



South Africa's second National Plan of Action for the Conservation and Management of Sharks (NPOA-Sharks II)



forestry, fisheries
& the environment

Department:
Forestry, Fisheries and the Environment
REPUBLIC OF SOUTH AFRICA



South Africa's second National Plan
of Action for the Conservation and
Management of Sharks
(NPOA-Sharks II)

Contents

Executives Summary.....	1
Acronyms.....	2
Glossary.....	3
Forward.....	5
Introduction.....	6
Status and progress related to shark fishing in South Africa.....	6
Shark fisheries.....	6
Markets.....	8
Bather protection.....	8
Spatial management.....	9
Internal review of the NPOA-Sharks I.....	9
Shark Expert Panel Review.....	9
Stakeholder engagement.....	10
More than a promise: Actions and goals for the next five years.....	10
Monitoring and Evaluation.....	18
References.....	18
Acknowledgements.....	18
Appendices.....	19
Appendix 1.....	19
Appendix 2.....	20
Appendix 3.....	25
Appendix 4.....	28

Cover photo courtesy Morné Hardenberg
NPOA footer illustrations by Charlene da Silva

ISBN: 978-0-621-50398-2

Executive Summary

South Africa's marine ecosystems, spanning from the subtropical waters of the Mozambique Channel to the polar waters of the Prince Edward Islands, harbour one of the most diverse shark, ray, skate and chimaera faunas in the world. South Africa is home to nearly 200 species of these cartilaginous fishes (also known as chondrichthyans), and additional species continue to be discovered. For the purpose of this document the term "sharks" is used to refer to all chondrichthyans. Sharks form an integral part of South Africa's marine biota and their importance for the ecosystems cannot be overemphasized. Sharks have also been part of South African traditional fisheries for more than a century and some species are targeted and caught as bycatch in appreciable quantities. South Africa is committed to the conservation and optimal, long-term, sustainable use of sharks. The first South African National Plan of Action for sharks (NPOA-Sharks I) was finalized in 2013 and provided baseline information on the status of chondrichthyans in South Africa and assessed research, management, monitoring, and enforcement frameworks associated with shark fishing and trade of shark product in the South African context. Issues particular to South African chondrichthyan resources that require intervention in the form of specific actions were listed with associated responsibilities and time-frames. The NPOA-Sharks I went through an internal review process and also a comprehensive external review by an international panel of experts appointed by the Minister in 2020.

The panel recognized South Africa's achievements, in particular in the discipline of scientific assessments, but also identified areas where improvements are still needed. Emanating from this review, after an extensive stakeholder consultation phase, the revised NPOA (NPOA-Sharks II) builds on the achievements and lessons learned from NPOA-Sharks I and closely follows the recommendations of the Shark expert panel: The following needs were considered priorities in the development of the 41 actions contained in 5 clusters that form the heart of the NPOA-Sharks II: (i) more effective communication and coordination; (ii) measurable outcomes; (iii) recognition of ecosystem effects of fishing and the need for spatial management; (iv) a stronger focus on illegal, unregulated and unreported (IUU) fishing; and (v) improvement and modernization of data collection, capture and storage and integration. These actions will be tracked through the life of this plan against measurable indicators.

The NPOA-Sharks II identifies fewer actions, but these have measurable goals and are assigned to specific Chief Directorates within the Department of Forestry, Fisheries and the Environment, who will be responsible for their delivery, in partnership with other entities. With this plan South Africa again cements its role as a leader among developing countries in the conservation and management of marine resources, recognizing their value for marine ecosystems as well as for the people who depend on it directly and indirectly.



Photo credit: Rob Tarr



Acronyms

ASPM:	Age-Structured Production Model	MCS:	Monitoring, Compliance and Surveillance
BMP:	Biodiversity Management Plan	MLRA:	Marine Living Resources Act
CCAMLR:	Commission for the Conservation of Antarctic Marine Living Resources	MLRF:	Marine Living Resources Fund
CCSBT:	Commission for the Conservation of Southern Bluefin Tuna	MPA:	Marine Protected Area
CITES:	Convention on International Trade in Endangered Species of Wild Fauna and Flora	MRM:	Marine Resources Management
COFI:	FAO Committee on Fisheries	MSC:	Marine Stewardship Council
EEZ:	Exclusive Economic Zone	NDF:	Non-Detriment Finding
FAO:	Food and Agriculture Organization of the United Nations	NPOA-Sharks:	National Plan of Action for Sharks
FRAP:	Fisheries Resource Allocation Process	OMP:	Operational Management Plan
FRD:	Fisheries Research and Development	PEI:	Prince Edward Islands
ICCAT:	International Commission for the Conservation of Atlantic Tunas	PUCL:	Precautionary Upper Catch Limit
IOTC:	Indian Ocean Tuna Commission	RFMO:	Regional Fisheries Management Organisation
IPOA-Sharks:	International Plan of Action for the Conservation and Management of Sharks	RR:	Resources Research
IUCN	International Union for Conservation of Nature	SABS:	South African Bureau of Standards
IUU Fishing:	Illegal, Unregulated and Unreported Fishing	SAIAB:	South African Institute for Aquatic Biodiversity
KZNSB:	KwaZulu-Natal Sharks Board	SANBI:	South African National Biodiversity Institute
		SAR:	Shark Assessment Report
		SASSI:	Southern African Sustainable Seafood Initiative
		TAC:	Total Allowable Catch
		TAE:	Total Allowable Effort
		VMS:	Vessel Monitoring System



Glossary

ABUNDANCE: Degree of plentifulness; for example, the total number of fish in a population or a stock.

AGE-STRUCTURED PRODUCTION MODEL: A model that uses forward computations to estimate population sizes given observed catches, based upon the contribution of different cohorts or year classes to the fished population.

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.

BYCATCH: 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 act of maintaining, protecting or enhancing natural resources and ecosystems.

DEMERSAL: Living in close relation with the bottom and depending on it. Example: hake, sole and lobster 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 organisms whose life cycle includes large scale systematic movement patterns, usually through the EEZ of two or more countries as well as into international waters.

JOINT PRODUCT: Term used to describe the utilisation of bycatch 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.

MANAGEMENT: The process 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: Organisms 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.

NON-DETRIMENT FINDING (NDF): In accordance with Articles III and IV of CITES, export permits for specimens of species included in Appendices I and II shall be granted only when a Scientific Authority of the State of Export has advised that such export will not be detrimental to the survival of the species (a determination known as a 'non-detriment finding' or NDF).

OPTIMAL: Most favourable or desirable.

PELAGIC: Sharks that frequent 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: Is the ability to exercise prudent foresight to avoid unacceptable or undesirable situations, taking into account that changes in fisheries systems are only slowly reversible, difficult to control, not well understood, and subject to change in the environment and human values. The precautionary principle therefore promotes that measures be implemented to prevent degradation of the ecosystem where there are threats of serious or irreversible damage even in the absence of full scientific certainty.

RATIONAL USE: Decisions on resource utilization are derived in a consistent way given the available information.

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 refer to all members of the class Chondrichthyes (sharks, skates, rays and chimaeras).

STAKEHOLDER: An entity (individuals or organizations) 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.

SUSTAINABLE USE: The use of a renewable resource in a way that does not lead to its long-term decline, thereby maintaining its potential to meet the needs and aspirations of present and future generations.



Photo credit: Morné Hardenberg

Foreword

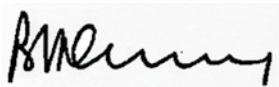


South Africa's Exclusive Economic Zone spans three oceans, encompassing tropical, temperate and polar ecosystems, it is home to a rich variety of cartilaginous fishes, the sharks, rays and related species. These species form an integral part of our aquatic biodiversity and fulfil a range of important functions within the ecosystems they inhabit. Sharks are also an important living resource. Some of the iconic species are the focus of ecotourism activities and attract visitors to our shores from all over the world. Sharks have also been part of our traditional fisheries for more than a century and continue to represent an important source of revenue for fishing communities along the coast.

