

User Rights: Conflict between Sri Lanka's small scale fishermen and mechanized trawlers in Northern Sri Lanka

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Abstract

Sri Lanka is an island state consisting of a 1 340 km long coastline and claims sovereign rights of 223 000 km² of Exclusive Economic Zone (EEZ) in the Indian Ocean. The open-access nature of the fishing grounds has expanded fishing effort over the years. The small-scale fishing boats used in the coastal fishery usually consist of non-motorized and motorized vessels reaching between 4-14 m in average length. Fiberglass reinforced plastic boats powered by outboard motors ranging between 15-25 hp are used to carry out gill-net, longline and hand-line fishing operations. Multi-day 3.5tonne fishing boats are between 8-9 m long and equipped with two cylinder diesel engines of 25-30 hp. Fishermen in Northern Sri Lanka depend on traditional boats and gear such as nets and hand-lines due to the shallow nature of the fishing grounds. These fishermen compete for resources with over 5 000 south Indian large-scale mechanized bottom trawlers. The bottom trawling fishermen illegally cross the Indo-Sri Lankan Maritime Boundary (IMBL), breaching the treaty signed by both countries in 1976. The Fisheries and Aquatic Resources Act No 2 of 1996 has been adopted for Sri Lanka's overall fisheries management. Restriction of destructive fishing practices and gear have been implemented through the Sri Lanka National plan of action to prevent, deter and eliminate Illegal, Unreported and Unregulated (IUU) fishing. Therefore, industrial scale bottom trawlers have left Sri Lankan fishermen with reduced fish stocks, destroyed marine habitats and gear. Creating severe conflict between the scale of fisheries and neighbouring countries. This case study discusses and proposes the use of environmentally friendly fishing practices such as size segregated (SS) pole and line fishing and the introduction of modernized gear as a solution to mitigate the conflict. Statistics reported for the year 2016 from main fishery districts in the north have been taken into consideration for the purpose of this case study.

1. INTRODUCTION

Sri Lanka historically due to its strategic geographical location and the tropical nature of the Indian Ocean, has been relying on its rich diversity of fishery resources as a source of income and livelihood. The fisheries industry provided livelihoods for more than 2.7 million coastal communities with over 272 140 individuals actively fishing throughout the country in 2017. The fisheries sector of Sri Lanka can be divided into marine, coastal, inland and aquaculture. The 2016 Fisheries Outlook report published by The National Aquatic Resources Research and Development Agency (NARA, 2018) reported that 86 percent of Sri Lanka's annual fishery production consisted of marine fish. The marine sector, consisting of fish caught within Sri Lanka's EEZ and high seas is used for both local consumption and export purposes.

Sri Lanka's fishing industry is considered small scale with the fishing fleet consisting of:

- Multi-day boats (offshore waters) avg. length 9.8m - 17.9m boats with an inboard engine (40 - 60 hp or over) (consists of insulated fish holds, without larger scale facilities such as freezers, longline spools, Echo Sounder, Fish finder etc.)
- One day Boats (coastal waters) avg. length 8.8m - 12.2m boats with an inboard engine (40 hp) (Insulated fish hold only)
- Boats (Coastal water) avg. length 5.5 m - 7.2 m boat with outboard engine (15 – 25 hp)
- Non-Motorized Traditional crafts

