

# **The need for sustainable development of the small-scale fisheries -**

*A case study from the Northern Province, Sri Lanka.*

---

**Nimalan Nadanasabesan**

*Master thesis in International Fisheries Management, November 2015*



## ACKNOWLEDGMENT

First of all with great pleasure I wish to thank my supervisor Professor Bjørn Hersoug, The Norwegian College of Fishery Science, for his invaluable advice and encouragement to successfully complete the thesis. This research would not have been possible without your guidance, contribution and encouragement.

I would like to express my sincere gratitude to the UiT the Arctic University of Norway for granting me to follow Master degree in International Fisheries Management. My sincere gratitude especially to Ane Marie Hektoen, course coordinator of Master's program in International Fisheries Management for her support provided to me throughout the degree program. My thanks are extended to all the lecturers and staffs of Norwegian College of Fisheries Science, for providing the knowledge and service throughout the degree program.

I am especially thankful to the Mr. Kugan Velayutham, Mr. Kamal, and Mr. Rocksan Dias for arranging the field work successfully in the Northern Province of Sri Lanka.

My appreciation goes to Mr. Andtru, Fisheries Inspector of Delft, and Mr. Dhanapalasingam, Fisheries Inspector of Pesalai, for allowing me to access the fisheries information during the fieldwork. My thanks are to be extended to Mr. B. Daniswaran, Fisheries Minister of the Northern Province, for providing me the necessary data and vital information.

I especially thank to Mr. S. Sriharan who has financially supported and directed me to a different type of profession by broadening my knowledge in the area of fisheries management. Finally my sincere thank goes to my wife who has been staying and giving me so much support for study.

Nimalan Nadasabesan

Tromsø, November 2015.

## **ABSTRACT**

The purpose of this master thesis is to explore the present situation of the coastal small-scale fishery in the Northern Province of Sri Lanka and to bring an overall picture of the coastal small-scale fishery. To attain this, a strength, weakness, opportunity and threat matrix was formulated. The study also point out the main bottlenecks of sustainable fishery development. Finally the study recommends ways to improve the present situation.

The study used case study research methodology. The study involved interviews with thirty nine Northern fishermen. The primary data were collected using a questionnaire. The secondary data were retrieved from internet sources. Once the data were collected, they were edited, coded and summarized. Microsoft Excel was then used to analyze the data. Data were then presented by way of tables and figures.

The first objective was to explore present situation of the coastal fishery of the Northern Province. The findings revealed the situation in terms of marine resources, fishing methods, fishing communities and fishery production trend.

The second objective sought to formulate a SWOT matrix and to analyze the strengths, weaknesses, opportunities and threats of the Northern coastal fishery for sustainable development. The study showed that the coastal fishery of the Northern Province is characterized by range of SWOT elements. Strengths include the potential new marine resources, effective policy implementation tools in place, established markets and infrastructure and strong local ecological knowledge. Weaknesses include the lack of reliable data and declining catches, strong dependency on middlemen, large postharvest losses and lack of extension services. The locally growing demand for fish and organizational supports represent opportunities. Finally, this study showed that intrusion of Indian fishermen, IUU fishing by the Northern fishermen, prolonged ethnic conflict and climate change are the threats for the sustainable development of the coastal fishery of Sri Lanka.

The third and fourth objectives sought to uncover the main bottlenecks of sustainable fishery development and to recommend ways to improve the present situation for the sustainable development of the coastal fishery respectively.

## TABLE OF CONTENTS

<b>ACKNOWLEDGMENT .....</b>	<b>I</b>
<b>ABSTRACT.....</b>	<b>II</b>
<b>TABLE OF CONTENTS .....</b>	<b>III</b>
<b>LIST OF FIGURES .....</b>	<b>V</b>
<b>LIST OF TABLES .....</b>	<b>VI</b>
<b>LIST OF ABBREVIATIONS .....</b>	<b>VII</b>
<b>CHAPTER 1: INTRODUCTION.....</b>	<b>1</b>
1.1 Overview of Sri Lanka.....	1
1.2 Problem statement.....	2
1.3 Research objectives.....	2
1.4 Research questions.....	3
1.5 Structure of the thesis.....	3
<b>CHAPTER 2: THE SRI LANKAN FISHERY SECTOR.....</b>	<b>4</b>
2.1 Background of the Sri Lankan fishery .....	4
2.2 Legislation of the Sri Lankan fishery sector .....	5
2.3 Organizations involved in fishery management .....	6
2.4 Location and geography of the Northern Province.....	8
2.5 Climate and population of the Northern Province .....	9
<b>CHAPTER 3: LITERATURE REVIEW .....</b>	<b>10</b>
3.1 Civil war and Sri Lankan fishery .....	10
3.2 The Tsunami and Sri Lankan fishery.....	11
3.3 Food security and the small-scale Sri Lankan fisheries.....	14
3.4 The fisheries management system of Sri Lanka .....	15
3.5 IUU fishing and the coastal fishery of Sri Lanka .....	17
3.6 SWOT analysis .....	18
3.6.1 Background about SWOT analysis.....	18
3.6.2 SWOT history .....	18
3.6.3 The SWOT in fishery management .....	19
<b>CHAPTER 4: METHODOLOGY .....</b>	<b>20</b>
4.1 Planning the research .....	20
4.1.1 Rationale for choosing the specific study area .....	21
4.2 Research design .....	22
4.3 Data collection .....	23
4.3.1 Primary data collection .....	24

4.3.2 Secondary data collection .....	25
4.4 Data analysis .....	26
4.5 Limitations of the chosen methodology.....	27
<b>CHAPTER 5: RESULTS AND DISCUSSION .....</b>	<b>29</b>
5.1 Present fishery situation of the Northern Province of Sri Lanka .....	29
5.1.1 Marine resources of the Northern Province .....	29
5.1.1.1 Marine resources of the Jaffna district.....	30
5.1.1.2 Marine resources of Mannar district .....	31
5.1.2 Fishing method of the Northern Province.....	31
5.1.3 The Northern fishing communities .....	32
5.1.4 Fishery production trend .....	34
5.2 SWOT results and discussion of the Northern coastal fishery .....	37
5.2.1 Strengths of the Northern fishery.....	38
5.2.1.1 Potential new marine resources .....	38
5.2.1.2 Policy implementation tools - effort, mesh size and TAC.....	39
5.2.1.3 Established markets and infrastructure .....	43
5.2.1.4 Strong local ecological knowledge (LEK).....	45
5.2.2 Weaknesses of the Northern fishery .....	48
5.2.2.1 Lack of reliable data and declining catches .....	48
5.2.2.2 Strong dependency on middlemen (Control of prices) .....	49
5.2.2.3 Large post harvest losses .....	51
5.2.2.4 Lack of extension services .....	52
5.2.3 Opportunities of the Northern fishery.....	54
5.2.3.1 Demand for fish as protein source .....	54
5.2.3.2 Organizational support (Government and Non Government) .....	55
5.2.4 Threats of the Northern fishery.....	58
5.2.4.1 Intrusion of Indian fishermen.....	58
5.2.4.2 IUU fishing by Northern fishermen.....	62
5.2.4.3 Prolonged ethnic conflict .....	63
5.2.4.4 Climate change and fishery.....	66
<b>CHAPTER 6: CONCLUSION AND RECOMMENDATIONS .....</b>	<b>68</b>
6.1 Conclusion .....	68
6.2 Recommendations.....	71
6.3 Utility of the SWOT analysis.....	72
<b>REFERENCES.....</b>	<b>74</b>

## LIST OF FIGURES

Figure 1: Map showing the Sri Lankan maritime boundary. ....	4
Figure 2: Location of the Northern Province and the five administrative districts. ....	8
Figure 3: Boats devastated by tsunami in Point Pedro, Jaffna. ....	12
Figure 4: Number of OFRP boats - pre and after the tsunami. ....	14
Figure 5: Surplus yield analysis of data for the coastal fisheries in Sri Lanka showing yield (t) against fishing effort (A) and maximum sustainable yield, maximum economic yield and open access equilibrium points of the coastal fisheries in Sri Lanka (B). ....	16
Figure 6: Study area in the Northern Province – Delft, Point Pedro, Chundikulam, Pesalai and Pallimunai. ....	21
Figure 7: Conceptual framework for SWOT analysis of small-scale fishery. ....	22
Figure 8: Beach-seine operation in Chundikulam and interviewing a beach-seine owner in Chundikulam. ....	24
Figure 9: Woman involvement in beach-seine fishery in Chundikulam and a seasonal migrant family in Delft. ....	24
Figure 10: Post harvest handling - Point Pedro fishery and interviewing a traditional fisherman – Pesalai. ....	25
Figure 11: Age structure and education level of the Northern fishermen. ....	27
Figure 12: The Northern Province and its surrounding marine resources. ....	30
Figure 13: Available fishing boat types in the Northern Province in 2011 & 2012. ....	32
Figure 14: Fishing households by district (Marine fisheries). ....	33
Figure 15: Active fishermen in the Northern fishery (Marine Fisheries). ....	33
Figure 16: National marine fish production in metric tons. ....	35
Figure 17: The Northern Provincial marine fish production in metric tons. ....	35
Figure 18: S.A Miranda at his office (left), processing (middle) and drying the fish (right) in Pesalai. ....	38
Figure 19: Policy implementation tools that were ranked by fishermen. ....	42
Figure 20: Jenny Miranda waving his crab nets (right) and sorting of crabs in a company (left). ....	42
Figure 21: Available Ice plant facilities in Mannar (left) and Jaffna (right). ....	44
Figure 22: Benard Thomas and temporary huts in Delft during the interview. ....	46
Figure 23: Awareness about coral resource and opinion about marine resource exploitation level. ....	46
Figure 24: Identified market structure of small-scale fishermen. ....	50
Figure 25: A small-scale fisherman at his temporary hut and drying the fish in Delft. ....	51
Figure 26: Alberd at his temporary hut, and transport facility between Delft and Jaffna. ....	53
Figure 27: Pie chart of fishermen opinions on government support. ....	56
Figure 28: Identified organizational support to the industry. ....	57
Figure 29: Poaching pathway of Indian fishermen into Sri Lanka and satellite picture of trawlers. ....	58
Figure 30: Rasenthiram, with day catch and his worker in Delft, Jaffna. ....	60
Figure 31: Arulthas with his temporary storage hut, member of Alai Osai in Delft, Jaffna. ....	60

Figure 32: Thilakenthiran darning his net in Athisakthi cooperative buildings, at Point Pedro. Sukanthan, at his fish collection center in Chundikulam.....	61
Figure 33: Cases of reported IUU fishing by Northern fishermen .....	62
Figure 34: Migrant beach-seine fisherman, and his catch of first shift, at Chundikulam. ....	64
Figure 35: Sivananthan, a beach-seine fisherman with his family, and his catch, at Chundikulam.....	64
Figure 36: Internally displaced fisherman and a fishermen cooperative meeting at Point Pedro. ....	65
Figure 37: Traditional fisherman and his <i>katumarang</i> among other boats at Pesali, Mannar. ....	66

## LIST OF TABLES

Table 1: Comparison of fishing boats with pre and post-tsunami situation .....	13
Table 2: Proposed SWOT matrix.....	23
Table 3: Analysis of SWOT matrix from database.....	26
Table 4: Marine habitat areas in the Northern Province of Sri Lanka .....	29
Table 5: Number of fishery divisions, fisheries organizations and members in 2012.....	34
Table 6: Summary of categorized SWOT matrix results.....	37
Table 7: Crab size and price adapted by a company in Pesalai, Mannar .....	42
Table 8: Input supply from MFARD to the Northern fishermen - 2013/2014 .....	55

## LIST OF ABBREVIATIONS

BOBLME	Bay of Bengal Large Marine Ecosystem project
CFC	Ceylon Fisheries Corporation
CFHC	Ceylon Fishery Harbour Corporation
CNFL	Cey-Nor Foundation Limited
DFAR	Department of Fisheries and Aquatic Resources
EEZ	Exclusive Economic Zone
E <sub>MEY</sub>	Effort at Maximum Economic Yield
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FI	Fishery Inspector
GDP	Gross Domestic Production
IDAY	Day Boat with inboard engine
IMUL	Off-shore Multi-day boat
IOTC	Indian Ocean Tuna Commission
IPHT	Institute of Post Harvest Technology
IPOA	International Plan of Action
IUU fishing	Illegal Unregulated and Unreported fishing
LKR	Sri Lankan Rupees
MCSS	Monitoring, Control and Surveillance System
MFARD	Ministry of Fisheries and Aquaculture Development
MSY	Maximum Sustainable Yield
MTRB	Mechanized Traditional craft
NAQDA	National Aquaculture Development Authority
NARA	National Aquatic Resources Research and Development Agency
NBSB	Non-mechanized beach seine craft
NTRB	Non-mechanized traditional craft
OFRP	Outboard Fibre Reinforced Plastic Boats
SWOT	Strength, Weakness, Opportunity, Threat
UNP	United National Party
VMS	Vessel Monitoring System
Yrs	Years



## **CHAPTER 1: INTRODUCTION**

Small-scale fisheries around the world contribute about fifty percent of the fish caught for human consumption (FAO, 2015). They are important in terms of food security by providing enough protein sources to people (Béné et al., 2007). In spite of inadequate management practices, they employ an increasing number of people by being based on open access. By considering the importance of securing the small-scale fishery of Sri Lanka this study was conducted to explore the present situation of Sri Lankan small-scale fishery which suffers from natural and man-made disasters in the past. This study tends to find out the overall strengths, weaknesses, threats and opportunities (SWOT) of that industry by formulating a SWOT matrix in order to provide recommendations for a sustainable fishery production and development. So, this study analyzes the present situation of a particular area of Sri Lanka and come up with a SWOT analysis.

This chapter will give an overview of Sri Lanka, followed by the problem statement, research objectives and research questions. Finally I outline the structure of the thesis.

### **1.1 Overview of Sri Lanka**

Sri Lanka, which is called as “Pearl of Indian Ocean”, is located within the latitude of 6<sup>0</sup>-10<sup>0</sup> north and longitude 70<sup>0</sup> - 82<sup>0</sup> east. It is an island country of 65,510km<sup>2</sup> of land area and the mean temperature ranges from 26-28<sup>0</sup> C. Since it is a tropical country the Southwest monsoon and the Northeast monsoon determine the major agricultural and fishing seasons in Sri Lanka<sup>1</sup>.

According to Wijayarathne (2001) fish has been harvested in Sri Lanka since ancient times. During Second World War the fishing industry in most developing countries emerged. In Sri Lanka, the Department of Fisheries was established in 1940 (Sivasubramaniam, 1997). Since independence, fishing was a quite significant component of the Sri Lankan economy, offering food and employment to a rapidly growing of population. When consider the fishers and other employees directly and indirectly involved, the fishery sector provides livelihood for more than 1 million people (Hersoug and Munkejord, 2003).

---

<sup>1</sup> Climate & Seasons: Sri Lanka. <http://www.mysrilanka.com/travel/theland/climate.htm>. Accessed: 15/03/2015.

The island has had a miserable fisheries sector, which was exaggerated by the civil war in the North province of the country for the past thirty years (Soosai Siluvaithasan and Stokke, 2006) . The tsunami, which hit in 2004, also had colossal impacts on the fishery sector of the Northern Province (Sigurdarson and Wickramasooriya, 2006). Those phenomena led to my interest in studying the coastal small-scale fishery of the Northern Province of Sri Lanka.

## **1.2 Problem statement**

The Medical Research Institute (MRI) of Sri Lanka suggested that per-capita demand of fish consumption of 60 g/day is ample as protein intake, but fisheries statistics show that 31g/day is supplied by national fish resources as well as by import. The dearth of fish demand needs to be filled in a sustainable manner. The Ministry of Fisheries and Aquaculture Development (MFARD) has the policy vision to “fulfill the shortage of demand” in sustainable manner (MFARD, 2010).

An economist can think to maximize the profit by reducing the effort to the maximum economic yield ( $E_{MEY}$ ) level, a biologist can come up with optimizing the maximum sustainable yield (MSY) to save the marine resources and a social scientist can think to maximize the welfare of the society. This study is not going to use or separate biological, economic or social science perspective view, but to look for a combined perspective offering an overall picture of the fishery.

There are lots of factors that threaten the sustainable fish production such as over-exploitation, destructive fishing practices, uncontrolled selective harvesting, poaching by foreign vessels, inadequate monitoring, control and surveillance capabilities, post harvest losses, non-target species in gillnet fisheries and inadequate management. So, in order to function, a small-scale fishery with the aim of proper management and sustainable production, the community or the industry must be studied in terms of their capabilities and limitations. For that purpose, the following research objectives were formulated.

## **1.3 Research objectives**

By concerning the problem statement mentioned above, the research objectives were formulated. This study will explore the current situation of fish production and fishery development of the Northern Province of Sri Lanka which was under three decades of civil

conflicts. Fishery resources were under-utilized and had less development over the time period due to restricted access to the coastal area. There are small-scale fishermen in the Northern part of Sri Lanka who contribute to the food security. So, the objectives are; to bring the overall picture of the prevailing situation; to point out main bottlenecks in fishery development of that area and; to find out the ways that can be done to improve the situation. Finally, the objective is to provide recommendations to the governance system in order to improve the current situation. The specific objectives are the following:

1. To understand the current situation of the coastal fisheries of the Northern Province of Sri Lanka.
2. To identify the strengths, weaknesses, opportunities and threats of the fishery industry through a SWOT analysis.
3. To point out the main bottlenecks in fishery development of the Northern Province of Sri Lanka.
4. Finally, to provide recommendations to improve the current situation of the fishing industry.

#### **1.4 Research questions**

The following research questions were formulated according to the research objectives:

1. What is the current situation regarding the coastal fish production in the Northern Province of Sri Lanka?
2. What are the strengths, weaknesses, opportunities and threats of those fishing communities in relation to fish production and fishery development? (SWOT analysis)
3. What are the main bottlenecks in fishery development of the Northern Province of Sri Lanka?
4. How can the governance system improve the current situation?

#### **1.5 Structure of the thesis**

The next chapter elaborates about Sri Lankan fishery Sector. The third chapter is a literature review regarding Sri Lankan fisheries, SWOT analysis, food security and small-scale fisheries. Chapter four describes the methodology used in the study. Chapter five presents the research findings as results and discussion while conclusions and recommendations are presented in chapter six.

## CHAPTER 2: THE SRI LANKAN FISHERY SECTOR

This chapter gives a brief introduction to the Sri Lankan fishery sector, and is sub divided into five parts: background of the Sri Lankan fishery, legislation of fishery sector, organizations involved in fishery management, location and geography of the Northern Province, and climate and population of the Northern Province.

### 2.1 Background of the Sri Lankan fishery

Sri Lanka has a 517,000 km<sup>2</sup> exclusive economic zone (EEZ) (see figure 1), and a coast line of 1,760 km. The coastal water is the marine area from the shore to the edge of the continental shelf which is about 26,000 km<sup>2</sup> (MFARD, 2009). There are 45 major brackish water lagoons and estuaries covering a water area of 158,000 ha. In 2013, the marine fish production was 445,930 Mt. The fisheries sector contribution to the GDP<sup>2</sup> stood at around 2% in 2014 at current procure prices. Sri Lanka earned around 26 Billion of Sri Lankan money (Rupees) as foreign exchange in 2014 from the fishery production (MFARD, 2014a).

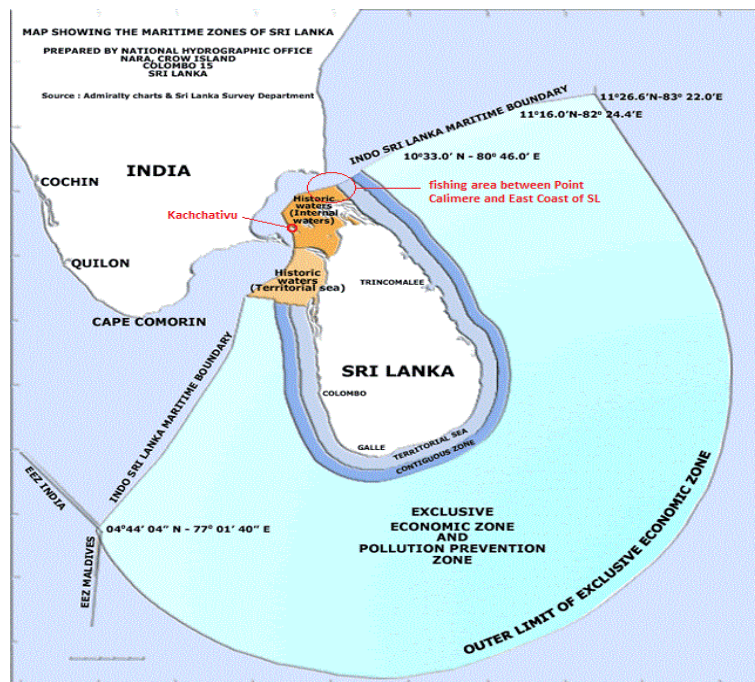


Figure 1: Map showing the Sri Lankan maritime boundary.

(Source: NARA, 1993. Available at: <http://www.slam.lk/#!about/cjg9>. Accessed: 17/03/2015)

<sup>2</sup> Gross Domestic Production – (Available from 2000-2009 at <http://regionalblog.chamber.lk/wp-content/uploads/2011/02/Fisheries-Sector-final-3.pdf>)

The major economic activity and livelihood for the coastal community of Sri Lanka, is fishing which was practiced from time immemorial. Nowadays the fisheries sector has been considered as one of the major potential areas for expansion (MFARD, 2009). This sector is the source for income generation, foreign exchange earnings and provision of reasonably priced protein for the rural and urban people in the country. The Sri Lankan fishery sector is classified as coastal, off-shore and aquaculture. This study focuses on the coastal fisheries. The coastal fisheries, which take place within the continental shelf and are undertaken by the fishing crafts in single day operations, are open access, based on common property, except to the stake-net and beach seine fishery (Atapattu, 1985). The coastal fishery dominates in production and contributed about 53% of the total catch in 2009 (MFARD, 2009). There are 15 fisheries harbors in operation and three are under construction in Sri Lanka. In addition, we find 40 anchorages and 1,562 fish landing sites providing fish landing facilities for fishing crafts throughout the island (MFARD, 2014a).

## **2.2 Legislation of the Sri Lankan fishery sector**

The fishery sector in Sri Lanka is fundamentally managed by the legislation called “The Fisheries and Aquatic Resources Act No-2 of 1996”. Under this Act, so far, twenty three regulations have been imposed (MFARD, 2006). The prominent provisions of this Act are: Formation of fisheries and aquatic resources advisory council; Preparation of plan for the management, regulation, conservation and development of fisheries and aquatic resources; Designation of fisheries management areas; Designation of fisheries committees; Designation of management authorities; Provision of license of all types of marine fisheries introduced; Inclusion of a section for aquaculture management; Inclusion of provisions to collect access on all imported fish and fish products; Stipulating a course of action to be followed in handling fishing disputes; Inclusion of more types of offences and penalties for them (GOSL, 1996).

There are other legislation and acts to be considered as for the coastal and fishery management, described below:

1. Coast Conservation Act No 57 of 1981 makes provisions for a survey of the coastal zone and the preparation of a coastal zone management plan. Those provisions are connected to the fisheries management process (FAO, 2006a).
2. The Fauna and Flora Protection (Amendments) Act 1949 (No 38), 1964 (No. 44), 1970 (No. 1) and 1993 (No. 49) indicate the protected fish species and provisions for the

establishment of Natural reserves, Nature reserves and Sanctuaries within which no person shall take fish or other aquatic animals without a permit issued by the Director of the Department of Wildlife (FAO, 2006a).

