel undertaken to witness the unique natural or ecological quality of particular sites or regions, including the provision of services to facilitate such travel.

FINNING: The practice of removing fins and discarding the carcass, usually pertaining to sharks.

FISHING EFFORT: Measure of the amount of fishing.

HABITAT: means any area which contains suitable living conditions for a species.

HIGHLY MIGRATORY SPECIES OR STOCKS: Marine species whose life cycle includes lengthy migrations, usually through the EEZ of two or more countries as well as into international waters.

JOINT PRODUCT: Term used to describe the utilisation of by-catch species.

LONGLINE: A fishing gear in which short lines carrying hooks are attached to a longer main line at regular intervals. Longlines are either laid on the bottom or suspended horizontally at a predetermined depth with the help of surface floats.

MANAGMENT: The art of taking measures affecting a resource and its exploitation with a view to achieving certain objectives, such as the maximization of the production of that resource. Management includes, for example, fishery regulations such as catch quotas or closed seasons.

MIGRATION: Systematic (as opposed to random) movement of individuals of a stock from one place to another, often related to season. A knowledge of the migration patterns helps in targeting high concentrations of fish and managing shared stocks.

MIGRATORY SPECIES: Species that move over national boundaries, and hence require international cooperation to enable their management.

NON-CONSUMPTIVE USE: Refers to cases where one person's enjoyment does not prevent others from enjoying the same resource. For example, the viewing of marine mammals or other wildlife does not prevent another from enjoying the same resources.

OPTIMAL: Most favourable or desirable.

PELAGIC: Sharks that frequents surface waters or occur in the water column, not associated with the bottom but may make diurnal migrations between the surface and the ocean floor.

PRECAUTIONARY APPROACH: The precautionary principle is that lack of full scientific certainty should not be used as a reason for postponing a measure to prevent degradation of the environment where there are threats of serious or irreversible environmental damage.

REQUIEM SHARKS: Any shark of the family Carcharhinidae, predominantly grey in appearance, live-bearing and migratory.

SHARKS: For the purpose of this document the term "sharks" is used to describe all chondricthyans (sharks, skates, chimeras and rays).

STAKEHOLDER: An actor having a stake or interest in a physical resource, ecosystem service, institution, or social system, or someone who is or may be affected by a public policy.

STOCK: Fish stocks are subpopulations of a particular species of fish, for which intrinsic parameters (growth, recruitment, mortality and fishing mortality) are the only significant factors in determining population dynamics, while extrinsic factors (immigration and emigration) are considered to be insignificant.

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5 INTRODUCTION

There is international concern over the global increase of shark catches. Sharks are particularly vulnerable to overexploitation due to closed stock-recruitment relationships, low biological productivity, and complex spatial structures. Sharks are often caught as by-catch in fisheries that are managed for species that can sustain a higher fishing pressure and sharks form part of the unwanted by-catch that is discarded at sea, much of which is unrecorded and unregulated. Fishing is therefore regarded as the single largest threat to shark populations. Noting these concerns, the FAO Committee on Fisheries (COFI) developed in 1998 an International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks) within the framework of the Code of Conduct for Responsible Fisheries to which South Africa is a signatory. The IPOA-sharks is a voluntary instrument which encourages states to conduct a Shark Assessment Report (SAR) and adopt a National Plan of Action for Sharks (NPOA- sharks) if their vessels conduct shark-directed fishing or if their vessels regularly catch sharks in non-directed fisheries. The objective of the IPOA-Sharks is to ensure the conservation and management of sharks and their long-term sustainable use, with the following specific aims:

i. Ensure that shark catches from directed and non-directed fisheries are sustainable;
ii. Assess threats to shark populations, determine and protect critical habitats and implement harvesting strategies consistent with the principles of biological sustainability and rational long-term economic use;
iii. Identify and provide special attention, in particular to vulnerable or threatened shark stocks;
iv. Improve and develop frameworks for establishing and coordinating effective consultation involving all stakeholders in research, management and educational initiatives within and between States;
v. Minimize unutilized incidental catches of sharks;
vi. Contribute to the protection of biodiversity and ecosystem structure and function;
vii. Minimize waste and discards from shark catches in accordance with article 7.2.2.(g) of the Code of Conduct for Responsible Fisheries (for example, requiring the retention of sharks from which fins are removed);
viii. Encourage full use of dead sharks;
ix. Facilitate improved species-specific catch and landings data and monitoring of shark catches;
x. Facilitate the identification and reporting of species-specific biological and trade data.

The IPOA-Sharks requires each state to develop, implement and monitor its NPOA-Sharks. These plans were required to be submitted to COFI in 2001 and a progress report on implementation is required every two years.

South Africa has a responsibility to develop a SAR and to adopt a NPOA-Sharks as good practice and consistent with its role as a signatory to the FAO Code of Conduct for Responsible Fisheries, it is Member Party of the International Commission for the Conservation of Atlantic Tunas (ICCAT), the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), a Co-operating Non-Contracting Party of the Indian Ocean Tuna Commission (IOTC) and the Commission for the Conservation of Southern Bluefin Tunas (CCSBT). Moreover, South Africa has one of the most diverse faunas of cartilaginous fishes (Class Chondrichthyes) in the world, accounting for 181 species (15% of the world's shark species) (Appendix 1, Species Summary) of which 27.1% are endemic to Southern Africa (Appendix 1, Species Summary). Most species are poorly understood and constitute stocks of relatively low biomass (Appendix

1, Species Summary) However, a number of species are caught in appreciable quantities in directed and non-directed shark fisheries. Directed fisheries for sharks include the demersal shark longline, St Joseph (Elephantfish) net fishery, the traditional linefish fishery, recreational linefishery, and the Kwazulu Natal Bather Protection Programme (Table 1, section 7). Important non-directed fisheries for retained shark include the tuna/swordfish longline fishery, and inshore/ offshore trawl.

The South African National Plan of Action for sharks (NPOA-Sharks) provides information on the status of chondrichthyans in South Africa as well as on structure, mechanisms and regulatory framework related to research, management, monitoring, and enforcement associated with shark fishing and trade of shark product in the South African context. This information is contained in section 7 and provides the baseline for South Africa as required by the IPOA-Sharks in terms of a Shark Assessment Report.

This information is then used to identify, group and prioritize issues particular to the South African chondrichthyan resources that require intervention in the form of specific actions with associated responsibilities and time frames in order to attain the goals set out in the vision statement:

6 VISION

"The effective conservation and management of sharks that occur in the South African EEZ to ensure their optimal, long-term, sustainable use for the benefit of all South Africans, including both present and future generations."

The NPOA-Sharks recognizes the need to determine and implement harvesting strategies consistent with the principles of biological sustainability, attained through scientifically based management, and consistent with a Precautionary Approach*. Furthermore, it strives to identify and direct attention, in particular, to vulnerable or threatened shark stocks, minimize unutilized incidental capture of sharks and contribute to the protection of biodiversity and ecosystem structure and function.

The NPOA-Sharks recognizes the potential of non-consumptive use of sharks through ecotourism activities. These aspects of use need to be explored so as to find an optimum balance between consumptive and non consumptive use, maximizing their benefits with low impact on the marine ecosystem.

Although the NPOA further recognizes that pollution, coastal development and climate change might negatively impact on sharks, the focus of the first NPOA-Sharks is fisheries related, including fisheries where sharks are caught as by-catch but not retained. The Plan is intended to have an initial implementation period of four years (2012-2015) with an annual review scheduled to determine progress. The final consultative review in year four would be used to provide the basis for a revision of the NPOA-Sharks, taking into account any new changes in fisheries.

7 BASELINE INFORMATION

7.1 SPECIES INFORMATION

The South African EEZ straddles two oceans and, if one considers the sub Antarctic Prince Edward Islands, includes all marine bio-zones, from tropical to polar. Consequently, South Africa has one of the most diverse faunas of cartilaginous fishes (Class Chondrichthyes) in the world. South African chondrichthyofauna include representatives from all 10 orders of cartilaginous fishes, 44 of the 60 families (73%), 100 out of 189 genera (53%), over 181 of the 1171 world species (15%) and 34 endemic species to southern Africa (27%) (Appendix 1) (Compagno 2000). This high level of diversity and endemism engenders South African responsibility in conserving and managing sharks that occur in South African waters and protecting those that enter South African waters periodically.

7.2 MANAGEMENT AGENCIES AND LEGISLATION

The Branch Fisheries Management, of the Department of Agriculture, Forestry and Fisheries is the lead governmental agency responsible for the management of sharks caught in South African fisheries. Fisheries Management is legally mandated to manage sharks in terms of the Marine Living Resources Act (MLRA), 1998 (Act No 18 of 1998) and the Regulations promulgated thereunder. Other additional acts that have relevance to the conservation of sharks include the National Environmental Management: Biodiversity Act, 2004 (Act No 10 of 2004), the National Environmental Management: Protected Areas Act, 2003 (Act No 57 of 2003), Dumping at Sea Control Act, 1980 (Act No 73 of 1980). Fisheries Management, in managing sharks, is supported by a number of agencies/ institutions, namely Oceans and Coast (Department of Environmental Affairs), South African National Biodiversity Institute (SANBI), Kwazulu-Natal Sharks Board, Ezemvelo KZN Wildlife, Oceanographic Research Institute, South African National Parks, Cape Nature, Bayworld, Iziko Museum of Natural History and the South African Institute for Aquatic Biodiversity (SAIAB).