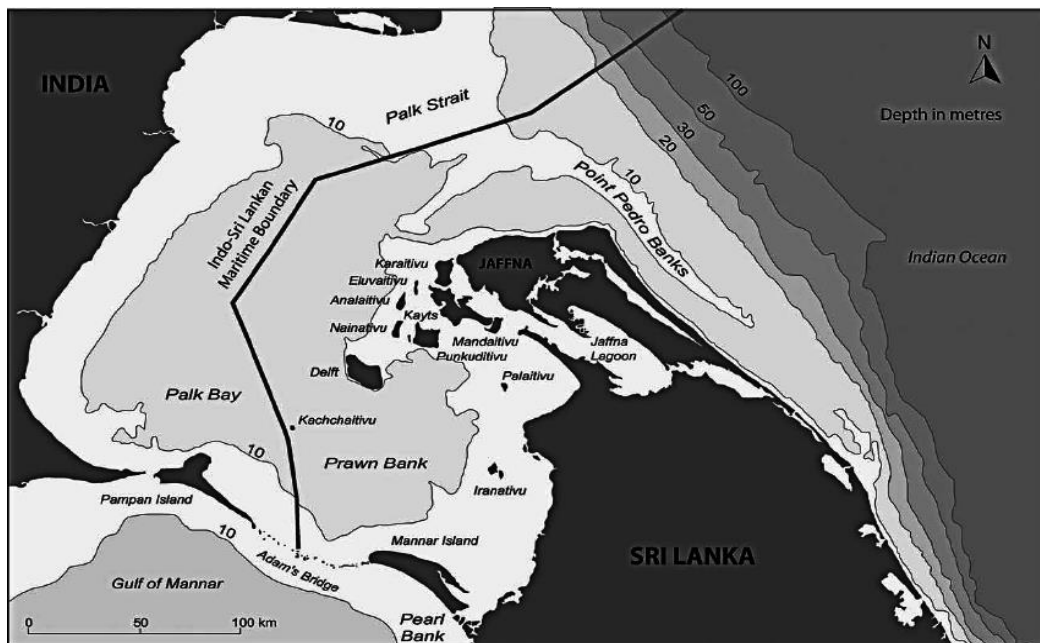


Figure 1. Ocean depths surrounding northern fishing districts of Sri Lanka.

Source: Stokke, Kristian & S. Soosai, A & Shanmugaratnam, N. (2008). Impacts of Intra-state Warfare and International Resource Conflicts on Livelihoods of Fishing Communities in Northern Sri Lanka.

Fishing grounds in the northern areas of Sri Lanka are significantly shallower with a wider continental shelf when compared with fishing areas in the rest of the country (Fig.1). Therefore, motorized and non-motorized traditional fishing crafts with gear such as gillnets and handlines are predominantly used. The Palk Bay and the Gulf of Mannar has been found to be a biodiversity hotspot as it is estimated to include over 20 percent of marine life from the entire Indian Ocean. The Gulf of Mannar alone is inhabited by more than 3 600 different species. 30.8 percent of Sri Lanka's annual fish production (marine) resulted from the Northern provinces (2016). Prior to 1985, Jaffna district was a dominant fish-producing district that contributed more than 25 percent to the total marine fish production while contributing 7 percent to the annual production of 2016. Although women in the northern districts are not actively fishing, they have a significant role in activities such as sorting and selling fish and fishery products, production of dry fish and repairing of nets.



Figure 2. Small scale, motorized boat used for squid fishing, Jaffna, Sri Lanka.

Source: <https://www.newsheads.in/world/news/indian-fishermen->

Sri Lanka's Squid Fishery

Eight species of squid have been recorded within the Sri Lankan EEZ (Figure 3). This resource is underutilized due to the increased amounts of manpower and resources needed to fish for squid using traditional methods. Squid fishing in Sri Lanka is carried out using nets, hand lines or jig lines that must be pulled up manually. Jigging can be defined as a method of catching squid by continuously lowering and retrieving a line from a fishing vessel. The scale of the above-mentioned methods more often outweighs the benefits and therefore is not feasible long term. The current methods used in squid fishing are labour-intensive compared to large-scale fleets, which use purse seines, drift nets with trawlers in order to catch entire schools of squid at a time. Sri Lanka's fishing industry utilizes a significant amount of bait for various fisheries due to prohibition of purse seining, trawling and reduced use of nets. Currently, the majority of the squid used is imported from countries such as the Falkland Islands, Argentina and China. The Sri Lankan tuna industry currently imports 100 percent of their squid bait.

