Received: 4 & 14 September, 2012
IOTC–2012–WPEB08–15 Rev_1

A Review on Shark Fishery Resources in Sri Lanka

Hasarangi D.G.N., Maldeniya R., and Haputhantri S.S.K

National Aquatic Resources Research and Development Agency (NARA), Crow Island, Mattakkuliya, Colombo 15, Sri Lanka.

Abstract

This study reviews the past and present status of the shark fishery in Sri Lanka. The large pelagic fishery database (*PELAGOS*) of the National Aquatic Resources Research and Development Agency (NARA) in Sri Lanka and the published database for sharks of the Indian Ocean Tuna Commission (IOTC) were incorporated for this review. There is an increasing trend of shark landings since 1950's with the peak of 34,842 Mt reported in 1999. Thereafter, annual shark production has shown a considerable decline up to 3,601 Mt, reported in 2005. Although, sharks were dominant in the historical large pelagic fish landings, their production at present is at a low level and the catches mostly come as a by-catch. During the period from 1950 to 1974, sharks accounted for more than 45% of the total large pelagic fish production. However, at present, the contribution of sharks to the total large pelagic fish production is less than 4%. Currently, the highest percentage of total shark landings is reported from the Southwest coast followed by the South and West coasts and a large quantity of sharks are being caught as a by-catch of the longline-gillnet gear combination. Over 60 shark species have been reported in marine fish landings in Sri Lanka. However, about 12 species are predominant. Among these, currently silky sharks (*Carcharhinus falciformis*) account for more than 50% of the shark species landed by weight. The landings of this species had peaked in 1999 (13,725.6 Mt) and there was a considerable decline thereafter. Oceanic White Tip Shark (*Carcharinus longimanus*) and Blue Shark (*Prionace glauca*) are the next dominant species. This study reveals that shark catches have considerably declined over the past period and Sri Lanka is in the process of implementing several measures for conservation and management of sharks.

Introduction

Sri Lanka is an island state in the Indian Ocean, south-east of the Indian sub-continent between latitudes 6-10° N longitudes 80-82° E. The fisheries sector in Sri Lanka plays an indispensable role in the economy and it is important in terms of income generation, employment, foreign exchange earnings and the animal protein intake for the population. The sector provides 475,000 direct & indirect employment and contributes about 200 million US dollars to foreign exchange earnings as well as accounts 1.7 % of the total GDP at current producer price in 2011 (MFARD, 2012).

Sri Lankan fisheries and aquatic resource base includes a territorial sea of 21,500 km^2 and an Exclusive Economic Zone (EEZ) of 517,000 km^2 (Figure 1). The country has a narrow continental shelf with an average width of 22 km and its extent is 30,000 km^2 which is 5.8% of the country's ocean area. The marine fisheries sector in Sri Lanka is mainly divided into two sub-sectors: Coastal and Offshore & high sea for administrative and analytical purposes.

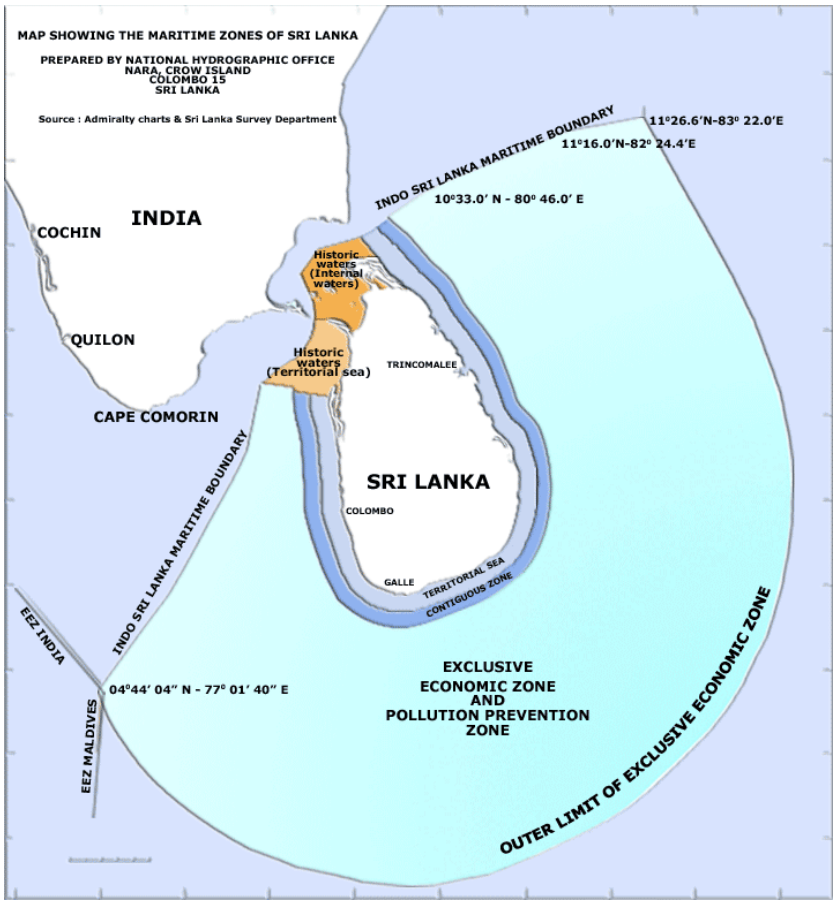

Figure 1. Sri Lankan territory and Exclusive Economic Zone (EEZ)

