

Republic of Seychelles



National Plan of Action for the Conservation and Management of Sharks 2016-2020





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This National Plan is dedicated to the memory of Mr Augustin Poole.

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Introduction

This document constitutes Seychelles National Plan of Action for the Conservation and Management of Sharks³ 2016-2020 (NPOA) and it replaces the previous NPOA 2007-2011. It has been developed and structured in line with the Food and Agriculture Organisation of the United Nations (FAO) guidance for the development of national shark plans to support implementation of the overarching International Plan of Action for the Conservation and Management of Sharks (IPOA).

The first NPOA summarised in some detail the concerns and history behind the development of the IPOA and hence these will not be repeated here. The purpose of this document is to build on and move forward from its predecessor; to progress and realise change and advancement in the conservation and management of sharks in, and by, Seychelles.

³ For the purposes of this document the term “shark” is used to cover all species of Chondrichthyan - sharks, skates, rays and chimaeras. In the Seychelles context the focus of this document however is primarily upon true sharks and rays.

The Need for Shark Conservation and Fishery Management

There are more than 1,000 known species of Chondrichthyan fishes (Class *Chondrichthyes*) made up of sharks, skates, rays and chimaeras. This ancient class has existed for at least 400 million years and this constitutes one of the most ancient vertebrate groups still in existence today. The expansion and the industrialisation of fishing since the 1950s coupled with the typical Chondrichthyan life history characteristics (of slow growth, late maturation, low fecundity and long reproductive cycles) has seen marked decline in shark stocks worldwide.

Chondrichthyans as, often high trophic level, predators play an important ecological role in the structure and function of marine ecosystems. It is widely accepted that significant declines in predator populations destabilise marine ecosystems and possibly ultimately lead to ecosystem collapse or phase shift (Jackson 2001, Jackson *et al* 2001)

Recent studies indicate that the worrying trend of shark stock declines continues. Worm *et al* (2013) estimated the global catch and mortality of sharks from fishing activities at 1.44 million metric tonnes in 2000 and 1.41 million tonnes in 2010. Using analysis of average shark weights Worm *et al* found this equated to a mortality estimate of 100 million sharks in 2000 and 97 million in 2010 with a range of possible values between 63 to 273 million sharks per annum. They also utilised three different measures to assess stock exploitation rates which provided an average exploitation range of between 6.4% and 7.9% all of which exceed the average rebound rate for many shark populations of 4.9% per annum which they conclude explains the ongoing declines in most populations for which data exist.

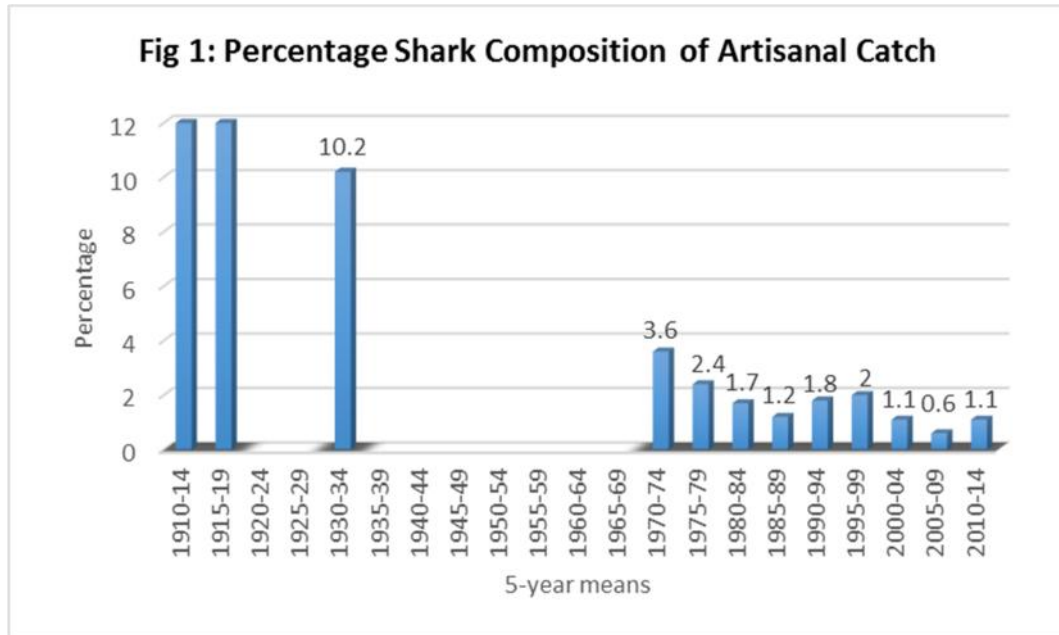
A subsequent systematic analysis of threat for 1,041 Chondrichthyan fishes (Dulvy *et al* 2014) estimated that one-quarter are threatened according to IUCN Red List criteria due to overfishing. The study found that Chondrichthyan extinction risk is substantially higher than for most other vertebrates, that population depletion has occurred “throughout the world’s ice-free waters” and only one-third of species were considered safe.

These two recent and leading global studies both concluded that improved management of fisheries and related trade is required to significantly reduce mortality in order to avoid extinctions and promote population recovery and full marine ecosystem functionality.

Part I: Sharks in Seychelles (National Shark Assessment)

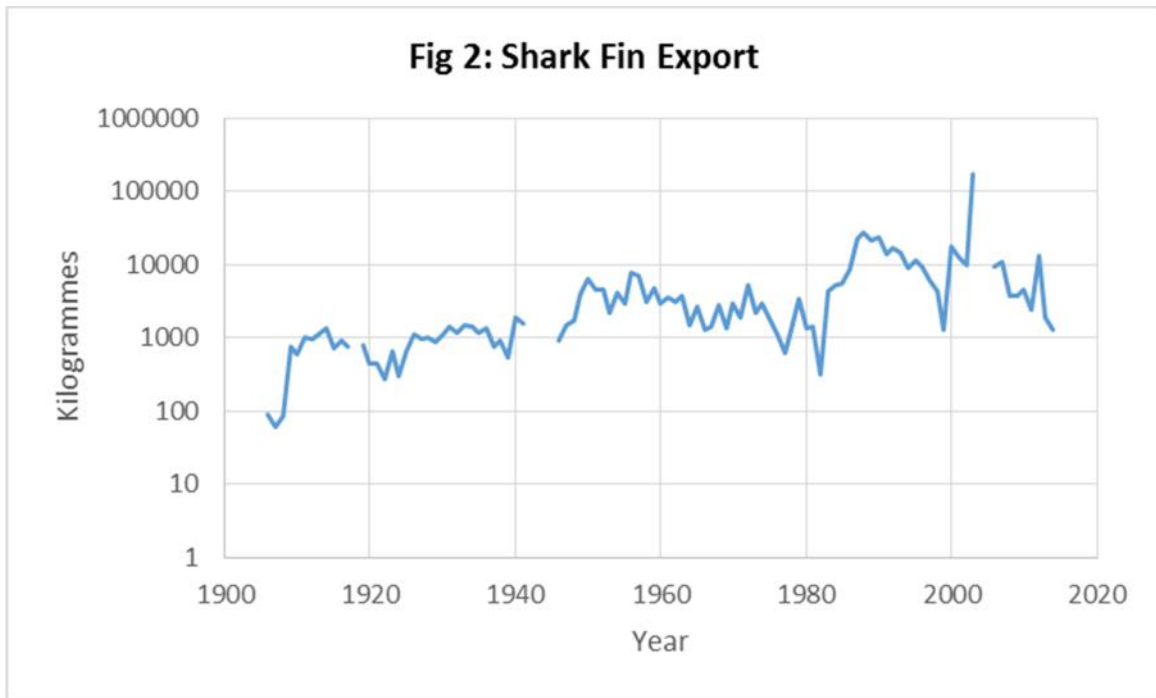
The Republic of Seychelles is an archipelago of 115 islands spread across an Exclusive Economic Zone of some 1.4 million square kilometres in the tropical western Indian Ocean. The vast majority of the country's small population - 90,945 (NBS 2012) - resides on the principal island of Mahé and the islands of Praslin and La Digue all situated in the central archipelago on the Seychelles bank. The national economy is based and dependent on tourism and fisheries including a significant industrial tuna fishery and canning factory on Mahé.

Seychelles has a short human history having only been colonised in the 1770s. Early accounts of the waters around the islands therefore describe a pristine ecosystem and often indicate that sharks were very numerous and aggressive (SFA 2007). Historical accounts indicate that sharks remained abundant through the 1940s but were drastically reduced in number by an intensive targeted schooner fishery from the late 1940s to the mid-1960s. The population did not recover as the emergence of the Asian Tiger economies in the 1980s and the subsequent rise of China as a global economic powerhouse saw the price of fin rocket and made viable the targeting of the ever fewer and smaller shark. Data on shark catch is chronically lacking, one key indicator of relative shark abundance can be found, however, in the assessment of percentage shark composition of the overall artisanal catch (see **Fig 1**).

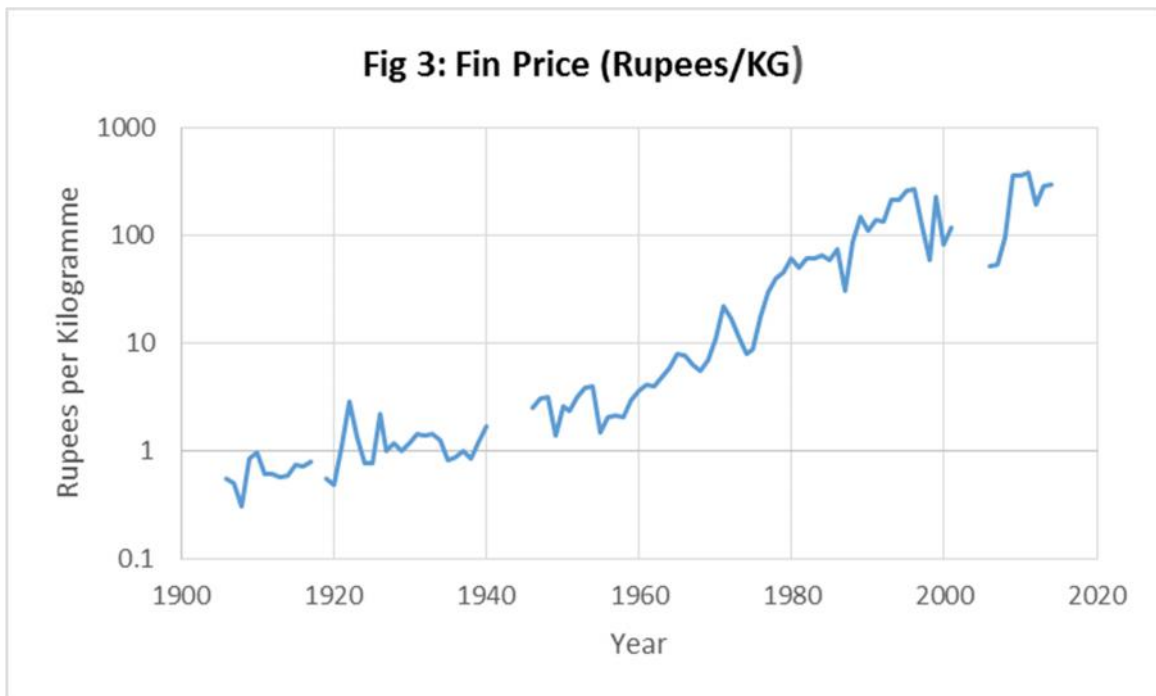


(Compiled from Nevill 2005, SFA 2007 & 2015)

The driving force of fin price can also be traced by the export of fin and the progressive change in its unit value over the last 100 years as presented in **Figures 2 & 3** below (note vertical scales are logarithmic).



(Compiled from Nevill 2005 & SFA 2015)



(Compiled from Nevill 2005 & SFA 2015)

The Shark Fishery

The shark fishery in Seychelles has both targeted and incidental catch components that can be divided into three categories: The Industrial fishery, the Semi-industrial fishery and the artisanal fishery.

The Industrial Fishery

The industrial fishery consists of purse seiners and long line vessels that target tuna and tuna and billfish respectively. **Table 1** shows the number of licenses issued to industrial vessels to fish in Seychelles EEZ through the period of the previous NPOA (2007-2014).

Gear	Year							
	2007	2008	2009	2010	2011	2012	2013	2014
Purse Seine	51	51	47	38	34	37	38	43
Long Line	189	137	111	65	80	167	174	141
Total	240	188	158	103	114	204	212	184

(Compiled from SFA 2015)

The decline in number of licensed vessels recorded 2008-2011 can be directly linked to the problems of Somalia-based piracy in the western Indian Ocean at that time.

The industrial purse seine and longline industries are both known to have significant by-catch issues including sharks. **Table 2** and **3** provide the official statistics on bycatch for the fisheries within the Seychelles EEZ. For the purse sein fishery by-catch is classified as “other” with no breakdown or analysis of its components whilst for the long line fishery sharks are listed as a distinct category.

Year	Catch (Mt)	“Others” (Bycatch) Mt	Percentage Bycatch
2007	66,574	82	0.12%
2008	55,240	20	0.03%
2009	37,146	7	0.02%
2010	57,465	18	0.03%
2011	59,268	6	0.01%
2012	57,531	5	0.01%
2013	36,101	89	0.25%
2014	54,601	93	0.17%

(Compiled from SFA 2015)

The document from which the data in Table 2 were derived (SFA 2015) states in its notes section with regard to the purse seine fishery: *“Readers should note that the catch composition recorded by fishermen in their daily catch and effort reports were corrected based on scientific sampling carried out during transshipment or landing in Port Victoria.”* Whilst it is not entirely clear what this entails or means it may be that the report only

includes record of bycatch that is actually landed. It is particularly notable that in the breakdown of catch by flag state vessels neither Seychelles flagged or Spanish flagged vessels are recorded as having any bycatch for the year 2013.

From what is known about the nature of bycatch in global tropical purse seine fisheries (Hall & Roman 2013) it is clear that these figures do not record the actual catch and discards of the purse sein fishery in Seychelles' waters and this is a matter of concern and clearly limiting to sound fishery management.

Also of legitimate concern are the projections of extraordinarily high mortality rates for Silky sharks, by Filmlalter *et al* (2013), (*Carcharhinus falciformis*) due to entanglement in Fish Aggregating Devices used by the purse seine fleet in the Indian ocean which would likely not be represented in discard figures either.

Year	Catch (Mt)	Shark Bycatch (Mt)	% Shark Bycatch
2007	8,054.3	136.8	1.7%
2008	5,060.6	238.2	4.7%
2009	2,503.9	186.0	7.4%
2010	2,381.7	115.6	4.9%
2011	1,342.6	68.1	5.1%
2012	9,306.1	433.2	4.7%
2013	7,076.5	330.4	4.7%
2014 ⁴	4,411.5	288.1	6.5%

(Compiled from SFA 2015)

It is notable that on seeking information on the species breakdown of the industrial Long line shark bycatch inside the Seychelles EEZ, the following figures (**Table 4**) were provided by the Seychelles Fishing Authority (SFA):

Species	2009	2010	2011	2012	2013	2014
Blue Shark	60	186	207	520	412	337
Mako Sharks	14	37	32	70	63	49
Oceanic Whitetip	0	1	0	1	0	1
Porbeagle	0	0	0	1	1	1
Requiem Sharks (NEI)	346	148	69	225	195	66
Grand Total	420	372	308	817	671	454

(Source: Statistics Management office, SFA, 2015).

The first obvious concern is the large discrepancy between the respective annual shark bycatch figures for 2009 to 2014 in **Tables 3 and 4**. The reason, or reasons, for these

⁴ The statistics presented for the year 2013 are based on 84% of logbook returned to SFA whilst for 2014; the figures are for only 57% of the logbooks returned.

differences are not clear but may perhaps reflect the difference between bycatch including discards (**Table 4**) and landed bycatch (**Table 3**). Also of concern however is the:

- i). remarkably low catch of Oceanic whitetip (*Carcharhinus longimanus*) recorded – ad-hoc observations and landing sites and points of sale suggest much more is caught.
- ii). listing of catches of Porbeagle (*Lamna nasus*) a species that does not occur in Seychelles waters
- iii). absence of any record of Hammerhead (*Sphyrna sp*) catch – despite it being a known component of the bycatch.
- iv). listing of requiem sharks (*Carcharhinidae*) NEI (not elsewhere included) which highlights the ongoing problem of carcharhinid species identification.

These concerns all serve to reemphasise the need to improve data gathering, management and presentation.

Seychelles is a contracting party to the Indian Ocean Tuna Commission (IOTC) which has the objective:

“To promote cooperation among the Contracting Parties (Members) and Cooperating Non-Contracting Parties of the IOTC with a view to ensuring, through appropriate management, the conservation and optimum utilisation of stocks covered by the organisation’s establishing Agreement and encouraging sustainable development of fisheries based on such stocks.”

IOTC’s mandate (IOTC 1993) covers the stocks of 16 species of tuna, billfish, neritic tunas and mackerels but not directly bycatch. The Commission does however state that it collects data on *“non-target, associated and dependent species affected by tuna fishing operations, i.e. marine turtles, marine mammals, seabirds, sharks and fish species caught incidentally (bycatch).”* (IOTC 2015)

Perusal of IOTC data (IOTC 2015 b-i) and reports (IOTC 2015j) however makes it clear that work in regard to bycatch is lacking in useful substance or progress with the status of stocks of the seven main species of shark bycatch all classified as “Not Assessed/Uncertain”. It is clear therefore that Seychelles, if it wishes to comply with the Code of Conduct for Responsible Fisheries and the objectives of the International Plan of Action for the Conservation and Management of Sharks, should assume a strong lobbying position in the IOTC to significantly enhance bycatch research and mitigation measures.

The Semi-Industrial Fishery

The local Semi-industrial fishery was initiated in the mid-1990s to target swordfish and tuna. In the late 1990s some vessels in the long line fleet were noted to be increasingly targeting shark and finning them to export to the high commodity value eastern market (Bargain 2001). The targeting of sharks increased dramatically when the Seychelles Government banned the export of swordfish (2003 –2005) to the EU until issues regarding the cadmium content of the fish exceeding EU recommended levels were resolved. This resulted in most of the long-line fleet (at that time 11 vessels) switching to shark fishing for fin in order to

meet their financial obligations (SFA 2007). Fin export for 2003 was an order of magnitude higher than any previous year on record (Nevill 2005) (see **Fig 2**). Following the renewal of exports in 2005, 4 or 5 long liners continued to target shark for quite some time because of the lucrative nature of the fin trade and the transition costs to switch back to meeting E.U. sanitary requirements. It was also common practice at that time for all boats to switch to targeting shark July-August each year during the low season for swordfish.

Since 2007 the number of vessels active in the fishery each year has varied from 4 to 9 vessels (See **Table 5**), with some vessels having switched to other fishing activities such as operating as dive platforms in the sea cucumber fishery. Figures for catch and proportion of shark bycatch recorded therein are set out in **Table 5**.

The credibility of these figures is also suspect not least because of instances where vessels have been found with significant store of fins aboard. It seems probable that shark catch is understated as vessels are required to not exceed a 15% fin to shark carcass ratio in their catches if they are to claim subsidised fuel rates (SFA internal policy requirement).

Year	Active Vessels	Catch (Mt)	Shark bycatch (Mt)	% Shark Bycatch
2007	4	249	5	2.0%
2008	7	233	22	9.4%
2009	9	329	12	3.7%
2010	9	295	6	2.0%
2011	4	238	15	6.3%
2012	7	271	14	5.2%
2013	6	262	12	4.6%
2014	9	82	2	2.4%

(Derived from SFA 2015)

It is also notable that a detailed survey of the catch proportions of the fishery in 2000 (Bargain 2001) recorded the following species composition for the year's catch: 52% swordfish, 9% Yellowfin tuna, 10% Bigeye tuna and 29% of "Other species" notably sharks. The classification "Other species" is composed of Sailfish, Marlins, Shark and Others. An analysis of the catch data for these components 2007-2014 gives an annual average for "Others Species" of 9% (range 4.9-14.2%) again suggesting when compared to the detailed 2000 assessment an under recording of shark catch.

The decline in activity and catch recorded in 2014 is attributed to new problems regarding the export of swordfish to the European Union this time due to its high mercury content. Interestingly SFA (2015) states: *"This has led most semi Industrial vessels to switch to targeting demersal species instead of pelagic fish."* The switch to targeting demersal fisheries, in particular groupers from Amirantes and southern islands, is likely due to the collapse in the local market prices for shark fin (see **Socioeconomic Issues**) coupled with inflated prices being offered for groupers and snappers by a locally based fishery export company.

A species analysis of the declared shark bycatch component of the S-I fishery was sourced from SFA and is set out in **Table 6**.

Species	2009	2010	2011	2012	2013	2014
Blue Shark	2.1	0.3	0	6.7	8.9	1.5
Longfin Mako	0	0	0	0.1	0	0
Mako shark	0.1	0	0	0.5	1.4	0.2
Oceanic Whitetip	1.5	0	0	1.1	1.8	0
Sharks (NEI)	7.9	6.0	14.9	4.9	0	0.1
Hammerhead shark	0.1	0	0	0.6	0.2	0
Grand Total	11.7	6.3	14.9	14.0	12.2	1.8

(Source: Statistics Management office, SFA, 2015).

Perusal of the figures in **Table 6** again highlights the problems with correct species identification as embodied by the Sharks (NEI) classification, whilst quantities of Oceanic whitetip and Hammerhead appear low relative to what is observed entering the local market from S-I vessels (J. Nevill *pers obs*).

The Artisanal Fishery

The artisanal fishery is complex consisting of multiple vessel types, using varied fishing methods to target diverse species. The number of vessels, of all categories combined, active 2007-2014 has averaged 408 (see **Table 7**). Shark is generally a bycatch from the artisanal fishery though the vast majority of decked boats will carry at least one shark line to deal with a troublesome shark that takes hooked fish from the line or for use should they happen to hit an aggregation of shark of an economically viable species.

Vessel Type	2007	2008	2009	2010	2011	2012	2013	2014
Pirogue	19	15	15	10	10	9	9	7
Outboard	209	261	310	284	270	283	287	298
Inboard	1	1	2	1	0	0	1	1
Whaler	99	103	104	97	96	96	99	95
Schooner	17	19	21	22	21	22	20	19
S-I Longliner	2	1	1	1	1	2	2	4
Annual total	347	400	453	415	398	412	418	424

(Derived from SFA 2015)

The artisanal fishery unlike its industrial and semi-industrial counterparts does not practice finning, rather the whole shark is landed and typically put to good use. Depending on size and species, in addition to using the meat and fins, jaws, stomachs and the skin from the head and bodies may be taken for processing and sale. In some case the spine is also utilised for making into walking sticks or jewellery in the curio trade.

There is also a targeted artisanal shark fishery consisting of approximately 8-10 outboard boats operating from the islands of Mahé and Praslin. These vessels target shark on a seasonal basis (and opportunistically depending on the productivity of other fisheries such as the occurrence of mackerel etc...) during the South east monsoon and also targeting the aggregation phases in the lifecycles of some species. Sharks are targeted using a modified anchored longline known locally as “drag”⁵ and particular species can be targeted depending on location, depth of the set and the bait used.

Rays are targeted inshore using beach seine nets, and fishers utilising harpoons either on foot or on vessel. Most decked artisanal vessel will carry a harpoon in case rays are encountered during their other fishing activities. As with sharks the illegal use of gill nets is also apparent on some specimens brought to sale.

Table 8: Artisanal Catch and Shark/Ray component			
Year	Catch (Mt)	Shark/Ray (Mt)	% Shark/Ray
2007	4,195.6	21.4	0.51%
2008	4,777.8	22.8	0.47%
2009	3,030.6	40.2	1.32%
2010	2596.6	20.7	0.80%
2011	2871.0	26.9	0.94%
2012	2506.4	34.0	1.36%
2013	4150.4	36.3	0.87%
2014	3632.5	48.7	1.34%

(Derived from SFA 2015)

Table 8 shows the proportion catch percentage of sharks and rays within the broader artisanal fishery. **Figure 1** can be referenced to put these percentages into the longer term context.

One key issue here is the grouping of shark and ray data together. The fisheries are distinct and the status of their component species is likewise different (see **Socioeconomic Issues**). In order to manage these fisheries appropriately and to detect changes of status of species considered particularly at risk, shark and ray catch needs to be collected presented separately and as much as possible identified to species level.

⁵ The use of gill nets, banned by the 1998 Prohibition of net fishing of sharks Regulations, is still evident in specimens brought to sale.

Shark Fin Trade

A more than century long overview of the Seychelles fin trade can be found in **Figures 2 & 3**. **Table 9** gives the detailed breakdown for shark fin export 2006-2014 and converts the figure for fins into biomass using a 5% fins to body mass ratio.

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014
Fin Exports (Mt)	9.3	10.7	3.7	3.7	4.6	2.4	13.2	1.9	1.3
Shark catch (MT) at 5% fin/shark ratio	186	214	74	74	92	48	264	38	26

(Derived from SFA 2015)

The peak in fin export in 2012 is notable because it coincides with the State and private sector sponsoring of an unscientific shark cull (see ‘Shark Management’ in **Socioeconomic Issues** below) following the tragic shark attack deaths of two swimmers at Anse Lazio, Praslin in August 2011. The slump in fin exports in 2013 is a matter of concern as it may reflect the broad impact on shark populations around the central archipelago following the uncontrolled culling in 2012.

Socioeconomic Issues

Artisanal shark fishers

Artisanal shark fishers are defined as artisanal fishers that actively target shark utilising specialised gear (i.e. the short anchored longline known locally as “drag”) and who derive 30% or more of their annual income from shark landings. The 2007 NPOA estimated there were some 10-12 artisanal boats active in this fishery. Though no structured survey has been undertaken since recent monitoring suggests this number had dropped to 8-10 vessels by 2015. With on average 2.5 fishers per vessel and a land based partner for sales this suggests 28 - 35 fishers and their families are directly dependent on the fishery.

Market forces

Since the national and international financial crisis of 2008 shark meat has found a ready sale on the local market as a cheap source of high-quality protein for financially pressed families. This has been accentuated by the fact that from 2010-2015 the mean price of teleost fish on the local market has increased by 250% (GoS 2015) whilst the price of shark meat has remained stable at SR 25 for the standard portion.

The price of shark fin on the local market collapsed in 2014 (approximately 90% decline in value) following the decision of key airlines servicing Seychelles to no longer accept dried fins as freight. There is anecdotal evidence to suggest that this has significantly reduced the shark catch and landings of the semi-industrial longline fleet which previously finned shark

for the commodity market, whereas now there is a tendency to release shark caught due to lack of fin value.

The decline in fin value has also reduced the shark catch of the artisanal fishery, notably the targeted bull shark fishery was not undertaken in 2014 (J. Nevill *pers obs*) as the meat of this species is considered of lower quality and the profit margin for the fishery had previously come from value of the species large fins.

Dive Industry

In 2015 the Seychelles Tourism Board listed 21 dive companies as licensed to operate in Seychelles. Whilst no economic analysis has been undertaken, these companies consider megafauna and particularly shark as key attractions for and assets of their industry. The dive industry has been very active in stakeholder consultations for the development of the previous and current NPOAs and has expressed strong concerns about the marked observed and ongoing decline of sharks in general and at dive sites. Notably the Grey reef shark aggregation off Marianne island which 20 years ago would commonly host 70 plus sharks whereas today no more than 4-5, if any, are typically seen.

Shark Management

In August 2011, 2 people were tragically killed in shark attacks, fourteen days apart, in the waters off Anse Lazio on Praslin. These sad events led to several ill-informed and misleading statements to the media by local officials resulting in wide international coverage deemed negative to the national tourism industry. This resulted in a knee-jerk response and unscientific culling of sharks around the Praslin group of islands. The cull was sponsored by Government and the local tourist industry. Government temporarily repealed the ban on fishing for sharks with gill nets and indeed provided nets to fishers to catch sharks. Expert shark fishers from Mahé were subsidised to travel to Praslin carry out the cull. It was a period of significant misinformation with public fear being fuelled by media hyperbole, to the extent that a national newspaper featured photos on its front page of harmless large Lemon sharks (*Negaprion acutidens*) that were caught and strung up during the cull and stated that they were dangerous man-eating Tiger sharks.

The circumstances of the shark attacks were never properly investigated, e.g. concerns regarding water quality in the area related to the presence of two large infrastructures on either side of Baie Chevalier, the bay in which Anse Lazio lies, and the numerous yachts that moor each night in the bay were not assessed. Rather the cull was undertaken, permanent drumlines were set offshore and shark nets were placed in the bay to provide safe swimming areas. A tooth fragment removed from the second victim was sent to Prof. Mahmood Shivji of the Guy Harvey Research Institute, DNA extracted from the tooth was able to identify that a Bull shark was responsible for the second attack.

It is generally recognised by stakeholders now that the whole unfortunate sequence of events was poorly managed exacerbated by ill-informed statements to the media such that the action plan of this document includes activities to develop a response protocol should such an event happen again.

In 2013 divers working on hull maintenance of vessels moored in Port Victoria complained of the presence of numerous large Bull sharks (*Carcharhinus leucas*) in the port area. In response to this perceived threat the Seychelles Maritime Safety Administration (SMSA) organised a targeted fishing operation in the Port Area. These actions saw at least 16 Bull sharks caught over the next 3 weeks. 13 of these sharks were examined, all were female, 5 were heavily pregnant and the other 8 appeared to be in prime mating condition. 75% of those with stomach contents were found to contain fish heads (Wahoo and Tuna that had been clearly cut by a knife) or tuna by-catch species (Oceanic triggerfish etc...) i.e. clearly ship discards. Further investigation showed that dumping of fish waste was rife in the Port contrary to existing regulations. This abundant food supply coupled with the seasonal aggregation of Bull sharks off the east coast of Mahe to pup and mate – the east coast provides suitable sheltered conditions and the requisite freshwater input for Bull shark nursery habitat – had led to the dense aggregation of mature Bull sharks in the Port area (Nevill 2013). It was therefore agreed that re-enforcement of the Port sanitary regulations rather than shark culling should be the preferred management measure.

Artisanal Shark Fishery Survey

Seychelles' first NPOA (SFA 2007) identified the lack of species specific data - occurrence, size, ecology and catch - as key obstacles to the sound management of shark fisheries. As part of the process to address this information shortfall and some of the capacity needs related to it a grant was provided by the GoS/UNDP/GEF project "Mainstreaming Biodiversity management into Production Sector Activities" to undertake an intensive year-long study of the artisanal shark catch in 2013.