7.3 CURRENT MANAGEMENT TOOLS

Fisheries Management uses various management tools which have contributed to the conservation and sustainable fishing of many shark species. Some species due to their compromised conservation status have been afforded special protection status under the Regulations of the MLRA, e.g. the great white shark and the sawfish (Pristiophoridae). In addition, spotted gully and raggedtooth sharks have been commercially delisted in terms of the Regulations of the MLRA (Appendix 2). Entry into any commercial fishery is limited by a rights allocation process, which is managed by Fisheries Management. The allocation takes into account scientific recommendations in limiting the number of vessels, crew and Total Allowable Catch (TAC) or Total Allowable Effort (TAE) for target species as well as precautionary catch limits for by-catch species. A number of coastal Marine Protected Areas (MPAs) have also been promulgated along the South African coastline with the aim of conserving biodiversity hot spots and providing harvest refuges for highly resident fishes. In so doing partial protection is afforded to some coastal shark species such as ragged tooth sharks, cow sharks, smooth hounds, cat sharks and juvenile requiem sharks. The impact of fisheries on some shark species has been reduced through permit conditions in certain fisheries e.g. tuna

pole, which prohibit the landing of shark. Recreational bag limits have been reduced to one shark per fisher per day.

7.4 HARVESTING OF SHARKS IN SOUTH AFRICA

The total South African shark catch is estimated at 3 500 t per annum (Appendix 3) and is derived from fisheries that can be divided into two principle components, that of directed and by-catch fisheries (Table 1). The first component represents fishing activities that target sharks –the demersal shark longline-, traditional line-, and St. Joseph shark net-fishery as well as the bather protection program and shark fishing for the aquarium trade. Sharks are also caught as both by-catch and as a targeted species in the large pelagic longline fishery and the recreational linefishery. For the purpose of this document, the large pelagic longline and the recreational linefishery are also regarded as targeting sharks due to the relatively high shark catch that are retained in these fisheries. The second component is represented by fisheries that catch sharks as a component of their by-catch, e.g. hake longline, inshore trawl, offshore trawl, mid-water trawl/ purse seine fishery, and the beach seine ('treknet') fishery. Appreciable shark by-catches are also made in the tuna pole, prawn trawl, patagonian toothfish and in the rock lobster trap fisheries, but the animals are not necessarily retained. In the interest of clarity, catches from fisheries that target sharks and those with appreciable by-catch are discussed separately.

Table 1. South African fisheries that have a shark component.

Fishery	Area	Main Shark Species	Target / By-catch
Demersal Shark Longline	West and South Coast	Smoothhound spp and soupfin sharks	Target
Large Pelagic Longline	Offshore to beyond EEZ	Blue and mako sharks	Target and By-catch
Bather Protection Program	East Coast	Large Carcharhinids species	Target
Traditional Linefish	Inshore to 200 m	Smoothhound spp and soupfin sharks	Target
St Joseph net	West Coast	St Joseph sharks	Target
Recreational Linefishery	Inshore to 200m	Large Carcharhinids	Target
Tuna Pole	Offshore to beyond EEZ	Blue and Mako sharks	By-catch
Hake Longline	West and South Coast to	Common smoothhound and soupfin sharks	By-catch

	500 m		
Inshore Trawl	South and East Coast to 200 m	Squalidae, Scyliorhinidae, smoothhounds spp, soupfin sharks, St Joseph and Rajids .	By-catch
Offshore Trawl	West Coast, Agulhas Bank to shelf edge (600 m depth)	Squaliform, Scyliorhinidae, soupfin sharks, Rajids and Chimeara .	By-catch
Prawn Trawl	Natal East Coast to 600 m	Carcharhinid and Sphyrnid species	By-catch
Midwater trawl	South and East Coat	Pelagic sharks	By-catch
Gill net / Beach Seine (legal and illegal)	West and South Coast	Smoothhound spp, soupfin and St. Joseph sharks	Target and by-catch
Patagonian Tooth fishery (Experimental)	Prince Edward Islands	Deep water scyliorhinids, six gills, Rajidae	By-catch
Rocklobster trap		Scyliorhinid spp	By-catch
Aquarium trade		Small Carcharhinids and Scyliorhinidae	Target

7.4.1 DIRECTED FISHERIES

7.4.1.1 DEMERSAL SHARK LONGLINE

In the 1990s, over 30 permits were issued to target shark (pelagic and demersal species combined). Many of the permits were, however, not utilized as permit holders generally held permits in other more lucrative fisheries. The initial incentive to obtain these permits was to exploit loopholes in the regulations to catch hake by longline, banned in 1990 (Crawford et al., 1993). Due to poor performance the number of permits was decreased to 11 in 2004 and finally 6 permits in 2005. Due to the steep learning curve in catching and marketing demersal sharks catches of soupfin (*Galeorhinus galeus*) and common smoothhound sharks (*Mustelus mustelus*) only increased in this fishery in 2006. In 2010 catches of sharks were as follows: soupfin (106 t), common smoothhound (110 t), bronze whaler sharks (*Carcharhinus brachyurus*) (32 t) and skates (Rajidae.) (33 t).

The current demersal shark longline is restricted to coastal waters and uses weighted longline with hooks to target soupfin, smoothhound spp, dusky (*C. obscurus*) and bronze whaler sharks. The fishery is currently restricted to a Total Applied Effort (TAE) of 6 vessels. As a precautionary measure the fishery is prohibited from fishing North of East London, where biodiversity increases and the continental shelf narrows up the East Coast of South Africa. Vessels are tracked by a Vessel Monitoring System (VMS) that directly links to the Fisheries Management base station. All landings are independently monitored and skippers are required to complete logbooks per longline set. There is generic reporting of skates and carcharhinid species. There is an overlap of species caught in this fishery with the traditional linefish fishery and the recreational fishery.

7.4.1.2 LARGE PELAGIC LONGLINE FISHERY

The large pelagic longline fishery was established in 1997 as an experimental fishery. This fishery uses pelagic longline to target swordfish (*Xiphias gladius*), yellowfin tuna (*Thunnus albacores*) and bigeye tuna (*Thunnus obesus*) along the entire coastline of South Africa. Sharks accounted for 30-40% of the catch. Blue shark (*Prionace glauca*) is the most common shark species caught followed by shortfin mako sharks (*Isurus oxyrinchus*). Other sharks caught include silky shark (*Carcharhinus falciformis*), thresher shark (*Alopias vulpinus, A. pelagicus and A. superciliosus*), oceanic whitetip (*Carcharhinus longimanus*), scalloped hammerhead (*Sphyrna lewini),* and other Carcharhinid species. The large pelagic fishery was formalized into a commercial fishery in 2005 with the allocation of 18 swordfish and 26 tuna-directed long-term fishing rights. One of the goals of the allocation was also to terminate the directed pelagic shark fishery by issuing large pelagic rights to the shark fishers. Due to an administrative oversight the amalgamation of the fisheries never occurred and seven shark fishers were granted exemptions until March 2011 to target pelagic sharks (mainly targeting blue and shortfin mako sharks). For the period 2005 to March 2011 there were two fisheries which caught pelagic shark species. During this period the large pelagic fishery was restricted to a 10% by-catch limit of sharks (i.e. sharks landings could not exceed 10% of the weight of the targeted swordfish and tuna species) and wire traces were banned. In 2010 the pelagic shark fishery landed 515 t of shortfin mako, 198 t of blue sharks, 25 t of bronze whalers and 9 t of skates. In the same year the large pelagic longline fishery landed 66 t shortfin mako and 100 t of blue sharks. In April 2011 the directed pelagic shark fishery was terminated when six shark fishers were allocated large pelagic rights.

In the current large pelagic fishery, sharks are managed under a Precautionary Upper Catch Limit (PUCL) of 2 000t per annum, based on shark catch ratios during the experimental fishery when no shark by-catch restrictions applied and extrapolating for the development of the tuna/swordfish fleet. In addition foreign charter vessels are restricted to a 10% shark by-catch limit and these vessels have 100% observer coverage. Observer coverage was targeted at 20% for domestic vessels, but due to the expiry of the observer contract with the service providers no observer coverage could be obtained for domestic vessels during 2011. Observers typically record species composition, length frequencies, live releases, and discards. All vessels in this fishery are monitored by VMS. All landings are weighed and independently monitored. Logbooks are required to be completed on set-by-set basis. All fisheries data pertaining to pelagic sharks are submitted to ICCAT and IOTC on an annual basis but South Africa's capacity to send experts to RFMO scientific meetings is still a concern. Shark finning is banned in terms of permit conditions. Landings of certain shark species are banned due to concern over their conservation status namely, silky sharks, oceanic whitetip, all thresher sharks, and all hammerhead sharks. The correct identification of some shark species by fishers and MCS personnel remain a challenge.