Marine fish production of Sri Lanka is still dominated by coastal fish production and the fisheries statistics of the last four years indicates that the contribution from coastal fisheries is always exceeding the offshore and high sea fish production. Coastal subsector accounted for about 61% of the total marine fish production while about 39% was taken by offshore and high sea fishing in 2011 (MFARD, 2012). The offshore and high sea fish production is dominated by tuna and tuna like fish.

In the marine fishery sector, sharks have traditionally contributed considerably to the marine fish catch in Sri Lanka and were exploited mostly within the coastal waters and gradually it was extended up to offshore and deep sea areas. Originally, the shark fishery was focused to catch demersal sharks within a localized distribution in the coastal waters.

Historically, sharks were second only to tuna in terms of the amount caught from the large pelagic catches. De Bruien *et al.* (1994) included 48 species as being of interest to the marine fisheries in Sri Lanka (Appendix I). De Silva (1999) recorded 61 species of sharks belonging to 5 orders and 7 families. These species comprise currently known shark species caught from both the territorial waters of Sri Lanka and the Exclusive Economic Zone. Among the commercially important shark species found in Sri Lanka, Amarasooriya (2001) identified 46 species of pelagic and demersal sharks from the landings. However, approximately about 12 species are dominant in the commercial landings in Sri Lanka (Joseph, 1999). Shark meat has enjoyed a ready domestic market in Sri Lanka as there is a high demand, both in fresh and sun dried form and also high demand for shark fins in the export trade. The annual shark production has been estimated at 4851 metric tons in 2009 and it contributes around 3% of the total marine fish production in the country (IOTC, 2012).

This study reviews the past and present status of the shark fishery in Sri Lanka and the management and conservation measures. Two databases, Indian Ocean tuna Commission (IOTC) published database for sharks and *PELAGOS* database of the National Aquatic Resources Research and Development Agency (NARA) were used for this analysis.

Received: 4 & 14 September, 2012
IOTC–2012–WPEB08–15 Rev_1

Evaluation of the shark fishery in Sri Lanka: 1950-2009

Shark fishery

The shark fishery was a target fishery in Sri Lanka around 1990's, however this has gradually changed and sharks are now considered as a by catch species. That is because fishermen had switched to target tuna since catching of tuna has become more profitable than sharks. In fact, tuna fishery became profitable because there is a considerably high demand for tuna in Japanese and the European markets. Apart from that, some management measures taken by the Sri Lankan government (For an example, shark regulation gazette in 2001 under fisheries act) and strengthening of law enforcements against the maritime boundaries were also partially responsible for declining of the shark landings.

Shark data collection

As a responsible party, National Aquatic Resources Research and Development Agency (NARA) in Sri Lanka has directly involved for offshore and coastal fishery data collection and has a well established large pelagic fishery data collection programme (including a database) since 1994. Species wise shark catch recording was also carried out until 2004 by NARA under above programme and it was decided to lump all the shark catches instead of reporting species wise data since there was a very low contribution of sharks to the total large pelagic fish production. However, species wise catch reporting was restarted in 2011 in order to comply with the recently adopted resolutions for sharks by the Indian Ocean Tuna Commission (IOTC).

Fishing vessels and gear

In past, fishing activities conducted for targeting sharks were mostly confined to coastal waters and sharks were caught with coastal vessels. The drift longline fishery for sharks (shark longline fishery) was introduced to Sri Lanka in the late 1950's along with the introduction of the new 3.5 GT inboard engine crafts. At the beginning, these boats were provided with 20 bundles of tuna longlines for catching tuna. However, this fishery was not sustained since the high cost of bait and low catches of tuna. As a result, fishermen started to target sharks and the tuna longline fishery gradually transformed into a drift longline fishery for catching sharks. Since 1970s and 1980s other gears such as gillnets were more and more popularized among the fishermen with the motorization of fishing crafts and large mesh drift

gillnets were started to use for catching sharks too. With the expansion in the offshore fishery in Sri Lanka in 1980´s along with the reintroduction of tuna longlines, the shark fishery extended well beyond the EEZ for targeting pelagic sharks and gillnet longline combination became more popular (Joseph, 1999).