3. The National Environmental Act No 47 amended by No 56 of 1988 makes provisions for the protection, management and enhancement of the environment and for the regulation, maintenance and control of the quality of the environment; and to prevent abetment and control pollution (GOSL, 1988).
4. The Forest Act 34 of 1951 amended in 1954, 1966 and 1979, covers the large area of mangrove forest, and some of the inland water bodies surrounded by the forests fall within the control of this Act executed by the Forest Conservator (Silva et al., 2013).
5. The Fishermen's Pension and Social Security Benefit Scheme Act No. 23 of 1990 is to offer a pension for fishers and to grant insurance for physical disability or fatality of a fisher for his family. Both fishers and the government contribute to the pension fund and the social security is provided through a group life insurance scheme of the Insurance Corporation (Wijayaratne, 2001).
6. Marine Pollution Prevention Act No. 59 of 1981 provides for the anticipation, diminution and control of pollution in Sri Lankan waters and is in part to fulfill with international conventions to prevent pollution of the sea (GOSL, 1981).

### **2.3 Organizations involved in fishery management**

Fishery resources and fishery sector of Sri Lanka is structured, managed and engaged with the formulation of policies, strategies and plans for sustainable utilization made by the Ministry of Fisheries and Aquatic Resources Development (MFARD). The marine fisheries sector in the Exclusive Economic Zone (EEZ) of 517,000 km<sup>2</sup> is administrated by MFARD (MFARD, 2014a). To implement the national and sectoral policies, different organizations have been established under the ministry, and they work together to achieve the objectives. Those organizations are described below.

**Department of Fisheries and Aquatic Resources (DFAR)** is the main implementation body to manage, develop and conserve the fisheries and aquatic resources of Sri Lanka. It works to update the legislation given by the Fisheries and Aquatic Resources Act No-2 of

1996, and declares various fisheries related management practices in line with the regional and international conventions and regulations (DFAR, 2012).

**National Aquaculture Development Authority (NAQDA)** was established in 1998 under the National Aquaculture Development Authority of Sri Lanka Act, No. 53 of 1998. It develops and manages the aquaculture industry, and inland fisheries. There are nine regional aquaculture development centers, a shrimp-farm monitoring unit, and a central aquaculture training facility for it (NAQDA, 2010).

**National Aquatic Resources Research and Development Agency (NARA)** was established in 1982 under the Act, No. 54 of 1981 to conduct research and provide advisory and consultancy services on scientific, technological and legal matters related to exploitation, management, conservation and development of aquatic resources. It deals with marine biological resources, inland aquatic resources and aquaculture, fishing technology, post harvest technology, environmental studies, oceanography, information technology and hydrography (NARA, 2014).

**Ceylon Fishery Harbour Corporation (CFHC)** was established in 1962 under the Act, No. 49 of 1957. Planning, constructing and maintaining the fishery harbours and anchorages are the role of CFHC. There are 20 fishery harbours and 58 anchorages managed by them. In addition to that it provides security services to MFARD (CFHC, 2013).

**Cey-Nor Foundation Limited (CNFL)** is a government owned company registered under the Companies Act, No. 7 of 2007. They produce fiber glass boats, supply fishing nets and fishing gears, plan and construct fisheries harbours, anchorages and coastal buildings (CNFL, 2011).

**Ceylon Fisheries Corporation (CFC)** was established in 1964 under the State Industrial Corporation Act No.49 of 1957. The role of CFC is purchasing and sale of fish, production and sale of ice, provision and maintenance of cold storage facilities and production and sale of fishery by-products (MFARD, 2014b).

Other than those state owned organizations, at present there are some local and foreign funded projects involved. They support the fishery sector in various manners, such as vessel monitoring system (VMS) project, state of the art fishery harbour, fishery harbours and

anchorage development project and Bay of Bengal Large Marine Ecosystem project (BOBLME) (MFARD, 2014a).

The supplementary government organizations coming under purview of different ministries work together and collaborate with fishery stakeholders and fishermen to provide support and to resolve fishery related problems involved in the fishery. They are; Department of Wildlife, Department of Co-operatives, District Agents/Secretaries and Divisional Secretaries, Provincial fisheries ministries and Departments, Provincial councils, Municipal and Urban councils and village level Pradesheeya Sabas (Wijayaratne, 2001).

## 2.4 Location and geography of the Northern Province

In order to use the case from the Northern Province of Sri Lanka, this subsection brief about the location and geography of the Northern Province.

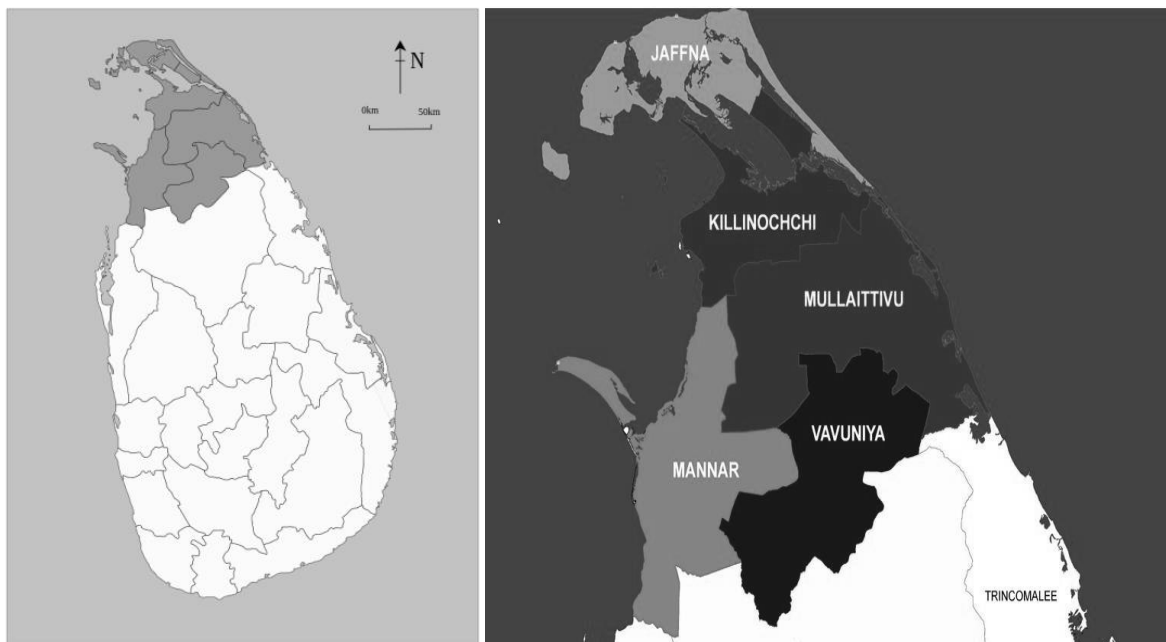


Figure 2: Location of the Northern Province and the five administrative districts.

(Available at: [https://en.wikipedia.org/wiki/Northern\\_Province,\\_Sri\\_Lanka](https://en.wikipedia.org/wiki/Northern_Province,_Sri_Lanka))

According to Department of Census and Statistics, Sri Lanka (2011), the land area extent of the Northern Province which includes Vavuniya, Mannar, Kilinochchi, Mullaitivu, and Jaffna districts, is the 3<sup>rd</sup> largest province out of nine provinces in Sri Lanka. It has 8,884 km<sup>2</sup> of land area and is located at 09°12' N and 80°25' E coordinates.



The Northern Province is surrounded by the Gulf of Mannar and Palk Bay to the west, Palk Strait to the North West, the Bay of Bengal to the north and east and the Eastern, North central and North western provinces to the south (Normann et al., 2003). The province has a number of lagoons, the largest being Jaffna lagoon, Nanthi kadal, Chundikkulam lagoon, Vadamarachchi lagoon, Uppu aru lagoon, Kokkilai lagoon, Nai aru lagoon and Chalai lagoon (NPSL, 2014).

## **2.5 Climate and population of the Northern Province**

The Northern Province is categorized as Low land Dry zone, which experiences the tropical monsoon climate that is hot and dry in the dry season from February to September, and moderately cool and wet in the wet season from October to January (Wijialudchumi, 2014). The average temperature is around 28° C to 30° C. Relative humidity varies from 70% to 90%. This region receives much rainfall by the north east monsoon from November to February and less by the southwest monsoon from May to August. Annual rainfall is less than 1,250 mm (DCS, 2011).

The Northern province's population was 1,058,762 in 2012. The majority of the population are Sri Lankan Tamil (93.86%) , with a minority Sri Lankan Moor (3.06%) and Sinhalese (3.05%) population (DCS, 2011).

## **CHAPTER 3: LITERATURE REVIEW**

This chapter presents the literature review of selected Sri Lankan fisheries. First the subchapter explains about civil war and Sri Lankan fishery. The second sub chapter deals with the tsunami and how the fishery was affected by the tsunami. Then food security and small-scale fishery is explained. Next sub chapter presents the fisheries management system of Sri Lanka. After that Illegal Unregulated and Unreported (IUU) fishing and its characterizations in Sri Lanka are explained. Finally, the last sub chapter explains about the SWOT analysis.

### **3.1 Civil war and Sri Lankan fishery**

It is important to brief about Sri Lankan civil war which destroyed human and their settlement in Northeastern part of the country. In our case, the war impacted severely on the fisheries. Sri Lanka, which received independence in 1947, is populated with 21 million people of different ethnic groups, where Sinhalese constitute 74% and the Tamils 12% of the population (CBSL, 2014). In 1956, the United National Party (UNP) presented Parliament with the Official Language Act, which declared Sinhala as the only official language. The act was passed and immediately caused a reaction among Tamils, who perceived their language, culture and economic position to be under attack. The passage of the Official Language Act induced a nonviolent protest among Tamils that was answered with violent retributions on the streets by Sinhalese (Global IDP Database, 2005). S.J.V. Chelvanayakam, the leader of the Tamil dominated Federal Party, agreed to a wide measure of Tamil autonomy in the Northern and Eastern provinces (Hafeez, 2009).

Despite the fact that it was the Tamil population that was aggrieved with policies directed at the “Sinhalization” of the state, much of the subsequent violent attacks were initiated by Sinhalese. Sri Lankan Tamils did not form violent military units in the 1950s and 1960s, the period in which cultural oppression intensified. Only in 1972 did Tamil groups begin violent attacks against state targets, and Tamil groups only became armed secessionists after 1977 (Global IDP Database, 2005). The Sri Lankan government continued to support Sinhala settlement in Tamil areas even though its officials understood the incendiary implications. A major reason for this policy is that it was popular among land-hungry southerners. A second reason was that it made sense in terms of economic development. Thus there was an official plan in the mid 1980s to settle 30,000 Sinhalese in the dry zone of Northern Province, giving each settler land and funds to build a house and each community

armed protection in the form of rifles and machine guns. Tamil spokesmen accused the government of promoting a new form of “colonialism” (Hafeez, 2009; Midlarsky and Midlarsky, 2009).

Civil war continued up until an unstable ceasefire was brokered with assistance from Norwegian diplomats in 2002. The war resumed in 2006, and continued until 2009, when the Sri Lankan army militarily defeated the Liberation Tigers of Tamil Eelam (LTTE). It has claimed the lives of at least 80,000 Sri Lankans, making it one of the longest and most brutal civil wars in the last 30 years (United Nations, 2011; GOSL, 2009).

Due to the conflict, many communities have been displaced. Hundreds of fisher people have been killed. Income from the fishery declined. Mutually beneficial relationships between different ethnic groups that had traditionally cooperated in the harvesting, processing and marketing of fish have been disrupted. During 30 years of conflict, the fishery of the Northern Province was severely affected; fishermen were not allowed to fish in certain areas, while they were restricted in other areas, so the catch from the Northern part declined during the conflict period. It drastically affected the wellbeing of the fishing communities (Fernando and Moonesinghe, 2012). Soosai Siluvaithasan and Stokke (2006) in their study of fisheries in Jaffna showed how the ability of Jaffna fisher folk to make a living varied through different phases of the war. Before the war, the north and east produced more than 50% of the country’s fishery production, by the end 2002, this had dropped to less than 5%.

As a result of the civil war the small-scale fishermen faced many constraints including: cycles of debt attributed to the intrinsic seasonality of fishing practices; the lack of capital required to access suitable technology and to diversify fishing methods; unwillingness of the younger generation to engage in direct fishing activities. In addition the government prioritized offshore fisheries (Fernando and Moonesinghe, 2012).

### **3.2 The Tsunami and Sri Lankan fishery**

Man-made conflict was not the only incident affecting the fisheries. The tsunami in 2004 also affected the Sri Lankan fisheries to a large degree, in which fishermen were killed and their homes also destroyed. There are few studies about the impacts of the tsunami on fish stocks and their habitats.

A 9.0 magnitude earthquake off the coast of Sumatra formed tsunami waves radiating out into the Bay of Bengal, the Andaman Sea, and the Indian Ocean on Sunday morning, December 26, 2004. The tsunami hit more than two thirds of Sri Lanka's coastline including northern, eastern, southern and southwestern coasts of Sri Lanka causing catastrophic destruction and loss of life (Julian Caldecott and Wickremasinghe, 2005). The government of Sri Lanka reported that 31,000 people were killed and about 7,000 more people were missing and more than 440,000 people were displaced due to the tsunami (GOSL, 2005).

The marine fishery was one of the most severely devastated sub-sectors of the Sri Lankan seafood industry involving 142,500 active fishermen and around 200, 000 people employed indirectly at that time (MFARD, 2003). Before the tsunami there were about 29,700 fishing boats in operation and 703 boat landing beaches and 12 main fishing harbours (NARA, 2003). Due to the tsunami, about 16,000 crafts were lost by fishers while about 7000 crafts were broken (Amarasinghe, 2005). The natural disaster almost paralyzed the industry and the livelihoods of the dependent communities in Sri Lanka (MFARD, 2005). Twelve per cent of the buildings in Sri Lanka were located in the coastal districts badly affected by the tsunami. Fishing implements such as outboard motors, ice storage, fishing gears and nets were destroyed. Most of the damaged boats were washed ashore by the tsunami waves and were lying shattered on the coastal lands and roads (DCS, 2005).



Figure 3: Boats devastated by tsunami in Point Pedro, Jaffna<sup>3</sup>.

Out of twelve, ten main fishing harbours were damaged by the tsunami (MFARD, 2005). This was a huge burden for a country with a capital deficit. Marine structures, service facilities and equipment in the harbours, including shore structures, heavy mechanical

---

<sup>3</sup>Source: <https://www.tamilnet.com/art.html?catid=13&artid=14183>

equipment, ice plants, buildings, breakwater boulders, boat repair yards and distribution systems were badly damaged.

The tsunami caused extensive damage to the National Aquatic Resources Research and Development Agency (NARA), Coast Protection and Conservation division, the National Institute of Fisheries and Nautical Engineering, and the Ceylon Fisheries Cooperation and Monitoring Control and Surveillance System (MCSS). Furthermore, a majority of the Ceylon Fisheries Cooperative's retail outlets as well as privately owned fish outlets were also either damaged or destroyed, incurring heavy monetary losses and losses in employment and livelihoods to thousands of dependents (De Silva and Yamao, 2007).

Around the island most of the retail fish markets were supplied with imported dry fish and canned fish soon after the disaster, the prices of which were higher than the average price of fresh locally caught fish (Subasinghe, 2005). Traditional processing activities along the coast were affected and fishing households were displaced. Especially in the post harvest sector, damage to fish marketing infrastructure, such as municipal and other retail markets, and privately owned retail fish stalls, was significant. The small-scale fish vendors and their assets also were damaged. Moreover, waste water leaked into fishing grounds, which led to viral, bacterial and parasitic infections posing yet another threat to the sector (De Silva and Yamao, 2007).

More than 80% of the fishing fleet was damaged by the tsunami. The Ministry has implemented several rehabilitation programmes to recover the fisheries, and various organizations and donors were involved in rebuilding the coastal communities. Therefore the fishing fleet in Sri Lanka has increased to a level higher than the pre-tsunami. Table 1 shows that the total fleet numbered about 43,000 boats, an increase of 36%. It also shows that the NBSB and IDAY boats decreased by 3% and 22% respectively (MFARD, 2007).

Table 1: Comparison of fishing boats with pre and post-tsunami situation

<b>Boat Type</b>	<b>2004</b>	<b>2007</b>	<b>Change %</b>
Off-shore multi-day boat (IMUL)	1,581	2,631	66%
Day boat with inboard engine (IDAY)	1,493	1,163	-22%
Outboard fibre reinforced plastic boats (OFRP)	11,559	17,973	55%
Mechanized traditional craft (MTRB)	674	1,815	169%
Non-mechanized traditional craft (NTRB)	15,260	18,483	21%
Non-mechanized beach seine craft (NBSB)	1,052	1,022	-3%
<b>TOTAL</b>	<b>31,619</b>	<b>43,087</b>	<b>36%</b>

Source: Ministry of Fisheries and Aquatic Resources, 2007

The outboard fibre reinforced plastic (OFRP) boats statistics show that all districts had a higher amount of OFRP boats in post-tsunami than pre-tsunami situation. There were more than 300 OFRP boats in post-tsunami in Mannar as shown in figure 4.

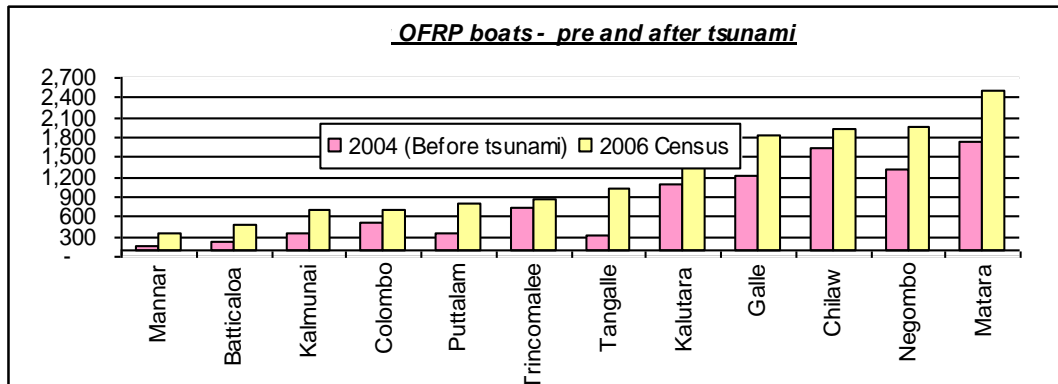


Figure 4: Number of OFRP boats - pre and after the tsunami

Source: Ministry of Fisheries and Aquatic Resources, 2007

### 3.3 Food security and the small-scale Sri Lankan fisheries

Food security is defined as “When all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life” according to the World Food Summit of 1996. It further describes that food security is built on three pillars. First, the food *availability* which ensure sufficient quantities of food available on a consistent basis; second, the food *access* of having sufficient resources to obtain appropriate foods for a nutritious diet; and the last, food *use* that means appropriate use of food based on knowledge of basic nutrition and care, as well as adequate water and sanitation (FAO, 2006b). In many developing countries, fish from small-scale fisheries offer animal-source food for fishing populations by supplying both high-quality protein and vital micronutrients (Kawarazuka and Béné, 2011).

One of the objectives of the code of conduct for responsible fisheries is to promote the involvement of fisheries to food security and food quality (FAO, 1995). Small-scale fisheries are not always acknowledged as an important supplier to food security and earnings in Asia. It is necessary that small-scale fisheries should not be marginalized and their contribution to national economies and food security be more widely distinguished and appreciated (FAO, 2010). Sri Lanka has included food security within its fisheries policy content. In Sri Lanka,

fish is widely seen as a cheap, widely available source of protein and micro-nutrients, which is particularly accessible to poorer rural and coastal communities (MFARD, 2013a).

Even though there is no proper definition for “small-scale fisheries”, FAO (2005) has identified some important characteristics such as using comparatively small fishing vessels, without onboard cold store-room or other preservation facilities, making short fishing trips, close to shore, mainly for local utilization. They are more labour-intensive and rely less on capital and energy than large-scale fisheries, often using manual fishing gears.

In fisheries, development can be explained as “a process of change through which sustainable and equitable improvements are made to the quality of life for all or most members of a society” (Bailey and Jentoft, 1990). Incorporate the need for sustainability implies that these improvements necessitate to be achieved devoid of risk to the long-term stability of the ecosystem concerned. So the economic, environmental or ecological, social and governance dimensions can be considered as the indicators of sustainable development of fisheries (FAO, 1999).

### **3.4 The fisheries management system of Sri Lanka**

This chapter explains the fisheries management system of Sri Lanka, specially the conditions and successive practices already available in the coastal fisheries sector. Since coastal fisheries are small-scale and labour intensive, it essentially demands an effective mechanism, which can tackle the problem of a resource bounded with too many people (Wijayaratne, 2001). To credit successive practices, there have been community based management approaches in the fisheries sector in Sri Lanka. Although the common law - Roman Dutch law- upholds the right to fish in the sea being open to all, in many places fisheries have been operated in terms of territorial use rights, guaranteed by customary law. Customary rights are limited to beach-seine, stake-nets and fish weirs (Atapattu, 1994).

Common property and open access nature is the main characteristics of Sri Lankan fishery except for beach-seine and stake-netting. Hardin (1968) explained how a scarce common resource "open to all" leads to overexploitation. He used a pasture open to all herdsmen for cattle grazing as an example. The pasture will become overgrazed since each herdsman can capture all the benefits of adding more cows, while sharing only a fraction of the costs. The damage caused by excessive grazing is caused by the intention of maximizing

individual benefits against shared costs. The tragedy is that each individual is locked into a system of competition for grass that leads to ruin. This is valid for all common resources utilization including an open access fishery where each fisher receives all the benefits of harvesting more fish, having no concern about the sustainability of both fishery and fishing, which provide their livelihood. However, Hardin (1968) overlooked the possibility of organizing the fisheries in the commons.

By considering above phenomena with available catch and effort data, Wijyaratne (2001) studied the bio-economic nature of the coastal fishery, and he has estimated a maximum sustainable yield (MSY) level of 165,235 tons based on the premise that the coastal fisheries in Sri Lanka are fully exploited, and further exploitation will cause a decrease in catch, which in turn reduces the profits for the coastal fisheries of Sri Lanka.

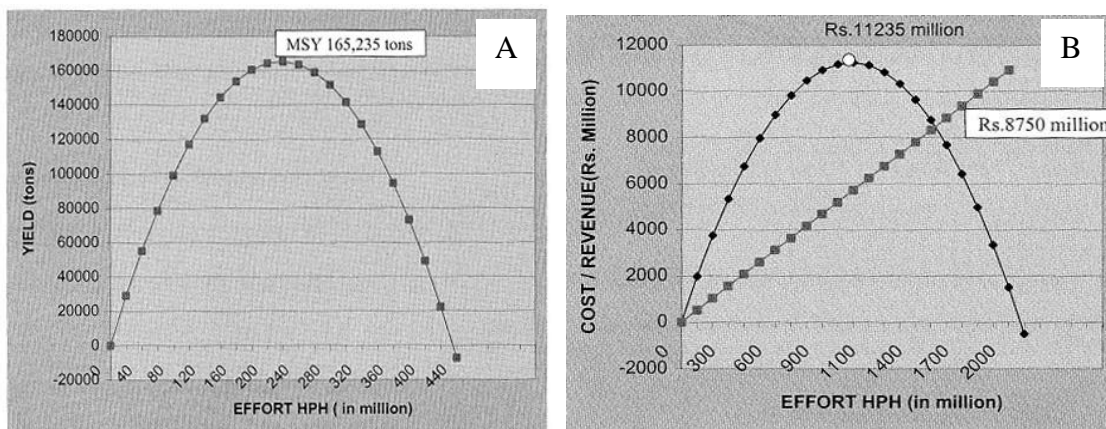


Figure 5: Surplus yield analysis of data for the coastal fisheries in Sri Lanka showing yield (t) against fishing effort (A) and maximum sustainable yield, maximum economic yield and open access equilibrium points of the coastal fisheries in Sri Lanka (B).

(Source: Wijyaratne, 2001)

He added that data accuracy and reliability might change the results. According to his point of view, the coastal fishery has already reached MSY and now the coastal fishermen are in overfishing stage.