Methodology

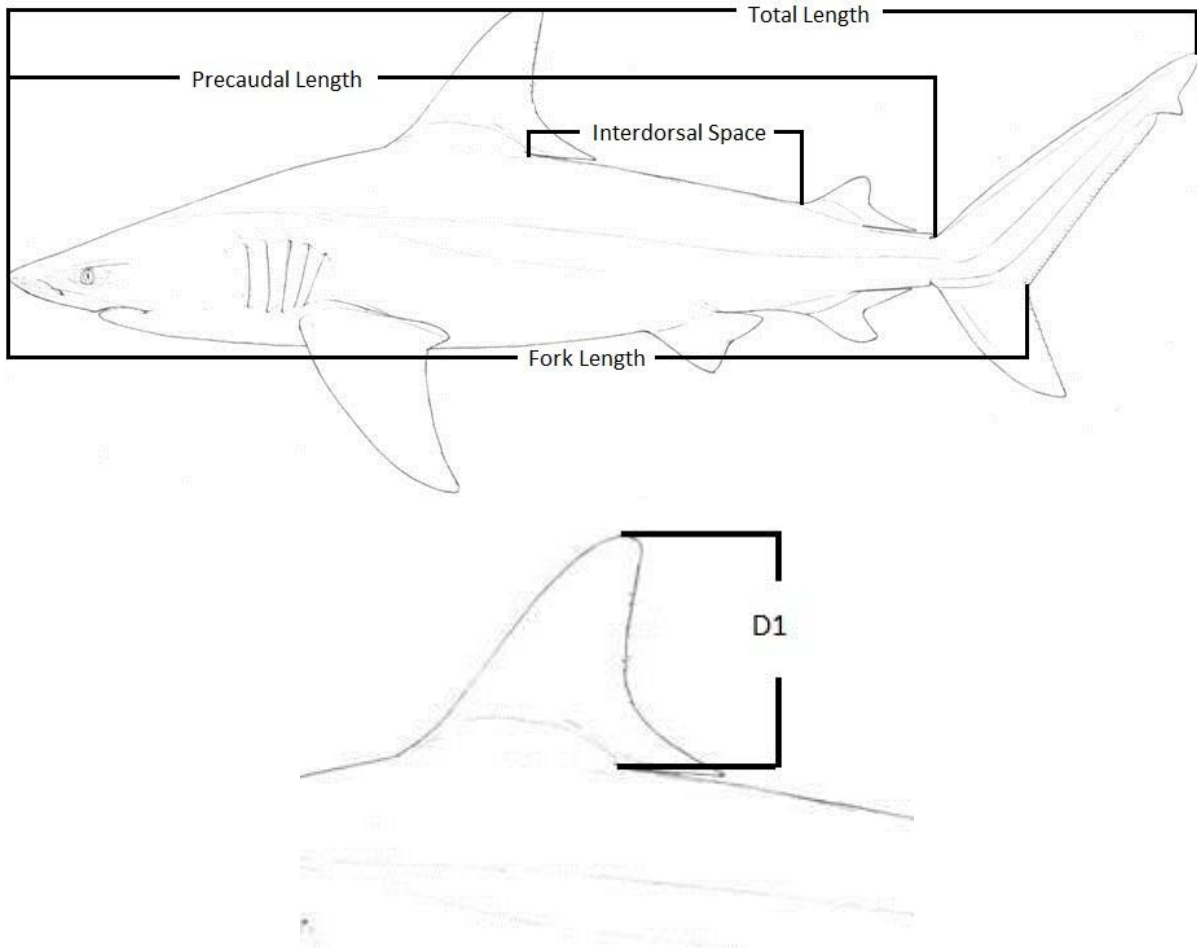
An intensive 12 month survey of artisanal shark catch was undertaken on the principal island of Mahé, throughout 2013, to elucidate the abundance, diversity and seasonality of species. SFA statistics consistently show that since 1986 approximately 90% of the national artisanal catch is landed on Mahé. Furthermore whilst there is no contemporary information available as to the proportion of catch that goes to sale at the main market in Victoria, historical records showed it to be approximately 50% of the catch. Construction of regional and district markets plus the exportation of grouper and snappers means that this proportion is reduced in current times. However this reduction is less so for shark which in general do not have an export market for their meat and sell best at the biggest central market where the demand is highest. It is estimated therefore that more than 50% of the larger sharks (> than 1 metre TL) are brought to sale at the Victoria market⁶. This coupled with the cooperation of members of the Artisanal Shark Fishers Association and other artisanal fishers at landing sites meant that the shark data gathered was highly representative of the overall national catch.

The main national fish market in Victoria was monitored 5 days a week (Tuesday – Saturday) and ad-hoc attendance at landing sites was undertaken with the assistance of the Artisanal shark fishers association and other assisting artisanal fishermen.

The following measurements for intact specimens were taken in order to develop species morphometric models: Total Length (TL), Interdorsal Space (IDS), Precaudal length (PCL), Fork Length (FL) and first Dorsal fin height (D1) (see **Figure 4**). TL was measured from the tip of the nose dorsally in a straight line to the tip of the upper caudal lobe, specimens were positioned naturally and not stretched. PCL was measured from the tip of the nose dorsally to the tip of the dorsal projection into the precaudal pit. FL was measured from the tip of the nose dorsally to the caudal posterior notch. IDS was measured from the insertion of D1 to the origin of D2 where it protrudes from the dorsal surface. D1 height was measured as the vertical straight distance from the point of insertion to the height of the apex of the fin.

⁶ The proportion of neonate and small juvenile sharks incorporated into the survey is likely to be significantly less due to their vulnerability to diverse fishery activities and ready local and roadside sale.

Figure 4: Key Monitoring Measurements.



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Additional measurements for certain species were recorded as follows: for Hammerhead sharks (*Sphyrna* spp) the span of the cephalophoil (head) was measured and for Bull sharks the height of the second dorsal (D2) fin was also taken to allow for differentiation between Bull (*Carcharhinus leucas*) and Javan (*C. amboinensis*) sharks. For the purpose of this study the key measurement is IDS, as this is the only measurement that is available on a fully dressed carcass. The very high correlation between IDS and TL provides a sound basis for a pragmatic monitoring protocol.

Measurements were taken using a carpenter’s metal spring recoil tape measure, this offered the advantage of locking on key measurements and a rigid perpendicular surface at the beginning of the tape by which to secure measurements from the nose. All measurements were undertaken by the same practitioner and rounded to the nearest 2.5 mm.

Morphological models were developed for the 10 most common species, which constituted more than 98% of the numerical catch.

Results

20 species of shark⁷, including two species of batoid⁸ *Rhina ancylostoma* and *Rhynchobatus sp.*, were recorded as caught by the artisanal fishery in 2013⁹ constituting 3,259 carcasses examined in total (See **Table 10**).

	Species	Carcasses measured	% of total
1	<i>Carcharhinus albimarginatus</i>	168	5.2
2	<i>Carcharhinus amblyrhynchos</i>	1,034	31.7
3	<i>Carcharhinus brevipinna</i>	286	8.8
4	<i>Carcharhinus falciformis</i>	81	2.5
5	<i>Carcharhinus leucas</i>	37	1.1
6	<i>Carcharhinus limbatus</i>	464	14.2
7	<i>Carcharhinus melanopterus</i>	2	< 0.1
8	<i>Carcharhinus plumbeus</i>	16	0.5
9	<i>Carcharhinus sorrah</i>	374	11.5
10	<i>Galeocerdo cuvier</i>	17	0.5
11	<i>Hemipristis elongatus</i>	3	< 0.1
12	<i>Loxodon macrorhinus</i>	6	0.2
13	<i>Nebrius ferrugineus</i>	1	< 0.1
14	<i>Negaprion acutidens</i>	7	0.2
15	<i>Rhina ancylostoma</i>	1	< 0.1
16	<i>Rhynchobatus sp.</i>	97	3.0
17	<i>Sphyrna lewini</i>	595	18.3
18	<i>Sphyrna mokarran</i>	65	2.0
19	<i>Sphyrna zygaena</i>	1	< 0.1
20	<i>Triaenodon obesus</i>	4	0.1
	Total	3,259	

Notably the bulk of the catch is constituted by only a few species. The two most commonly caught species constitute 50% of the catch whilst the 10 most common make up more than 98% of the total catch (See **Table 11** and **Figs 5 & 6**).

⁷ *Carcharhinus longimanus* and *Isurus oxyrinchus* were also recorded at the market but were brought from the semi-industrial fishery.

⁸ The Seychelles NPOA includes these species because they are subject to the same fishing pressures for fins and meaty s are the true sharks.

⁹ Other species i.e. *Rhizoprionodon acutus*, *Carcharhinus amboinensis* and *C. galapagensis* have been recorded in other years but not during the 2013 period.

	Species	Percentage of overall catch	Cumulative Percentage
1	<i>Carcharhinus amblyrhynchos</i>	31.7	31.7
2	<i>Sphyrna lewini</i>	18.3	50
3	<i>Carcharhinus limbatus</i>	14.2	64.2
4	<i>Carcharhinus sorrah</i>	11.5	75.7
5	<i>Carcharhinus brevipinna</i>	8.8	84.5
6	<i>Carcharhinus albimarginatus</i>	5.2	89.7
7	<i>Rhynchobatus sp.</i>	3.0	92.7
8	<i>Carcharhinus falciformis</i>	2.5	95.2
9	<i>Sphyrna mokarran</i>	2.0	97.2
10	<i>Carcharhinus leucas</i>	1.1	98.3

Figure 5: Artisanal Shark Catch Species Composition (Nevill 2014)

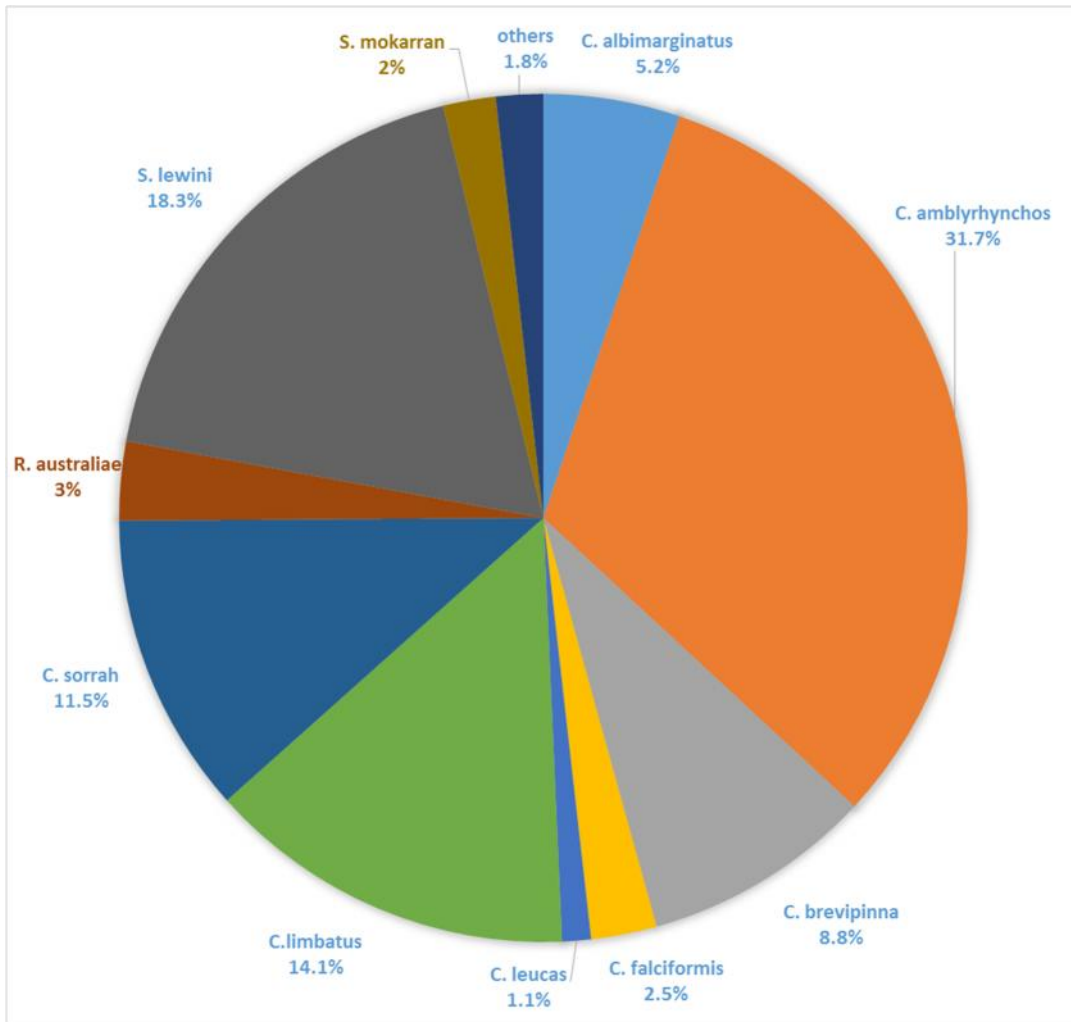
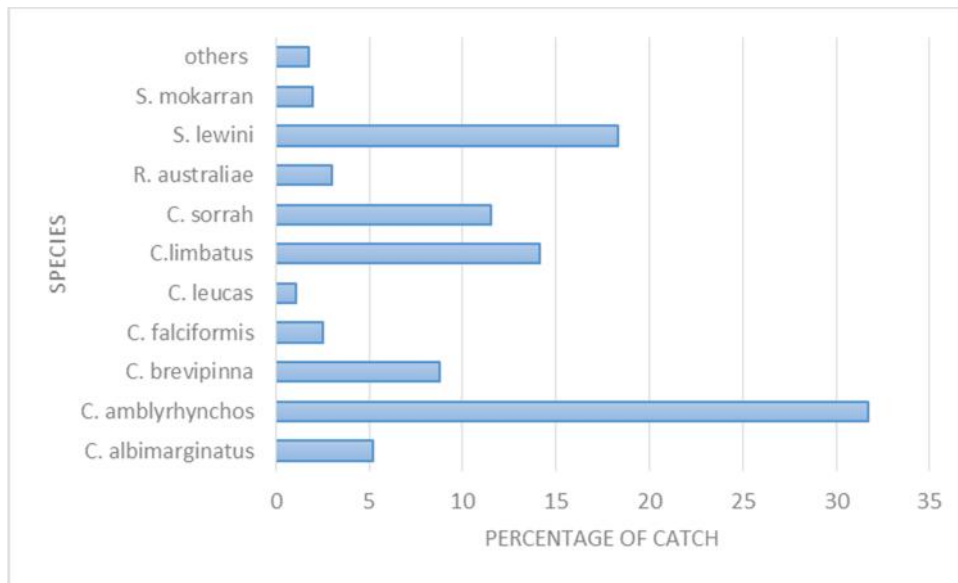


Figure 6: Artisanal Shark Catch Species Composition (Nevill 2014)



Species Analysis

Catch data is discussed in the following pages on a species by species basis. The 10 most common species provided sufficient intact specimens to generate morphological models such that IDS measurements for dressed carcasses can be converted into total length figures. This means that for future monitoring a single measurement is sufficient to gather data for more than 98% (numerically) of the catch. A simple regression analysis of IDS against TL of intact specimens provides the equation for converting IDS to TL and also characterises the accuracy of the model (R^2)

English name: Silvertip shark
Latin name: *Carcharhinus albimarginatus*
Creole name: Reken waro



168 *C. albimarginatus* carcasses were measured in 2013, 24 of which were intact and 144 dressed.

The morphological model has limitations not least because of the low number of specimens (24) but also because only neonate and juvenile specimens were caught intact (size range TL 78 – 124cm) (See Fig 7). This reflects the ecology of the species which as adults tends to live off the continental shelf where as its pups and has nursery grounds on the outer banks. Sex ratio was exactly 50/50 (12 male and 12 female specimens recorded) (See Fig 8). There is some indication that pupping occurs in the third quarter.

Fig 7: *C. albimarginatus* Catch Total Length by Month 2013 (Nevill 2014)

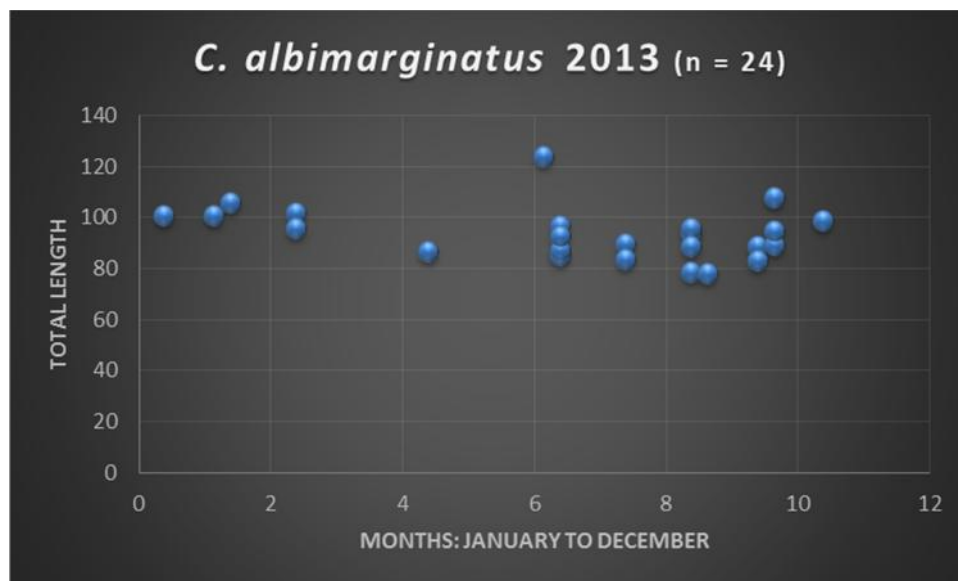
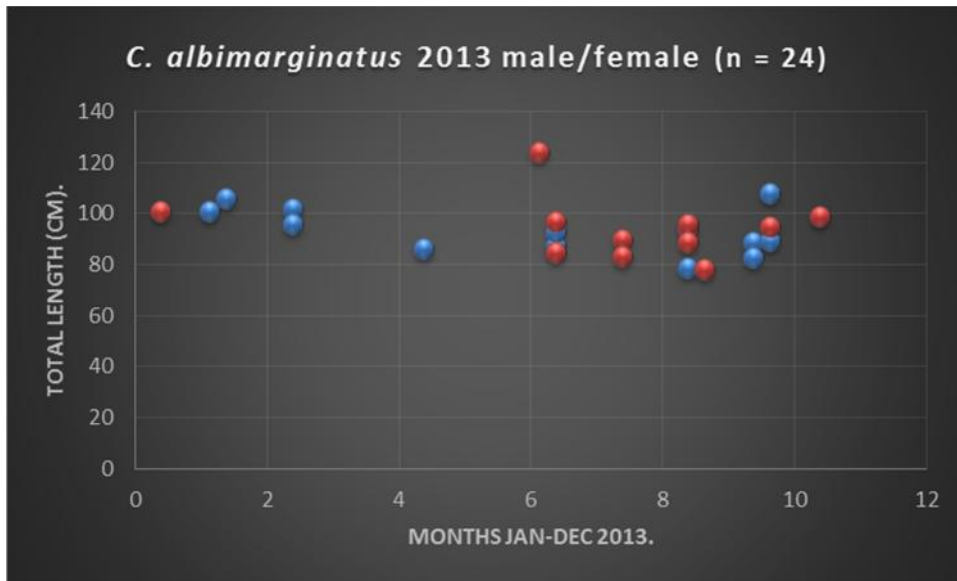


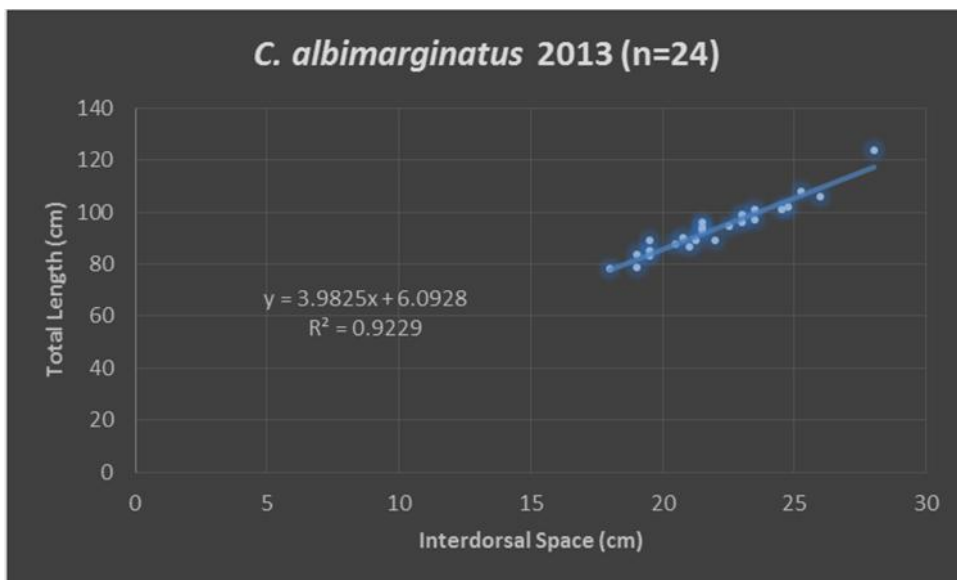
Fig 8: *C. albimarginatus* Catch TL by Month and Sex (Male/Female) (Nevill 2014)



The regression analysis (see **Fig. 9**) based on the limited sample available (n=24) provides the following equation, with 92% accuracy, for the calculation of Total Length (y) from the Interdorsal space (x):

$$Y = 3.9825x + 6.0928$$

Fig 9: *C. albimarginatus* IDS/TL Regression Analysis (Nevill 2014)



English name: Grey reef shark
Latin name: *Carcharhinus amblyrhynchos*
Creole name: Kaser or Reken bar



1,034 *C. amblyrhynchos* carcasses were measured in 2013, 393 of which were intact and 641 dressed.

C. amblyrhynchos was by far the most common shark caught in the 2013 artisanal fishery accounting numerically for more than 30% of the total catch. This reflects, in part, its continental shelf ecological niche with animals spending their entire lifespan on the plateau (size range TL 60.5 – 173cm). Sex ratio of the intact specimens was 41/59 (162 males and 231 females). Considerably more mature females were caught than mature males reflecting the aggregating behaviour displayed by females.

Fig 10: *C. amblyrhynchos* Catch Total Length by Month 2013 (Nevill 2014)

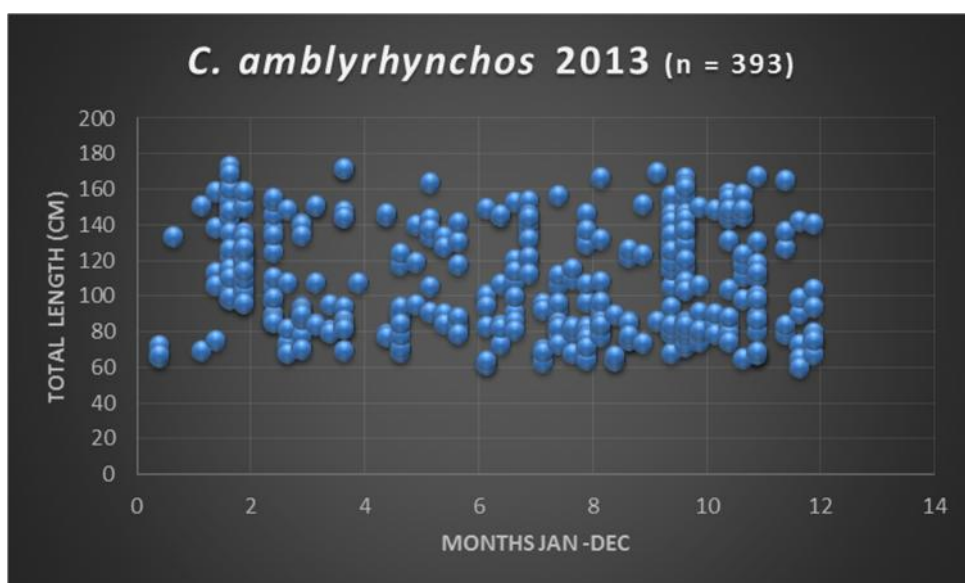
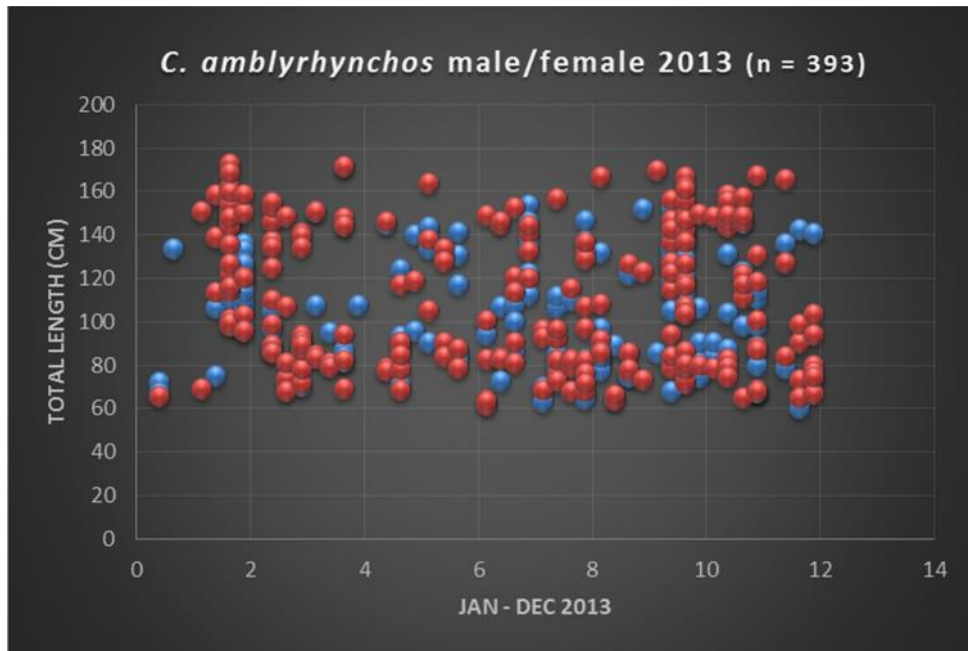
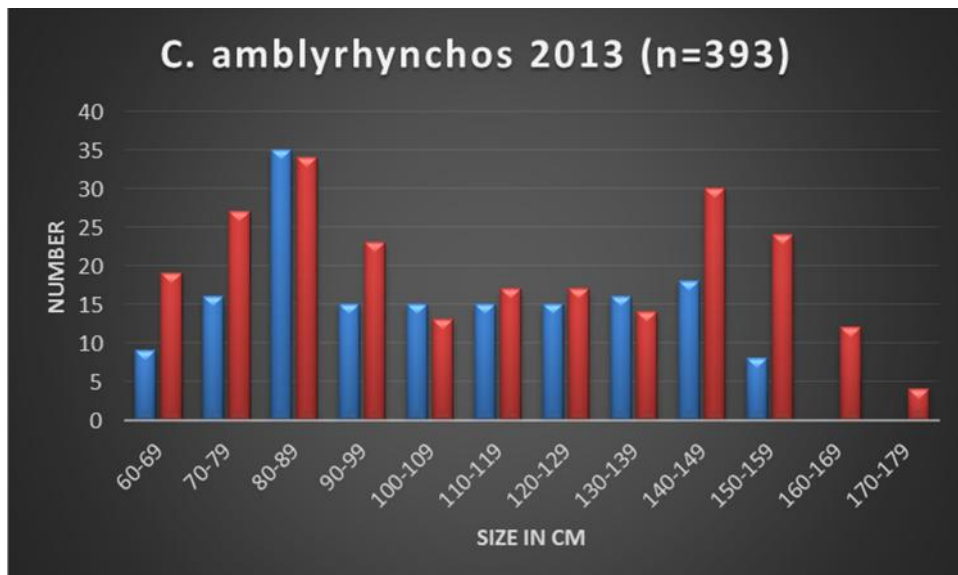


Fig 11: *C. amblyrhynchus* Catch TL by Month and Sex (Male/Female) (Nevill 2014)



The number and full demographic spread of the specimens recorded allows for further analysis of the population structure by size. **Fig 12** clearly shows that mature females attain a larger size than males, presumably due to the reproductive advantage of larger size, and that significantly more mature females are caught than males. This likely reflects the known aggregating behaviour of female Grey reef sharks making them more vulnerable to targeted fishing effort.

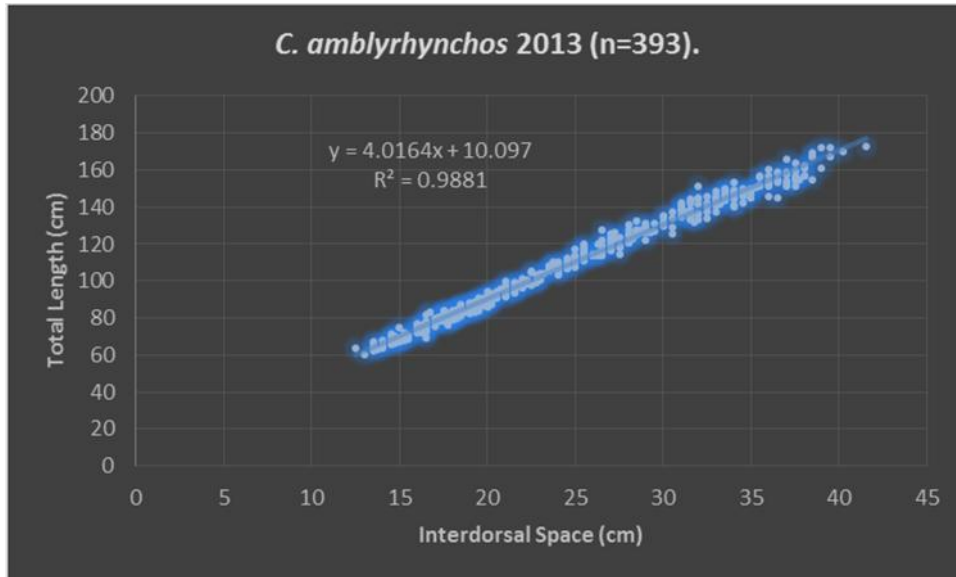
Fig 12: *C. amblyrhynchus* Size and Sex Comparison (Male/Female) (Nevill 2014)



The good sample size and highly linear growth pattern of *C. amblyrhynchos* provides for a very accurate morphological model. The regression analysis (see **Fig. 13**) provides the following equation, with 99% accuracy, for the calculation of Total Length (y) from the Interdorsal Space (x):

$$Y = 4.0164x + 10.097$$

Fig 13: *C. amblyrhynchos* IDS/TL Regression Analysis (Nevill 2014)



English name: Spinner shark
 Latin name: *Carcharhinus brevipinna*
 Creole name: Nennen pwent



286 *C. brevipinna* carcasses were measured in 2013, 210 of which were intact and 76 dressed.

No mature specimens were recorded (size range TL 81 – 158cm) suggesting the plateau serves as a nursery area and habitat for sub-adults whilst adults reside further offshore. Sex ratio of the intact specimens 56/44 (118 males and 92 females). **Figs 14** and **15** appear to show to annual growth cohorts. The absence of *C. brevipinna* from the catch during the 3rd quarter is also notable.