Shark production

Historically sharks were dominant in the large pelagic fish production and there is an increasing trend of shark landings since 1950's to a peak production of 34,842 Mt reported in 1999 (Figure 2). The drastic increase in the shark production after mid 1980s' may be due to the rapid development of marine fisheries sector in Sri Lanka after reintroduction of tuna longlines for offshore fishery. At the beginning, these longliners were very popular for catching sharks too and the localized shark fishery was extended up to EEZ and beyond for targeting pelagic sharks. However, the annual shark production has shown a considerable decline after 1999 with the lowest catch of 3,601 Mt reported in 2005. The gap between the total large pelagic fish production and the shark production has increased with time and it has further widened with the declining of shark landings after 1999. The sudden drop in the total large pelagic fish production in 2005 was due to the tsunami disaster at the end of 2004.

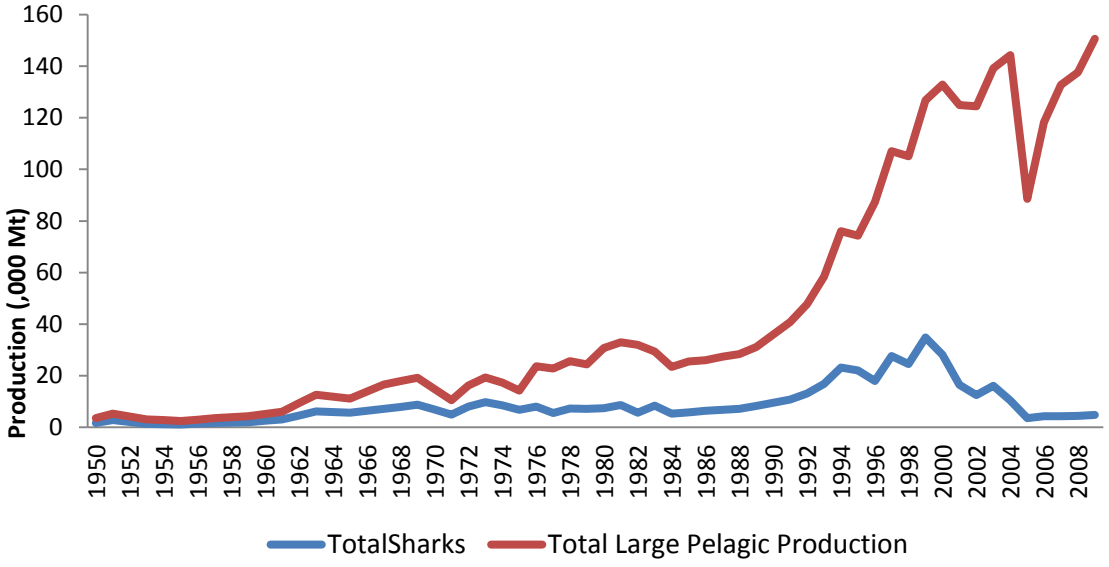

Figure 2. Shark production vs. total large pelagic fish production: 1950 - 2009

The contribution of sharks to the total large pelagic fish production clearly indicates a gradual decline with time (Figure 3). Although the contribution of sharks had accounted more than

45% of the total large pelagic fish production until 1974, it has become less than 5 % over the last five year period.

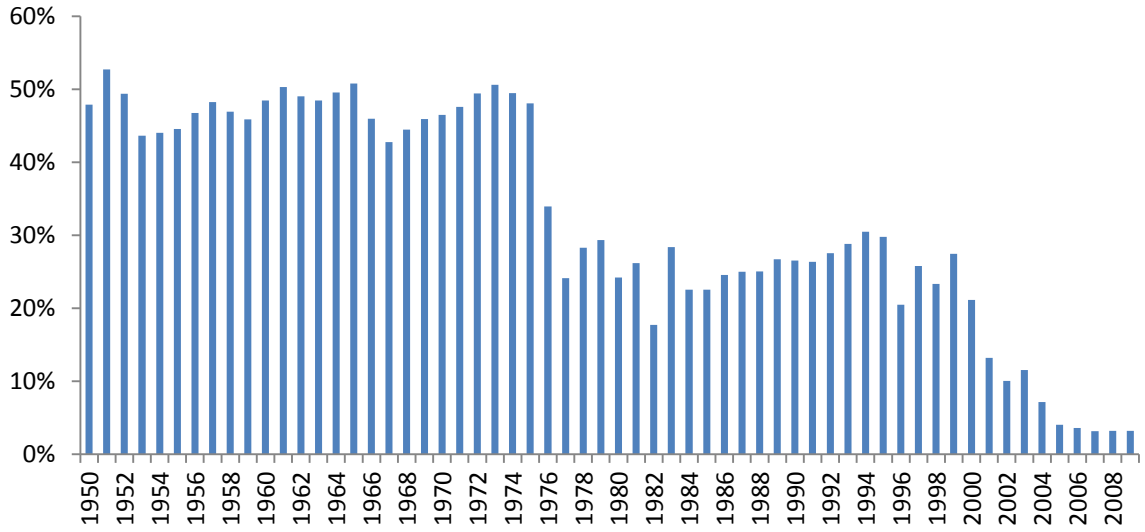

Figure 3. Percentage contribution of sharks to total large pelagic fish production: 1950 – 2009

In early 1980´s, sharks were almost caught by gillnets (Figure 4). However since mid 1980´s, gillnet–longline gear combination was popular for catching sharks and this combination was responsible for the bulk of shark landings.