For example, the sea cucumber fishery is an open access fishery, and no regulations or precautionary approach is used for management, except issuing licenses for diving and transportation, and forbidding the export of product if it exceeds 200 pieces per kg to avoid the exploitation of undersized specimens. Hence, the fishery is almost totally unregulated. Recently there are some signs of population depletion, including lower volumes of high value species and fishers having to travel further, and concerns were raised regarding the sustainability of the fishery (Dissanayake et al., 2010).



### **3.5 IUU fishing and the coastal fishery of Sri Lanka**

The Food and Agriculture Organization (FAO) stated that Illegal, Unregulated and Unreported (IUU) fishing has emerged as a major global issue. FAO published an International Plan of Action (IPOA) to prevent, deter and eliminate IUU fishing (FAO, 2001). IUU fishing continues to be a threat to the effective conservation and management of fish stocks in the North West Indian Ocean, and is causing economic and social losses for the coastal countries in this region that negatively impact their food security and livelihoods (FAO, 2015).

Sri Lanka was identified by the European Union (EU) in 2010 as having serious shortcomings in tackling IUU fishing and the situation is getting worse, according to the European fisheries commissioner Maria Damanaki. The EU is Sri Lanka's dominant trade partner for fish and fisheries product exports, bringing in an income of about Rs. 22 billion annually. But EU gave a yellow card for IUU fishing and banned importation of fish from Sri Lanka (The Sundaytimes, 2012).

Illegal Fishing refers to fishing activities; conducted by local or foreign fishing boats in Sri Lankan waters in contravention of the laws and regulations of Sri Lanka; by local fishing boats in high seas; by local fishing boats in waters under the jurisdiction of another State, without the permission of such State. Indian fishermen who poach in Sri Lankan waters are characterized as illegal fishing. Sri Lankan fishermen and divers exploit sea cucumber beds well away from Sri Lankan waters because of the high demand and the high income provided by the industry is also considered as an illegal fishery (Kumara et al., 2005).

Unreported fishing refers to fishing activities which have not been reported or have been misreported in contravention of the reporting procedures of DFAR.

Unregulated fishing refers to fishing activities; in the area of competence of the Indian Ocean Tuna Commission (IOTC) or any other Regional fisheries management organizations (RFMO) that are conducted by fishing boats without nationality; in areas or for fish stocks in relation to which there are no applicable conservation or management measures and where such fishing activities are conducted in a manner inconsistent with State responsibilities for the conservation of living marine resources under international law.

In Sri Lanka, most fish stocks are fully exploited. The coastal demersal species have generally been heavily exploited. The general lack of catch and effort statistics makes it

difficult to assess these stocks, but it is believed that small pelagic stocks are still less heavily exploited. Most of the shrimp species appear to be fully exploited (FAO, 2000).

### **3.6 SWOT analysis**

It is a simple and pliable tool, consisting of collecting opinions from a knowledgeable body of people who are familiar with a particular organization or industry to help evaluate internal strengths and weaknesses, as well as external opportunities and threats (Helms and Nixon, 2010).

#### **3.6.1 Background about SWOT analysis**

SWOT analysis provides the foundation for realization of the desired alignment of organizational variables or issues (Porter, 1991). Planners can better understand how strengths can be leveraged to realize new opportunities and understand how weaknesses can slow progress or magnify organizational threats, by listing appropriate and inappropriate internal and external issues in a SWOT analysis grid. In addition, it is possible to hypothesize ways to overcome threats and weaknesses or future strategies, from SWOT analysis (Hofer and Schendel, 1978).

#### **3.6.2 SWOT history**

SWOT analysis was characterized by Learned et al., (1969) and has grown as a key tool for presenting complex strategic situations by curtailing the quantity of information to ameliorate decision making. But the origin of the term “SWOT” is unknown. According to Stanford University Professor Haberberg (2000) SWOT was a concept used by Harvard academics in the 1960s, whereas Turner (2002) attributed SWOT to Ansoff (1987).

Wheelen and Hunger (1998) used SWOT to find gaps and matches between competences and resources and the business environment in their popular business policy and strategy text, while Dealtry (1992) approached SWOT in terms of groups and vectors with common themes and interactions. Regardless of the exact historical credit for coining the term “SWOT”, it has a half century of use and documentation in the literature.

### **3.6.3 The SWOT in fishery management**

A SWOT analysis is commonly used to initiate strategic planning in the fields of business and management. Recent application of SWOT analyses in business journals were reviewed by Helms and Nixon (2010), who identified its broad utility as a planning tool and for recommending strategic actions by businesses, industries, non-profit organizations and countries. However, SWOT has been criticized because it does not offer implementation strategies, or sufficient context for strategy optimization, and thus there is a need to link SWOT analysis to other follow-up strategic tools and methodologies (Helms and Nixon, 2010). Nevertheless, despite some criticism, there seems to be general agreement that SWOTs are useful in early stages of long-term strategic planning (Helms and Nixon, 2010).

The SWOT analysis was applied to marine and freshwater fisheries appeared in recent years in peer-reviewed journals (Çelik et al., 2012; Panigrahi and Mohanty, 2012; Stead, 2005; Rimmer et al., 2013) and administrative reports (GSG, 2004; Loefflad et al., 2014). Applications of SWOT analyses to aquaculture systems are more ubiquitous (Ahmed and Luong-Van, 2009; Bolton et al., 2009; Cowx et al., 2010; Garza-Gil et al., 2009; Rimmer et al., 2013).

Recently, SWOT analysis was utilized to judge the strengths and weaknesses of alternative discard mitigation approaches to achieve mandates under the 2012 reform of the European Union's Common Fisheries Policy that bans future fishery discards (Sigurðardóttir et al., 2015). That analysis provided useful contrasts and revealed potential unintended consequences of some mitigation alternatives. Moreover, it uncovered that mitigation may be most successful when measures are used in combination, rather than isolation, and concluded by formulating guidelines to design a comprehensive discard mitigation strategy.

Very recently, a SWOT analysis was used by Glass et al., (2015) to provide appropriate information to both fishery managers and scallop industry members in order to contribute to the environmental, economic and social sustainability of the scallop fishery.

## **CHAPTER 4: METHODOLOGY**

This is an exploratory study. The adopted research strategy was the case study approach. This type of case study can be used to seek answers for questions that seek to explain the presumed causal links in real-life interventions that are too complex for the survey or experimental strategies. In evaluation language, the explanations would link program implementation with program effects in which the intervention being evaluated has no clear, single set of outcomes (Yin, 2003). A case study approach helps for clear understanding of the processes being executed within a given context and it has the ability to generate answers to the questions “why?”, “what?”, and “how?” (Yin, 2009). Yin (2009) further describes that the case study research method as an “empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used”.

The methodology of the research is clearly related to the research purpose and the objectives. The main aim of this research is to explore and understand the strengths, weaknesses, opportunities and threats of the fishery industry. Therefore a stepwise case study process was derived from the planning to the reporting stage.

### **4.1 Planning the research**

With thorough literature review, objectives and research questions the above methodological path was selected. This method was planned as my research questions start with “what, why and how”, has no control on the events, and could be able to focus on contemporary events. Firstly, evidence was researched to describe the prevailing situation of the Northern Sri Lanka. Secondly, the research questions were formed, then the study area was selected, after that an interview guide was prepared to identify the general SWOT categories to interview the small-scale fishermen. Finally, data were collected from the costal fishermen and fishery professionals in order to achieve the research objectives.

#### 4.1.1 Rationale for choosing the specific study area

Three districts in the Northern Province namely Mannar, Killinochchi and Jaffna were selected for the study by considering the specific research objectives as to explore the present situation and to conduct the SWOT analysis of the coastal fishery sector.

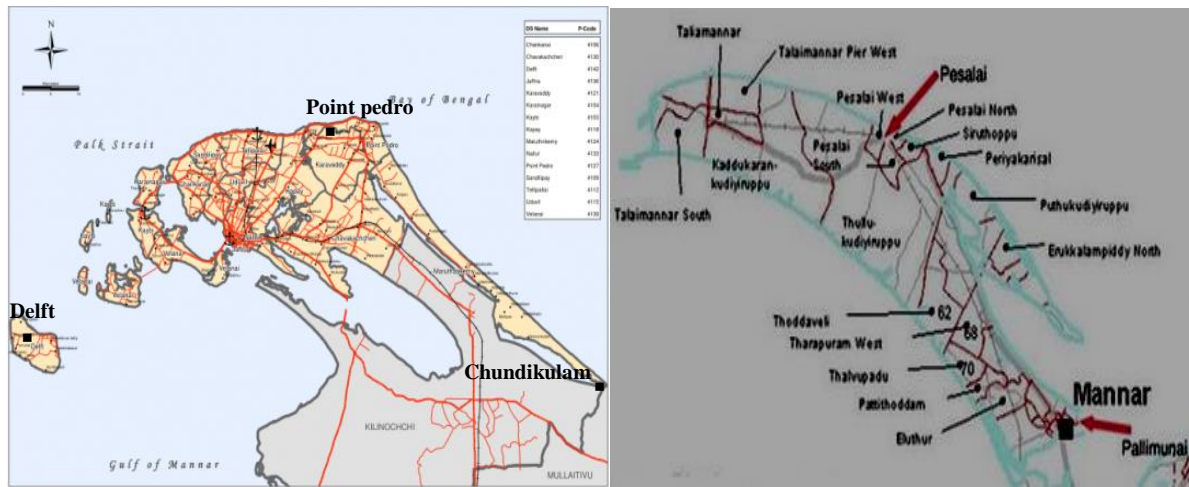


Figure 6: Study area in the Northern Province – Delft, Point Pedro, Chundikulam, Pesalai and Pallimunai

The Northern Province was severely affected by thirty years of civil war and the coastal communities and fishery sectors were also affected by restricted entry for fishing. The tsunami destroyed the social system connected to the fisheries in numerous ways in 2004. The reasons to select the above study area for research include: the fishery sector of Northern Province is under-developed; there are small-scale fishermen in that region; less modernized fishery nature and have relatively higher production compared to other northern districts; relatively homogeneous physiographic condition; same fishing grounds and relatively same target fish. Finally, communication and data collection suitability of this area also led me to choose the above three districts in the Northern Province of Sri Lanka.

There are five districts in the Northern Province. Vavuniya district does not have a coastline. Fishery production is very little from Mulaitivu districts. So I skipped those two districts. The Delft and Point Pedro areas were chosen in Jaffna district, Pesalai and Pallimunai areas were chosen in Mannar district, finally I have selected Chundikulam area from Killinochchi district to conduct the study.

## 4.2 Research design

The research design is the logic that links the data to be collected to the initial questions of study (Yin, 2009). As I explained above, the objectives and research questions are the base for the research design. Research propositions directs the scope of study by forming “how, why” questions. The Northern fishery community is the unit of analysis in this study. Collected data were linked to propositions in many ways, such as explanation and statistical analysis with the help of qualitative and quantitative methods. The current situation regarding the coastal fish production in the Northern Province of Sri Lanka was collected by designing the quantitative methods from secondary data. At the early stage of conceptual frame work formulation, fishery governance model was utilized to create a conceptual framework (see figure 7) for the field interview.

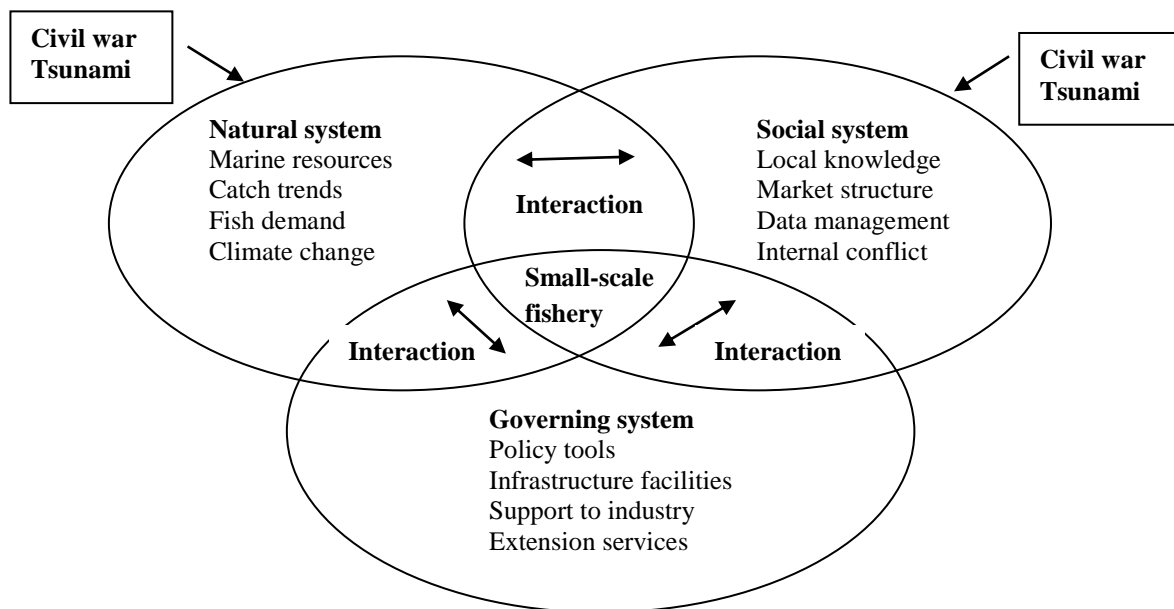


Figure 7: Conceptual framework for SWOT analysis of small-scale fishery

The key sustainable development indicators of natural, social and governing system are explained in figure 7. Those elements are explained in the SWOT analysis. The study seeks to analyze the interaction between social and governing system, natural and governing system and interaction between the natural and social system.

Later, with the help of literature, strengths, weaknesses, opportunities and threats (SWOT analysis matrix) of fishing communities in relation to fish production and fishery development was designed (see table 2).

Table 2: Proposed SWOT matrix

<b>Strengths</b>	<b>Weaknesses</b>
A) Marine resources B) Policy implementation tools C) Market and infrastructure D) Local ecological knowledge	A) Reliable data and catch trend B) Postharvest quality C) Extension services D) Control of price (Middlemen)
<b>Opportunities</b>	<b>Threats</b>
A) Demand for fish B) Organizational support	A) IUU fishing B) Climate change C) Conflict of fishermen

Later the SWOT elements were grouped under appropriate headings of SWOT by the investigator. The interview guide was the tool to summarize the actual situation of the Northern fishery. The main bottlenecks of fishery development of the Northern Province of Sri Lanka were summarized based on the findings. At last, “how can the governance system improve the current situation” was discussed from the investigator’s point of view.

#### **4.3 Data collection**

It was determined that qualitative data collection was the most appropriate form of research to be used in this study. Qualitative research can be defined as "any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification" (Strauss and Corbin, 1998:11). Qualitative research is also a neutralistic approach to understanding a particular context-specific setting (Golafshani, 2003). Qualitative research is capable of discovering the truth attached to a problem (Carr, 2008). Further, qualitative research fairly expresses a social phenomenon since the data occurs naturally and there is no need to have an experimental type of design (Hancock, 2002). It is about experiences, understandings, opinions, and feelings of the individuals of the study, which is a holistic perspective (Groenewald, 2004). Despite their pros and cons, both qualitative and quantitative research designs are valuable in discovering key findings. Such key findings are capable of unfolding the “the big picture” (Hancock, 2002).

Moreover, qualitative research helps in developing theoretical concepts and provides a better understanding of the social world (Golafshani, 2003). Woods (2006) identified five features of qualitative research: a) it focuses on natural settings; b) it has interest in meanings; c) it involves perspectives and understandings; d) it emphasizes on process; and e) it involves concerns related to inductive analysis and grounded theory.

Yin (2009) says there are six sources of evidence commonly used in case studies data collection: documentation, archival records, interviews, direct observations, participant observations and physical artifacts. I have utilized documents, voice records, interviews and direct observations to collect the data.

#### 4.3.1 Primary data collection

Primary data were collected by interviews for SWOT analysis. Interview evidence was utilized for the data analysis. Data were collected on March 2015, started on 18<sup>th</sup> of March to 1<sup>st</sup> of April for three weeks from five communities, namely Delft and Point Pedro in Jaffna district, Pesalai and Pallimunai in Mannar district. At last data was collected from Chundikkulam fishery area of Killinochchi district. The following figure 8 shows an interview of beach-seine fishermen and the traditional operation of beach-seine in Chundikkulam.



Figure 8: Beach-seine operation in Chundikkulam and interviewing a beach-seine owner in Chundikkulam



Figure 9: Woman involvement in beach-seine fishery in Chundikkulam and a seasonal migrant family in Delft



At least six fishermen were interviewed from each village; all together 39. A set of questions were asked individually and/ or group with a prepared interview guide. All the interviews with their opinions were recorded as voices as well as written documents with the consent letter signed prior to the interviews. The “snow balling method” was adapted to find and contact the interviewees.

On many occasions direct observations were used and the situation in many areas documented by photographs. For example figure 9 (left) shows a woman involved in post harvest handling of fishes and a seasonal family migration in the coastal fishery (right). Figure 10 presents the poor post harvest handling technique (left) in the Northern Province and status of a traditional fisherman (right).



Figure 10: Post harvest handling - Point Pedro fishery and interviewing a traditional fisherman – Pesalai.

#### 4.3.2 Secondary data collection

Documentation is one of the evidence gathering sources in a case study. It plays an explicit role in any data collection method (Yin, 2009). Most of them were gathered through internet. They are stable, unobtrusive, exact and broad coverage of events. But, there are some weaknesses; retrievability, biased selectivity and poor repeated accessibility (Yin, 2009). Secondary information included those furnished by the DFAR and the statistical division of the MFARD. In addition an array of documents, such as journals, annual reports, administration reports and FAO reports were used. Moreover, research reports and other publications of research workers were also of significant importance as secondary sources of information. I utilized many online articles, books and documents that are related to the Sri Lankan fisheries, all of them documented in the list of literature.

#### 4.4 Data analysis

I tried to follow the three principles of data collection. First, I used multiple sources of evidence like interviews, documents and direct observations. Second, I have recorded the data on paper, voice records and using Excel, creating a data base used to check data quality control and for the analysis. As in any other qualitative study the data collection and analysis occur concurrently. The type of analysis engaged in will depend on the type of case study. Yin (2009) briefly describes five techniques for analysis: pattern matching, linking data to propositions, explanation building, time-series analysis and cross-case synthesis. Yin (2003) noted that one important practice during the analysis phase of any case study is the return to the propositions.

I mostly utilized the data linking to propositions and explanation building technique for the analysis. Primary and secondary data were utilized to answer the present situation of Sri Lankan fishery sector. Whereas most of the primary data which were collected during the field work were categorized in the SWOT matrix, and each interviewees were assigned a number under each categories. For example, a fisherman called “Miranda” who talked about potential marine resources under the strengths category will be assigned as number 9, the same person was assigned same number under another category if he talked about that issue. Likewise the SWOT matrix created is shown in table 3.

Table 3: Analysis of SWOT matrix from database

Strengths	Interviewees	Weaknesses	Interviewees
Potential new marine resources	9, 32	Lack of reliable data	9, 35
Policy implementation tools	10, 35, 36	Strong dependency on middlemen	9, 35
Established markets and infrastructure	7, 8, 9, 36, 37	Large postharvest losses	36
Strong local ecological knowledge	10, 30, 35, 40	Lack of extension services	33, 34, 36
Opportunities	Interviewees	Threats	Interviewees
Strong demand for fish as protein source		IUU fishing	15, 24, 29, 31
Organizational support	9, 10, 35, 40	Prolonged internal conflict	17, 26, 28
		Climate change	11, 16

Another linking of proposition from interview evidence is to create graphs. The following pie chart (figure 11) was created to analyze the age structure and education level of interviewees.

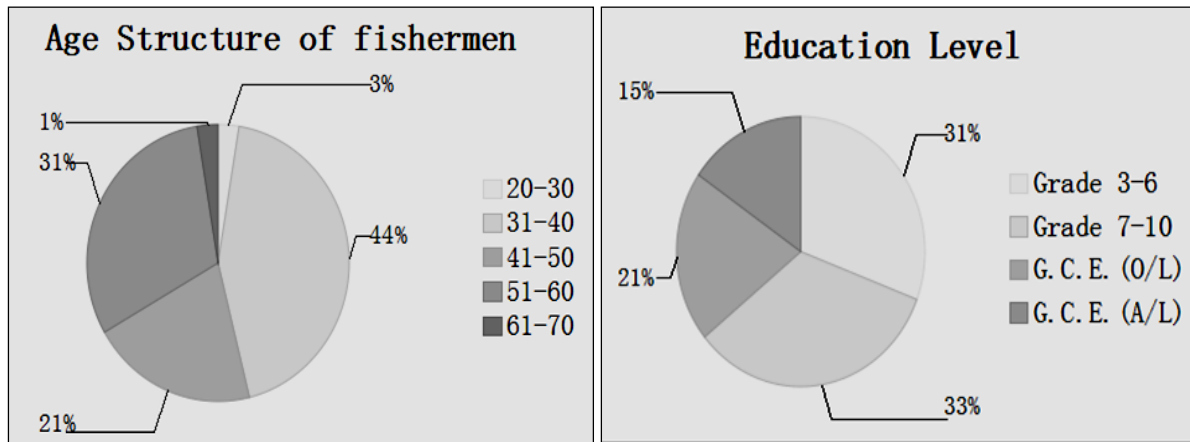


Figure 11: Age structure and education level of the Northern fishermen

From the above figure, it is clear that majority (44%) of the fishermen are in the 31-40 age category, 31% of them are in the 51-60 age category. Most of the Northern fishermen had grade 7-10 education level, but 36% of them had at least completed the ordinary level of education.

#### 4.5 Limitations of the chosen methodology

There are some advantages and disadvantages of conducting the research as a case study. Case studies can offer important evidence better than many other methods. But, there are some objections attributed to it. The main limitations associated with case studies are described below:

- 1- Lack of rigor - The investigator can be sloppy or less systematic and may be allowed equivocal evidence or biased views to influence the direction of the findings and conclusion.
- 2- Provide little basis for scientific generalization - There is no samples to represent findings are expanded and theories are generalized (Lipset et al., 1956).

3- Case studies take too long time and result is massive, unreadable documents. (However, data collection methods like ethnographies require long time).

4- Case studies can seemingly emerge with the renewed emphasis on randomized field trials. So, it cannot directly address the issue.

The study results and lessons learnt could be difficult to apply to a larger population. This is due to the generally small sample group and selection of subjects on a non-random basis (Hancock, 2002). The case study method has less ability to give cause-effect conclusions (Stuart et al., 2002) and sometimes it is hard to generalize the findings (Gerring, 2004).

The snow balling method of data gathering may lead to bias when the researcher gathers information from same area and choosing the friends of the interviewees. Only higher proportions of secondary data were utilized to analyze the present status of Sri Lankan fishery. Moreover, a case from the Northern Province can be a limitation to apply the findings to whole country. The study area was selected by the researcher based on convenience approach which in turn can limit the results of the study. In most cases the interview data of fishermen were utilized for the SWOT analysis, but I did not include other fishery stakeholders like producers, distributors and marketers except for some government officials.

## CHAPTER 5: RESULTS AND DISCUSSION

This chapter describes the present fishery situation of the Northern Province of Sri Lanka, followed by a discussion of the SWOT results.

### 5.1 Present fishery situation of the Northern Province of Sri Lanka

Due to the presence of a large continental shelf and a trawlable bottom, the northern fishing grounds were responsible for producing over 40% of the country's reported landings, because they were most productive and accessible fishing grounds in Sri Lanka (Engvall et al., 1977). But, the tsunami and the conflict situation led to destruction of the fishery sector and a decline in production (Soosai Siluvaithasan and Stokke, 2006). With the end of the civil war in 2010, efforts to increase fisheries production in the north were a high priority for the Department of Fisheries (Anon, 2010). So, this chapter will focus on the present status of Northern Province coastal fishery.