KWAZULU_NATAL BATHER PROTECTION PROGRAM

The bather protection fishery uses shark nets and drumlines from Richards bay to Port Edward monitored by the KZN Sharks Board. The KwaZulu-Natal shark control program is managed by the Natal Sharks Board (NSB). The objective of the program is to protect bathers and other resource users from shark attack

– principally, from those sharks that are regarded as potentially dangerous. This is achieved by reducing the local populations of the target species in designated bathing beach areas. In order to achieve this, large mesh gillnets are set off a number of designated bathing beaches along the coast of KwaZulu-Natal (KZN). Between 2005 and 2007 79 drumlines were introduced and tested to replace selection sections in an attempt minimize capture of undesired species without compromising bather protection. The species targeting include large Carcharhinids and lamnids, however other shark species, turtles and dolphins are also caught. Total average annual catch is less than 10 t. All mortalities are biologically sampled and have contributed sustantially to life-history studies. One of the problems with this fishery is that the target reference level for the fishery is set at the level that minimises attacks on bathers, without reference to biological sustainability. This target reference level may be below biological sustainable level.

7.4.1.3 TRADITIONAL LINEFISHERY

The linefishery is considered the oldest fishery to have historically targeted sharks, predominantly soupfin in the 1940's as a source for vitamin A. Post World War II sharks were targeted as a cheap source of protein for African countries. More recent catches have been driven by market demand and the seasonal availability of target teleost species. The linefish fishery was an open-access fishery until 1984. In 1985 the fishery was capped at around 3200 vessels. Focused research on linefish species in the ensuing decade had identified that many of the target teleost species were compromised. Subsequently effort levels were reduced in the fishery to a the current level of 450 vessels (and a maximum crew of 3 450), all of whom which retain access to sharks. Species targeted include soupfin, common smoothhound, hardnose smoothhound (*M. mosis*) and whitespotted smoothhound (*M. palumbes*), Carcharhinid spp. smooth hammerhead (*S. zygaena*) and Rajidae. Major shark catches in 2010 were reported as soupfin (89 t), houndsharks (25 t), Carcharhinid sharks (64 t), blue sharks (13 t) and skates (59 t).

The traditional linefish fishery operates along the entire length of the South African coastline. Vessel movements are monitored by VMS. Discharge of landings are not monitored, but land-based observers have been placed at primary harbours/ slipways to determine species composition, biological samples, and length frequencies. Daily catches are recorded in logbooks and are submitted on a monthly basis. Logbook data is not verified and is considered a considerable under-estimate of the total shark catch. Furthermore, catches are not reported on species level. Shark species caught in this fishery are the same as those targeted by the demersal longline fishery and the recreational linefish fishery.

7.4.1.4 ST JOSEPH FISHERY

A directed shark fishery for Ploughnose chimeras, locally referred to as St. Joseph sharks (Callorhinchus capensis), operates on the west Coast of South Africa and is managed on a TAE of 162 rights holders. Landing of other sharks is not allowed due to a history of illegal fishing in this sector. The St Joseph shark net fishery employs 178 mm stretched mesh, monofilament, bottom-set gill nets. The nets have a fall of 3m and are no longer than 150m. The fishery is an effort based fishery confined to the west coast. The fishery is intrinsically associated with the "harder (cape mullet) fishery. Only 80 of the 177 gillnet permits available in 2002 allowed the use of Joseph nets, all within the St Helena Bay fishing Area. The permit entitles the holder to have in their possession 2 St Joseph and 2 mullet-directed (haarder: Liza spp.) gill nets at any-one time. Those individuals that have permits that are restricted to "haarder" may only be in possession of 2 "haarder" gill nets. They are however entitled to retain any St Joseph by-catch. Originally catches were in the order of 650 tons of St Joseph per annum. The St Joseph catches by the gillnet fishery may be linked to increased trawl catches, but could also be due to the gillnet fishery targeting breeding aggregations. The time series of abundance indices from west coast surveys shows a decline in St Joseph from 1997 to 2004 followed by an increase in the last few years so that the overall trend is slightly negative however the slope is not significantly different from zero.

7.4.1.5 RECREATIONAL LINEFISHERY

The recreational linefishery includes shore anglers, boat-based fishers and estuarine fishers (all of which use rod and reel), as well as spearfishers. An estimated 850 000 people participate in the shore-based recreational fishery alone. Recreational fishing in South Africa is regulated by output control in terms of bag-, size and area limits and requires the purchase of a permit. Catches of most sharks are restricted by a bag limit of one shark per day and the sale of the catch is not permitted. Illegal sale of shark catches are of concern together with the exceeding of bag limits. Recreational fishers are not required to report any catches to Fisheries Management. Another challenge is posed by recreational tournament fishing, which remains unregulated. The catch and release of sharks in these tournaments may also pose a problem as there is little information on post-release survival.

7.4.2 BY-CATCH FISHERIES

7.4.2.1 TUNA POLE

The commercial tuna pole fishery started in 1979 with the initial targeting of yellowfin tuna in the first year. Thereafter albacore has been the primary target species of this fishery. The fishery operates from September to May along the west coast of South Africa. In 2006, 191 long-term fishing rights were allocated to use 198 vessels and a crew of 2950 to target albacore and yellowfin tuna. The fishery does not have a history in catching shark, but the increase use of rod and reel gear since 2003 to target yellowfin tuna has resulted in increased encounters with pelagic sharks. The current landing of sharks is banned in terms of permit conditions and hence all sharks are required to be released at sea. There is no on board observer coverage for this fishery and hence it is unknown whether proper release procedures are implemented to ensure the post-release survival of sharks. The tuna pole fishery is monitored by VMS and

skippers are required to record catches in a daily logbook, which is submitted to Fisheries Management on a monthly basis. There is no monitoring of discharges in this fishery.

7.4.2.2 HAKE LONGLINE

The demersal hake long-line fishery was initiated in 1994, and has since attained commercial status with the first 50 rights being allocated in 1998. The fishery comprises two zones: the West Coast fishery that targets the deep water hake *Merluccius paradoxus*, and the South Coast fishery that targets the shallow water hake *Merluccius capensis*. An observer by-catch program is operational in this fishery. Unfortunately, the shark by-catch component is recorded at a group level – species identification is not undertaken. Nevertheless, the shark by-catch usually comprises less than 0.5% of the total catch. A kingklip (*Genypterus capensis*) directed fishery was initiated in 1983, however a subsequent stock collapse curtailed operations, and the fishery had to be closed in 1990. Nevertheless, while in operation, there was an appreciable shark by-catch component to this fishery (D.Japp, per. comm.). A total of 4 tons of unidentified "sharks, skates and rays" was reported in 2010.

7.4.2.3 TRAWL

There are several trawl fisheries in South Africa the largest of which is the south and west coast demersal component targeting the Cape hakes *Merluccius capensis and M. paradoxus* and other lucrative benthic species; the demersal prawn trawl fishery situated on the east coast along Kwa-Zulu Natal and a midwater trawl fishery targeting horse mackerel along the south coast. The trawl fishery for Cape hakes can be separated into two distinct fishery sectors, namely the offshore and inshore trawl components. Trawl fisheries targeting hake provide over half of the value of all fisheries in South Africa and account for more than 50% of the total value of the combined South African fisheries. The development of trawling in SA commenced in 1890 and remains centered on the South African hake resource which comprises two species, the shallow-water Cape hake and the deep-water Cape hake. Prior to the declaration of the 200 nautical mile South African EEZ in 1977, the Cape hakes were subjected to increasing levels of exploitation after the First World War, with the incursion of foreign fleets during the 1960s culminating in a peak catch of close to 300 000 t in the early 1970s. Subsequent to 1977 and the declaration of the EEZ, South Africa implemented a relatively conservative management strategy by imposing Total Allowable Catches (TACs) set at levels aimed to rebuild the hake stocks, and annual catches have subsequently remained relatively stable in the 120 000 – 150 000 t range. The hake TAC is determined annually by the application of an Operational Management Plan (OMP). In 2004 the South African demersal trawl fishery obtained Marine Stewardship Council (MSC) certification and this eco-labeling has resulted in additional focus on the management of by-catch species.

7.4.2.3.1 INSHORE TRAWL

The inshore fishery targets primarily both hake species and East-coast sole (*Austroglossus pectoralis*) and is restricted to the area between Cape Agulhas (20° E) in the west and the Great Kei River in the east. The vessels operating in the inshore fishery are wetfish trawlers which are smaller than those active in the offshore fishery. These vessels may not be larger than 30 m. Although there are ecosystem-based management measures being developed for this fishery, there are significant by-catch issues which

including sharks. Shark by-catch in this fishery is common, and includes considerable quantities of a large number of species, including Squalus spp, Scyliorhinids, soupfin sharks, smoothhound spp and rays and skates being caught (Attwood et al 2011).

In the past decade the number of vessels in this sector has dropped from a historic level of around 32 vessels to 24 vessels operating currently. All vessels in this sector are monitored by VMS and all the landed catch is monitored. A proportion of the operations at sea is subjected to monitoring via the Scientific Observer Programme which has attained a maximum coverage of 4.4% of trawls (Attwood et al., 2011). (Attwood et al., 2011). All discharges from the inshore demersal trawl fleet are subject to discharge monitoring but generic categorization of products remains challenging.