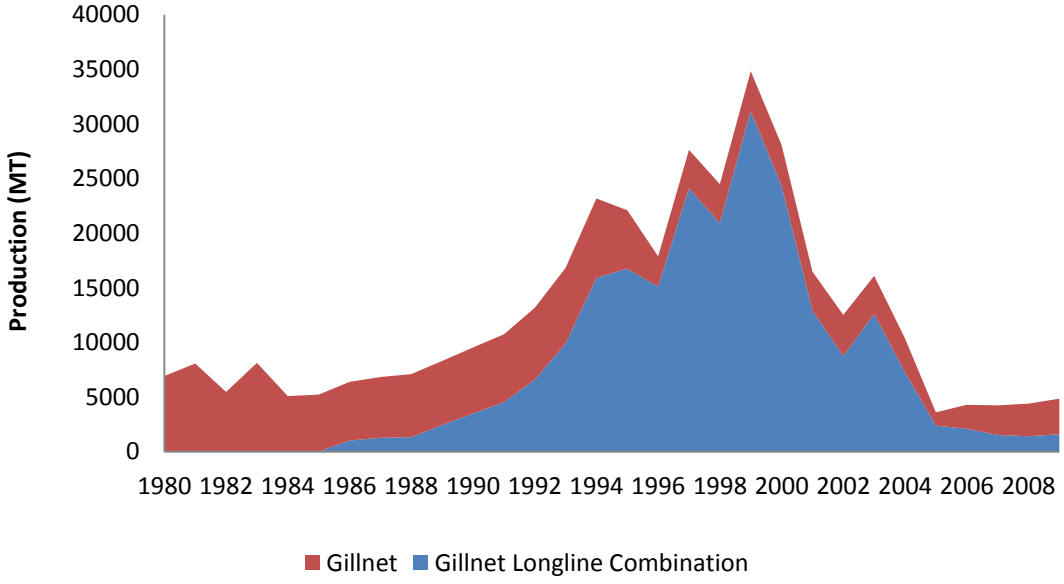

Figure 4. Gear wise shark landings:1980 - 2009

Species Composition

Among the sharks landed in Sri Lanka, Silky Shark (*Carcharhinus falciformis*) is the dominant species followed by Blue Shark (*Prionace glauca)* and Oceanic White Tip Shark (*Carcharinus longimanus),* respectively (Figure 5). The total Silky Shark production was peaked in 1999 (13,725.6 Mt) and there was a drastic decline thereafter.

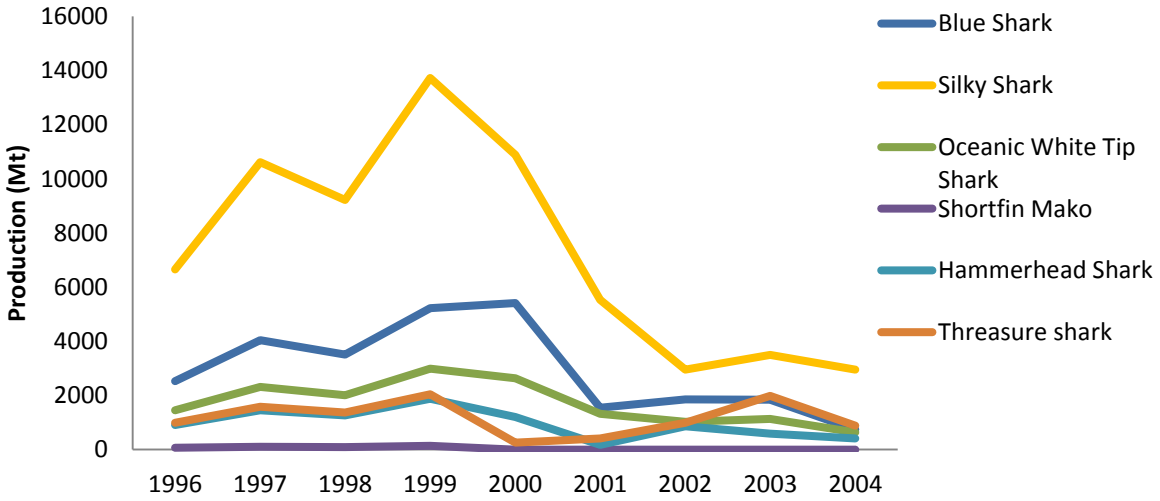

Figure 5. Shark landings by major species: 1996-2004

Current status of the shark fishery in Sri Lanka

Shark Production

At present, shark is a non-target species and majority of the catch comes as a by- catch. Currently, the percentage contribution of sharks to the total large pelagic fish production by weight remains around 4% while tuna has accounted more than 70% to the total large pelagic fish production (Figure 6).