Fig 14: *C. brevipinna* Catch Total Length by Month 2013 (Nevill 2014)

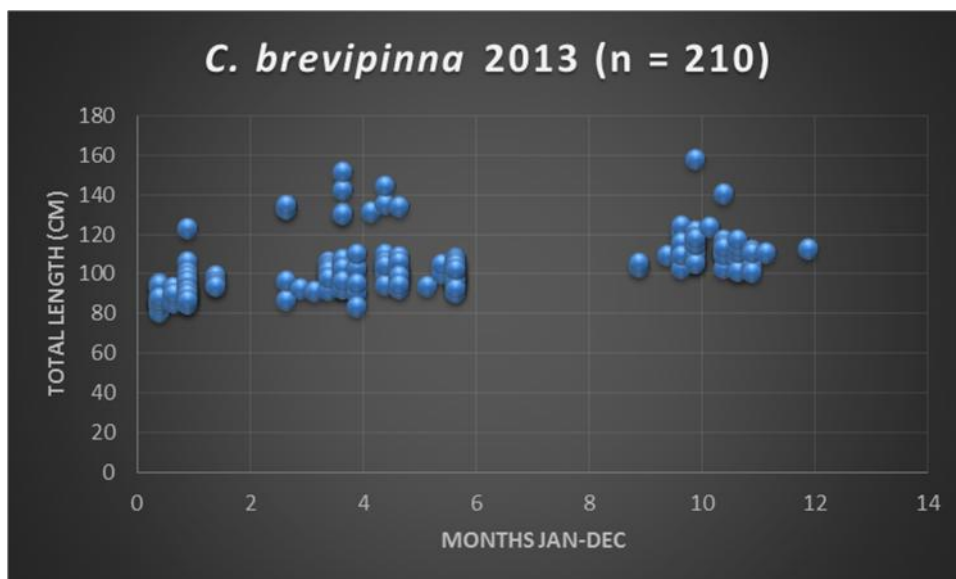
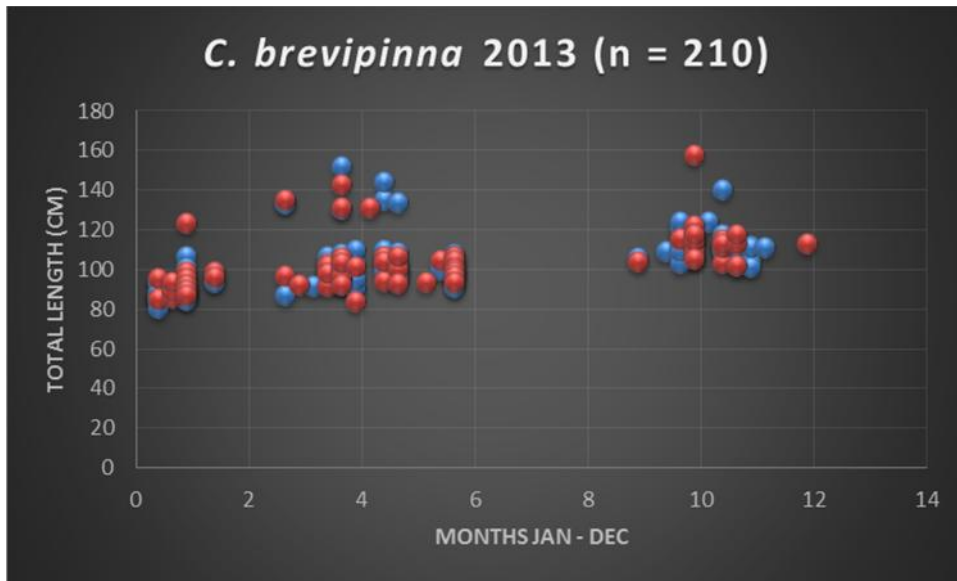


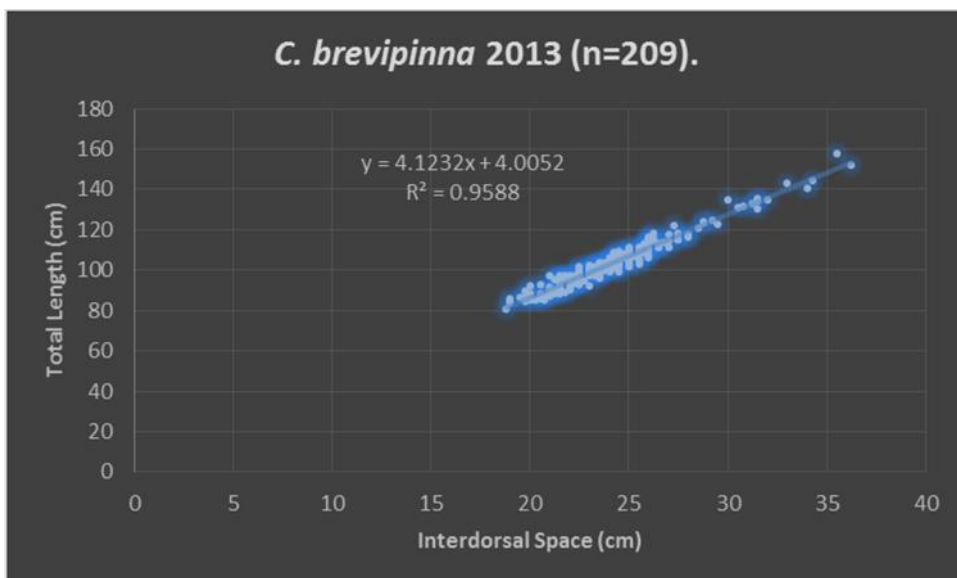
Fig 15: *C. brevipinna* Catch TL by Month and Sex (Male/Female) (Nevill 2014)



The good sample size and highly linear growth pattern of *C. brevipinna* gives a good morphological model, though limited by absence of mature adults in the sample. The regression analysis (see Fig. 16) provides the following equation, with 95% accuracy, for the calculation of Total Length (y) from the Interdorsal Space (x):

$$y = 4.1232x + 4.0052$$

Fig 16: *C. brevipinna* IDS/TL Regression Analysis (Nevill 2014)



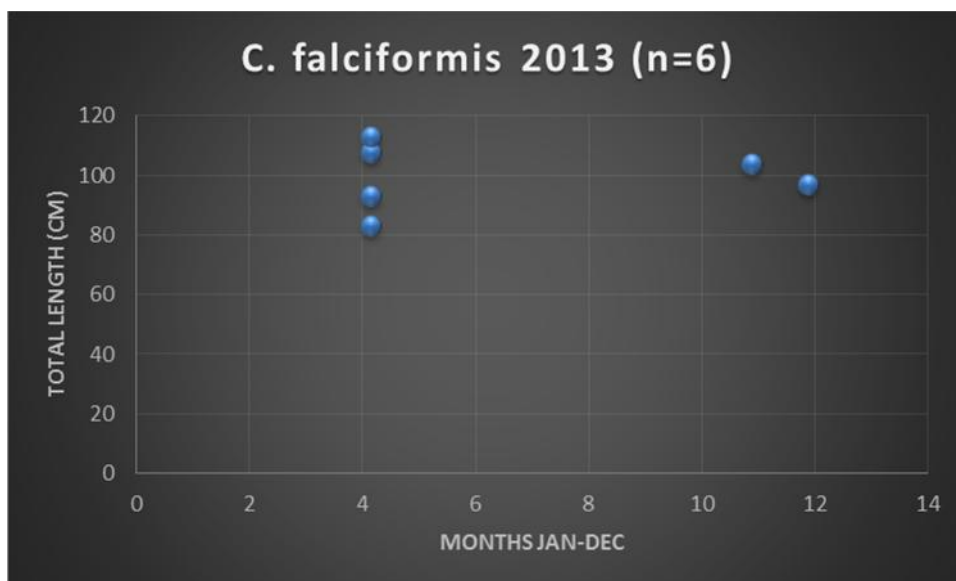
English name: Silky shark
Latin name: *Carcharhinus falciformis*
Creole name: Lapo kler



81 *C. falciformis* carcasses were measured in 2013, only 6 of which were intact and 75 dressed.

All of the intact specimens were juvenile (Size range TL 83-113cm) whilst the majority of the dressed carcasses were adult but originated from the semi-industrial fleet catch and hence are not pertinent in this study. The intact specimens were landed by the artisanal fishery suggesting that the outer banks may serve as a nursery habitat for this otherwise pelagic species. All 6 specimens were female but the sample is too small to draw any conclusion or develop a viable morphometric model.

Fig 17: *C. falciformis* Catch Total Length by Month 2013 (Nevill 2014)



English name: Bull shark
Latin name: *Carcharhinus leucas*
Creole name: Kilpa, Reken erkil, Reken grolatet.



37 *C. leucas* carcasses were measured in 2013, 32 of which were intact and 5 dressed. Although quite a limited sample size, not surprising for such a large apex species, the demographic representation is quite good (size range TL 69 – 292.5cm) (see **Fig 18**). Sex ratio of the intact specimens was 31/69 (10 males and 22 females) with all mature specimens being female except for one (see **Fig 19**). This predominance of females reflects their seasonal pupping activity in the fourth quarter of the year which brings them into near shore waters. Fascinatingly a large female Bull shark resident in the Amirantes was satellite tagged in 2014 and recorded to migrate approx. 2000km south to the coastal waters of Madagascar to pup before returning to the Amirantes (Lea *et al* 2015). This highlights the need for further study of the Bull shark populations in the different island groups in Seychelles to determine to what extent they are distinct or overlap with other populations.

Fig 18: *C. leucas* Catch Total Length by Month 2013 (Nevill 2014)

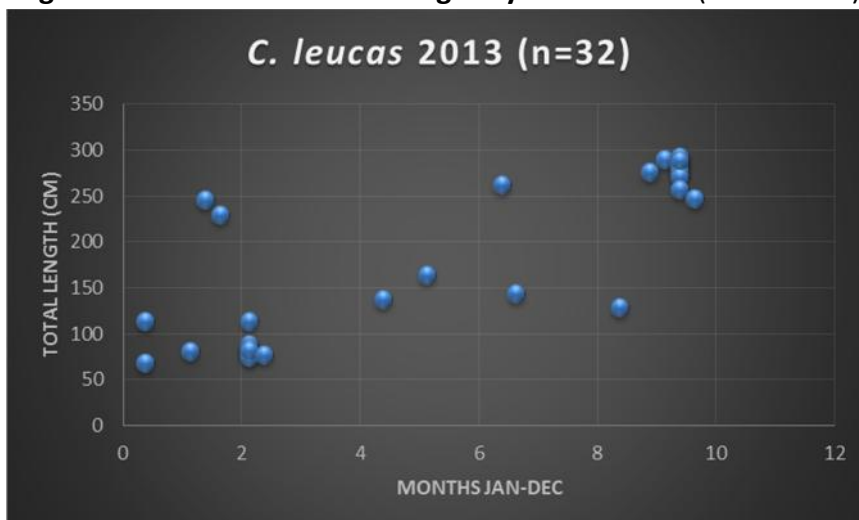
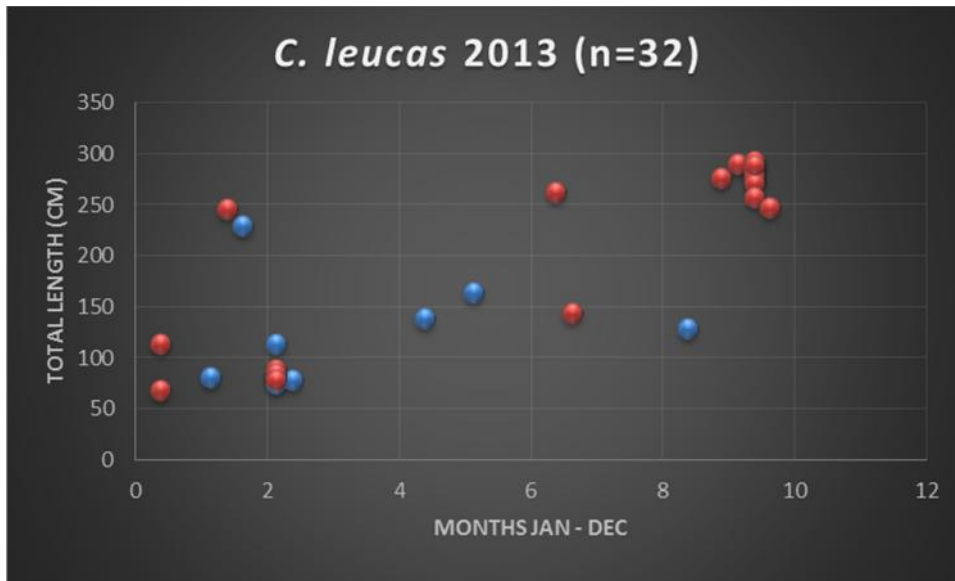


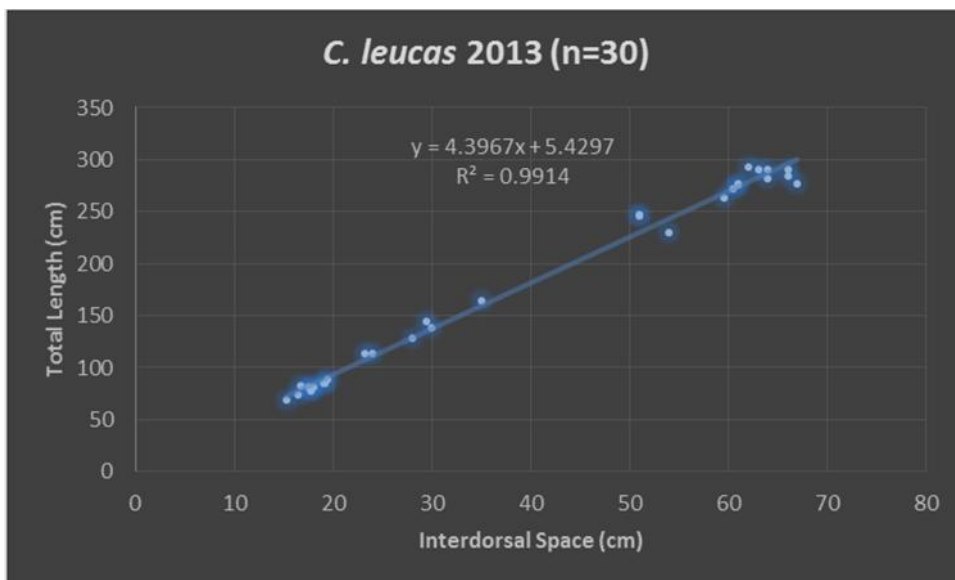
Fig 19: *C. leucas* Catch TL by Month and Sex (Male/Female) (Nevill 2014)



Despite the limited sample size the regression analysis provides an excellent *C. leucas* morphological model, 99% accuracy, and equation for the calculation of Total Length (y) from the Interdorsal Space (x):

$$y = 4.3967x + 5.4297$$

Fig 20: *C. leucas* IDS/TL Regression Analysis (Nevill 2014)



Also of note is the absence of specimens in the catch TL 160cm to TL 230 suggesting that juveniles remain in inshore nurseries until they reach the size of TL 150-160 cm at which point they disperse further afield, returning when adults to breed.

English name: Blacktip shark
Latin name: *Carcharhinus limbatus*
Creole name: Nennen pwent.



464 *C. limbatus* carcasses were measured in 2013, 313 of which were intact and 151 dressed.

Though a good sample size only a few mature specimens were recorded caught in the artisanal fishery in 2013 (size range TL 62 – 208.5 cm) and none of these were male. The preponderance of the catch was made up of neonates, juveniles and sub-adults with a distinct pupping season in the second quarter and distinct annual cohorts for years 1 and 2 (see **Fig 21**). Sex ratio of the intact specimens was 38/62 (121 males and 195 females) with all mature specimens being female (see **Fig 22**) suggesting a difference in behaviour between the sexes.

Fig 21: *C. limbatus* Catch Total Length by Month 2013 (Nevill 2014)

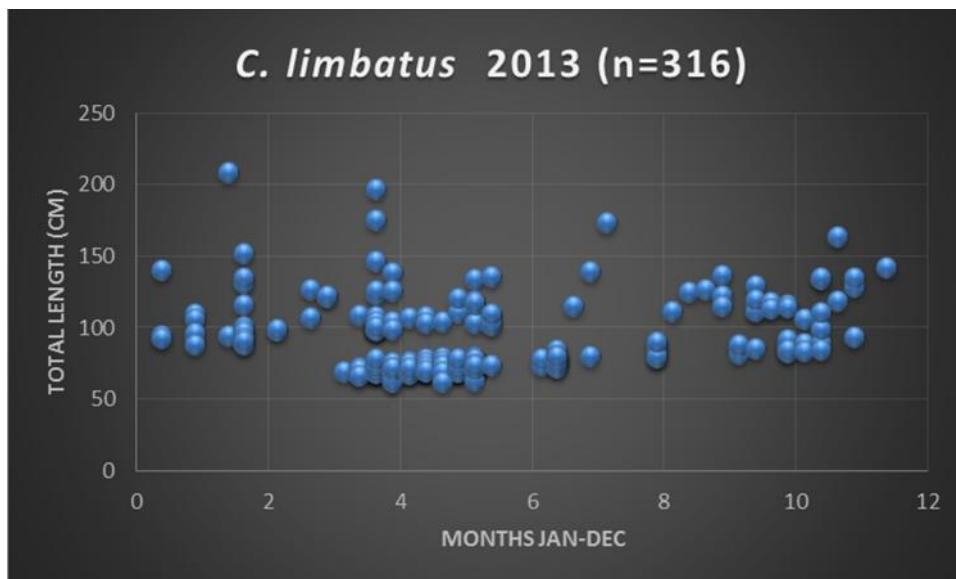
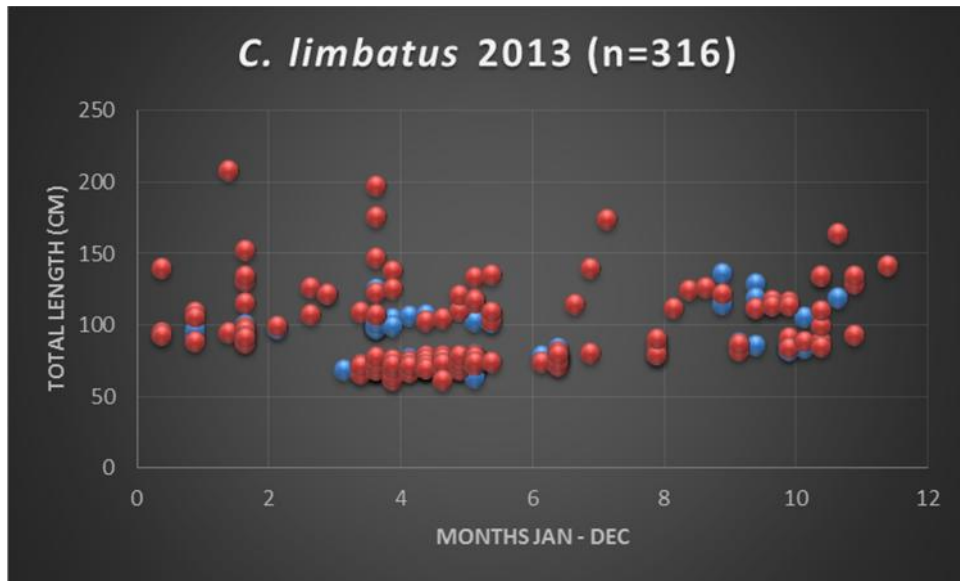


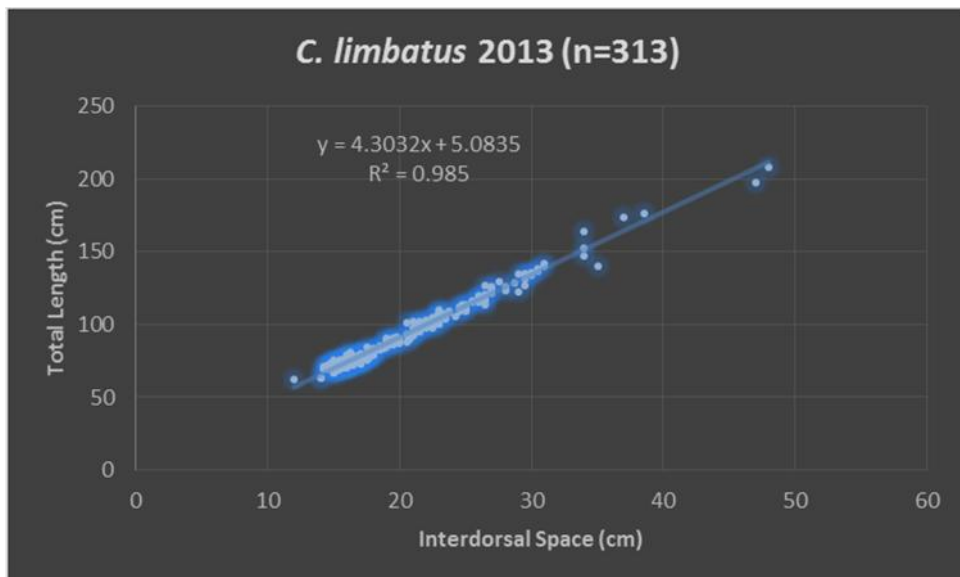
Fig 22: *C. limbatus* Catch TL by Month and Sex (Male/Female) (Nevill 2014)



The good sample size of neonates, juveniles and sub-adults coupled with a few mature individuals has proved sufficient to provide a good *C. limbatus* morphological model, 99% accuracy, and equation for the calculation of Total Length (y) from the Interdorsal Space (x):

$$y = 4.3032x + 5.0835$$

Fig 23: *C. limbatus* IDS/TL Regression Analysis (Nevill 2014)



English name: Blacktip reef shark
Latin name: *Carcharhinus melanopterus*
Creole name: Reken sek or Reken nwar.



Only 2 specimens of *C. melanopterus* were recorded in 2013 and both were dressed carcasses. Furthermore both were caught in the Amirantes meaning none were landed from the Seychelles plateau. This is cause for concern as in natural circumstances the species would be expected to be common in inshore waters. It seems likely that the favoured nursery habitat of the Blacktip reef shark being in very shallow inshore lagoons may have made the species very vulnerable to human exploitation leading to their near extirpation on the Seychelles plateau. The Blacktip shark does reportedly still form an occasional component of the fishery around the Praslin group of islands. It is understood they are still to be found on the banks around Denis Island.

English name: Sandbar shark
Latin name: *Carcharhinus plumbeus*
Creole name: Zelron



16 carcasses of *C. plumbeus* were recorded and measured during 2013 only two of which were intact providing insufficient data for analysis. This low count (constituting just 0.5% of the catch) is however cause for concern with the species having been recorded as the third most common on the banks in the mid-20th century.

English name: Spottail shark
Latin name: *Carcharhinus sorrah*
Creole name: Nennen pwent



374 *C. sorrah* carcasses were measured in 2013, 242 of which were intact and 132 dressed.

A good sample size with a moderate number of mature specimens from both sexes suggests that the inshore areas serve as nurseries for juveniles with adults dispersing out over the plateau after breeding (size range TL 55.5 – 127.5)(see **Fig 24**). Sex ratio of the intact specimens was 54/46 (130 males and 112 females) (see **Fig 25**). The pupping season occurs at the turn of the year and distinct annual growth cohorts are apparent in the data (see **Figs 24 & 25**).

Fig 24: *C. sorrah* Catch Total Length by Month 2013 (Nevill 2014)

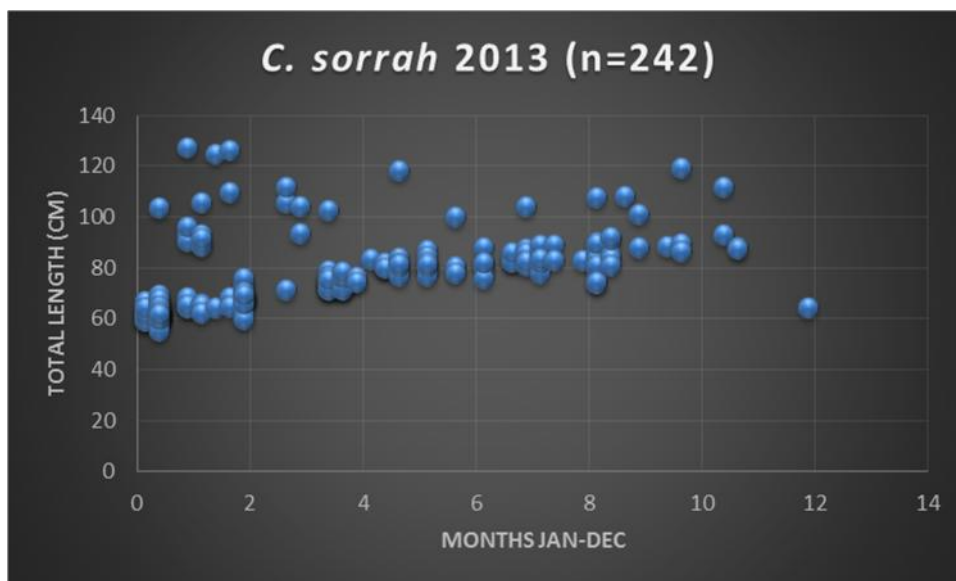
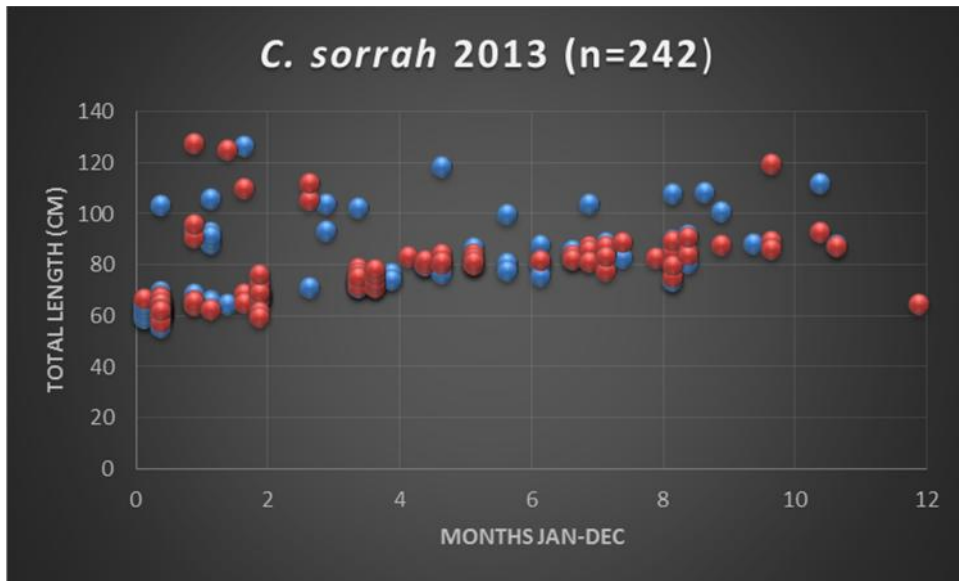


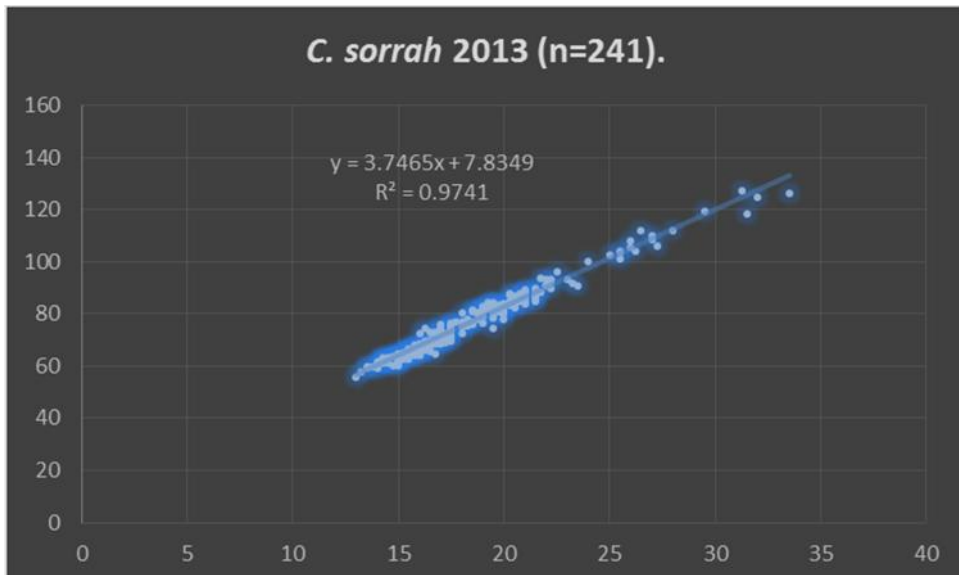
Fig 25: *C. sorrah* Catch TL by Month and Sex (Male/Female) (Nevill 2014)



The good sample size and reasonable demographic spread provides a good *C. sorrah* morphological model, 97% accuracy, and equation for the calculation of Total Length (y) from the Interdorsal Space (x):

$$y = 3.7465x + 7.8349$$

Fig 26: *C. sorrah* IDS/TL Regression Analysis (Nevill 2014)



English name: Tiger shark
Latin name: *Galeocerdo cuvier*
Creole name: Demwazel



17 specimens of *G. cuvier* were recorded in 2013, only 4 of which were intact and 13 dressed providing insufficient data for analysis. Anecdotal information indicates that the Tiger shark was formerly much more common in coastal waters.

English name: Snaggletooth shark
Latin name: *Hemipristis elongata*
Creole name: Ledan deor



Only 3 specimens of *H. elongata* were recorded in 2013, 2 of which were intact, providing insufficient data for analysis. Anecdotal information suggests that the Snaggletooth shark was formerly much more common in coastal waters.

English name: Sliteye shark
Latin name: *Loxodon macrorhinus*
Creole name: Landonny



Only 6 specimens of *L. macrorhinus* were recorded in 2013, 4 of which were intact, providing insufficient data for analysis. It was notable however that all 6 were caught in the month of July.

English name: Tawny nurse shark
Latin name: *Nebrius ferrugineus*
Creole name: Landormi



Only 1 specimen was recorded in 2013, it was intact, and so data analysis is not feasible. This apparent lack of Tawny nurse shark is however an artefact of the fishery dependent nature of this survey. Divers report *N. ferrugineus* as one of the most abundant species they see and it is commonly caught by fishers, however due to the low value of the meat fishermen generally release specimens caught.

English name: Sicklefin lemon shark

Latin name: *Negaprion acutidens*

Creole name: Kabo roz



7 carcasses of *Negaprion acutidens* were recorded in 2013, 3 intact and 4 dressed carcasses, providing insufficient data for in depth analysis.

English name: Bowmouth ray

Latin name: *Rhina ancylostoma*

Creole name: Gitar or Pantouf



(Photo courtesy of Mr Yannick Bamboche)

Only one specimen of *Rhina ancylostoma*, an intact mature male, was recorded in 2013. This rare species is not well known by local fishers.

English name: **White-spotted Guitarfish**

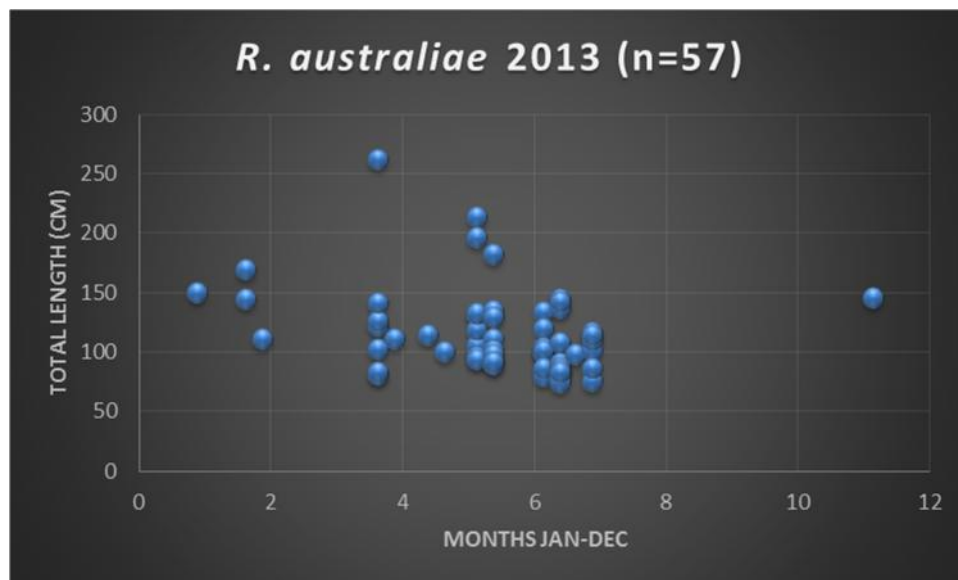
Latin name: ***Rhynchobatus australiae*¹⁰**

Creole name: **Vyolon**



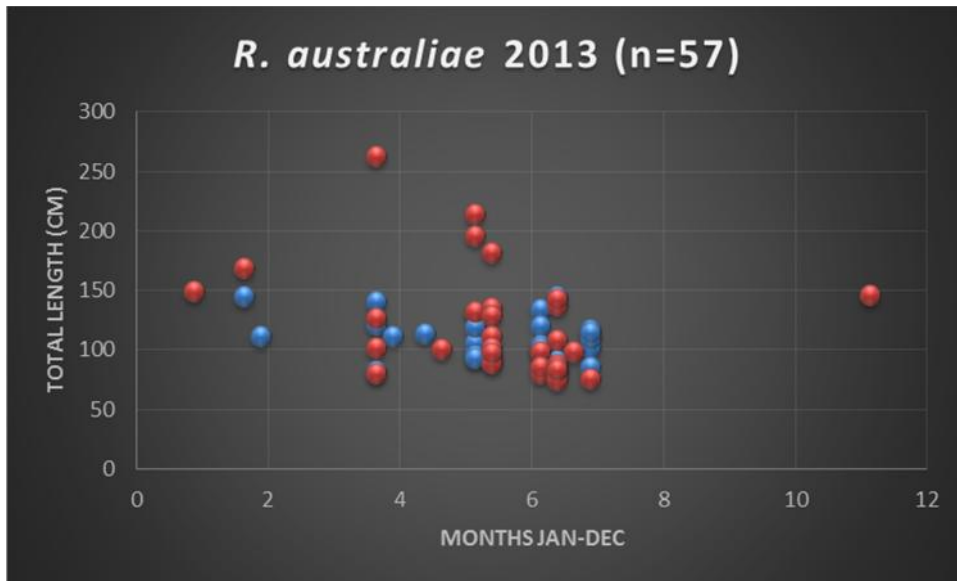
97 specimens of *Rhynchobatus australiae* were recorded in 2013, 57 intact and 40 dressed carcasses. The data gathered in 2013 does not give a strong indication as to seasonality.

