



**REGIONAL FISHERIES LIVELIHOODS PROGRAMME  
FOR SOUTH AND SOUTHEAST ASIA (RFLP)**

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**Rapid fisheries frame survey report of coastal and brackish water fisheries  
in the district of Negombo**

**(Activity 1.2.2 Conduct rapid fisheries assessment of coastal and brackish water  
fisheries in the fisheries district of Negombo)**

**For the Regional Fisheries Livelihoods Programme for South and Southeast Asia**

**Prepared by**

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## Abbreviations and Acronyms

DFAR	- Department of Fisheries and Aquatic Resources
DNGD	- Drag net
DNGR	- <i>Gok ran dela</i>
DNST	- Shrimp trawl
FAO	- Food and Agriculture Organization
FGCN	- Cast net
FI	- Fisheries Inspector
GN divisions	- <i>Grama Niladhari</i> division
GNBS	- Bottom-set gillnet
GNHD	- Fyke net ( <i>Haras dela</i> )
GNKD	- Surrounding net ( <i>Kotu dela</i> )
GNLM	- Large-mesh gillnet
GNSM	- Small-mesh gillnet
GNTR	- Trammel net
GT	- Gross Tonnage
HLBL	- Bottom longline
HLHL	- Hand line
HLRL	- Rod and line
HLSJ	- Stilt fishing
HLTL	- Tuna longline
HLTR	- Troll line
IDAY	- Day Boats fitted with inboard engines
LNCR	- Crab pot
LOA	- Letter of Agreement
MTRB	- Motorized Traditional Boats (Log rafts, outrigger canoes, etc)
NBSB	- Non-motorized Beach Seine Boats
MSSC	- Scoop net
NTRB	- Non-motorized Traditional Boats (Log rafts, outrigger canoes, etc.)
OFRP	- Fibre reinforced Plastic boats powered by outboard motor engines
RFLP	- Regional Fisheries Livelihoods Programme
SRL	- Sri Lanka
TRKD	- Stake net

## 1. Introduction

This report is provided in part fulfillment of the Letter of Agreement (LOA) signed between the Director General, Department of Fisheries and Aquatic Resources (DFAR) of Sri Lanka and the Representative for the Food and Agriculture Organization (FAO) of the United Nations for Sri Lanka and Maldives. Under this LOA, FAO/Colombo has agreed to provide DFAR a financial contribution of Rs. 5, 399,460 for DFAR to:

- 1) Conduct rapid fisheries frame surveys on the coastal marine and brackish water fisheries in the fisheries districts of Puttalam, Chilaw and Negombo and provide three reports for the three districts, synthesizing the findings in terms of distribution of fishing population by village, fishing craft and gear (type and quantity) by landing centre/village, estimated catch by landing centre/boat and gear types, marketing arrangements and post harvest activities by village etc.
- 2) Establish 12 Fisheries Committees in Puttalam lagoon and 12 Fisheries Committees in Chilaw lagoon for the purpose of promoting fisheries co-management in the aforesaid lagoons and, provide two reports on the establishment of fisheries committees in Chilaw and Puttalam lagoons including the process and the methodology adopted.

The Regional Fisheries Livelihoods Programme (RFLP) - GCP/RAS/237/SPA is a regional programme funded by the Spanish Government with a total budget of US\$ 19.54 million for four years in six countries (Cambodia, Indonesia, the Philippines, Sri Lanka, Timor-Leste, and Viet Nam). With the in-kind contribution from the Government of Sri Lanka, RFLP Sri Lankan Component is being implemented by the Ministry of Fisheries and Aquatic Resources Development.

The RFLP' overall objective is to achieve *“Strengthened capacity among participating small-scale fishing communities and their supporting institutions towards improved livelihoods and sustainable fisheries resources management.”*

Under the above overall objective, five main national outputs of the programme are:

1. Co-management mechanisms for sustainable utilization of fishery resources;
2. Improved safety and reduced vulnerability for fisher communities;
3. Improved quality of fishery products and market chains;
4. Strengthened existing and diversified income opportunities for fisher families; and
5. Facilitated access to micro-finance services for fishers, processors and vendors.

The RFLP annual activity work plan 2011 for Sri Lanka was approved by the National Coordination Committee in January 2011. In this context, RFLP Sri Lanka has agreed on the project activity implementation in order to achieve the project outputs. In particular, Activity 1.2.2 refers to the rapid fisheries frame survey in the coastal district of Negombo, coming within the project area of RFLP Sri Lanka (SRL).



The last fisheries census was conducted in 2003 and was based on sample surveys. The fishing boat census conducted by DFAR during 2006/7 period focused only on the distribution of fishing boats, in response to the need for obtaining accurate data on the fishing fleet after the post-tsunami rehabilitation of the sector which resulted in the addition of a large number of fishing boats in a somewhat un-coordinated and haphazard manner. There is no reliable district-wise data/information on the fishing population, fishing activities, fish production, marketing and infrastructure, in particular those related to coastal and lagoon fisheries.

The rapid fisheries frame survey is intended to provide basic data/information on the coastal and estuarine/lagoon fisheries that can be used by RFLP SRL for planning its activities as well as for development planning by policy makers, development and management agencies, donors, NGOs and other stakeholders interested in the management and development of coastal and estuarine/lagoon fisheries in the district.

## **2. Survey methodology**

### **2.1 Field data collection**

For administrative purposes, the coastal belt of Negombo fisheries district is divided into 13 Fisheries Inspector (FI) divisions. Each FI division is under the care of a Fisheries Inspector (FI) and generally includes a number of fishing villages and fish landing centers. In addition to the FIs assigned to each FI division, the district fisheries office of Negombo also has other categories of staff – Fisheries Resource Management Assistants and Fisheries Social Mobilizers, with considerable field experience. They were also trained and mobilized for the frame survey. A total of 27 personnel attached to the Negombo district fisheries office were involved in field data collection for the rapid frame survey.

Negombo lagoon (technically an “estuary”) is surrounded by 09 FI divisions and the FIs assigned to these divisions were deployed to conduct the frame survey in the Negombo lagoon.

A total enumeration of all fishing households associated with the coastal and lagoon fisheries in the fisheries district of Negombo was undertaken to provide basic data and information on;

- Distribution of fishing population by Fisheries Inspector (FI) division /village;
- Fishery related activities by FI area /village and by gender;
- Fishing craft and gear (type and quantity) distribution by landing centre/FI area/village;
- Estimated catch by landing centers, boat and gear types and seasons;
- Marketing arrangements and post harvest activities by village/FI area; and,
- Infrastructure by FI area /village/landing centre.

The design and conduct of the frame survey was guided by FAO Fisheries Technical Paper No. 425 – Sample-based fishery surveys by Constantine Stamatopoulos.

The structured questionnaire used in the field to obtain the above data and information was developed by senior officers of DFAR in consultation with the senior officers of the district fisheries offices of the Negombo, Chilaw and Puttalam districts. It is given as **Annex 1** of this

report. Awareness creation meetings were held and orientation trainings were conducted on 18<sup>th</sup> February 2011 and 11<sup>th</sup> April 2011 for all 27 field staff who were involved in data collection. The questionnaire was also field tested before it was finalized for printing.

From available data/information, it was assumed that about 9,000 households in Negombo are associated with coastal and brackish water fisheries. On this basis, the manpower allocation for field data collection by 27 people was scheduled for 14 days during the month of April 2011 (**Annex 2**).

Each field data collector was expected to spend about 2-3 hours in field data collection during the week days and 6-10 hours during weekends when they are not at work, primarily to ensure that they visited each household and surveyed both male and female members in each household. Being predominantly catholic areas, the majority of fishers do not fish on Sundays, providing an ideal opportunity to interview them at their homes on Sundays. During week days, the field data collectors spent 2-3 hours early in the morning or late evening collecting field data, so as not to disrupt their official duties. Depending on the type of fishing the male household member was engaged in, the field data collector had a reasonable idea when he would be at home. All data collectors met with the head of household, either at their homes or at landing centres, to obtain required data/information and sometimes had to re-visit a household if the head of household was absent during the first visit.

## **2.2 Data analysis and reporting**

The frame survey data was collected by a team of 27 between mid-April to the end of September. 10 staff attached to the Management Division of DFAR were involved in data entry. Manpower allocation for data entry, including those from Chilaw and Puttalam districts is given in **Annex 3**. Data entry was conducted over 46 days during April and May 2011.