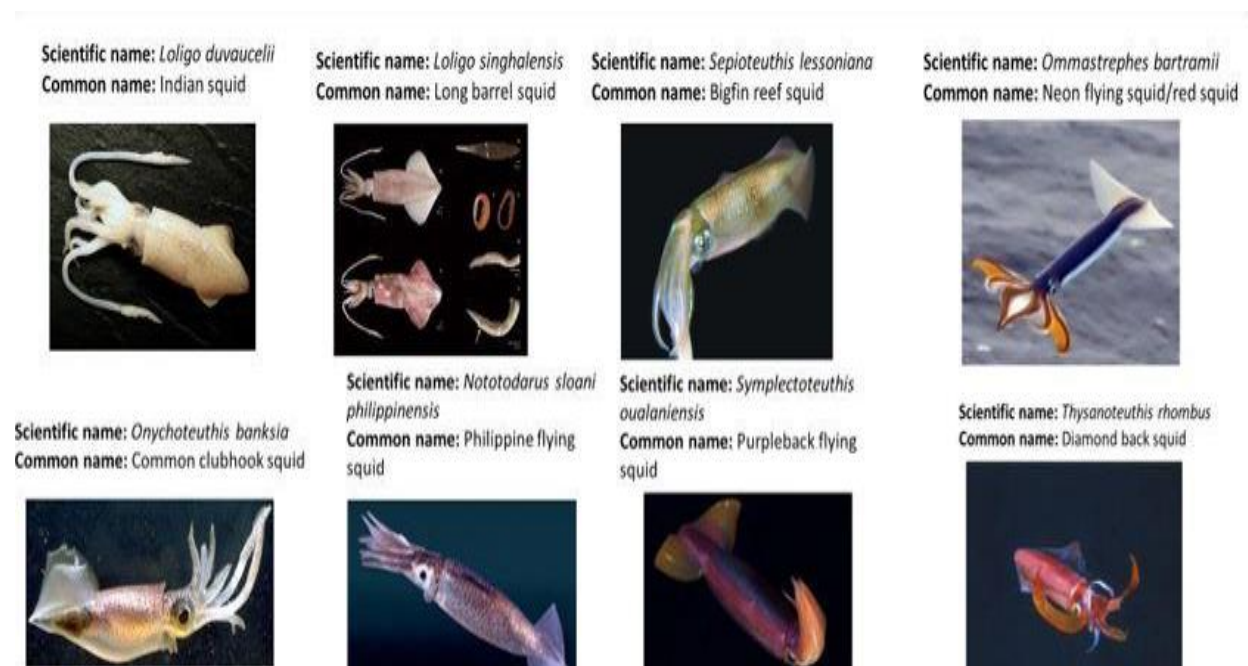


Figure 3. Squid species available within Sri Lanka's EEZ.

Sources: <https://www.theguardian.com/lifeandstyle/shortcuts/2016/oct/19/squids-out-are-there-any-that-it-is-still-ok-to-eat#img-5>, <http://keralamarinelife.in/view.aspx?searchid=1229;>, [https://www.flickr.com/photos/wagnbat/2913086617,](https://www.flickr.com/photos/wagnbat/2913086617/) <http://mostlyopenocean.blogspot.com/2013/02/flying-squid-really-fly.html>, <http://tolweb.org/tolarchive/19419/20070709/Onychoteuthidae.html>, <http://www.divephotoguide.com/underwater-photography-special-features/article/photo-series-social-life-purple-backed-flying-squid/>,

2. MANAGEMENT OF THE SRI LANKA'S MARINE FISHERY AND RIGHTS-BASED APPROACH

Sri Lankan fishermen have open access to overall marine fisheries, excluding the beach seine and stake-net fisheries (Atapattu 1994). Even though the fishery has an all-access approach, the fishery is highly regulated and managed on several levels. Fishing within the Sri Lankan EEZ is only permitted to licensed fishing vessels of Sri Lankan origin and ownership to maintain better fleet management.

The entire fishing sector is regulated using the “The Fisheries and Aquatic Resources Act No 2 of 1996” and the Sri Lanka Coast Conservation Act no. 57 (and the Amendments of 1988) to ensure fishing carried out in Sri Lankan waters are stringently monitored and regulated. These Acts also ensure that fishing is carried out sustainably with minimal environmental impact. Sri Lanka has implemented and enforced a National plan of action to prevent, deter and eliminate Illegal, Unreported and Unregulated (IUU) fishing (2013). Fisheries and marine laws are constantly being updated to ensure regulation and management of aspects such as import-export management, prohibition and reduction or unsustainable fishing gear and practices, protection of Endangered, Threatened and Protected species. Furthermore, all fishing vessels are required to be registered and licensed for fishing, maintain a logbook for each catch and Marine Protected Areas and habitats have been established across the country. At an international level, Sri Lanka has ratified the FAO agreement on port state measures (PSM). The country also works closely with the Indian Ocean Tuna Commission (IOTC) to ensure that fishing conducted in FAO area 57 is sustainably carried out and has adopted the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