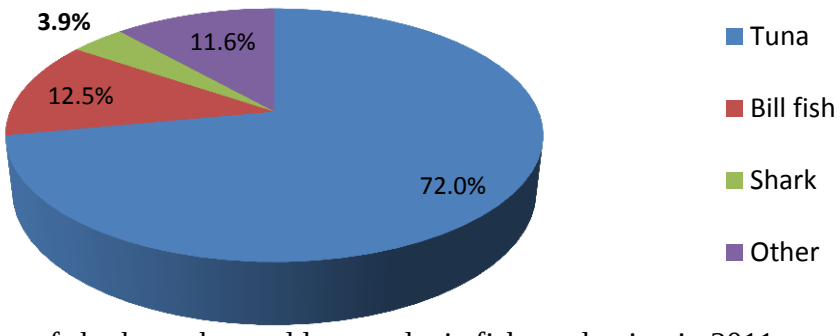

Figure 6. Contribution of sharks to the total large pelagic fish production in 2011

Species composition

As same as reported in historical catches, silky sharks still account for the highest contribution to the total shark landings (around 66% of the total shark landings by weight) in Sri Lanka (Figure 7). The contribution of the next two dominant species; Oceanic white tip shark and blue shark are 6.1% and 6% respectively. The total contribution of these three species to the total shark landings is around 80% and the percentage contributions of other sharks including scalloped hammerhead shark and Longfin Mako to the total landings remain relatively small.

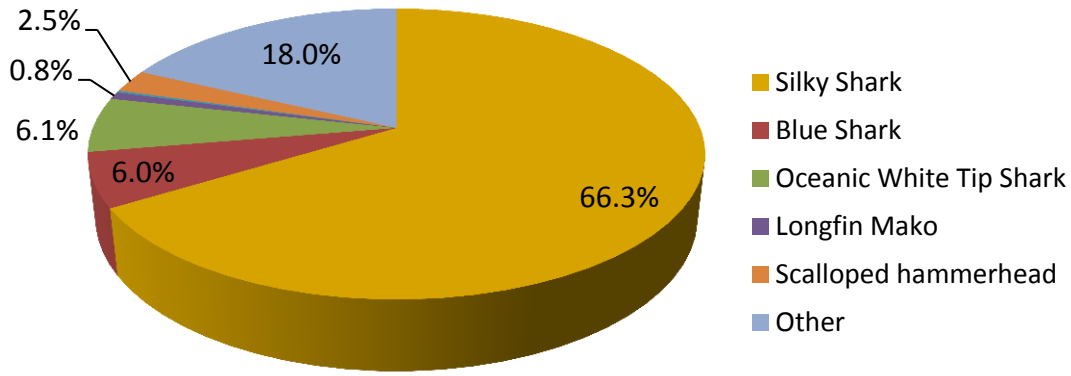

Figure 7. Species wise contribution in the total shark production in 2011

Shark landings by gear

Sharks are mainly landed as a by-catch of gillnet, longline and gillnet-longline combination and the by-catch is higher in tuna longliners than gillnet and gillnet –longline combination (Figure 8). However, the contribution of gillnet-longline combination in 2011 has accounted 45.9% of the total landings of sharks by weight where gillnet along and longline along have accounted 28.2% and 26% respectively (Figure 9). This is due to longline-gillnet combination is most widely used fishing gear in offshore and deep sea fishing in Sri Lanka (Longline-gillnet combination contributes more than 75 % of the total offshore and deep sea fishing effort) (Dissanayake and Hewapathirana, 2011).