## **2.3 Monitoring and supervision**

The rapid frame survey was implemented under the overall supervision of the Director General, DFAR and under the direct supervision of the Deputy Director, Fisheries Management Division of DFAR. The Assistant Director in charge of the district fisheries office, Negombo was responsible for coordinating and conducting of all field level activities. Three senior officers (an Economist, a Biologist and a Fisheries Resources Management Assistant) of the Fisheries Management Division of DFAR were deployed to assist the district office and to coordinate all activities between the district office and the DFAR head office in Colombo, through frequent field visits for the purpose of monitoring and supervision.

# **3. Results and analysis**

## **3.1 Distribution of coastal fishing households**

The distribution of coastal fishing households in Negombo district by fishing village, FI division and village headman "*Grama Niladhari*" (GN) division are given in **Annex 4**. The GN divisions established for civil administration do not always coincide with the villages, or with the FI divisions established for fisheries administration, necessitating analysis of distribution in terms of village, FI and GN divisions. A summary of the distribution of

coastal and lagoon fishing households by village, GN division and FI division is given in **Table 1**.

**Table 1: Distribution of coastal and lagoon fishing households in Negombo district**

FI Division	GN Divisions	Fishing Villages	No. of households	Male	Female	Total
Aluthkuruwa	2	4	642	981	1,021	2,002
Duwa	2	5	343	751	750	1,501
Ettukala	9	8	391	848	811	1,659
Ja-Ela	31	21	315	562	578	1,140
Kammalthuraya	7	5	403	906	843	1,749
Kepungoda	3	3	768	1,347	1,366	2,713
Kudapaduwa	4	2	660	1,613	1,548	3,161
Pitipana	5	10	963	1,877	1,811	3,688
Town I	8	6	904	2,073	2,077	4,150
Town II	19	9	622	1,220	1,170	2,390
Town III	6	8	987	2,335	2,340	4,675
Uswetakeyiyawa	20	36	444	822	818	1,640
Wattala	17	26	623	1,323	1,325	2,648
<b>Total</b>	<b>133</b>	<b>143</b>	<b>8,065</b>	<b>16,658</b>	<b>16,458</b>	<b>33,116</b>

The 13 FI divisions of Negombo fisheries district encompass 133 GN divisions and 143 fishing villages. There were 8,065 coastal and lagoon fishing households with a total population of 33,116; males and females were more or less in equal proportion. The number of fishing villages within FI areas ranged from 02 in Kudapaduwa to 36 in Uswetakeyiyawa. FI areas with comparatively large stretches of the coast had more fishing villages (e.g. Uswetakeyiyawa, Ja-Ela and Wattala) than FI areas with small coastal fronts. However, the number of fishing households and fishing population was high in some of the FI areas comprising only of a few villages (e.g. Town III, Town I, Pitipana and Kudapaduwa).

The fisheries frame survey was planned on the assumption that about 9,000 households were associated with coastal and lagoon fisheries in Negombo. The frame survey result gave 8,065 households which was approximately 10% less than the assumed total.

### 3.2 Fishery associated livelihoods

Village-wise data/information on fishery associated livelihoods of the coastal and lagoon fishing population in Negombo fisheries district is given in **Annex 5**. These ranged from those who were involved in fishing, fish vending, marketing of dried and salted fish and a few who were engaged in brush pile fishery, cast net fishery, etc. A summary of data/information on fishery associated livelihoods of the coastal and lagoon fishing population in Negombo fisheries district by FI division is given in **Table 2**.

A total of 9,652 or approximately 29% of the total coastal fishing population in the district were involved in fishery associated livelihoods. Approximately 86% were directly involved in fishing in the coastal waters and/or in the lagoon.

**Table 2: Fishery associated livelihoods of coastal fishing populations of Negombo district**

FI Division	Fishing			Dry fish seller		Fish Vendors		Other *
	Owner	Skipper	Crew	Male	Female	Male	Female	
ALUTHKURAUWA	226		210	12	5	46	19	10
DUWA	143	3	182	16	3	35	1	
ETTUKALA	158		237	2	1	30	13	1
JA-ELA	140		70	6	4	79	19	
KAMMALTHURA	197		321	3	4	29	39	
KEPUNGODA	456		285	4	1	38	12	18
KUDAPADUWA	343	9	414	30	7	32	8	
PITIPANA	228	2	466	16	1	163	5	
TOWN I	365	5	531	122	58	111	20	
TOWN II	174	3	362	14	2	61	23	18
TOWN 111	221		662	20	7	63	11	9
USWETAKEIYAWA	157	17	261	1	1	17	7	1
WATTALA	248	105	364	1	1	37	2	5
<b>TOTAL</b>	<b>3,056</b>	<b>143</b>	<b>4,365</b>	<b>247</b>	<b>95</b>	<b>741</b>	<b>179</b>	<b>62</b>

Overall, women represented only 3% of the fishery associated work force, but they were better represented in fish vending (21%) and processing and marketing of salted and dried fish (26%).

Only a small number of respondents reported on “other” fishery related livelihoods; examples included fish processing and net mending activities.

### 3.3 Coastal and lagoon fishing fleet

A number of different types of fishing craft were operated in the coastal waters off Negombo and in Negombo lagoon. The following codes used by the Department of Fisheries and Aquatic Resources to identify different types of coastal and lagoon fishing boats were also used in this report:

Boat description	Code
Non-motorized Traditional Boats (Log rafts, outrigger canoes, etc.)	NTRB
Motorized Traditional Boats (Log rafts, outrigger canoes, etc powered by outboard motor engines)	MTRB
Non-motorized Beach Seine Boats	NBSB
Fibre reinforced Plastic boats powered by outboard motor engines	OFRP

Boat description	Code
Day Boats fitted with inboard engines	IDAY

The 9.0 m, 3.5 GT in-board engine powered boats (IDAY boats) and the 6-7 m Fibre Reinforced Boats powered by 15-25 HP outboard motors (OFRP boats) operated primarily in the coastal waters. While the motorized traditional crafts (MTRB) such as outrigger canoes and log rafts also operated in the sea, the non-motorized, traditional outrigger canoes and log rafts (NTRB) operated both in the sea as well as in the lagoon. In addition, the large beach seine craft (NBSB) were operated in the beach seine fishery during the non-monsoonal months of October to March. **Annex 6** provides data/information on the number and type of fishing crafts registered under each village and FI division and the area of fishing. A summary of data/information on the distribution of coastal and lagoon fishing fleet by FI division is shown in **Table 3**.

The coastal and lagoon fishing fleet in Negombo totalled 3,377 vessels. Motorized craft that operated in coastal waters made up approximately 56% of the fishing fleet, while the balance 44% was non-motorized. Approximately 75% of the IDAY fishing fleet was located within Wattala FI division and were engaged in coastal shrimp trawling. While the motorized traditional craft and the beach seine craft were restricted to a few FI divisions, the OFRP boats and the non-motorized traditional crafts were geographically more widespread along the coast as well as around the lagoon.

**Table 3: Distribution of coastal and lagoon fishing fleet in Negombo by FI division**

FI Division	IDAY	MTRB	NBSB	NTRB	OFRP	Total
ALUTHKURUWA		3		215	17	235
DUWA	2			33	108	143
ETTUKALA				23	129	152
JA-ELA		1		140		141
KAMMALTHURA			2	43	163	208
KEPUNGODA			18	365	42	425
KUDAPADUWA	6	0	0	11	308	325
PITIPANA	1	0	8	111	158	278
TOWN I	3			51	330	384
TOWN II	2			143	38	183
TOWN III				327	14	341
USWETAKEIYAWA	11	2		157	51	221
WATTALA	70	11		154	106	341
<b>TOTAL</b>	<b>95</b>	<b>17</b>	<b>28</b>	<b>1,773</b>	<b>1,464</b>	<b>3,377</b>

The distribution of coastal and lagoon fishing fleet by FI division and area of fishing is shown in **Table 4**. All motorized craft operated in the coastal sea. Of the non-motorized craft, approximately 66% operated solely in the lagoon, 28% in the sea and around 6% operated both in the lagoon and the sea, depending on the season.