7.4.2.3.2 OFFSHORE TRAWL

The offshore hake trawl industry in South Africa is one of the largest sectors of the marine fishery. Offshore vessels are restricted from operating deeper than 110m on the south coast. There is no restriction on the west coast, but they do not operate shallower than 200m.Therefore, the vessels used in this fishery are mostly large, powerful, ocean-going stern trawlers. A comprehensive Scientific Observer Programme has collected information on target and non-target species, the results of which have been used in management advice. Furthermore, measures to reduce impacts on benthic habitat have been introduced, including 'ring-fencing' existing trawling grounds to reduce the amount of habitat affected. Surveillance capacity has also increased, and the entire hake fishing fleet is now covered by a Vessel Monitoring System (VMS). Trawling is a particularly unselective fishing method, and thus produces a high level of by-catch. Species caught include deepwater sharks, skates and rays. Low value shark species are discarded only once the main catch has been sorted, potentially resulting in an increased mortality of released by-catch species. Generic reporting of species is a common occurrence. Presently the offshore trawl landings are largely not monitored during discharge and catch information is thus seldom verified.

7.4.2.3.3 MIDWATER TRAWL

Historically adult Cape horse mackerel (*Trachurus capensis*) have been caught as by catch within the offshore hake trawl sector. In the 1960s the bulk of the adult horse mackerel catch was taken by purse-seine on the west coast, but that resource has disappeared. A Japanese midwater trawl fishery operated off the South Coast during the 1980s and 1990s .The annual catch limit varied from 34 000t to 54 000 t during that period. In the late 1990s the Japanese fleet was replaced with South African vessels with a catch limit of 34 000 t divided between midwater trawl and demersal trawl. In about 2010 the Precautionary Upper Catch Limit (PUCL) was raised to 44 000 t (31 500t – allocated to Right Holders for targeted midwater trawl fishing and 19 500 held in reserve to cover incidental by-catch in the demersal trawl fishery). (The bulk of the catch is made by one vessel of 121 meters with a gross tonnage of 7628t using a midwater trawl capable of making catches of up to 100t per trawl. The horse mackerel fishery is restricted to the south coast (west of Cape Agulhas). A midwater trawl fishery for round herring (*Etrumeus whiteheadi*) and anchovy (*Engraulis encrasicolus*) has been recently established on the west coast (actually it may still be an experimental fishery). The vessels use excluder devices to prevent the capture of marine mammals and pelagic sharks.

A number of species of pelagic shark are recorded in the by-catch all of which is discarded once the main catch has been sorted, potentially resulting in an increased mortality of released by-catch species. Permit conditions require a scientific observer be present on all trips.

7.4.2.3.4 PRAWN TRAWL

The South African prawn trawl fishery operates around the Tugela Bank (KwaZulu-Natal), and between Cape Vidal and Amanzimtoti. Catches (by mass) of the prawn fishery consist of roughly 20 percent target species, 10 percent retained by-catch and 70 percent discarded by-catch. The vessels employed in the fishery tend to be small (24-33m length), and use 38mm stretched cod-end mesh nets. Shark by-catch include stingrays (Dasyatidae), hammerhead sharks (Sphyrnidae), requiem sharks (Carcharhinidae), angelsharks (*Squatina africana*) and catsharks (Scyliorhinidae). The fishery is managed on a TAE basis with seasonal area restrictions designed to mitigate catches of juvenile linefish (Anon, 2010). As fishing activity is concentrated in a region recognized as a shark biodiversity hotspot, by-catch of regionally endemic demersal shark species is of concern. Some data have been collected by a scientific observer program during the past 5 years.

7.4.2.4 BEACH SEINE FISHERIES

The beach seine fishery has operated traditionally since 1652 and operates from False Bay to Port Nolloth. In 2001, a reallocation of rights saw a reduction in fishing effort from around 200 to 28 beach seine operations. Nets range from 120m to 275m in length with net depths varying according to fishing area, but may not exceed 10m (Anon, 2010b). Nets have a stretched mesh of 48mm and minimum cod end size of 44mm. This fishery primarily targets teleosts; however considerable quantities of shark are also caught (Lamberth, 2006). With the exception of protected shark species status such as great white sharks (*Carcharhinus carcharias*), raggedtooth sharks (*Carcharias taurus*), spotted gully sharks (*Triakis megalopterus*), pyjama sharks (*Poroderma africanum*), and leopard catsharks (*Poroderma pantherinum*) no by-catch restrictions for sharks exist within this fishery.

7.4.2.5 PATAGONIAN TOOTHFISHERY

The Patagonian Toothfish fishery started as an experimental fishery in 1996 and targeted toothfish (*Dissostichus eleginoides*) using Spanish longline around Prince Edward and Marion Islands (an extension of South Africa's EEZ). Five permit holders used two vessels to fish their experimental allocation of 3 000 t. The fishery was formalized into a commercial fishery in 2005 where five long-term rights were allocated on board two vessels. Only one vessel has been fishing up until 2011. In 2011 a second vessel joined the fishery and the fishing method changed to trot lines. The current TAC is 400 t of Patagonian toothfish. As the fishery is not permitted to retain sharks all sharks are released at sea. The fishery is stringently managed with VMS reporting, observer coverage (two observers per vessel) and monitoring of all landings. Daily logbooks are required to be completed by set. Shark catches are considered small, but there is concern regarding the identification of shark species and the impact the fishery could have on species that are long-lived and sensitive to fishing pressure. Hence, protocols for shark release procedures are needed and require enforcement.

7.4.2.6 ROCKLOBSTER FISHERY

The West Coast rocklobster (*Jasus lalandii*) fishery is separated into an inshore fishery using hoopnets and an offshore component using traps. No sharks are caught in the hoopnets, however catches in the offshore component may be significant. Sharks caught in traps include Scyliorhinids which may not be sold for commercial purposes and are consequently discarded. The main concerns therefore relate to fishery mortality and handling mortality.

7.4.2.7 AQUARIUM TRADE

Limited trade of raggedtooth sharks, small Carcharhiniformes and rays exists in South Africa. Sharks are caught with rod and line and transported to the aquarium or holding facility. A small number of sharks are exported to international aquariums per year. This trade is currently managed on an *ad-hoc* basis and a formal regulatory framework might be needed.

7.4.3 MARKETS

The Marine Living Resources Act (MLRA, 1998) regulates all fisheries in South Africa, including aspects of the processing, sale and trade of most marine living resources. In terms of the MLRA, sharks may not be landed, transported, transshipped or disposed of without the authority of a permit. The market is divided into three separate components, (1) processing and filleting demersal shark carcasses or "logs", (2) fin drying, and (3) processing and exporting of pelagic shark steaks. Each component operates separately although fins are contributed by both the demersal and pelagic sharks. In the demersal shark fillet trade processed "logs" are separated depending on the value of the flesh determined by the handling, cleaning processes and mercury content. In general, sharks between 1.5kg-12kg are considered ideal as mercury levels of sharks over 12 kg exceed permissible limits (da Silva and Bürgener, 2007). In the past decade, the export market for South African shark meat has grown considerably. The majority of processed shark is sold to Australia, where there is high consumer demand for shark fillets. Big and/or low value animals are dried and sold as dried fish sticks. All fins are dried and exported to Asian markets. The increased fin price provides strong incentives for the targeting of large sharks regardless of fillet value. Pelagic shark carcasses are mainly exported to Europe with some species, namely shortfin mako and porbeagle, exported to Asia.

A recent analysis of trade data between South Africa and Australia indicated discrepancies in import versus export statistics. Thus, it does not currently appear feasible to use trade data as a proxy indicator for shark catches in South Africa. A detailed description of the South African shark meat harvest, including processing, handling and export information, can be found in Da Silva and Bürgener (2007).

8 FROM ISSUES TO ACTION

Although South Africa has come a long way in the development and implementation of shark management since the conception of the IPOA in 2001, the following issues need to be addressed to achieve the goals set out in the vision of the NPOA-Sharks. The broad challenges identified here mirror those identified in the

IPOA and in NPOAs of other countries. The Challenges are clustered around seven broad groups: *Data and reporting, Classification and assessment, Sustainable management, Optimum use, Capacity and infrastructure, Enforcement of compliance and Regulatory tools.* The individual issues are specific to the South African context and require particular actions by one or more stakeholder groups. Suggesting responsibilities for remedial actions will enable South Africa to effectively implement these actions within the suggested timeframes. As many issues are interlinked and require a particular sequence of actions, the actions were prioritized to make the execution of this plan viable within its four –year life span. Priorities are given on four levels*, Immediate, High, Medium and Low* and required timeframes are indicated to facilitate progress monitoring and evaluation. As there is limited budget dedicated to the implementation of this plan, the actions are expected to be achievable within existing allocations of funds to research, management and conservation agencies. As the lack of shark-specific funding has been identified as one of the issues, the application for additional funding from international agencies should be facilitated after the formal adoption of this plan.

Table 2. An overview of issues facing particular fisheries divided into clusters with proposed action, responsibilities, priorities and timeframes.