#### 5.1.1 Marine resources of the Northern Province

Fishing has been one of the main economic activities in northern Sri Lanka. It is noted that under the NOAA/IUCN project on "World Heritage Biodiversity", the Gulf of Mannar cluster have been identified as 'High Regional Priority Areas' within the Central Indian Ocean region (Ward, 2003). It says that Northern Province has potential marine resources to be managed and exploited for the wellbeing of the coastal communities and the country. Management of these fishery resources of the Northern Province is also important for the country's economy. Livelihoods of the northern fishing families and the industry have been severely affected by the war situation during the last three decades (Soosai Siluvaithasan and Stokke, 2006). But, it is still noted that resources are there for the industry to develop and grow in a sustainable manner regarding fish production. The following table 4 shows the marine habitat areas in the Northern Province (NARA, 2013).

Table 4: Marine habitat areas in the Northern Province of Sri Lanka

District	Land Area (Km <sup>2</sup> )	Inland Waters		Mangroves (ha)	Salt Marshes (ha)	Lagoons (ha)
		(Km <sup>2</sup> )	(ha)			
Jaffna	929	96	9,600	260	4,963	45,525
Mannar	1,880	116	11,600	1,261	5,179	3,828
Mulaitivu	2,415	202	20,200	463	517	9,233
Kilinochchi	1,205	74	7,400	312	4,975	11,917

Source: Survey Department/ Statistics Unit, Ministry of Fisheries and Aquatic Resources Development, 2013

### 5.1.1.1 Marine resources of the Jaffna district

The fishing around the Jaffna peninsula takes place in the Palk Bay, the Palk Strait, Point Pedro Bank, and the Jaffna Lagoon (Normann et al., 2003). The Palk Bay consists of shallow waters and large patches of eel grass and is dominated by inshore shallow water species such as silver bellies, bream, prawn, rabbit fish, mullet, cuttlefish and squid. Large pelagic fish, such as *parai*<sup>4</sup>, seer, barracuda, and queen fish, are also caught in addition to prawns and crabs. Palk Strait is a shallow area north of the Jaffna peninsula. The dominant species here are bream, rock cod, small inshore fish, sardine, herring, small *parai*, barracuda, pomfret, wolf herring, ribbon fish, cuttlefish, squid, lobster and crab, as well as shark, skate and ray. Point Pedro Bank (figure 12) is a long strip along the east coast of the Jaffna peninsula with rich stocks of different types of large demersal fish. Point Pedro Bank is a source of both smaller fishes for local consumption and larger skates, rays and sharks. The Jaffna Lagoon is a shallow area between the Jaffna peninsula and the mainland which holds various pelagic and demersal inshore species, bream, rabbit fish, small *parai*, barracuda, rock cod, mullet, prawn and crab (Sivasubramaniam, 1995).

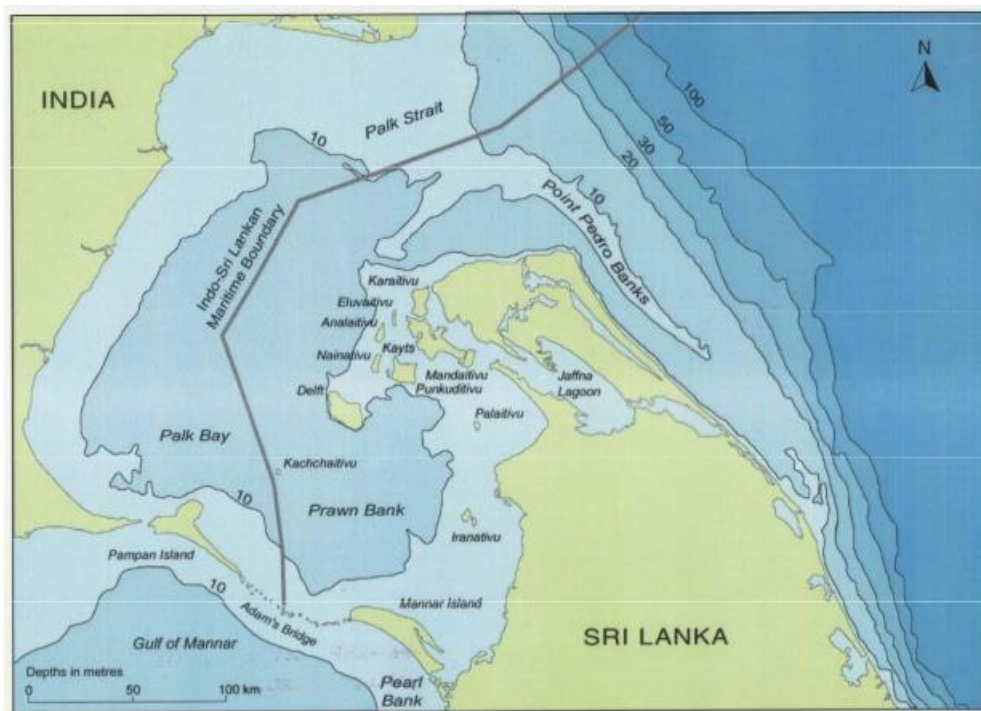


Figure 12: The Northern Province and its surrounding marine resources.

Source: Hydro-grapher of the Navy, 1987

<sup>4</sup> Tamil name of Indian mackerel (Kumbala in Sinhala) - *Rastrelliger kanagurta* (see at: [http://www.fisheriesdept.gov.lk/fisheries\\_beta/index.php/common-commercial-fish-types-of-sri-lanka](http://www.fisheriesdept.gov.lk/fisheries_beta/index.php/common-commercial-fish-types-of-sri-lanka))

### **5.1.1.2 Marine resources of Mannar district**

When compared with the other parts of Sri Lanka, the sea of Mannar has remarkable marine environment with rich fishing areas suitable for fishing and strong tradition of lagoon, coastal and offshore fishing. It has a marine coast line with a stretch of 163 km, from Theavanpiddi to Mullikkulam. Mannar island is surrounded by Palk Bay and the Gulf of Mannar. Encircling the Mannar island is a shallow continental shelf with rich fishing banks, pearl bank and prawn banks as well as extensive area of 3,828 ha with brackish water and mangroves (Soosai, 2008). There are variety of species of fin fish, shell fish and holothurians on the continental shelf of the Palk Bay in the coastal water. There are shallow water species like silver billies, bream prawn, rabbit fish, mullet, cuttle fish and squid in that region. The large pelagic fish such as ‘paarai’, seer, barracuda, and ‘katta’ are also found, in addition to prawn and crabs. The coastal lagoon is a shallow area between the Mannar island and the mainland, which holds various pelagic and demersal inshore species. This diversity of marine environment with rich fish resources has been the basis for a long and strong tradition of lagoon, coastal and offshore fishing as well as for diving (Soosai, 2008).

### **5.1.2 Fishing method of the Northern Province**

Coastal Fisheries, Offshore Fisheries and Inland Fisheries are the main three fishery sectors in Sri Lanka (MFARD, 2014a). Coastal fishery is dominant in the Northern Province in terms of fish production. Both traditional and modern fishing methods are identified during the field work. ‘*Vallam*’, ‘*oru*’, and ‘*kaddumaram*’ are the boats used in traditional fishing. Set nets, beach-seines, cast nets, traps and hand line are the traditional fishing gears. Trawlers (28-32 feet) and Fibre Reinforced Plastic (OFRP) boats (17.5 - 23 feet) with trawl nets, gill nets and ring nets are the modern fishing tools in use. The coastal fishery contributes 99% of the fishing in Mannar. Inland fishing was abandoned due to the war condition. There is no offshore / deep sea fishery in Mannar (NARA, 2013).

Fishing is conducted from a large number of relatively small crafts, ranging from non-mechanized or mechanized traditional wooden craft (*vallam* and *kattumaram*), through two kinds of medium sized, mechanized fiber glass boats (17.5 feet and 28-32 feet), to multi-day boats that may fish for up to four weeks per trip. The predominant fishing method is gill-netting, but fishing gear types also include long lines, poles and lines, trawls, purse-seines and beach-seines (NARA, 2013).

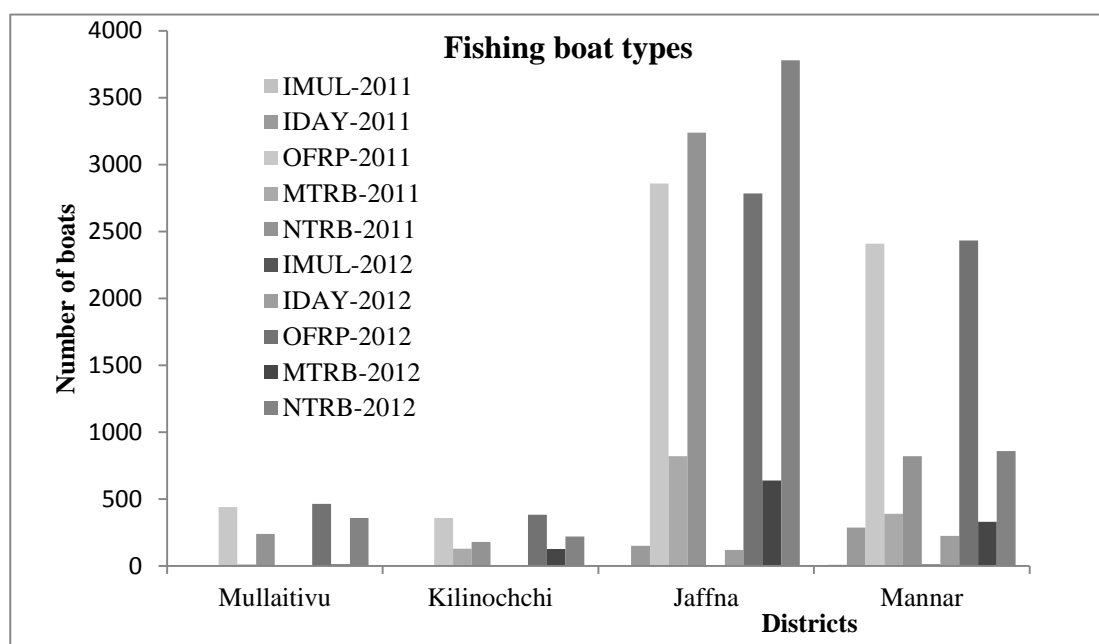


Figure 13: Available fishing boat types in the Northern Province in 2011 & 2012

Source: Survey Department/ Statistics Unit, Ministry of Fisheries and Aquatic Resources Development 2013

By looking at the figure the number of fishing boats, which are available in the Northern Province in 2011 and 2012, Mullaitivu, and Killinochchi districts had very few boats compared to Jaffna and Mannar. There is a total increase in the number of boats from 2011 to 2012. OFRP<sup>5</sup> and NTRB are the widely available boats in the Northern Province. Jaffna district had total of 7,331 boats, whereas Mannar district had total of 3,858 boats in 2012. This study only considers the coastal fishery of the Northern Province, so Vavuniya district was omitted in some statistics, since it does not have a coastline.

### 5.1.3 The Northern fishing communities

From the ancient time, people along the coast line have the tradition of fishing in Sri Lanka. It was open access to all who have the social acceptance, values and norms and caste system also allowed them to do fishing (Bavinck, 2015). But, after the marine legislation of 1996 the people who have the boat and registered as fishermen can fish legally under the open access regime. According to the Ministry of Fisheries and Aquatic Resources Development (MFARD, 2013b), the four coastal districts in the Northern Province had 40,020 fishing households in 2012 (figure 14). There were about 48,450 (figure 15) active fishermen in these four coastal districts in 2012.

<sup>5</sup> (See the List of Abbreviations in page vii)



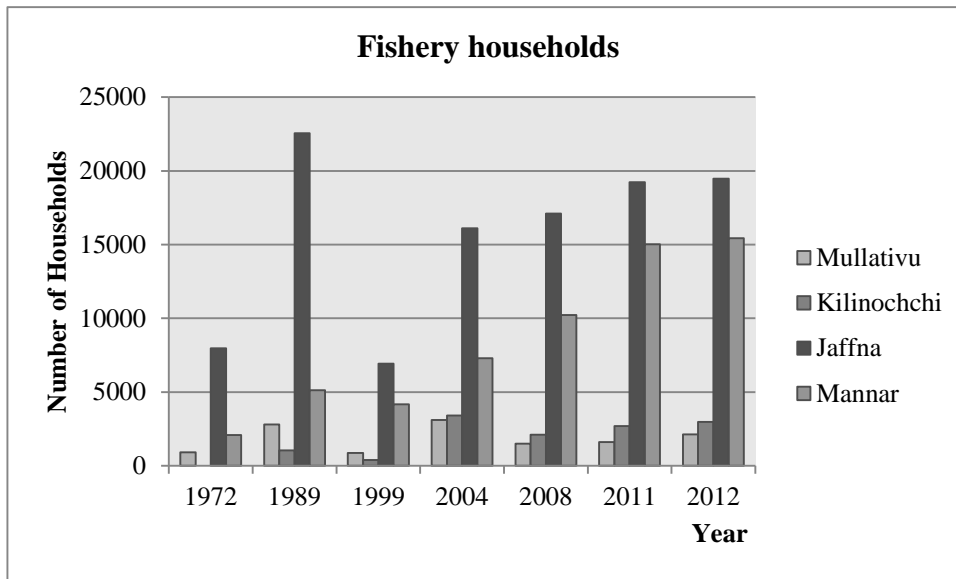


Figure 14: Fishing households by district (Marine fisheries)

Source: Survey Department/ Statistics Unit, Ministry of Fisheries and Aquatic Resources Development, 2013.

Figure 14 shows that the fishing households over forty years in the Northern Province of Sri Lanka. In 1970s there were about 10,000 fishing household in the Northern Province, later in 1989, the number of fishing households increased up to 25, 000.

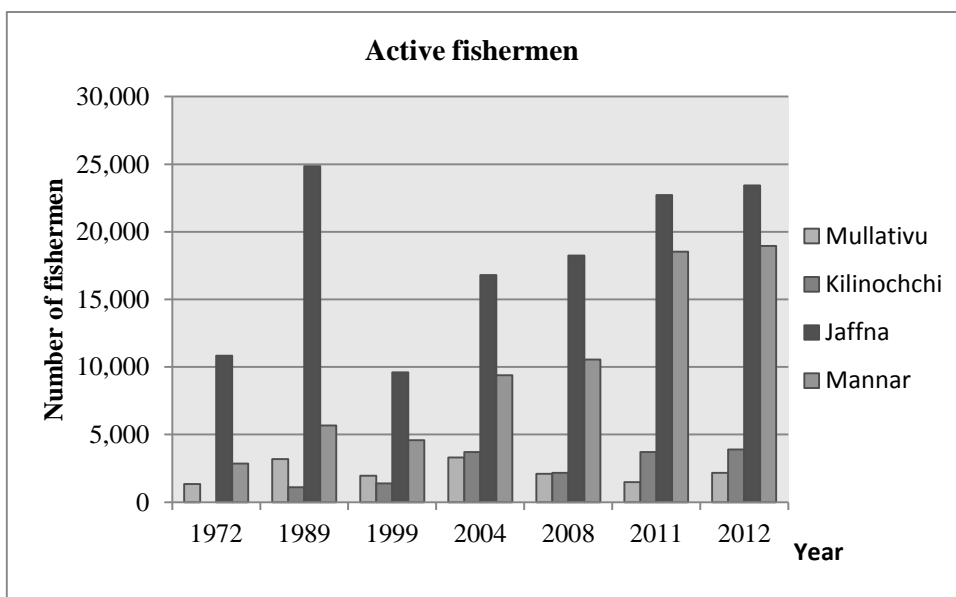


Figure 15: Active fishermen in the Northern fishery (Marine Fisheries)

Source: Survey Department/ Statistics Unit, Ministry of Fisheries and Aquatic Resources Development, 2013.

People of Jaffna were internally displaced in 1996 due to the civil war, and there was a huge reduction of fishing activities and number of households in the Northern Province (a

reduction of 10,000 in 1999). During peace time in 2002 and relocation of fishermen, the number of households increased again in 2004. When considering Mullaitivu and Killinochchi districts, the figure clearly shows that there was a huge reduction of number of households from 2004 to 2008. It is because of the tsunami. After 2008, and by end of the war in 2009, all the districts of the Northern Province had an increase trend of fishing households. There were possibilities to rebuild the industry by the organizational support. The same explanation is applicable to the active fishermen in the Northern Province as it shows a similar trend in terms of households.

Table 5: Number of fishery divisions, fisheries organizations and members in 2012

Districts of Northern Province	No. of FI divisions	No. of fishery organizations	No. of Members
		Coastal	Coastal
Jaffna	14	87	9,147
Mannar	6	71	6,719
Mullaitivu	4	24	3,034
Kilinochchi	5	24	1,645

Source: Survey Department/ Statistics Unit, Ministry of Fisheries and Aquatic Resources Development, 2013.

From table 5, the number of fisheries inspector (FI) divisions can be obtained in those districts. Jaffna has highest number of FI divisions and members in 2012. There are many fishery communities in the Northern Province of Sri Lanka. From the same table, it is noted that Jaffna has 87 coastal fisheries organizations and Mannar 71, Mullaitivu, and Kilinochchi has 24 coastal fisheries organizations in 2012.

#### 5.1.4 Fishery production trend

The total fish production of the country in 2013 was 512,840Mt. Marine fish production was 445,930 Mt while the rest 66,910 Mt comes from inland and aquaculture. The national coastal fish production was about 250,000 Mt in 2013. Although there are 15 fisheries districts in Sri Lanka, now Galle and Matara districts together contributes more than 20% to the total marine fish production of the country. Figure 16 shows the national fish production from 1960 to 2015. Figure shows five consecutive years' catch data from 1960 to 2005, after 2005 catch data is presented in each year. The coastal, offshore and total marine productions are indicated in the figure. Coastal fish production is dominating which is about 100,000 metric tons more than the offshore production in 2014.

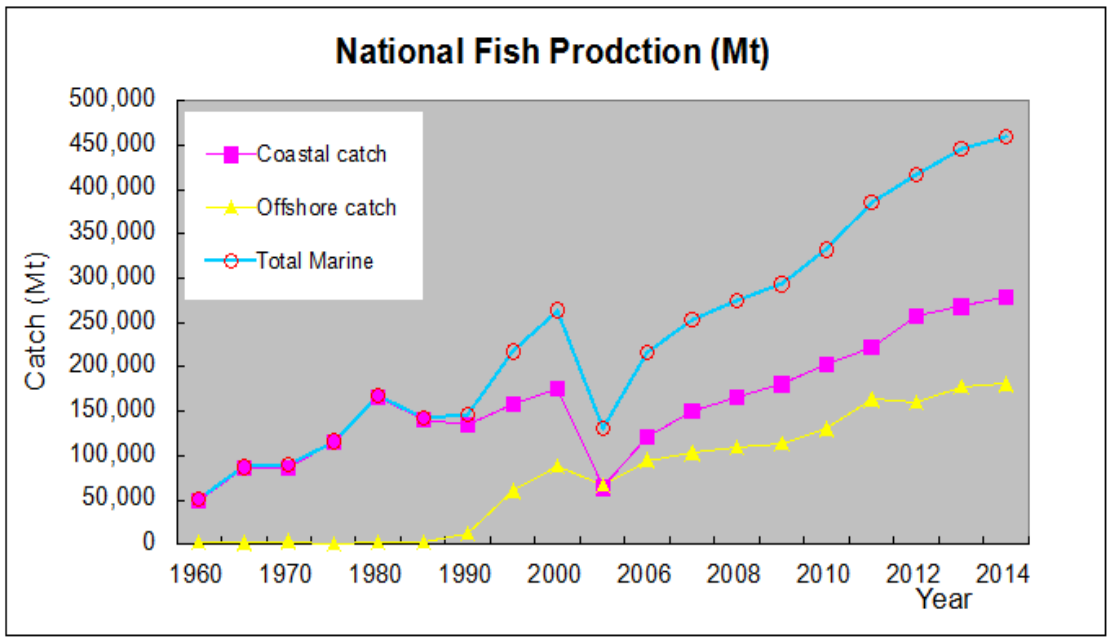


Figure 16: National marine fish production in metric tons

Source: Ministry of Fisheries and Aquatic Resources Development, 2014.

National fish production especially the coastal fishery shows an increase trend at a decreasing rate over the time. National fishery production shows similar trend to the Northern Province’s fish production. In this section, it is important to consider fish production in the Northern Province over the time period. Following figure 17 shows the marine catch data in the Northern Province from 2000 to 2013.

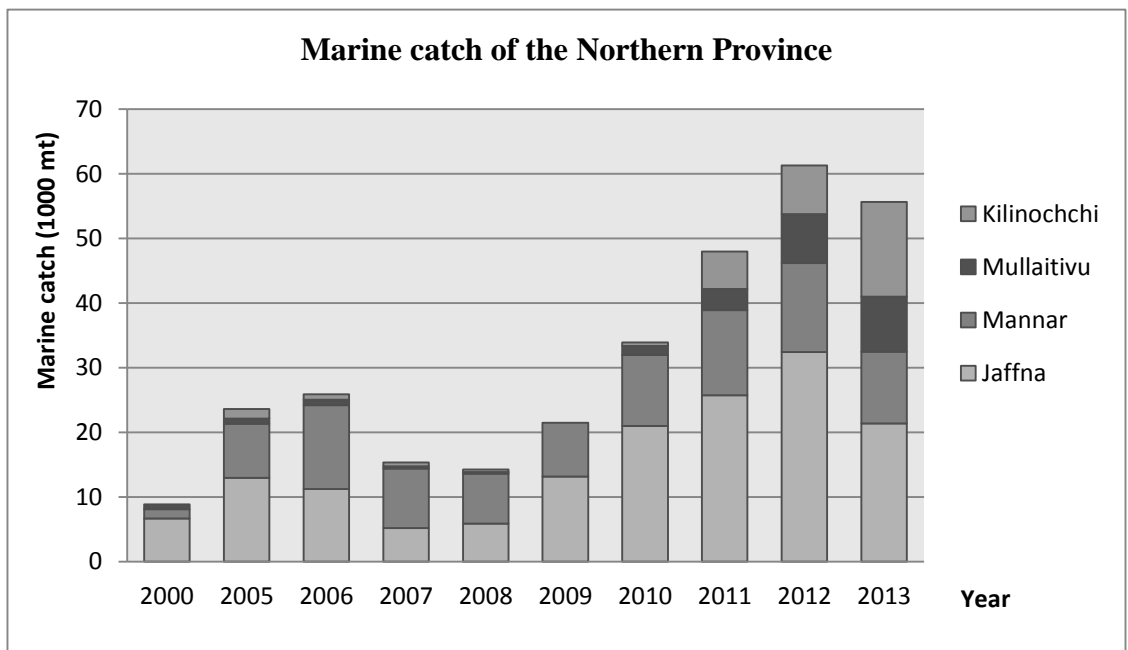


Figure 17: The Northern Provincial marine fish production in metric tons

Source: Ministry of Fisheries and Aquatic Resources Development, 2013.

The marine fish catch from the Northern Province before 1990 was about 8000 metric tons. After 1989 the catch was reduced drastically up to about 1,000 metric tons due to beginning of the civil war conflict of Sri Lanka. After 2002 there was a growth trend in fish production. According to the above figure 17, two stages of fish production can be identified during the past fourteen years, starting from 2000 ending in 2013. Stage 1 lasts from 2000 to 2008; stage 2 lasts from 2009 to 2013. Those stages clearly show that there were steady production and declining and growing stage. One cannot identify whether these clear demarcation of growth is due to fishery management. It is clearly known that stage variation is due to the war situation and limited access to fishing grounds in that area over the years. Moreover the stage demarcation is due to the tsunami impacts as well. But when we consider the production before 2000, it was low due to the inefficient fishing methods, based on traditional technology. After that there was growth in production due to transition to modern fishing methods with the introduction of outboard engines and mechanized inboard boats, and nets using synthetic fiber.