**Table 4: Distribution of coastal and lagoon fishing fleet in Negombo by FI division and fishing area**

FI Division	IDAY	MTR B	NBS B	OFRP	NTRB		
					Coastal Fishing	Lagoon	Lagoon & Sea
ALUTHKURUWA		3		17	20	173	22
DUWA	2			108	2	30	1
ETTUKALA				129	23		
JA-ELA		1			4	135	1
KAMMALTHURA			2	163	43		
KEPUNGODA			18	42	3	304	58
KUDAPADUWA	6			308	11	0	0
PITIPANA	1		8	158	1	108	2
TOWN I	3			330	18	31	2
TOWN II	2			38	50	92	1
TOWN III				14	102	220	5
USWETAKEIYAW A	11	2		51	73	79	5
WATTALA	70	11		106	154		
<b>TOTAL</b>	<b>95</b>	<b>17</b>	<b>28</b>	<b>1,464</b>	<b>504</b>	<b>1,172</b>	<b>97</b>

The distribution of coastal and lagoon fishing fleet in Negombo by type of landing site is shown in **Table 5**. Fish landing centres in Sri Lanka were categorized into fishery harbours, anchorages and beach landing sites:

- Fishery harbours – with marine structures (breakwaters, groynes, etc.), dredged harbour basin and with shore facilities and services required by motorized fishing vessels;
- Anchorages – sheltered water bodies where fishing vessels (inboard engine craft) are anchored/moored and where certain basic facilities may be available; and,
- Beach landing centres – sites where small coastal vessels (traditional craft and 5-7 metre OFRP boats) are landed on the beach. Few basic facilities are provided at some landing sites.

Negombo does not have a fisheries harbor, nor is there a fully fledged anchorage for marine fishing vessels, particularly the so called offshore ‘multi-day’ boats of 10-15 m LOA. The anchorage at Pitipana on the banks of the Negombo estuary mouth caters to over three hundred offshore boats as well as a few IDAY and OFRP boats.

Nearly 89% of the fishing fleet engaged in coastal and lagoon fisheries in Negombo operates from *Thotupolas* which are small landing centres located in enclosed and sheltered areas along the coast and also around the lagoon perimeter. Over 90% of the non-motorized craft as well as the OFRP, MTRB boats reported beach landing their catch at these *Thotupolas*. While 59 IDAY boats were anchored in the Hamilton canal that joins the lagoon with the sea,

another 28 IDAY boats were anchored within the lagoon, between the main lagoon mouth at Duwa and the Pitipana fish landing centre *Lellama* near the bridge and inside the lagoon opposite Kuttiduwa. While some OFRP boats were also anchored along the lagoon banks, a small number of traditional crafts were pulled up to the back yards of the boat owners residing along the coast and/or at the lagoon edge. These were all listed under the “other” category.

**Table 5: Distribution of coastal and lagoon fishing fleet in Negombo by type of landing site**

<b>Landing</b>	<b>IDAY</b>	<b>MTRB</b>	<b>NBSB</b>	<b>NTRB</b>	<b>OFRP</b>	<b>Total</b>
Anchorage	8	-	-	-	171	<b>179</b>
Thotupola	-	15	28	1,720	1,234	<b>2,997</b>
* Other	87	2	-	53	59	<b>201</b>
	<b>95</b>	<b>17</b>	<b>28</b>	<b>1,773</b>	<b>1,464</b>	<b>3,377</b>

**Figures 1 to 6** shows the different types of coastal and lagoon fishing craft operating in Negombo fisheries district and **Figure 7** shows the fish landing centres in Negombo (source: MFAR. 2007).



Fig.1: IDAY boats



Fig. 2: OFRP boats





Fig. 3: Outrigger canoe



Fig. 4: Sailing outrigger canoe engaged in shrimp trawling



Fig. 5: Log raft (*Teppam*)



Fig. 6: Beach seine craft (covered during off season)

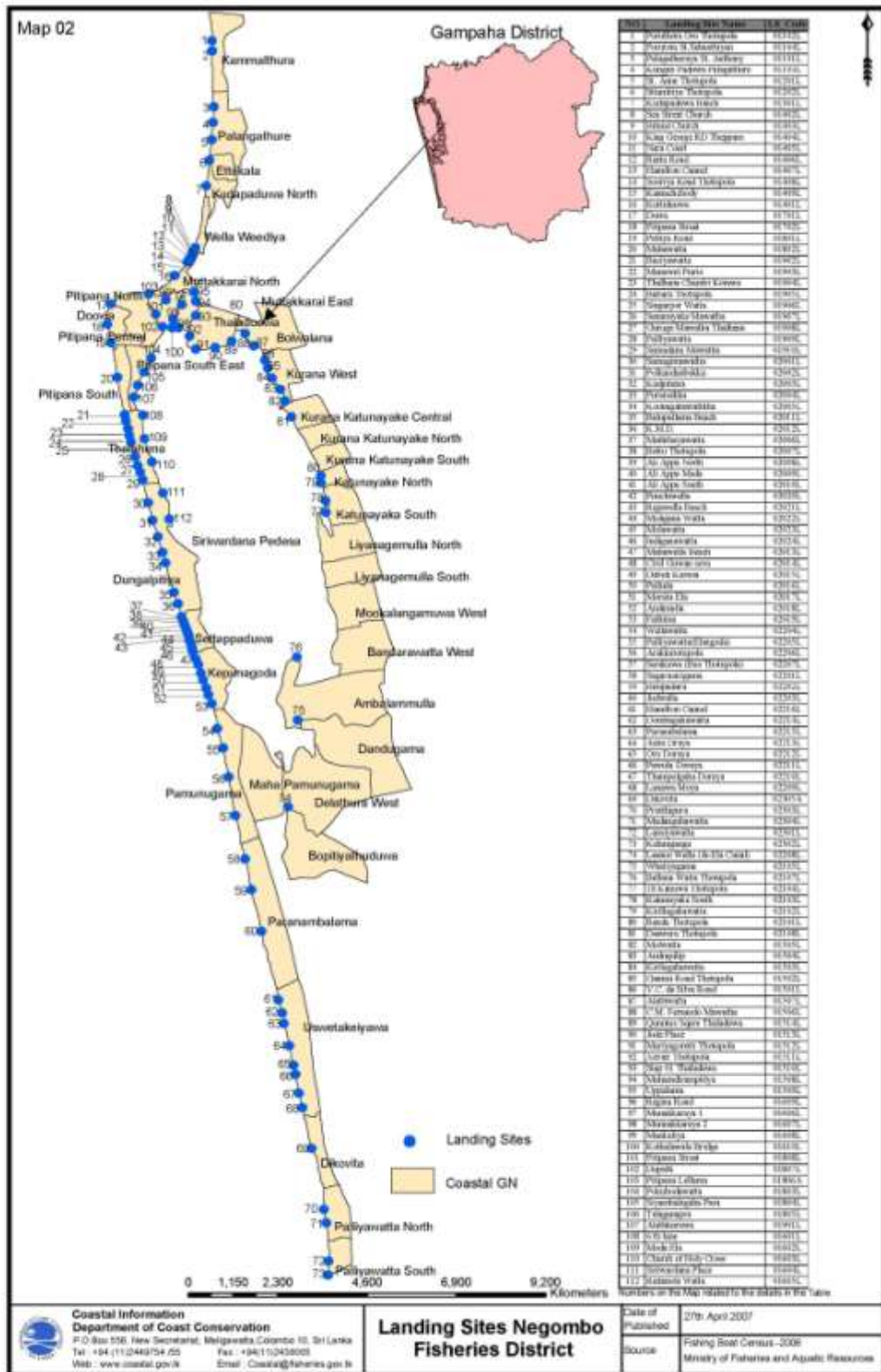


Fig.7: Fish landing centres in Negombo fisheries district (Source: MFAR, 2007)

### 3.4 Fishing gear used in coastal and lagoon fisheries

A diverse array of fishing gear and methods are used in coastal and brackish water fisheries in Negombo district. The codes assigned by DFAR for different fishing gear and methods as well as for species and species groups in Sri Lanka, given in **Annex 7** have been followed in this report.

The variety and complexity of fishing gear used differed by craft type. The IDAY fishing fleet consisted of very old boats with limited engine capacity. The main fishing gear used in the IDAY boats and fish catches made are given in **Annex 8**. Data on fishing gear are summarized by FI division in **Table 6**.

Shrimp trawling was conducted by nearly 60% of the IDAY boats, while smaller numbers were engaged in large mesh gill net fishing, bottom-set gillnet fishing and hand lining. Some of the shrimp trawlers were reported to be engaged in small mesh gillnet fishing during the shrimp off-season. Characteristics of the main fishing gears used in IDAY boats are given in **Table 7**. The shrimp trawl operated in Negombo by IDAY boats was reported to have a cod end mesh size of 12 mm and the body mesh size was of 18-22 mm (DFAR, 1995).