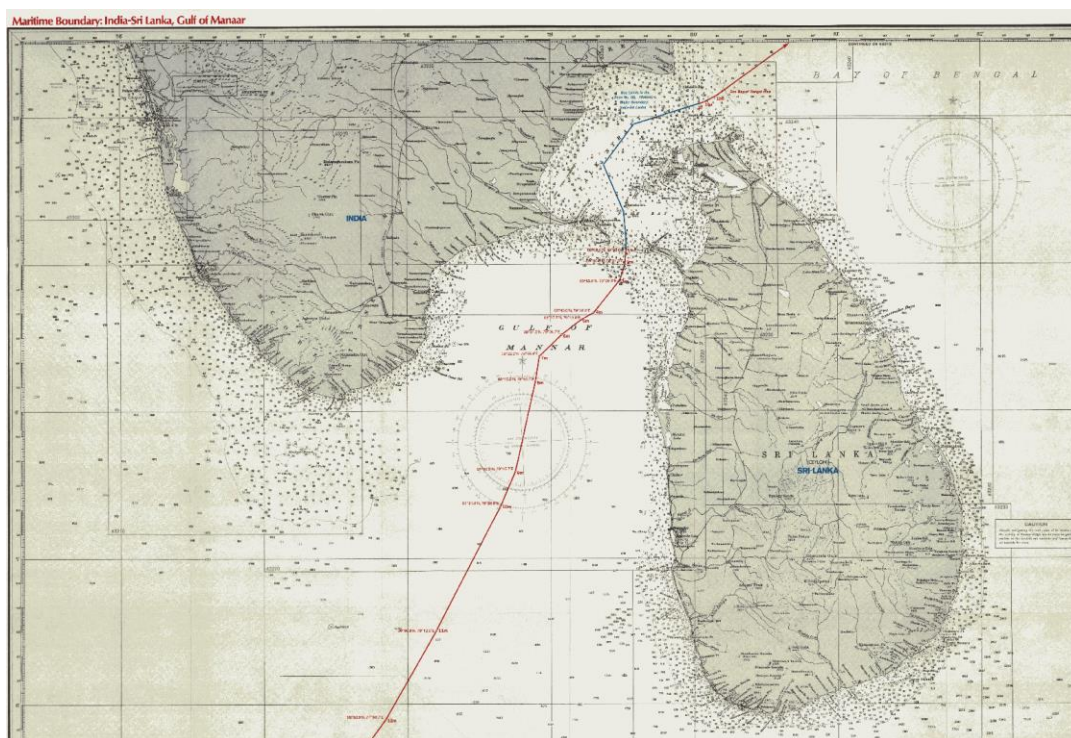


Figure 4. Original map used for the establishment of Indo-Sri Lankan Maritime Boundary Line (IMBL).

Source: "Maritime boundaries: India-Sri Lanka". Limit in the seas. U.S. State Department. 77. 16 February 1978.

3. MAIN CHALLENGES AND WAY FORWARD

3.1 Main Challenge: Conflict between Sri Lanka's small-scale squid fishery and mechanized trawlers

Although several measures have been put in place to ensure that Sri Lanka's marine resources are utilized sustainably, the fishermen from the northern districts of Sri Lanka are faced with restriction of fishing grounds and depletion of fishery resources due to large scale fleets of mechanized bottom trawlers. Fishermen from the North and East of Sri Lanka were restricted from going out to sea due to the ethnic

conflict that began in 1983. During this time, fishermen from regions such as Tamil Nadu began to cross the Indo-Sri Lankan Maritime Boundary Line (IMBL), which was established in the mid-1970s. The crossing of the IMBL goes against the treaty signed by both countries regarding Sri Lanka's sovereign rights to fish in Sri Lankan historic waters. The mechanized bottom trawlers crossed into areas such as the Palk Strait and the Gulf of Mannar to meet the resource demands of their prawn and fishery industry.