The ecologically sustainable management of these marine living resources, based on sound scientific advice, for the benefit of all South Africans, present and future, remains a firm commitment of our government. The South African National Plan of Action for Sharks II (NPOA-Sharks II), therefore represents an important milestone in achieving this goal and will be at the heart of the department's efforts to strengthen shark conservation and management. NPOA-Sharks II is a product of extensive consultations with all stakeholders. It builds on the achievements and lessons learned from South Africa's original NPOA-Sharks, which underwent a well-publicized, unprecedented international expert panel review. During its lifespan, the original NPOA-Sharks has laid the scientific foundation for improved shark management in South Africa. The findings of the population assessments and the International Union for Conservation of Nature (IUCN) risk assessments are clear and undeniable: Some of our shark species are under threat and their populations are in decline. Specific management interventions are necessary to safeguard these populations to a sustainable future. To achieve that, sound scientific investigation is required to determine the cause of these population declines, which are often a combination of direct and indirect anthropogenic impacts. Management action needs to be swift, effective and in direct response to the threats. Unsustainable fishing is one such threat and great strides have been made by South African scientists to piece together data from all fisheries operating in our waters to quantify this threat for all shark species affected by it.

This information will enable us to implement harvesting strategies consistent with the principles of biological sustainability, attained through scientifically based management, and to direct attention to threatened sharks that are mainly impacted by fishing. Balancing the dichotomy between the management of consumptive and non-consumptive use of marine living resources such as sharks needs to be one of the priorities. A Shark Biodiversity Management Plan, which addresses threats other than fishing, is currently being developed by the Oceans and Coast Branch of the Department and will complement the NPOA-Sharks II.

I am confident that the NPOA-Sharks II, will guide us in our efforts to sustain this important component of our natural heritage going into the future.

A handwritten signature in black ink, appearing to read 'Barbara Creecy'.

Barbara Creecy
Minister: Forestry, Fisheries and the Environment
Republic of South Africa



Introduction

The class Chondrichthyes (sharks, rays, and chimaeras), hereafter collectively referred to as sharks, represents an ancient (420-million-year-old) lineage of fishes. Sharks are present in all major marine systems and represent some of the apex predators in many marine food webs. As with many terrestrial predators, sharks are particularly vulnerable to overexploitation due to closed stock-recruitment relationships, low biological productivity, and complex spatial structures. Since the 1970s, the global abundance of oceanic sharks and rays has declined by 71% owing to an 18-fold increase in relative fishing pressure (Pacoureau et al. 2021). Globally, according to the International Union for Conservation of Nature (IUCN), it has been estimated that more than a third (37.5%) of the 1 200 known species are currently threatened with extinction. For two thirds of all threatened shark species, overfishing remains the sole threat to their populations (Dulvy et al. 2021). Sharks are often caught as part of the unwanted bycatch in fisheries that are managed for species that can sustain a higher fishing pressure. This unwanted bycatch is discarded at sea, and much of it is unrecorded and unregulated. Fishing has long been acknowledged to be the biggest threat to sharks and hence the FAO Committee on Fisheries (COFI) developed an International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks) in 1998 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 maritime 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 and requires each state to develop, implement and monitor an NPOA for the conservation and management of sharks. South Africa's first such national plan, NPOA-Sharks I, published in 2013, provides information on the status of chondrichthyans in South Africa as well as on structures, mechanisms and the regulatory framework related to research, management, monitoring, and enforcement associated with shark fishing and trade of shark product in the South African context. The NPOA-Sharks does not address issues pertaining to the non-consumptive utilization of sharks, such as shark-related tourism and filming, as these are considered in the South African Shark Biodiversity Management Plan, which is updated concurrently with the NPOA-Sharks. The Shark-BMP includes wider anthropogenic pressures such as climate change and pollution and complements the NPOA-Sharks.

Status and progress related to shark fishing in South Africa

The southern African chondrichthyo fauna includes representatives from all 13 orders of cartilaginous fishes with 50 families and 105 genera (Ebert et al. 2021), representing 20% of all known chondrichthyans with 111 shark, 72 batoid and 8 chimaera species, 13% of these endemic to the region. Just over half of the 191 (da Silva et al. 2015; Ebert et al. 2021) chondrichthyan species that occur in southern Africa are impacted by fisheries, ranging from recreational angling to industrialized fishing such as trawling and pelagic longline fishing. Of the 103 species of chondrichthyans that are impacted by South African fisheries, catches in excess of 11 t are reported for only 22 species (Appendix 2). The most-recent estimate (2019) of the dressed-weight catch of chondrichthyans across all fisheries in South Africa decreased to 1 153 t or 55% of the 2016 estimate. Seven new species were described, and three taxonomic revisions occurred (Ebert et al. 2021).

Shark fisheries

The Branch: Fisheries Management of the Department of Forestry, Fisheries and the Environment 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. 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), and the KwaZulu-Natal Sharks Board Act, 2008 (Act 5 of 2008). Fisheries Management, in managing sharks, is supported by a number of agencies/institutions, namely the Branch: Oceans and Coasts of the Department, 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). A Shark Biodiversity Management Plan (SBMP) was developed by the Branch: Oceans and Coasts and was gazetted in 2015 to manage wider anthropogenic pressures.

The Branch: 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 (*Pristidae*). In addition, spotted-gully and ragged-tooth sharks have been commercially delisted in terms of the Regulations of the MLRA (Appendix I). Further protection is provided through recreational fishers being restricted to catching and landing only one shark, per species, per day. Entry into any South African commercial fishery is governed by a rights allocation process. This policy recognises the need to ensure the optimal, long-term and justifiable use of marine living resources for both present and future generations. The impact of fishing on both the target species and the ecosystem, including species not targeted (bycatch species), is managed based on scientific principle and international best practice. This is primarily done either through the setting of a Total Allowable Catch (TAC) per targeted species or species group in a particular area, a Total Applied Effort (TAE) of units of time spent fishing, fishing gear, vessels or fishers, or other management tools (such as a Precautionary Upper Catch Limit [PUCL]), or a combination thereof. Management measures for bycatch species of conservation concern particular to individual fisheries are specified in the respective Sector Specific Policies. The impact on some shark species has been reduced through applying permit conditions in certain fisheries, e.g. tuna pole, where the landing of sharks is prohibited.

South Africa has only one shark-directed fishery, the demersal shark longline fishery. The fishery targets few species, smoothhound and soupfin shark comprising the bulk of the catch. In most years the fishery lands the largest proportion of the South African catch of smoothhound sharks, but together the trawl and the line fisheries have a larger impact on demersal shark populations. Total catch of sharks across all fisheries is in the order of 1 000 metric tonnes per annum. The tuna-directed large-pelagic longline fishery still incurs significant catches of mako and blue shark, but these species have been designated as bycatch. The St Joseph (technically not a shark, but a chimaera, a member of a different order of cartilaginous fishes) is targeted by a segment of the coastal gillnet fishery restricted to 60 km of the West Coast. The commercial, recreational and small-scale line-fisheries target sharks in certain areas and during certain seasons. The demersal trawl fisheries catch a variety of sharks and rays as by-product or unwanted bycatch.

A comprehensive review of the history and management of shark fisheries in South Africa can be found in da Silva et al. (2015). Literature about shark fishing in South Africa goes back as far as 1934 (von Bonde 1934; Kroese et al. 1996; Kroese and Sauer 1998) and catch data even as far as the late 1800s. Regulations aimed at limiting chondrichthyan catches, coupled with species-specific conditions, currently exist in the following fisheries: demersal shark longline, large pelagic longline,

recreational line and beach-seine and gillnet fisheries. Limited management measures are currently in place for chondrichthyans captured in other fisheries. Since the completion of NPOA-Sharks I in 2013 there have been a number of substantial changes in how sharks are managed both in target and in bycatch fisheries. In the demersal shark longline fishery, no species listed in CITES Appendix II, nor broadnose sevengill sharks *Notorynchus cepedianus*, may be landed. A slot limit of 70–130 cm has been implemented for all elasmobranchs in this fishery and in the Commercial Traditional Linefishery, whereby retention of sharks outside the limit is prohibited. Strict handling and release protocols and data requirements apply to all released sharks. The oldest fishery to have historically targeted sharks; the commercial linefishery, has small segments of fishers in historical shark fishing areas that target smoothhound, soupfin and requiem shark species. The 70–130 cm slot limit has also been implemented in this fishery. The most substantial changes in shark management occurred in the large pelagic longline fishery. The shark-directed component of this fishery was merged with the tuna-directed fishery and sharks have become designated as bycatch with strict bycatch regulations in place. These include: (i) the removal of wire traces as permitted fishing gear; (ii) prohibition on retention of CITES Appendix II listed species, including look-alike species; and (iii) implementation of permit conditions requiring sharks to be landed either with fins naturally attached or partially attached but tethered. The observer coverage in this fishery was increased to 20%, stratified by vessel and season. The most significant change occurred once bycatch permit conditions were introduced in 2018, which penalized vessels with high shark bycatch with mandatory observers, and this resulted in an 85% reduction in shark catches in 2020.