Issue cluster	Issue	Description	Fishery sector	Action	Respon-sibility	Priority	Time-frame
Data and reporting	Shark species identification and reporting	In catch statistics, sharks are often lumped into generic categories.	All Fisheries excluding the KZN bather protection program	Create a identification guide	FR	Immediate	1
				Develop permit conditions	MRM	Immediate	1
				Education and Implementation	MRM Working Groups	High	2
				Review progress	FR and MRM	Medium	3-4
	Observer coverage	There is currently no observer coverage except for the foreign flagged pelagic tuna longline fleet.	All sectors	Re-establish, re - assess and expand observer coverage	FR	Immediate	1
		Observer programmes do not collect data that are adequate to	All sectors	Define and set sampling requirements per fishery sector	FR	Immediate	1-2

		assess impact of fishing on species that are not landed.		Initiate new sampling strategy	FR	High	2-4
	Discharge monitoring	Discharge of fish is only monitored in selected fisheries. Catch reporting is not verified.	Offshore trawl, traditional linefish, tuna pole,	Review discharge monitoring coverage and quality of information	FR, MCS	High	1-2
				Establish additional discharge monitoring requirements	FR and MCS	High	2-3
	Reporting of directed catch and "joint product'"	Directed catches of sharks are only reported for commercial sectors.	Recreational linefish	Develop and implement a land based monitoring program expanding coverage	FR	High	1-2
		Landed catch is not weighed	Line, net fish and recreational linefish	Instigate monitoring of landings	FR, MRM and MCS	Medium	2-4
		There is no mandatory reporting	Recreational fishery	Engage with recreational initiative for web-based catch recording	FR and Recreational MRM Working Group	Medium	2-4
		There is no routine collection of length frequencies and conversion factors do not exist for most species.	All except Large Pelagic longline	Set target for observer coverage	FR	High	1
				Develop morphometric relationships to allow for conversion factors	FR	High	1-2

		Shared stocks	All fisheries	Identify overlaps	FR and MRM	High	1-2
				Engage with neighbouring countries and set-up data sharing agreements	MRM	Medium	3-4
	Estimation of discards	Unable to quantify total shark mortality associated with by-catch fisheries	All fisheries	Identify short falls	FR	High	1
				Develop monitoring procedures and implement through observer programme	FR	High	1-3
Classification and assessment of shark species	Gaps in taxonomy	Taxonomical classification is uncertain for a number of shark species	All fisheries that catch rays, skates and deepwater shark species	Reclassification of all rays, skates and deepwater shark species using genetics and morphometrics (Barcoding of Life Programmes)	FR	Immediate	Ongoing
	Stock delineation	There are several stocks that might be genetically distinct to areas in SA, while others are appear to be shared with other countries.	All fisheries	Collection of additional genetic material through national research surveys and observer programme	FR	Medium	Ongoing
	Gaps in the knowledge of life	For many species, basic information	All fisheries	Gap analysis example South African marine status reports	FR	Immediate	1

	history	on life history i.e. age and growth and reproductive capacity is not available or fragmented.		Prioritise species	FR	High	1
				Source research capacity i.e. students	FR	High	1
				Collect and work up biological material from national research surveys and observer programme	FR	High	1-3
	Spatio-temporal behaviour	Information gaps exist around spatio-temporal behaviour i.e. identification of nursery and mating areas for live-bearing sharks.	All fisheries	Reference gap analysis	FR	Immediate	1
				Prioritise species	FR	High	1
				Source research capacity i.e. students	FR	High	1
				Collect and work up biological material from national research surveys and observer programme	FR	High	1-3
	Ecosystem changes induced by fishing	Habitat alteration through Fishing activities i.e. pupping grounds of demersal sharks.	Inshore and offshore trawl	Engage with EcoFish project that is investigating the trawl effects of the benthos	FR	Medium	ongoing

		Cascading effects on the ecosystem by the removal of apex predators	All fisheries	Ecosystem modeling using ecosym and ecopath	FR	Low	Ongoing
	Lack of formal assessments	Only two of the 98 species have been assessed, a further 14 species were assessed for the KZN region.	All fisheries	Prioritize species for assessment	FR	High	1-2
				Identify suitable assessment models	FR	High	1-4
				Collect and collate relevant material	FR	High	1-4
				Undertake assessments	FR	High	1-4
Sustainable management	Lack of formal management protocol for target and "joint product species"	Two species were assessed in terms of a per- recruit and an ASPM, respectively, according to the available data. There is no formal protocol on assessments and recommendations in any of the fisheries.	All fisheries	Develop management protocol	FR and MRM	High	1-2
				Implement management protocol	FR	Medium	2-3
				Management action based on protocol	MRM	Medium	2-4
	Lack of coordination of shark fishery management	Most sharks are caught by more than one fishery. Currently there is no formal mechanism	All fisheries	Review fisheries and non-extractive impacts on sharks	MRM	High	1
				Integrate into management protocol	MRM	High	1-2

		for shark management across fisheries. Furthermore, no formal mechanism to consider non-extractive use i.e. tourism. Inter-sector conflict					
				All fisheries that involve sharks take the NPOA into account during the development and implementation of species specific management plans	MRM	High	4
Optimum use	Concern around health risk of shark meat consumption	High levels of heavy metal contamination are suspected for many top predators, including most shark species, making them potentially unsafe for human consumption.	All fisheries	Collect material from national research surveys and observers for priority species	FR	Medium	1-2
				Analyze data	FR	High	1-2
				Minimize catch as a safety precaution	FR and MRM		
	Lack of knowledge or mechanisms to reduce fishery	Mitigation measures for unwanted species Proper release protocols for	All fisheries	Review existing mitigation measures	FR	Medium	2-4
				Develop best practice release protocols per fishery	FR	Medium	2-4

	mortality	unwanted by-catch		Incorporate best practice release protocols into Permit conditions	MRM	Medium	2-4
	Retained sharks are not fully utilized	Finning. Dumping of carcasses, killing of unwanted by-catch, no by-catch mitigation. There is no investigation into value adding and development of products i.e. shark leather etc. Large sharks are caught for fins and fillets not utilized.	All fisheries	International review of potential shark products	FR		
				Engage Technicons and Universities to develop possible shark products, meat as well as leather and Review possible Pharmaceutical products	FR and MRM	Medium	2-4
				Engage with relevant sections within DAFF regarding developing alternate livelihoods through full utilization of shark products ie. Leather, markets for unwanted low value species such as St. Joseph sharks	MRM	Medium	2 weeks
	Traceability of shark products from catch to sale	Product names cannot be matched with species names i.e. generic white fish	All fisheries	Introduce standardization of product codes/names	SASSI	High	1-2

		Custom HS codes only reflect generic sharks and not the individual species.		Engage with Customs to review product codes for export/import	MRM/Traffic	High	1-3
		Fillet identification is a problem	All Fisheries	Review of genetic coding tools.	FR Traffic	Medium	2-3
		Fins cannot always be identified to species level Illegal recreational sale		Fin identification guide	Research	Medium	2-3
Capacity and infrastructure	Lack of awareness	Lack of awareness and education to change misconceptions about sharks and shark fisheries Fishery pollution eg. discard of bait box packaging	All fisheries	Determine requirements for educational material	Research and Management	Medium	2-3
				Implement training and awareness program	Management	Medium	3-4
				Ensure compliance with permit conditions	Compliance and Management	High	1-2
				Develop responsible fisheries programs	DAFF	Medium	3-4

				pertaining to sharks			
	Lack of capacity	Lack of scientific capacity to timeously complete assessments and biological analysis		Develop departmental capacity and where necessary outsource shortfalls	DAFF	High	1-2
		Representation at shark international scientific working groups and stock assessment working groups of relevant RFMO	Large Pelagic Fishery	Shark expert from Fisheries Research attend relevant meetings	DAFF	Immediate	Ongoing
	Lack of funding	Funding for shark fisheries directed research and management is therefore limited		Explore funding opportunities from International agencies.	DAFF	Medium	2-3
Compliance	Lack of enforcement	Finning of pelagic sharks Inability to identify shark species Recreational sale of commercially valuable shark	All Fisheries	Develop of a monitoring and enforcement strategy	DAFF: compliance with input from research and management	High	1-2

		species Exceeding recreational bag limits Interpretation and knowledge of permit conditions pertaining to sharks					
Regulatory Tools	Inadequate regulatory Reference to sharks	Shark fishing competitions are not regulated adequately Fisheries specific permit conditions pertaining to sharks are not informed by overarching regulatory frameworks	All Fisheries	Review and develop regulatory tools	Legal with input from Research and Management	Immediate	1

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669 **9 MONITORING AND EVALUATION**
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671 The Fisheries Management Branch at DAFF has been the lead agency for drafting the NPOA-Sharks and
672 will remain responsible for coordinating its implementation. Collectively, the Chief Directorates Marine
673 Resource Management and Fisheries Research will be responsible for assessing the overall
674 implementation of NPOA-Sharks during its operational period. The structure of the plan, with actions
675 prioritized by a delivery timeline, should enable the Fisheries Management Branch to iteratively monitor
676 progress. Progress will be evaluated annually by the EAF-working group. Upon conclusion of the four-year
677 operational period of the plan, the overall progress of the NPOA-Sharks will be evaluated against its goals
678 and objectives. The layout allows for an assessment of individual actions, their outputs and their outcome in

terms of the overall vision. If an action is not completed, an explanation for the lack of completion should also be included.

Table 3. Assessment framework for NPOA-Sharks.

Action	Responsible agencies	Original Timeframe	Output	Outcome	Challenges/Reasons for not completing the action

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12 APPENDIX

APPENDIX 1

SHARKS IN SOUTH AFRICA

L.J.V. Compagno

1. SPECIES COMPOSITION OF SOUTH AFRICA SHARKS

Despite its relatively short coastline, South Africa has one of the most diverse faunas of cartilaginous fishes (Class Chondrichthyes) in the world. South Africa possesses representatives from all of the 10 orders, and most of the living families of cartilaginous fishes. Cartilaginous fishes are primarily marine, with about 5% penetrating fresh water. Most species are known from the intertidal to the epipelagic zone and the mid-slope, there are however a few deep slope (below 1500 m) and mesopelagic or bathypelagic taxa.