According to Soosai Siluvaithasan and Stokke (2006), development of infrastructure facilities for processing and preservation also triggered the growth. So, 5 - 6% of the coastal fish production was covered by Mannar during the early 1980s (9,745 MT of 182,530). After the war the collapse of the fisheries led to low production in that region. Mannar district has had steady production of about 10,000 Mt over the period. But Jaffna district has had two stages of production due to war time impacts. Mulaitivu and Killinochchi districts have had very little fishery production compared to other districts due to the war and reduced data collection over the time period.

With the end of war in 2009, all the districts except Mannar, had a remarkable growth in the fishery production. According to MFARD (2013b) especially Killinochchi district produced more than Mannar district in 2013. But the total marine fish production from the Northern Province was reduced by 5,000Mt from 2012 to 2013 due to less production from Jaffna districts which might be due to the Indian poaching conflicts.

This sub chapter explained the present situation of the small-scale coastal fishery in the Northern Province of Sri Lanka in order to answer the first research question. I explained the marine resources of the Northern Province, fishing methods, fishing communities and fishery production from that area under the different sub chapters. Later, I summarize the present situation of the fishery with adequate evidences in the SWOT analysis.

## 5.2 SWOT results and discussion of the Northern coastal fishery

The Northern Province of Sri Lanka contributed as much as 30 percent of the total fish catch of the country in the 1970s. However, 30 years of civil war had an adverse impact on the fisheries of the Northern Sri Lanka. Upon the conclusion of the war, the government has embarked on a very ambitious programme of developing the fisheries of the Northern area to regain its lost status, and fisheries are identified as the major sector to rebuild the economy and the livelihoods of the fishermen of the area. This chapter describes the results and discusses the strengths, weaknesses, opportunities, and threats (SWOT) of the Northern fishery sector.

Research findings from the field survey with structured interviews of fishermen, fishery professionals and secondary data, provide us with an overall picture of the Northern Province fishery industry and its strengths, weakness, opportunities and threats. They are explained with examples from the study area. Strengths, weaknesses, opportunities, and threats are explained in separate subsections in this chapter. One can find some ‘strength’ points to be categorized as ‘opportunity’; on the other hand a weakness may be included in threat. So, sometimes strength can be considered as opportunity, ‘weakness’ can be categorized as ‘threat’ by various people. Some categories can also be interchangeable in a SWOT analysis over time.

Table 6: Summary of categorized SWOT matrix results

<b>Strengths</b>	<b>Weaknesses</b>
1) Potential new marine resources 2) Effective policy implementation tools in place 3) Established markets and infrastructure 4) Strong local ecological knowledge	1) Lack of reliable data and declining catch 2) Strong dependency on middlemen 3) Large postharvest losses 4) Lack of extension services
<b>Opportunities</b>	<b>Threats</b>
1) Strong demand for fish as protein source 2) Organizational support (Government & Non Government)	1) Intrusion of Indian fishermen 2) IUU fishing by the Northern fishermen 3) Prolonged ethnic conflict 4) Climate change

### 5.2.1 Strengths of the Northern fishery

According to the findings of this thesis study, the SWOT analysis shows that communities which are socio-economically dependent on the fishing industry are characterized by a range of strengths. These include potential new fishery resources, policy implementation tools like effort and total allowable catch (TAC), market and infrastructure and strong local ecological knowledge among the fisher folk. Furthermore, there are strong and good relationships between fishing families which could be observed throughout the field work.

#### 5.2.1.1 Potential new marine resources

Sri Lanka has potential fishery resources in the exclusive economic zone, and has great potential for the development of coastal fisheries. The Northern Province has a rich biodiversity and marine habitats as was explained in the previous subsection. But, coastal fisheries are multi-species in nature and some specific fisheries like shrimp, crab, sea cucumber and chunk are considered to be separate fisheries in the Northern Province, even though they are at the initial stage in terms of management implications. If those fisheries are managed properly, they could be a good contribution to the livelihoods of the coastal community since the marine resources are identified as one of the strengths for the industry.

From the interview of S.A. Miranda (President, Pesalai fisheries cooperative, 50 yrs) who explained, “It is a shallow water area, we have enough fishery resources. The fishes come and lay eggs in Mannar sea which is suitable for their growth as they have warm water and coral habitat” (Interview: 28/03/2015). This indicates that they have fishery resources and they have identified the potential of their coastal area which could provide them sustainable food and livelihoods.



Figure 18: S.A Miranda at his office (left), processing (middle) and drying the fish (right) in Pesalai

Another example from the sea cucumber fishery in Pallimunai indicated that they were sustaining the fishery resources until it was disturbed by external threats like excess licenses and illegal fishing methods. Anton, (President, Fulusiya fishermen cooperative, 39 yrs) mentioned, “The season for sea cucumber is from September to April in Pallimunai, I usually go with a boat owner and whatever we catch, we share the profit with four others. We do not process it; just sell the raw items to a known middleman. We normally get Rs. 7,000 to 10,000 per month during the season, but earlier we could even get Rs. 50,000 per month. We had lots of resources, now we get some new species and small size sea cucumber by diving”. (Interview: 29/03/2015).

For example, if we look into the sea cucumber fishery, although it was a well established fishery around Sri Lanka in the past (Dissanayake and Wijeyaratne, 2010), at present it is restricted to the northwestern and eastern parts of the country. The rapid development of the sea cucumber fishery in Sri Lanka occurred during the last few years, due to the high demand for sea cucumber on the international market and the attractive prices offered. This has changed the previously unimportant and unregulated fishery into a commercially important one, in which fishers invest considerable effort. Now, however, the sea cucumber populations show signs of depletion (Dissanayake et al., 2010). In Sri Lanka, research on holothurians or any other echinoderm species is at a very preliminary level. Intensive research needs to be undertaken regarding the reproductive biology and ecology of sea cucumbers, as well as determining stocks, in order to prepare and implement a management plan for the sustainable use of this resource (Athukorala and Dissanayake, 2009).

#### **5.2.1.2 Policy implementation tools - effort, mesh size and TAC**

Effective policy implementation tools are identified as strength of the coastal fishery industry because it creates and implements the policy in a social system of governance for sustainable utilization and development of the fishery. Sri Lanka mainly attempts to restrict fishing effort through the number of licenses issued and by controlling the days or time at sea. Restricted spatial access is the most common form of input control, being relatively easy to legislate and control and if defined properly. Marine Protected Area (MPA) and closed seasons can make a substantial contribution to stock conservation and achieving management objectives. But gear restriction is easier to regulate and implement. Those are the fisheries policy tools that are currently implemented in Sri Lanka.

For example, Sebastiyampillai (member, Alai Osai fishermen cooperative, 52 yrs) stopped operating trawlers in the Delft area as government banned trawling. He continued “I earned a lot when I used trawlers, but I strongly agree that government banned it, as it is not beneficial for fish resource build up. Usage of *thangoosi valai*<sup>6</sup> is also banned, but actually it is easy to catch the fishes than *nool valai*<sup>7</sup> which is higher price than *thangoosi valai*. I have to consider about the cost of production to sustain myself.” (Interview: 19/03/2015).

Another example, Alberd (member of Alai Osai fishermen cooperative, 46 yrs) said “I strongly agreed on government policies like issuing license, and banning some nets like *thangoosi valai* (monofilament net) to protect the fishery resource”. (Interview: 19/03/2015).

Manpower, the amount of fuel, the number of boats, days at sea and the number of nets are considered as units of fishing effort. Increasing effort is one of the main threats to the small-scale fisheries around the world. So, it can be considered as threats to the fishery rather than considering it as strength. In our case, fishing effort is considered as strength because the Northern Province had been severely affected and fishing effort was reduced by tsunami and thirty years of civil war. The tsunami destroyed the coastal areas and livelihood of fisher communities in 2004. So, lots of boats, *kattumaram*<sup>8</sup>, and anchorages were destroyed, some fishermen were killed and displaced during that time. Due to the civil war situation, fishermen were not allowed to fish in some coastal areas; especially Northern fishermen could not do their normal fishing activities for the past thirty years. That reduced the fishing effort dramatically in the Northern Province. After 2009, some coastal communities were allowed to do normal fishing, therefore positive growth of fishing effort can be a strength for this community to rebuild their livelihoods and sustain the industry. It is uncertain at what level the fishing effort can grow for the sustainable development.

Even though the effort control is effective in the region, nowadays children of fishermen are more interested in acquiring higher education and they don't bother about fishing. On the other hand some fishermen also encourage their children to go to other industries and not to turn their interest to fishing as it is uncertain and dangerous for them. This may lead to effort reduction in the future, but newcomers may take over the stewardship. These phenomena should also be scientifically studied for the sustainable coastal fishery management.

---

<sup>6</sup> Monofilament net

<sup>7</sup> Cotton thread net

<sup>8</sup> Traditional catamaran



Mesh size restrictions are widely used throughout the country that is based on different net types and configurations, as well as target species and periods of usage. Sri Lanka uses minimum landing sizes for certain species. However, the majority of catch has no size minimum and whilst this reduces discards rates, inevitably it has implications for juvenile by-catch and possible impairment on recruitment.

Jenyjood (member, Pesalai fisheries cooperative, 36 yrs) explained, “I stopped using *surukku valai*<sup>9</sup> which was banned by government, but my neighbors who go to high seas use them even near the coast, it is difficult for us. I have different nets for different species like *saalai valai*<sup>10</sup>, and *kumbula valai*<sup>11</sup> for *salai* (sardinella) and *kumbula* (mackerel). I follow the mesh size regulations as fishing nets were provided by government”. He continued that government had announced to stop catching of spawning crabs, but some people wanted to make money out of it, so they even catch the crabs with eggs. (Interview: 28/03/2015).

TAC is the total allowable catch to be taken from a resource in a specified period, as defined in the management plan. Sri Lanka has implemented TAC for lobsters and chank. It is widely recognized that whilst TAC work in some fisheries, the allocation of TAC shares and the monitoring of TAC uptake is challenging and may lead to unwanted side-effects such as increased discarding. TAC was recently developed for the sea cucumber fishery in the Northwestern and Eastern province of Sri Lanka with a pilot study (Dissanayake and Wijeyaratne, 2010). Adaptive management is required for policy implications to work on the sea cucumber fishery in the future.

The Sri Lankan government intervenes in the fishery in numerous ways using five policy implementation tools; seasonal closing, fishery training, size regulations, tax on inputs and effort limits. The fishermen were asked to rank these management measures and the results are shown in figure 19. All the fishermen said the issuing of licenses was the first identified government interventions; tax on input was the last identified tool. Gear size, and landing size regulations were the second most used intervention by the government. Seasonal closing for some species like lobster, and crab are identified as the third most used policy tool followed by fishery training as the fourth.

---

<sup>9</sup> Small purse seine

<sup>10</sup> Sardine net

<sup>11</sup> Mackerel net

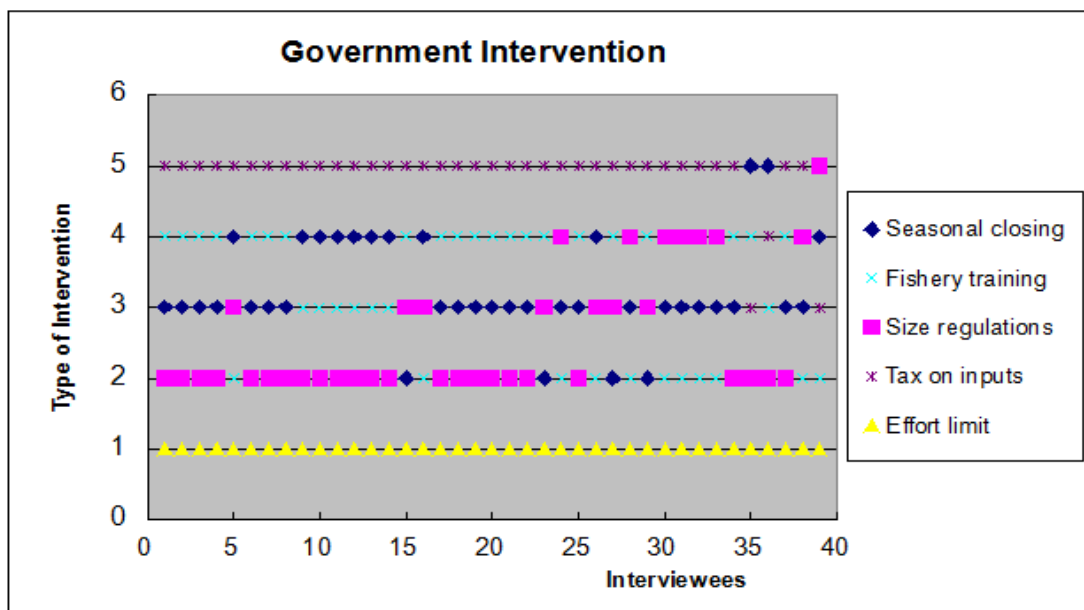


Figure 19: Policy implementation tools that were ranked by fishermen

A crab fisherman Jeny Miranda (member, Pesalai fisheries cooperative, 40 yrs) mentioned that a company engage us to catch big size crabs by providing higher price for big size and lower price for small size. (Interview: 28/03/2015). It can be considered as a policy implementation tool of size regulations, on the other hand it leads to more by-catches and discards of small crabs. It is wastage of fishing effort and fishery resources as fishermen tend to discard small sized crabs. Table 7 shows the price and size of crab during the interview period.

Table 7: Crab size and price adapted by a company in Pesalai, Mannar

Size	Price (LKR)
Small (100-150g)	200-300
Medium (151-200g)	400-500
Large (above 201g)	600-700



Figure 20: Jenny Miranda waving his crab nets (right) and sorting of crabs in a company (left)

Figure 20 shows that a company actively involved in sorting of crabs in order to export, on the other hand it encourages the fishermen to manage the crab fishery in a sustainable manner by regulating the minimum size of crabs. Even though the government already made some policies for fishery management, the government's ability to implement and use the policy tools is considered as strengths for the sustainable coastal fishery management. The study area was an example for effective implementation of some fishery policies. The Northern Province will be sustained if those fishery policies are continued to be implemented properly.

### **5.2.1.3 Established markets and infrastructure**

Market structure is also considered to be a strength in this study, because it plays an important role in the development of the fisheries sector. Marketing of fish starts from fishermen and ends with the consumer and in between it can reach a number of stakeholders, depending on the situation. Those include middlemen, retailers, whole sellers, transporters, entrepreneurs, processors, investors, marketers, distributors, etc. The market system is determined by demand and supply. So, the system depends not only upon human involvement, but rather it depends on the market structure that makes the system to play. So, the market system of the fishery industry should be a strength factor for its provision of food security to the community.

S.A. Mirenda (President, Pesalai fisheries cooperative, 50 yrs): "I have established an own market network, and supply the fish to the broker who would pay me higher prices. I have a vehicle so I can transport to their place. If we catch more fishes and if there is lower prices, I choose to give the fishes to the fish mill or dry them to make dried fish and that would make more money". (Interview: 28/03/2015).

For example Dason, (President, Yuthaa sangam, 40 yrs) said: "A recently opened company (Navanthurai company) buy fishes from all the Delft's fishermen, if we catch the fishes any time we could sell them to the company and we are able to get reasonable price from them. Earlier it was not like that, it was difficult to transport and sell our catches from the Delft". (Interview: 19/03/2015).

Lack of transport facilities in the Delft area is observed even though market and infrastructure is developed in the Jaffna district. Alberd (member of Alai Osai fishermen cooperative, 46 yrs) mentioned that he had to choose the fuel (Rs.59 per liter in Jaffna, Rs.75

in Delft) from his village which is higher than in Jaffna when he consider about the transport cost and time. (Interview: 19/03/2015).

To achieve production and consumption targets it is essential to ensure the availability of at least the basic fisheries infrastructure such as fishery harbours, anchorages, landing sites, ice plants and cold rooms. In addition, it is important to maintain and manage the infrastructure facilities to ensure that the fishing operators can carry out their activities efficiently and without hindrance complying with the requisite hygienic standards. The infrastructure facilities related to the fisheries sector is administered by the CFHC.

Fishery infrastructure and markets are well established in the Mannar district, according to Santhuru (Pesalai, Mannar, 34yrs) Ice plants and marketing of fish is easy, he does not face any problem in this regard. (Interview: 28/03/2015).

Velichor (Pesalai, Mannar, 54yrs) mentioned that infrastructure was good, but they still lack some emergency recovery situation like light house, and reporting of extreme weather condition. Those facilities need to be improved in Mannar district (Interview: 28/03/2015).



Figure 21: Available Ice plant facilities in Mannar (left) and Jaffna (right).

In Sri Lanka, several initiatives have been taken to improve the marketing network, to establish state owned retail outlets all over the island, modernize the current outlets, and enhance fish sales through the cooperative city like, “Sathosa”. In addition, private super market chains have engaged in marketing of the Ceylon Fisheries Corporation’s fish products. A fish market at Jaffna was established with a cost of Rs. 1.7 Million in 2014<sup>12</sup>. The Ceylon Fisheries Corporation (CFC) also operates retail sales outlets in other regions, employing its own staff and selling fish at regulated and reasonable prices to consumers.

<sup>12</sup> [http://np.gov.lk/index.php?option=com\\_content&view=article&id=3169:new-modern-fish-market-opened-in-jaffna-01-october-2014&catid=15&Itemid=121](http://np.gov.lk/index.php?option=com_content&view=article&id=3169:new-modern-fish-market-opened-in-jaffna-01-october-2014&catid=15&Itemid=121).

A certain degree of market intervention through CFC is necessary to ensure affordable prices of fish for the consumers and to strengthen the competition. The major share of fish marketing in Sri Lanka is handled by the private sector, while only around 10 percent is handled by the Ceylon Fisheries Corporation. With the involvement of CFC in fish purchasing and selling, it is also envisaged that the margins of the middlemen which are invariably at the expense of the fishers as well as the consumers, can be reduced.

To sum up, established markets and the development of infrastructure in the Northern Province is considered a strength to the fishery industry. Even though the Northern fishermen do not have a fishery harbour and modernized landing sites in their region, they could operate their marketing activities with the already available facilities. If market development is further supported by the government, they could manage the coastal fishery in a sustainable manner in the near future since the market and infrastructure are one of the strengths of the fishing industry.

#### **5.2.1.4 Strong local ecological knowledge (LEK)**

Local ecological knowledge (LEK) is considered as a strength to the fishery industry, even though some limitations may trigger it to improper decision making by fishermen themselves. LEK of fishermen is very important when it comes to daily fishing activities and researchers also utilize the knowledge of locals for their research purposes (Johnsen et al., 2014).

The Northern fishermen utilize the weather pattern knowledge to identify certain available species at that time. Benard Thomas (President, Alai Osai fishermen cooperative, 38 yrs) said: “We utilize the monsoon pattern and migrate temporarily for six months period (December to May) to the east of the Delft and mainly target for anchovies (*soodai*), which is suitable for making dried fish. In the rainy season (*vaadai kaathu*), prices of fish will be high, and if we catch during this season we could get higher prices. So, we could sustain in this sector”. (Interview: 19/03/2015). His villagers also follow him and migrate to the eastern part for fishing. Then they return to their home following the next monsoon.



Figure 22: Benard Thomas and temporary huts in Delft during the interview.

When we consider this particular area of research, fishermen have adequate knowledge about weather patterns and the availability of fish varieties throughout the year, and they utilize market price of fish and decide when to fish. If there is lower price for some species, they don't go for fishing by analyzing the labour cost and fuel prices.

Fishermen have adequate knowledge about the fishery habitat like corals and they know that if it is disturbed, it will contribute to depleting the resources. Sebastiyampillai, (member, Alai Osai fishermen cooperative, 52 yrs) mentioned, "I started fishing with my father when I was young, we could catch lots of fish while operating five boats at that time, it was our golden time. I knew that corals were destroyed in our coastal area, and catches were declining". (Interview: 19/03/2015).

The following radar graph (figure 23- left) shows that 90% of fishermen are aware of coral destruction. Only 10% of them were not aware of coral destruction. Knowledge of fishery habitats is limited among the fishermen.

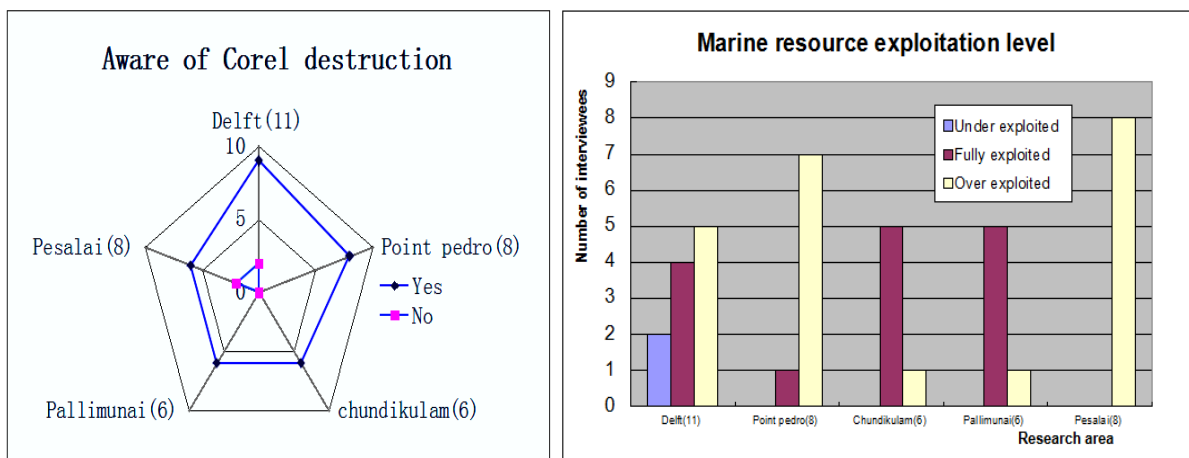


Figure 23: Awareness about coral resource and opinion about marine resource exploitation level

When it comes to the natural phenomena that affect their daily fishing activity, all of them except two fishermen in Jaffna, reported that the monsoon disturb their daily livelihood. Above figure 23 (right) shows that different areas have had different opinions about the marine resources exploitation level. At least two Delft fishermen think that their resources are under-exploited. All other areas had fishermen who think that the marine resources are over-exploited. Especially all the Pesalai fishermen reported that their resources are over-exploited. This figure is to show that the Northern fishermen have opinions about their marine resources exploitation level. It could be taken as a strength to the industry.

Andru (Fisheries inspector, Delft) supported that LEK of fishermen is a strength for their survival. He added: “Experience and physical strength is important for fishermen, they have knowledge about the seasonal variation and types of fish especially old fishermen could use different kind of nets for the different fishes according to the weather pattern. They have a strong mindset that effort would lead to success.” (Interview: 23/03/2015).

Jenyjood (member, Pesalai fisheries cooperative, 36 yrs) indicated that it was not good to catch crabs which are on spawning stages. “I do not catch crabs during the season of spawning especially in *amaavaasai* (dark moon) period”. I catch prawns during August while *sola kathu* (Southern wind) prevails. You know we have to be more careful during the *katchan kaathu* (South east monsoon) from May to August that could even make the boats to sink”. (Interview: 28/03/2015).

To sum up, LEK is applicable mostly to the fishing boat owners who decide their fishing routine. Whereas part time workers who work for wages, it does not matter. If they were asked to do the fishing job, they do not consider about the weather and even price of the fish. In case of this study area, there are no enough scientific research identified for LEK of fishermen that leads them to decision making and management of the fishery. Our findings show that LEK helps them in their activities as fishers. More research should be conducted to find out how and to what degree LEK can influence the actual fisheries management.

## **5.2.2 Weaknesses of the Northern fishery**

The Northern Province's fishing industry is characterized by a range of weaknesses too. Those include unreliable data and declining catches, control of prices, post harvest losses and lack of extension services. Those weaknesses can lead to long-term detrimental effects on the social and economic structures of coastal fishing communities of the Northern Province.