All chondrichthyans impacted by fisheries in South Africa are shown in Appendix 2, showing estimated catch between 2010 and 2012 as well as estimated total landings between 2013 and 2019 using the methodology presented in da Silva et al. (2015). Moreover, the conservation status according to the IUCN list of threatened species is shown for species that have been assessed. IUCN red list divides species into 9 categories; Not evaluated (NE), Data Deficient (DD), Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Endangered (EN), Critically Endangered (CR) and Extinct in the Wild and Extinct. The first two categories apply in cases where species have not been evaluated with the latter because of no available data to assess them. The remaining 7 categories range from least to most threatened. A decline in catches between these two periods was observed for St Joseph *Callorhynchus capensis* (LC), bronze whaler shark *Carcharhinus brachyurus* (VU), dusky shark *C. obscurus* (EN), blue shark (Near Threatened NT), shortfin mako shark (EN), biscuit skate *Raja straeleni* (NT), soupfin shark (CR) and smoothhound shark (EN). In total, 24% of chondrichthyans landed in SA fisheries are listed as either endangered (EN) or critically endangered



(CR), while a third of all chondrichthyans impacted by fisheries are listed as least concern (LC). It should be noted that 5 of the species listed as Endangered are not caught in appreciable amounts in any fisheries, therefore threats they are facing are likely related to change or deterioration of their environment. For the 22 species caught in excess of 11 tonnes, a less than a third are listed as Endangered or Critically Endangered. Local risk assessments have been completed for 25 species, with data from national research surveys. Of these, nine species show lower extinction rates locally than predicted globally. Only six species of chondrichthyans have catches in excess of 100 t, and three of these are listed as Endangered or Critically Endangered, with fisheries being the sole threat to their populations. The mitigation against the threats to endangered species is a priority action in the new NPOA.

Markets

The international trade in shark product from South Africa shows no evidence of a declining trend. The lack of species-specific trade statistics hinders the ability to identify any shifts in utilization between species. Data discrepancies exist in the trade, indicating higher exports of shark meat and fins than are reported caught in South African waters and with no re-export data from South Africa to account for these discrepancies. Data discrepancies are especially high for fins destined for Hong Kong markets (Lowe and Burgener 2022). Understanding which species are targeted for the meat and fin trade is crucial to conserve less-resilient species. 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, trans-shipped, or disposed of without the authority of a permit. A recent trade analysis highlights South Africa as a crucial role player in the international shark trade for the southern Africa region (Lowe and Burgener 2022). There has been a shift in value from fins to meat in the past decade. The shark meat trade now makes a higher contribution to the economy in South Africa, even though shark fins still have a higher value in destination markets. Shark meat from South Africa is predominantly destined for import by countries in South America and Europe where there is a high demand as a source of protein.

There has also been a shift in demand towards skate and ray meat. This is of concern as species-specific information with regard to fishing for these groups is lacking. There has been an overall decline in the reported volume of shark meat exported from South Africa since 2019. This decline in reported volume is due to poor reporting of customs data combined with logistical issues experienced during the COVID pandemic and does not necessarily reflect population declines. Hong Kong's import records show that South

Africa is a key source country for dried shark fins with imports steadily increasing since 2017.

Bather protection

The KwaZulu-Natal Sharks Board (KZNSB) provides protection against shark attack at 37 beaches between Richards Bay and Port Edward. This is achieved by fishing for sharks directly off the beaches, using large-mesh gillnets or baited drumlines or both, thereby reducing the likelihood of a potentially dangerous shark encountering humans. In KZN, the introduction of bather protection gear has reduced the incidence of unprovoked fatal shark attack at protected beaches by nearly 100%. This is in marked contrast to shark attacks in both the Eastern Cape and the Western Cape, which have continued to increase. The annual contribution of tourism to the economy of KZN is approximately R10bn and the industry employs 200,000 people. Although not all is attributable to coastal tourism, most of the tourism infrastructure in the province is associated with coastal resorts. Beach tourism is a major attraction, which is only made possible through the activities of the KwaZulu-Natal Sharks Board bather protection programme in providing public confidence in the safety of KZN beaches against shark attack.

There has been substantial progress to reduce catches to minimize any potential negative impact to the marine environment, yet still provide a safe environment for water users. Some of the changes implemented include:

A 70% reduction in the length of nets deployed along the coast from a peak of 44.5 km in 1992 to 13.5 km in 2021. Nets have been replaced with 177 drumlines, which catch significantly less bycatch species and increase release success.

- There has been a reduction in the number of beaches with gear from a peak of 44 beaches in 1993 to 37 in 2021.
- Since 2019, nets from all beaches are removed for a 5-month period, with the exception of Richards Bay, Durban and Scottburgh, between the 1st of June and the 1st of November to reduce bycatch and whale entanglements associated with the sardine run

These changes have resulted in a significant decline in the total number of animals caught:

- Between 1978 and 2021 a 55% reduction in the total number of all species caught and a 67% reduction in shark species caught
- Between 1981 and 2021 a 72% reduction in the total number of harmless species caught

Due to the ongoing catch mitigation activities of the KZNSB, the cumulative catch of this programme makes up only 2.4% of South Africa's total shark catch,



much of which is released alive. Extensive testing and development of a non-lethal alternative to nets and drumlines, using an electrical barrier system is undertaken to further reduce shark mortality without compromising bather safety.

It should be further noted that the data collected from the KZNSB provides one of the most important long-term datasets for the monitoring and assessment of non-commercial shark species. These data are utilized by numerous local and international research organisations, the results of which are published in peer-reviewed scientific journals.

Spatial management

A number of coastal Marine Protected Areas (MPAs) have 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 also afforded to some coastal shark species such as ragged-tooth sharks, cow sharks, smooth-hounds, catsharks and juvenile requiem sharks. South Africa's MPA network was increased from 0.4% to 5.4% of the ocean area around mainland South Africa with the declaration of 20 new MPAs in 2019. Fisheries data, including data from shark fisheries, were used for the spatial planning decisions specifically for the new offshore MPAs.

Internal review of the NPOA-Sharks I

The NPOA-Sharks I was reviewed by the Department in 2018 and the review was presented at the IOTC Working Party for Ecosystems and By-catch (IOTC-2018-WPEB14-II_RevI). The internal review indicated good progress in classification and assessment of sharks, but less progress in monitoring populations and in the development of overarching regulatory frameworks. While specific shark regulations exist in several fisheries, there is no overarching framework or management body to ensure shark management across fisheries and against larger anthropogenic impacts.

Shark Expert Panel Review

In May 2020, following widely publicized concern about a number of shark-related issues, including: (i) perceptions around illegal shark fishing; (ii) the poor status of some shark populations; (iii) the increased conflict between shark tourism operators and traditional fishers; and (iv) the shift of white sharks away from the centres of the white shark diving tourism industry, the Minister appointed an Expert Panel to formally review South Africa's first National Plan of Action for the Conservation and Management of Sharks (NPOA-Sharks I). The Panel was made up of nine experts with scientific and management knowledge in fishery, conservation, and biological diversity resources, representing national and international institutions. The Panel scrutinized 72 documents over

three months and held 8 virtual meetings to review NPOA-Sharks I. The Panel reviewed the 62 actions of NPOA-Sharks I and provided scores and comments for each action. The systematic review focused on alignment with the International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks) of the Food and Agricultural Organization of the United Nations (FAO), recommendations on the overall structure, completeness of the plan and identification of gaps, achievability of the plan, clarity of the actions and indicators and areas of general progress or lack of progress (Appendix 3).