**Table 6: Main fishing gear used in IDAY boats in Negombo district**

FI division	DNST	GNBS	GNLM	HLHL	GNSM
DUWA	2				
KUDAPADUWA		3	3		
PITIPANA			1		
TOWN I		1	1		2
TOWN-II			1		
USWETAKEIYAWA	2				09
WATTALA	54		3	7	10
<b>Total</b>	<b>58</b>	<b>4</b>	<b>9</b>	<b>7</b>	<b>21</b>

**Table 7: Characteristics of fishing gear used by IDAY boats in Negombo**

Fishing gear	No. of boats	Mesh size	Number of panels	No. of hooks
Large-mesh gillnet	07	3.5-6" (87-150 mm)	19 (range 10-40)	
Small-mesh gillnet	11	1-2.25" (25-56 mm)	20 (range 8-30)	
Bottom-set gillnet	04	4.75-6" (118-150 mm)	29 (range 20-40)	
Shrimp trawl	08	0.5-1" (12-25 mm)		
Hand line	05			05

Fishing gear and catches of OFRP boats in Negombo district are given in **Annex 9** and the data and information on fishing gear are summarized by FI division and shown in **Table 8**. Of a total of 1,950 entries, 48 were erroneously filled and therefore were not considered during analysis.

Small mesh gillnet fishing was the most dominant fishing gear for 82% of the OFRP boats, followed by hand line (8%), large mesh gillnet (3%) and bottom long line (2%). Other gears

used by a much smaller number of OFRP boats included the bottom set gillnet, trammel net, tuna long line, rod and line, troll line and hand lining for squid.

**Table 8: Fishing gear used by OFRP boats in Negombo district**

FI division	GNBS	GNLM	GNSM	GNTR	HLBL	HLHL	HLRL	HLSJ	HLTL	HLTR
ALUTHKURAUWA			9	1		2	2			
DUWA	15	10	54		1	2	3	2	2	9
ETTUKALA	1	2	173	1	5					
KAMMALTHURA		14	288			29			2	
KEPUNGODA	2		21	19						
KUDAPADUWA	1	4	330		5					
PITIPANA	4		22		29	93	7		9	1
TOWN I			483		1					
TOWN II			47							
TOWN III		1	14							
USWETAKEIYAWA	6		42		1	4			1	
WATTALA		22	81			18			3	
<b>Total</b>	<b>29</b>	<b>53</b>	<b>1,564</b>	<b>21</b>	<b>42</b>	<b>148</b>	<b>12</b>	<b>2</b>	<b>17</b>	<b>10</b>

The small mesh gillnets used in OFRP boats targeted different varieties/groups of small to medium pelagic resources using nets of different mesh sizes. Large variations were observed in the data related to mesh sizes and the number of net panels/sections used to target different species/groups of species. In order to minimize bias, extremely low and high values were not considered during the analysis.

**Table 9** provides information on the small mesh gillnet fisheries conducted by OFRP boats targeting different varieties/groups of small and medium pelagic fish, mesh sizes and the average number of net panels used. The spotted sardine or the trenched sardine (*Amblygaster sirm*) ‘hurulla’ was the target for over 41% of the OFRP boats operating small mesh gillnets. The number of net panels taken by over 90% of the boats ranged from 10 to 30, with an average of 22. Gillnets used by over 84% of the boats were of 1-1.5” mesh (25-38 mm). Other smaller varieties of sardines were the target of over 30% of the OFRP boats operating small mesh gillnets; averaging 23 net panels per boat (range 10-30 for 91% of the boats).

**Table 9: Characteristics of gillnets used by OFRP boats in Negombo**

Target fishery/resource	No. of boats	Mesh size	No. of panels
Trenched sardine	603	1-1.5” (25-38 mm)	22
Sardines	450	1-1.5” (25-38 mm)	23
Indian mackerel	195	2-3.5” (50-87 mm).	18
Anchovy	101	0.5-1” (12.5-25 mm)	21
Flying fish	50	1.5-2” (38-50 mm)	22
Frigate tuna	38	2.5-3” (62-88 mm)	20
Large pelagic fish	25	4-6” (100-150 mm)	12

The gillnet fishery for Indian mackerel was popular among 13% of the OFRP boats using small mesh gillnets. The average number of net panels taken per boat was 18 (range 5-30) with over 60% of the boats using nets of mesh size 2-3.5” (50-87 mm). Anchovies were targeted by 7% of the OPRP boats using small mesh gillnets of 0.5-1” mesh (12.5-25 mm). Each boat carries an average of 21 net panels (range 10-30 for 85% of the boats).

The gillnet fishery for flying fish was more a seasonal fishery in Negombo. Each boat carried an average of 22 nets (range 10-30 for 82% of the boats) with a mesh size 1.5-2” (38-50 mm). The OFRP boats conducting gillnet fishing for medium sized pelagic, primarily frigate tuna, half beaks and barracuda used nets of 2.5-3” (62-88 mm) mesh. An average of 20 nets was carried by one boat (range of 7-30 nets per boat). A few of the OFRP boats also operated large mesh gillnets of 4-6” mesh (100 – 150 mm) targeting skipjack and other smaller tuna. These boats carried an average of 12 nets per boat (with a range of 10-25).

Motorized traditional crafts (MTRB) were few in number and were restricted to a few FI divisions. Fishing gear and catches of MTRB boats in Negombo are given in **Annex 10** and a summary of fishing gear used in MTRB boats are shown in **Table 10**. Small mesh gillnets, trammel nets, large mesh gillnets and bottom set gillnets were the gears used, all in the coastal sea as no motorized boats are allowed to fish in the lagoon.

**Table 10: Fishing gear used by MTRB boats in Negombo district**

Fishing village	FI division	Fishing gear used			
		GNBS	GNLM	GNSM	GNTR
BASIYAWATTA	ALUTHKURAUWA				2
THALAHENA					1
DIKOVITA	WATTALA			3	
LANSIYAWATTA				1	
LUNAWAMOYA		1			
MADANGAHAWATTA			3		
PREETHIPURA			1	1	
KATUNAYAKE NORTH	JA-ELA				1
USWETAKEIYAWA	USWETAKEIYAWA			3	
<b>Total</b>		<b>1</b>	<b>4</b>	<b>8</b>	<b>4</b>

MTRB boats used large- mesh gillnets of 3.5-4.5” (87-112 mm) mesh to target scads and smaller tuna varieties, while small-mesh gillnets of 1-2.25” (25-56 mm) mesh were used to target sardines, Indian mackerel and scads. An average of 11 net sections were taken per boat for these fisheries (**Table 11**). Lobsters were the target catch of the bottom-set gillnet fishery, while shrimp were the target of the trammel net fishery. The inner panel of the trammel net had a mesh size of 1.1” (27 mm).

**Table 11: Characteristics of fishing gear used by MTRB boats in Negombo**

Fishing gear	No. of boats	Mesh size	No. of panels
Large-mesh gillnet	04	3.5-4.5” (87-112 mm)	11 (range 10-12)
Small-mesh gillnet	08	1-2.25” (25-56 mm)	11 (range 10-15)

Bottom-set gillnet	01	4.5'' (112 mm) / 1.1'' (27 mm)	10
Trammel net	04		30 (15-35)

Fishing gear and catches of NTRB boats are given in **Annex 11**. Fishing gear used by NTRB boats was analyzed separately for the lagoon and sea fisheries. A summary of information on fishing gears and methods used in the lagoon is presented in **Table 12**.

**Table 12: Fishing gear and methods used in Negombo lagoon by FI area**

FI division	DNGD	DNGR	FGCN	GNBS	GNHD	GNKD	GNSM	GNTR	LNCR	MSSC	TRBP	TRKD
ALUTHKURAUWA	2		18		3		1	134	1		19	
DUWA					1	1	1			1		27
JA-ELA			1	1			9	152			4	
KEPUNGODA	21	2		9			9	422			3	
PITIPANA			56					3				34
TOWN I						1	2					12
TOWN II			5				1	24			3	39
TOWN III	3		1				5					2
USWETAKEIYAWA	2		1	2			17					
<b>Total</b>	<b>28</b>	<b>2</b>	<b>81</b>	<b>12</b>	<b>4</b>	<b>2</b>	<b>45</b>	<b>735</b>	<b>1</b>	<b>1</b>	<b>29</b>	<b>114</b>

Considering the fishing gear used by fishing craft that fished full-time in the lagoon as well as part-time and also fishing methods employed without the use of a craft, there were a total of 1,045 records available for analysis. The characteristics of fishing gear used by NTRB boats in Negombo lagoon fisheries are given in **Table 13**. Some of the major fishing gear and methods used in Negombo lagoon are shown in **Fig. 8** (source: GCEC, 1991).