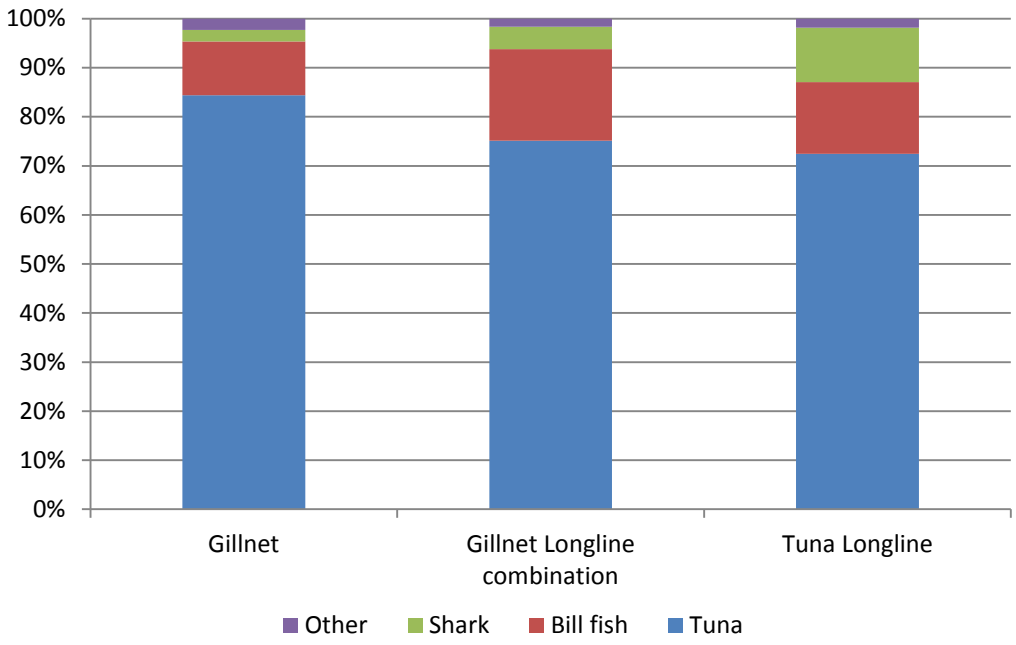

Figure 8. Percentage large pelagic catch and shark by-catch in 2011by gear

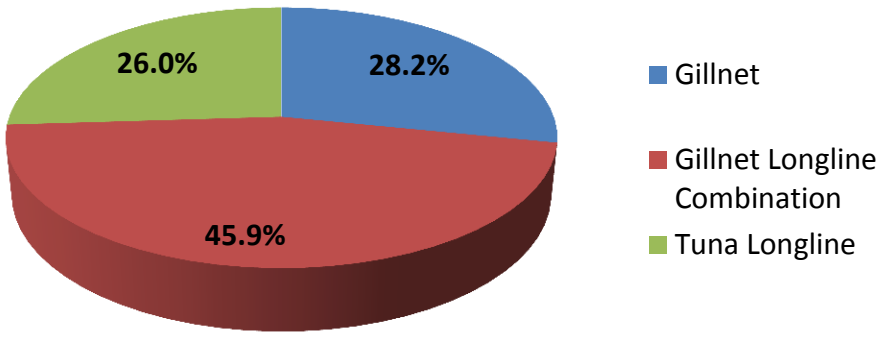

Figure 9. Shark landings by gear in 2011

Shark landings by fishing zones

The coastline around Sri Lanka has been divided into seven fisheries statistical zones; Northeast, Northwest, South, Southeast, Southwest and West for fisheries data collection purposes (Figure 10). However, the sampling programme of NARA has not yet been implemented for the North due to the civil war that prevailed for more than 30 years in Sri Lanka.

Figure 10. Principal statistical zones and major landing centers used in estimating offshore fish production in Sri Lanka.

Among these statistical zones, Southwest coast in Sri Lanka has recorded the highest shark landings while South and West coasts are in next (Figure 11). Furthermore, the highest contribution of sharks to the total landings has been recorded for the Southwest and the West Coasts respectively (Figure 12).