The Panel provided five specific recommendations:

1. The experts identified the lack of effective communication and coordination from science to policy to be a major challenge in achieving the actions of the NPOA-Sharks I. This was especially applicable to compliance and implementation of management actions. It was applicable within different sections of the Department, and between the Department and external stakeholders (different branches of government, conservation agencies, NGOs, fishing industry, academics, and neighbouring countries). Timeous feedback amongst units, a significant shortening of the lag time between scientific advice and management action, and the transparent and rapid communication with stakeholders were considered to be extremely important.
2. The Panel emphasized the need for measurable indicators to track the progress and completion of actions. These should include timelines and quantities (e.g. the number of species assessments completed, percentage of observer coverage, etc.). The Panel recommended an adequate prioritisation of actions within the individual clusters to ensure that the species, gaps and pressures with the greatest need are prioritised. The Panel advised that fewer actions should be prioritized to maximise the available human and financial resources to implement the NPOA-Sharks.
3. The Panel noted that the ecosystem effects of fishing and spatial conservation and management measures were not adequately covered in the current plan. Emerging science demonstrates that area-based management can have positive impacts for shark and ray populations, and can reduce conflicts between user groups. The IPOA-Sharks also specifically directs that critical habitat of sharks need to be conserved. Direct and indirect impacts of shark fishing on ecosystems, in particular interactions between consumptive and non-consumptive user groups, need special consideration as there is considerable potential for conflict. The need for better coordination, communication and a



framework for identifying and reducing conflict were emphasized by the Panel.

4. The Panel recommended a stronger focus on illegal, unregulated and unreported fishing and improved monitoring, surveillance and enforcement of compliance. The use of illegal gillnets along the coast is an emerging problem. Furthermore, it was suggested that cancellation or suspension of fishing rights should be made public, both as a deterrent and means of informing consumers and industry. Monitoring, reducing and optimizing shark and ray bycatch in commercial fisheries, especially trawl fisheries, need attention, especially lumping of large catches under genus (e.g. *Mustelus* spp.) and family (e.g. Rajidae). There also needs to be increased effort to better monitor and manage recreational fisheries, which are currently not monitored and are inadequately regulated.
5. The Panel recommended modernizing and integrating data collection and storage to improve access to data for better assessments. The use of technology should be embraced to improve monitoring and evaluation of management actions and compliance with permit conditions. Importantly, this includes electronic monitoring programs and online submission of catch returns.

Additional suggestions for improvements included sourcing socio-economic data, in addition to biological and ecological data, for holistic and informed decision-making, and the development of adequate funding models to support the actions and implementation of the NPOA-Sharks.

Based on the recommendations the Panel drafted a new action table for the NPOA-Sharks, in line with the review analysis and recommendations, which provided the nucleus for the NPOA-Sharks II and further prioritizes actions.

Stakeholder engagement

The Shark Expert Panel report recommended that the revised NPOA-Sharks needed to be widely communicated to stakeholders, from the public to policy makers. Consequently, the new action table draft was widely disseminated and workshopped among stakeholders within the department, academia, NGOs and the South African fishing industry (Appendix 4).

More than a promise: Actions and goals for the next five years

The NPOA-Sharks II builds on the achievements and lessons learned from NPOA-Sharks I and closely follows the recommendations of the Shark Expert Panel. The 10 original IPOA-Sharks goals were grouped into five clusters. Actions in the old NPOA-Sharks table that have been accomplished were removed from the new action table (Table I). The main recommendations of the Panel are reflected in the overall structure of the plan and the specific actions. These were, when possible, tied to quantifiable goals. Effective communication and coordination was added as a separate issue cluster in the action table to emphasise its importance. Accordingly, the NPOA-Sharks II contains 41 actions grouped into five issue clusters. The actions are prioritized to three levels, which in many cases build on each other chronologically, such that research translates into planning and implementation.



Photo credit: Mark van Coller AEF

Table 1: NPOA-Sharks: New proposed Action Table 2022 indicating measurable indicators per action for five clusters of issues identified, entities responsible and priority levels from high (1) to low (3). CD = Chief Directorate, FRD = Fisheries Research and Development, OCR = Oceans and Coasts Research, MRM = Marine Resource Management, OC = Branch: Oceans and Coasts, SMS = Specialised Monitoring Services, MCS = Marine Compliance Surveillance, Comms = Communication, DDG = Deputy Director General, DTI = Department of Trade, Industry and Competition; IR = International Relations. All chief directorates are within Branch: Fisheries Management except OCR and SMS, which are in Branch: Ocean and Coasts.

ISSUE CLUSTER	ISSUE DESCRIPTION	ACTION NO.	ACTION	MEASURABLE INDICATORS	ENTITY RESPONSIBLE FOR ACTION	PRIORITY [1 -3]
Foundations	Species prioritization - prioritise chondrichthyans in need of research, assessment and management intervention	1	Compile report with information for all fisheries-affected shark species	Complete report produced	CD: FRD	1
		2	Species prioritization through gap analysis. Research plan developed.	Completion of reports Gap analysis in relation to life-history of chondrichthyans caught in SA	CD: FRD	2
	Biological sampling (conversion ratios, life-history, genetics) and research related to 5 priority species selected every 5 years.	3	Biological sampling for prioritized species per fishery sector	Research completed and scientific reports presented at relevant scientific and management working groups	CD: FRD	3
		4	Conduct necessary research (life-histories required for assessment and management) based on samples for priority species	Completed scientific reports presented at relevant scientific and management working groups	CD: FRD	3
	Monitoring shark catches in all fisheries (landings, observer coverage)	5	Improve identification of chondrichthyans caught in fisheries by distributing ID guides to rights holders in major fisheries, observers, compliance, inspectors and Customs	Identification training courses conducted for each group. Shark ID video instructions to supplement training.	CD: FRD, CD: OCR, CD: MRM	2



ISSUE CLUSTER	ISSUE DESCRIPTION	ACTION NO.	ACTION	MEASURABLE INDICATORS	ENTITY RESPONSIBLE FOR ACTION	PRIORITY [1 -3]
		6	Develop and implement a scientific sampling programme that includes land- and sea-based sampling for all fisheries with sampling strategy set for sharks.	Sampling programme designed (number of sites with effective landing monitoring programmes and number of vessels with observers) and implemented across all fisheries.	CD: FRD – design, CD: MRM – permit conditions	2
	Assessment of prioritised species	7	Regular assessments for targeted shark species. Annual abundance indices and assessments every 3 years	Presented at relevant scientific working groups	CD: FRD	1
		8	Investigate other data sources suitable for trend analyses through workshops/calls for data	Distribute calls for data through scientific community	CD: FRD, CD: OCR	2
		9	Risk assessments for Data Deficient chondrichthyan species every 3 years	Presented at relevant scientific working groups	CD: FRD, CD: OCR	1
Sustainable management	Develop shark-specific offloading and onboard observer regulations across all fisheries	10	Re-establish, re-assess and expand land- and sea-based scientific observer coverage, including monitoring of fin and trunk consignments according to CITES requirements. This includes observer coverage and surveillance at all points of entry.	Observer programmes established in all relevant fisheries through permit conditions	CD: FRD and CD: OCR, MCS	1
		11	Establish web-based catch recording for recreational	Web-based recreational catch monitoring and control	CD: MRM, CD: FRD	2

ISSUE CLUSTER	ISSUE DESCRIPTION	ACTION NO.	ACTION	MEASURABLE INDICATORS	ENTITY RESPONSIBLE FOR ACTION	PRIORITY [1 -3]
			fisheries for all species	system implemented		
		12	Establish additional monitoring requirements for all fisheries for IUCN listed species	Monitoring requirements implemented across relevant fisheries through permit conditions	CD: MRM, CD: FRD, CD: OCR	3
	Shark-specific regulatory framework in all fisheries	13	Review and develop regulatory tools for all sectors (permit conditions, regulations, and policy)	Permits in place, regulations and policies amended	CD: MRM, CD: FRD, CD: MCS, CD: OCR	1
		14	Develop and implement management protocols for all fisheries	Management protocols operational for all fisheries	CD: MRM, CD: FRD, CD: MCS, CD: OCR	1
		15	Harmonize shark-specific permit conditions across all fisheries, including NDF protocols for CITES-listed species and product tracing	Shark specific permit conditions harmonized	CD: MRM, CD: FRD, CD: MCS, CD: OC	2
		16	Review existing mitigation measures and those used in other regions	Presented at relevant working groups	CD: MRM, CD: FRD, CD: MCS, CD: OC	2
		17	Incorporate into permit conditions, where appropriate, best-practice release protocols for all gear types, considering animal welfare and ethics, in consultation with industry	Best-practice release protocols incorporated in all relevant permits	CD: MRM, CD: FRD, CD: MCS, CD: OC	2
Optimal use	Optimization of shark product from sustainable fisheries	18	Investigate better utilization of shark carcasses,	Presented at relevant working groups	CD: MRM, CD: FRD, CD: MCS, CD: OC	3