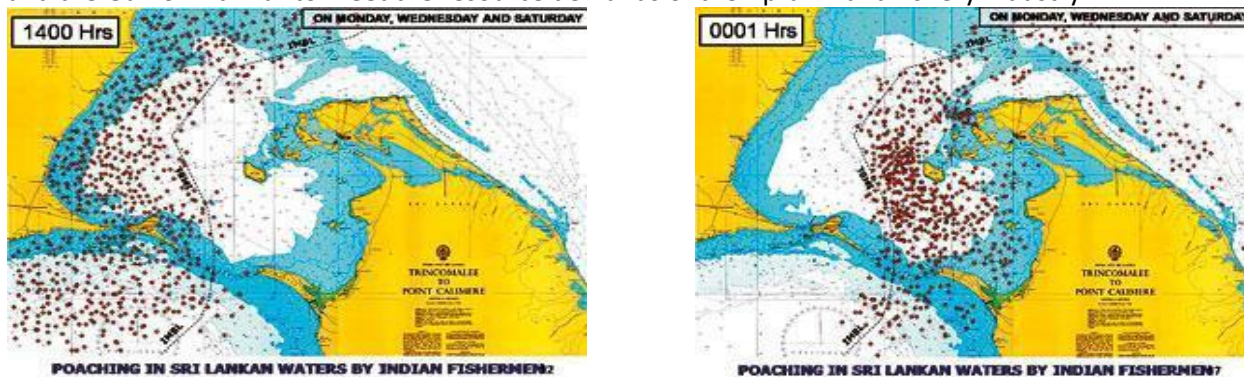


Figure 5. Satellite images provided by Sri Lankan Navy showing the movement of Mechanized bottom trawlers crossing the IMBL.

Source: http://www.sundaytimes.lk/110227/News/nws_17.html

Reports have shown that in 2001, India's bay consisted of 12 727 fishing vessels while the Sri Lankan region was found to have 5 135 in 2002. The signing of a cease-fire agreement between the LTTE and the Sri Lankan government in 2002, enabled the fishermen to resume fishing in the north and the east of the country. However, the increased presence of the illegal bottom trawlers in Sri Lanka's waters during the absence of Sri Lankan fishermen resulted in a severe degradation of marine habitat and allowed limited access to the local fishermen.

The Fisheries Act of 1996 defines "bottom trawl net" as a towing net having a cone-shaped body and a bag of cod end connected to the apex with or without two wings connected to the other end and towed by motorized or mechanized fishing boats. The use of bottom trawling fishing gear by Sri Lankan fishermen was prohibited due to the severe damage the fishing gear causes to the environment. The Act states that no person shall engage in bottom trawling practices, nor purchase or sell bottom-trawling nets for the purpose of the operation. It further states that no license shall be issued by the Director-General under Part II of this Act for operations carried out by bottom trawl nets to be towed by a motorized or mechanized fishing boat in Sri Lanka Waters. If found guilty of the utilization of bottom trawling in Sri Lankan waters, the responsible parties will be subjected to criminal charges and be liable to imprisonment. Therefore, the number of mechanized trawler vessels were significantly higher than that of Sri Lanka's small-scale traditional vessels. It has been recorded that up to 150 mechanized trawlers illegally cross the IMBL daily, with approximately 2 500 boats trawling up to date.



Figure 6. a) Size difference between Sri Lankan fishing boat and multiple illegal mechanized bottom trawler b) Mechanized bottom trawl catch including several turtles in Sri Lankan waters.

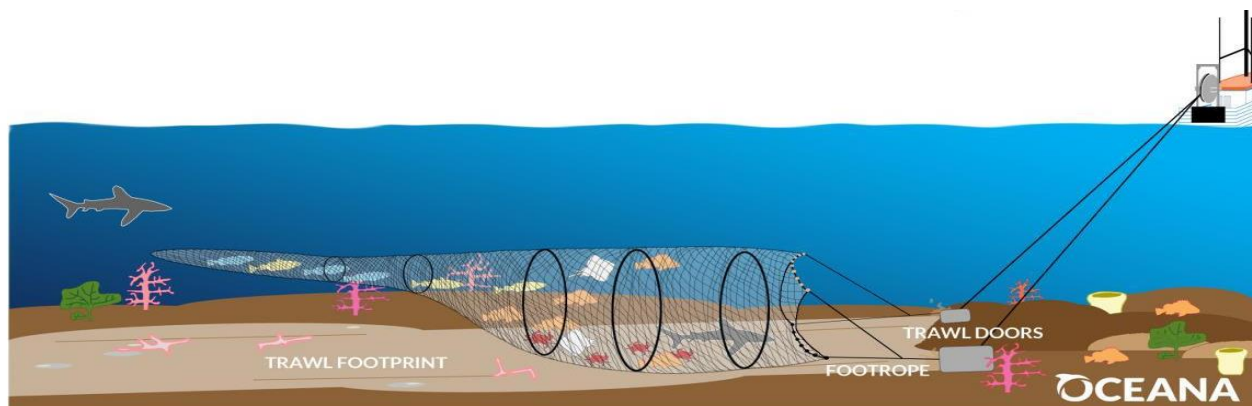
Source a: <http://www.dailynews.lk/2016/03/14/features/why-bottom-trawling-should-be-banned>