### **5.2.2.1 Lack of reliable data and declining catches**

Sri Lanka still suffers from a lack of reliable catch data from the coastal fisheries. Fisheries inspectors estimate and provide the catch data by divisional field visits. On the other hand fishermen do not adequately provide their catch and effort data to the fishery officers in the Northern Province. Some fishermen feel that providing the daily landing catch data to anybody will lead to future catch reduction. The government gets the data from the middlemen, and sales output also. Some fishery inspectors roughly estimate the catch data without visiting the site. Those are the barriers for getting the accurate data from fishermen. But, nowadays government has planned to introduce the daily note book to fishermen to note the catch of the day. However the data are questionable as they don't monitor both fishermen and fishery inspectors.

It is clear that the coastal fishery lacks reliable data, as demonstrated by S.A. Mirenda (President, Pesalai fisheries cooperative, 50 yrs). He said: "No one comes and record our catch, we would like to provide the catch data, but there is no one to get the fishery data from us. I do this business for fifteen years, as per my observation the marine resources are declining, and we get very small fishes now. (Interview: 28/03/2015).

But, the Department of Fisheries and Aquatic Resources (DFAR, 2012) says that they have already implemented the log books. A data recording system for the vessels over 32 feet (>9.6m) started from January 2012. But, so far the coastal fishery is not taken into consideration for the systematic data recording which implies a weakness of the industry.

Declining fishery resources is an important weakness of the industry which shows the overall management inadequacy or failure of the governance system. In the case of Sri Lanka, the ten year framework from 2007 to 2016 justifies the expansion of coastal fisheries on the basis of old estimates of the maximum sustainable yield (MSY), but the MSY concept is not really applied as the basis on which to manage fisheries, although some recent Ministry work under an FAO project has established MSYs for some species, such as lobster and sea cucumber (Athukorala and Dissanayake, 2009).



From the interview, Sebastiyampillai, (member, Alai Osai fishermen cooperative, 52 yrs) mentioned, “Earlier I could fish for full time, now I do it as a part time job because of declining catches. For one trip it cost about three to four thousands *rupees* for fuel and return nothing.” (Interview: 19/03/2015). It illustrate that coastal fishery production is in declining trend, fishermen try to find alternative livelihoods for their income. Industry itself will face the problem of marine resource depletion.

#### **5.2.2.2 Strong dependency on middlemen (Control of prices)**

Middlemen involvement in terms of controlling the price in the fisheries is another weakness from this researcher’s point of view. But one can also determine this phenomenon as a strength to the fishery. Because the middlemen are involved in investment, transportation, and they create new markets for the fishery industry.

It is true that middlemen actually create demand, provide transportation, connect fishermen and customers, invest, and provide employment. S.A. Mirenda (President, Pesalai fisheries cooperative, 50 yrs) is this kind of middleman. He employed 32 fishermen, but he goes to sea for fishing too. He mentioned: “It is true that middlemen control the price of fish, I have the contacts with most of the market’s brokers, and I speak to them and know the market price of fish in a particular area. Then I decide in which market to sell. (Interview: 28/03/2015). His effort is also affected by other middlemen in the supply chain, but there are no options to escape from the market structure.

But, he earns the margins of profit by controlling the price. But small-scale fishermen don’t earn much profit for their effort on the exploitation of natural resource. So, from fishermen’s point of view, the middlemen represent a weakness of the industry. Sudden removal of middlemen involvement will affect the industry for a long time. But, government can fill the gap and make possible arrangements for the price control. Therefore the actual fishermen livelihood won’t be affected and he will be uplifted in the society, thus the small-scale fishery industry could grow sustainably.

Whereas Sebastiyampillai, (member, Alai osai fishermen cooperative, 52 yrs) adds that middlemen involvement is beneficial to the industry. “It is not possible to fish here in Delft and transport my catch to the customers who is in Jaffna. We need a transporter or a middleman. Middlemen also face lots of problem with regard to transport as they also do the

business on credit base. But, it is true that they get a higher profit margin than a fisherman. In our society, middlemen involvement is unavoidable”. (Interview: 19/03/2015).

Market structure analyzed based on the interview shows that there are many different supply chains involved in the Northern Province’s fishery sector. As shown in figure 24, the simplified structure is derived to show that control of price does not depend on the price demand of fishermen, the price is heavily determined by a third party who indirectly or directly is involved in the marketing of fish. Here the export and import channels with their complex networks of marketing are not considered for the simplification of the argument.

There are 46% of fishermen (18) reporting that their market is from the fishermen to the end consumer through middlemen and market or auction. The 31% of fishermen depend on middlemen only. 15% of them sell to the market first. Only 8% of fishermen (3) reported that they could directly sell their catches to consumers without middlemen involvement.

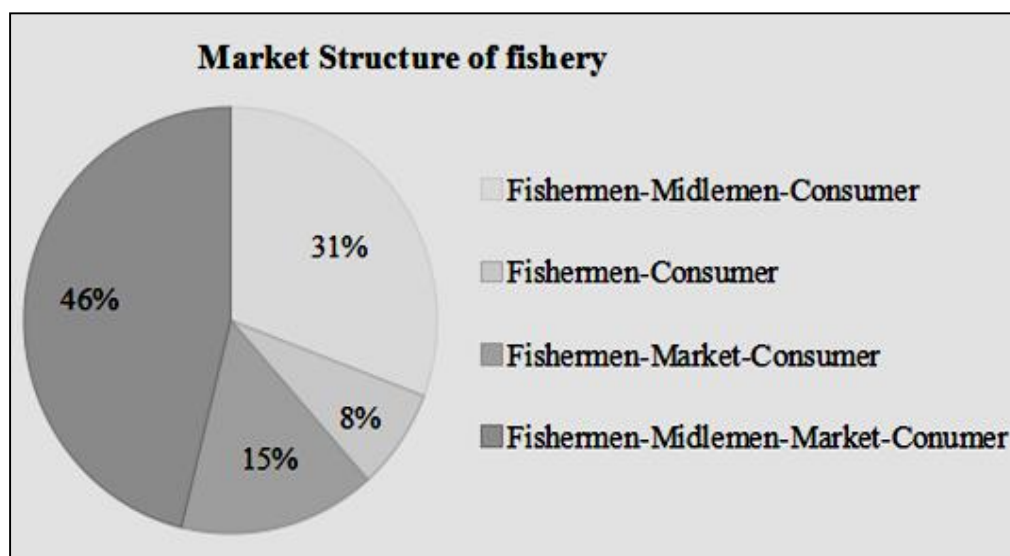


Figure 24: Identified market structure of small-scale fishermen

This is not a rigid market structure, sometimes fishermen switch from one chain to another market chain depending on the situation. Market means sales centers or auction sales. Collectively 92% of them do not have the power to control the prices and are trapped in a system of middlemen involvement which allows fishermen to get loan for nets or fuel, and borrow boats from middlemen (*muthalali or sammati*) to catch fish, and their catches are directed to the middlemen. Thus a fisherman always depends on a middleman. That is why middlemen involvement is considered as one of the weaknesses in the Northern coastal fishery.

### 5.2.2.3 Large post harvest losses

When we consider the Northern Province of Sri Lanka, the post harvest losses are considerably higher when they try to dry the fish for long term purposes. During the process of drying fish, they use natural sun light as the heating source to remove the moisture. For that, they spread the fishes on a net which is laid on the bare ground, thus sand, dust and dirt particles attach to the dried fish and open sun drying even helps bacteria and fungus to grow on fish which make them to deteriorate quickly. This leads to post harvest losses. Poor hygienic handling of fishes leads to the same problems.

Alberd (Alai osai fishermen cooperative, 46 yrs): “We do not have access to the ice plants in the Delft. I mostly catch small fish like “*soodai*” which is good for dried fish. I have family members to clean the fishes. I dry the fish near the beach which may lead to postharvest losses, but I do not care when consider about the capital cost for proper method of drying. You see I use old nets to dry them”. (Interview: 19/03/2015).

Of course following figure (figure 25) shows that he dried the fishes on the nets above the soil which can leads to quality reduction of dried fish and there can be secondary infection too.



Figure 25: A small-scale fisherman at his temporary hut and drying the fish in Delft.

Alberd could not overcome this problem because he was strictly concerned about the capital cost to reduce the postharvest losses. Further he was a temporary migrant fisherman from mid- Delft to east Delft for the season. So, he had to depend on the temporary resources to sustain his income. For the industry, it is one of the big weaknesses for sustainable growth and development.

The Sri Lankan government and NGOs are conducting workshops and training programs on proper handling of fish and fishery products and good manufacturing practices to stakeholders. For example the Norwegian government conducted workshops to reduce the rapid deterioration of quality of fish in order to increase the food security and sustainable utilization of fish resources. The Institute of Post Harvest Technology (IPHT) also conducts research to develop marine resource based food products.

#### **5.2.2.4 Lack of extension services**

Fisheries extension plays an important catalytic role in fisheries and coastal development as it brings the fisheries community information and new technologies that can be adopted to improve production, incomes and standards of living. Fisheries extension provides a channel by which the fishermen's problems are identified for research and the modification of fisheries policies. The extension system also organizes fishermen into functional groups in order to gain access to production resources such as credit, inputs, marketing services and information.

Examples from field work indicated that lack of extension services lead to weaken the industry. Juris, (member, Alai Osai fishermen cooperative, 37 yrs) continued: "We need more extension services on process of dried fish, but that is not available in our village, we lost nets due to Indian fishermen. Some other fishermen were given nets by government, but we did not receive any support from them. Even getting ice cubes is also difficult in our village". (Interview: 19/03/2015). This illustrates how lack of extension services can be considered as a weakness.

Another fisherman from Delft, Alberd (member of Alai osai fishermen cooperative, 46 yrs) also mentioned that lack of spare parts in his village and it was difficult to repair the boat engine in his village. "We are in a small island, if the boat engine is damaged I have to take the engine to Jaffna for repair, transport is difficult as we have limited ferry transport (See figure 26). If there were services for boat engine repairing locally, he would not have to waste the time and money for the transportation. (Interview: 19/03/2015).



Figure 26: Alberd at his temporary hut, and transport facility between Delft and Jaffna

Edverd Uthayarasa, (member, Alai osai fishermen cooperative, 51 yrs) also mentioned same: “We lack transport facilities and lack spare parts for boats in our village” (Interview: 19/03/2015). The figure 26 shows the limited ferry transport between Delft and Jaffna. It makes difficult for the fishermen to transport their catches and even more so for emergency situations. Overall, the small-scale fishery is weakened by lack of extension services.

The system to be governed is one of the main elements in fishery governance, natural and social systems are the important systems to be governed in the complex fisheries. Government should collaborate with the social system for the sustainable fishery management. Top down management of fishery can be observed in coastal fishery in terms of fishery legislation. Community based management is involved in some fisheries especially shrimp and sea cucumber. Government has its vision to develop the fishery sector nationwide, but when it comes to the Northern Province it is seldom that extension services are available for fishermen in that area after the civil war. On the other hand, fishermen are not aware of the extension services available for them from the government. But non-governmental organizations (NGOs) are actively involved in the fishery sector empowering both the society and the fishery sector.

To sum up, Sri Lanka has established six government institutions for the fishery sector for policy formulation and implementation, management, infrastructure development, research & development and for marketing. But when it comes to fishery management, coordination and communication among them are poor. So, responsibilities are complicated and interrelated to all organizations. Often it is difficult for the fishermen to have a clear picture of how to relate to them in their fishery management. So, the poor organizational

arrangement and lack of extension services make the fishing industry more complicated and this is identified as a weakness for the sustainable development of fishery.

### **5.2.3 Opportunities of the Northern fishery**

Management of coastal fishing areas is made more challenging by the high level of uncertainties and unknown impacts of external factors. Nonetheless, opportunities that can counterbalance the weaknesses and focus on economic diversification are essential for developing sustainable fishery communities and the coastal fisheries. The Sri Lankan people still have a greater demand for marine capture fish than for inland aquaculture fish. This is an opportunity for the industry. Organizational support from various organizations is also identified as an opportunity for the sustainable development of the small-scale coastal fisheries.

#### **5.2.3.1 Demand for fish as protein source**

Sri Lankan government has its vision to increase the supply of protein through sustainable exploitation of the fishery resources. Sri Lankan intake of protein comes mainly from fish sources rather than animal meat, milk and grains. Per-capita consumption of fish is about 11kg (DFAR, 2013). But the demand for fish is ever increasing, and the Northern Province was doing well in harvesting fish from sea and gaining foreign earnings.

From the interview (Rasenthiram, President, *Yuthas sangam*, 56 yrs, Interview: 19/03/2015) “Most of the fishermen first fulfill their daily family consumption of fish. They sell the remaining fish to the market and earn profit. In certain days, when there are lower price for some species, they go to sea for family consumption. They do not fish more for market. If they do so, the market price will drop even further future income will be affected. Some fishermen do not consider the market price, they fish more and make them dry and preserve the fish expecting higher price for dried fish in the following season”. This is how their decision making, drives them to fishing activities. But it is questionable to what degree they can depend on the market price and decide the fishing routine.

Many countries have policies focused on increasing the value of their seafood products; mostly through generic promotion, through eliminating post harvest losses, better post harvest infrastructure and fiscal policies for product development and value-addition. So, Sri Lanka should also get involved in such demand creation.

### 5.2.3.2 Organizational support (Government and Non Government)

Government and non government organizations support the coastal fishery in numerous ways in the Northern Province of Sri Lanka. It includes building infrastructure, providing loans to buy boats, donation of nets, postharvest losses education programme, fuel subsidies, storage facilities and information on safety at sea, etc. This is considered as an opportunity for the industry to build on. But some remote fishermen are not informed about those facilities provided by the organizations and many fishermen do not find adequate means to access and get the support from the organizations.

In order to reduce the risk involved in the sector, and to give financial support for marine fishery a fishermen insurance scheme, a low interest loan scheme and a fisheries pension scheme have been established by government. To facilitate social security of the fishermen, this scheme provides loans for fishing boats, engines and fishing gears. Sebastiyampillai, (member, Alai osai fishermen cooperative, 52 yrs) mentioned: “I could receive loan from a bank three years ago for the fishery, but still I could not return back the whole amount. Our society received benefits from government like nets and fuel subsidies, but the actual fishermen received the benefit is questionable” (Interview: 19/03/2015).

Another fisherman, Jenyjood (member, Pesalai fisheries cooperative, 36 yrs) also mentioned that he received fishing nets worth of Rs. 117,000 from the government through his fishermen cooperative society. (Interview: 28/03/2015).

Insurance scheme for fishermen was introduced in order to reduce the risk involved in the sector and facilitate them with more financial stability options. But Thilakenthiran from Point Pedro said that the Northern Province’s fishermen are not interested to join the insurance scheme as they require a government servant’s warranty. Under the MFARD programme GPS, jackets, nets, boats and canoes were subsidized to the Northern Province in 2013 as listed in the table 8.

Table 8: Input supply from MFARD to the Northern fishermen - 2013/2014

<b>Jaffna District</b>	<b>Killinochchi District</b>	<b>Mannar District</b>	<b>Mulaitivu District</b>
Technical Training Programmes for Fishermen	Canoes 100	Canoes 100	Canoes 100
GPS 62	Out riggers 100	Out riggers 100	Out riggers 100
Life jackets 1044	Mechanical boats 01	Mechanical boats 01	Mechanical boats 01
Net pieces 460	Net pieces 297	Net pieces 1630	Net pieces 418
	Life jackets 594	Life jackets 260	Life jackets 836

A fisherman noted that not only input supply, but there should be services available from government to fishermen. He continued (S.A. Mirenda, President, Pesalai fisheries cooperative, 50 yrs) that: “Fishermen should be educated. Government or non-governmental organizations should engage fishermen towards sustainable fishery management practices. New technologies should be introduced in fishery. Politics should not be mixed to the fishery”. (Interview: 28/03/2015).

For example, the Oceanic and Fisheries Information Center of National Aquatic Resources Research and Development Agency (NARA) was opened recently. From this centre, it is possible to access instant data and information regarding the weather disasters and weather pattern. But, many fishermen in the Northern Province are not aware of that. Andru (Fisheries Inspector, Delft) indicated that there are lots of NGOs helping the Northern fishery in numerous ways. He added: “UNDP<sup>13</sup>, World Vision, Save the Children, and IOM<sup>14</sup> are some examples of NGOs that involved helping in fishery development. For example “Save the Children” helped to build a cold store in Delft area through the fishermen cooperative (*Samaasam*). “JICA<sup>15</sup>” provided Global Positioning System (GPS) training programme to the fishermen” (Interview: 23/03/2015).

The Sri Lankan government supports the coastal fishery in many ways and the following figure summarizes the fishermen opinions about the policy support.

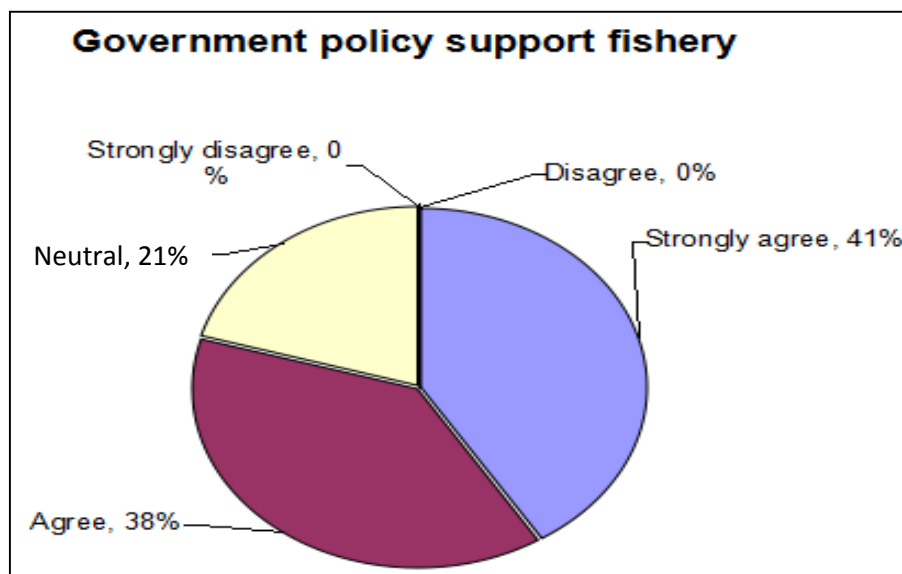


Figure 27: Pie chart of fishermen opinions on government support

<sup>13</sup> The United Nations Development Programme

<sup>14</sup> International Organization for Migration

<sup>15</sup> Japan International Cooperation Agency



Fishermen were asked to rank five answer scales whether the government support their fishery industry as shown in figure 27. There were no fishermen who disagreed or strongly disagreed. Rather 41% of them reported that they strongly agreed with the government supports to the fishery, 38% of them stated that they agreed with the government support, while 21% of them stayed neutral.

When they were asked, how government or NGOs support their industry, they have answered that loans, grants and inputs are the main supports from the organizations that is shown in the figure below.

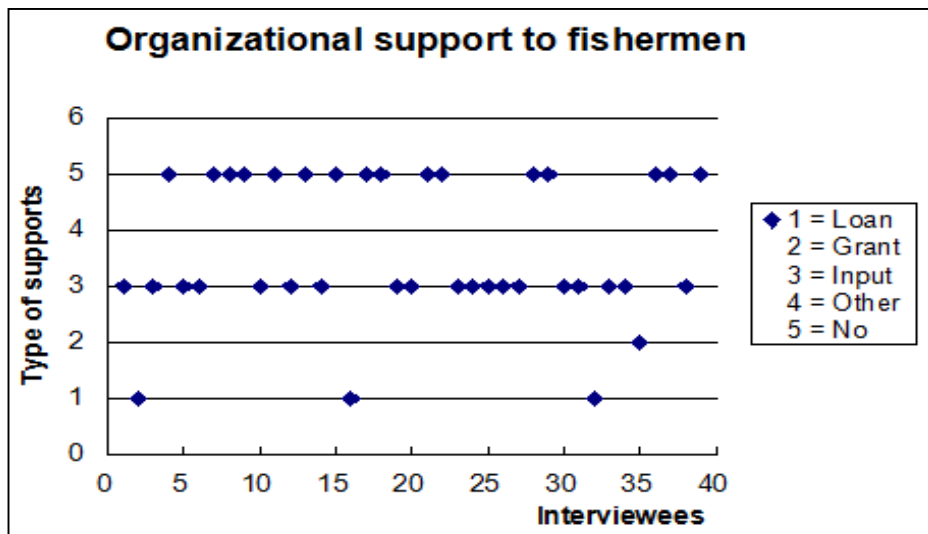


Figure 28: Identified organizational support to the industry

The Northern fishermen were supported by loans for boats; grants like boats donations; input supports like nets and fuel subsidies from the government and NGOs as well. Loan for fishery was received by 7% of them, 3% of them received boat grants, 48% of them received input support like fishing nets and fuel from the government. It is noted the 41% of the interviewed fishermen said that they were not supported by any means from the organizations.

Finally, it is clear that the Northern coastal fishery has opportunities for growth and development as there are increasing demand for local fish, and government and NGOs have continued to support the fishery. In this SWOT analysis the increasing demand for fish and organizational supports are considered as opportunities for the sustainable development of the Northern coastal fishery.

## 5.2.4 Threats of the Northern fishery

Poaching of Indian fishermen from Sri Lankan historic and territorial waters is the biggest threat to the existence of the coastal fishery of Sri Lanka. Indian trawler fishermen engaged in bottom trawling are destructing the coral reefs which serve as habitat for the fishery resources used by Northern fishermen. Furthermore, the uncontrolled massive amounts of Indian boats cause depletion of important fish stock. Other than intrusion of Indian fishermen there are other characteristic threats also identified throughout the fieldwork. These include illegal, unreported and unregulated (IUU) fishing by Northern fishermen, ethnic conflicts among the fishermen and climate change.

### 5.2.4.1 Intrusion of Indian fishermen

Sri Lanka and the Tamil Nadu state of India are connected by Palk Strait and the conflict of illegal fishing is one that has dragged on for a long time. Both countries agreed on the setting up of a maritime boundary in 1976 as per UNCLOS (Jagota, 1985). During the civil war in Sri Lanka, Indian fishermen blatantly violated this border by operating freely in Sri Lankan waters as Sri Lankans were restricted to fishing, directly and indirectly by fear about the civil war situation. With the end of the war, the situation has changed, and when Sri Lankan fishermen returned to their traditional grounds, they were being encroached upon by the Indian fishermen and their livelihoods were affected as a result. According to Amarasinghe (2014), the annual loss to Sri Lanka from Indian poaching is estimated to be in the order of LKR 47 billion.

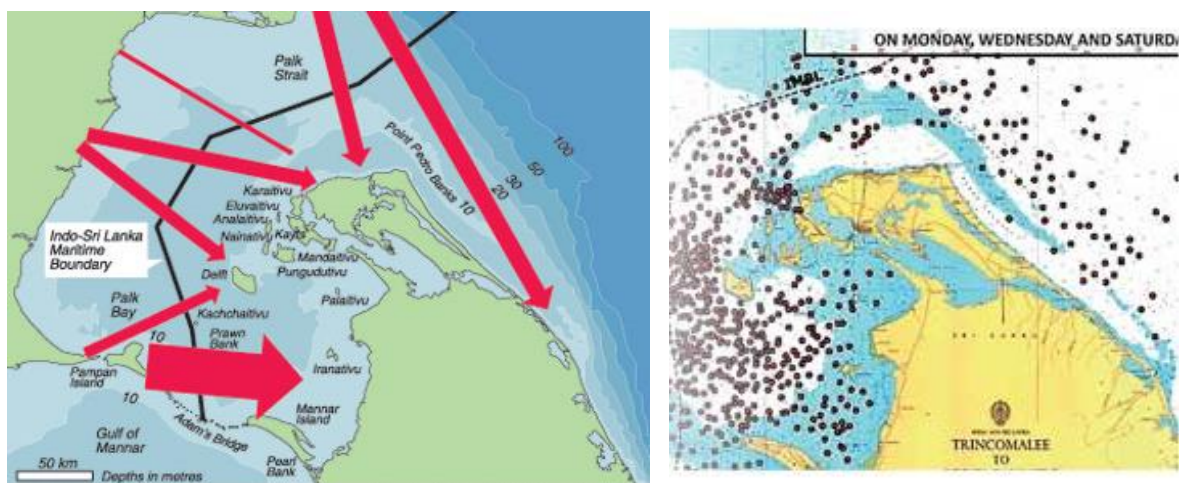


Figure 29: Poaching pathway of Indian fishermen into Sri Lanka and satellite picture of trawlers.