ISSUE CLUSTER	ISSUE DESCRIPTION	ACTION NO.	ACTION	MEASURABLE INDICATORS	ENTITY RESPONSIBLE FOR ACTION	PRIORITY [1 -3]
			e.g. shark leather, alternative processing of shark meat in non-industrial fisheries, pharmaceutical uses, etc.			
	Review protocols for eco-toxic species (concern around health risk of shark meat consumption)	19	Review research into prioritised commercial species for ecotoxicology and food safety	Presented at scientific working groups of relevance, revision of national guidelines for consumption of shark meat	CD: MRM, CD: FRD, CD: MCS, CD: OC	3
	Review of suitability of low value/"charismatic" species for non-consumptive use.	20	Develop protocols for removing sharks from permitted fisheries retention lists according to standardised criteria.	Presented at scientific working groups of relevance	CD: SMS	2
	Apply finning legislation across all industries.	21	Develop and apply finning legislation to all existing fisheries; include skate wings	Finning legislation applied to existing fisheries and extended to include skates	CD: MRM, CD: FRD	1
Understanding and Management of threats	Investigate ecosystem threats related to fishing	22	Review and identify fisheries-related non-extractive impacts on sharks (pollution, 'ghost fishing')	Presented at relevant working groups	CD: SMS, CD: OCS	3
		23	Investigate post-release mortality	Advice for mitigation provided	CD: FRD	3
		24	Develop permit conditions to mitigate against these threats across fisheries	Permits in place, regulations and policies amended	CD: MRM	3
	Impacts of illegal, unregulated and unreported (IUU) fishing activities	25	Investigate IUU fishing activities (e.g. illegal gillnetting, FADs, illegal gear)	Regular, comprehensive, transparent updates on response to IUU activities provided	CD: SMS, CD: MCS	1

ISSUE CLUSTER	ISSUE DESCRIPTION	ACTION NO.	ACTION	MEASURABLE INDICATORS	ENTITY RESPONSIBLE FOR ACTION	PRIORITY [1 -3]
	Understanding the impact of fishing chondrichthyans on ecosystems	26	Promote and encourage research that investigates the impacts of fishing for chondrichthyans on ecosystems (e.g. food web analyses). Investigate causes, consequences & mitigation of shark depredation of catch across fisheries.	Scientific report or published paper	CD: OCR, CD: FRD	3
	Spatial management and protection against fishery impacts	27	Review existing protection for chondrichthyans in MPAs, estuaries and Fishery Management Areas.	List and quantification of chondrichthyans occurring in each MPA and in estuaries	CD: OC and CD: SMS	1
		29	Promote and encourage research that investigates the effectiveness of spatial protection	Scientific report or published paper	CD: OC and CD: SMS	3
		28	Develop/ update a spatial conservation plan for chondrichthyans	Shark Biodiversity Management Plan updated, reviewed and implemented	CD: OC and CD: SMS	2
Co-ordinate stakeholder engagement and communication	Education and awareness	30	Determine requirements for educational material at various levels (school, tertiary, public, etc.).	Educational material provided at relevant level	CD: Comms, CD: OC , CD: FRD, Marine and Coastal Educators Network	2
		31	Implement training on shark product identification (including fins, fillets, chain of custody)	Product ID guide developed. Staff trained	CD: Comms, CD: MCS, MPA managers, Customs Services	3
		32	Develop responsible fisheries programmes pertaining to sharks	Awareness programme rolled out to fishing community	CD: MRM, including small-scale and linefish	3

ISSUE CLUSTER	ISSUE DESCRIPTION	ACTION NO.	ACTION	MEASURABLE INDICATORS	ENTITY RESPONSIBLE FOR ACTION	PRIORITY [1 -3]
	Internal coordination within the Department	33	Coordination across scientific working groups at DFFE: Fisheries Management and DFFE: Oceans and Coasts	Scientific input integrated across branches. Regular research indabas.	DDGs Fisheries Management + OC	1
		34	Close coordination between science, management and enforcement	Operations manual produced to increase transparency of decisions. Scientific advice is acknowledged on receipt. Deviations from advice is substantiated and documented in writing. Implementation of scientific advice is fed back to science and enforcement groups. Science to policy loop completed in one year.	DDGs Fisheries Management + OC	1
		35	Coordination of assistance with enforcement activities	Number of affidavits and cross-sectional groups established.	CD: SMS, CD: MCS, CD: FRD	2
	Coordination among agencies	36	Formal use of the South African Seafood Naming Standard in all permitting documents (exports, sale, transport etc.)	Only officially accepted common names and scientific names used for relevant documentation schemes (exports, imports, sale and transport) Revision of the SARS tariff lists	CD: MRM together with other relevant Departments (e.g. DTI, etc.)	2
		37	Relevant stakeholders are incorporated in scientific and management fisheries working groups	Consultation held on key issues relating to sharks. Stakeholders integrated into relevant working groups	CD: FRD, CD: MRM, CD: OCR	2



ISSUE CLUSTER	ISSUE DESCRIPTION	ACTION NO.	ACTION	MEASURABLE INDICATORS	ENTITY RESPONSIBLE FOR ACTION	PRIORITY [1 -3]
		37	Relevant stakeholders are incorporated in scientific and management fisheries working groups	Consultation held on key issues relating to sharks. Stakeholders integrated into relevant working groups	CD: FRD, CD: MRM, CD: OCR	2
	Communication	38	Develop mechanism to share new developments related to research, management and conservation of sharks	Rapid and frequent communication on new research, management and conservation efforts.	DDG: Fisheries Management, DDG: Oceans and Coasts, CD: Comms	2
		39	Roll out regular, transparent means of communication with stakeholders. Rapid response to incorrect and misleading media content. Timeous and comprehensive response to queries from stakeholders, including journalists, conservation agencies and fishers.	Number of responses produced within agreed time-frame. Close communication lines.	DDG: Fisheries Management, DDG: Oceans and Coasts, CD: Comms	1
		40	Review of communication by means of modern technology and develop new ones (i.e. social media, electronic publication, etc.)	Social media strategy developed and implemented.	CD: Comms	3
	Explore funding opportunities	41	Explore funding opportunities through local and international agencies.	All NPOA-related actions adequately funded.	DDG: Fisheries Management, DDG: Oceans and Coasts	3



Monitoring and Evaluation

The Department of Forestry, Fisheries and the Environment and its partners will be responsible for the overall coordination of the implementation of NPOA-Sharks II. Individual actions will be implemented by the designated implementers assigned in the action table (Table 1). Upon conclusion of the five-year operational period of the plan, the progress of the NPOA-Sharks will be evaluated against the specific goals of the 41 actions (Table 2). Based on the positive response of the Shark Expert Panel review it is envisioned that the review of the NPOA-Sharks II will follow a similar process.

Table 2: Assessment framework for NPOA-Sharks.

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

References

- da Silva C, Booth A, Dudley S, Kerwath S, Lamberth S, Leslie R, Zweig T. 2015. The current status and management of South Africa's chondrichthyan fisheries. *African Journal of Marine Science* 37: 233–248.
- da Silva C, Winker H, Parker D, Wilke C, Lamberth SJ, Kerwath S. 2018. Update and review of the NPOA for Sharks South Africa. Indian Ocean Tuna Commission, 14th Working Party on Ecosystems and Bycatch, 10–14 September 2018, Cape Town, South Africa. IOTC-2018-WPEB14-II_Rev1..
- Dulvy NK, Fowler SL, Musick JA, Cavanagh RD, Kyne PM, Harrison LR, Carlson JK, Davidson LN, Fordham SV, Francis MP, Pollock CM. 2014. Extinction risk and conservation of the world's sharks and rays. *eLife* 3: e00590.
- Ebert DA, Wintner SP, Kyne PM. 2021. An annotated checklist of the chondrichthyans of South Africa. *Zootaxa* 4947(1): 1–127.
- Lowe S, Bürgener M. In press. South Africa's shark and ray trade dynamic: An analysis of the international meat and fin trade. WWF TRAFFIC.
- Kroese M, Sauer WH, Penney AJ. 1996. An overview of shark catches and by-catches in South African fisheries. *Collective Volume of Scientific Papers ICCAT* 45: 318–328.
- Kroese M, Sauer WH. 1998. Elasmobranch exploitation in Africa. *Marine and Freshwater Research* 49: 573–577.
- Pacoureau N, Rigby CL, Kyne PM, Sherley RB, Winker H, Carlson JK, Fordham SV, Barreto R, Fernando D, Francis MP, Jabado RW. 2021. Half a century of global decline in oceanic sharks and rays. *Nature* 589: 567–571.
- TRAFFIC. 2020. 3D replica shark fins. Available at <https://www.traffic.org/3d-replica-shark-fins/>.
- von Bonde C. 1934. Shark fishing as an industry. *Fisheries and Marine Biology Division, Union of South Africa, Investigational Report* 2: 1–19.