Source b: <http://tamildiplomat.com/india-proposes-subsidy-to-end-bottom-trawling-in-sri-lankan-waters/>

3.2 Depletion of Sri Lanka's Marine resources due to illegal bottom trawlers

The use of mechanized bottom trawlers is depleting Sri Lanka's once abundant marine resources. Bottom trawling is carried out by a net that digs into the first foot of the seafloor and dredges up everything as the net is dragged across the ocean floor. The dragging of the iron bars or metal plates fixed at the mouth of the trawling net has a detrimental effect on the ocean floor and its surrounding environment. The dredging of the sea bottom dislodges all sediment, coral and vegetation as the net is dragged, thus destroying the entire ecosystem. The extent of the damage of bottom trawlers to the environment is such that the recovery rate is minimal, and the ecosystem is almost never completely restored.

The unsustainable nature of bottom trawling practices is not only a major threat to Sri Lanka's coastal biodiversity but also a major threat to the livelihood of the fishing community. In addition to the destruction of the physical environment of the ocean floor, discarded by-catch is a significant negative effect of the use of bottom trawlers. In most cases, 80 to 90 percent of the catch using trawlers is considered by-catch. The by-catch most often includes non-target species such as endangered marine mammals, turtles, juvenile and nursery stocks of finfish that are discarded. Furthermore, due to the nature of the fishing gear, most fish must be discarded due to the loss of value attributed to the external damages seen on the fish when hauling in the catch (economic wastage = economic loss). The loss of marine life due to discarded by-catch and damaging of the ocean bed leads to the lack of fish and other target species and potential income for small-scale fishermen.



**Illustration is representative of gear used, not set to actual scale.*



Figure 7. Mechanism of bottom trawling and negative impact on marine habitat and ecosystem.

Source: <https://usa.oceana.org/bottom-trawling>, <http://www.coraltriangle.org/conservation/Conservation-CoralTriangle-Marine-Culture-Biodiversity-Fisheries.html>, <https://ocean.si.edu/conservation/fishing/net-full-bycatch>

Economic loss due to mechanized bottom trawling

The loss caused by the illegal mechanized bottom trawlers has been estimated to be over USD 750 million annually (Roshan Fernando, former president of SEASL, 2007). 29 772 Indian fishermen illegally engaged in fishing using mechanized bottom trawling in Sri Lankan waters in 2008 (Madanayaka & Madanayaka, 2015).

Relevance to Squid Fishery

Sri Lankan fishers targeting squid using jig lines on boats, which are usually 17-23ft in length, are significantly smaller than the 28-46ft mechanized bottom trawl vessels. The large vessels have been found to damage local vessels and fishing gear by running over/cutting nets. Thus, the fishing community avoids going out to sea during times when the mechanized bottom trawlers are active.

4. SQUID FISHERY POTENTIAL

The recent changes in oceanic water temperatures around the world has affected distribution patterns of many marine species. However, the increase in temperature in certain areas has been found to be favourable for cephalopod species, such as squid. Therefore, a significant spike in squid production has been observed in the global seafood industry.

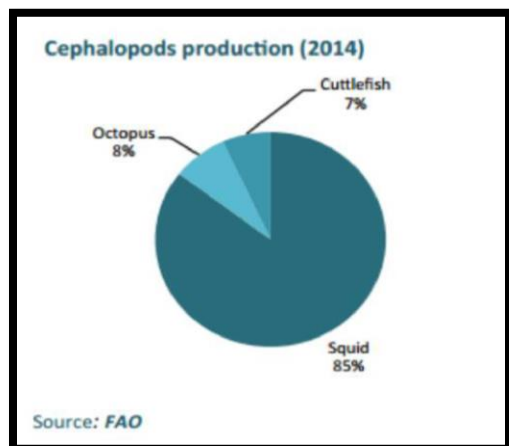


Figure 8. Cephalopods Production, 2014.

Source: <http://www.fao.org/3/a-i5803e.pdf>.

BBC reports show that today, squid are being caught at 60 percent of survey stations located in the North Sea compared to the 20 percent observed in the 1980s. These environmental changes, however, can also disrupt the global squid market. FAO reports (Jan- March 2016) show that leading squid exporters, (China and Peru) exhibited a reduced number of shipments to locations such as Spain and Japan. However, squid exports from locations such as Chile were shown to increase by 27.2 percent and India up to 85.7 percent (5 200 tonnes) as the strong El Niño affected squid landings in South America. The report also suggests that because of reduced catch, depending on availability, the overall price of squid fluctuated between EUR 6.00-6.10/Kg.