Source: Soosai and Stokke (2006), Navy Sri Lanka (dots indicate the Indian boats).

South Indian fishermen illegally enter to Sri Lankan maritime boundary near the Delft, Mannar, Point Pedro and Killinochchi coastal areas of the Northern Province as indicated in the figure 29 (see left). Satellite pictures from the Navy of Sri Lanka (figure 29 - right) show how close and intensively Indian trawlers enter the Northern coastal areas.

Professor Amarasinghe (2015) department of Agricultural Economics, Faculty of Agriculture, University of Ruhuna, Sri Lanka explained on a news paper that,

“Nearly three or more days a week, about 2,000 Indian trawl boats or more are crossing the International Maritime Boundary Line to fish on the Sri Lankan side of the Palk Bay in the north. The northern fishers of Sri Lanka, who started to fish after the cruel civil war which kept them away from fishing for nearly 30 years, face strict competition from the poaching Indian trawlers, who steal their fish and damage their nets. More recently (on 27/02/2015) more than 80 Indian trawlers crossed the Maritime Boundary Line and started trawling near Kaddaikadu in the east coast of the Jaffna peninsula, stealing the resources of the local fishers, damaging their nets and even attacking them. They came prepared for an attack and carried arms and explosives. The levels of force used and deprivation of the rights of northern fishers of Sri Lanka are unacceptable. Both their right to fish and the right to live are violated”.

He clarified how poaching of Indian fishermen threaten the livelihood and the coastal industry of the Northern Province of Sri Lanka.

Bottom trawling was banned both in India and Sri Lanka. Trawling destroys the sea bed and increase the level of by-catch of valuable creatures (Scholtens et al., 2012). Indian bottom trawlers fishing in Sri Lankan waters are identified as an internationally sanctioned, illegal, unregulated and unreported (IUU) fishing practice. There are over 5000 mechanized trawlers in Tamil Nadu and 2500 of them come to Sri Lankan waters on Monday, Wednesday and Saturday. According to satellite information provided by the Sri Lankan Navy and interviews with fishermen, by 8 pm. on a Monday their fleet start moving towards the territorial boundary. At around 1am all of them are in Sri Lankan waters and by 4 am they start going back to India. Most of the time those who are caught are arrested and handed over to the Department of Fisheries, but they are often remanded, citing other reasons such as entering Sri Lanka without a visa. Therefore the actual reasons for illegal fishing are not highlighted.

The problems caused by Indian trawlers can be illustrated through the interviews that I had with Sri Lankan fishers in the North.

Rasenthiram (President, *Yuthas sangam*, 56 yrs) from Delft explained that he lost fishing nets and catches were declining because of Indian trawlers. He continued: “I fish for 4 days per week because of Indian trawlers. They come too close to our shore and fish, I lost part of nets this year, yesterday night I could not spread my nets due to Indian trawlers. When they returned home, we could put our net in the sea around 4.30 am, today morning we caught about 3 kg of fish which is for my family and for worker”. (Interview: 19/03/2015).

Following figure 30 shows his catch of the day before the interview.



Figure 30: Rasenthiram, with day catch and his worker in Delft, Jaffna.

Another fisherman (figure 31) from same area called Arulthas, (*Alai oosai*, 35 yrs) explained: “Our fishing is sustainable otherwise Indians interrupt us. As happened yesterday (18/03/2015 - Indian trawlers entered), they came at 4 am in the morning, and we go near the maritime boundary and return with nothing, but they just pass us and come near our shore and wipe the beds. Next day “*pai vallam*” come from India and fish at mid-water. We do the job, by pawning the gold, at last we get lost because of them”. (Interview: 19/03/2015).



Figure 31: Arulthas with his temporary storage hut, member of Alai Osai in Delft, Jaffna.

Not only the Delft fishermen but Point Pedro fishermen also are directly affected by Indian trawling. Thilakenthiran, (*Athi sakthi* cooperative, 47 yrs) mentioned: “Our society members have lost around 20 nets last month due to Indian trawling. We have reported to FI and AD but still they did not take any action. The Indian Commission told that they would provide aids for affected fishermen, but none of us received anything”. (Interview: 22/03/2015).



Figure 32: Thilakenthiran darning his net in Athisakthi cooperative buildings, at Point Pedro. Sukanthan, at his fish collection center in Chundikulam

The Chundikulam beach-seine fishermen are not always directly affected by Indian trawling. They are affected indirectly when Indian fishermen come and poach even in their coastal territory. During the field study Sukanthan (President, *Kallaru* fishermen cooperative, 37 yrs) explained: “My father and me were doing beach-seine here, But, I lost my father in tsunami, a sister and two brothers were lost during war. Even though we do beach-seine, we are affected by Indian trawlers who just wipe the sea bed which serve as habitat for our fish resource”. (Interview: 21/03/2015). He has his own fish collection center in Chundikulam (see figure 32 - right).

Likewise all the Northern coast communities and their fishing activities are threatened by Indian trawlers directly by poaching their resources, and by destructing the fishing gears and indirectly by damaging the corals and thus cause decline in fish catches of the small-scale Sri Lankan fishermen. From the interview and observation (18/03/2015 - 01/04/2015) of the Northern fishery communities, all of them reported that they were severely affected by IUU fishing by Indian fishers at some point, except some part-time mangrove shrimp fishermen who fish in the lagoons of Chundikulam.

#### 5.2.4.2 IUU fishing by Northern fishermen

According to Atapattu (1994) the coastal fisheries of the Northern Province are open access common property, except beach seine and stake-net fishery. The beach seine and stake-net fisheries operate under locally sanctioned systems of limited entry based on the customary rights and socio-cultural barriers. The open access nature has augmented the fishing effort over the years. Population growth in the country and the lack of alternative income generating opportunities has led to more and more pressure on coastal fisheries (Wijayaratne, 2001). As a result the Northern fishermen started to practice illegal fishing methods in their coastal areas.

Much of the fishing is carried out near the coral reef area of the Northern Province. In many areas of Gulf of Mannar, and Point Pedro bank, the majority of the reefs have been destroyed by fishing due to modern fishing techniques like mechanized launches with trawling nets and gill nets and also by destructive fishing practices such as dynamite fishing. These destructive methods cause direct damage to the corals and indirectly affect the growth of marine resources.

During the field work, fishermen were asked to summarize the destructive fishing methods in their areas. They have reported bottom trawling, dynamite fishing and illegal nets usages are the observed or practiced IUU fishing. In the previous discussion of unreliable catch data, I have mentioned in the coastal fishery there is a lack of reliable data. It is considered as unreported fishing. The following figure explains the illegal and unregulated nature of the Northern coastal fishery.

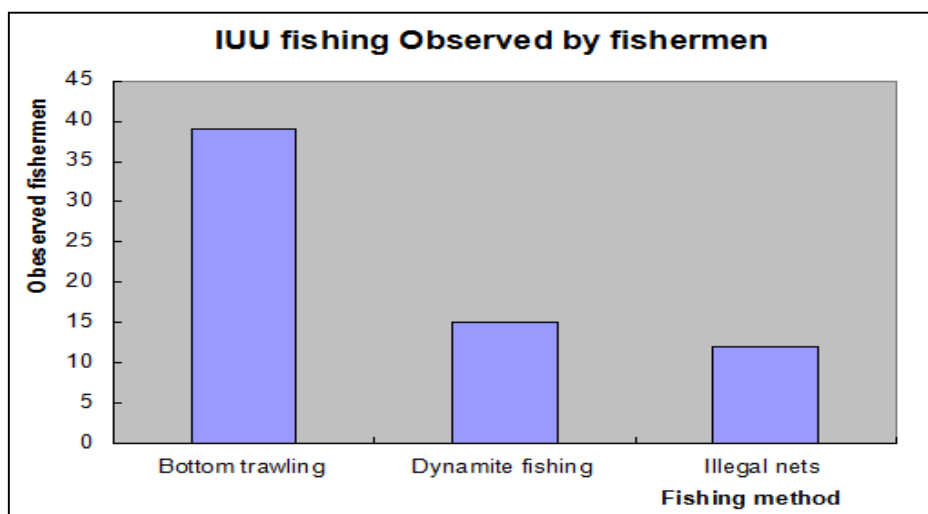


Figure 33: Cases of reported IUU fishing by Northern fishermen

The Northern Province's fishermen are engaged in IUU fishing by various methods. Figure 33 shows those fishermen who observed those methods in their coastal areas. None of them directly reported that they have done it, rather they have reported about some other fishermen from other districts that had done it or being caught and punished for IUU fishing. All of them reported that Indian fishermen were threatening their fishery industry by bottom trawling, but it is noted that the Northern fishermen also have trawlers to catch shrimp in Mannar and Jaffna. It is considered as illegal fishing. Dynamite fishing is identified or reported to fishery inspectors by 15 fishermen in the Northern Province. There were 12 fishermen reporting that they had monofilament nets, which were banned by government. So, this is considered as illegal fishing.

To sum up, IUU fishing activities of the Northern fishermen is considered as one of the main bottlenecks that threaten the sustainable development of the coastal fishery.

#### **5.2.4.3 Prolonged ethnic conflict**

As I explained in chapter three, Sri Lanka has undergone prolonged internal conflict for about 30 years and violation of human rights. It is evident that people have lost their livelihoods and income generating capacity (United Nations, 2011). Many communities have been displaced. Hundreds of fisher people have been killed. Mutually beneficial relationships between different ethnic groups that had traditionally co-operated in the harvesting, processing and marketing of fish, have been disturbed. Even now, fishermen migrate to different places during the monsoon and conflicts arise here and there mainly in the beach-seine fisheries.

Fishing stewardship still exists in Sri Lanka like fishing rights of beach-seiners. But, internal conflicts threaten the fishery as explained by Ranjan (*Vathurankuli* fishermen cooperative, 36 yrs) who moved to Chundikulam with eight other friends seeking for jobs. They got a contract from Kathiresan (owner) for three months in Chundikulam. He said, "We face problems from neighbor beach-seiners because we came from another district, they shout to us; to go back to our place". (Interview: 21/03/2015). (See figure 34).



Figure 34: Migrant beach-seine fisherman, and his catch of first shift, at Chundikulam.

Whereas a neighbor to Ranjan, called Sivananthan (Vice president, Chundikulam fishermen cooperative, 46 yrs) argued that he got the fishing rights from his parents who were living for long time in Chundikulam. He was displaced and continued in Udappu during the war period, after the war he came back there and started to continue the beach-seine fishing. His neighbors came from some other places and bought the beach-seine license from the relatives of fishermen who had died.

Sivananthan continued that “This is not acceptable; we are going to report it to Additional Director (AD), Colombo decided to give license permission to southern fishermen, but Jaffna fishermen cooperatives do not agree to the immigrant fishermen fishing rights” (Interview: 21/03/2015). So, the conflicts can be seen among the fishermen cooperatives level in Chundikulam. Following figure 35 shows his family and catch of the day.



Figure 35: Sivananthan, a beach-seine fisherman with his family, and his catch, at Chundikulam.



As I explained the internal conflicts about the beach-seine fishermen, gill net fishermen also still face the problem of internal conflicts that threaten the small-scale coastal fishery. A Point Pedro fisherman called Ratnarasa (Secretary, Myliddythurai fishermen's cooperative, 51 yrs) explained:

“We are still displaced fishermen due to high security zone in our village, we go to Myliddythurai sea and fish there, but we have to land the catches at the Point Pedro landing site as military took over the coastal area of Myliddythurai. We feel strange about our situation as a result of conflict, but we collect money from our members and conduct some social welfare programme like primary free education”. (Interview: 22/03/2015).



Figure 36: Internally displaced fisherman and a fishermen cooperative meeting at Point Pedro.

The above figure shows a displaced fisherman and a cooperative meeting in another place as a result of internal conflict of Sri Lanka. So, the internal conflicts among Sri Lankan population are still threatening the fishery sector in many ways. Thus the small-scale fishermen, whether beach-seiners or gill netters face more and more complex nature of their business and the coastal fishery will also continue to be threatened until a solution to internal conflict has been found.

#### 5.2.4.4 Climate change and fishery

Climate change is visible and sea level rise, glaciers melting and ocean acidification are expected to result in significant changes across a wide range of aquatic ecosystems (IPCC, 2014). Effects of climate change will combine with other pressures, pollution, ecosystem degradation and overfishing, particularly on coastal areas and coral reefs (Barange et al., 2014). Climate change is expected to have a wide range of impacts on the production, availability, breeding patterns of marine resources although its impacts on the fisheries sector has not been assessed or quantified widely (Jayatilake, 2008). But there are a few studies about climate change and fisheries that predict the impacts in Sri Lanka. So, this section heavily supported by literature evidence rather than field work evidence. Fishery-dependent communities may also face increased vulnerability in terms of less stable livelihoods, loss of already insecure entitlements (Allison et al., 2009). These impacts of climate change will in turn affect the four dimensions of food security and nutrition: availability, stability, access and utilization of food supplies (HLPE, 2012).

When it comes to Sri Lankan meteorological changes, the rate of increase of mean air temperature from 1961- 1990 has been identified as 0.016 °C per year (Basnayake et al., 2007). Annual average rainfall has decreased to an amount of 144 mm. According to the Intergovernmental Panel on Climate Change (IPCC, 2007), the global average sea level has risen since 1961 at an average rate of 1.8 mm/year and since 1993 at 3.1 mm/year. With a rise in sea level, Sri Lanka is impacted in many ways such as coastal erosion; natural habitat destruction; intrusion of salinity, and shoreline retreat. Sri Lanka has been experiencing a staggering coastal erosion rate of 0.30-0.35 meter a year (Baba, 2010).



Figure 37: Traditional fisherman and his *katumarang* among other boats at Pesali, Mannar.

A traditional fisherman, Jems Kulas (Pesalai fishermen's cooperative, 69 yrs) mentioned that: "We cannot do agriculture here as we have hot climate, so we depend on fishing. Earlier

we caught lots of fish but now very few amount, we could not even find some old species here. I abandoned beach-seine fishing five years ago and now I have two *katumarang*". (Interview: 28/03/2015).

Thevarasa (Point Pedro fishermen's cooperative, 40 yrs): "Our coastal water called 'Munai' was the sink for fish production earlier, but now many fish species were lost, we cannot find some old species now, earlier we spent an hour to catch fish near the coast but now even if we spend more than four hours we could not catch enough amount". They tend to go to deep sea fishing as a result. He mentioned that coral destruction was also cause for resource depletion. (Interview: 28/03/2015).

Not only coastal gill nets fishermen are affected due to climate change, but beach-seine fishermen are also affected. The revenue from this fishery accounted for over 40% of the total national fish landings until the early 1950s before the advent of motorized fishing crafts, but dropped to a mere 5% of the total fishery by the late 1980s. Beach seine operations have dropped due to many factors, particularly due to loss of beach areas for tourism related activities and coastal erosion (Samaranayake, 2005).

Another example from the literature is that Pitchaikani and Lipton (2012) explained in a report about *Sardinella longiceps*<sup>16</sup> landings with respect to meteorological changes in Gulf of Mannar. Since no sufficient data on sardine fishery is available in this region, they used three years field data collected during the study period. Climate changes are expected to affect the marine fisheries productivity because of changes in water temperature. Moderate temperature between 24.9 and 28.5°C could be considered as favorable for the sardine fishery. Analyses indicated that the oil sardine catch has been decreasing from 2008 to 2010. Like other parts of Gulf, the oil sardine fishery in Gulf of Mannar also show declining trend (Pitchaikani and Lipton, 2012).

Evidence of quantified impacts due to climate change from Sri Lankan fishery sector is rare and is at initial stage, more research is needed since there is a lack of reliable data. The government launched a national plan to ensure the safety of fishermen and fishing vessels at sea. The plan launched mainly aims at ensuring the safety and wellbeing of fishermen and fishing vessels at sea due to climate change.

---

<sup>16</sup> Munroe, T.A. & Priede, I.G. 2010. *Sardinella longiceps*. The IUCN Red List of Threatened Species 2010: e.T154989A4684198. <http://dx.doi.org/10.2305/IUCN.UK.2010-4.RLTS.T154989A4684198.en> . Accessed on 22/10/2014

## **CHAPTER 6: CONCLUSION AND RECOMMENDATIONS**

This chapter presents the conclusions of the study and it summarizes the main bottlenecks in fishery development of the Northern Province of Sri Lanka in order to answer the third research question. Recommendations of the study are represented afterwards in order to answer the fourth research question which is stated in the introduction chapter, that is; how can the governance system improve the current situation. Finally, I summarize the utility of the SWOT analysis, the need for future research, and the limitations of the study.

### **6.1 Conclusion**

There is a high unsatisfied demand for fish in Sri Lanka. The fishery contributes about 2% of GDP in 2014. The fishery is subdivided in to three categories such as coastal, offshore and inland. The coastal fishery dominates in fish production in Sri Lanka, with a total catch of 250,000 metric tons in 2014. The coastal fishery is multi-species in nature. The national fishery production and the Northern Province's fish production show similar trends over the time period. The Northern Province has marine habitats like lagoons, mangroves, salt marshes and corals which provide potential marine resources to be managed and exploited. Point Pedro banks and Jaffna lagoons are the main sources of coastal fishery resources for Jaffna. The Prawn bank and Gulf of Mannar are the coastal fishery resources for Mannar district.

The present status of Sri Lankan fishery production shows an increasing trend. The coastal fishery is conducted using traditional and modern fishing methods. Outboard fiber reinforced plastic boats, and non-mechanized traditional crafts are widely used in the Northern Province. There were about 1,000 boats in Killinochchi and Mulaitivu districts in 2012. In Mannar it was about 3,500 boats in 2012, but Jaffna had about 8,000 boats in 2012. The Northern Province holds 40,020 fishing households and about 50,000 active fishermen in 2012. The changes in fishery production trends and changes in number of fishing households and boats are due to the civil war and the tsunami impacts in the Northern Province of Sri Lanka. Overall, the production from the fishery is rebuilding.

The SWOT analysis showed that there are characterized strengths, weaknesses, opportunities, and threats in coastal small-scale fishery industry of Sri Lanka. Strengths include potential new marine resources, policy implementation tools, market and infrastructure, and strong ecological knowledge of the fisher folk. Crab, sea cucumber, and shrimp are the key marine resources in the Northern Province. Issuing limited licenses, mesh size regulations, banning of destructive fishing gears, banning of trawlers, catch size regulations are the fishery management tools that are effectively practiced in the Northern Province of Sri Lanka. Established markets and development of infrastructure is identified as one of the strengths of fishery industry because during the civil war situation the total market system collapsed. Therefore rebuilding capacity of the market system is considered to be a strength of the fishery industry. Fishermen from the Northern Province utilize the weather patterns to fish throughout the year. They have mainly two fishing seasons in a year. Extreme weather during October to February limits their fishing activities. Good local ecological knowledge of the fishermen is one of the strengths that could lead the industry towards sustainable development.

Reliable data and declining catch, control of prices, post harvest losses, and lack of extension services are categorized as weaknesses of the Northern Province of Sri Lanka. It is concluded from the study that coastal fishery of Sri Lanka still struggle to have reliable catch data. Lack of reliable landing data further constrains the estimation of the fishery resources. Middlemen involvement and control of the prices of fish is another weakness that limits the growth of the coastal fishery. Visual observations of the Northern coastal areas indicated that there are significant post harvest losses along the process from fresh to dried fish. Because most of migrant small-scale fishermen use traditional methods of drying, in which coastal bare sandy beaches are the place for drying of fishes. Most of the time information from the government reaches the fishermen indirectly, mainly through extension services. Lack of extension services in the Northern Province limits the development of fishery industry.

Internal factors like demand for fish and organizational supports are the opportunities for the sustainable development of the small-scale coastal fishery. The Northern fishermen fulfill their family consumption of fish whenever possible. Thus food is secured. They sell the remaining fish to the market and earn profit. The Northern fishery industry is supported by government and non government organizations. The government policy of 2010 – 2016 is an example of government support for the development of the coastal fishery in Sri Lanka.

World Vision, Save the Children, and JICA are some of the non government organizations that support the small-scale coastal fisheries in Sri Lanka.

The coastal fishery of Sri Lanka is threatened by IUU fishing, internal conflicts and climate change. These are the main bottlenecks which limit the growth and development of the small-scale coastal fishery in Sri Lanka. The Northern fishermen and Tamil Nadu fishermen are involved in a range of illegal, unreported and unregulated fishing activities. First of all, Indian fishermen illegally fish in Sri Lankan exclusive economic zone. Second, they use the bottom trawlers which are banned in India and Sri Lanka. Third, Indians damage the fishing gears of Sri Lankan fishermen. As a result, corals habitats are destroyed and the fish catches from the Northern Province started to decline. Food security of the Northern fishermen is finally threatened by the Indian fishermen.

The Northern fishermen tend to use illegal fishing methods to escape from food insecurity and for their survival. Furthermore, Sri Lankan fishermen inadequately report their catches to the fisheries authorities. Except for sea cucumber and the lobster fishery, other multi-species coastal fisheries are unregulated in the Northern Province of Sri Lanka.

Prolonged internal conflict is another bottleneck to the development of the coastal fishery. In particular there are conflicts between beach-seine fishermen and internal migrant beach-seine fishermen. It makes them less efficient in fishing as they have to legally meet the fishery officials to solve the conflict, and they ended up with less cooperation in the fishery organizations. Last, but not least, the climate change is another constraint which limits the sustainable development of coastal fishery in Sri Lanka. There are few quantified studies showing the impacts of climate change on the fishery. But, I gathered some qualitative information that explained the nature of climate change and the impacts on the coastal fishery of the Northern Province. There is no common understanding among the fishers that the decline in catch is due to climate changes.

This study mainly focused on the coastal fishermen to collect the data than collaborating with other stakeholders and other fishery professionals. Based on the study I described the present status of the coastal fishery in the Northern Province of Sri Lanka. The study described the strengths, weaknesses, opportunities and threats of the Northern coastal fishery based on the SWOT analysis. Next sub chapter provide the recommendations, followed by the utility of SWOT analysis in fishery.

## **6.2 Recommendations**

Based on the SWOT analysis I would recommend the following in order to answer how the governance system can improve the current situation:

The characterized strengths of the coastal fishery should be maintained and improved scientifically for sustainable development. For that, Government should identify the potential marine resources. Species-wise marine resources should be estimated with landings or acoustic survey data. Government should enhance the implementation of fishery management tools like mesh size regulations for crabs, closed season for multi species fishery. Government should update the “Fisheries and Aquatic Resources Act No-2 of 1996” in order to implement species specific fishery management tools.

There is only one government owned fish market in the Northern Province. The number of fish outlets should be increased, and reasonable prices for fish can enhance the livelihoods of the fishermen. There are no fishery harbours in the Northern Province, and the government should start to build or rebuild the damaged harbor in Jaffna. It can enhance the infrastructure of the fishery industry. Lack of transport facilities in the Delft area should be mitigated to reduce the post harvest losses. Local ecological knowledge of the coastal fishermen in the Northern Province should be incorporated in to the official fishery management.

The characterized weaknesses of the coastal fishery should be minimized and solutions introduced to strengthen sustainable development. To combat lack of reliable landing data, government should introduce a monitoring, control and surveillance system to the coastal fishery. Industry should identify the declining fish species, and formulate management practices to rebuild these fisheries. The burden of middlemen involvement in fish price control should be mitigated through sound government involvement, by engaging transport facilities and provision of initial capital like a boat loan scheme. Fishermen should be educated to reduce the post harvest losses. IPHT should collaborate with the fishermen’s cooperative societies to provide such facilities in the coastal fishery. Government officials should encourage the fishermen to use the extension services that are available in their divisions. Finally scientific research should be conducted to minimize the weaknesses of the coastal fishery in future.