2. CLASSIFICATION OF TAXA

Cartilaginous fishes are divided into two subclasses, Elasmobranchii for sharks and rays and Holocephalii for the chimaeras. The major features of the synthetic classification include the subdivision of the living elasmobranch fishes or neoselachians into two superorders: the Galeomorphii and the Squalomorphii. The Galeomorphii includes four orders, the Heterodontiformes (bullhead sharks), the Lamniformes (mackerel sharks), the Orectolobiformes (carpet sharks), and the Carcharhiniformes (ground sharks). The Squalomorphii include the Hexanchiformes (cow and frilled sharks), the Squaliformes (dogfish sharks), the Squatiniformes (angel sharks), the Pristiophoriformes (sawsharks), and the Rajiformes (batoids). While living elasmobranchs were usually subdivided into two major groups, Selachii (sharks) and Batoidea (rays); phyletic studies suggest that the batoids are best included as a large and diverse order of 'flat sharks' (Rajiformes) within the Squalomorphii. The Rajiformes are the immediate sister group of the Pristiophoriformes, and with them forms the sister group of the Squatiniformes.

South African chondrichthyofauna include representatives from all 10 orders of cartilaginous fishes, 44 of the 60 families (73%), 100 out of 189 genera (53%), and over 181 of the 1171 world species (15%) (Table 2.1). With respect to world Chondrichthyan fauna, South Africa has similar relative numbers of species of chimaeroids, but has higher numbers of squaloids, lamnoids, hexanchoids, carcharhinoids, and lower numbers of orectoloboids (which are most diverse in the Western Pacific). The batoids (Rajiformes) are the largest order of sharklike fishes, but with respect to the world fauna, are found in far fewer relative numbers off South Africa (37%). In addition, batoids outnumber other chondrichthyans by 54%. The approximately nine batoid suborders also show divergence between Southern Africa and the world, with South Africa having relatively more Pristoids and fewer Rhinobatoids, Rajoids and Myliobatoids. In addition, there is no representation of the small suborders Zanobatoidei (West Africa) and Platyrhinoidei (North Pacific). In part, this suggests that batoid diversity, particularly of deep-water rajoids and tropical East Coast myliobatoids, may increase with further exploration of the South African chondrichthyofauna. There are many species of cartilaginous fishes currently known from Namibia and Mozambique waters that in the future, are likely to be found in South African waters.

767
768 Table 1. Comparison of relative numbers of species of South African
769 and world chondrichthyan fauna
770

Taxa	World		South Africa	
	No. species	% total	No. species	% total
Class Chondrichthyes	1171	100.0	181	100.0
Subclass Elasmobranchii	1121	95.7	172	95.6
Superorder Galeomorphii	336	28.6	66	37.1
Order Heterodontiformes	9	0.8	1	0.6
Order Lamniformes	15	1.3	12	6.6
Order Orectolobiformes	34	2.9	3	1.7
Order Carcharhiniformes	278	23.7	51	28.2
Superorder Squalomorphii	785	67.0	106	58.7
Order Hexanchiformes	6	0.5	5	2.8
Order Squaliformes	119	10.2	33	18.2
Order Squatiniformes	18	1.5	1	0.6
Order Pristiophoriformes	9	0.8	1	0.6
Order Rajiformes	633	54.1	66	36.5
Suborder Pristoidei	7	0.6	3	1.7
Suborder Rhinoidei	1	0.1	1	0.6
Suborder Rhynchobatoidei	6	0.5	1	0.6
Suborder Rhinobatoidei	47	4.0	5	2.8
Suborder Platyrhinoidei	3	0.3	0	0.0

Suborder Zanobatoidei	4	0.3	0	0.0
Suborder Torpedinoidei	77	6.6	6	3.3
Suborder Rajoidei	286	24.4	24	13.3
Suborder Myliobatoidei	202	17.3	26	14.4
Subclass Holocephali				
Order Chimaeriformes	50	4.3	8	4.4

The Prince Edward Islands (Marion and Prince Edward Islands) are isolated South African possessions in the Southern Indian Ocean. Their sub-Antarctic chondrichthyan fauna is little known, and has only been elucidated through the activities of international long-line vessels fishing for Patagonian toothfish (*Dissostichus eleginoides*, Family Nototheniidae). So far, two of the three species recorded (*Hydrolagus* sp. and *Lamna nasus*) are also known from South Africa but the third, *Amblyraja* sp. is presently not recorded, and is of uncertain identity. It is probable that additional collections will reveal more species around the Prince Edward Islands, and include *Somniosus antarcticus*, which occurs nearby on the Crozet Plateau about 500 km NNE of Prince Edward Island. In addition, it is likely that other species of skates and possibly squaloid sharks, chimaeras, and other taxa will be discovered in the area.

3. DISTRIBUTION PATTERNS

The South African chondrichthyan fauna is zoogeographically complex, and includes a variety of unique species. These include wide ranging species, local endemics and regional Southern African endemics that have minimal overlap with adjacent areas. South Africa, and by extension Southern Africa, is a center of endemism for a variety of taxa, most notably members of the catsharks (Family Scyliorhinidae), finback catsharks (Proscylliidae), houndsharks (Triakidae), sawsharks (Pristiophoridae), dogfish (Squaliformes), skates (Rajoidei) and chimaeras (Chimaeriformes).

Distribution and habitat data are listed for all South African cartilaginous fishes.Distributions are based on those described by Compagno *et al.* (1989). Additional data is presented on range and depth extensions, and catch data on sharks and rays provided by the KwaZulu-Natal Sharks Board (G. Cliff and S. Dudley, *pers. comm.).* In essence, 38.7% of the species are wide-ranging, 27.1% are endemics, and 16.6% Indo-Pacific species. There are lesser contributions from other areas (Table 2).

798

799

800 Table 2. Distribution types for South African cartilaginous fishes.

801

Distribution type	No. species	% total
Eastern Atlantic to South-Western Indian Ocean	8	4.4
Atlantic	7	3.9
Eastern Atlantic and Mediterranean	5	2.8
Atlantic coast of Africa	2	1.1
Southern African endemics	34	18.8
Subequatorial African endemics	5	2.8
South-eastern African endemics	1	0.6
South African endemics	15	8.3
Indo-Pacific	30	16.6
Western Indian Ocean	4	2.2
Wide-ranging	70	38.7
Total	181	100.0

802

803 While there may be some overlap in distribution, shelf chondrichthyans, and to some extent deep-slope
804 species, can further be subdivided into cool-temperate, warm-temperate and subtropical-tropical
805 species.Cool-temperate areas include the Northern Cape and Western Cape to Cape Point; warm
806 temperate areas include the south coast of the Western Cape from False Bay to East London in the
807 Eastern Cape; subtropical-tropical areas include the Transkei coast and KwaZulu-Natal. South African

808 species are listed below by distribution off the provincial coasts (Table 3). Diversity increases from west to
809 east, and from the Northern Cape to KwaZulu-Natal.

810
811 Table 3. Distribution categories for South African cartilaginous fishes.
812

Distribution category	No. species	% total
Eastern Cape	1	0.6
Eastern Cape to KwaZulu-Natal	15	8.3
KwaZulu-Natal	51	28.2
Northern Cape	4	2.2
Northern and Western Cape	10	5.5
Northern, Western Eastern Cape	16	8.8
Northern Cape to KwaZulu-Natal	29	16.0
Northern and Western Cape, KwaZulu-Natal	2	1.1
Western Cape	13	7.2
Western and Eastern Cape	10	5.5
Western and Eastern Cape, KwaZulu-Natal	25	13.8
Western Cape, KwaZulu-Natal	5	2.8
Total	181	100

813
814 **4. HABITAT PATTERNS**
815

816 Cartilaginous fishes are broadly divisible by habitat into species of the *continental shelves* (the intertidal to
817 about 200 m), the *continental slopes* (below 200 m to the ocean floor), and the *oceanic zone* (beyond the
818 shelves and above the slopes and sea bottom). In comparison with some other areas - including the
819 Eastern North Pacific - South Africa has a remarkably rich slope fauna. The slope fauna forms the largest
820 habitat category (Table 4), followed by the continental shelf fauna. A few species penetrate fresh water.
821 Very few South African cartilaginous fishes are oceanic, and the low diversity of cartilaginous fishes found
822 in the oceanic zone reflects this. A few large sharks including the bluntnosed sevengill and white sharks
823 have a wide range of habitats, and occur oceanically, on the slopes, and inshore. Some shelf species
824 favour muddy bays or sandy beaches, while others favour coral or rocky reefs.