Due to the increased demand for squid products in today's seafood industry, Sri Lanka can become one of the larger suppliers if automated squid jigging practices are introduced. The data presented on figure 8 summarizes the top importers of squid at a global scale with its suppliers for the year 2015. The above-mentioned countries should be taken as potential export markets for Sri Lankan caught squid, ensuring a positive effect on the country's already prominent place in the global seafood industry.

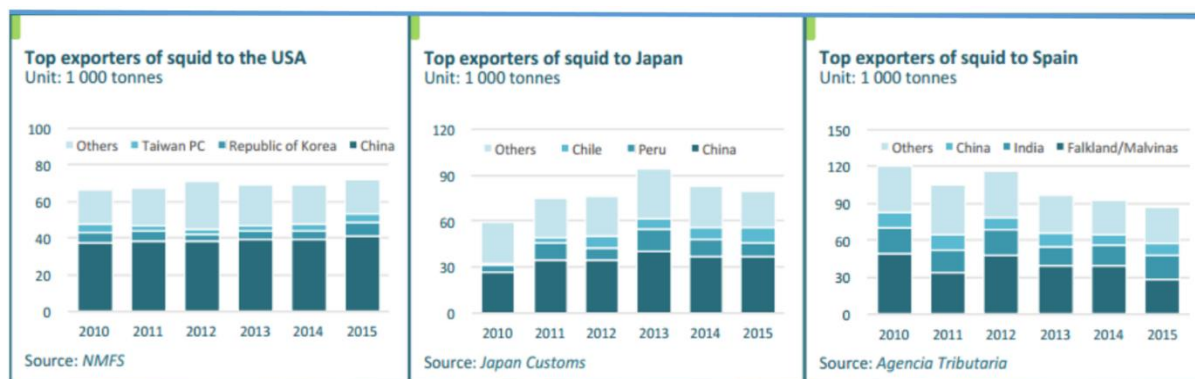


Figure 9. Top squid importers around the world (2010-2015).

Source: <http://www.fao.org/3/a-i5803e.pdf>.

5. MOVING FORWARD: INTRODUCTION OF ENVIRONMENTALLY SUSTAINABLE FISHING PRACTICES AND MODERNIZED GEAR TO INCREASE FISHING OPERATIONS

It is proposed that the introduction of environmentally friendly fishing practices, modernized gear and stringent enforcement of prohibited fishing gear as per Fisheries act no. 2 of 1996 will ensure that fishermen can sustainably utilize marine resources. The continuous presence of Sri Lankan fishermen in the fishing grounds due to revitalized operations increased vigilance and reporting will result in the reduction of illegal mechanized bottom trawlers.

Studies are being carried out for the application of size segregated (SS) devices in pole and line fishing and automated squid jigging as a viable environmentally friendly solution to mitigate the conflict currently faced by small-scale fishermen. Such promotion will reduce the over-exploitation of the fish stocks, pollution and environmental degradation of the sea bottom caused by dragged gear currently employed by Indian fishermen.

5.1 Size segregated devices in pole and line fishing

As mentioned previously, the majority of fishermen in the north of Sri Lanka use gillnetting or beach seining as a preferred fishing method due to the shallow nature of their fishing grounds. Gillnets are considered to be one of the least catch controllable and least environmentally sustainable gears. Due to the indiscriminate nature of gillnet fishing on the already depleted marine resources ascribed to bottom trawling, it is suggested that marine fishermen switch to longline, handline, jigging and pole and line gear. However, it is also suggested that all vessels involved in pole and line fishing have a catch size regulation device installed onboard. The use of this device would enable the pole and line fishery to be more sustainable and mitigate the catch of juvenile fish.

The Yellowfin tuna (YF), a highly migratory, pelagic species is one of the most commercially valuable species caught by Sri Lankan fishermen. This tropical species is found to spawn in the Indian Oceans throughout the year. As spawning takes place close to the surface reproductively active fish and juveniles are almost always found at the surface. It has been suggested that a mature adult at about 2.8 years would weigh >25 kg while having a length greater than 105 cm (Fromentin and Fonteneau 2001). Reports show that intermediate age individuals are rarely taken into commercial fisheries because of juveniles and new recruits being caught by shallow gear such as gillnets, hand lines and pole and line, while matured fish are caught using deep-set gear such as long lines. IOTC reports have shown that Indian Ocean Yellowfin Tuna (YFT) catch by pole and line gear mostly consist of juvenile individuals (approximately 60cm or less).