Fig 27: *Rhynchobatus australiae* Catch Total Length by Month 2013 (Nevill 2014)



¹⁰ Previously cited in literature as *Rhynchobatus djiddensis* recent genetic analysis has identified the Seychelles species as *Rhynchobatus australiae* (Ebert, D.A. Moss Landing Marine Laboratories, pers. comm).

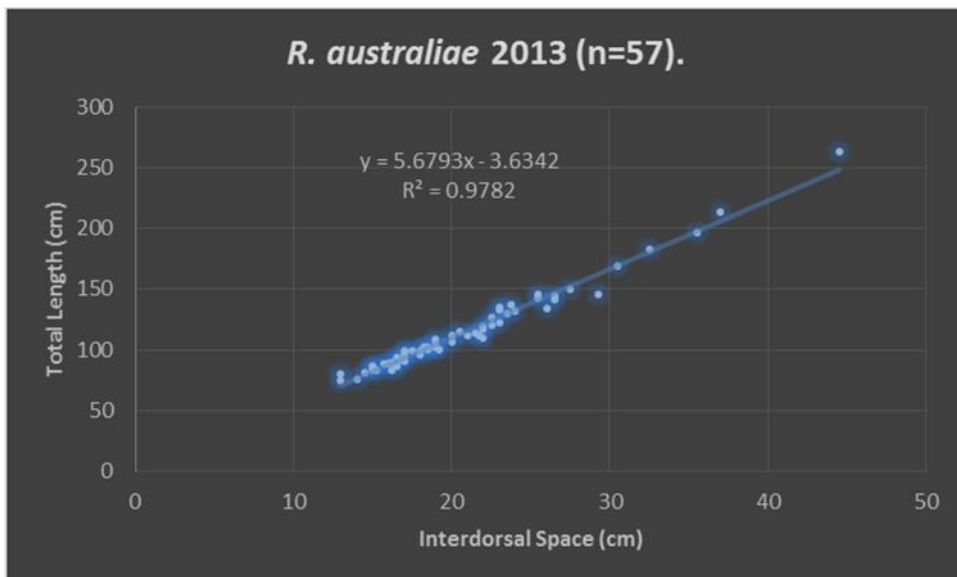
Fig 28: *Rhynchobatus australiae* Catch TL by Month and Sex (Male/Female) (Nevill 2014)



The good sample size and reasonable demographic spread provides a good *R. australiae* morphological model, 97% accuracy, and equation for the calculation of Total Length (y) from the Interdorsal Space (x):

$$y = 3.7465x + 7.8349$$

Fig 29: *Rhynchobatus australiae* IDS/TL Regression Analysis (Nevill 2014)



English name: Scalloped Hammerhead

Latin name: *Sphyrna lewini*

Creole name: Marto Rouz



595 *Sphyrna lewini* carcasses were measured in 2013, 354 of which were intact and 241 dressed.

S. lewini was the second most commonly caught shark in the 2013 artisanal fishery constituting over 18% of the total numerical catch. Size range recorded was TL 49-253cm (See **Figs 30 & 32**) and sex ratio was 58/42 (204 males and 150 females). Significantly more mature males were caught than mature females reflecting it is believed the mating dynamic of the species where males aggregate waiting for females to come in to pup and mate. *S. lewini* exhibits a very distinct pupping and breeding season when adults aggregate in coastal waters during the months of July and August.

Fig 30: *Sphyrna lewini* Catch Total Length by Month 2013 (Nevill 2014)

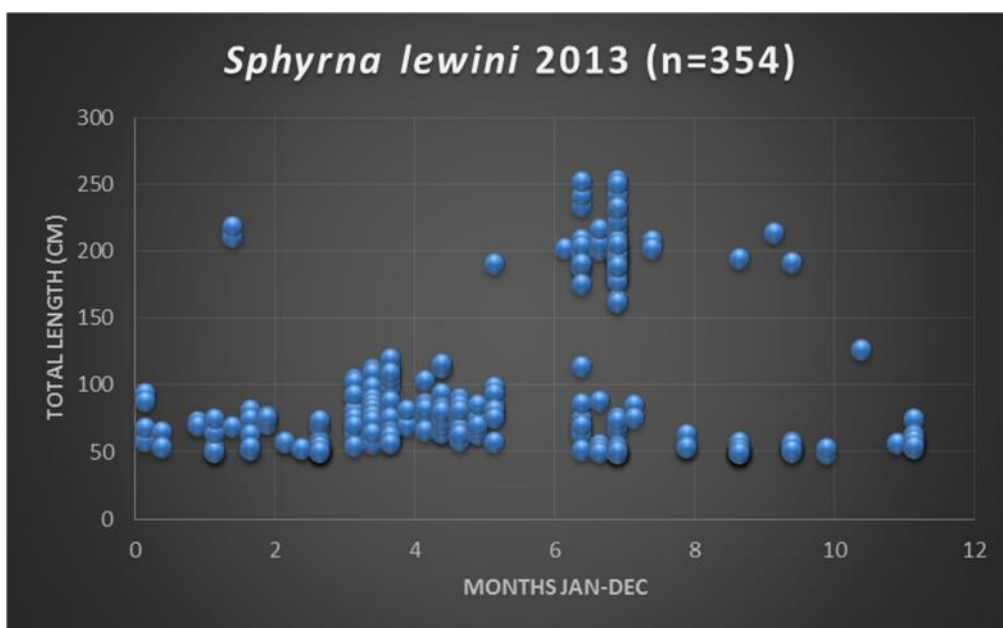
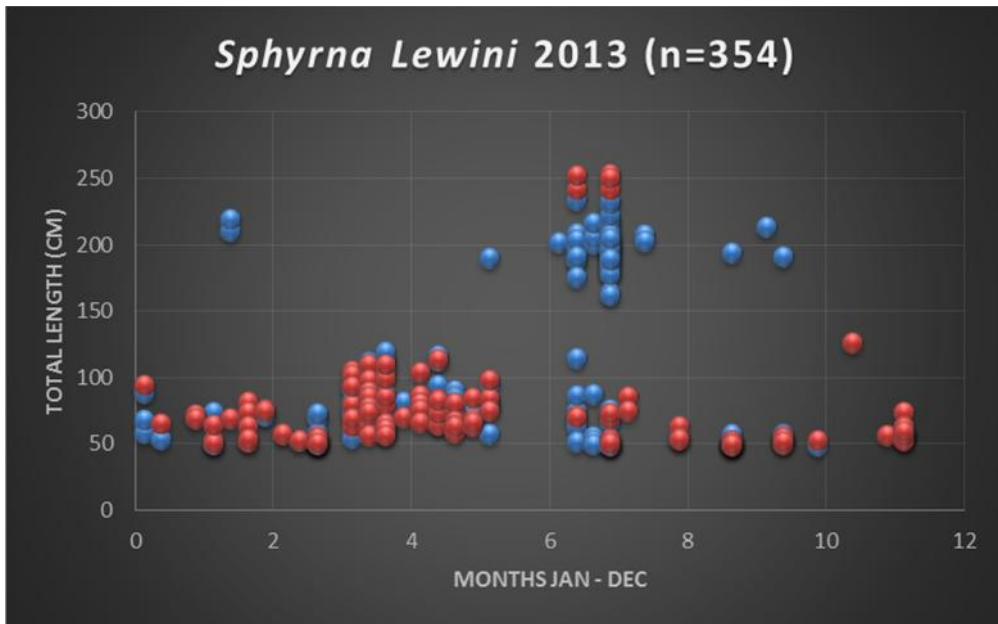
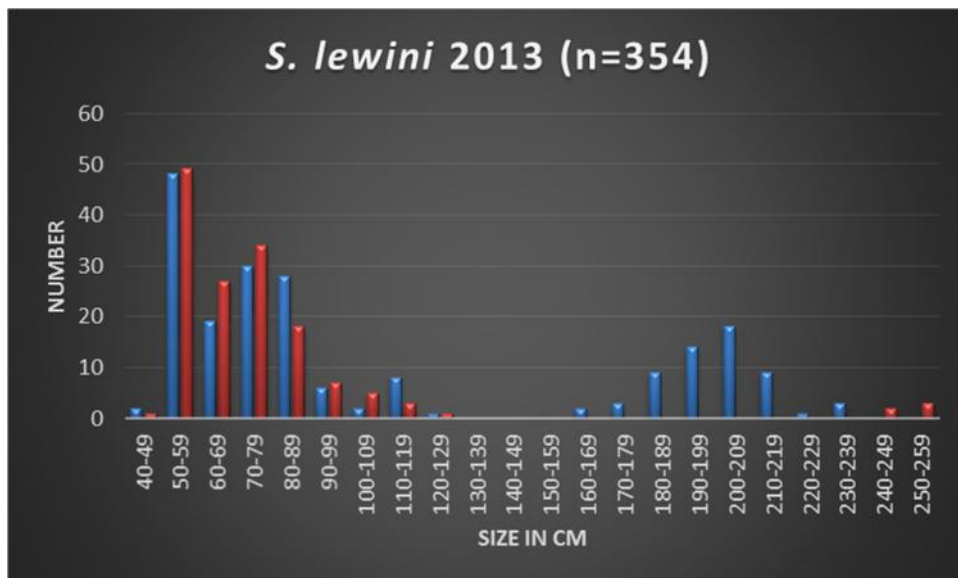


Fig 31: *Sphyrna lewini* Catch TL by Month and Sex (Male/Female) (Nevill 2014)



The number and full demographic spread of the specimens recorded allows for further analysis of the population structure by size. **Fig 32** clearly shows that mature females attain a larger size than males, presumably due to the reproductive advantage of larger size, and that significantly more mature males are caught than females. It is also apparent that having reached a size of 1 metre or so (TL) juveniles leave the coastal waters and do not return until they are mature and come back to breed.

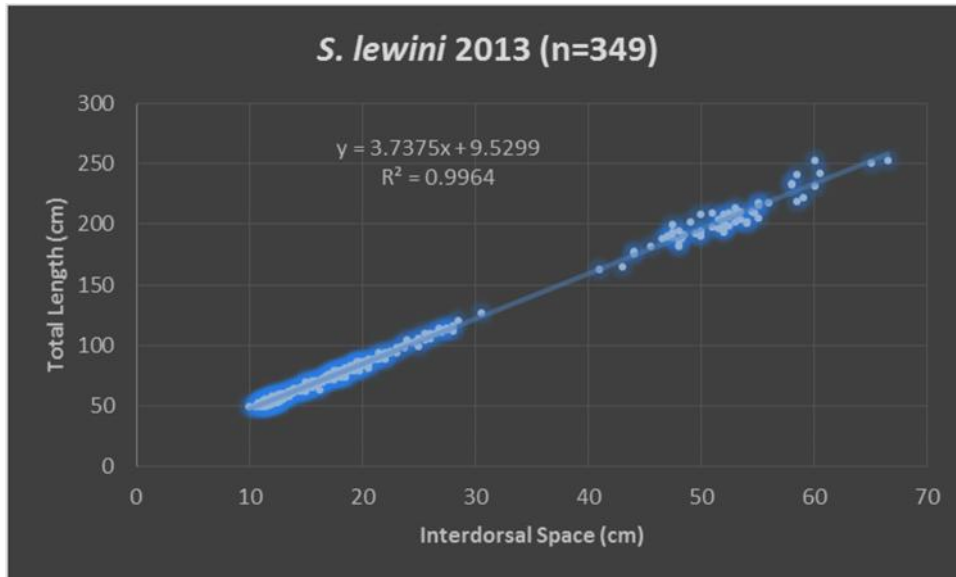
Fig 32: *S. lewini* Size and Sex Comparison (Male/Female) (Nevill 2014)



The good sample size and highly linear growth pattern of *S. lewini* provides for a highly accurate morphological model. The regression analysis (see **Fig. 33**) provides the following equation, with more than 99% accuracy, for the calculation of Total Length (y) from the Interdorsal Space (x):

$$Y = 3.6375x + 9.5299$$

Fig 33: *Sphyrna lewini*. IDS/TL Regression Analysis (Nevill 2014)



English name: Great Hammerhead

Latin name: *Sphyrna mokarran*

Creole name: Marto Blan



65 *Sphyrna mokarran* carcasses were measured in 2013, 34 of which were intact and 31 dressed.

The majority of specimens were first year juveniles such that the progress of the year 1 cohort can be clearly seen in figures 34 & 35. The others were sub-adults. No adults were recorded in the 2013 artisanal catch. Size range recorded was TL 80-218.5cm and sex ratio was 47/53 (16 males and 18 females). Pupping season is believed to be at the turn of the year.

Fig 34: *Sphyrna mokarran* Catch Total Length by Month 2013 (Nevill 2014)

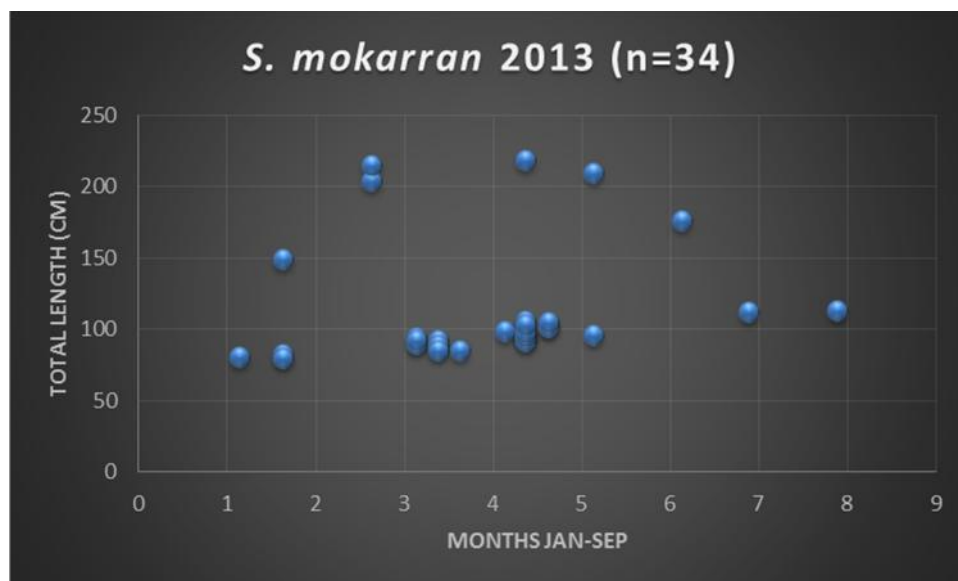


Fig 35: *Sphyrna mokarran* Catch TL by Month and Sex (Male/Female) (Nevill 2014)

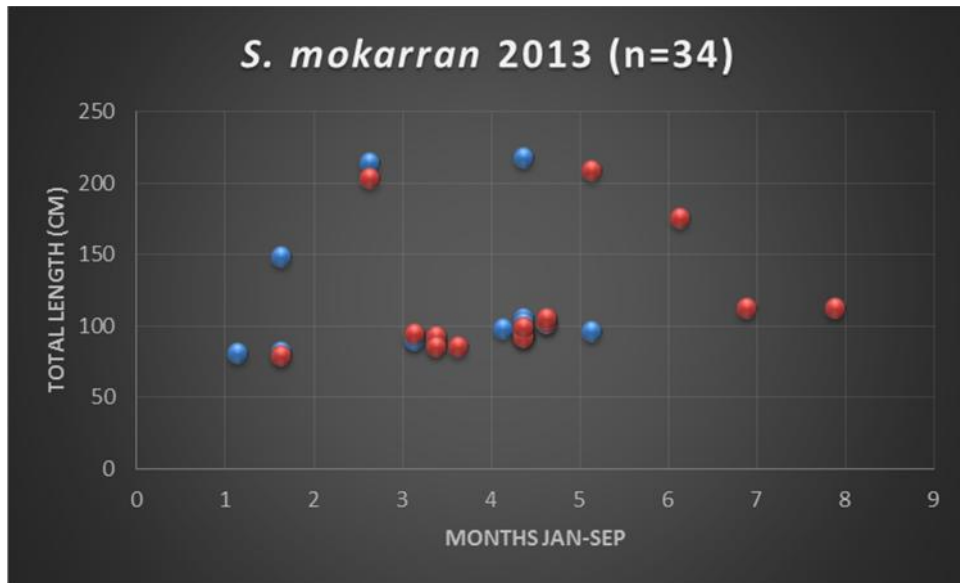
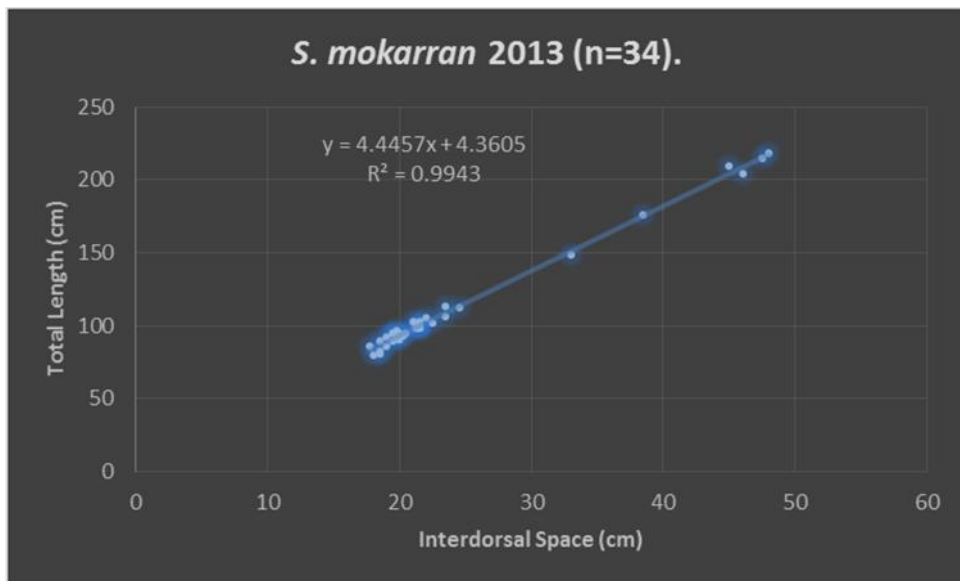


Fig 36: *Sphyrna mokarran* IDS/TL Regression Analysis (Nevill 2014)



Despite the limited sample size the regression analysis provides an excellent *S. mokarran* morphological model for juveniles to sub-adults with 99% accuracy. The equation for the calculation of Total Length (y) from the Interdorsal Space (x):

$$y = 4.4457x + 4.3605$$

English name: Smooth Hammerhead
Latin name: *Sphyrna Zyagena*
Creole name: Marto Ronn or Marto Nwar



Only 1 dressed carcass of *Sphyrna zygaena* was recorded in 2013 and appears to only be an occasional component of the artisanal catch.

English name: Whitetip Reef Shark
Latin name: *Triaenodon obesus*
Creole name: Landormi reken



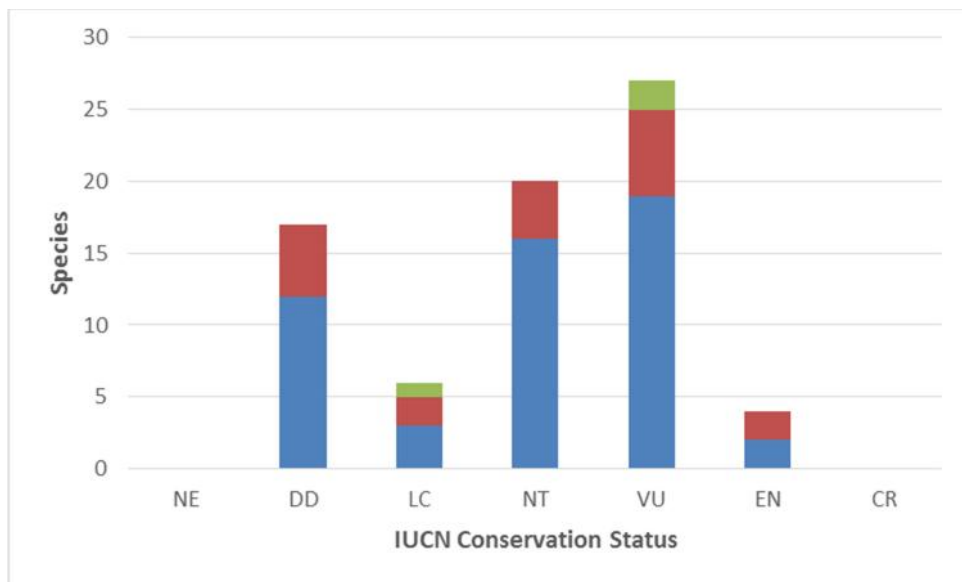
4 intact *Triaenodon obesus* were recorded in 2013 providing insufficient data for in depth analysis. This however does not reflect the abundance of the species in Seychelles waters. *T. obesus* is by far the most common species seen by divers, its low occurrence in the catch reflects the fact that it has low commercial value and is generally released by fishers when caught.

Species Status Analysis

Historical accounts indicate that there has been a significant decline in shark biomass on the Mahe plateau and banks of Seychelles (GoS 2007). It is also apparent from diverse historical accounts that several species have been extirpated or reduced to scarcity from previous abundance notably: the extirpation of 2 species of Sawfish (*Pristis* spp)¹¹, the extirpation of Great white sharks (*Carcharodon carcharias*) from coastal waters¹² and the marked decline in populations of Great hammerhead (*Sphyrna mokarran*), Tiger (*Galeocerdo cuvier*)¹³ and Sandbar (*Carcharhinus plumbeus*)¹⁴ shark populations.

74 species of elasmobranch (52 sharks, 19 rays and 3 batoids) have been recorded to occur and identified to species level in Seychelles waters. 31 species are considered threatened (27 Vulnerable and 4 Endangered) whilst 17 species are classified as Data Deficient.

Figure 37: Elasmobranch Species Threatened Status Analysis



Series 1: Sharks

Series 2: Rays

Series 3: Batoids.

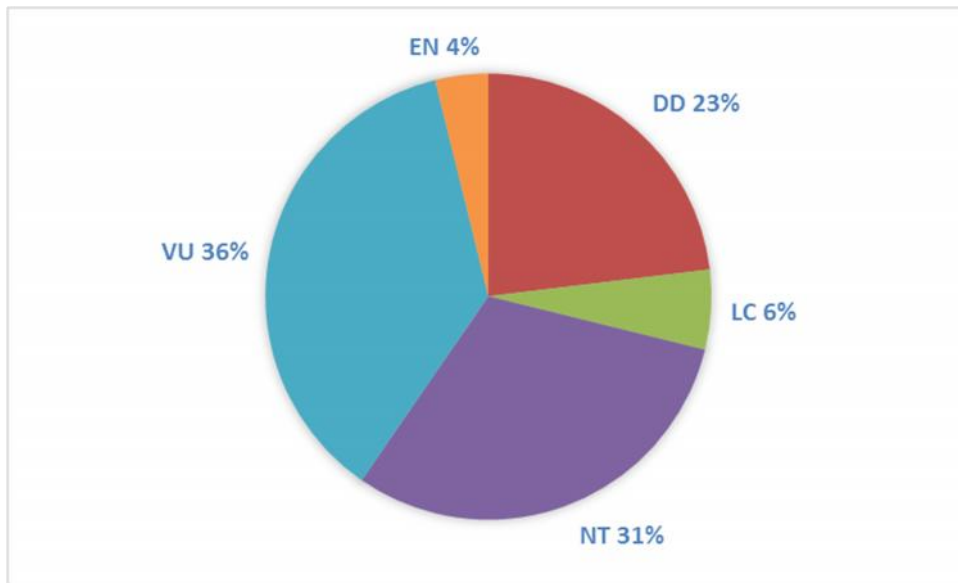
¹¹ Two species of Sawfish (*Pristis* spp) were recorded in the central Seychelles in the 1860s (Ward S, 1873), JLB Smith recorded a *Pristis* sp at Aldabra in the 1950s and fins were still being exported from Seychelles into the early 1980s (Lai-Lam, R, pers comm 2005).

¹² Great white sharks in coastal waters are frequently referred to in historical texts (SFA 2007) up until the mid-1940s (Ommanney 1965), they are still occasionally reported as caught offshore by the industrial tuna fishery.

¹³ Large Great hammerhead and Tiger sharks in coastal waters are frequently reported in historical accounts (SFA 2007) through to the 1940s (Ommanney 1965) whereas today large specimens (i.e. 4 metres plus) are only rarely reported in the fishery catch.

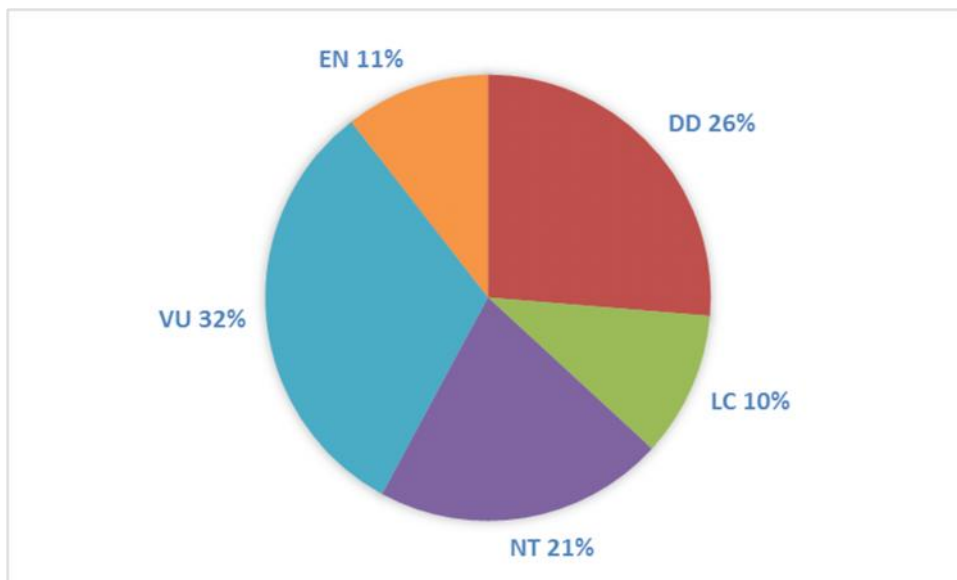
¹⁴ Sandbar shark was the third most common shark caught in the mid-1940s (Wheeler & Ommanney 1953) but constituted only 0.5% of the shark catch in 2013 (Nevill 2014)

Figure 38: Shark Species Threatened Status Analysis



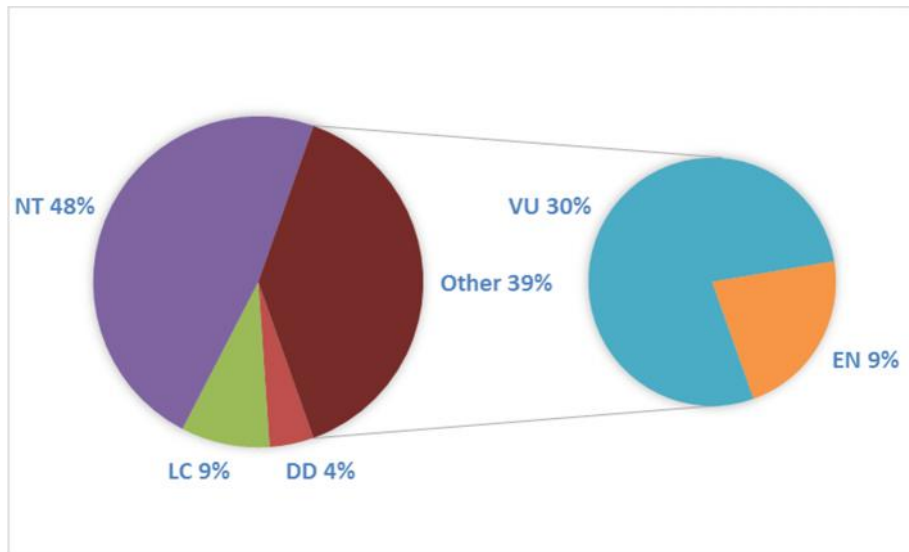
Of the 52 shark taxa identified to species level: 2 species are classified as endangered, 19 as Vulnerable, meaning 40% of shark species are classified as Threatened under IUCN criteria. 16 species are listed as Near Threatened and 3 as Least Concern. 12 species are listed as Data Deficient.

Figure 39: Ray Species Threatened Status Analysis



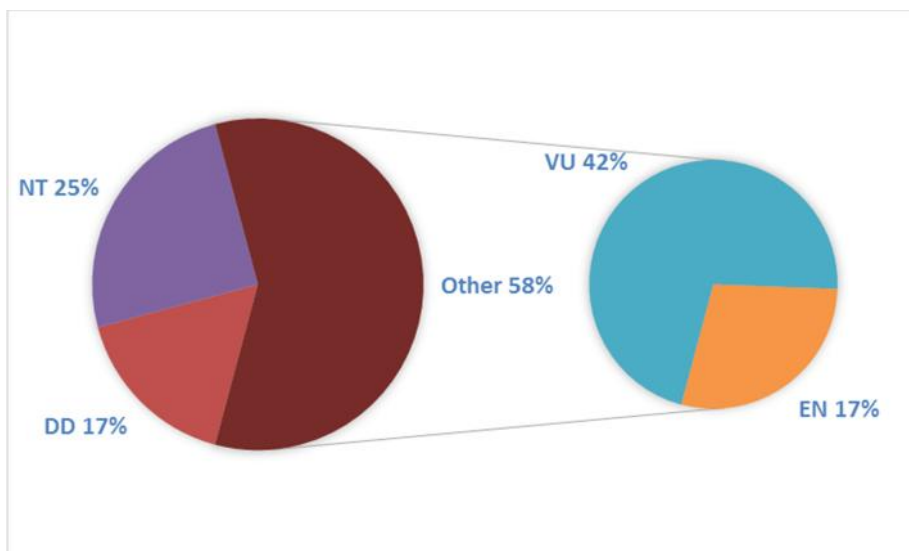
Of the 19 species of Ray recorded in Seychelles waters: 2 are endangered, 6 are vulnerable meaning 43% are classified as Threatened. 4 species are listed as Near Threatened, 2 as Least Concern and 5 as Data Deficient.

Figure 40: Shark Fishery Threatened Status Analysis



The IUCN conservation status of the 23¹⁵ species of shark recorded in the artisanal fishery, including 2 species of guitarfish¹⁶, is listed as follows: 1 species data deficient, 2 as Least Concern, 11 as Near Threatened and 9 species, or 39% of the fishery, are classified as threatened – 7 species Vulnerable and 2 species Endangered.