**Table 13: Characteristics of fishing gear used by NTRB boats in Negombo lagoon**

Fishing gear	No. of records	Mesh size	No. of panels
Trammel net	735	1-1.75'' (30-45 mm)	30 (range 10-40)
Stake net fishery ( <i>Kattu dela</i> )	114	0.25-0.5'' (06-12 mm)	
Cast net	81	0.6-1'' (15-25 mm)	
Small-mesh gillnet	45	1-3.5'' (25-87 mm)	08 (range 04-20)
Brush pile	29	0.25-1.5'' (06-38 mm)	
Lagoon seine ( <i>Gawana dela</i> )	28	0.6- 2.25'' (15-56 mm)	
Bottom-set gillnet	06	4.5-5'' (112-125 mm)	08 (range 5-12)
Cross net ( <i>Haras dela</i> )	03		
Drag net ( <i>Kadippu dela</i> )	02		
Drive-in-net ( <i>Gok ran dela</i> )	02	0.25-0.4'' (6-9 mm)	

Trammel nets were the dominant fishing method (70%) in Negombo lagoon. Approximately 90% of the trammel nets used by NTRB boats in Negombo lagoon were targeting shrimp catch year round. The inner panel has a mesh size of 1-1.75'' (30-45 mm), while the two outer

panels had a mesh size of 5-6” (127-152 mm). Over 75% of the boats operated with 10-40 net panels, with the average number of net panels/sections being 30 per boat.

The stake net fishery was the second most important fishery (11%) in Negombo lagoon. It is a traditional fishing method with limited entry. The cod end of the net has a mesh size of 0.25-0.5” (06-12 mm) mesh, and targets shrimp. The cast net was the most popular fishing method for those fishing in the lagoon without a boat. It was also mainly used to target shrimp, with mesh sizes of 0.6-1” (15-25 mm).

The small-mesh gillnets operated by NTRB boats in the lagoon were characterized by a range of mesh sizes used (1-3.5” – 25-87 mm), targeting different groups of fish. The number of net panels ranged from 4-20, averaging 08 per boat. In the brush pile fishery, the brush piles were made of twigs and branches of mangrove and were visited regularly to collect the aggregated fish. The net used to collect the fish had a mesh size of 0.25-1.5” (06-38 mm). The lagoon seine (*Gawana dela*) was 40-50 m long, and 4-5 m deep and was dragged along the bottom by two fishers with the direction of the tidal current. Different parts of the net have mesh sizes ranging from 0.6-2.25” (15-56 mm), to target both shrimp and fish.

The bottom-set gillnets used in Negombo lagoon to catch the lagoon crab had mesh sizes of 4.5-5” (112-125 mm) and a boat takes an average of 08 net panels. The cross net (*Haras dela*) is a fixed gillnet operated at a depth of 2-3 m to catch mainly the green tiger shrimp. The gear specifications recorded during the survey were different from those cited in the literature. The drive-in-net (*Gok ran dela*) is a gillnet held by two fishers into which fish are driven by a device - a 100-150 m long rope attached with coconut leaves by another two fishers. The net has a mesh size of 0.25-0.4” (6-9 mm) and was used to target small brackish water shrimp (*Malissa*).

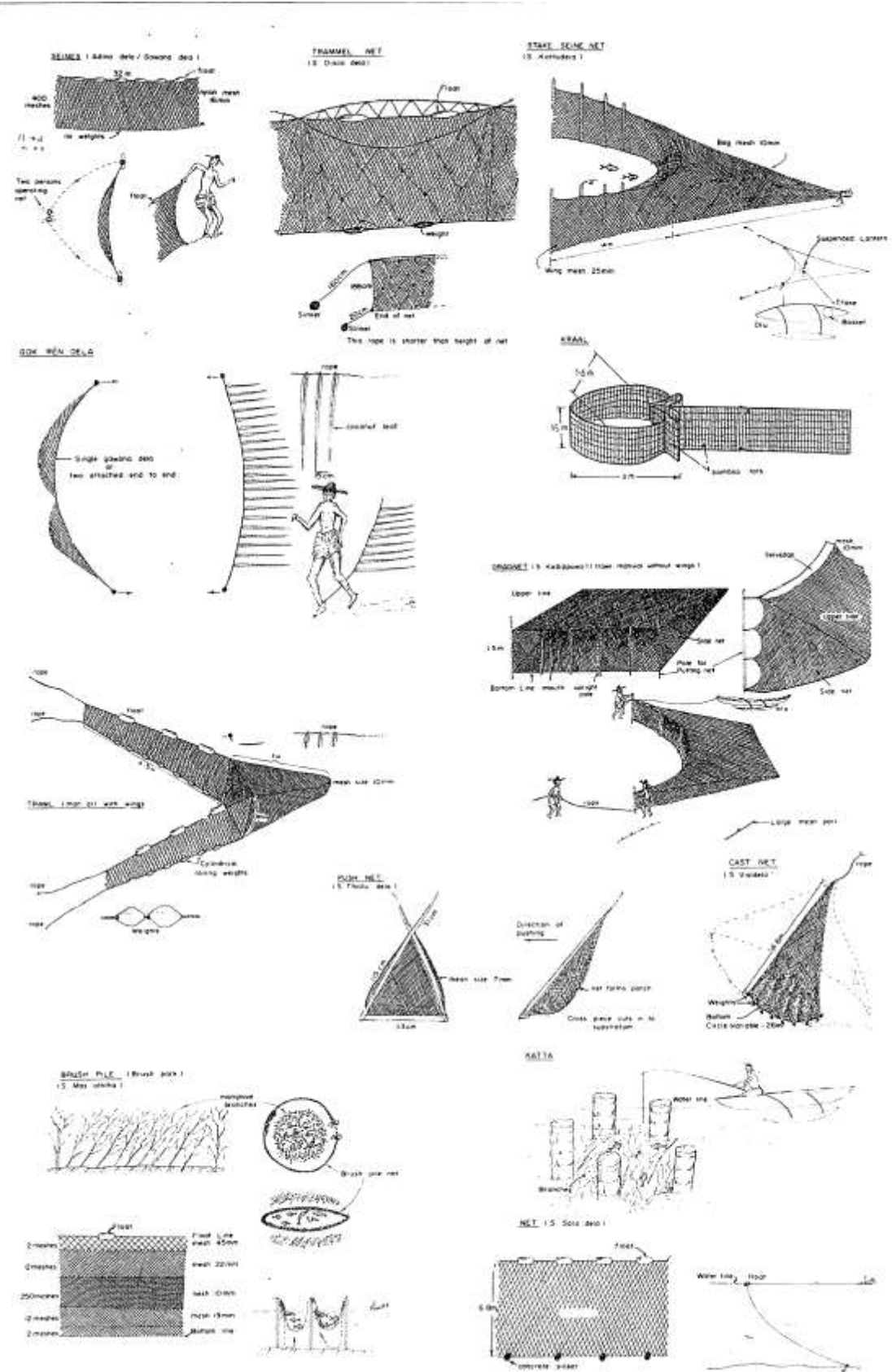
The NTRB boats of Negombo operating in the coastal seas also employed an array of fishing gear. Information provided in **Annex 11** on the fishing gear types used by NTRB boats in Negombo coastal fisheries is summarized by FI division and presented in **Table 14**.

**Table 14: Fishing gear used by NTRB boats in Negombo coastal fisheries by FI area**

FI division	DNST	GNBS	GNSM	GNTR	HLHL	GNLM	SNBS
ALUTHKURAUWA		2	6	10			1
DUWA							
ETTUKALA			18	3		2	
JA-ELA				5			
KAMMALTHURA	37	1	10				
KEPUNGODA		3	22				8
KUDAPADUWA		1	10				
PITIPANA							
TOWN I			19				
TOWN II	18		5				
TOWN III	5	1	45			1	
USWETAKEIYAWA		5	80	3			2
WATTALA		1	120	2	18	26	



FI division	DNST	GNBS	GNSM	GNTR	HLHL	GNLM	SNBS
<b>Total</b>	<b>60</b>	<b>14</b>	<b>335</b>	<b>23</b>	<b>18</b>	<b>29</b>	<b>11</b>



**Fig. 8:**

**Fishing gear and methods used in Negombo lagoon (source: GCEC, 1991)**

**Table 15** provides a summary of the main characteristics of the fishing gear types used by NTRB boats in Negombo coastal fisheries.