Considering the low recruitment rates reported in the latest IOTC stock assessments, this study proposes that a minimum catch size is introduced for pole and line fishing to minimize juvenile catch

5.2 Automating squid jigging in Sri Lanka

This method is less labour intensive, as manpower is only needed to operate the machinery and the final sorting of the catch and therefore increases productivity and incentivizes the fishermen to engage in more fishing operations.

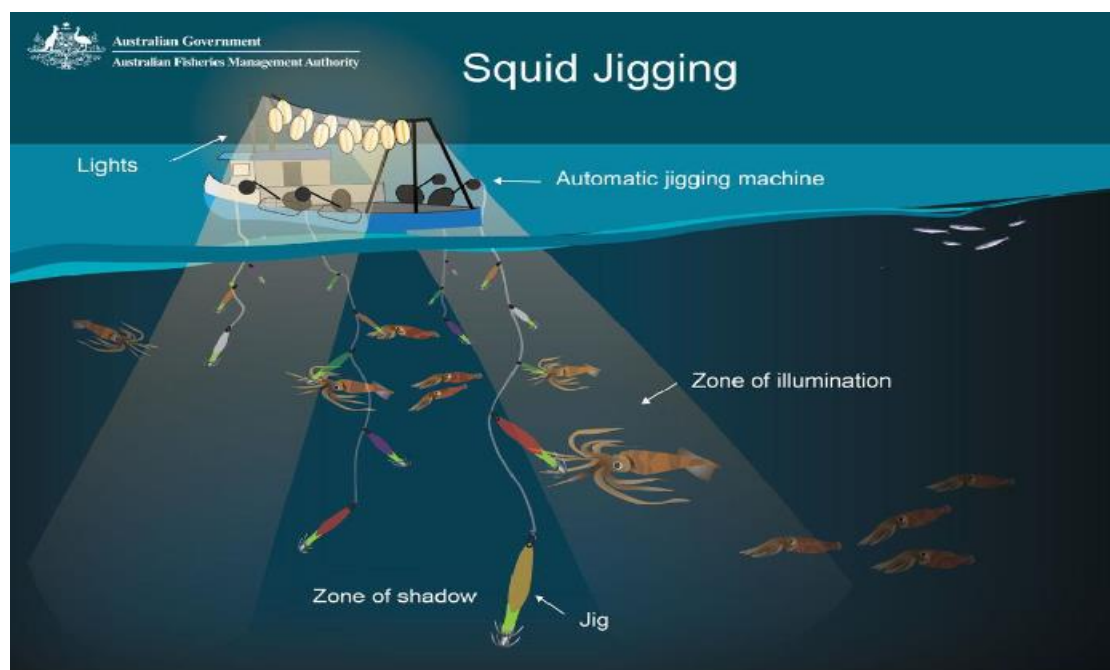


Figure 10. Squid jigging.

Source: <https://www.afma.gov.au/fisheries-management/methods-and-gear/squid-jig>

For example: 2 fishermen + 2 automatic jigging machines = estimated the productivity of 10 fishermen using hand jigging the same cost of production

5.3 Social benefits

Introducing automated squid fishing using jigging, benefits the fishing community socially through their involvement during catch landings on a weekly basis. Due to the involvement of the DFAR and organizations such as NARA, educational courses and training can be conducted within the community. In turn, the local fishermen benefit from new skills and increasing opportunities for advancement.

Sri Lanka has employed an open access rights approach system for fishing with restriction to environmentally unsustainable fishing practices and gear due to the small-scale nature of their fleet. The breach of the agreement signed in November 1976 regarding fishing rights and access to Sri Lanka's EEZ by mechanized bottom trawl vessels have led to the limited access to fishing grounds and depletion of marine resources for Sri Lanka's small-scale fishermen. The introduction of SS pole and line fishing and automated squid jigging will ensure that the fishermen can increase their fishing presence in northern fishing grounds with modernized boats and higher catch rates. The use of environmentally sustainable fishing practices and increased presence will ensure future catch, improved employment opportunities and reduction of border crossing by the bottom trawlers, regaining full access to their fishing grounds.