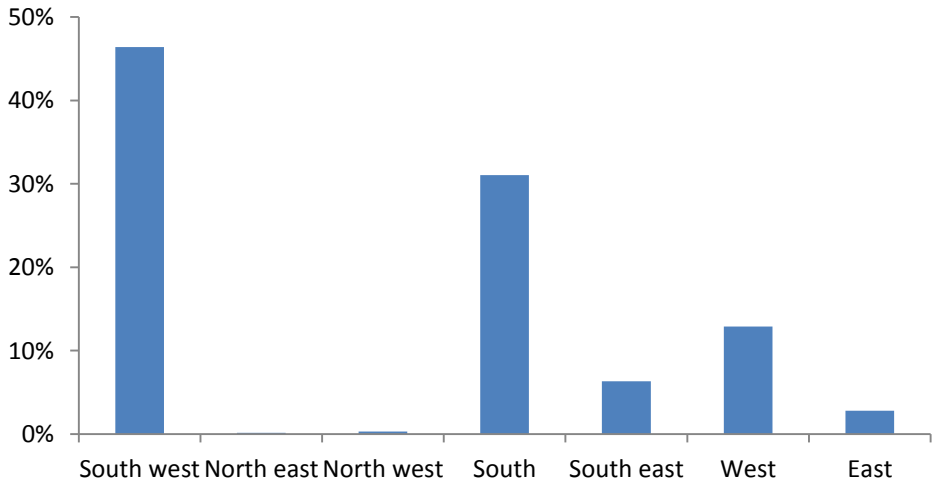

Figure 11. Shark landings by fisheries statistical zones in 2011

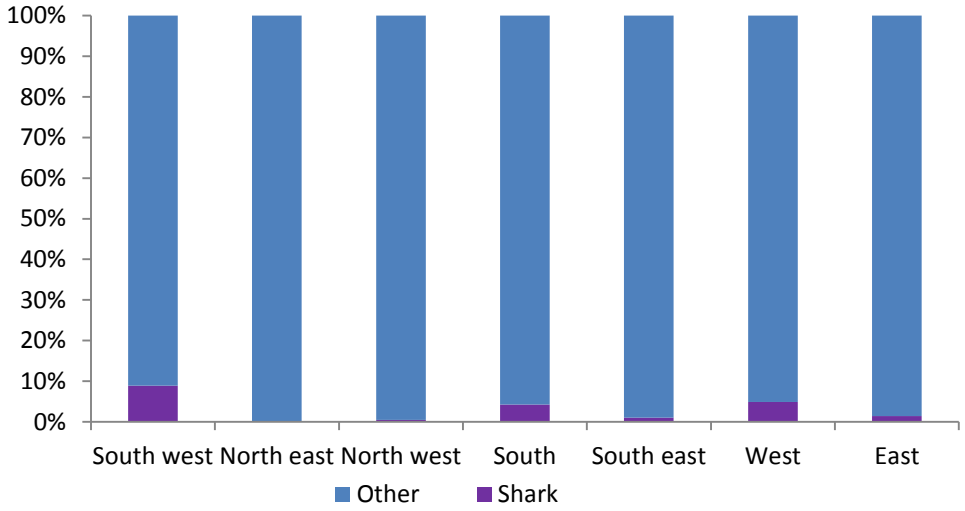

Figure 12. Percentage contribution of shark landings to the total large pelagic fish production by fisheries statistical zones in 2011

Management measures

Sharks have slow and much more reduced population recruitment than most marine species and they are exceptionally vulnerable to overexploitation with the high magnitude of international trade for sharks during the past few decades. These issues have created special concern regarding the management and conservation of sharks nationally as well as internationally. Therefore, as a fishing nation, Sri Lanka coordinates with most of the international and regional shark management and conservation bodies such as, Food and Agriculture Organization (FAO), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Asia-Pacific Fisheries Commission (APFIC), the International Organization of Marine Affairs Cooperation (IOMAC), Indian Ocean Tuna Commission (IOTC) and the Bay of Bengal Programme - Inter- Governmental Organization (BOB IGO).

Even though, Sri Lanka is still having some management issues due to inconsistent of catch, effort, landings and trade, limited information on the biological parameters of many species as well as species identification problems, it has taken some important initiatives for conservation and management of sharks. Preparation of National Plan of Action (NPOA) for sharks which was proposed by the FAO is one of the actions initiated by Sri Lanka and it will be implemented with the assistance of the Bay Of Bengal Large Marine Ecosystem

(BOBLME) project. The proposed NPOA will lead to assess the threats to the shark populations, determine and protect critical habitats and implement harvesting strategies for maintaining the biological sustainability and the long-term economic use. Further it would lead to identify and provide special attention, in particular to vulnerable or threatened shark stocks of the region and will contribute to the protection of biodiversity and ecosystem structure and functions in favor of shark populations.

Fisheries Act and other environmental related legislations have also taken some initiatives to conserve and manage the shark fisheries in Sri Lanka by gazetting regulations. As the first regulation, landing of sharks with fins attached to the body (banning the fining at sea) is regulated by a gazette notification since year 2001. Further, in accordance to the IOTC resolution relevant to the thresher sharks, Sri Lanka has compiled a regulation to ban thresher sharks. The regulation has already gazetted in July 2012 and to initiate this regulation, immediate steps have been taken into actions such as conducting awareness programmes for stakeholders by a collective effort of the Department of Fisheries and Aquatic Resources, Ministry of Fisheries and Aquatic Resources and National Aquatic Resources Research and Development Agency (NARA). As a result of this collective effort, the thresher shark landings has reduced to some extent when compared to the catches reported in the previous years and Sri Lanka walking towards for a complete banning of the landings of thresher sharks. All these steps taken by Sri Lanka will ensure the sustainability of the shark populations.

Acknowledgement

It is pleasure to express sincere gratitude to Dr. Chamari Dissanayake, Research Officer at National Aquatic Resources Research and Development Agency (NARA) for her critical comments, advice and guidance. A note of gratitude is owed to Ms. D.N.A.Ranmadugal and Ms. D. Herath, Research Officers at NARA for their valuable support. Also thankful to staff members of the National Aquatic Resources Research and Development Agency (NARA) for their valuable support and especially thankful to Mr. Malith Anupama for his support by providing necessary data.