Figure 41: Ray Fishery Threatened Status Analysis

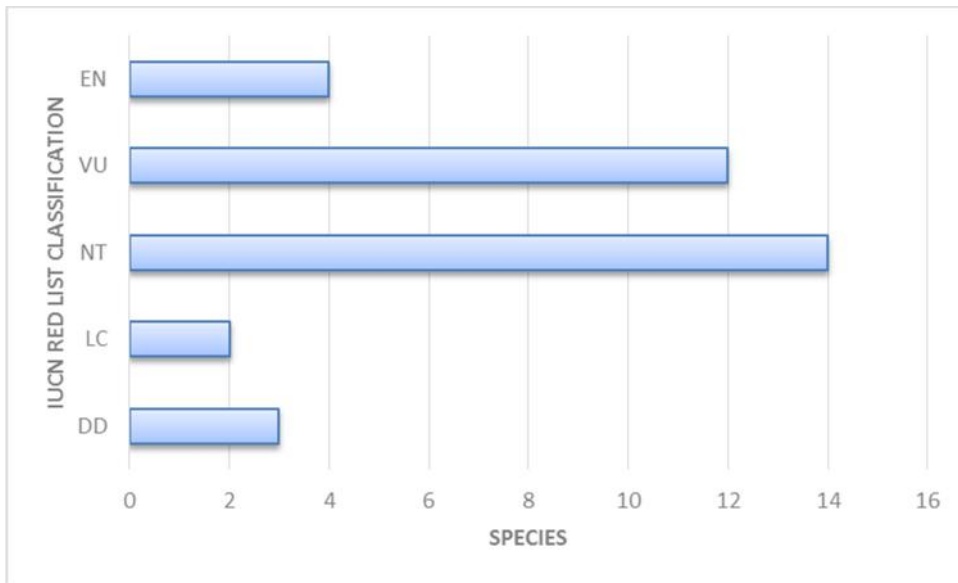


The Ray fishery (**Fig 41**), not including the two species of guitarfish (*Rhynchobatus australiae* & *Rhina ancylostoma*) consists of 12 species identified to date: 2 Data Deficient, 3 Near Threatened and 7 (or 58%) are listed as Threatened – 5 Vulnerable and 2 Endangered.

¹⁵ 20 species in 2013 plus 3 other species recorded in other years.

¹⁶ Guitarfish though strictly rays are included in the shark fishery because, due to the nature of their fins and meat, they are subject to the same commercial fishing pressures as true sharks.

Figure 42: Artisanal Elasmobranch Fishery Threatened Status Analysis



The high percentage of threatened species in the overall elasmobranch fishery reflects the vulnerability of their typical lifecycle characteristics (late maturation and low fecundity) to fishing pressure. It does not necessarily reflect the actual status of each species population in Seychelles. Particularly when for many species the populations on the Seychelles plateau and the banks of the outer islands are geographically and possibly genetically isolated from the wider stocks in the Western Indian Ocean. Genetic analysis and tracking projects are required to ascertain species populations' status in Seychelles waters.

Legislation

The legislation that pertains directly to sharks, shark-related fisheries and their management is summarised below.

a) **The Fisheries Act (2014)**, sets out the framework for fishery management measures for local and foreign vessels. The primary regulations pertaining to the shark fishery fall under this Act:

- Zones where fishing by foreign vessels is prohibited (Reg. 5a, Schedule 1 carried over from the 1986 Fisheries Act as per Fisheries Act 2014 Para 79: Savings and Transitional provisions): covers all islands and related banks prohibiting fishing activity within 3km of the 200m isobath. This in effect reserves the fishing of banks and inshore areas to local operators.
- Prohibition of net fishing of sharks (Reg. 16c carried over from the 1986 Fisheries Act as per Fisheries Act 2014 Para 79: Savings and Transitional provisions): forbids the fishing of shark using nets from the 1st August 1998. This regulation was brought in due to concerns about by-catch of turtles, marine mammals and non-target whale shark in gillnets. Subsequent to this SFA developed and distributed the local “drag” (anchored longlines) system of fishing to former net fishermen.
- Fisheries (Shark Finning) Regulations 2006: forbids the practice of finning by foreign vessels licensed to operate in Seychelles EEZ by requiring vessels to land fin to the quantity of no more than 5% of the mass of dressed shark carcass. The feasibility/effectiveness of the enforcement of this regulation has yet to be assessed.
- Plan for management of fishery (Fisheries Act 2014, Part II Management of Fisheries, Sub-Part 1 Management plans and management measures, Paras 5(6) and 5(7)):
 - (6) The fishery management plan or review of the plan shall be submitted to the Minister for approval.
 - (7) The Minister shall cause the plan for management of a fishery or review of the plan approved under subsection (6) to be published in the *Gazette*.
- Prohibition against chumming (Fisheries Act 2014, Part II Management of Fisheries, Sub-Part 6 Control of fishing activities, Paras 32(3)):
 - (3) Subject to the regulations, a person shall not attract shark in Seychelles waters by placing in the water fish, parts of fish, blood, or such matter upon which shark feed, lured to, for the purpose of making use of shark for any sport, game, or any activity, and this shall not restrict any approved scientific research or activity.

- b) **The Wild Animals and Birds Protection Act (1961)**, establishes the legal framework for the protection of species of wild animals and birds:
- Wild Animals (Whale Shark) Protection Regulations, 2003: declares the whale shark (*Rhincodon typus*) protected throughout Seychelles at all times. The whale shark was not previously fished in Seychelles waters, the legislation was rather introduced in order to facilitate the pursuit of an international conservation agreement for the species.
- c) **The National Parks and Nature Conservancy Act (1969)**, establishes the framework for the declaration of different categories of protected area. There are 3 marine Special Reserves and 6 marine National Parks declared, to date under this Act, where fishing is prohibited.
- The special reserve and UNESCO world heritage site of Aldabra is significant in that it effectively protects the shark stocks and nursery of the bank and lagoon of a world heritage site the marine area of the special reserve has recently been significantly enlarged.
 - The origin of four of the marine national parks relates primarily to their locations being ideally suited to tourism operations whilst the others, Silhouette and Ile Cocos/Ile Fouches/Iles Plattes, were declared primarily for the protection of a nesting marine turtle population and coral gardens respectively. The motivation for the main parks was not therefore originally as a measure for fisheries conservation. Ste Anne Marine Park does however harbour a portion of an important multispecies shark pupping ground and nursery. Indeed coastal waters around the main islands are generally of importance as shark nursery habitat. Recent studies by the Seychelles National Park Authority (SNPA) and Global Vision International (GVI) have highlighted the waters within the Curieuse Marine National park as a nursery habitat for Lemon sharks (*Negaprion acutidens*).

International Obligations

Seychelles has in general adopted a proactive approach to the signing of multilateral environmental agreements, several of which specify or imply obligations relevant to the conservation and management of sharks.

1). The United Nations Convention on the Law of the Sea (UNCLOS)

UNCLOS entered into force in 1994, Seychelles having signed it in 1982 and deposited its ratification in 1991. UNCLOS makes strong provisions, pertinent to the development of the Seychelles NPOA, for the conservation and sustainable use of marine biodiversity under **Article 61** (*Conservation of the living resources*), **Article 63** (*Stocks occurring within the exclusive economic zones of two or more coastal States or both within the exclusive economic zone and in an area beyond and adjacent to it*) and **Article 64** (*Highly Migratory Species*). The Convention makes clear the requirement for conservation and sustainable use and utilises mandatory language (i.e. “States shall...”) e.g.:

Article 61 paras 2 & 3:

“2. The coastal State, taking into account the best scientific evidence available to it, shall ensure through proper conservation and management measures that the maintenance of the living resources in the exclusive economic zone is not endangered by over-exploitation. As appropriate, the coastal State and competent international organizations, whether subregional, regional or global, shall cooperate to this end.

3. Such measures shall also be designed to maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield, as qualified by relevant environmental and economic factors, including the economic needs of coastal fishing communities and the special requirements of developing States, and taking into account fishing patterns, the interdependence of stocks and any generally recommended international minimum standards, whether subregional, regional or global.”

Article 63 paras 1 & 2:

“1. Where the same stock or stocks of associated species occur within the exclusive economic zones of two or more coastal States, these States shall seek, either directly or through appropriate subregional or regional organizations, to agree upon the measures necessary to coordinate and ensure the conservation and development of such stocks without prejudice to the other provisions of this Part.

2. Where the same stock or stocks of associated species occur both within the exclusive economic zone and in an area beyond and adjacent to the zone, the coastal State and the States fishing for such stocks in the adjacent area shall seek, either directly or through appropriate subregional or regional organizations, to agree upon the measures necessary for the conservation of these stocks in the adjacent area.”

Article 64 para 1:

“1. The coastal State and other States whose nationals fish in the region for the highly migratory species listed in Annex I shall cooperate directly or through appropriate international organizations with a view to ensuring conservation and promoting the objective of optimum utilization of such species throughout the region, both within and beyond the exclusive economic zone. In regions for which no appropriate international organization exists, the coastal State and other States whose nationals harvest these species in the region shall cooperate to establish such an organization and participate in its work.”

This article is highly pertinent as the Annex I to which it refers lists the following shark species:

“Oceanic sharks: Hexanchus griseus; Cetorhinus maximus; Family Alopiidae; Rhincodon typus; Family Carcharhinidae; Family Sphyrnidae; Family Isuridae.”

UNCLOS also sets how pertinent clauses on the conservation and management of living resources of the high seas, in particular **Article 117** (*Duty of States to adopt with respect to their nationals measures for the conservation of the living resources of the high seas*), **Article 118** (*Cooperation of States in the conservation and management of living resources*) and **Article 119** (*Conservation of the living resources of the high seas*). The implications of all these provisions are analysed in **Annex III** of this document.

2). The Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks Agreement

The Straddling and Highly Migratory Fish Stocks Agreement puts into effect the provisions of UNCLOS in this regard; Seychelles acceded in 1998 and the Agreement came into force in 2001. The Agreement’s objective is:

“to ensure the long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks through effective implementation of the relevant provisions of the Convention”.

Its pertinent provisions and their implications to the content of Seychelles’ NPOA are examined in **Annex III** of this document

3). The Indian Ocean Tuna Commission (IOTC)

The IOTC was established in 1993 under the auspices of Article XIV of the FAO Constitution and entered into force in 1996. The IOTC directly addresses aspects of UNCLOS **Article 118** (*Cooperation of States in the conservation and management of living resources*) with its objective being:

“To promote cooperation among the Contracting Parties (Members) and Cooperating Non-Contracting Parties of the IOTC with a view to ensuring, through appropriate management, the conservation and optimum utilisation of stocks covered by the organisation’s establishing Agreement and encouraging sustainable development of fisheries based on such stocks.”

The IOTC's mandate however is explicitly limited to 16 species of tuna and tuna like fish and does not cater for sharks¹⁷ beyond the stated intent to collate data on non-target species affected by tuna fishing operations. Perusal of IOTC data (IOTC 2015 b-i) and reports (IOTC 2015j) however makes it clear that work in regard to bycatch is lacking in useful substance or progress with the status of stocks of the seven main species of shark bycatch all classified as "Not Assessed/Uncertain".

4). The Nairobi Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Western Indian Ocean

The Nairobi Convention was developed under the auspices of the Regional Seas Programme, a UNEP initiative launched in 1974 following the 1972 UN Conference on the Human Environment. The aim of the Regional Seas Programme is *"to address the accelerating degradation of the world's oceans and coastal areas through the sustainable management and use of the marine and coastal environment, by engaging neighbouring countries in comprehensive and specific actions to protect their shared marine environment"*.

The Nairobi Convention was adopted in 1985 and entered in to force in 1996 (it was amended in 2010) and has the central objective to:

"prevent, reduce and combat pollution of the Convention area and to ensure sound environment management of natural resources..."

Article 11 addresses matter of Biological Diversity:

"1. The Contracting Parties shall, individually or jointly, take appropriate measures to conserve biological diversity and protect and preserve rare or fragile ecosystems as well as rare, endangered or threatened species of fauna and flora and their habitats in the Convention area.

2. The Contracting Parties shall, in areas under their jurisdiction, establish protected areas, such as parks and reserves, and shall regulate and, where required and subject to the rules of international law, prohibit any activity likely to have adverse effects on the species, ecosystems or biological processes that such areas are established to protect."

The Nairobi Convention is structured as a framework agreement with protocols established for its implementation.

5). Protocol Concerning Protected Areas and Wild Fauna and Flora in the Eastern African Region

This protocol, formed under the auspices of the Nairobi Convention, was adopted in 1985 and came into in 1996 recognising that natural resources need to be effectively protected and stressing the importance of *"protecting and, as appropriate, improving the state of the wild fauna and flora and natural habitats of the Eastern African region among other means by the establishment of specially protected areas in the marine and coastal environment,"*

¹⁷ IOTC therefore does not address UNCLOS **Article 118** in so far as it pertains to sharks.

Article 2: General Undertaking

“1). The Contracting Parties shall take all appropriate measures to maintain essential ecological processes and life support systems, to preserve genetic diversity, and to ensure the sustainable utilization of harvested natural resources under their jurisdiction. In particular, the Contracting Parties shall endeavour to protect and preserve rare or fragile ecosystems as well as rare, depleted, threatened or endangered species of wild fauna and flora and their habitats in the Eastern African region.

2). To this end, the Contracting Parties shall develop national conservation strategies and co-ordinate, if appropriate, such strategies within the framework of regional conservation activities.”

Article 5 (*Harvestable Species of Wild Fauna*) sets out various management measures to ensure the protection of depleted or threatened wild fauna listed in Annex III. At this point in time however that annex does not list any species of Chondrichthyan. **Article 12** (*Traditional Activities*) allows for important provisions for traditional activities pertinent to Seychelles artisanal shark fishers, in the case that additional protective measures are brought in.

Article 12: Traditional Activities

“1. The Contracting Parties shall, in promulgating protective measures, take into account the traditional activities of their local populations in the areas to be protected. To the fullest extent possible, no exemption which is allowed for this reason shall be such as:

- a. to endanger either the maintenance of ecosystems protected under the terms of the present Protocol or the biological processes contributing to the maintenance of those ecosystems;*
- b. to cause either the extinction of, or any substantial reduction in, the number of individuals making up the species of animal and plant populations within the protected ecosystems, or any ecologically connected species or populations, particularly migratory, endemic, rare, depleted, threatened or endangered species.”*

The implications of all the pertinent provisions of the Nairobi Convention and this protocol are analysed in **Annex III** of this document.

6). The Convention on International Trade in Endangered Species (CITES)

CITES was adopted in 1973 and came into force in 1975. Seychelles acceded to the Convention in 1977. The aim of CITES is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

CITES regulates trade in species listed in its Appendices. All listed species (see **Table 12**) require the provision of a permit by the appropriate national CITES authority to enable their transboundary trade. The issuance of a permit requires the national authority to ensure the transaction meets various criteria most notably:

“(a) a Scientific Authority of the State of export has advised that such export will not be detrimental to the survival of that species;

(b) a Management Authority of the State of export is satisfied that the specimen was not obtained in contravention of the laws of that State for the protection of fauna and flora;”

To ascertain this a Non-Detriment Finding (NDF) is required to be undertaken, something that Seychelles’ has very limited capacity to do. Guidance on the undertaking of CITES NDF for shark species has recently been produced and Seychelles contributed to the review of the draft guidelines.

Table 12: CITES Listed Elasmobranchii			
Species	Appendix I	Appendix II	Appendix III
<i>Carcharhinus longimanus</i>		X	
<i>Sphyrna lewini</i>		X	
<i>Sphyrna mokarran</i>		X	
<i>Sphyrna zygaena</i>		X	
<i>Cetorhinus maximus</i>		X	
<i>Carcharodon carcharias</i>		X	
<i>Lamna nasus</i>		X	
<i>Rhincodon typus</i>		X	
<i>Pristidae spp (7 species)</i>	X		
<i>Manta alfredi</i>		X	
<i>Manta birostris</i>		X	
Key:		Species known to occur in Seychelles waters.	
		Historical records suggest 2 species of pristid formerly occurred in Seychelles waters, both are now believed to have been extirpated.	
		Species believed not to occur in Seychelles waters.	

7). The Convention on the Conservation of Migratory Species of Wild Animals (CMS/Bonn Convention).

The CMS was adopted in 1979 and entered into force in 1983 to provide a platform for the conservation and sustainable use of migratory animals and their habitats. Seychelles acceded to the convention in 2005.

Article II of the CMS set out its fundamental principles:

- “1. The Parties acknowledge the importance of migratory species being conserved and of Range States agreeing to take action to this end whenever possible and appropriate, paying special attention to migratory species the conservation status of which is unfavourable, and taking individually or in co-operation appropriate and necessary steps to conserve such species and their habitat.*
- 2. The Parties acknowledge the need to take action to avoid any migratory species becoming endangered.*
- 3. In particular, the Parties:*
- a) should promote, co-operate in and support research relating to migratory species;*
 - b) shall endeavour to provide immediate protection for migratory species included in Appendix I; and*
 - c) shall endeavour to conclude Agreements covering the conservation and management of migratory species included in Appendix II.”*

Appendix I lists species which are endangered and require immediate protection while Appendix II lists species that are considered to have an unfavourable conservation status and which require or would benefit from the establishment of an international agreement.

Articles III paragraphs 4 and 5 pertain to Appendix I species:

- “4. Parties that are Range States of a migratory species listed in Appendix I shall endeavour:*
- a) to conserve and, where feasible and appropriate, restore those habitats of the species which are of importance in removing the species from danger of extinction;*
 - b) to prevent, remove, compensate for or minimize, as appropriate, the adverse effects of activities or obstacles that seriously impede or prevent the migration of the species; and*
 - c) to the extent feasible and appropriate, to prevent, reduce or control factors that are endangering or are likely to further endanger the species, including strictly controlling the introduction of, or controlling or eliminating, already introduced exotic species.*

5. Parties that are Range States of a migratory species listed in Appendix I shall prohibit the taking of animals belonging to such species. Exceptions may be made to this prohibition only if:

 - a) the taking is for scientific purposes;*
 - b) the taking is for the purpose of enhancing the propagation or survival of the affected species;*
 - c) the taking is to accommodate the needs of traditional subsistence users of such species; or*

d) extraordinary circumstances so require; provided that such exceptions are precise as to content and limited in space and time. Such taking should not operate to the disadvantage of the species.”

Article IV Paragraph 3 sets out the obligations for parties relating to species listed in Appendix II:

“3. Parties that are Range States of migratory species listed in Appendix II shall endeavour to conclude AGREEMENTS where these should benefit the species and should give priority to those species in an unfavourable conservation status.”

Table 13 (overleaf) sets out the species of Elasmobranchii listed in the Appendices.

The CMS is a framework Convention that utilises Agreements and Memoranda of Understanding to assist in the multilateral implementation of its provisions. Parties to the CMS elaborated an MoU for sharks culminating in its signature in 2010 – see Section 8 for details.

Table 13: CMS Listed Elasmobranchii		
Species	Appendix I	Appendix II
<i>Rhincodon typus</i>		X
<i>Carcharhinus falciformis</i>		X
<i>Sphyrna lewini</i>		X
<i>Sphyrna Mokarran</i>		X
<i>Cetorhinus maximus</i>	X	X
<i>Carcharodon carcharias</i>	X	X
<i>Isurus oxyrinchus</i>		X
<i>Isurus paucus</i>		X
<i>Lamna nasus</i>		X
<i>Alopias pelagicus</i>		X
<i>Alopias superciliosus</i>		X
<i>Alopias vulpinus</i>		X
<i>Squalus acanthias</i>		X
<i>Anoxypristis cuspidata</i>	X	X
<i>Pristis clavata</i>	X	X
<i>Pristis pectinata</i>	X	X
<i>Pristis zijsron</i>	X	X
<i>Pristis pristis</i>	X	X
<i>Manta alfredi</i>	X	X
<i>Manta birostris</i>	X	X
<i>Mobula mobular</i>	X	X
<i>Mobula japanica</i>	X	X
<i>Mobula thurstoni</i>	X	X
<i>Mobula tarapacana</i>	X	X
<i>Mobula eregoodootenkee</i>	X	X
<i>Mobula kuhlii</i>	X	X
<i>Mobula hypostoma</i>	X	X
<i>Mobula rochebrunei</i>	X	X
<i>Mobula munkiana</i>	X	X
Key:		Species known or believed to occur in Seychelles waters.
		Species that may occur in Seychelles waters. Note Pristidae are believed to be extinct in Seychelles waters.
		Species believed not to occur in Seychelles waters.

8). CMS memorandum of Understanding on the Conservation of Migratory Sharks (CMS Sharks MoU).

Seychelles played a lead role from 2004 in the lobbying for the development of an Agreement or MoU under the auspices of the CMS including hosting a CMS meeting in 2007 to “Identify and Elaborate an Option for International Cooperation on Migratory Sharks”. Despite this however Seychelles has yet to sign the MoU. The MoU is a non-legally binding mechanism to facilitate cooperation between CMS parties to support the implementation of the CMS and the MoU objective.

The MoU has the following objective:

“to achieve and maintain a favourable conservation status for migratory sharks based on the best available scientific information, taking into account the socio-economic and other values of these species for the people of the Signatories.”

The MoU currently covers 7 species¹⁸ of Shark listed in its Annex I though this will likely increase following the second meeting of the signatories scheduled for February 2016.

The first meeting of Signatories held in September 2012 elaborated a Conservation Plan the objectives of which are as follows:

- Improving the understanding of migratory shark populations through research, monitoring and information exchange
- Ensuring that directed and non-directed fisheries for sharks are sustainable
- Ensuring to the extent practicable the protection of critical habitats and migratory corridors and critical life stages of sharks
- Increasing public awareness of threats to sharks and their habitats, and enhance public participation in conservation activities
- Enhancing national, regional and international cooperation

¹⁸ The second meeting of the Signatories to the MoU is scheduled for February 2016 and will consider for listing in Annex I all shark and ray species listed by the CMS.

Part II: Seychelles Second National Plan of Action for the Conservation and Management of Sharks

Process

The NPOA was prepared in line with the FAO guidelines as set out in the International Plan of Action for the Conservation and Management of Sharks (IPOA) and as per the terms of reference provided by the Seychelles Fishing Authority (SFA).

The process began with a stakeholder analysis (**Annex I**) to identify the full scope of consultation required. This was submitted to SFA for approval before commencing consultations.

A review of the implementation of the NPOA 2007-2011, and analysis of factors limiting to its implementation, was undertaken through a combination of methods: i) a standard questionnaire to former Steering Committee members, ii) interviews with agencies that implemented components of the NPOA or undertook shark research and iii) review of Steering Committee and SFA implementation reports. This report is summarised in **Annex II** of this document, the full report (Nevill 2015) is available from SFA.

International obligations were assessed by a thorough review of Seychelles' international commitments pertinent to sharks under various Multilateral Environmental Agreements and communications with various government officials responsible for pertinent portfolios. This review was sent to SFA, the Department of Environment, the Blue Economy Department and the National Focal Point for the Convention on Migratory Species for their review. Key obligations are presented in the section entitled "International Obligations" and further details are tabulated in **Annex III**.

The baseline knowledge on sharks was compiled and updated through review of: national fishery statistics, the data from the 2013 artisanal shark fishery survey (Nevill 2014) and information received from national agencies involved in shark research.

A compiled draft NPOA without the action plan, which was to be developed by stakeholders through a national workshop process, was submitted to SFA for review and comments.

The first national stakeholder workshop was held on the 25th November 2015, at the SFA Training Room. Stakeholders were, in the morning: i) (re)introduced to the IPOA and NPOA process, ii) given a presentation on the implementation of the previous NPOA with related conclusions and recommendations, and iii) briefed on Seychelles existing international commitments; all with associated question/answer/discussion sessions. In the afternoon stakeholders were presented with framework action plan for the NPOA which addressed the findings of the implementation review, Seychelles international commitments and incorporated priority issues identified by stakeholders in previous consultation correspondence. Stakeholders assessed priorities and elaborated activities in working groups. Activities were presented to plenary and discussed with consensus options being compiled into a draft action plan.

The second national stakeholder workshop was held on the 15th December 2015 at the SFA Training Room. In the morning session stakeholders were given a presentation on the overall format and content of the draft NPOA followed by a comments, questions and feedback session. The compiled action plan from the first workshop was presented, before stakeholders reviewed the plan in working groups before presenting and finalising in plenary. The results of the second workshop were compiled into final action plan and circulated one more time to stakeholders for approval before incorporation into the completed NPOA document. The completed NPOA 2016-2020 document was then submitted to the Seychelles Fishing Authority for final endorsement.

Structure

The Action plan consists of a Vision statement, i.e. the long term goal to which the NPOA seeks to contribute, and a Mission statement, i.e. the goal the NPOA aspires to meet within its 2016-2020 timeline. The Mission statement is supported by 10 Strategic Objectives which reflect verbatim the guidance of the IPOA (FAO 1999) as to what an NPOA should aim to achieve. Activities to realise the attainment of the Strategic Objectives are set out in 9 Work Programmes:

1. Co-management of the NPOA
2. Fishery Data Gathering and Management
3. Research
4. Managing Effort in Line with a Precautionary Approach
5. Optimising Use of Capped Shark Catch
6. Non-consumptive Sustainable Use
7. Conservation and Management Measures
8. International Obligations and Cooperation
9. Education and Awareness

The Work Programmes are to be implemented within the context of four fundamental working principles and a time bound plan duration and review process; and are set out in a modified logframe format as depicted below:

Work Programme: Objective	Description		OVI
Results			
Activities	Description	Priority/ Timeline	OVI
Notes			

SEYCHELLES PLAN OF ACTION FOR THE CONSERVATION AND MANAGEMENT OF SHARKS¹⁹

Vision

“Shark Stocks in the Seychelles EEZ are effectively conserved and managed to enable the fulfilment of their ecological role and optimal long-term sustainable use.”

Mission

Fishery-related shark mortality is reduced and critical habitats managed such that shark populations are in recovery and special measures are in place for endangered/heavily depleted populations

Strategic Objectives

- 1).** Ensure that shark catches from directed and non-directed fisheries are sustainable.
- 2).** 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.
- 3).** Identify and provide special attention, in particular to vulnerable or threatened shark stocks.
- 4).** Improve and develop frameworks for establishing and coordinating effective consultation involving all stakeholders in research, management and educational initiatives within and between States.
- 5).** Minimize unutilized incidental catches of sharks.
- 6).** Contribute to the protection of biodiversity and ecosystem structure and function.
- 7).** Minimize waste and discards from shark catches in accordance with article 7.2.2(g) of the Code of Conduct for Responsible Fisheries.
- 8).** Encourage full use of dead sharks.
- 9).** Facilitate improved species-specific catch and landings data and monitoring of shark catches.
- 10).** Facilitate the identification and reporting of species-specific biological and trade data.

¹⁹ For the purposes of this document the term “shark” is taken to include all species of sharks, skates, rays and chimaeras (class Chondrichthyes) unless otherwise stated.

Working Principles

The Interdependence of Humans and Biodiversity

Intrinsic Value

The Precautionary Principle

Ecologically Sustainable Development

Plan Duration and Review

The Plan is intended to have a 5-year duration (2016- 2020) with an independent review during year four, which will provide the basis for a consultative revision of the NPOA so as to enable an adaptive management approach and the optimal attainment of its strategic objectives.

Work Programme 1: Co-management of the NPOA

Objective The implementation of the NPOA is overseen and coordinated by a representative, equitable and transparent steering committee mechanism

	Description	OVI s
Results	i, ii & iv). SC is formed, mandated and operational within the first semester of 2016	SC membership, ToR and minutes.
	iii). The SC functions in an efficient, effective, transparent, equitable and timely manner with sound record keeping and coordination of NPOA implementation.	Minutes, implementation reports etc...
	v). The NPOA is empowered by regulations under the Fisheries Act.	Fisheries regulations

	Description	Priority/ Timeline	OVI s
Activities	i). Identify Steering Committee (SC) Membership ¹	1 Jan-Mar 2016	SC membership and minutes.
	ii). Determine and formalise SC Terms of Reference and <i>modus operandi</i> ² .	1 Jan-Mar 2016	SC Minutes and ToR document.
	iii). Provide sufficient priority, secretariat personnel and resources to enable effective functioning of SC.	1 2016-20	SC Minutes and SFA staff allocation.
	iv). Launch and commence operation of SC.	1 2016	Media coverage and SC minutes
	v). Utilise 2014 Fisheries Act to give legal status to the NPOA.	1 2016-17	National Gazette

Notes:

1). The steering Committee shall have a balanced and representative membership and will be chaired by a high-level SFA official.

2). ToR and MO to include:

- An equitable and transparent mode of function.
- A specified minimum number of meetings per annum,
- Subsidised attendance of Artisanal Shark Fishers.
- A defined strategic approach to NPOA implementation,
- A key function being to foster and facilitate fund raising for and stakeholder involvement in implementation of the NPOA.

Work Programme 2: Fishery Data Gathering and Management

Objective Establish, manage and maintain a shark fishery database to provide the factual basis for the informed conservation and sustainable use of sharks in Seychelles.

	<i>Description</i>	<i>OVI</i> s
	i). Ray fishery species composition, abundance, occurrence and demography identified through a minimum 12-month intensive survey of fishery catch.	Fishery description and report. Species list etc...
	ii). Species and fin identification capacity is built and maintained in appropriate field agencies.	No. of trained national agency staff.
	iiia). National shark fin exports recorded as a distinct item.	Technical and national reports.
	iiib). Fins imports from high seas are identified and recorded.	SFA and CITES authority records.
Results	iiic). All transboundary movement in products of CITES listed species is recorded and managed appropriately.	Technical and annual reports
	iiid). National statistics and reports present shark and ray catches separately.	Catch logs, SFA records and reports.
	iv). Correct and representative data on the shark catch from the S-I fleet is gathered, recorded, managed and presented.	SFA statistics and reports. Catch logs etc
	v). Industrial catch monitoring and data gathering is upgraded to meet international standards.	Data collection is optimised.
	vi). Other fishery shark catches assessed & data gathering protocol, fishery guidelines/management plans/regulations in place if and as appropriate.	

	<i>Description</i>	<i>Priority/Timeline</i>	<i>OVI</i> s
	i). Undertake ray fishery assessment, identify species composition, relative abundance, seasonal occurrence and population demography.	1 2016-17	Minimum 12 month intensive study undertaken.
	ii). Further develop species and fin identification capacity to enable trade management.	1 2016-20	Training workshops and programmes etc...
	iiia). SFA to record and present fin export data separately from other commodities.	1 2016-20	Technical and national reports.
	iiib). Record all fins imported from the high seas.	1 2017-20	SFA and CITES authority records.
Activities	iiic). Identify CITES species listed fins to meet international obligations.	1 2016-20	CITES authority records. Technical and annual reports
	iiid). SFA to record shark and ray catch separately.	1 2017-20	
	iv). Enforce data gathering and provision requirements of Semi-Industrial shark catch (targeted & untargeted) & monitor for accuracy.	1* 2016-20	S-I log sheets, catch assessments, observer reports etc...
	v). Review industrial fishery shark catch data gathering, strengthen/implement as appropriate.	1 2017-20	Review report. Correct data gathered.
	vi). Assess the sports, recreational, beach seine and mackerel fisheries to determine if they should be incorporated into monitoring system ¹ .	3 2018-19	Assessment reports Records of activities with sports fishers etc
	Develop fishery guidelines/management plans/regulations if and as appropriate.	3 2019-20	

Notes:

1). Shark “control” fishery activities i.e. at Anse Lazio and in the Port Area should also be assessed and reviewed.

*: Stakeholders identified this activity as being a “crucial” priority.

Work Programme 3: Research

Objective	NPOA implementation is enabled and effectively supported by a management oriented national shark research agenda.		
	Description		OVI
Results	i-iii). A national prioritised shark research agenda that supports the implementation of the NPOA and management oriented objectives is developed and under implementation with governmental, institutional and donor support.		Research Reports, Papers etc... Steering Committee Minutes
	Description	Priority/ Timeline	OVI
Activities	i). NPOA Steering Committee or a representative stakeholder working group ¹ develops prioritised research agenda that supports NPOA implementation. Considerations should include: a). research required to meet international obligations. b). generation of science-based recommendations for the conservation and sustainable use of Seychelles shark stocks. c). research to inform management measures to minimise impact and rehabilitate populations of species identified as being at high risk. d). Research to assess efficacy of conservation and management measures.	1 2016	Draft Research Agenda Minutes of meetings etc...
	ii). Identify options for financial and institutional support to facilitate the implementation of the research agenda.	1 2016	Implementation recommendations.
	iii). Support implementation of Research Agenda.	1 2016-20	Implementation reports Research Updates etc

Notes:

1). The process should include NISTI and all agencies with a history of shark research activities.