**Table 15: Characteristics of fishing gear used by NTRB boats in Negombo coastal fishery**

Fishing gear	No. of records	Mesh size	Number of panels
Small-mesh gillnet for Indian mackerel	103	2-2.5" (50-75 mm)	12
Small-mesh gillnet for sardines	58	1 – 1.5" (25-38 mm)	12
Small-mesh gillnet for Anchovy	29	0.5 – 1" (12-25 mm)	11
Small-mesh gillnet for Trenched sardine	29	1.5-2" (38-50 mm)	16
Small-mesh gillnet for frigate tuna	11	3-3.5" (75-87 mm)	12
Shrimp trawl	60	0.5-1.75" (12-43 mm)	
Large mesh gillnet	29	3.5-5.5" (87-138 mm)	10
Trammel net	23	0.75-1.25" (18-32 mm)	19
Bottom-set gillnet	14	5-14" (125-350 mm)	09
Hand line	18		04 hooks/boat
Beach seine	11	0.6 -1.75 (15-43 mm)	

Of the total number of 385 edited records, including boats that seasonally fish in the sea, 230 boats or nearly 60% of the NTRB boats operating in the sea were involved in small-mesh gillnet fisheries. Nearly 45% of the small mesh gillnets used by NTRB boats were targeting medium sized pelagic fish such as Indian mackerel and scads in the coastal sea, using nets of 2-2.5" (50-75 mm) mesh. The number of net panels ranged from 05 to 22, but averaged around 12 per boat. Approximately 25% of the small mesh gillnets used by NTRB boats were targeting sardines in the coastal sea, using an average of 12 net panels (range 8 – 25) of 1-1.5" mesh (25-38 mm). Gillnets used to catch anchovy and *Hurulla*, the trenched or spotted sardine (*Amblygaster sirm*) each constituted just about 12% of the small mesh gillnets operated by NTRB boats. The anchovy gillnets were of 0.5 – 1" (12-25 mm) mesh size and an average of 11 net panels (range 5-20) were used per boat. The *Hurulla* gillnets are of 1.5-2" (38-50 mm) mesh and an average of 16 net panels (range 8-20) were carried per NTRB boat. A few of the NTRB boats were reported to operate gillnets (5% of the total small mesh gillnets) targeting medium pelagic fish varieties such as frigate tuna, barracuda, half beaks, etc. These boats carried an average of 12 net panels (range 5-25) per boat.

Other fisheries conducted by NTRB boats in the coastal seas off Negombo included shrimp trawling (15%), large-mesh gillnet fishery (7%), trammel net fishery (6%), bottom-set gillnet fishery (4%), hand line fishery (5%) and the beach seine fishery (3%). Shrimp trawling was conducted by sailing outrigger canoes. Boats operating large mesh gillnets used nets of 3.5-5.5" (87-138 mm) mesh and each boat carried an average of 10 nets (range 08-20). Trammel nets targeting shrimp had an inner panel of 0.75-1.25" (18-32 mm) mesh and boats had an average of 19 net panels. The bottom-set gillnets used netting of large mesh size 5-6" and 10-14" (125-150 and 250- 250 mm) to catch large demersal finfish and skates respectively. Each boat carried an average of 09 panels/net sections (range 6-15). The beach seine fishery was conducted seasonally during the calm non-monsoonal months using large beach seine boats which were exclusively used for this fishery.

### 3.5 Fish catch by coastal and lagoon fishing boats

Monthly fish catch data provided during the frame survey were used to estimate annual fish production from different fisheries conducted by different boats. While monthly catches were provided by the boat owners for many craft/gear combinations, daily catches were provided for some craft /gear combinations and still others had both daily and monthly catches. Depending on the amount of data available, annual production was estimated using both the daily and monthly catches. For estimating fish production, the Statistics Unit of MFARD assumes that a boat would be engaged in fishing typically for a total of a maximum of 22 days in a month. This same assumption was used when the mean daily catch per boat was used to estimate monthly production. Here again, in order to minimize bias, extreme low and high catch values were excluded from the calculations.

In each case, the range of daily catches and monthly catches and the number of boats are given in parenthesis. Estimates under category ‘A’ were made using the mean daily catch per boat, while estimates made under category ‘B’ were made using the mean monthly catch per boat.

Fish catch data of IDAY boats by FI division and fishing gear in Negombo district are given in **Annex 8** and the estimates of annual fish production from different fisheries conducted by IDAY boats are given in **Table 16**. Data were only available for a small number of IDAY boats engaged in the gillnet fishery for large pelagic fish, the gillnet fishery for small pelagic fish, the bottom-set gillnet fishery and the hand line fishery. In the main shrimp trawl fishery, the mean daily catch of 51.1 kg worked out to a monthly production of 1,124 kg and an annual production of 13,488 kg per boat.

**Table 16: Production estimates for fisheries conducted by IDAY boats in Negombo (in kg)**

Fishery	A			B	
	Catch/day	Monthly catch	Annual catch	Monthly catch/boat	Annual catch/boat
Shrimp trawling	51.1 (20-120 /58 boats)	1,124	13,488		
Gillnet fishery for large pelagic fish	102.6 (8-200 / 03 boats)	2,257	27,084	1,000 (800-1,200 / 04 boats)	12,000
Gillnet fishery for small pelagic fish	42.8 (18-60 / 17 boats)	561	6,732	781 (300-1,500 / 26 boats)	9,372
Hand line fishery	30 (10-60 / 07 boats)	660	7,920		
Bottom –set gillnet fishery	31.9 (15-40 / 04 boats)	702	8,424	850 (300-1,400 / 04 boats)	10,200

The total annual fish production from the IDAY fishing fleet in Negombo has been estimated using data/information provided in Tables 06 and 16. Although the total fish production from the IDAY fleet is estimated at 1,209 MT (**Table 17**), it must be noted that the high annual production of an IDAY boat involved in large-mesh gillnet fishery was based on data from only three boats.

**Table 17: Total annual fish production from the IDAY fishing fleet in Negombo (in kg)**

<b>Fishery</b>	<b>No. of boats</b>	<b>Mean annual catch/boat</b>	<b>Total catch (kg)</b>
Shrimp trawling	55	13,488	741,840
Small-mesh gillnet fishery	20	6,732	134,640
Large-mesh gillnet fishery	09	27,084	243,756
Hand line fishery	07	7,920	55,440
Bottom –set gillnet fishery	04	8,424	33,696
<b>Total</b>			1,209,372

Details of fishing gear and catch of OFRP boats by FI division is given in **Annex 9**. Annual production from different fisheries conducted by OFRP boats in Negombo, estimated using mean daily catch per boat and mean monthly catch per boat are given in **Table 18**. Only daily catch data were available for the bottom-set gillnet, trammel net, bottom longline, tuna longline, troll and rod and line fisheries. A substantial number of boats provided daily as well as monthly catches for the other fisheries.

Gillnet fisheries targeting small and large pelagic fish provided extrapolated annual yields in the range of 9,600-11,800 kg per boat. Some highly seasonal fisheries such as the small-mesh gillnet fishery for flying fish provided higher monthly catches and higher annual estimates, however the annual estimate is likely to be an over-estimate as this seasonal fishery is not conducted all year. The hand line fishery which is a year round fishery for OFRP boats in Negombo provided a significantly higher annual estimate of 16,296 kg per boat.

**Table 18: Production estimates for fisheries conducted by OFRP boats in Negombo (in kg)**

<b>Fishery</b>	<b>A</b>			<b>B</b>	
	<b>Catch/day</b>	<b>Monthly catch</b>	<b>Annual catch</b>	<b>Monthly catch/boat</b>	<b>Annual catch</b>
Gillnet fishery for Trenched sardine	30.2 (10-215 / 496 boats)	664	7,968	925 (250-3,000 / 102 boats)	11,110
Gillnet fishery for sardine	31.0 (10-200 / 375 boats)	682	8,184	989 (300-2,500 / 61 boats)	11,868
Gillnet fishery for Indian mackerel	25.5 (10-60 / 154 boats)	561	6,732	781 (300-1,500 / 26 boats)	9,372
Gillnet fishery for Anchovy	28.1 (10-100 / 78 boats)	618	7,416	850 (400-1,500 / 12 boats)	10,200
Gillnet fishery for	36.6	805	9,660	670	8,040

Fishery	A			B	
	Catch/day	Monthly catch	Annual catch	Monthly catch/boat	Annual catch
large pelagics	(10-50 / 19 boats)			(400-1,500 / 05 boats)	
Gillnet fishery for flying fish	128.3 (20-200 / 12 boats)	2,823	33,876	1,455 (1,000-1,500 / 18 boats)	17,460
Gillnet fishery for Frigate tuna	27.6 (10-80 / 31 boats)	607	7,284	575 (400-750 / 02 boats)	6,900
Bottom-set gillnet fishery	24.6 (08-70 / )	541	6,492		
Trammel net fishery for shrimp	4.6 (2-10 / 19 boats)	101	1,212		
Hand line fishery	30.7 (10-50 / 109 boats)	675	8,100	1,358 (600-1,500 / 29 boats)	16,296
Bottom long line fishery	31.9 (15-40 / 40 boats)	702	8,424		
Tuna long line fishery	34.8 (20-50 / 17 boats)	766	9,192		
Troll fishery	29.5 (15-50 / 10 boats)	649	7,788		
Rod and line fishery	20.1 (05-40 / 12 boats)	442	5,304		