825 Table 4. Habitat categories of South African cartilaginous fishes.
826

Habitat category	No. species	% total

Oceanic	13	7.2
Continental shelves	59	32.6
Shelves, fresh-water	6	3.3
Shelves to oceanic	10	5.5
Shelves to slopes	17	9.4
Continental slopes	67	37.0
Slopes to oceanic	3	1.7
Shelves to semi-oceanic	4	2.2
Wide range in habitats	2	1.1
Total	181	100.0

5. KNOWLEDGE OF THE FAUNA

The South African chondrichthyan fauna is not well known. Compagno (2000) noted that the discovery of Southern African and South African cartilaginous fishes lagged behind those of the rest of the world, and that prior to being recorded off South Africa, wide-ranging species were usually described from other regions. There are extralimital species that include Southern African and other wide-ranging species, that may be recorded off South Africa in the future - in particular, those from the inshore tropical, deep slope, and oceanic environments. Several undescribed South African species are known, but have not been formally described. In addition, further exploration may reveal new undescribed species. In 1998, the deep-slope ghost catshark (*Apristurus manis*) was found off Cape Town, and was identified as such in 1999. Recently a long-standing record of the North Atlantic skate *Amblyraja radiata* was found to be based on an Antarctic and Southern Indian Ocean species, *A. taaf*, which had only been described in 1987 (M. Endicott, *pers. comm.*). A rare megamouth shark (*Megachasma pelagios*) was stranded on a beach in the Eastern Cape in 2002, and was the first specimen collected in South Africa, southern Africa, and the African continent (Smale *et al.* 2002). In retrospect, it seems obvious that our basic knowledge of the chondrichthyan fauna has increased markedly only when active interest in the ichthyofauna, and vigorous field explorations have occurred. For example, during the period in which Andrew Smith, John Gilchrist, his colleagues, and contemporary researchers were engaged in collecting specimens and examining material in systematic collections. Conversely, there was a reduction in the rate of discoveries when there was limited or no interest in the fauna or its exploration.

Table 5 presents an estimate of how well the South African chondrichthyan fauna is known. A score of 0 is essentially unknown. Scores of 1 and 2 are intermediate and somewhat arbitrary. 3 is scored where extensive long-term sampling programs have been undertaken - such as Marine and Coastal Management's offshore demersal surveys of the west and southeast coast hake zones, the Natal Sharks Board's sampling that have yielded relatively few surprises in the last decade or two, and anglers in most parts of South Africa that intensively sample the inshore shelf from the intertidal to 50 m.

Table 5. Knowledge of South African cartilaginous fishes by habitats.

Habitat category	Ranking
Inshore (0 to 50 m)	1 to 3
Offshore (50 to 200 m)	1 to 3
Upper slope (200 to 600 m)	0 to 3
Mid slope (600 to 1200 m)	0 to 3
Lower slope (below 1200 m)	0 to 2
Epipelagic zone	0 to 2

Knowledge of the inshore (0 to 50 m) benthic and littoral chondrichthyan fauna is patchy, and areas like the Northern Cape coast are sketchily known. In contrast, the larger inshore elasmobranchs of KwaZulu-Natal - particularly large elasmobranchs that are caught in antishark nets and fished by anglers - are very well known. However, small species that can slip through the meshes of shark nets, and those that are of no interest to anglers or commercial fishers are sketchily known. Likewise, the reef-dwelling species in the far north that are not caught in shark nets are also relatively unknown. The offshore shelf (50-200 m) and upper slope (200-600 m) fauna on the West and Southwest coasts includes some of the best known demersal and epibenthic chondrichthyan faunas. In contrast, on the East Coast, the upper slope faunas are sketchily known. The middle slope between 600 to 1200 m is best known from the West coast and from limited parts of the South coast of South Africa. This is primarily a result of sampling by the *Africana*. The fauna in those areas that have not been sampled are sketchily or poorly known. Lower slope faunas below 1200 m are sketchily known on the West coast of South Africa - due to early collections by the RV *Pickle*, the current *RV Africana*, and commercial exploratory trawling and deep-set long-lining - but are poorly known elsewhere. Some wide-ranging deep slope species such as the false cat shark (*Pseudotriakis microdon*), the bigeye sand tiger (*Odontaspis noronhai*), and the smallspine spookfish (*Harriotta haeckeli*) have not been collected, but are to be expected in very deep water. The deepwater skate *Cruriraja durbanensis* was collected once by the RV *Pickle* off the Northern Cape and not seen since; while *Amblyraja robertsi* was described in 1970 from a single specimen found in the Western Cape (taken by the German research trawler, *Walter Herwig*). In the 1990s, the *RV Africana* recovered a few additional specimens from the same locality.

As elsewhere, the South African oceanic elasmobranch fauna is undiverse, and is well known to poorly

known in the epipelagic zone. It is poorly known in the mesopelagic and bathypelagic zones. New records are expected for certain wide-ranging species that have not currently been recorded from South Africa, or for that matter Southern Africa. These include the bigeye sand tiger (*Odontaspis noronhai*), largetooth cookiecutter shark (*Isistius plutodus*), and spined pygmy shark (*Squaliolus laticaudus*). Pelagic long-liners have found the whitetail dogfish (*Scymnodalatias albicauda*) in the Southern Ocean well Southwest and Southeast of South Africa. It may be recorded in South African waters in the future. Some dwarf oceanic species such as the taillight shark (*Euprotomicroides zantedeschia*) and the longnose pygmy shark (*Heteroscymnoides marleyi*) are rarely found, as are the pigmy shark (*Euprotomicrus bispinatus*), cookiecutter shark (*Isistius brasiliensis*), and the semipelagic broadband lanternshark (*Etmopterus gracilispinis*). The longfin mako (*Isurus paucus*) may occur off South Africa, however confirmation is required.

In most areas, there is little knowledge of the distribution of large common offshore oceanic sharks. These include the blue (*Prionace glauca*), silky (*Carcharhinus falciformis*), oceanic whitetip (*Carcharhinus longimanus*), bigeye and pelagic threshers (*Alopias superciliosus* and *A. pelagicus*), and shortfin mako (*Isurus oxyrinchus*). In comparison with the Northern Hemisphere, there are astonishingly few offshore records of these large pelagic sharks, and for that matter the associated pelagic stingray (*Pteroplatytrygon violacea*). What little we know of the distribution of the shortfin mako and pelagic thresher in Southern African waters is primarily from the KwaZulu-Natal shark nets. These samples are derived from individuals that occasionally wander close inshore. Important offshore commercial species such as the silky, blue, and oceanic whitetip sharks are not caught in the shark nets, and thus records are few and far between. This is an unfortunate situation, particularly when consideration is given to the intensity of epipelagic long-line fisheries in the South Atlantic and Southern Indian Ocean that are targeting scombroids, large non-batoid sharks, and the pelagic stingray (by-catch species). In addition, there is the burgeoning trade in the fins of the large pelagic sharks. Unfortunately, there have been few pelagic long-line surveys of sharks in the epipelagic zone of Southern Africa to match demersal work that has been undertaken off the West and South coast of South Africa and Namibia. The distribution of the large oceanic batoids of the Family Mobulidae (devil rays) is poorly known off South Africa. The relatively few records that exist are derived from either strandings or catches in the KwaZulu-Natal shark nets. Devil rays are rarely caught by long-lines, but were susceptible to giant pelagic gill nets during the past few decades.

The white shark (*Carcharodon carcharias*) is well-known from coastal records off the southwest and east coasts of South Africa, where it regularly occurs close inshore, but this species is poorly known north of Saldanha Bay on the west coast of South Africa, Namibia, Angola and Mozambique. In addition, it is poorly known in the epipelagic zone, which it apparently readily penetrates, as do other members of the Family Lamnidae. Such inadequate knowledge of its distribution and movements makes protecting this threatened species problematic.

6. ABUNDANCE OF THE FAUNA

A simple scale of the relative abundance of South African cartilaginous fishes is presented in Table 6. *Rare* species are those with 1-10 examples collected or otherwise sampled (photographed, observed, etc.). Species that are *infrequent* are known from 10 to 100 examples; *Unabundant* species from 100 to 1000; and *Common* species from 1000 or more examples. About half (52%) of known species are rare or unabundant, while slightly more than a quarter are common (including important fisheries species). An additional category, *abundant*, might be used for those species in which more than 100 000 specimens are

known, and *common* restricted to 1000 to 100000. However, the current data set is insufficient, and thus at present these categories cannot be distinguished.

Table 6. Abundance of the South African cartilaginous fishes.

Abundance Category	Nº. Species	% Total
Rare	64	35.4
Infrequent	30	16.6
Unabundant	39	21.5
Common	48	26.5
Total species	181	100.0

It is important to note that despite a high level of species diversity in the South African chondrichthyofauna, stock sizes remain relatively small. This low abundance is a function of the limited but diverse habitats that effectively compress the ranges of many species. Concomitant with the low abundance is a limited potential to sustain fishing pressure, and thus, these resources are vunerable to over exploitation.

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APPENDIX 2

CURRENT FISHING REGULATIONS PERTAINING TO SHARKS

Table 1. Sharks currently listed in Annexures 4, 5 and 6 of the Regulation gazette No. 6284, 2 September 1998 – listings presented here only refer to sharks and rays.