Work Programme 4: Managing Effort in line with a Precautionary Approach

Objective Shark fishing effort, both targeted and untargeted, is reduced to allow populations to recover to ecologically sound levels.

	<i>Description</i>	<i>OVI</i> s
Results	i). All active Artisanal Shark Fishers ¹ are identified and recorded.	ASF List
	ii a). Fishery is regulated and ASF are licensed and number of licenses limited to that number ² .	
	ii b). Artisanal shark fishery effort is effectively capped.	
	iii). Finning is banned, all shark carcasses must be landed with fins attached.	National Gazette Fisheries Regulations
	iv). Best practice is utilised in fishing gear and techniques to minimise shark bycatch and use of metal trace is banned in longline fisheries.	
	v). Zones where S-I long liners cannot operate are defined by law.	
	vi). Landings of neonate and juvenile sharks is significantly reduced.	Catch data.

	<i>Description</i>	<i>Priority/ Timeline</i>	<i>OVI</i> s
Activities	i) Survey and identify current artisanal shark fishermen, the number of boats and number of “drag” under use.	2 by 2018	List of active artisanal fishers
	ii) Legislate to license the fishery and give licenses only to current operators.	2 by 2018	Regulations Licensed Fishers.
	iii) Ban finning in all fishery activities.	1 2016-17	National Gazette Fisheries Regulations
	iv) Develop/use, to the extent practicable, selective, environmentally safe and cost-effective fishing gear and techniques in all fisheries to reduce shark bycatch. Including the phasing out ³ and legislation against the use of metal trace in (semi)industrial longline fisheries.	2 by 2019	Gear reviews and recommendations. Trial reports as appropriate. National Gazette.
	v). Identify and legislate for zones where S-I fleet is excluded from activity – i.e. on the banks/waters of less than a specified depth.	2 by 2019	National Gazette
	vi). Identify & implement means to minimise catch & consumption of juvenile sharks.	1 2017-19	Assessment and recommendations.

Notes:

1). Artisanal Shark Fishers are defined as fishers that actively target shark with specialised gear (i.e. the short anchored longline known locally as “drag”) and derive 30% or more of their annual income from the fishery.

2). The purpose is to reduce fishing effort in a precautionary manner and to ensure that if Work Programme 5 is successful it does not result in an increase in effort in the targeted artisanal shark fishery. The license criteria shall ensure that effort is curtailed to no more than existing levels. Consideration should be given to the passing of licenses down the generations of families.

3). Consideration must be given to the costs accrued in terms of loss of equipment by S-I vessels and the impact it may have on their competitiveness on the international market. Measures, if warranted, could include compensation for lost gear.

Work Programme 5: Optimising Use of Capped Shark Catch

Objective	The full use of dead sharks is optimised in the Seychelles socioeconomic context, without increasing the incentive to target and land sharks.		
	<i>Description</i>		<i>OVI</i>
	ia). The type and quantities of material are estimated and economies of scale incorporated into the consideration of a variety of economic activities to utilise currently discarded or underused body parts.		Assessment Reports
Results	ib). Potential for export of commodities such as squalene and cartilage are assessed.		Market analyses.
	ic). Local demand for products such as animal feed and fertiliser are assessed.		Market analyses.
	id). Recommendations regarding the development of value-adding/waste reducing activities are presented.		Recommendations.
	ii). If viable small enterprises are established to reduce waste and add value to the artisanal shark fishery.		Number of small scale commercial operations.
	<i>Description</i>	<i>Priority/ Timeline</i>	<i>OVI</i>
Activities	i). Investigate means for optimising use ¹ of whole carcass – i.e. head, internal organs etc... from the artisanal catch. Only implement this activity when WP 4 activities i & ii have been completed.	2 2017-19	Assessment reports
	ii). If additional production activities are found to be viable emphasis should be placed on encouraging/facilitating small scale value-adding enterprises in this domain.	2 2019-20	

Notes:

1). Products that could be considered include: fertiliser, animal feed, squalene, cartilage, artisanal goods such as jewellery, walking sticks etc... (Workshop participants expressed concern that encouraging a shark leather industry could encourage increased effort to land more sharks).

Work Programme 6: Non-consumptive Sustainable Use

Objective The potential for shark ecotourism is investigated and optimised.

	<i>Description</i>	<i>OVI</i> s
Results	i). Areas identified, agreed and regulated.	Maps and regulations
	ii). Trends in shark occurrence at no shark fishing areas determined and recommendations made if appropriate.	Data on shark occurrence.
	iii). Ecotourism proposals.	
	iv). Whale shark encounter Policy published and regulated in law.	Policy Document Legal regulations.
	v). Value of living shark determined.	Economic Valuation report

	<i>Description</i>	<i>Priority/Timeline</i>	<i>OVI</i> s
Activities	i). (Re)negotiate “no shark fishing” areas around various dive sites and formalise through regulations.	1 2016-17	Minutes of stakeholder meetings.
	ii). Dive operators monitor trends in shark occurrence and dive attraction and make recommendations.	2 2016-20	Dive records of elasmobranch sightings.
	iii). Investigate options for various ecotourism activities and make recommendations on possible activities and restrictions ¹ .	2 2017-19	Ecotourism potential assessment.
	iv). Publish whale shark encounter policy and establish licensing and enforcement regulations.	2 by end 2017	National Gazette.
	v). Assess the socioeconomic value of the living shark in Seychelles.	3 by end 2019	Draft study.

Notes:

1). Workshop participants expressed concerns about baited shark dives or shark feeding activities and their potential implications for public safety and conservation. It was felt that restrictions on activities to be allowed should be stated clearly at the outset.

Work Programme 7: Conservation and Management Measures

Objective Seychelles is an example of best practice in its measures to conserve sharks and manage shark fisheries.

	Description	OVI s
Results	i). Key habitats, in particular nursery habitats for threatened species, are identified and appropriately protected.	PA legislation Maps registered etc..
	ii). Fishing pressure on and landings of threatened shark species are significantly reduced. Where appropriate endangered species receive full legal protection and/or recovery/management plans.	Catch records Fisheries/Wild Animals regulations. Species recovery or management plans.
	iii). All species that Seychelles is obliged (i.e. at end 2015) to protect are legally protected by end 2017. International obligations are monitored and implemented so that Seychelles remains in line with its obligations.	Fisheries/Wild Animals regulations.
	iv). The PAN and the provisions of national MSP incorporate priorities identified to support shark conservation and use.	PAN/MSP maps and legislation.
	v). Provision is made for sound solid waste management in the port area, dumping of fish remains and waste in the Port is prevented and consequently numbers of large shark occurring there decline.	Site verification. Shark reports.
	vi). Seychelles regulates for the use of the best gear and techniques to reduce shark bycatch.	National Gazette Fishery regulations.
	vii). Shark protection and fishery regulations are updated and harmonised in line with outputs of the NPOA.	Fishery regulations.
	viii). Regulations are fairly and effectively enforced – in particular regarding finning, trade in fins and use of gear.	Enforcement reports Legal actions.
	ix). Shark risk and safety issues are reviewed and response protocols in place including: guidelines for media statements and coverage and database of national expertise.	Protocol and database.

	Description	Priority/ Timeline	OVI s
Activities	i). Identify and appropriately protect critical habitats – e.g. nurseries, aggregation sites etc...	1 2016-20	Reports, papers and maps
	ii). Identify and implement means to effectively protect threatened species including species assessments and the development of species management/recovery plans as appropriate in the Seychelles context ¹ .	1 2016-20	Species assessments and recommendations. Draft recovery/management plans.
	iii). Protection of species as per international obligations.	1 2016-17 2017-20	National Gazette and national reports.
	iv). Incorporation of shark considerations into Protected Area Network (PAN) and Marine Spatial Planning (MSP) ² (i.e. activity i above)	1 2016-20	PAN/MSP maps and justifications
	v). Solid waste management in the port area is improved and regulations enforced ³ .	1 2016-20	Plans, proposals. Enforcement reports.
	vi). Gear restriction legislation gazetted in line with findings of WP 4 Activity iv.	2 2020	National Gazette Fishery regulations.
	vii). Review and improve pertinent shark-related regulations.	2 2018-20	National Gazette

viii). Review and improve enforcement of regulations respectively.	1* 2016-20	Enforcement reports
ix). Review shark management and safety issues and prepare response protocols.	2 2017	Draft Protocols and database.

Notes:

1). Global endangered status may not reflect the status of stocks in Seychelles and likewise some local species stocks may be heavily depleted whereas globally they are not considered threatened.

2). The fine scale planning format as developed under the GEF PA project (Dr Klaus) will be required for shark management around the central islands.

3). Regulations are in place but are not being enforced, the agency responsibility for their enforcement and agency responsibility for monitoring of enforcement needs to be clarified and accountability ensured.

*: Stakeholders noted that whilst all conservation and management measures were important and a relative priority monitoring of fishery activities/catches and enforcement of regulations, currently recognised as weak, are of primary and overriding importance.

Work Programme 8: International Obligations and Cooperation

Objective	Seychelles meets its international obligations and optimises international cooperation and support to that end.		
	Description		OVI
	ia). Seychelles signs and commences implementation of the CMS sharks MoU		MoU signed in 2016
	ib). Seychelles effectively utilises mechanisms under the Nairobi Convention and SADC, if and as appropriate.		
Results	ii). Pertinent species are protected under national law, CITES provisions are effectively implemented.		National Gazette Fisheries/Wild Animals regulations.
	iii). Seychelles effectively accesses international funding and cooperation to enable broad stakeholder implementation of its NPOA.		Cooperative projects, technical assistance, funded projects etc...
	iv). NPOA is published and disseminated to stakeholders and available in hard and digital copies and to download. Reports are submitted in a timely manner to FAO.		Digital and Hard Copies. SFA website. Reports to FAO.
	Description	Priority/ Timeline	OVI
	i) Seek means ¹ through international cooperation and agreements to actively promote the IPOA-Sharks.	1 2016 & 2016-20	Cooperative initiatives New agreements etc...
	ii). Address international obligations in particular with regard to International trade and listed/endangered species ² .	1 2016-20	National Gazette Fisheries/Wild Animals regulations.
Activities	iii). Seek international assistance and resources to enhance national capacity to implement the NPOA.	1 2016-20	Correspondence, meeting minutes, draft proposals etc...
	iv). Disseminate the NPOA (and related assessments and implementation reports) internationally and fulfil reporting requirements to FAO.	2 2016-20	Digital and Hard Copies. SFA website. Reports to FAO.

Notes:

1) Including establishment of cooperative: research programmes, stock assessments and conservation and management initiatives for transboundary, straddling, highly migratory and high seas shark stocks. Options to realise these objectives include: signing and implementing the CMS Sharks MoU, pursuing a regional agreement under the auspices of existing mechanisms of the Nairobi Convention or SADC, developing a Regional Plan of Action for the Conservation and Management of Sharks (RPOA).

2). Cross reference with International Obligations Analysis (Nevill 2015b) and Work Programme 7 Activity iii.

Work Programme 9: Education and Awareness

Objective A coordinated national public education and awareness campaign effectively engenders public support for, and stakeholder participation in, the implementation of the NPOA.

	<i>Description</i>	<i>OVI</i> s
Results	i). The general public and stakeholders are actively informed of the issues and enabled to participate in NPOA implementation as appropriate.	Approved PE&A Strategy Document
	ii a). Baseline knowledge of the public and stakeholders is ascertained, gaps identified and addressed by the PE&A campaign.	Baseline knowledge assessment.
	ii b). Effectiveness of strategy is assessed through subsequent baseline knowledge assessments and adaptively managed accordingly.	Implementation reports Knowledge assessments.

	<i>Description</i>	<i>Priority/ Timeline</i>	<i>OVI</i> s
Activities	i) Develop and implement a public education and awareness strategy aimed at the general public and stakeholders that: <ul style="list-style-type: none"> • Highlights the status, role and progressive implementation of the NPOA. • Educates the public about the myths and realities of shark behaviour, conservation and management. • Emphasises the role of sharks in the marine environment and their vulnerability to fishing. • Addresses by-catch issues and encourages the successful return of living sharks to the sea. • Educates stakeholders on the need for accurate shark catch data and species identification. • Develops stakeholder awareness of the legislation and management measures, reporting requirements and penalties. 	1 2016	Reports/outcomes of strategy development process Draft PE&A Strategy Document
	ii) Monitor effectiveness of the strategy and adaptively manage.	2 2018-20	Baseline knowledge assessment. Implementation reports. Subsequent knowledge assessments.

Notes:

Table 14 : Strategic Objectives/Work Programmes Matrix									
Strategic Objective	Work Programmes								
	1	2	3	4	5	6	7	8	9
1). Ensure that shark catches from directed and non-directed fisheries are sustainable.		x	x	X			X	x	x
2). 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.		x	X				X	x	x
3). Identify and provide special attention, in particular to vulnerable or threatened shark stocks.		x	X			X	X	X	x
4). Improve and develop frameworks for establishing and coordinating effective consultation involving all stakeholders in research, management and educational initiatives within and between States.	X						x	X	x
5). Minimize unutilized incidental catches of sharks.				X	X		x	x	x
6). Contribute to the protection of biodiversity and ecosystem structure and function.		x	X	X		X	X	x	x
7). Minimize waste and discards from shark catches in accordance with article 7.2.2(g) of the Code of Conduct for Responsible Fisheries.				x	X		x	x	x
8). Encourage full use of dead sharks.					X			x	x
9). Facilitate improved species-specific catch and landings data and monitoring of shark catches.		X	x				x	x	x
10). Facilitate the identification and reporting of species-specific biological and trade data.		X	x					x	x
Key: X: Primary Interaction x: Secondary Interaction									

ANNEXES

Annex I: Stakeholder Analysis

Annex II: NPOA 2007-2011 Implementation Assessment

Annex III: International Obligations Analysis

Annex IV: Species Listing

Annex V: References

Annex I: Stakeholder Analysis	
Govt. Agency.	Notes
Ministry for Fisheries and Agriculture (MF&A)	Ministry with portfolio responsibility for Fisheries.
Seychelles Fishing Authority (SFA)	Authority responsible for fisheries management and research. Active in various shark research initiatives.
Ministry of Environment, Energy and Climate Change (MEECC)	Portfolio responsibility for biodiversity conservation including: Wild Animals (Whale Shark) Protection Regulations S.I. 1 of 2003, CITES, oversight of PA expansion and marine spatial planning processes.
Seychelles National Park Authority (SNPA)	Authority responsible for marine national parks with Marine Research Section. Actively undertaking shark research in Curieuse and Port Launay Marine Parks.
The Blue Economy Department (BED)	Department with portfolio responsibility for the steering and coordination of the national development of the Blue Economy. A marine-centred sustainable use and development paradigm.
Seychelles Maritime Safety Administration (SMSA)	Formed under the Seychelles Port Authority Act in 2004. Involved in shark control measures off Praslin and Port Victoria.
National Institute for Science, Technology and Innovation (NISTI)	Established under ACT 6 of 2014 NISTI is responsible inter alia for the promotion and coordination of scientific research.
Seychelles Island Foundation (SIF)	Entrusted with the management of Aldabra Special Reserve, the largest marine protected area in Seychelles.
Civil Society	
Fishers Associations	Artisanal Shark Fishers Association Bel Ombre Fishers Association Praslin Fishers Association Fishing Boat Owners Association
Shark fin exporters	Only two currently known to be operating.
Dive Operators	21 licensed dive centres/operations.
Seychelles Sports Fishing Club	Registered Association promoting sustainable sports fishing and related research initiatives.
Marine Charter Association	Umbrella organisation for sports fishing and boat hire operators.
Global Vision International	Volunteer organisation undertaking shark research with SNPA at Curieuse MNP.
Marine Conservation Society Seychelles (MCSS)	Only national environmental NGO dedicated exclusively to the conservation and sustainable use of marine biodiversity.
Green Islands Foundation (GIF)	NGO active in shark research/conservation projects.
Save Our Seas Foundation	Various marine research activities, including shark projects ongoing.
Interested Parties	
Indian Ocean Tuna Commission	RFMO secretariat based in Victoria.
UNDP PCU	Coordinating various GEF projects which relate to this issue.
GEF SGP	Funding shark research/conservation/management projects.
Mangroves for the Future	Donor organisation - has funded some shark-related projects.
Key:	Primary Stakeholders

Annex II: NPOA 2007-2011 Implementation Assessment

Part I: Review of the progress towards achieving the Strategic Objectives through the implementation of the Work Programme and Actions.

Work Programme 1: Co-management of the NPOA			
<p>Context: It was felt that the complexity of the shark fishery and the diversity of stakeholders made it essential that the plan and its oversight have broad stakeholder support and participation. As such it was agreed that the Steering Committee (SC) should:</p> <ul style="list-style-type: none"> • be balanced and representative in membership, • be equitable and transparent in function, • have a clear executive role in the management of the plan, • function as, or make provision for, a dispute resolution mechanism, • form sub-committees as necessary to address issues of management, research, education and effective broader stakeholder communication and consultation. • be chaired by the Seychelles Fishing Authority (SFA) or the Dept of Environment. 			
Action		Implementation	
		Y/N	
1	Identify SC membership.	Yes	Steering committee with representative and equitable stakeholder representation was formed.
2	Formalise SC terms of reference, mandate and <i>modus operandi</i> .	Yes	ToR established in SC Meeting of April 2008. Executive role however was not mandated.
3	Launch and commence operation of SC	Yes	The SC was launched and met on several occasions ¹ .
4	Seek to harness full national capacity to implement the NPOA, through partnerships and cooperative agreements.	No	The SC was not successful in harnessing national capacity or engendering broader community implementation of the NPOA.
5	Means to be found to subsidise the attendance of artisanal fishermen to the SC.	Yes	The attendance of Artisanal Fishers representatives at the SC was subsidised.
<p>Notes:</p> <p>1). Meetings however were not regular and lacked strategic guidance from the chair with SFA often only being represented by a junior staff member. Latterly the CEO of SFA did take on the role of chair but meetings were again too few and infrequent for the SC to fulfil its role.</p> <p>2). With regard to mandate of the SC as set out in the context above:</p> <ul style="list-style-type: none"> • The executive Role of the SC with regard to the NPOA was not established. • A dispute resolution mechanism was not established and the SC itself did not function in that regard, indeed the disparate interests and perspectives of SC members lead to more than one impasse in the workings of the SC. • SC did form one sub-committee to address Work Programme (WP) 2. 			
<p>Conclusions: The intermittent meeting of the SC coupled with a lack of strategic approach to its work was identified by members as the primary obstacle to the effective implementation of the NPOA. This needs to be effectively addressed and corrected in the formulation and <i>Modus Operandi</i> of the SC for NPOA 2, its Chairmanship, strategic approach and schedule of meetings etc... It is also vital that the NPOA and its Steering Committee be given sufficient importance in the broader workings of national fishery management including sufficient time and resources for an appropriately experienced coordinating officer.</p>			

Work Programme 2: Immediate Stakeholder Issues		
<p>Context: The process to develop the NPOA identified issues that engendered friction between primary stakeholders. It was felt these should be addressed as a matter of priority in order to enable subsequent positive stakeholder interaction in the workings of the SC. The issues were:</p> <ul style="list-style-type: none"> • Artisanal shark fishers placing their lines (“drag”) at dive sites • The Semi-industrial fleet placing its long lines on the Mahe plateau and even close to the central islands. <p>Generally considered that the S-I long liner fleet should operate off the Mahe plateau and other banks as it targets swordfish and tuna, however at the time of formulating the NPOA boats would seasonally target shark and 3 boats were fulltime targeting shark and this mostly for fin. This often entailed fishing on and throughout the Mahé plateau.</p>		
Action		Implementation
		Y/N
1	Determine membership, mandate and initiate works of sub-committee (Sub-C).	Yes Sub-Committee was formed of dive industry reps and artisanal shark fishers.
2	Identify and agree on number, location and size of dive areas where artisanal fishermen agree not to place anchored long lines (“drag”).	Yes Agreement was reached on various locations including 100 m exclusion zone for fishing activity (SC Minutes April 2009) but no follow up ensued, policy was not instituted etc...
3	Develop and agree on format and nature of monitoring that dive centres will undertake at specified sites.	No Not done.
4	Negotiate and determine distance from the islands of Mahe, Praslin and La Digue within which S-I boats agree to not set their lines.	No Not done.
5	Legislate if and as appropriate.	No
Notes:		
Conclusions: This process remains valid and needs to be re-initiated.		

Work Programme 3: Data Gathering and Management		
Context: Lack of species-specific information on shark catch was identified as a critical impediment to shark stock management. Key problems behind this included correct species identification, particularly of dressed carcasses, and the lack of a monitoring protocol.		
Action		Implementation
		Y/N
1	Develop user-friendly identification keys with standardised Creole nomenclature	Yes Recently completed (2015) under Green Islands Foundation GEF SGP – to be widely distributed before end 2015.
2	Develop criteria for sharks to be landed in form that facilitates species identification.	No. This relates to the SI fishery, artisanal fishers land entire carcass.
3	Develop standardised data gathering methods and user-friendly data charts.	Yes Monitoring protocol for artisanal fishery developed and national training workshop undertaken – developed by NGO Artisanal Shark Fishers Association (ASFA). Data sheets for S-I fleet already exist.
4	Develop an effective, secure database that facilitates data gathering and management, summarisation, efficient data extraction and exchange between partners whilst securing information rights.	Yes This is due to be completed and operational by end of 2015 under GEF grant project of ASFA. It includes one year's (2013) data on artisanal fishery. Information rights were not addressed but currently there are not multiple agencies gathering and sharing data.
5	Determine if listed species ¹ are caught.	Y/N Not formerly done but will be undertaken as part of the preparation of NPOA 2.
6	Establish where possible appropriate mechanisms for the validation of biological, catch and trade data.	No This is related to WP 9 Action 4.
7	Assess the nature and extent of the sports/recreational fishery and if appropriate incorporate into the standardised monitoring system.	No
Notes: 1). i.e. species that may be classified as endangered or threatened under IUCN criteria or protected by national law or international agreement.		
Conclusions: This WP is fundamental to the NPOA and any future informed management of the fishery. It needs to be reviewed for and elaborated in NPOA 2.		

Work Programme 4: Research			
Context: Information on the current species-specific status and distribution of shark stocks, their biology and role in the ecosystem was identified as critically lacking and representing a fundamental obstacle to the effective adaptive management of shark stocks and the shark fishery.			
Action		Implementation	
		Y/N	
1	Identify and prioritise key research requirements to enable efficient and cost-effective implementation of the NPOA.	Y/N	A list was provided in the original NPOA some aspects of which have been addressed by an intensive survey of artisanal shark catch in 2013.
2	Develop and implement/facilitate prioritised research programme.	Y/N	This was not officially undertaken under the auspices of the NPOA. However following the two fatal shark attacks in 2011 pertinent stakeholder agencies did come together to develop a shortlist of research priorities for this specific concern which were addressed to a limited degree.
3	Generate science-based recommendations for the conservation, management and sustainable use of shark stocks.	No	Various research programmes have been undertaken but have either not yet been published or did generate recommendations in this regard.
4	Develop and pilot risk assessment criteria for priority shark species.	No	A trial CITES Non-Detriment Finding (NDF) was undertaken for the Great hammerhead (<i>Sphyrna mokarran</i>) as part of the international IUCN project to develop CITES NDF Guidelines for sharks.
5	Initiate management and research actions to minimise impact and rehabilitate populations of species identified as being at high risk.	No	
6	Monitor and assess efficacy of conservation measures.	No	Clearly, as no conservation measures were developed this action could not be implemented.
Notes: Despite the lack of an overall research strategy or prioritised programme, various agencies have been involved in and undertaken shark research since 2006 including: Seychelles Fishing Authority (including cooperation with IRD), the Marine Conservation Society, Seychelles (MCSS), the Green Islands Foundation (GIF), the Artisanal Shark Fishers Association (ASFA), Seychelles National Park Authority (SNPA), GVI Seychelles and the SOSF D'Arros Research Centre, a summary of the work undertaken will be included in NPOA 2.			
Conclusions: A management oriented and targeted research programme should be a priority for development and implementation under NPOA 2.			

Work Programme 5: Managing Effort in Line with a Precautionary Approach		
Context: Scientific, historical and anecdotal information indicate significant decline in shark abundance on the Seychelles banks over the last 70 years, leading to SFA categorising the shark fishery in general as “ <i>over exploited or depleted</i> ” and hence warrants an active and progressive application of the precautionary approach.		
Action		Implementation
		Y/N
1	Survey and identify artisanal shark fishers, the number of boats and “drag” in use.	Yes An assessment was undertaken by ASFA but is now outdated.
2	Legislate the fishery and license only current operators.	No
3	Investigate viable alternatives to shark fishing for the S-I fleet.	No
4	Progressively limit and ultimately prohibit, the use of metal trace in the non-shark licensed fishery, by the conclusion of the first four years of this plan.	No
5	Investigate scope for gear modifications or introductions to limit by-catch.	No Research undertaken through “MADE” project (Mitigating Adverse Ecological impacts of open ocean pelagic fisheries) completed in 2011 but info not found.
Notes:		
Conclusions: the dramatic fall in fin price on the local market since 2013 has apparently seen a decline (unquantified) in fishing effort in both Artisanal and S-I fisheries. Now is the ideal time to ban metal trace and the unsustainable practice of finning.		

Work Programme 6: Develop/Access Markets for Shark Products			
Context: This programme was intended as a means of making it viable for the S-I fleet to land the whole shark by finding overseas markets for the meat etc... this as a pre-requisite to banning finning by providing economic options to the vessel operators. It was noted that these activities must not result increased effort in the shark fishery as WP 5.			
Action		Implementation	
		Y/N	
1	Assess international markets for shark and shark products and seek to secure access for local produce	No	
2	Review needs for the local processing of sharks.	No	
3	Develop mechanism to ensure primary access to local market for artisanal fishermen.	No	
4	Establish Processing facilities, market and test local products (within 4-year NPOA).	No	
5	Review local market and propose measures to expand and develop it.	No	
6	Liberalise fin export to allow local fisherman to export their own fin.	No	However it was determined that in fact there is no licensing of shark fin exporters rather a permission for each export is required from the Ministry of Finance.
Notes:			
Conclusions: Time and circumstances have moved on since 2006 this WP is now obsolete. In light of changing local market for fins and Seychelles desire to be seen as leading the way in marine management (Blue Economy etc...) it is recommended that authorities should move to ban finning outright.			

Work Programme 7: Optimising Use of Shark Catch.			
Context: This work programme is intrinsically linked to the successful implementation of WPs 5 & 6 without which it should not be implemented. As it is fundamental to the overall implementation of the NPOA that effort in the shark fishery be reduced to allow recovery of populations.			
Action		Implementation	
		Y/N	
1	Enable the viability of landing the whole shark (within time span of plan - 4 years).	No	
2	Develop timeline and criteria for legislation regarding landing of whole shark.	No	
Notes:			
Conclusions:			
1). Though artisanal fishers do land the whole shark a significant portion of the animal – its head and intestines are typically, though not always, discarded it would still be desirable to investigate scope for use of these parts – e.g. animal feed, fertiliser, oil and cartilage production etc...			
2). Time and circumstances have moved on since 2006. In light of changing local and international factors (e.g. price of fin on local market, Seychelles Blue Economy drive) it is recommended that authorities should move to ban finning outright, making Action 1 above obsolete.			

Work Programme 8: Non-consumptive Sustainable Use.			
Context: The NPOA recognised the potential of ecotourism to further the conservation and sustainable use of sharks by imbuing value to the living animals.			
Action		Implementation	
		Y/N	
1	Identify and declare no shark fishing areas.	Y/N	Areas were identified under WP 2 but no further action was taken.
2	Enforce no shark fishing areas.	No	
3	Monitor designated areas to assess impact on sharks.	No	
4	Initiate ecotourism activities when shark populations reach a viable density and diversity.	No	The pre-existing whale shark ecotourism activities operating out of Beau Vallon continue.
5	Investigate options for ecotourism activities.	No	
6	Publish whale shark encounter policy and establish licensing and enforcement regulations.	No	The Whale shark ecotourism guidelines developed under the SEYMEMP project 2000-2003 have still to be officially adopted.
7	Assess the socioeconomic value of the living shark in Seychelles.	No	
Notes:			
Conclusions: The economic evaluation of living shark in Seychelles and the expansion of sustainable ecotourism activities to imbue direct economic value to the living sharks are important aspects to enable the conservation and sustainable use of shark stocks.			

Work Programme 9: Review and Improve Administrative, Management and Conservation Measures.			
Context: The NPOA stated that these measures required review in light of NPOA development to realise synergies, identify capacity needs and ensure measures are viable and appropriate.			
Action		Implementation	
		Y/N	
1	Assess feasibility and capacity requirements for enforcement of the Fisheries (Shark Finning) Regulations 2006, and develop measures for their effective implementation.	No	However many foreign vessels have their own monitoring activities and subject to their own legislation that outlaws finning.
2a	Undertake a national capacity assessment to optimise implementation of NPOA.	No	
2b	Develop capacity building plan to address needs.	No	
3a	Assess current management arrangements for sharks against the objectives and actions of this Shark-plan and whether they are enforceable and consistent with the ecologically sustainable use of sharks.	No	This was not undertaken however the current management arrangements for sharks all pre-date the NPOA: 1). Illegal to fish within MPAs. 2). Fisheries Act –1998 Prohibition of net fishing regulations. 3). The Wild Animals (Whale shark) Protection Regulations 2003 provide full protection to the species. 4). The Fisheries (Shark Finning) regulations 2006 forbids foreign, but not local, vessels from finning.
3b	Develop and implement action plan to address any deficiencies.	No	No special measures have been undertaken to date, to address the needs of threatened or listed shark species.
4	Review, streamline and improve current trade management and related collection of data.	No	The aspects that pertained to forex restrictions are no longer pertinent the Seychelles Rupee having been floated on the exchange markets. Trade data however needs to be refined to cater for CITES species restrictions.
5	Improve monitoring and enforcement of local fisheries and regulations respectively.	No	
6	Implement recommendations identified in WP 4 iii, 8 iii & 8 v.	No	The identified actions were not undertaken.
7	Investigate scope for funds to be sourced from fishery tax revenues, and other sources for implementation of the NPOA.	No	
8	Review incentives (e.g. Fisheries Incentive Act).	No	
Notes:			
Conclusions: Central to any NPOA this WP requires review and updating for inclusion in NPOA 2.			

Work Programme 10: International Cooperation		
Context: International cooperation is essential for the implementation of the IPOA-sharks. Existing bi- and multilateral agreements and RFMOs (in this case the Indian Ocean Tuna Commission) should be utilised to include or give higher priority to shark fisheries and particularly transboundary and straddling stocks.		
Action		Implementation
		Y/N
1	Seek means through international agreements to actively promote the IPOA-Sharks, establish cooperative research, stock assessments, conservation and management initiatives for transboundary, straddling, highly migratory and high seas shark stocks.	Y/N Seychelles was a lead a country in the conception and development of the CMS Sharks MoU, including hosting the international CMS meeting “ <i>to Identify and Elaborate an Option for International Cooperation on Migratory Sharks.</i> ” In December 2007. Seychelles however has yet to actually sign the MoU.
2	Analyse data promptly and publish results in a timely manner and understandable format and make available for peer review	Y/N Outside of whale shark related work only a few papers have been published in peer reviewed journals.
3	Seek international assistance and resources to enhance national capacity to implement the NPOA.	Y International funding has been sourced for various shark related projects including: 2 GEF SGPs, 2 MFF projects and cooperation with IRD.
4	Disseminate the NPOA (and related assessments and implementation reports) internationally and fulfil reporting requirements to FAO.	Y SFA have submitted implementation reports to FAO The NPOA is available online from the FAO website. Seychelles was represented by two private researchers that presented their work on shark ecology and the shark fishery respectively at Sharks International 2014.
Notes:		
Conclusions: International Cooperation is important for the implementation of NPOA 2 and there is considerable scope to improve on the cooperation and financial assistance accessed to date. Seychelles move to sign the CMS MoU and additional funds should be sought with Government assistance to implement shark research and conservation projects. Support is also required to facilitate and support stakeholders in preparing their findings for publication.		