Acknowledgements

We are especially grateful for the valuable input and guidance of the Shark Expert Panel. The stakeholders, individually and institutionally, are thanked for their suggestions (see Appendix 4). These were incorporated whenever feasible.

Appendices

Appendix I: Current fishing regulations pertaining to sharks Sharks currently listed in Annexures 4, 7 and 8 of the amended regulations of the Marine Living Resources Act, Gazette No. 35903, 23 November 2012 – listings presented here only refer to sharks and rays.

Annexure	List	Common name	Species
4 & 7 – Regulation 21	Prohibited species list for commercial and recreational fishers	Leopard catshark (prohibited in commercial fishing only)	<i>Poroderma pantherinum</i>
		Ragged-tooth (prohibited in commercial fishing only)	<i>Carcharias taurus</i>
		Spotted gully (prohibited in commercial fishing only)	<i>Triakis megalopterus</i>
		Striped catshark (prohibited in commercial fishing only)	<i>Poroderma africanum</i>
		Great white shark	<i>Carcharodon carcharias</i>
		Sawfishes	Pristidae
		Basking shark	<i>Cetorhinus maximus</i>
		Whale shark	<i>Rhinocodon typus</i>
8 – Regulation 22	Exploitable list	Elasmobranchs	<i>Elasmobranchii</i>
	Excluding	Great white	<i>Carcharodon carcharias</i>
		Leopard catshark	<i>Poroderma pantherinum</i>
		Ragged-tooth	<i>Carcharias taurus</i>
		Spotted gully	<i>Triakis megalopterus</i>
		Striped catshark	<i>Poroderma africanum</i>



Photo credit: Rob Tarr



Appendix 2. Estimated dressed catches [t] of chondrichthyans caught by South African fisheries from 2019. Current scientific name and authority follows Ebert and van Hees (2015). Fisheries abbreviations: Demersal shark longline (DSL), Pelagic longline fishery (PL), Bather Protection Programme (KZNS), Recreational linefish (RecL), Commercial Linefish (LF), Beach seine and gillnet fisherise (BG), Offshore/inshore demersal trawl fisheries (TF), Small pelagic and midwater trawl (SP), Hake longline (HLL), Prawn Trawl fishery (PT), Rocklobster (RL). *Species prohibited for retention. ** Species generally released if alive,***Catches changed from da Silva et al. 2015 due to automatic raising factors in TF database. TF not reflecting release due to high mortality. # overfished and overexploited, ## not overfished but overexploited

Family	Scientific name	Estimated average annual catch 2010 - 2012(t)	Estimated average annual catch 2013- 2019 (t)	Fishery/ fisheries catching>75%	Local trend/ stock status	IUCN Status	Global trend
Alopiidae	<i>Alopias pelagicus</i> *	<1	<1	PL**, SP**		EN 2018	↓
	<i>Alopias superciliosus</i> *	<1	<1	PL**,SP**		VU 2018	↓
	<i>Alopias vulpinus</i> *	1-10	1-10	PL**,LF**,BG**		VU 2018	↓
Crurirajidae	<i>Cruriraja</i> spp.	11-100	11-100	TF		LC	—
Arhynchobatidae	<i>Bathyraja smithii</i>	11-100	11-100	TF		LC 2018	—
Callorhynchidae	<i>Callorhynchus capensis</i>	400-500**	300-400	TF	LC ↑	LC 2020	—
Carcharhinidae	<i>Carcharhinus amboinensis</i>	<1	<1	RecL**,KZNS**		VU 2020	↓
	<i>Carcharhinus brachyurus</i>	101-200	11-100	LF,DSL,PL,BG**	LC ↑	VU 2020	↓
Carcharhinidae	<i>Carcharhinus brevipinna</i>	1-10	1-10	KZNS**,LF,RecL**		VU 2020	↓
	<i>Carcharhinus falciformis</i> *	1-10	1-10	PL**,SP**		VU 2018	↓
	<i>Carcharhinus leucas</i>	1-10	1-10	RecL**, KZNS**		VU 2020	↓
	<i>Carcharhinus limbatus</i>	1-10	1-10	LF, RecL**, KZNS**		VU 2020	↓
	<i>Carcharhinus longimanus</i> *	<1	<1	PL**,SP**		CR 2018	↓
	<i>Carcharhinus melanopterus</i>	<1	<1	LF,PL		VU 2020	↓
	<i>Carcharhinus obscurus</i> *	11-100	1-10	LF**, RecL**,DSL,BG**		EN 2018	↓
	<i>Carcharhinus plumbeus</i>	1-10	<1	KZNS**		EN 2020	↓
	<i>Galeocerdo cuvier</i>	1-10	1-10	KZNS**,RecL**		NT 2018	↓
	<i>Prionace glauca</i>	301-600	400-500	PL		NT 2018	↓
	<i>Rhizoprionodon acutus</i>	<1	<1	LF,RecL**		VU 2020	↓



Family	Scientific name	Estimated average annual catch 2010 - 2012(t)	Estimated average annual catch 2013- 2019 (t)	Fishery/ fisheries catching 75%	Local trend/ stock status	IUCN Status	Global trend
Centrophoridae	<i>Centrophorus</i> spp.	<1	<1	TF			
	<i>Deania</i> spp.	<1	<1	TF			
Cetorhinidae	<i>Cetorhinus maximus</i>	1-10	1-10	TF**		EN 2021	↓
Chimaeridae	<i>Hydrolagus</i> or <i>Chimaera</i> spp.	<1	<1	TF			
Chlamydoselachidae	<i>Chlamydoselachus africana</i>	<1	<1	TF		LC 2018	—
Dalatiidae	<i>Isistius brasiliensis</i>	<1	<1	PL**		LC 2017	
	<i>Dalatias licha</i>	<1	<1	TF		VU 2017	↓
Dasyatidae	<i>Bathytoshia brevicaudata</i>	<1	<1	RecL**, BG**		LC 2021	—
	<i>Dasyatis chrysonota</i>	<1	<1	TF, RecL**, BG**	EN ↓	NT 2019	↓
	<i>Himantura leoparda</i>	<1	<1	LF**, TF, HLL**		VU 2015	↓
	<i>Himantura uarnak</i>	<1	<1	PT**		EN 2020	↓
	<i>Pteroplatytrygon violacea</i>	1-10	1-10	TF, PL**		LC 2018	—
	<i>Taeniura lymma</i>	<1	<1	LF**, TF, HLL**		LC 2020	↑
Echinorhinidae	<i>Echinorhinus brucus</i>	<1	<1	TF, RecL**		EN 2020	↓
Etmopteridae	<i>Centroscyllium fabricii</i>	<1	<1	TF		LC 2019	—
	<i>Etmopterus</i> spp.	1-10	1-10	TF			
Gymnuridae	<i>Gymnura natalensis</i>	1-10	1-10	BG**, TF		LC 2018	—
Hexanchidae	<i>Heptranchias perlo</i>	<1	<1	TF, HLL**		NT 2019	↓
	<i>Hexanchus griseus</i>	<1	<1	HLL**		NT 2019	↓
	<i>Notorynchus cepedianus</i>	1-10	1-10	LF, DSL**, RecL**, BG**		VU 2015	↓
Lamnidae	<i>Carcharodon carcharias</i> *	1-10	1-10	RecL**, KZNS**		VU 2018	↓

South Africa's second National Plan for the Conservation and Management of Sharks (NPOA-sharks II)