The OFRP fishing fleet in Negombo consisted of 1,464 boats. Data/information provided in Tables 08, 09 and 18 have been used to estimate the total annual fish production from the OFRP fleet. Table 18 shows that for many fisheries, including seasonal ones, the annual production estimates made using daily catch rates of a larger sample of boats were low compared to estimates made using monthly catch rates of a smaller sample of boats. Therefore, the lower annual estimates made for different fisheries have been used in estimating the total production from the whole OFRP fleet. In the absence of accurate data/information on the exact season for various fisheries and what fisheries these boats are engaged in during other times (for no OFRP boat is laid off during the course of a year), the total annual production from the seasonal fisheries have been considered when computing the total production from the whole fleet. The bias is, however, minimized by the fact that only a small number of boats are engaged in these seasonal fisheries and the production from these boats during the rest of the year can be assumed to be much lower. The total annual production from the fleet of 1,464 OFRP bats in Negombo is estimated at 11,827 MT (**Table 19**).

**Table 19: Total annual fish production from the OFRP fishing fleet in Negombo (in kg)**

Fishery	No. of boats	Mean annual catch/boat	Total catch (kg)
Gillnet fishery for Trenched sardine	506	7,968	4,031,808
Gillnet fishery for sardine	378	8,184	3,093,552
Gillnet fishery for Indian mackerel	163	6,732	1,097,316

<b>Fishery</b>	<b>No. of boats</b>	<b>Mean annual catch/boat</b>	<b>Total catch (kg)</b>
Gillnet fishery for Anchovy	84	7,416	622,944
Gillnet fishery for flying fish	42	17,460	733,320
Gillnet fishery for Frigate tuna	31	7,284	225,804
Gillnet fishery for large pelagics	42	9,660	405,720
Bottom-set gillnet fishery	23	6,492	149,316
Trammel net fishery for shrimp	16	1,212	19,392
Hand line fishery	115	8,100	931,500
Bottom long line fishery	33	8,424	277,992
Tuna long line fishery	14	9,192	128,688
Troll fishery	08	7,788	62,304
Rod and line fishery	09	5,304	47,736
<b>Total</b>			<b>11,827,392</b>

Fishing gear and catch data of MTRB boats operating in Negombo are given in **Annex 10**. Production estimates for MTRB boats are given in **Table 20**. Monthly catches were provided for all boats engaged in gillnet fisheries for small and large pelagic fish, the trammel net fishery and the bottom-set gillnet fishery.

**Table 20: Production estimates for fisheries conducted by MTRB boats in Negombo (in kg)**

<b>Fishery</b>	<b>A</b>		
	<b>Catch/day</b>	<b>Monthly catch</b>	<b>Annual catch</b>
Gillnet fishery for small pelagic fish	12.5 (10-25 / 06 boats)	275	3,300
Gillnet fishery for large pelagic fish	5.8 (03- 08 / 04 boats)	128	1,536
Trammel net fishery for shrimp	10.8 (02 - 45 / 05 boats)	238	2,856
Bottom –set gillnet fishery	04 (01 boat)	88	1,056

Data/information provided in Tables 10 and 20 have been used to compute the total annual fish production at 45,024 kg or 45 MT from the fleet of MTRB boats operating in Negombo (**Table 21**).

**Table 21: Total annual fish production from the MTRB fishing fleet in Negombo (in kg)**

<b>Fishery</b>	<b>No. of boats</b>	<b>Mean annual catch/boat</b>	<b>Total catch</b>
Small-mesh gillnet fishery	08	3,300	26,400
Large-mesh gillnet fishery	04	1,536	6,144
Trammel net fishery	04	2,856	11,424
Bottom –set gillnet fishery	04	1,056	1,056
<b>Total</b>			<b>45,024</b>

Fish catch data of NTRB boats operating in Negombo coastal sea as well as both in the lagoon and the sea are given in **Annexes 11**. Estimates of annual fish production from NTRB boats engaged in different fisheries in Negombo lagoon are given in Table 22.

**Table 22: Production estimates for fisheries conducted by NTRB boats in Negombo lagoon (in kg)**

<b>Fishery</b>	<b>A</b>		
	<b>Catch/day</b>	<b>Monthly catch</b>	<b>Annual catch</b>
Trammel net fishery for shrimp	1.9 (1-2 / 559 boats)	42	504
	2.2 (1-8 / 710 boats)	48	576
Trammel net fishery for fish	3.2 (2-9 / 47 boats)	70	845
Stake net fishery	18.5 (8-80 /97 boats)	407	4,884
Cast net fishery for shrimp	1.7 (01-03 / 52 boats)	37	444
Cast net fishery for fish	2.0 (1-20 / 24 boats)	44	528
Small-mesh gillnet fishery	11.8 (3-50 / 30 boats)	260	3,120
Drag net fishery for shrimp	7.5 (04-14 / 17 boats)	165	1,980
Drag net fishery for finfish	12.3 (08-14 / 17 boats)	271	3,252
Bottom-set gillnet fishery	5.5 (04-08 / 06 boats)	121	1,452
Brush pile fishery - shrimp	2.0 (02 / 08 records)	20	240
Brush pile fishery - finfish		40	480
Cross net fishery	4.7 (02-10 / 03 boats)	103	1,236
Drive-in-net fishery	7.0 (06-08 / 02 boats)	154	1,848

The reported daily catch of shrimp from 559 (76%) of the NTRB boats using trammel nets in Negombo lagoon ranged from 1 kg to 2 kg. The estimated average catch per day of 1.9 kg would give a monthly production of approximately 42 kg and an extrapolated annual production of 504 kg per boat. If the 2.2 kg daily average catch estimated from 710 (96%) of the boats having a range of 01-08 kg/day was considered, the monthly catch would be 48 kg and the extrapolated annual catch 576 kg per boat. The average daily catch of 47 NTRB boats using trammel nets to catch finfish was 3.2 kg and the monthly and extrapolated annual catches were 70 kg and 845 kg per boat respectively.

The stake net fishery is operated on a rotational system and the extrapolated annual production was the highest of any lagoon fishery, assuming that each boat or permit holder was allowed to fish 22 days a month; which is unlikely considering the numbers involved in this fishery. This extrapolated annual figure is therefore likely to be an over-estimate of the catch from the stake net fishery.



Cast net fishing primarily targeting shrimp and finfish was a very popular fishing method in Negombo lagoon. It is a year round fishery with a daily catch of shrimp ranging from 1-3 kg and 1-20 kg of lagoon finfish per fisher. The estimated average catch per fisher of 1.7 kg of shrimp and 2.0 kg of finfish gives an extrapolated monthly total catch of approximately 37 kg of shrimp and 44 kg of finfish per fisher.

In the small-mesh gillnet fishery targeting lagoon/estuarine fish in Negombo lagoon, the monthly production was estimated at 260 kg per craft, giving an extrapolated annual production of 3,120 kg per boat. For all other fisheries, the amount of data available may not have been sufficient to make reliable and acceptable estimates.

For the brush pile fishery, DFAR (1995) reported that brush piles were typically visited every 3-4 days for the collection of shrimp and every 30 days for the collect of fish. On this basis, a brush pile would be visited about 10 days in a month for shrimp harvest and once a month for finfish harvest. The annual production from a brush pile was therefore estimated to be 240 kg of shrimp and 480 kg of finfish. The daily catch in the bottom-set gillnets operated by NTRB boats in the lagoon for crabs was reported to range from 4-8 kg per boat, with an average of 5.5 kg per boat. The monthly production assuming 22 fishing days per month was therefore estimated at 121 kg per boat, giving an extrapolated annual production of 1,452 kg per boat. The cross net fishery (*haras dela*) and the drive-in-net fishery (*Gok ran dela*) also yielded fairly high annual shrimp production estimates, though these estimates were based on very limited data.

The fleet of NTRB boats in Negombo numbered 1,773 (Table 4) and of these, 1,269 were reported to fish in Negombo lagoon – 1,172 on a full time basis and 97 on a part-time basis. Boats fishing part-time are those that move into lagoon fishing during the southwest monsoon months of May to October when the sea is rough. Data/information provided in Table 12 has been used to determine the total number of boats engaged in different fisheries. In addition, the number of boats operating full time and part-time was determined for each fishery, applying the ratio of 1,172 full time boats to 97 part-time boats. In determining the total annual catch of part-time boats, only 50% of the estimated annual production was considered.