Work Programme 11: Education and Awareness		
Context: The NPOA recognised that broad stakeholder education and awareness is central to its effective implementation.		
Action	Implementation	
	Y/N	
1	Develop and implement a PE&A strategy aimed at the general public and stakeholders that:	No No strategy was developed, however various sensitisation campaigns were developed and undertaken by NGOs.
	a). Educates the public about the realities of shark behaviour, conservation and management.	Yes ASFA authored a series of articles that were published in the Today Newspaper 2012-2013.
	b). Emphasises the vulnerability of sharks to fishing pressure and their key ecosystem role.	Yes ASFA authored a series of articles that were published in the Today Newspaper 2012-2013.
	c). Addresses by-catch issues and encourages the successful return of living sharks to the sea.	No
	d). Highlights the status, role and progressive implementation of the NPOA.	No
	e). Educates stakeholders on the need for shark catch data and species identification.	Yes ASFA GEF protocol and database development and training of technicians. GIF GEF SGP awareness campaign, training of technicians.
	f). Disseminates identification keys and trains stakeholders in their use.	Yes GIF GEF SGP developed and printed Identification guide for the artisanal fishery – to be widely disseminated before the end 2015.
	g).Trains stakeholders in the correct implementation of data gathering protocols.	Yes Yes training workshops for technicians under both ASFA and GIF projects.
	h). Develops stakeholder awareness of the pertinent legislation and management measures, reporting requirements and penalties.	No
2	Monitor effectiveness of the strategy and adaptively manage.	No
Notes:		
Conclusions:		

It is clear from perusal of the preceding work programme assessments that implementation of the NPOA was patchy at best and in some sections entirely absent. Table 1 overleaf shows how the Work Programmes contribute to attainment of the Strategic Objectives in terms of both primary and secondary interaction. Those Steering Committee members that expressed a view were in agreement that a key shortcoming on the NPOA was the weak functioning of its Steering Committee – in terms of not being given sufficient priority in the Fisheries Portfolio, insufficient secretariat support, a lack of strategic approach and insufficient and irregular meetings, these shortcomings need to be addressed as a priority in NPOA 2.

Moderate to good progress however was recorded under the auspices of Work Programmes 2, 3, 4 and 10 and these in turn supported the substantive realisation of Strategic Objectives 9 & 10, namely:

9) Facilitate improved species-specific catch and landings data and monitoring of shark catches.

10) Facilitate the identification and reporting of species-specific biological and trade data.

The achievement of these two objectives provides the basis for the realisation of the first of the 2 mission statements:

“to establish the necessary capacity, systems and databases to enable the informed adaptive management of shark stocks in Seychelles”

and hence provides the foundation for much more substantive achievement under NPOA 2 provided sufficient technical support is provided and funds can be accessed.

Table 1: Strategic Objectives/Work Programmes Matrix											
Strategic Objective	Work Programmes										
	1	2	3	4	5	6	7	8	9	10	11
1). Ensure that shark catches from directed and non-directed fisheries are sustainable.			x	x	X	X	X		X	x	x
2). 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.			x	X					x	x	x
3). Identify and provide special attention, in particular to vulnerable or threatened shark stocks.			x	X				X	x	X	x
4). Improve and develop frameworks for establishing and coordinating effective consultation involving all stakeholders in research, management and educational initiatives within and between States.	X	X							x	X	x
5). Minimize unutilized incidental catches of sharks.				x	X	X			x	x	x
6). Contribute to the protection of biodiversity and ecosystem structure and function.		X		X	X			X	X	x	x
7). Minimize waste and discards from shark catches in accordance with article 7.2.2.(g) of the Code of Conduct for Responsible Fisheries.				x		X	X		x	x	x
8). Encourage full use of dead sharks.				x		X	X		x	x	x
9). Facilitate improved species-specific catch and landings data and monitoring of shark catches.			X	x					X	x	x
10). Facilitate the identification and reporting of species-specific biological and trade data.			X	x					X	x	x
Key: X: Primary Interaction x: Secondary Interaction											

Part II: Review of the Strategic Objectives, Work Programmes and Actions in relation to the current global situation.

The Strategic Objectives of the NPOA reflect verbatim the guidance within the IPOA as to what an NPOA should aim to achieve. The most recent review of IPOA implementation (Fischer *et al* 2012) did not make any recommendations to amend said objectives and as such they retain their validity and should be included in Seychelles NPOA 2.

The Work Programmes reflected the consensus of stakeholders in 2006 as to how best to address the objectives and achieve the mission statements of the NPOA. As reported in Part I the implementation of them was in general limited, though sufficient has been achieved to conclude that the basis for the realisation of the first Mission Statement has been attained.

Work Programme 1: Co-management of the NPOA.

The successful operationalisation of WP 1 is fundamental to the effective realisation of the NPOA Strategic Objectives. The poor implementation of this WP is considered the primary reason for the overall disappointing coordination and level of attainment of the first NPOA. WP 1 therefore needs to be retained in NPOA 2 but upgraded with greater priority and detail, in particular with regard to the operational priority it is given in terms of:

- Being chaired by a High-level official
- Having sufficient resources (i.e. experienced and qualified personnel with sufficient time and means allocated) to undertake the effective administration and coordination of the NPOA SC and monitoring of NPOA implementation relative to its timelines and priorities.
- Developing a sound strategic approach to NPOA implementation
- Developing a clear and concise ToR for the SC and its *Modus Operandi*
- Ensuring an effective membership and regular and a minimum number of meetings per annum.
- Utilising scope under the Fisheries Act 2014 to give legal force to the NPOA as a national fisheries management plan.
- Providing support to all agencies seeking to raise funds for or actively implementing activities under the auspices of the NPOA 2.

Work Programme 2: Immediate Stakeholder Issues.

Depending on findings of the Stakeholder workshops it may be appropriate to prioritise 2 or 3 key issues considered to be precursors for the effective further implementation of the NPOA 2.

Work Programme 3: Data Gathering and Management

This WP is vital to the NPOA and the future informed management of shark fisheries in Seychelles. Progress has been realised under this programme but requires strengthening, expansion and institutionalisation. In particular data gathering on shark by-catch in S-I and Industrial fisheries.

Work Programme 4: Research

Various shark related research programmes have been undertaken in Seychelles since 2006, many however are quite academic and do not necessarily assist greatly in realising the objectives of the NPOA. It is important therefore that a priority research agenda is developed that supports the implementation of the NPOA.

Work Programme 5: Managing Effort in Line with a Precautionary Approach

This WP remains highly relevant in all of its actions.

Work Programme 6: Develop/Access markets for shark products

This WP was motivated by the desire to enable the landing of the whole shark by the Semi-industrial fleet. The national and international scenario has changed significantly since 2006 in this regard. The wasteful and unsustainable practise of finning runs entirely counter to Seychelles environmental image and focus on the Blue Economy. Couple this with the collapse of the fin price on the local market in the last 18 months and the fact that the artisanal fishery lands the entire shark, NPOA 2 should move swiftly to amend the 2006 shark finning regulations and ban the finning of sharks by all Seychelles' vessels and vessels operating in Seychelles waters' and the rest of this WP can be dropped – action (vi) having already been addressed.

Work Programme 7: Optimising Use of Shark Catch

WP 7 was intrinsically linked with WP 6 and the objective to moving towards the complete ban of finning in by Seychelles' vessels and vessels operating in Seychelles' waters. It is still relevant to investigate, however, how the carcasses of sharks landed can be put to better and full use. Currently heads and internal organs are generally discarded – though skin from the head and stomachs of large specimens are often taken for salting.

Work Programme 8: Non-consumptive Sustainable Use

WP 8 remains highly relevant and desirable in all of its aspects and may benefit from further elaboration under NPOA 2.

Work Programme 9: Review and Improve Administrative, Management and Conservation Measures.

This WP remains highly pertinent in terms of:

- capacity assessment to implement the NPOA and a capacity building plan to address needs.
- the improvement of monitoring and enforcement of fishery regulations
- improving the collection and management of trade data
- reviewing incentives to the fishing industry in particular to identify perverse incentives that are operate counter to the conservation and sustainable use of shark stocks.

WP 9 also covers a key area where additional measures will need to be incorporated into NPOA 2 specifically:

- management arrangements for listed species and,
- fulfilling of international obligations under CITES, CMS and IOTC – these will be assessed and set out in the text of NPOA 2.

Work Programme 10: International Cooperation

This WP remains pertinent but could logically be expanded to include Seychelles signing of the CMS Sharks MoU, whilst the aspect of data publication could logically be transferred to the work programme on research.

Work Programme 11: Education and Awareness

Education and Awareness should remain key cross-cutting aspect of NPOA2 the details of which can best be elaborated when the other work programmes are finalised.

Annex III: International Obligations Analysis

A review of pertinent international agreements was undertaken to assess existing obligations that should be reflected in the Action Plan of the new NPOA. The following international agreements were identified:

- 1). The United Nations Convention on the Law of the Sea (UNCLOS)
- 2). The Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks Agreement (SFSA)
- 3). The Nairobi Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Western Indian Ocean (NC)
- 4). Protocol Concerning Protected Areas and Wild Fauna and Flora in the Eastern African Region (NC Protocol)
- 5). Southern African Development Community (SADC) Protocol on Fisheries (SADC Fisheries)
- 6). The Convention on International Trade in Endangered Species (CITES)
- 7). The Convention on the Conservation of Migratory Species of Wild Animals (CMS).

The Convention on Biological Diversity (1992) and the Algiers Convention on the Conservation of Nature and Natural Resources (1968)²⁰ are also both relevant but pertinent shark²¹ related issues are more specifically reflected in the above listed agreements. The SADC Protocol on Wildlife Conservation and Law Enforcement does not apply to fishery resources which are covered under the SADC Protocol on Fisheries.

The India Ocean Tuna Commission while having a potentially important role, under the auspices of UNCLOS and its Straddling Fish Agreement, explicitly excludes sharks from its mandate. It is also apparent that it is not attaining its professed objectives to assess issues of shark by-catch in the industrial fisheries under its ambit.

Review of the texts of the 7 listed agreements above found extensive commitments that relate to sharks many of which are not currently addressed.

Summary of Obligations

The 7 agreements in question typically use mandatory language i.e. “States shall...” making the actions specified technically obligatory. Key conclusions drawn from their obligations are summarised in **Table 1** below. A full breakdown of text and related conclusions is presented thereafter in **Table 2**.

²⁰ The revised (2003) African Convention on the Conservation of Nature and Natural Resources has not yet been signed by Seychelles and it has also yet to come into force.

²¹ For the purposes of this document the term “shark” is taken to include all species of sharks, skates, rays and chimaeras (class Chondrichthyes).

Table1: Key Obligation and Agreement Matrix							
	UNCLOS	SFSA	NC	NC Protocol	SADC Fisheries	CITES	CMS
Catch and Effort							
Limit fishing effort (direct & Indirect) to safe ecological parameters							
Manage overexploited/depleted stocks to improve status							
Utilise environmentally friendly fishing tech to reduce shark bycatch.							
Data Collection and Management							
Review and upgrade data collection and management							
Lobby IOTC to better assess shark bycatch.							
Research							
Upgrade shark stock status research including development of stock specific reference points.							
Identify additional species for listing							
International Cooperation							
International cooperation on regional shark management							
Sign CMS Sharks MoU							
International cooperation on migratory sharks							
Other Management Measures							
Ban finning for all fisheries and vessel types							
Special consideration for artisanal shark fishers							
Enhance status of threatened migratory shark species							
Remove fishery subsidies							
Precautionary approach applied in management measures							
Conserve rare, endangered and threatened species of shark							
Incorporate critical habitats into PAN							
Protect habitats by legislation e.g. against pollution etc...							
Build CITES science/management capacity (e.g. NDFs & fin ID etc...)							
Legal protection for listed species							

Table 2: International Obligations Analyses	
1). United Nations Convention on the Law of the Sea	
Text	Implications for NPOA 2 and national shark conservation and fishery management
<p>Article 61 Conservation of the Living Resources Para 1. The coastal State <u>shall</u> determine the allowable catch of the living resources in its exclusive economic zone.</p>	Where appropriate catch limits (e.g. size, temporal, spatial or complete ban) should be applied to shark catches. Seychelles currently has none and in this case where the shark fishery is recognised as overfished and depleted limits should be researched and developed.
<p>Para 2. The coastal State, taking into account the best scientific evidence available to it, <u>shall</u> ensure through proper conservation and management measures that the maintenance of the living resources in the exclusive economic zone is not endangered by over-exploitation. As appropriate, the coastal State and competent international organizations, whether subregional, regional or global, shall cooperate to this end.</p>	Catches of shark and direct and indirect fishing effort should be limited within safe ecological parameters.
<p>Para 3. Such measures <u>shall</u> also be designed to maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield, as qualified by relevant environmental and economic factors, including the economic needs of coastal fishing communities and the special requirements of developing States, and taking into account fishing patterns, the interdependence of stocks and any generally recommended international minimum standards, whether subregional, regional or global.</p>	Overexploited, depleted and recovering shark species stocks must be managed to improve their fishery status (reduction in effort, reduced by-catch, temporal/geographic protection measures, change in gear etc...). Note NPOA 2007 and the best current information all indicate that all fished species are currently overexploited or depleted. Consideration must be taken for the special needs of Artisanal shark fishers.
<p>Para 4. In taking such measures the coastal State <u>shall</u> take into consideration the effects on species associated with or dependent upon harvested species with a view to maintaining or restoring populations of such associated or dependent species above levels at which their reproduction may become seriously threatened.</p>	Measures are required to reduce the shark bycatch in non-shark targeted artisanal fisheries, the semi-industrial fishery and the industrial purse sein and long line fisheries. E.g. control of FAD use and use of non-entanglement design FADs. Banning of metal trace use in the long line fishery, enforcement of fishery regulations with regard to equipment use in the artisanal fishery.

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<p>Para 5. Available scientific information, catch and fishing effort statistics, and other data relevant to the conservation of fish stocks <u>shall</u> be contributed and exchanged on a regular basis through competent international organizations, whether subregional, regional or global, where appropriate and with participation by all States concerned, including States whose nationals are allowed to fish in the exclusive economic zone.</p>	<p>Seychelles must make available catch data and related fishery research to international organisations. To this end Seychelles needs to significantly upgrade the quality and resolution of data collected on the shark fishery by industrial and semi-industrial fleet.</p>
<p>Article 63 Stocks occurring within the exclusive economic zones of two or more coastal States or both within the exclusive economic zone and in an area beyond and adjacent to it. Para 1. Where the same stock or stocks of associated species occur within the exclusive economic zones of two or more coastal States, these States <u>shall</u> seek, either directly or through appropriate subregional or regional organizations, to agree upon the measures necessary to coordinate and ensure the conservation and development of such stocks without prejudice to the other provisions of this Part.</p>	<p>Seychelles must seek international cooperation on regional shark stock management. IOTC mandate does not cover sharks. Seychelles could pursue these issues through signing the CMS shark MoU if it has appropriate regional representation and/or seeking a regional plan of action for sharks ideally through the Nairobi Convention (as this is in line with its PAs, fauna and flora protocol) or SADC. The development of a Regional Plan of Action for Sharks (RPOA) may be appropriate under the auspices of SADC or the Nairobi Convention membership or both.</p>
<p>Para 2. Where the same stock or stocks of associated species occur both within the exclusive economic zone and in an area beyond and adjacent to the zone, the coastal State and the States fishing for such stocks in the adjacent area shall seek, either directly or through appropriate subregional or regional organizations, to agree upon the measures necessary for the conservation of these stocks in the adjacent area.</p>	<p style="text-align: center;">As above</p>
<p>Article 64 Highly Migratory Species 1. The coastal State and other States whose nationals fish in the region for the highly migratory species listed in Annex I <u>shall</u> cooperate directly or through appropriate international organizations with a view to ensuring conservation and promoting the objective of optimum utilization of such species throughout the region, both within and beyond the EEZ. In regions for which no appropriate international organization exists, the coastal State and other States whose nationals harvest these species in the region shall cooperate to establish such an organization and participate in its work.</p>	<p>Annex I lists the following oceanic shark species all of which occur, or have representatives that occur, in Seychelles waters: 16. Oceanic sharks: <i>Hexanchus griseus</i>; <i>Cetorhinus maximus</i>; Family <i>Alopiidae</i>; <i>Rhincodon typus</i>; Family <i>Carcharhinidae</i>; Family <i>Sphyrnidae</i>; Family <i>Isuridae</i>. Need to identify which carcharhinid species occurring in Seychelles can truly be considered migratory. Seychelles could address these obligations through signing the CMS shark MoU and seeking a regional plan of action for sharks through the Nairobi Convention (as it is in line with its PA, fauna & flora Protocol) or SADC.</p>

<p>Article 117 Duty of States to adopt with respect to their nationals measures for the conservation of the living resources of the high seas <u>All States have the duty to take, or to cooperate with other States in taking,</u> such measures for their respective nationals as may be necessary for the conservation of the living resources of the high seas.</p>	<p>Make illegal for all Seychelles flag vessels unsustainable fishing practices and mitigate bycatch issues – e.g. finning (already banned for industrial fishery but not all fisheries), use of metal trace in long lining etc... making mandatory the release of non-target species from purse seine etc...</p>
<p>Article 118 Cooperation of States in the conservation and management of living resources States <u>shall</u> cooperate with each other in the conservation and management of living resources in the areas of the high seas. States whose nationals exploit identical living resources, or different living resources in the same area, shall enter into negotiations with a view to taking the measures necessary for the conservation of the living resources concerned. They <u>shall</u>, as appropriate, cooperate to establish subregional or regional fisheries organizations to this end.</p>	<p>If it has appropriate membership signing the CMS MoU might be a suitable mechanism for addressing high seas shark conservation and management obligations. Alternatively regional approaches could be pursued through SADC or the Nairobi Convention. A regional POA also offers potential. IOTC has scope but its mandate currently explicitly excludes sharks.</p>
<p>Article 119 Conservation of the living resources of the high seas 1. In determining the allowable catch and establishing other conservation measures for the living resources in the high seas, States <u>shall</u>: b). take into consideration the effects on species associated with or dependent upon harvested species with a view to maintaining or restoring populations of such associated or dependent species above levels at which their reproduction may become seriously threatened.</p>	<p>IOTC would superficially be the ideal agency to address this but their mandate explicitly excludes shark. As with previous points the CMS Sharks MoU, if membership is appropriate and/or a SADC or Nairobi Convention based regional approach could address these obligations</p>
<p>2. Available scientific information, catch and fishing effort statistics, and other data relevant to the conservation of fish stocks <u>shall</u> be contributed and exchanged on a regular basis through competent international organizations, whether subregional, regional or global, where appropriate and with participation by all States concerned.</p>	<p>Seychelles must make available catch data and related fishery research to international organisations. To this end Seychelles needs to review and upgrade the quality and resolution of by-catch data collected on the tuna and bill fish fisheries.</p>
<p>3. States concerned <u>shall</u> ensure that conservation measures and their implementation do not discriminate in form or in fact against the fishermen of any State.</p>	<p>Seychelles must expand the finning ban to cover all vessels not just foreign ones.</p>

2). The Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks Agreement	
Text	Implications for NPOA 2 and national shark conservation and fishery management
<p>Article 2 Objective The objective of this Agreement is to ensure the long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks through effective implementation of the relevant provisions of the Convention.</p>	<p>Generic requirements</p>
<p>Article 3 Application 1. Unless otherwise provided, this Agreement applies to the conservation and management of straddling fish stocks and highly migratory fish stocks beyond areas under national jurisdiction, except that articles 6 and 7 apply also to the conservation and management of such stocks within areas under national jurisdiction, subject to the different legal regimes that apply within areas under national jurisdiction and in areas beyond national jurisdiction as provided for in the Convention.</p>	<p>Provisions pertaining to: Article 6: Application of the Precautionary Approach, and Article 7: Compatibility of conservation and management measures are also applicable within the Seychelles EEZ.</p>
<p>Article 5 General Principles In order to conserve and manage straddling fish stocks and highly migratory fish stocks, coastal States and States fishing on the high seas <u>shall</u>, in giving effect to their duty to cooperate in accordance with the Convention: (a) adopt measures to ensure long-term sustainability of straddling fish stocks and highly migratory fish stocks and promote the objective of their optimum utilization;</p>	<p>Seychelles must seek regional/international mechanisms to enable the sustainability of migratory shark populations.</p>
<p>(b) ensure that such measures are based on the best scientific evidence available and are designed to maintain or restore stocks at levels capable of producing maximum sustainable yield, as qualified by relevant environmental and economic factors, including the special requirements of developing States, and taking into account fishing patterns, the interdependence of stocks and any generally recommended international minimum standards, whether subregional, regional or global;</p>	<p>The objective of stock recovery must be to return stocks to levels that can provide MSY (for sharks this is likely significantly higher than the standard 30% biomass ration applied to mass spawning fish species).</p>

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<p>(d) assess the impacts of fishing, other human activities and environmental factors on target stocks and species belonging to the same ecosystem or associated with or dependent upon the target stocks;</p>	<p>A holistic review of factors affecting migratory shark stocks must be incorporated into measures to conserve and manage them.</p>
<p>(e) adopt, where necessary, conservation and management measures for species belonging to the same ecosystem or associated with or dependent upon the target stocks, with a view to maintaining or restoring populations of such species above levels at which their reproduction may become seriously threatened;</p>	<p>Seychelles must adopt measures to enhance the conservation status of threatened migratory shark species (currently there are none except for the national protection of the Whale shark).</p>
<p>(f) minimize pollution, waste, <u>discards</u>, <u>catch by lost or abandoned gear</u>, <u>catch of non-target species</u>, both fish and non-fish species, (hereinafter referred to as non-target species) and impacts on associated or dependent species, <u>in particular endangered species</u>, through measures including, to the extent practicable, the development and use of selective, environmentally safe and cost-effective fishing gear and techniques;</p>	<p>Seychelles must utilise the most environmentally friendly fishing technologies to minimise bycatch of migratory shark species and in particular endangered shark species. (e.g. limit use of FADs, require FADs to be of non-entangling design, ban the use of metal trace in longline fisheries and investigate the viability of using round hook and shark deterrent technologies).</p>
<p>(g) protect biodiversity in the marine environment;</p>	<p>General reference to protecting shark species and their populations to maintain their ecological role.</p>
<p>(h) take measures to prevent or eliminate overfishing and excess fishing capacity and to ensure that levels of fishing effort do not exceed those commensurate with the sustainable use of fishery resources;</p>	<p>Remove subsidies from fisheries. e.g. Ban finning, ban longlining on banks and the Mahe plateau.</p>
<p>(i) take into account the interests of artisanal and subsistence fishers;</p>	<p>Special consideration must be made for artisanal shark fishers when developing conservation and management measures.</p>
<p>(j) collect and share, in a timely manner, complete and accurate data concerning fishing activities on, inter alia, vessel position, catch of target and non-target species and fishing effort, as set out in Annex I, as well as information from national and international research programmes;</p>	<p>Develop and implement shark catch monitoring in line with the minimum international standards.</p>
<p>(k) promote and conduct scientific research and develop appropriate technologies in support of fishery conservation and management; and</p>	<p>As above and encourage and support civil society research initiatives.</p>
<p>(l) implement and enforce conservation and management measures through effective monitoring, control and surveillance.</p>	<p>Review and upgrade as appropriate monitoring regimes.</p>

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<p>Article 6 Application of the Precautionary Approach</p> <p>1. States <u>shall</u> apply the precautionary approach widely to conservation, management and exploitation of straddling fish stocks and highly migratory fish stocks in order to protect the living marine resources and preserve the marine environment.</p>	<p>Seychelles must incorporate the precautionary approach into its management measures of migratory sharks and sharks in its EEZ.</p>
<p>2. States <u>shall</u> be more cautious when information is uncertain, unreliable or inadequate. The absence of adequate scientific information <u>shall not</u> be used as a reason for postponing or failing to take conservation and management measures.</p>	<p>The absence of adequate scientific information (currently true in general of shark populations, shark catch and shark fisheries in Seychelles) shall not be used as a reason for postponing or failing to take conservation and management measures.</p>
<p>3. In implementing the precautionary approach, States <u>shall</u>: (b) apply the guidelines set out in Annex II and determine, on the basis of the best scientific information available, stock-specific reference points and the action to be taken if they are exceeded;</p>	<p>Seychelles must develop stock-specific reference points on shark fisheries.</p>
<p>(d) develop data collection and research programmes to assess the impact of fishing on non-target and associated or dependent species and their environment, and adopt plans which are necessary to ensure the conservation of such species and to protect habitats of special concern.</p>	<p>Seychelles must push for much more substantive measures to assess the bycatch under the auspices of the IOTC. Reporting requirements for the S-I fleet must be enforced. A prioritised management-oriented research programme must be developed and implemented on the shark populations of the Mahe plateau and other banks.</p>
<p>5. Where the status of target stocks or non-target or associated or dependent species is of concern, States shall subject such stocks and species to enhanced monitoring in order to review their status and the efficacy of conservation and management measures. They shall revise those measures regularly in the light of new information.</p>	<p>The 2007 NPOA classified the shark fishery in general in Seychelles as overfished and depleted – this para of Article 6 makes it clear that Seychelles is therefore required to “subject such stocks and species to enhanced monitoring in order to review their status and the efficacy of conservation and management measures”. It is pertinent to note that aside from the existing Protected Areas (which equal less than 0.1% of Seychelles EEZ), the ban of fining in the industrial fishery, the ban on the use of gill nets in the artisanal shark fishery and protection of the whale shark there are currently no conservation or management measures in place.</p>
<p>7. If a natural phenomenon has a significant adverse impact on the status of straddling fish stocks or highly migratory fish stocks, States <u>shall</u> adopt conservation and management measures on an emergency basis to ensure that fishing activity does not exacerbate such adverse impact. States <u>shall</u> also</p>	<p>Natural impacts e.g. algal blooms, ENSO, multiyear cycles etc. should be factored into management measures for shark stocks.</p>

<p>adopt such measures on an emergency basis where fishing activity presents a serious threat to the sustainability of such stocks. Measures taken on an emergency basis shall be temporary and shall be based on the best scientific evidence available.</p>	
<p>Article 7 Compatibility of conservation and management measures. 1(a) with respect to straddling fish stocks, the relevant coastal States and the States whose nationals fish for such stocks in the adjacent high seas area shall seek, either directly or through the appropriate mechanisms for cooperation provided for in Part III, to agree upon the measures necessary for the conservation of these stocks in the adjacent high seas area; 1(b) with respect to highly migratory fish stocks, the relevant coastal States and other States whose nationals fish for such stocks in the region shall cooperate, either directly or through the appropriate mechanisms for cooperation provided for in Part III, with a view to ensuring conservation and promoting the objective of optimum utilization of such stocks throughout the region, both within and beyond the areas under national jurisdiction.</p>	<p>International cooperation is required to harmonise management measures.</p>
<p>2. Conservation and management measures established for the high seas and those adopted for areas under national jurisdiction shall be compatible in order to ensure conservation and management of the straddling fish stocks and highly migratory fish stocks in their entirety. To this end, coastal States and States fishing on the high seas have a duty to cooperate for the purpose of achieving compatible measures in respect of such stocks. In determining compatible conservation and management measures, States shall [<i>inter alia</i>]: (f) ensure that such measures do not result in harmful impact on the living marine resources as a whole.</p>	<p>International cooperation is required to harmonise management measures.</p>
<p>3. In giving effect to their duty to cooperate, States shall make every effort to agree on compatible conservation and management measures within a reasonable period of time.</p>	<p>Action in this regard should be taken and advanced forthwith.</p>

<p>Article 8 Cooperation for conservation and management 1. Coastal States and States fishing on the high seas <u>shall</u>, in accordance with the Convention, pursue cooperation in relation to straddling fish stocks and highly migratory fish stocks either directly or through appropriate subregional or regional fisheries management organizations or arrangements, taking into account the specific characteristics of the subregion or region, to ensure effective conservation and management of such stocks.</p>	<p>IOTC explicitly does not address shark stocks. Seychelles therefore is required to pursue other regional or sub-regional approaches, e.g. the development of an RPOA-sharks for SADC or the development of measures under the auspices of the Nairobi Convention and its wildlife protocol. If the CMS Sharks MoU has appropriate regional membership it may also provide a basis to address this article.</p>
<p>5. Where there is no subregional or regional fisheries management organization or arrangement to establish conservation and management measures for a particular straddling fish stock or highly migratory fish stock, relevant coastal States and States fishing on the high seas for such stock in the subregion or region <u>shall</u> cooperate to establish such an organization or enter into other appropriate arrangements to ensure conservation and management of such stock and shall participate in the work of the organization or arrangement.</p>	<p style="text-align: center;">As Above</p>
<p>Article 10 Functions of subregional and regional fisheries management organisations and arrangements (d) obtain and evaluate scientific advice, review the status of the stocks and assess the impact of fishing on non-target and associated or dependent species;</p>	<p>Seychelles must lobby the IOTC to properly undertake its role to assess the impact of tuna fishing on shark species.</p>
<p>Article 24 Recognition of the special requirements of developing States (b) the need to avoid adverse impacts on, and ensure access to fisheries by, subsistence, small-scale and artisanal fishers and women fishworkers, as well as indigenous people in developing States, particularly SIDS.</p>	<p>Conservation and management measures must take into consideration the needs of artisanal shark fishers.</p>

3). Nairobi Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Western Indian Ocean (as amended 2010)	
Text	Implications for NPOA 2 and national shark conservation and fishery management
<p>Article 4: General Obligations 1. ...to ensure sound environment management of natural resources, using for this purpose the best practicable means at their disposal, and in accordance with their capabilities.</p>	
<p>Article 11: Biological Diversity 1. The Contracting Parties <u>shall</u>, individually or jointly, take appropriate measures to conserve biological diversity and protect and preserve rare or fragile ecosystems as well as rare, endangered or threatened species of fauna and flora and their habitats in the Convention area. 2. The Contracting Parties shall, in areas under their jurisdiction, establish protected areas, such as parks and reserves, and shall regulate and, where required and subject to the rules of international law, prohibit any activity likely to have adverse effects on the species, ecosystems or biological processes that such areas are established to protect.</p>	<p>Seychelles is required to take appropriate measures to “protect and preserve” rare, endangered and threatened species of shark.</p> <p>Appropriate measures may include protected areas for sharks.</p>
4). Protocol Concerning Protected Areas and Wild Fauna and Flora in the Eastern African Region	
<p>Article 2: General Undertaking 1). The Contracting Parties shall take all appropriate measures to maintain essential ecological processes and life support systems, to preserve genetic diversity, and to ensure the sustainable utilization of harvested natural resources under their jurisdiction. In particular, the Contracting Parties shall endeavour to protect and preserve rare or fragile ecosystems as well as rare, depleted, threatened or endangered species of wild fauna and flora and their habitats in the Eastern African region.</p>	<p>Seychelles must endeavour to protect and preserve rare, depleted, threatened or endangered species of shark in the Nairobi convention area – an RPOA-sharks would be perhaps an appropriate mechanism.</p>