References

Amarasooriya, P.D.K.D. 2001. Species identification of the shark caches landed in the west coast of Sri Lanka with special references to the silky shark. M.Sc Thesis,

De Bruien, Russel and Bogusch (1994). Afield guide to The Marine Fishery Resources of Sri Lanka. FAO, Rome 62 - 78

De Silva, R (1984). The great white shark in Sri Lanka Loris XX(1): 10 -11

Dissanayake, C. and Hewapathirana, K (2011). Sri Lanka National Report to the Scientific Committee of the Indian Ocean Tuna Commission, 2011: [August 20, 2012] <www.iotc.org/files/proceedings/2011/sc/IOTC-2011-SC14-NR24.pdf>

Dissanayake, D.C.T. (2005). Monitoring and assessment of the offshore fishery in Sri Lanka: [July 20, 2012] < www.unuftp.is/static/fellows/document/chamari05aprf.pdf>

IOTC (2012). IOTC Database for sharks , 1950 – 2009: Indian Ocean Tuna Commission, [July 2, 2012] <www.iotc.org/English/data/databases.ph>

Joseph, L (1999).cd Management of shark fisheries in Sri Lanka. Case studies of the management of elasobranch fisheries FAO Fisheries Technical paper 378/1

MFARD (2012). Fisheries sector development strategy 2010-2013: Ministry of Fisheries and Aquatic Resources Development [July 12, 2012] < http://www.fisheries.gov.lk/ >

MFARD (2012). Annual fisheries statistics - 2010: Ministry of Fisheries and Aquatic Resources Development [July 15, 2012] < http://www.fisheries.gov.lk/ >

Received: 4 & 14 September, 2012
IOTC–2012–WPEB08–15 Rev_1

Appendix 1

Commercial shark species in Sri Lanka

	Family	**Species name**	**Common English Name**
1	Hexancchidae squalidae	*Hexanchus griseus*	Cow shark
2		*Centroschyllium ornatum*	Ornate dogfish
3		*Centrophorus moluccensis*	Gulper shark
4		*C.uyato*	Gulper shark
5		*Dalatias licha*	Kitefin shark
6	Echinorhinidae	*Echinorhinus brucus*	Bramble shark
7	Chiloscyllidae	*Chiloscyllium griseum*	Grey bamtoo shark
8		*C.indicum*	Slender bamboo shark
9	Ginglymostomatidae	*Nebrius ferrugineus*	Tawny nurse shark
10	Stegostomatidae	*Stegostoma fasciatum*	Zebra shark
11	Rhinodontidae	*Rhinodon typus*	Whale shark
12	Odontasididae	*Odontaspis noronhai*	Bigeye sandtiger shark
13		*O .ferox*	Small tooth sand tiger shark
14	Pseudocarchariidae	*Pseudocarcharias kamoharai*	Crocodile shark
15	Alopidae	*Aloptas peiagicus*	Pelagic thresher shark
16		*A. supercitiosus*	Vigeye thresher shark
17		*A. vulpinus*	Thresher shark
18	Laminidae	*Isurus oxyrinchus*	Shortfin mako shark
19		*I. paucus*	Longfin mako shark
20	Trackidae	*Mustelus manazo*	Starspotted smooth hound shark
21		*M. mosis*	Arabian smooth hound shark
22	Hemigaleidae	*Hemipristis elongatus*	Snaggletooth shark
23	Carhanhinidae	*Carcharinus altimus*	Bignose shark
24		*C . albimarginatus*	Silvertrip shark
25		*C. amblyrhynchos*	Grey reef shark
26		*C. amboinensis*	Pigeye shark
27		*C. brevipinna*	Spinner shark
28		*C. falciformis*	Silky shark
29		*C. hemiodon*	Pond cherry shark
30		*C . limbarus*	Blacktip shark
31		*C. longimanus*	Oceanic whitetaip shark
32		*C. macloti*	Hardnose shark
33		*C. melanopterus*	Blacktip reef shark
34		*C. plumbeus*	Sandbar shark
35		*C. sorrah*	Spot-tail shark
36		*C. wheeleri*	Blacktail reef shark
37		*Galeocerdo cuvier*	Tiger shark
38		*Lamiopsis temmincki*	Broadfin shark
39		*Loxdon macrorhinus*	Sliteye shark
40		*Negaprion brevirostris*	Lemon shark
41		*Prionace glauca*	Blue shark
42		*Triacnodon obesus*	Whitetip reef shark
43		*Rhizoprionodon acutus*	Milk shark

44		*Scolidon laticaudus*	Spadenose shark
45	Spymidae	*Eusphyra blochii*	Winghead shark
46		*Sphyrna lewini*	Scalloped hammerhead shark
47		*S. mokuraan*	Great hammerhead shark
48		*S. zygaena*	Smooth hammerhead shark