Annexure	List	Common name	Species
4 - Regulation 21	Non-saleable recreational list	Leopard catshark	*Poroderma pantherinum*
		Ragged tooth	*Carcharias taurus*
		Spotted gully	*Triakis megalopterus*
		Striped catshark	*Poroderma africanum*
5 – Regulation 22	Specially protected list	Great white	*Carcharodon carcharias*
		Sawfishes	Pristidae
8 – Regulation 22	Exploitable list	Elasmobranchs	*Elasmobranchii*
	Excluding	Great white	*Carcharodon carcharias*
		Leopard catshark	*Poroderma pantherinum*
		Ragged tooth	*Carcharias taurus*
		Spotted gully	*Triakis megalopterus*
		Striped catshark	*Poroderma africanum*

950 **APPENDIX 3**

951 SYNOPSIS OF SHARK SPECIES TARGETED BY SOUTH AFRICAN FISHERIES AND POTENTIALL SOURCES OF FISHERY DEPENDENT
952 AND INDEPENDENT SURVEY DATA

Superorder/Family	Species	Estimated catch 2010 (t)	Commercial linefishery	Recreational linefishery	Demersal shark longline	Pelagic shark longline	Tuna and swordfish pelagic longline	Gill and beach seine net fisheries	Offshore /inshore demersal trawl fishery	Small pelagic fishery	Hake longline fishery	Bather protection	Prawn trawl fishery	Fishery-dependant data	Fishery- independent data	Biological Data	Stock assessments
Squalomorphea	unidentified	1-10									■						
Hexanchidae	*Heptranchias perlo*	0													X		
	Notorynchus cepedianus	<1-10	■	Δ	○									X	X	A	
	Hexanchus griseus	<1									■				X		
	Chlamydoselachidae spp	<1							■						X		
Squalidae	*Centrophorus* spp	<1							■						X		
	Centroscyllium fabricii	<1							■						X		
	Centroscymnus spp	<1							■						X		
	Deania spp	<1							■		Δ			X	X		
	Etmopterus spp	<1							■		Δ			X	X		

	Isistius brasiliensis	<1							●	●				X	X		
	Squalus acanthias	<1	Δ		Δ			Δ	■					X	X		
	*Cirrhigaleus asper (squalas asper)**	<1											■		X		
	Squalus megalops	11-100							Δ		■			X	X	D	
	Squalus mitsukurii	<1							■		Δ			X	X		
Carcharhinidae	*Carcharhinus amboinensis*	<1										■					E
	Carcharhinus brachyurus	101-200	●	Δ	○	○	Δ	Δ	Δ	Δ		Δ	Δ	X	X	F;G;H	E
	Carcharhinus brevipinna	1-10	○		⊘	○	○		⊘			○	Δ	X			E
	Carcharhinis falciformis	1-10				●	●		●				Δ	X			
	Carcharhinus leucas	1-10	○		○	○	○		Δ			○		X		B;I;G	E
	Carcharhinus limbatus	1-10	●		⊘	⊘	⊘				⊘	⊘	Δ	X		B;C;J;K	E
	Carcharhinus longimanus	1-10				●	●						Δ	X			
	Carcharhinus melanopterus	1-10	○		○	○	○					○	Δ	X	X		
	Carcharhinus plumbeus	<1										■	Δ				
	Carcharhinus obscurus	1-10	○		○	○		○			○	○	Δ	X	X	L;C;M	
	Galeocerdo cuvier	1-10	●									●		X			E
	Prionace glauca	301-400	⊘	Δ	Δ	□	●			Δ	Δ					N	

Triakidae	*Galeorhinus galeus*	301-400	●	Δ	●	Δ		Δ	●	Δ	Δ			X	X	A; O	O
	Mustelus mustelus	101-200	○	Δ	□	⊘			○	Δ	Δ			X	X	P;Q	Q
	Mustelus palumbes	11-100	⊘		⊘				■			⊘		X	X	A	
	Mustelus mosis	1-10	○	○	○				●					X			
	Rhizoprionodon acutus	<1	Δ	Δ									Δ	X			
	Triakis megalopterus	1-10	●								●			X	X	R	R
Scyliorhinidae	*Apristurus saldanha*	<1							■					X			
	Halaelurus natalensis	1-10	●						●		●			X	X		
	Halaelurus lineatus	<1							■						X		
	Haploblepharus edwardsii	1-10	●		●				●					X	X		
	Haploblepharus fuscus	1-10	●						●					X			
	Haploblepharus pictus	1-10	●						●					X			
	Holohalaelurus regani	1-10							●		●			X			
	Poroderma africanum	1-10	●		●									X	X	A	
	Poroderma pantherinum	1-10			●				●					X	X	A	
	Scyliorhinus capensis	1-10	⊘		⊘				■					X	X		
Sphyrnidae	*Sphyrna lewini*	1-10	○			○	○			○	○	○	Δ	X	X		E
	Sphyrna mokarran	1-10	○			○	○					○		X	X		E

	Sphyrna zygaena	1-10	○	⊘	○	⊘	○		⊘	⊘		⊘		X	X		E
Lamnidae	*Carcharadon carcharias*	<1										■		X	X	S	E
	Isurus oxyrinchus	501-600				■	○							X	X	A;B	E
	Lamna nasus	<1					■								X		
Alopiidae	*Alopias pelagicus*	1-10	○			○	○		○	○		○		X			
	Alopias superciliosus	1-10	○			○	○		○	○		○		X	X		
	Alopias vulpinus	1-10	●			○	○	○	○	○		○		X	X	A	
Pseudocarchariidae	*Pseudocarcharias kamoharai*	1-10				●	●							X			
Odontaspididae	*Carcharias taurus*	1-10	○			○	○		○		○	○		X	X	B;T	E
Pristiophoridae	*Pliotrema warreni*	1-10							■		Δ			X	X		
Squatinidae	*Squatina africana*	<1										■		X	X		
Torpedinidae	*Torpedo fuscomaculata*	1-10							■		Δ			X	X		
	Torpedo nobiliana	1-10							■		Δ			X	X		
	Torpedo sinuspersici	1-10							■					X			
	Heteronarce garmani	<1							■					X	X		
	Narke capensis	1-10							■		Δ			X	X		
Rajidae	*Bathyraja smithii*	11-100							■		Δ			X	X		
	Cruriraja spp	11-100							■		Δ			X	X		

	Raja spp	11-100	Δ		Δ				■		Δ			X	X		
	Rostroraja alba	11-100	●		●				●		Δ			X	X		
	Raja caudaspinosa	11-100							■		Δ			X	X		
	Raja confundens	1-10							■					X	X		
	Raja leopardus	11-100							■								
	*Raja miraletus**	11-100	Δ						■		Δ			X	X		
	Raja pullopunctata	11-100							■		Δ			X	X		
	Raja ravidula	1-10							●		●			X	X		
	Raja spinacidermis	11-100							■								
	Raja springeri	10-100							■		Δ			X	X		
	Raja straeleni	201-300	Δ		Δ				■		Δ			X	X		
	Raja wallacei	11-100	Δ		Δ				■		Δ			X	X	U	
Rhinobatidae	*Rhinobatos annulatus*	11-100	⊘	⊘	⊘			⊘	■		⊘			X	X		
	Rhinobatos blochii	1-10	○		○			○	○		○			X		V;W	
	Rhinobatus holcorhynchus	<1							■					X	X		
	Rhinobatos leucospilus	1-10	●	Δ	●									X			
	Rhinobatus occellatus	<1							■						X		
	Rhynchobatus djiddensis	<1							■					X	X		

Myliobatidae	*Aetobatus narinari*	1-10	Δ						■				Δ	X				
	Myliobatis aquila	1-10	○						□		○		Δ	X	X			
	Pteromylaeus bovinus	1-10	●						●		●				X			
	Mobula spp	<1						●		●			●		X			
	Manta spp	<1						●		●			●		X			
Dasyatidae	*Dasyatis brevicaudata*	<1	■										Δ	X	X			
	Neotrygon kuhlii (Dasyatis kuhlii)	1-10	●		●								Δ	X				
	Dasyatis chrysonata	1-10	○		○				○		○		Δ	X		X;Y		
	Dasyatis violacea	11-100				□	○		○					X	X			
	Gymnura natalensis	1-10	○		○				○		○		Δ	X				
	Himantura gerrardi	<1	■										Δ	X	X			
	Himantura uarnak	<1	■											X				
	Taeniura lymma	<1	■											X				
Chimaeridae	*Hydrolagus* spp.	<1							■						X			
Rhinochimaeridae	*Harriotta raleighana***	<1							■						X			
	*Neoharriotta pinnata***	<1							■						X			
	Rhinochimaera spp	<1							■						X			

Callorhinchidae	*Callorhinchus capensis*	801-900						⦸	■					X	X	Z	

%catch per species: Δ <1 ⦸ 1-10 ○ 11-25	 ● 26-50 □ 51-75 ■ 76-100	Sources of institutional data: A-Department of Agriculture, Forestry and Fisheries: Inshore Resource Research, superscripts 1: National fisheries data, 3: Research data.; B- ORI tagging data, C-KZN Sharks Board.

A:DAFF unpublished	F:Walter and Ebert (1991)	K:Dudley and Cliff (1993)	P:Goosen and Smale (1997)	U:Walmsley-Hart (1999)	Z:Freer and Griffiths (1993b)
B:Oceonographic Research Institute	G:Cliff and Dudley (1992)	L:Natanson and Kohler (1996)	Q:da Silva (2007)	V:Dunn (2010)	
C:KZN Sharks board	H:Smale (1991)	M:Govender et al (1991)	R:Booth and Foulis (2010)	W:Rossouw (1984)	
D:Watson and Smale (1999)	I:Bass et al (1973)	N:Jolly (2011)	S:Wintner and Cliff (1999)	X:Cowley (1990)	
E:Dudley and Simpfendorfer (2006)	J:Wintner and Cliff(1996)	O:McCord (2005)	T:Govender et al (1991)	Y:Cowley (1997)	

953 *Species currently being re-described; **Species identification remains an issue for these species however DAFF databases record both species
954 separately

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