<p>2). To this end, the Contracting Parties shall develop national conservation strategies and co-ordinate, if appropriate, such strategies within the framework of regional conservation activities.</p>	<p>As above</p>
<p>Article 4 : Species of wild fauna requiring Special Protection The Contracting Parties <u>shall</u> take all appropriate measures to ensure the strictest protection of the endangered wild fauna species listed in annex II. To this end, each Contracting Party shall strictly regulate and, where required, prohibit activities having adverse effects on the habitats of such species. In particular, the following activities shall, where required, be prohibited with regard to such species:</p> <ul style="list-style-type: none"> a). all forms of capture, keeping or killing; b). damage to, or destruction of, critical habitats; c). disturbance of wild fauna, particularly during the period of breeding, rearing and hibernation; d). destruction or taking of eggs from the wild or keeping these eggs even if empty; e). possession of and internal trade in these animals, alive or dead, including stuffed animals and any readily recognizable part or derivative thereof. 	<p>Currently there are no sharks listed in Annex II, however the protocol offers an available regional means for listing endangered shark species and advancing their protection and conservation status.</p>
<p>Article 5 : Harvestable Species of Wild Fauna 1. The Contracting Parties <u>shall</u> take all appropriate measures to ensure the protection of the depleted or threatened wild fauna species listed in annex III. 2. Any exploitation of such wild fauna species shall be regulated in order to restore and maintain the populations at optimum levels. Each Contracting Party shall develop, adopt and implement management plans for the exploitation of such species which may include:</p> <ul style="list-style-type: none"> a). the prohibition of the use of all indiscriminate means of capture and killing and of the use of all means capable of causing local disappearance of, or serious disturbance to, populations of a species; b). closed seasons and other procedures regulating exploitation; c). the temporary or local prohibition of exploitation, as appropriate, in order to restore viable population levels; 	<p>Currently there are no sharks listed in Annex III, however the protocol offers an available regional means for listing depleted or threatened shark species and advancing their protection and conservation status.</p>

<p>d). the regulation, as appropriate, of sale, keeping for sale, transport for sale or offering for sale of live and dead wild animals;</p> <p>e). the safeguarding of breeding stocks of such species and their critical habitats in protected areas designated in accordance with article 8 of this Protocol;</p> <p>f). exploitation in captivity.</p>	
<p>Article 6 : MIGRATORY SPECIES The Contracting Parties <u>shall</u>, in addition to the measures specified in articles 3, 4 and 5, co-ordinate their efforts for the protection of migratory species listed in annex IV whose range extends into their territories. To this end, each Contracting Party shall ensure that, where appropriate, the closed seasons and other measures referred to in paragraph 2 of article 5 are also applied with regard to such migratory species.</p>	<p>Currently there are no sharks listed in Annex IV, however the protocol offers an available regional means for listing migratory shark species and advancing their protection and conservation status.</p>
<p>Article 8 : ESTABLISHMENT OF PROTECTED AREAS</p> <p>1. The Contracting Parties <u>shall, where necessary, establish protected areas</u> in areas under their jurisdiction with a view to safeguarding the natural resources of the Eastern African region and shall take all appropriate measures to protect those areas.</p> <p>2. Such areas shall be established in order to safeguard:</p> <p>a). the ecological and biological processes essential to the functioning of the Eastern African region;</p> <p>b). representative samples of all types of ecosystems of the Eastern African region;</p> <p>c). populations of the greatest possible number of species of fauna and flora depending on these ecosystems;</p> <p>d). areas having a particular importance by reason of their scientific, aesthetic, cultural or educational purposes.</p> <p>3. In establishing protected areas, the Contracting Parties shall take into account, inter alia, their importance as:</p> <p>a). natural habitats, and in particular as critical habitats, for species of fauna and flora, especially those which are rare, threatened or endemic;</p> <p>b). migration routes or as wintering, staging, feeding or moulting sites for migratory species;</p>	<p>Critical habitats for sharks (e.g. nurseries, pupping grounds, aggregation areas, migratory corridors etc...) must be incorporated into the protected area network.</p>

<p>c). areas necessary for the maintenance of stocks of economically important marine species; d). reserves of genetic resources; e). rare or fragile ecosystems;</p>	
<p>Article 12 : TRADITIONAL ACTIVITIES 1. The Contracting Parties shall, in promulgating protective measures, take into account the traditional activities of their local populations in the areas to be protected. To the fullest extent possible, no exemption which is allowed for this reason shall be such as: a). to endanger either the maintenance of ecosystems protected under the terms of the present Protocol or the biological processes contributing to the maintenance of those ecosystems; b). to cause either the extinction of, or any substantial reduction in, the number of individuals making up the species of animal and plant populations within the protected ecosystems, or any ecologically connected species or populations, particularly migratory, endemic, rare, depleted, threatened or endangered species. 2. Contracting Parties which allow exemptions under paragraph 1 of this article with regard to protective measures shall inform the Organization accordingly.</p>	<p>Artisanal Shark Fishers’ needs may as appropriate be incorporated into the provisions of Protected Areas.</p>
<p>Article 16 : REGIONAL CO-OPERATION The Contracting Parties shall establish a regional programme to co-ordinate the selection, establishment, and management of protected areas and the protection of wild fauna and flora with a view to creating a representative network of protected areas in the Eastern African region. There shall be regular exchanges of information concerning the characteristics of the protected areas and wild fauna and flora, the experience acquired and the problems encountered.</p>	<p>Seychelles must cooperate in the establishment of regionally representative PAN.</p>

5). SADC Protocol on Fisheries	
<p>Article 3: Objective The objective of this Protocol is to promote responsible and sustainable use of the living aquatic resources and aquatic ecosystems in order to:</p> <ul style="list-style-type: none"> a). promote and enhance food security and human health; b). safeguard the livelihood of fishing communities; c). generate economic opportunities for nationals in the Region; d). ensure that future generations benefit from these renewable resources; e). alleviate poverty with the ultimate objective of its eradication. 	
<p>Article 5: National Responsibilities 1). State Parties <u>shall</u> take measures, at national and international levels, suitable for the harmonisation of laws, policies, plans and programmes on fisheries aimed at promoting the objective of this Protocol.</p>	<p style="text-align: center;">Seychelles will take national measures and pursue regional measures to ensure the responsible and sustainable use of sharks.</p>
<p>5). State Parties, taking into account the best scientific evidence available <u>shall</u>, through proper conservation and management measures ensure that aquatic living resources in the areas under their national jurisdiction are not endangered by over exploitation.</p>	<p style="text-align: center;">Seychelles will take national measures to ensure that sharks are not endangered by overexploitation.</p>
<p>Article 7: Management of Shared Resources 3). State Parties shall co-operate in exchange of information on:</p> <ul style="list-style-type: none"> a). the state of the shared resources; b). levels of fishing effort ; c). measures taken to monitor and control exploitation of shared resources; d). plans for new or expanded exploitation; and e). relevant research activities and results. 	<p style="text-align: center;">Seychelles must exchange information with other Parties pertaining to the conservation, sustainable use and management of shared (migratory for Seychelles) shark resources.</p>
<p>4). Two or more State Parties may establish instruments for coordination, cooperation, or integration of management of shared resources, including:</p> <ul style="list-style-type: none"> a). specialist scientific advisory groups; b). joint programmes and projects, in particular on integrated assessment of shared stocks; c). joint technical or advisory committees on resources management; d). joint ministerial commissions with powers to allocate shared resources among State Parties and agree on management measures; and 	<p style="text-align: center;">Caters for the development of bilateral/multilateral or regional shark plans of action.</p>

<p>e). collaboration in enforcement of management plans for shared resources.</p>	
<p>5). State Parties may agree on management plans, for shared resources, which may include the following components: a). harmonised, or integrated systems to monitor resources and their exploitation, joint fish stock assessment programmes, agreed scientific methodologies for determination of the state of the stocks and preparation of best scientific advice on sustainable levels of exploitation; b). agreed management measures and specification of means for implementing and enforcing such measures; c). principles, policies, and means for allocation of shared resources; and d). means for fostering joint venture enterprises.</p>	<p>Caters for the development of bilateral/multilateral or regional shark plans of action.</p>
<p>8). State Parties <u>shall</u> take measures to prevent and eliminate overfishing and excess fishing capacity in the Region and to ensure that levels of fishing effort do not exceed those commensurate with the sustainable use of fish resources.</p>	<p>Seychelles must take measures to reduce shark fishing effort to sustainable – in this case to allow for the recovery of stocks – levels.</p>
<p>Article 11: High Seas Fishing Consistent with Article 6 of this Protocol, States Parties <u>undertake</u> to: b). work towards effective management of the high seas c). collaborate in the establishment of common positions and policies with regard to the effective management of the high seas living aquatic resources; d). support the activities of international organisations which conserve and manage living aquatic resources on the high seas, and which act in non-discriminatory manner in relation to State Parties.</p>	<p>Caters for the development of bilateral/multilateral or regional shark plans of action. Seychelles should support international shark conservation initiatives</p>
<p>Article 12: Artisanal, Subsistence Fisheries and Small Scale Commercial Fisheries 1). State Parties <u>shall</u> seek a rational and equitable balance between social and economic objectives in the exploitation of living aquatic resources accessible to artisanal and subsistence fishers by: a). Instituting legal, administrative and enforcement measures necessary for the protection of artisanal and subsistence fishing rights, tenure and fishing grounds.</p>	<p>Special consideration must be given to the needs of Artisanal Shark Fishers when developing shark stock conservation and management measures.</p>
<p>6). State Parties shall facilitate broad based and equitable participatory processes to involve artisanal and subsistence fishers in the control and management of their fishing related activities.</p>	<p>Artisanal shark fishers must be equitably incorporated into shark fishery management regimes.</p>

<p>Article 14: Protection of the Aquatic Environment 3). State Parties <u>shall</u> address the causes of aquatic environmental degradation by undertaking measures in conformity with the Treaty and its Protocols and other international treaties and conventions of relevance to the environment.</p>	<p>Obligation to general marine protection</p>
<p>4). Each State Party <u>shall</u> in close cooperation with the SADC institutions and relevant international agencies take concerted action to protect endangered living aquatic species and their habitats, so as to: a). compile a list of the species; b). introduce measures to progressively replace fishing gear and other technologies which are hazardous to the species; c). promote broad awareness by all stakeholders of the need for protection of the species and their habitats; d). seek alternative economic activities for those whose livelihoods impact upon the survival of the species.</p>	<p>Seychelles must take action to protect endangered sharks including the replacement of fishing gear and other technologies which are hazardous to the species.</p>
<p>7). Each State Party <u>shall</u> coordinate the establishment of inland and marine protected areas, with particular reference to critical habitats and endangered species, especially migratory species in transboundary areas.</p>	<p>Seychelles must incorporate provision for endangered sharks in its PAN</p>
<p>8). Each State Party shall adopt the necessary legislative and administrative measures to prevent pollution of waters by inland, coastal or offshore activities.</p>	<p>Pollution of shark nursery habitats must be addressed by appropriate legislation and administration.</p>
<p>Article 21: Annexes 1). State Parties may develop and adopt annexes for the implementation of this Protocol. 2). An annex shall form an integral part of this protocol.</p>	<p>Offers scope for the listing of endangered, threatened, depleted and migratory shark stocks to be addressed by the appropriate provisions of the protocol.</p>
<p>6). The Convention on International Trade in Endangered Species (CITES)</p>	
<p>Article 3: Regulation of Trade in Specimens of Species Included in Appendix I</p>	<p>Seychelles waters are not currently known to host any Appendix I elasmobranch species, however this will likely change in the near future with changes to CITES listings, so the situation requires regular review. Although formerly known to host <i>Pristis</i> species these are now believed to have been extirpated from Seychelles waters.</p>

<p>Article 4: Regulation of Trade in Specimens of Species Included in Appendix II</p> <p>2. The export of any specimen of a species included in Appendix II shall require the prior grant and presentation of an export permit. An export permit shall only be granted when the following conditions have been met:</p> <p>a). a Scientific Authority of the State of export has advised that such export will not be detrimental to the survival of that species;</p> <p>b). a Management Authority of the State of export is satisfied that the specimen was not obtained in contravention of the laws of that State for the protection of fauna and flora; and</p> <p>c). a Management Authority of the State of export is satisfied that any living specimen will be so prepared and shipped as to minimize the risk of injury, damage to health or cruel treatment.</p>	<p>Currently Seychelles does not have the capacity or requisite information to undertake the NDF (Non-Detriment Finding) process for sharks required to fulfil (2a). This needs to be addressed.</p>
<p>3. A Scientific Authority in each Party shall monitor both the export permits granted by that State for specimens of species included in Appendix II and the actual exports of such specimens. Whenever a Scientific Authority determines that the export of specimens of any such species should be limited in order to maintain that species throughout its range at a level consistent with its role in the ecosystems in which it occurs and well above the level at which that species might become eligible for inclusion in Appendix I, the Scientific Authority shall advise the appropriate Management Authority of suitable measures to be taken to limit the grant of export permits for specimens of that species.</p>	<p>Seychelles Scientific authority and Management Authority are currently the same agency (indeed same individual)</p>
<p>6. The introduction from the sea of any specimen of a species included in Appendix II shall require the prior grant of a certificate from a Management Authority of the State of introduction. A certificate shall only be granted when the following conditions have been met:</p> <p>a). a Scientific Authority of the State of introduction advises that the introduction will not be detrimental to the survival of the species involved; and</p> <p>b). a Management Authority of the State of introduction is satisfied that any living specimen will be so handled as to minimize the risk of injury, damage to health or cruel treatment.</p>	<p>This is not currently undertaken. No information as to the amount of listed shark or shark products are introduced from the high seas onto the local market – especially fins.</p>

7). The Convention on the Conservation of Migratory Species of Wild Animals	
<p>Article II Fundamental Principles</p> <p>1. The Parties acknowledge the importance of migratory species being conserved and of Range States agreeing to take action to this end whenever possible and appropriate, paying special attention to migratory species the conservation status of which is unfavourable, and taking individually or in co-operation appropriate and necessary steps to conserve such species and their habitat.</p> <p>2. The Parties acknowledge the need to take action to avoid any migratory species becoming endangered.</p> <p>3. In particular, the Parties:</p> <p>a) should promote, co-operate in and support research relating to migratory species;</p> <p>b) shall endeavour to provide immediate protection for migratory species included in Appendix I; and</p> <p>c) shall endeavour to conclude Agreements covering the conservation and management of migratory species included in Appendix II.</p>	<p>Seychelles should cooperate on research and seek to identify additional species appropriate for nomination to Appendices I or II</p> <p>There are various shark \and ray species that occur in Seychelles waters classified by IUCN as endangered that are not currently listed by CMS.</p>
<p>Article III Endangered Migratory Species: Appendix I</p> <p>1. Appendix I shall list migratory species which are endangered.</p> <p>2. A migratory species may be listed in Appendix I provided that reliable evidence, including the best scientific evidence available, indicates that the species is endangered.</p>	<p>Appendix I currently lists 5 species of shark known to occur in Seychelles waters and 3 other species that may do.</p>
<p>4. Parties that are Range States of a migratory species listed in Appendix I shall endeavour:</p> <p>a) to conserve and, where appropriate, restore those habitats of the species which are of importance in removing the species from danger of extinction;</p> <p>b) to prevent, remove, compensate for or minimize, as appropriate, the adverse effects of activities or obstacles that seriously impede or prevent the migration of the species; and</p> <p>c) to the extent feasible and appropriate, to prevent, reduce or control factors that are endangering or are likely to further endanger the species...</p>	<p>None of the 5 species known to occur in Seychelles waters are currently protected by law.</p>

<p>5. Parties that are Range States of a migratory species listed in Appendix I shall prohibit the taking of animals belonging to such species. Exceptions may be made to this prohibition only if:</p> <p>a) the taking is for scientific purposes;</p> <p>b) the taking is for the purpose of enhancing the propagation or survival of the affected species;</p> <p>c) the taking is to accommodate the needs of traditional subsistence users of such species; or</p> <p>d) extraordinary circumstances so require; provided that such exceptions are precise as to content and limited in space and time. Such taking should not operate to the disadvantage of the species.</p>	<p>None of the 5 known species are currently protected by Seychelles law. Seychelles must assess the species in question in the national context and determine whether any of these exceptions apply.</p> <p>Note Mobula species predominantly <i>M. kuhlii</i> but possibly also <i>M. eregoodootenkee</i> are a frequent component of the artisanal catch.</p>
<p>Article IV Migratory Species to be the Subject of Agreements: Appendix II</p> <p>1. Appendix II shall list migratory species which have an unfavourable conservation status and which require international agreements for their conservation and management, as well as those which have a conservation status which would significantly benefit from the international cooperation that could be achieved by an international agreement.</p> <p>2. If the circumstances so warrant, a migratory species may be listed both in Appendix I and Appendix II.</p> <p>3. Parties that are Range States of migratory species listed in Appendix II <u>shall</u> endeavour to conclude AGREEMENTS where these should benefit the species and should give priority to those species in an unfavourable conservation status.</p> <p>4. Parties are encouraged to take action with a view to concluding agreements for any population or any geographically separate part of the population of any species or lower taxon of wild animals, members of which periodically cross one or more national jurisdiction boundaries.</p>	<p>Appendix II currently lists 14 species of shark known to occur in Seychelles waters and 3 other species that may do.</p> <p>Seychelles is not currently party to any agreements with regard to these species</p> <p>Seychelles should move to sign the CMS Sharks MoU and/or pursue other regional agreements to protect the species in question.</p>

Annex IV: Species Listing

Annex IV: Elasmobranch Species - known or believed to occur in Seychelles waters			
<i>Hexanchidae</i>	<i>Heptranchias perlo</i>	Sharpnose sevengill shark	NT
	<i>Hexanchus griseus</i>	Bluntnose sixgill shark	NT
	<i>Hexanchus nakamurai</i>	Bigeyed sixgill shark	DD
Somniosidae	<i>Centroscymnus coelolepis</i>	Portuguese dogfish	NT
	<i>Centroscymnus crepidater</i>	Longnose velvet dogfish	LC
	<i>Zameus squamulosus</i>	Velvet dogfish	DD
Centrophoridae	<i>Centrophorus granulosus</i>	Gulper shark	VU
	<i>Centrophorus moluccensis</i>	Smallfin gulper shark	DD
	<i>Centrophorus seychellorum</i>	Seychelles gulper shark	DD
	<i>Centrophorus sp. 1</i>		
	<i>Centrophorus sp. 2</i>		
	<i>Centrophorus spp.</i>		
Squalidae	<i>Centrophorus squamosus</i>	Leafscale gulper shark	VU
	<i>Cirrhigaleus asper</i>	Roughskin spurdog	DD
	<i>Squalus megalops</i>	Shortnose spurdog	DD
	<i>Squalus mitsukurii</i>	Shortspine spurdog	DD
	<i>Squalus lalannei</i>	Seychelles spurdog	DD
	<i>Squalus sp. 1-5</i>		
Squatinae	<i>Squatina africana</i>	African angelshark	DD
Stegostomatidae	<i>Stegostoma fasciatum</i>	Zebra shark	VU
Ginglymostomatidae	<i>Pseudoginglymostoma brevicaudatum</i>	Short-tail nurse shark	VU
	<i>Nebrius ferrugineus</i>	Tawny nurse shark	VU
Rhincodontidae	<i>Rhincodon typus</i>	Whale shark	VU
Odontaspidae	<i>Carcharias taurus</i>	Sand tiger shark	VU
	<i>Odontaspis ferox</i>	Smalltooth sand tiger	VU
Pseudocarchariidae	<i>Pseudocarcharias kamoharai</i>	Crocodile shark	NT
Alopiidae	<i>Alopias pelagicus</i>	Pelagic thresher	VU
	<i>Alopias superciliosus</i>	Bigeye thresher	VU
	<i>Alopias vulpinus</i>	Thresher	VU
Lamnidae	<i>Carcharodon carcharias</i>	Great white shark	VU
	<i>Isurus oxyrinchus</i>	Shortfin mako	VU
	<i>Isurus paucus</i>	Longfin mako	VU
Pseudotriakidae	<i>Pseudotriakis microdon</i>	False catshark	DD
Triakidae	<i>Mustelus manazo</i>	Starspotted smooth-hound	DD
Hemigaleidae	<i>Hemipristis elongata</i>	Snaggletooth shark	VU
	<i>Carcharhinus albimarginatus</i>	Silvertip shark	NT
	<i>Carcharhinus amblyrhynchos</i>	Grey reef shark	NT
	<i>Carcharhinus amboinensis</i>	Pigeon shark	DD

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Carcharhinidae	<i>Carcharhinus brevipinna</i>	Spinner shark	NT
	<i>Carcharhinus falciformis</i>	Silky shark	NT
	<i>Carcharhinus galapagensis</i>	Galapagos shark	NT
	<i>Carcharhinus leucas</i>	Bull shark	NT
	<i>Carcharhinus limbatus</i>	Blacktip shark	NT
	<i>Carcharhinus longimanus</i>	Oceanic whitetip	VU
	<i>Carcharhinus melanopterus</i>	Blacktip reef shark	NT
	<i>Carcharhinus plumbeus</i>	Sandbar shark	VU
	<i>Carcharhinus sorrah</i>	Spottail shark	NT
	<i>Galeocerdo cuvieri</i>	Tiger shark	NT
	<i>Loxodon macrorhinus</i>	Sliteye shark	LC
	<i>Negaprion acutidens</i>	Sicklefin lemon shark	VU
	<i>Prionace glauca</i>	Blue shark	NT
	<i>Rhizoprionodon acutus</i>	Milk shark	LC
	<i>Triaenodon obesus</i>	Whitetip reef shark	NT
Sphyrnidae	<i>Sphyrna lewini</i>	Scalloped hammerhead	EN
	<i>Sphyrna mokarran</i>	Great hammerhead	EN
	<i>Sphyrna zygaena</i>	Smooth hammerhead	VU
Rhinidae	<i>Rhynchobatus australiae</i>	Whitespotted wedgfish	VU
	<i>Rhina ancylostoma</i>	Bowmouth guitarfish	VU
	<i>Rhinobatus blochi</i>	Bluntnose guitarfish	LC
Torpedinidae	<i>Torpedo fuscomaculata</i>	Black-spotted torpedo	DD
	<i>Torpedo sinuspersici</i>	Marbled electric ray	DD
Plesiobatidae	<i>Plesiobatis daviesi</i>	Deepwater stingray	LC
Dasyatidae	<i>Neotrygon kuhlii</i>	Blue-spotted stingray	DD
	<i>Himantura granulata</i>	Mangrove whipray	NT
	<i>Himantura uarnak</i>	Honeycomb stingray	VU
	<i>Pastinachus sephen</i>	Cowtail stingray	DD
	<i>Pteroplatytrygon violacea</i>	Pelagic stingray	LC
	<i>Taeniura lymma</i>	Ribbontail stingray	NT
	<i>Taeniura meyeni</i>	Blotched fantail ray	VU
Myliobatidae	<i>Urogymnus asperrimus</i>	Porcupine ray	VU
	<i>Aetobatus narinari</i>	Spotted eagle ray	NT
	<i>Aetomylaeus maculatus</i>	Mottled eagle ray	EN
	<i>Aetomylaeus vespertilio</i>	Ornate eagle ray	EN
Rhinopteridae	<i>Rhinoptera javanica</i>	Flapnose ray	VU
Mobulidae	<i>Manta alfredi</i>	Reef manta ray	VU
	<i>Manta birostris</i>	Giant manta ray	VU
	<i>Mobula eregoodootenkee</i>	Pygmy devil ray	NT
	<i>Mobula kuhlii</i>	Shortfin devil ray	DD

Annex V: References

- Bargain, R.M. (2001).** Trends in the Seychelles Semi-Industrial Longline Fishery. IOTC Proceedings no. 4 (2001) page 110-119.
- Dulvy, N.K. et al (2014).** Extinction risk and conservation of the world's sharks and rays. eLIFE 2014;3:e00590.
- FAO (1999).** International Plan of Action for the Conservation and Management of Sharks. FAO Rome 1999. ISBN 92-5-104332-9
- FAO (2000).** FISHERIES MANAGEMENT 1. Conservation and management of Sharks. FAO Technical Guidelines for Responsible Fisheries. Food and Agriculture Organisation of the United Nations. Rome, 2000.
- Filmater, J.D. et al (2013).** Looking behind the curtain: quantifying massive shark mortality in fish aggregating devices. *Front Ecol Environ* 2013; 11(6): 291-296.
- Fischer, J. et al (2012).** Review of the Implementation of International Plan of Action for the Conservation and Management of Sharks. FAO Fisheries and Aquaculture Circular No. 1076. FAO, Rome, 2012. ISBN 978-92-5-107324-7.
- Hall, M. & Roman, M. (2013).** Bycatch and non-tuna catch in the tropical tuna purse seine fisheries of the world. FAO Fisheries and Aquaculture Technical Paper No. 568. Rome, FAO. 249 pp.
- IOTC (1993).** Agreement for the Establishment of the Indian Ocean Tuna Commission.
- IOTC (2015a).** Competence: Area & Species. <http://iotc.org/about-iotc/competence> (26/10/15).
- IOTC (2015b).** Status Summary for Species of Tuna and Tuna-like Species under the IOTC Mandate, as well as other Species Impacted by IOTC Fisheries. <http://www.iotc.org/science/status-summary-species-tuna-and-tuna-species-under-iotc-mandate-well-other-species-impacted-iotc> (26/10/15).
- IOTC (2015c).** Executive Summary: Blue Shark. Status of the Indian Ocean blue shark (BSH: *Prionace glauca*). http://www.iotc.org/sites/default/files/documents/science/species_summaries/english/Blue%20shark.pdf (26/10/15)
- IOTC (2015d).** Executive Summary: Oceanic Whitetip Shark. Status of the Indian Ocean oceanic whitetip shark (OCS: *Carcharhinus longimanus*). http://www.iotc.org/sites/default/files/documents/science/species_summaries/english/Oceanic%20whitetip%20shark.pdf (26/10/15).
- IOTC (2015e).** Executive Summary: Shortfin Mako Shark. Status of the Indian Ocean shortfin mako shark (SMA: *Isurus oxyrinchus*). http://www.iotc.org/sites/default/files/documents/science/species_summaries/english/Shortfin%20mako%20shark.pdf (26/10/25).

IOTC (2015f). Executive Summary: Scalloped Hammerhead Shark. Status of the Indian Ocean Scalloped Hammerhead Shark (SPL: *Sphyrna lewini*).

http://www.iotc.org/sites/default/files/documents/science/species_summaries/english/Scalloped%20hammerhead%20shark.pdf (26/10/15).

IOTC (2015g). Executive Summary: Silky Shark. Status of the Indian Ocean silky shark (FAL: *Carcharhinus falciformis*).

http://www.iotc.org/sites/default/files/documents/science/species_summaries/english/Silky%20shark.pdf (26/10/15).

IOTC (2015h). Executive Summary: Bigeye Thresher Shark. Status of the Indian Ocean bigeye thresher shark (BTH: *Alopias superciliosus*).

http://www.iotc.org/sites/default/files/documents/science/species_summaries/english/Bigeye%20thresher%20shark.pdf (26/10/15).

IOTC (2015i). Executive Summary: Pelagic Thresher Shark. Status of the Indian Ocean pelagic thresher shark (PTH: *Alopias pelagicus*).

http://www.iotc.org/sites/default/files/documents/science/species_summaries/english/Pelagic%20thresher%20shark.pdf (26/10/15).

IOTC (2015j). Report of the 19th Session of the Indian Ocean Tuna Commission. Busan, Rep. of Korea, 27 April – 1 May 2015. IOTC-2015-519-R[E].

Jackson, J.B.C. (2001). What was natural in coastal oceans? *PNAS* 98 (10) 5411-5418.

Jackson, J.B.C. et al (2001). Historical Overfishing and the Recent Collapse of Coastal Ecosystems. *Science* Vol. 293, Issue 5530, pp. 629-637.

Lea, J.S.E. et al (2015). To Madagascar and back: long-distance, return migration across open ocean by a pregnant female bull shark *Carcharhinus leucas*. *Journal of Fish Biology* 2015, doi: 10.1111/jfb.12805

NBS (2012). Population and Housing Census 2010 Report. National Bureau of Statistics, Victoria, Seychelles.

Nevill, J.E.G. (2005). Establishing a Baseline for Shark Fishery Management in the Seychelles. MSc. University of Newcastle upon Tyne, 2005.

Nevill, J.E.G. (2013). The Bull Shark (*Carcharhinus leucas*) on the Mahé Plateau. Bull shark SMSA Presentation.

Nevill, J.E.G. (2014). The Development of a National Shark Fishery Database with Streamlined Monitoring Protocol and Trained Technical Staff. Final Report. GoS/UNP/GEF Mainstreaming Biodiversity Management into Production Sector Activities Project.

Nevill, J.E.G. (2015). *Implementation and Assessment Report*. Seychelles National Plan of Action for the Conservation and Management of Sharks 2007-2001.

Ommanney, F.D. (1965). *A Draught Of Fishes*. Longmans Green and Co Ltd. 48 Grosvenor Street, London W1.

SFA (2007). Seychelles national plan of action for the conservation and management of sharks. Seychelles Fishing Authority, Victoria. Seychelles. 59p.

SFA (2015). Fisheries Statistical Report, Year: 2014. SFA/FSR/02, Seychelles Fishing Authority, P.O. Box 449, Fishing Port, Mahé, Seychelles.

Ward, S. (1873). In: Pike, N. (1873) Sub-tropical rambles in the land of Aphanapteryx. Sampson, Low, Marston, Low and Searle. Crown Buildings, 188 Fleet Street.

Wheeler, J.F.G. & Ommanney, F.D. (1953). Report on the Mauritius-Seychelles Fisheries Survey 1948-1949. Colonial Office. Fishery Publications Vol. I, No. 3, 1953. HMSO.

Worm, B. *et al* (2013). Global catches, exploitation rates, and rebuilding options for sharks. Marine Policy 40 (2013) 194-204.

Annex VI: Acronyms and Abbreviations

ASFA	:	Artisanal Shark Fishers Association
BED	:	Blue Economy Department
CITES	:	Convention on International Trade in Endangered Species
CMS	:	Convention on the Conservation of Migratory Species of Wild Animals
CR	:	Critically Endangered
EN	:	Endangered
D1	:	First dorsal fin height
D2	:	Second dorsal fin height
DD	:	Data Deficient
EEZ	:	Exclusive Economic Zone
EU	:	European Union
FAO	:	United Nations Food and Agriculture Organisation
FL	:	Fork Length
GEF	:	Global Environment Facility
GEF SGP	:	GEF Small Grants Programme
GIF	:	Green Islands Foundation
GoS	:	Government of Seychelles
GVI	:	Global Vision International
IDS	:	Interdorsal Space
IRD	:	Institut de Recherche pour le Developpement
IOTC	:	Indian Ocean Tuna Commission
IPOA	:	International Plan of Action for the Conservation and Management of Sharks
IUCN	:	International Union for Conservation of Nature
LC	:	Least Concern
MCSS	:	Marine Conservation Society, Seychelles
MEECC	:	Ministry of Environment, Energy and Climate Change
MNP	:	Marine Nation Park
MO	:	Modus Operandi
MoU	:	Memorandum of Understanding
MSP	:	Marine Spatial Planning

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Mt	:	Metric Tonnes
NBS	:	National Bureau of Statistics
NC	:	Nairobi Convention
NDF	:	Non-Detriment Finding
NEI	:	Not Elsewhere Identified
NE	:	Not Evaluated
NISTI	:	National Institute for Science, Technology and Innovation
NPOA	:	National Plan of Action for the Conservation and Management of Sharks
NT	:	Near Threatened
OVI	:	Objectively Verifiable Indicator
PAN	:	Protected Area Network
PCL	:	Precaudal Length
PE&A	:	Public Education and Awareness
RPOA	:	Regional Plan of Action for the Conservation and Management of Sharks
SADC	:	South African Development Community
SC	:	Steering Committee
SFA	:	Seychelles Fishing Authority
SFSA	:	United Nations Straddling Fish Stocks Agreement
S-I	:	Semi-Industrial
SIF	:	Seychelles Island Foundation
SMSA	:	Seychelles Maritime Safety Administration
SNPA	:	Seychelles National Park Authority
SOSF	:	Save Our Seas Foundation
TL	:	Total Length
ToR	:	Terms of Reference
UNCLOS	:	United Nations Convention on the Law of the Sea
UNDP	:	United Nations Development Programme
UNDP PCU	:	UNDP Project Coordination Unit
VU	:	Vulnerable
WP	:	Work Programme