The characterized opportunities of the coastal fishery should be utilized and incorporated scientifically for the sustainable development. The Internal demand for fish

protein is the key for the food security and sustainability. Innovative value added fish products and quality fish products from the coastal fishery should be initiated in order to supply the growing demand of fish among Sri Lankan population. Organizational support to the coastal fishery industry should be continued in order to utilize the strengths and minimize the weaknesses of the industry. Whether government or non-government organizations should make sure that the right type of support is provided to the right fishermen.

The identified external threats of the coastal fishery should be rectified with the help of fishery governance, and solutions should be immediately taken for the short term threats, and permanent solutions should be attained for the long term threats which are the bottlenecks to the sustainable development of coastal fishery. IUU fishing and climate change are the long term threats to the fishery. The fishery governance system of Sri Lanka should eliminate IUU fishing by Northern and Indian fishermen. For that, new policies should be formulated and implemented immediately. The monitoring, control and surveillance system should be updated for the coastal fishery as well. Importation, production, and distribution of trawlers and illegal fishing gears should be banned rather than controlling the fishermen not to use them. The government should ensure the removal of military camps and relocation of displaced fishermen in Myliddithurai coast. A transparent auction sale of fishing rights could lead to find the solution for the internal fishery conflicts especially in the beach-seine fishery. Finally, estimation of climate change impacts on the coastal fishery is at the preliminary stage in Sri Lanka. NARA or Government should initiate research on climate change impacts on the coastal fishery. Government should identify the climate change impacts and vulnerability profile of the coastal ecosystem which could tackle the long term bottleneck of sustainable development of the coastal fisheries in Sri Lanka.

### **6.3 Utility of the SWOT analysis**

The SWOT analysis helped to achieve the overall research objectives. It clearly identified the strengths, weaknesses, opportunities, threats of the industry. SWOT analysis helped to obtain the overall picture of the small-scale coastal fishery. Each and every element of the SWOT analysis could be formulated based on the SWOT matrix after analyzing the literature. The SWOT analysis helps to; understand the fishery industry better; it addresses weaknesses; it identifies threats and opportunities; it points out the strengths of the industry; it can help the governance system to develop fishery goals and strategies towards sustainable development.



There are limitations attached to SWOT analysis if it is done without the collaboration of a variety of participants. The design of a SWOT analysis by one person could limit the realities, and devalues the possible contributions of diverse members. It is difficult to address uncertain or two-sided factors that could either be a strength or a weakness or both. A SWOT analysis may be limited because it does not value the issues, it fails to provide solutions or offer alternative decisions. A SWOT analysis may produce a lot of information, but the information might not be useful.

The explained limitations of the SWOT analysis and methodology definitely constrained the results of this thesis. A larger variety of fishery stakeholders and fishery officials could have been incorporated for the interviews. Qualities of the SWOT results can be improved further if the SWOT matrix had been formulated by the participant during the brainstorming session of the interviews rather than the researcher formulating the SWOT matrix alone. Further research should be conducted by minimizing the limitations of the methodology. Future research to each SWOT elements could help the Sri Lankan fishery governance to achieve a more sustainable development of the coastal small-scale fisheries.

## REFERENCES

- Ahmed, N., Luong-Van, J., 2009. Can rice-fish farming provide food security in Bangladesh? *Aquac. Asia Mag* 16, 18–22.
- Allison, E.H., Perry, A.L., Badjeck, M.-C., Neil Adger, W., Brown, K., Conway, D., Halls, A.S., Pilling, G.M., Reynolds, J.D., Andrew, N.L., Dulvy, N.K., 2009. Vulnerability of national economies to the impacts of climate change on fisheries. *Fish Fish.* 10, 173–196. doi:10.1111/j.1467-2979.2008.00310.x
- Amarasinghe, O., 2015. Fisher war in the Palk Strait [WWW Document]. *Sunday Obs.* URL <http://www.sundayobserver.lk/2015/03/15/fea04.asp> (accessed 1.1.15).
- Amarasinghe, O., 2014. Emergence of fisheries conflicts at Palk Bay in the context of technological change and civil strife.
- Amarasinghe, O., 2005. An Assessment of the Post Tsunami Recovery process in the Fisheries Sector of Sri Lanka, in: *Sri Lanka Country Report , ICSF Post Tsunami Rehabilitation*. Chennai, India.
- Anon, 2010. Sri Lanka socio-economic data 2010.
- Ansoff, H.I., 1987. *Corporate Strategy*. Penguin Books Ltd.
- Atapattu, A., 1994. Community-Based Approaches to Fisheries Management: The Role of Marketing Development and Fisheries Cooperatives in Improving Socio-Economic Conditions of Small-Scale Fishermen [WWW Document]. *Fish. Aquat. Resour. Dep.* URL <http://www.apfic.org/Archive/symposia/1993/28.pdf> (accessed 6.6.15).
- Atapattu, A., 1985. Territorial use rights in fisheries (Turfs) in Sri Lanka. *Case Studies on Jakottu Fisheries in the Madu Ganga Estuary and Kattudel Fishery in the Negombo Lagoon*.
- Athukorala, S., Dissanayake, D.C., 2009. Status and Management of Sea Cucumber Fishery in Sri Lanka.
- Baba, N., 2010. Sinking the Pearl of the Indian Ocean: Climate Change in Sri Lanka. *Glob. Major. E-Journal*.
- Bailey, C., Jentoft, S., 1990. Hard choices in fisheries development. *Mar. Policy* 14, 333–344. doi:10.1016/0308-597X(90)90055-V
- Barange, M., Merino, G., Blanchard, J., Scholtens, J., Harle, J., Allison, E.H., Allen, J.I., Holt, J., Jennings, S., 2014. Impacts of climate change on marine ecosystem production in societies dependent on fisheries. *Nat. Clim. Chang.* 4, 211–216. doi:10.1038/nclimate2119
- Basnayake, B.R.S., Abjhyasinghe, K.R., Sumathipala, W.L., Punyawardene, P.B.V., Perera, N., Joseph, P.G., 2007. Climate Change in Sri Lanka: Impacts, Adaptation & Mitigation, in: *Department of Meteorology, C. for C.C.S. and K. (Ed.), The National Conference on Climate Change*. Asia-Pacific Network for Global Change Research, Colombo.
- Bavinck, M., 2015. Fishing rights in post-war Sri Lanka: results of a longitudinal village enquiry in the Jaffna region. *Marit. Stud.* 14. doi:10.1186/s40152-014-0019-0
- Béné, C., Macfadyen, G., Allison, E., 2007. Increasing the contribution of small-scale fisheries to poverty alleviation and food security. *FAO*.

- Bolton, J., Robertson-Andersson, D., Shuuluka, D., Kandjengo, L., 2009. Growing Ulva (Chlorophyta) in integrated systems as a commercial crop for abalone feed in South Africa: a SWOT analysis. *J. Appl. Phycol.* 21, 575–583. doi:10.1007/s10811-008-9385-6
- Carr, L., 2008. The strengths and weaknesses of quantitative and qualitative research: what method for nursing? *J. Adv. Nurs.* 20, 716–721. doi:10.1046/j.1365-2648.1994.20040716.x
- CBSL, 2014. Economic and social statistics of Sri Lanka 2014. Statistics Department, Central Bank of Sri Lanka, Colombo, Sri Lanka.
- Çelik, A., Metin, İ., Çelik, M., 2012. Taking a Photo of Turkish Fishery Sector: A Swot Analysis. *Procedia - Soc. Behav. Sci.* 58, 1515–1524. doi:10.1016/j.sbspro.2012.09.1138
- CFHC, 2013. CFHC [WWW Document]. URL <http://www.cfhc.lk/index.php> (accessed 6.12.15).
- CNFL, 2011. CNFL [WWW Document]. URL [http://www.parliament.lk/papers\\_presented/09112012/annual\\_report\\_cey\\_nor\\_foundation\\_limited\\_2011.pdf](http://www.parliament.lk/papers_presented/09112012/annual_report_cey_nor_foundation_limited_2011.pdf) (accessed 6.10.15).
- Cowx, I., Arlinghaus, R., Cooke, S., 2010. Harmonizing recreational fisheries and conservation objectives for aquatic biodiversity in inland waters. *J. Fish Biol.* 76, 2194–2215. doi:10.1111/j.1095-8649.2010.02686.x
- DCS, 2011. Department of Census and Statistics, Sri Lanka [WWW Document]. URL <http://www.statistics.gov.lk/agriculture/fishery/index.htm> (accessed 6.11.15).
- DCS, 2005. Preliminary Report of Census of Buildings and Persons Affected by the Tsunami. Colombo, Sri Lanka.
- De Silva, D.A., Yamao, M., 2007. Effects of the tsunami on fisheries and coastal livelihood: a case study of tsunami-ravaged southern Sri Lanka. *Disasters* 31, 386–404. doi:10.1111/j.1467-7717.2007.01015.x
- Dealtry, T.R., 1992. *Dynamic SWOT Analysis: Developer's Guide*.
- DFAR, 2013. Sri Lanka National Plan of action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated (IUU).
- DFAR, 2012. Report of implementation for the year 2011. Reporting CPC: Sri Lanka.
- Dissanayake, D.C., Athukorala, S., Amarasiri, C., 2010. Present status of the sea cucumber fishery in Sri Lanka. *SPC Beche-de-mer Inf.* 14–20.
- Dissanayake, D.C., Wijeyaratne, M.J., 2010. Studies on the sea cucumber fishery in the North Western coastal region of Sri Lanka. *Sri Lanka J. Aquat. Sci.* 12, 19–38.
- Engvall, L., Ratcliffe, C., Scheepens, T., 1977. *Assessment of problems and needs in marine small-scale fisheries*. Colombo.
- FAO, 2015. Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries [WWW Document]. URL <http://www.fao.org/3/a-i4356e.pdf> (accessed 8.20.15).
- FAO, 2010. Report of the APFIC/FAO Regional Consultative Workshop “Securing sustainable small-scale fisheries: Bringing together responsible fisheries and social development.” RAP Publication 2010/19, Bangkok, Thailand.

- FAO, 2006a. FAO Fishery Country Profile - Sri Lanka [WWW Document]. URL <http://www.fao.org/fi/oldsite/FCP/en/LKA/profile.htm> (accessed 3.20.15).
- FAO, 2006b. Policy brief - Food Security. Rome.
- FAO, 2005. Increasing the contribution of small-scale fisheries to poverty alleviation and food security. FAO Technical Guidelines for Responsible Fisheries. Rome.
- FAO, 2001. International Plan of Action to prevent, deter and eliminate illegal, unreported and unregulated fishing. Rome.
- FAO, 2000. The sustainable contribution of fisheries to food security.
- FAO, 1999. Indicators for sustainable development of marine capture fisheries. FAO Technical Guidelines for Responsible Fisheries [WWW Document]. FAO Fish. Resour. Div. URL <http://www.fao.org/docrep/004/x3307e/x3307e00.htm#sustaina> (accessed 6.13.15).
- FAO, 1995. Code of Conduct for Responsible Fisheries. Rome.
- Fernando, P., Moonesinghe, S., 2012. Livelihoods , basic services and social protection in Sri Lanka. ODI Secur. Livelihoods Res. Consort. Work. Pap. 6, 38.
- Garza-Gil, M.D., Varela-Lafuente, M., Caballero-Miguez, G., 2009. Price and production trends in the marine fish aquaculture in Spain. *Aquac. Res.* 40, 274–281. doi:10.1111/j.1365-2109.2008.02106.x
- Gerring, J., 2004. What is a case study and what is it good for? *Am. Polit. Sci. Rev.* 98, 341–354.
- Glass, J. ., Kruse, G. ., Miller, S. ., 2015. Socioeconomic considerations of the commercial weathervane scallop fishery off Alaska using SWOT analysis. *Ocean Coast. Manag.* 105, 154–165. doi:10.1016/j.ocecoaman.2015.01.005
- Global IDP Database, 2005. Profile of internal displacement: Sri Lanka. Geneva - Switzerland.
- Golafshani, N., 2003. Understanding Reliability and Validity in Qualitative Research. *Qual. Rep.*
- GOSL, 2009. Armed Conflicts Report - Sri Lanka [WWW Document]. URL [http://www.justice.gov/sites/default/files/eoir/legacy/2014/02/25/Sri\\_Lanka.pdf](http://www.justice.gov/sites/default/files/eoir/legacy/2014/02/25/Sri_Lanka.pdf) (accessed 4.6.15).
- GOSL, 2005. Sri Lanka: Post tsunami Recovery and Reconstruction.
- GOSL, 1996. Fisheries and Aquatic Resources Act, No. 2 of 1996 [WWW Document]. URL [http://www.fisheriesdept.gov.lk/fisheries\\_beta/regulations/Fisheries and Aquatic Resources Act.pdf](http://www.fisheriesdept.gov.lk/fisheries_beta/regulations/Fisheries%20and%20Aquatic%20Resources%20Act.pdf) (accessed 3.20.15).
- GOSL, 1988. National Environmental (Amendment) Act, No. 56 of 1988 [WWW Document]. URL <http://www.cea.lk/web/images/pdf/acts/act56-88.pdf> (accessed 3.20.15).
- GOSL, 1981. Marine Pollution Prevention Act, No. 59 of 1981 [WWW Document]. URL [http://hrsl.lk/PFF/Library\\_Domestic\\_Laws/Legislation\\_related\\_to\\_Environment/Marine Pollution Prevention Act No 39 of 1981.pdf](http://hrsl.lk/PFF/Library_Domestic_Laws/Legislation_related_to_Environment/Marine%20Pollution%20Prevention%20Act%20No%2039%20of%201981.pdf) (accessed 3.20.15).
- Groenewald, T., 2004. A phenomenological research design illustrated. *Int. J. Qual. Methods* 3.
- GSG, 2004. British Columbia Seafood Sector and Tidal Water Fishing: a Strengths, Resources,

## Opportunities and Threats Assessment.

- Haberberg, A., 2000. Swatting SWOT, Strategy, (Strategic Planning Society) [WWW Document]. September. URL <http://www2.wmin.ac.uk/haberba/SwatSWOT.htm> (accessed 6.12.15).
- Hafeez, M., 2009. Ethnic conflict in Sri Lanka. *Ethn. Racial Stud.* 9, 264–269. doi:10.1080/01419870.1986.9993529
- Hancock, B., 2002. Trent Focus for Research and Development in Primary Health Care: An Introduction to Qualitative Research. Trent Focus.
- Hardin, G., 1968. The Tragedy of the Commons. *Science* (80-. ). 162, 1243–1248.
- Helms, M., Nixon, J., 2010. Exploring SWOT analysis – Where are we now?: A review of academic research from the last decade. *J. Strateg. Manag.* 3, 215–251.
- Hersoug, B., Munkejord, S., 2003. Assessment of potential areas for development cooperation between Norway and Sri Lanka within the fisheries sector and outlining a project programme. Colombo.
- HLPE, 2012. Food security and climate change. A report by the High Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Rome.
- Hofer, C., Schendel, D., 1978. Strategy Formulation: Analytical Concepts.
- IPCC, 2014. Working Group II Climate Change 2014: Impacts, adaptation, and vulnerability.
- IPCC, 2007. Climate Change 2007: Synthesis Report Summary for Policymakers. Geneva, Switzerland.
- Jagota, S., 1985. Maritime boundaries: India - Sri Lanka [WWW Document]. URL <http://www.state.gov/documents/organization/58833.pdf> (accessed 8.20.14).
- Jayatilake, A., 2008. Climate change due to global warming: a global challenge in Sri Lanka perspective.
- Johnsen, J.P., Hersoug, B., Solås, A.-M., 2014. The creation of coastal space – how local ecological knowledge becomes relevant. *Marit. Stud.* 13, 2. doi:10.1186/2212-9790-13-2
- Julian Caldecott, Wickremasinghe W.R.M.S, 2005. Sri Lanka Post-Tsunami Environmental Assessment. United Nations Environment Programme.
- Kawarazuka, N., Béné, C., 2011. The potential role of small fish species in improving micronutrient deficiencies in developing countries: building evidence. *Public Health Nutr.* 14, 1927–1938.
- Kumara, P.B.T.P., Cumarathunga, P.R., Linden, O., 2005. Present status of the sea cucumber fishery in southern Sri Lanka: A resource depleted industry. *SPC Beche-de-mer Inf.* 24–29.
- Learned, E., Christiansen, C., Andrews, K., Guth, W., 1969. Business Policy: Text and Cases.
- Lipset, S., Trow, M., J, C., 1956. Union democracy: the internal politics of the F International Typographical Union. New York: Free Press, New York.
- Loefflad, M., Wallace, F., Mondragon, J., Watson, J., Harrington, G., 2014. Strategic Plan for Electronic Monitoring and Electronic Reporting in the North Pacific.

- MFARD, 2014a. Programme Performance Report. Colombo.
- MFARD, 2014b. Improvement of nutritional status and food security of the people.
- MFARD, 2013a. Sri Lanka National Plan of action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated (IUU) Fishing [WWW Document]. Dep. Fish. Aquat. Resour. URL [http://www.fisheriesdept.gov.lk/fisheries\\_beta/index.php/sri-lanka-national-plan-of-action-to-prevent-deter-and-eliminate-illegal-unreported-and-unregulated-iuu-fishing?showall=1&limitstart=](http://www.fisheriesdept.gov.lk/fisheries_beta/index.php/sri-lanka-national-plan-of-action-to-prevent-deter-and-eliminate-illegal-unreported-and-unregulated-iuu-fishing?showall=1&limitstart=) (accessed 6.18.15).
- MFARD, 2013b. Fisheries Statistics.
- MFARD, 2010. Fisheries sector development strategy. Colombo, Sri Lanka.
- MFARD, 2009. Fisheries Statistics.
- MFARD, 2007. Census of Fishing Boat. Colombo, Sri Lanka.
- MFARD, 2006. The National Fisheries and Aquatic Resources Policy.
- MFARD, 2005. National Programme for Repairing and Rebuilding of Fishing Crafts. Colombo, Sri Lanka.
- MFARD, 2003. Annual Report. Colombo, Sri Lanka.
- Midlarsky, M.I., Midlarsky, E.R., 2009. Extremism and Military Intervention in South Asia: Indian Muslims and Sri Lankan Tamils. Chile.
- NAQDA, 2010. NAQDA [WWW Document]. URL <http://www.naqda.gov.lk/> (accessed 6.10.15).
- NARA, 2014. NARA [WWW Document]. URL <http://www.nara.ac.lk/> (accessed 6.10.15).
- NARA, 2013. Fishery Industry Outlook.
- NARA, 2003. Annual Report. Craw-island, Colombo.
- Normann, A., Angelsen, K., Sivalingam, S., 2003. Restoration of Fisheries Activities in Jaffna District.
- NPSL, 2014. Northern Province, Sri Lanka - Geography [WWW Document]. URL [http://www.liquisearch.com/northern\\_province\\_sri\\_lanka/geography](http://www.liquisearch.com/northern_province_sri_lanka/geography)
- Panigrahi, J.K., Mohanty, P.K., 2012. Effectiveness of the Indian coastal regulation zones provisions for coastal zone management and its evaluation using SWOT analysis. *Ocean Coast. Manag.* 65, 34–50. doi:10.1016/j.ocecoaman.2012.04.023
- Pitchaikani, J.S., Lipton, A.P., 2012. Impact of environment variables on pelagic fish landings : Special emphasis on Indian oil sardine off Tiruchendur coast , Gulf of Mannar. *Oceanogr. Mar. Sci.* 3, 56–67. doi:10.5897/JOMS12.006
- Porter, M.E., 1991. Towards a dynamic theory of strategy. *Strateg. Manag. J.* 12, 95–117. doi:10.1002/smj.4250121008
- Rimmer, M.A., Sugama, K., Rakhmawati, D., Rofiq, R., Habgood, R.H., 2013. A review and SWOT analysis of aquaculture development in Indonesia. *Rev. Aquac.* 5, 255–279. doi:10.1111/raq.12017

- Samaranayake, R.A.D., 2005. Pre-and post-tsunami coastal planning and land-use policies and issues in Sri Lanka.
- Scholtens, J., Bavinck, M., Soosai, A., 2012. Fishing in dire straits. *Econ. Polit. Wkly.*
- Sigurðardóttir, S., Stefánsdóttir, E.K., Condie, H., Margeirsson, S., Catchpole, T.L., Bellido, J.M., Eliassen, S.Q., Goñi, R., Madsen, N., Palialexis, A., Uhlmann, S.S., Vassilopoulou, V., Feekings, J., Rochet, M.-J., 2015. How can discards in European fisheries be mitigated? Strengths, weaknesses, opportunities and threats of potential mitigation methods. *Mar. Policy* 51, 366–374. doi:10.1016/j.marpol.2014.09.018
- Sigurdarson, S., Wickramasooriya, N., 2006. Master Plan for the Reconstruction and Development of Anchorages and Fish Landing Centres along the coast of Sri Lanka.
- Silva, L.E., Katupotha, J., Amarasinghe, O., Manthirithilake, H., Ariyaratna, R., 2013. Lagoons of Sri Lanka: from the origins to the present. IWMI.
- Sivasubramaniam, K., 1995. Sri Lanka's Fisheries Resources, Development and Management in the past, in: *Towards a New Era in Fisheries Development*. Ministry of Fisheries and Aquatic Resources Development, Colombo, Sri Lanka.
- Sivasubramaniam, K., 1997. One Hundred Years of Fisheries Management in Sri Lanka: Lessons for the Future. Colombo, Sri Lanka.
- Soosai, A., 2008. The Situation of Small-Scale Fisheries in Mannaar, Sri Lanka, The Norwegian Fisheries Forum. Gjestetun, Os, Norway.
- Soosai Siluvaithasan, A., Stokke, K., 2006. Fisheries under fire: Impacts of war and challenges of reconstruction and development in Jaffna fisheries, Sri Lanka. *Nor. Geogr. Tidsskr. - Nor. J. Geogr.* 60, 240–248. doi:10.1080/00291950600891828
- Stead, S.M., 2005. Changes in Scottish coastal fishing communities - Understanding socio-economic dynamics to aid management, planning and policy. *Ocean Coast. Manag.* 48, 670–692. doi:10.1016/j.ocecoaman.2005.08.001
- Strauss, A., Corbin, J., 1998. *Basics of qualitative research: Techniques and procedures for developing grounded theory*, Sage Publications.
- Stuart, I., McCutcheon, D., Handfield, R., McLachlin, R., Samson, D., 2002. Effective case research in operations management: a process perspective. *J. Oper. Manag.* 20, 419–433.
- Subasinghe, S., 2005. Sri Lanka: Assessment of rehabilitation and re-construction needs in the tsunami affected post-harvest fisheries sector. Rome.
- The Sundaytimes, 2012. Illegal fishing: Lanka gets yellow card from EU [WWW Document]. Novemb. 25, 2012. URL <http://www.sundaytimes.lk/121125/news/illegal-fishing-lanka-gets-yellow-card-from-eu-22157.html> (accessed 6.28.15).
- Turner, S., 2002. *Tools for Success: A Manager's Guide*. McGraw-Hill.
- United Nations, 2011. Report of the Secretary-General's Panel of Experts on Accountability in Sri Lanka, United Nations.
- Ward, T.J., 2003. Potential world heritage sites of the Central Indian Ocean Region. Perth, Australia.

- Wheelen, T., Hunger, J., 1998. *Strategic Management and Business Policy*, 5th ed. Addison-Wesley, Reading, MA.
- Wijyaratne, B., 2001. *Coastal Fisheries in Sri Lanka : Some Recommendations for Future Management*.
- Wijialudchumi, R., 2014. *Statistical Information of the Northern Province*.
- Woods, P., 2006. *Qualitative research*. Faculty of education, University of Plymouth.
- Yin, D.R.K., 2003. *Case Study Research: Design and Methods: Design and Methods*.
- Yin, R.K., 2009. *Case Study Research: Design and Methods*. SAGE Publications.