**Table 23: Total annual fish production from NTRB boats operating in Negombo lagoon (in kg)**

Fishery			Annual catch/boat	Catch of fulltime boats	Catch of part-time boats	Total catch (kg)
	Fulltime	Part-time				
Trammel net fishery for shrimp	913	79	576	525,888	22,752	548,640
Stake net fishery	141	12	4,884	688,644	29,304	747,252
Small-mesh gillnet fishery	55	02	3,120	171,600	3,120	174,720
Drag net fishery	34	03	1,980	67,320	2,970	70,290
Bottom-set gillnet fishery	15	01	1,452	21,780	1,452	23,232
Cross net fishery	05	-	1,236	6,180	-	6,180

Drive-in-net fishery	03	-	1,848	5,544	-	5,544
						<b>1,575,858</b>

The total annual fish production from NTRB boats operating in Negombo lagoon was estimated at 1,576 MT (Table 23). The cast net fishery and the brush pile fishery targeting shrimp and fish are two major fisheries in Negombo lagoon that are conducted without using boats. With a mean annual production of 486 kg, the cast net fishery provides an annual yield of 39,366 kg from 81 cast net fishers. A mean annual production of 360 kg in the brush pile fishery provides an annual yield of 10,440 kg from 29 brush piles. Therefore, the total annual production from all the major fisheries in Negombo lagoon was estimated at approximately 1,625 MT.

Estimates of fish production for fisheries conducted by NTRB boats in Negombo coastal fisheries are summarized in **Table 24**. For the gillnet fisheries, the highest extrapolated annual production was for the trenched or spotted sardine fishery (4,836 kg per boat), while the annual extrapolated production from all other gillnet fisheries was within 2,100-2,700 kg range. For the small-mesh gillnet fishery for sardines, the average monthly catch of 175 kg (range 100-300 kg) estimated from only 06 boats gave an extrapolated annual production of 2,100 kg per boat, while the extrapolated annual production made using daily catch was 2,748 kg per boat.

**Table 24: Production estimates for fisheries conducted by coastal NTRB boats in Negombo (in kg)**

Fishery	A		
	Catch/day	Monthly catch	Annual catch
Gillnet fishery for Indian mackerel	10.2 / (05-50 / 96 boats)	224	2,688
Gillnet fishery for sardine	10.4 / (05-30 / 52 boats)	229	2,748
Gillnet fishery for Anchovy	9.8 / (05-20 / 29 boats)	216	2,592
Gillnet fishery for Trenched sardine	18.3 / (08-50 / 29 boats)	403	4,836
Gillnet fishery for Frigate tuna	09 / (04-20 / 10 boats)	198	2,376
Shrimp trawl	08 / (08 / 17 boats)	176	2,112
Large-mesh gillnet fishery	9.4/ (06-20 / 19 boats)	207	2,484
Trammel net fishery for shrimp	3.9 / (2-20 / 23 boats)	86	1,032
Bottom-set gillnet fishery	14.6 / (03-30 / 09 boats)	321	3,852
Hand line fishery	7.3 / (02-15 / 18 boats)	161	1,932
Beach seine fishery	108.9 / (40-300 / 09 boats)	2,396	14,376

Shrimp trawling was conducted by 60 non-motorized sailing outrigger canoes. The monthly catch of 43 of these trawlers ranged from 50-550 kg, with an average estimated at 201.3 kg per boat; comprised of 140 kg of shrimp and 61 kg of by-catch made up of small demersal fish. The annual production of 2,412 kg estimated from the average monthly production was close to the annual production estimated from daily catch rate given in Table 18.

With an average daily catch of 14.6 kg (range 6-30 kg) per boat, the monthly production from the bottom-set gillnet fishery by NTRB boats in the coastal sea off Negombo was estimated at 321 kg per boat, giving an extrapolated annual production per boat that was one of the highest (3,852 kg per boat) for NTRB boats in the Negombo coastal fishery.

The beach seine fishery is strictly a seasonal fishery, limited to the west coast between October to April months when the sea is calm. Therefore, the annual production was estimated based upon only a six month season and not over 12 months of the year.

A total of 601 NTRB boats operated in Negombo coastal waters – 504 on a full time basis and 97 on a part-time basis. Thus, a smaller number of boats have shifted to lagoon fishing during the southwest monsoon months of May to October. Data/information on number of NTRB boats involved in different fisheries, provided in Tables 14 and 15 have been used to extrapolate for the whole fleet. For each fishery, except for the beach seine fishery, the number of boats operating full time and part-time was determined by applying the ratio of 504 full time boats to 97 part –time boats. The total annual fish production from the NTRB fleet in Negombo coastal fisheries was estimated at 1,668 MT (**Table 25**).

**Table 25: Total annual fish production from NTRB boats operating in Negombo coastal fisheries (in kg)**

Fishery	No. of boats		Annual catch/boat	Catch of fulltime boats	Catch of part-time boats	Total catch (kg)
	Fulltime	Part-time				
Gillnet fishery for Indian mackerel	154	29	2,688	413,952	38,976	452,928
Gillnet fishery for sardine	87	16	2,748	239,076	21,984	261,060
Gillnet fishery for Anchovy	44	08	2,592	114,048	10,368	124,416
Gillnet fishery for Trenched sardine	44	08	4,836	212,784	19,344	232,128
Gillnet fishery for Frigate tuna	16	03	2,376	38,016	3,564	41,580
Shrimp trawl fishery	61	12	2,112	128,832	12,672	141,504
Large-mesh gillnet fishery	30	06	2,484	74,520	7,452	81,972
Trammel net fishery for shrimp	24	04	1,032	24,768	2,064	26,832
Bottom-set gillnet fishery	15	03	3,852	57,780	5,778	63,558
Hand line fishery	19	04	1,932	36,708	3,864	40,572
Beach seine fishery	-	14	14,376	-	201,264	201,264
<b>Total</b>				<b>1,340,484</b>	<b>327,330</b>	<b>1,667,814</b>

The estimated total annual fish production from the coastal and lagoon fishing fleet in Negombo is summarized in **Table 26**.

**Table 26: Summary of fish production from different types of coastal and lagoon fishing craft in Negombo (kg)**

<b>Boat type</b>	<b>Coastal fisheries</b>	<b>Lagoon fisheries</b>	<b>Total (kg)</b>
IDAY	1,209,372	-	1,209,372
OFRP	11,827,392	-	11,827,392
MTRB	45,024	-	45,024
NTRB	1,667,814	1,575,858	3,243,672
<b>Total</b>			<b>16,325,460</b>

Taking into account the production of 49,806 kg from cast net and brush pile fisheries in Negombo lagoon, the total annual coastal and lagoon fish production is estimated at 16,375,266 kg or 16,375 MT.

### **3.6 Marketing of coastal and lagoon fish**

Information on two aspects was sought in relation to marketing of coastal and lagoon fish – to whom fish was marketed at the first point of sale and what facilities were available for marketing. Information available for IDAY boats showed that except for two boats that sold their catch direct to consumers, fish from all other boats was sold to fish traders (**Annex 12**).

Marketing facilities available to sell catches from IDAY boats are summarized in **Annex 13**, by FI division and village. The majority of IDAY boats (64%) sold their catches at fish markets located in 11 villages, while 23% of the boats used auction centres located in 09 villages. Nine boats marketed their catch at landing centres in 05 villages, while 03 boats made other arrangements to market their catch.

Of 1,552 OFRP boats, only 08 sold their fish direct to consumers, while all others sold to fish traders. The FI division and the fishing village where OFRP boats sell their catches are given in **Annex 14**. Information on marketing facilities utilized by OFRP boats by fishing village and FI division is given in **Annex 15**. Fish caught by 22% of the OFRP boats in Negombo were marketed at the landing centres. Auction centres were utilized by 70% of the OFRP boats, while the catch of 7% of the OFRP boats was sold at fish markets. About 1% of the OFRP boats made other marketing arrangements.

In the case of NTRB boats, 98.5% of coastal and lagoon boats sold their catch to fish traders, with only 1.5% of the boats selling their fish directly to consumers (**Annex 16**). Approximately 47% of the fish landed by NTRB boats was marketed at landing centres, 16% at auction centres, 18.5% at fish markets and a further 18.5% was sold through other marketing arrangements. Detail information in terms of FI division and fishing village are given in **Annex 17**.

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