Family	Scientific name	Estimated average annual catch 2010 - 2012(t)	Estimated average annual catch 2013- 2019 (t)	Fishery/ fisheries catching 75%	Local trend/ stock status	IUCN Status	Global trend
Lamnidae continued	<i>Isurus oxyrinchus</i>	301-700	600-700	PL		EN 2018	↓
	<i>Isurus paucus</i>	<1	<1	PL		EN 2018	↓
	<i>Lamna nasus</i> *	<1	<1	PL**,SP**		VU 2018	↓
Mobulidae	<i>Mobula spp.*</i>	1-10	1-10	KZNS**,PL**		VU-EN	↓
Myliobatidae	<i>Aetomylaeus bovinus</i>	1-10	1-10	TF		CR 2020	↓
	<i>Aetobatus narinari</i>	1-10	1-10	TF		EN 2020	↓
	<i>Myliobatis aquila</i>	1-10	1-10	TF,RecL**,BG	EN ↓	CR 2020	↓
Narkidae	<i>Heteronarce garmani</i>	<1	<1	TF		NT 2019	↓
	<i>Narke capensis</i>	1-10	1-10	TF		LC 2018	—
Odontaspidae	<i>Carcharias taurus</i> *	1-10	1-10	RecL**, KZNS**,BG**		CR 2020	↓
Oxynotidae	<i>Oxynotus centrina</i>	<1	<1	TF, RecL**		EN 2021	↓
Pristiophoridae	<i>Pliotrema warreni</i>	<1	<1	TF	LC —	LC 2019	
Pseudocarchariidae	<i>Pseudocarcharias kamoharui</i>	<1	<1	PL**,SP**,HLL**		LC 2018	↑
Rajidae	<i>Dipturus pullopunctatus</i>	11-100	11-100	TF	LC ↑	LC 2019	↑
	<i>Dipturus springeri</i>	11-100	11-100	TF		LC 2018	—
	<i>Leucoraja wallacei</i>	11-100	11-100	TF	VU ↓	VU 2019	↓
	<i>Malacoraja spinacidermis</i>	1-10	1-10	TF		LC 2019	—
	<i>Raja spp.</i>	11-100	11-100	TF			
	<i>Raja ocellifera</i>	11-100	11-100	TF	EN ↓	EN 2020	↓
	<i>Raja straeleni</i>	201-300	100-200	TF	LC ↓	NT 2020	↓
	<i>Rajella barnardi</i>	1-10	1-10	TF		LC 2020	—
	<i>Rajella caudaspinosa</i>	11-100	11-100	TF		LC 2018	—
	<i>Rajella leoparda</i>	11-100	11-100	TF		LC 2020	—
	<i>Rajella ravidula</i>	<1	<1	TF		LC 2018	—
	<i>Rostroraja alba</i>	11-100	11-100	TF,DSL	VU ↓	EN 2006	↓



South Africa's second National Plan for the Conservation and Management of Sharks (NPOA-sharks II)

Family	Scientific name	Estimated average annual catch 2010 - 2012(t)	Estimated average annual catch 2013- 2019 (t)	Fishery/ fisheries catching 75%	Local trend/ stock status	IUCN Status	Global trend
Rhinobatidae	<i>Acroteriobatus annulatus</i>	11-100	11-100	TF, RecL**	LC ↑	VU 2019	↓
	<i>Acroteriobatus blochii</i>	<1	<1	BG**,RecL**		LC 2018	—
Rhinobatidae	<i>Acroteriobatus leucospilus</i>	<1	<1	LF,TF**		EN 2018	↓
	<i>Acroteriobatus ocellatus</i>	<1	<1	TF, HLL**		DD 2018	—
	<i>Rhinobatos holcorhynchus</i>	<1	<1	TF,HLL**		DD 2018	↓
Rhinochimaeridae	<i>Harriotta raleighana</i>	<1	<1	TF,HLL**		LC 2015	—
	<i>Neoharriotta pinnata</i>	<1	<1	TF		NT 2019	↓
	<i>Rhinochimaera</i> spp.	<1	<1	TF			
Rhynchobatidae	<i>Rhynchobatus djiddensis</i>	<1	<1	TF		CR 2018	↓
Scyliorhinidae	<i>Apristurus</i> spp.	<1	<1	TF			
	<i>Halaaelurus lineatus</i>	<1	<1	LF**,TF,RL**		LC 2019	—
	<i>Halaaelurus natalensis</i>	<1	<1	RecL**,LF**,RL**,BG*	EN ↓	VU 2020	↓
	<i>Haploblepharus edwardsii</i>	1-10	1-10	TF,RecL**,LF**,RL**,BG**	EN ↓	EN 2019	↓
	<i>Haploblepharus pictus</i>	<1	<1	TF,BG**		LC 2018	—
	<i>Haploblepharus fuscus</i>	<1	<1	TF	EN ↓	VU 2019	↓
	<i>Holohalaaelurus regani</i>	11-100	11-100	TF	LC ↑	LC 2019	↑
	<i>Holohalaaelurus fавus</i>	<1	<1	PT**		EN 2019	↓
	<i>Holohalaaelurus punctatus</i>	<1	<1	TF	LC ↑	EN 2020	↓
	<i>Poroderma africanum</i>	1-10	1-10	TF,RecL**,LF**,RL**,BG**	LC ↑	LC 2020	↑
	<i>Poroderma pantherinum</i>	<1	<1	TF,RecL**,LF**,RL**,BG**	LC ↑	LC 2019	↑
	<i>Scyliorhinus capensis</i>	1-10	1-10	TF,RecL**,LF**,RL**	LC ↓	NT 2020	↓
Somniosidae	<i>Centroscymnus</i> spp.	<1	<1	TF			
Sphyrnidae	<i>Sphyrna lewini</i> *	1-10	1-10	RecL**, KZNS**,SP**		CR 2018	↓



Family	Scientific name	Estimated average annual catch 2010 - 2012 (t)	Estimated average annual catch 2013- 2019 (t)	Fishery/ fisheries catching 75%	Local trend/ stock status	IUCN Status	Global trend
Sphyrnidae continued	<i>Sphyrna mokarran</i> *	1-10	<1	KZNS**		CR 2019	↓
	<i>Sphyrna zygaena</i> *	1-10	1-10	LF, RecL**, KZNS**, DSL**, BG**		VU 2018	↓
Squalidae	<i>Cirrhigaleus asper</i>	<1	<1	TL		DD 2019	
	<i>Squalus acanthias</i>	<1	<1	TL		VU 2019	↓
	<i>Squalus acutipinnis</i>	11-100	11-100	TL	LC ↓	NT 2019	↓
	<i>Squalus bassi</i>	1-10	1-10	TL	LC →	LC 2019	→
Squatinaidae	<i>Squatina africana</i>	<1	<1	KZNS**		NT 2017	↓
Torpedinidae	<i>Tetronarce cf. nobiliana</i>	1-10	1-10	TL		LC 2021	→
	<i>Torpedo fuscomaculata</i>	1-10	1-10	TL		DD 2018	↓
	<i>Torpedo sinuspersici</i>	1-10	1-10	TL		DD 2019	
Triakidae	<i>Galeorhinus galeus</i>	101-400	101-200	TL, LF, DSL	CR# ↓	CR 2020	↓
	<i>Mustelus mosis</i>	1-10	1-10	LF, RecL**		NT 2019	↓
	<i>Mustelus mustelus</i>	101-300	11-100	DSL, LF, TF, BG**	EN ## ↓	EN 2020	↓
	<i>Mustelus palumbes</i>	1-100	1-100	TF, DSL, LF	LC →	LC 2020	→
	<i>Triakis megalopterus</i> *	1-10	1-10	RecL**, BG**	LC ↑	LC 2020	→



Photo credit: Rob Tarr

Appendix 3: Shark Expert Panel combined scores on the NPOA-Sharks I action table (2020). Green shading indicates good progress with a score of 67–100%, orange indicates moderate progress with a score of 34–66% and red indicates limited progress with a score of 0–33%. *Capacity was increased during period, but recently lost.

Issue cluster	Panel score	Major achievements	Main challenge	Comments
<i>Data and reporting</i> Processes relating to the improvement of data from fisheries-dependent & independent sources	31%	Identification guide of 100 chondrichthyes completed & provided to fishers from several targeted shark fisheries Four shark specific management recommendations made through scientific working groups & permit conditions amended Observer specifications drafted for all land-based & sea-based observer programmes which includes monitoring of discards & catch Active participation in RFMOs & shark related issues Conversion factors completed for soupfin, smoothhound and blue sharks Conversion factors completed for soupfin, smoothhound and blue sharks Catch composition and overlaps in catch between fisheries identified in da Silva et al. 2015 Satellite tagging studies underway for shortfin mako and blue sharks	Lack of formal monitoring & observer programmes across all fisheries	Improved identification of sharks from fishers' logbooks & training of fishers, collection of fisheries independent data by observers, improved understanding of total catch & discards across fisheries Prioritisation of species & fisheries is required. The use of modern electronic systems would enhance & streamline actions Collaborate more widely with external institutions The lack of progress is mostly due to the absence of a formal observer program Missing detail e.g. the number of training sessions per quarter, in the description of the action also resulted in low scores
<i>Classification & assessment of shark species</i> Information needed for formal species assessments i.e. clarification of taxonomic uncertainty investigation into stock delineation, gaps in knowledge of life history,	73%	Species assessments completed for 21 species at a high global standard Stock assessments completed for soupfin & smoothhound sharks Six peer-reviewed papers on stock delineation and DNA barcoding Updated life-history	No assessment of ecosystem effects of fishing & little progress in habitat protection for sharks & the use of spatial management	Most notable achievements in this issue cluster includes stock assessments for demersal shark species, inputs into stock assessments of global species and implementation of an IUCN Red List support tool applied to 21 species of chondrichthyans



Issue cluster	Panel score	Major achievements	Main challenge	Comments
uncertainties related to unknown movement across RFMO & national boundaries, ecosystem changes induced by fishing		information for 100 chondrichthyans targeted or caught as by-catch Two peer-reviewed papers on pelagic shark nursery areas and on a Red List assessment tool		A priority species list is needed There needs to be improved integration and co-ordination of the NPOA-Sharks & the Shark Biodiversity Management Plan, especially to address ecosystem effects of fishing
<i>Sustainable management</i> Deals with management protocols across all fisheries & coordination between fisheries & management	27%	Scientific review on status and management of shark fisheries published in 2015	No management protocols exist for any fisheries	Little progress was made on these actions. The lack of co-ordination between separate management units within DFFE remains a barrier to effective implementation
<i>Optimum use</i> Involves research on the health risks associated with the consumption of shark meat, mitigation measures for unwanted by-catch, full utilization of shark catches and traceability of shark products from catch to sale	56%	Three peer-reviewed publications examining trace metals in consumed sharks & subsequent de-commercialisation of vulnerable species e.g. broadnose sevengill sharks New permit conditions requiring fins attached for the large pelagic fisheries South African Seafood naming standard Gazetted (prevent seafood fraud) Genetic identification method tested on confiscated shark fins Several shark identification training sessions in collaboration with PEW, TRAFFIC & WWF	Little coordination among implementing agencies	Increased accessibility of information & wider stakeholder engagement on work done & in progress is required to maximise outputs & build relationships. Increased communication of scientific findings to managers, compliance & the public will help with implementing the findings Improved linkages between DFFE & customs officials is required
<i>Capacity & infrastructure*</i> Revolves around awareness, capacity to complete frequent assessments, funding & staff capacity	39%	Increase of scientific capacity (but recently lost again) Increased representation of DFFE researchers at international scientific working groups (IOTC, ICCAT & CCSBT)	Little capacity & expertise to enforce shark related regulations	Increased collaboration with organisations already creating awareness around sharks is needed Scientific capacity needs to be increased again as a priority action



Issue cluster	Panel score	Major achievements	Main challenge	Comments
<i>Compliance</i> Lacked sufficient detail on this objective.	50%	Improved compliance related to finning regulations & the aquarium trade	No transparency on compliance achievements & no regular training of compliance officers	The score might not be a true reflection of the compliance efforts as there was too little information for the Panel experts to gauge the accomplishments. The experts advised on more transparency in enforcement of compliance results e.g. in the form of an annual compliance report
<i>Regulatory tools</i> Lacked sufficient detail on this objective	20%	Continuous improvements in shark related permit conditions in Large Pelagic Longline Fishery Shark has been designated as bycatch Wire traces have been banned Fins have to be attached during landing Observer coverage of local fleet increased	No overarching framework for shark regulations. No regulation of shark catch in trawl and linefisheries No regulation of recreational fishing competitions & charter fishing	There is no overarching framework for shark management & no improvement on shark management in recreational fisheries



Photo credit: Rob Tarr

Appendix 4: Stakeholder suggestions and comments, summarized and grouped by Issue cluster as perceived by stakeholders.

ISSUE CLUSTER	ISSUE DESCRIPTION	ACTION No	STAKEHOLDER RECOMMENDATIONS
Foundations	Species prioritization - prioritise chondrichthyes in need of research, assessment and management intervention Biological sampling (conversion ratios, life-history, genetics) and research related to 5 priority species selected every 5 years. Monitoring shark catches in all fisheries (landings, observer coverage) Assessment of prioritised species	I-9	Fisheries should identify to species level as per regulations Observer programme funding model needs to be revised. Sampling through observer programme should be increased Fisheries should be providing more samples. DFFE to produce video on how to fillet a shark so that this data can be collected by all researchers dissecting sharks Improved communication between DFFE, Scientists and public on long-term data available for research Bolster investigations into electronic monitoring systems on deck. Database repository by species for increased collaboration Industry already has programmes in place to improve fisher identification through Observer programmes Re-establish independent observer programme funded by the Department.
Sustainable management	Develop shark specific discharge, observer regulations across all fisheries Shark specific regulations in all fisheries	10-17	Sustainable use needs to be redefined. Training of fishermen within fisheries (Species ID, handling guidelines, general respect and welfare) CITES Non-detrimental findings be competed for CITES Appendix listed sharks. Observer programmes paid for by industry already exists in many fisheries and are now stretched and oversubscribed. It is vital that changes in permit conditions be specific to each fishery, to achieve this consultation and agreement with all affected fisheries are important. Release and handling protocols need to be discussed with all



ISSUE CLUSTER	ISSUE DESCRIPTION	ACTION No	STAKEHOLDER RECOMMENDATIONS
			industries. These will vary across fisheries and need input to be viable, practical and achievable. Harmonization and validation of permit conditions with regards release guides/mitigation measures across multiple sectors. Some annexures in several permit conditions need to be updated/evaluated. Re-evaluate slot-limits on demersal sharks Better regulation on Recreational Anglers (drone fishing, other gear regulations (i.e. limiting the weight of tackle, collection of data and handling procedures of large sharks) Examine the ethical/welfare of chondrichthyes impacted by SA fisheries (release procedures, capture stress, capture induced mortality.).
Optimal use	Optimization of shark products from sustainable fisheries Review protocols for eco-toxic species (Concern around health risk of shark meat consumption) Review of suitability of low value/ "charismatic" species for non-consumptive use. Apply finning legislation across all industries	18-21	Finning legislation needs to include skate wings A catalogue of shark products, samples and experts for all harvested chondrichthyes needs to be developed. Improved utilisation to be left to industry, if there was a viable use for a product it would have been found and monetised already Concerns were raised about monitoring ecotoxicology of sharks as this is already being done by NRCS/ SABS In cases with user conflict between fishing and ecotourism DFFE should arrange more frequent stakeholder meetings so that issues can be discussed In terms of finning legislation, industry felt that consultation and agreement is important. All certified fisheries will be required to apply finning legislation and or prove that its being adhered to. Fins naturally attached is problematic.



ISSUE CLUSTER	ISSUE DESCRIPTION	ACTION No	STAKEHOLDER RECOMMENDATIONS
			Industry recommended that DFFE considers fins naturally attached/ tethered instead
Understanding and Management of threats	Investigate ecosystem threats related to fishing Illegal, Unregulated and Unreported fishing activities (IUU) impacts Understanding the impact of fishing chondrichthyes on ecosystems Spatial management and protection against fishery impacts	22-29	Scientists and Compliance/ enforcement need to have a dedicated workshop Environmental Courts need to be re-established in SA and marine crimes need to become a priority crime. Genetics and Rapid testing for officials need to be made a reality Scientists within DFFE need to have job descriptions altered to ensure they are directly involved in prosecutions Central information hub is required as a link between scientists, experts, law experts and compliance so that when confiscations/ arrests are made then the officers can be confident in the information they are using when making arrests Need to go back to basics, current legislation is not being enforced. DFFE needs more people on the ground in all the provinces, not just in MPA's Consultation with industry is vital prior to MPA's being legislated. DFFE need to look at sustainable levels of exploitation and socio-economic impacts.
Co-ordinate stakeholder engagement and communication	Education and awareness Internal coordination within the Department Coordination among agencies Explore funding opportunities	30-41	An education and awareness strategy is required, from public, to experts to prosecutors, to scientists and to law enforcement Need for a dedicated person to undertake proposals for funding for the roll-out and actions of the NPOA A responsible fishing programme is already in place through SADSTIA (Trawl fishery) Industry recommended that the Responsible Fishing Alliance be approached for funding Communication with Industry can be improved by forwarding any items to FishSA for distribution Consultation and communication is important





Archival photo of the Soupfin shark fishery that operated out of Gansbaai in the mid 1900's.



