Auxis thazard; major contributor in Sri Lankan Neritic tuna fishery

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Abstract

Of the three key neritic tuna species; *Auxis thazard* (frigate tuna) is currently the highest contributor in the neritic tuna production and there is a great demand for this species among local consumers. Their catches are mainly confined to the shelf, shelf slope and outer fringes of offshore waters. Fishing gear employed in exploitation of the species is mainly medium mesh gillnet, ring net and lesser amount of trolline. However, over the time, relative contribution of the fishing method showed noticeable variations where in the recent coastal ring nets dominated the catch. A considerable increase in the frigate tuna production can be observed after 2010. The increase in the production could be mainly attributed to the higher fishing effort exerted by ring nets after loosening of government restrictions on ring net operations. In 2013, *Auxis thazard* represented around 42% of the total neritic tuna production and 5% of the total tuna production. A remarkable variation of frigate tuna catch was also noted among the different vessels. The vessels mostly operated in continental slope and bordering areas of offshore reported higher catches than the vessels operated in shallow waters and high seas. The size range of frigate tuna Fork Length (FL) recorded during 2010-2013 ranged between 19 cm to 72 cm. The relationships obtained for different L-L measurements of frigate tuna were SL = 0.853TL, SL = 0.928FL and FL = 0.918TL: SL-standard length, FL- fork length and TL- total length.

Introduction

There are three main neritic tuna species frequently found in Sri Lankan waters, namely, *Auxis thazard* (frigate tuna), *Auxis rochei* (bullet tuna) and *Euthynnis affinis* (kawakawa). *Scomberomorus commerson* (narrow-barred spanish mackerel) is dominated the catch of other species associated with neritic tuna. Among them, *Auxis thazard* plays an important role with its great demand among the local consumers. *Auxis thazard* is a small tuna belonging to the family of Scombridae and is abundantly found in tropical waters. In Sri Lanka, they are mainly confined to the shelf, shelf slope and outer fringes of offshore waters. The contribution of *Auxis thazard* in the past has shown that it is prominent among other neritic tuna species (Sivasubramanium, 1973; Bandaranayake and Maldeniya, 2012). This paper discusses some aspects related to this species including present status of the fishery and morphometric relationships.

Objective

To analyze frigate tuna landings in Sri Lanka and to estimate morphometric relationships

Methodology

PELAGOS database of the National Aquatic Resources Research and Development Agency (NARA) of Sri Lanka was mainly used for this analysis. Catch and effort data of frigate tuna by gear and craft were analyzed for the period of 2010-2013. A total of fifty individuals were taken from the western coastal landings and analyzed to obtain the length-length relationships. Lengths of the fish (Standard Length - SL, Fork Length -FL and Total Length -TL) were measured to the nearest 1 mm using a measuring board.

Results and Discussion

Production trend

Relative contribution of frigate tuna showed time to time variations in the past decades. From early 1980s to mid 2000s the frigate was the dominant species among the neritic tunas followed by Kawakawa and Bullet tuna respectively. However a considerable change was noted in the production for the period of 2005-2009 where Kawakawa became dominant resulted by multiple reasons: expansion of the fishing zone and new fishing practices etc (Bandaranayake and Maldeniya, 2012). After 2010, again frigate tuna became the major contributor with a remarkable increase in the production (Figure 1). The increase in the production could be mainly attributed to the higher fishing effort exerted by ring nets after loosening of government restrictions on ring net operations. In 2013, *Auxis thazard* represented around 42% of the total neritic tuna production and 5% of the total tuna production (Figure 2).

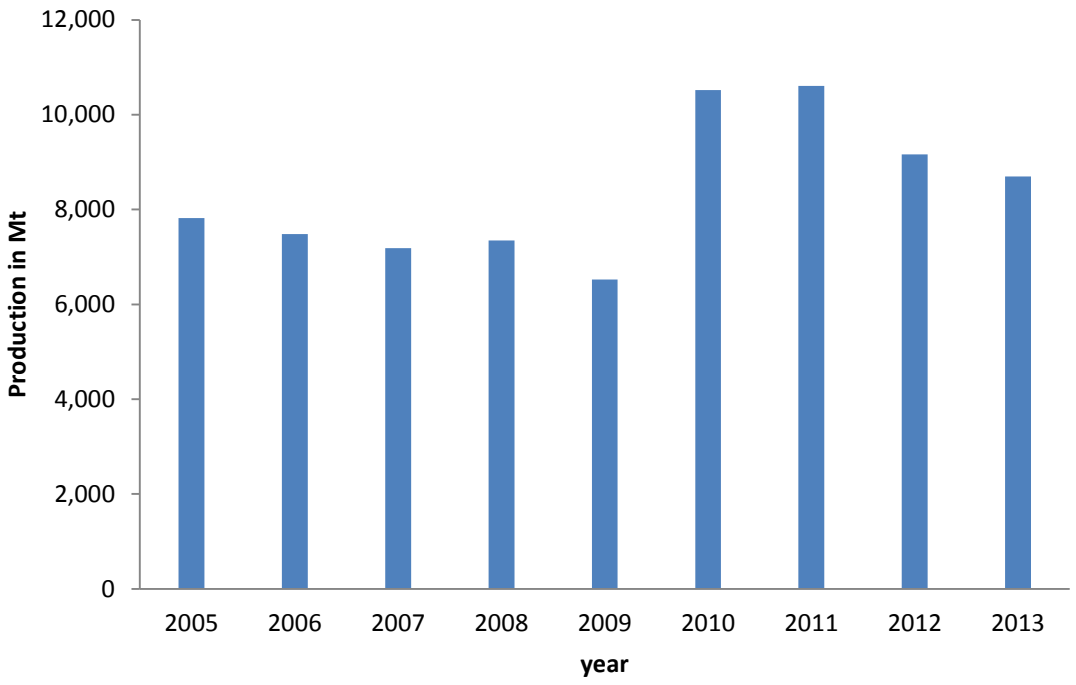

Figure 1. Frigate tuna annual production in Sri Lanka: 2005- 2013 (IOTC, 2014)

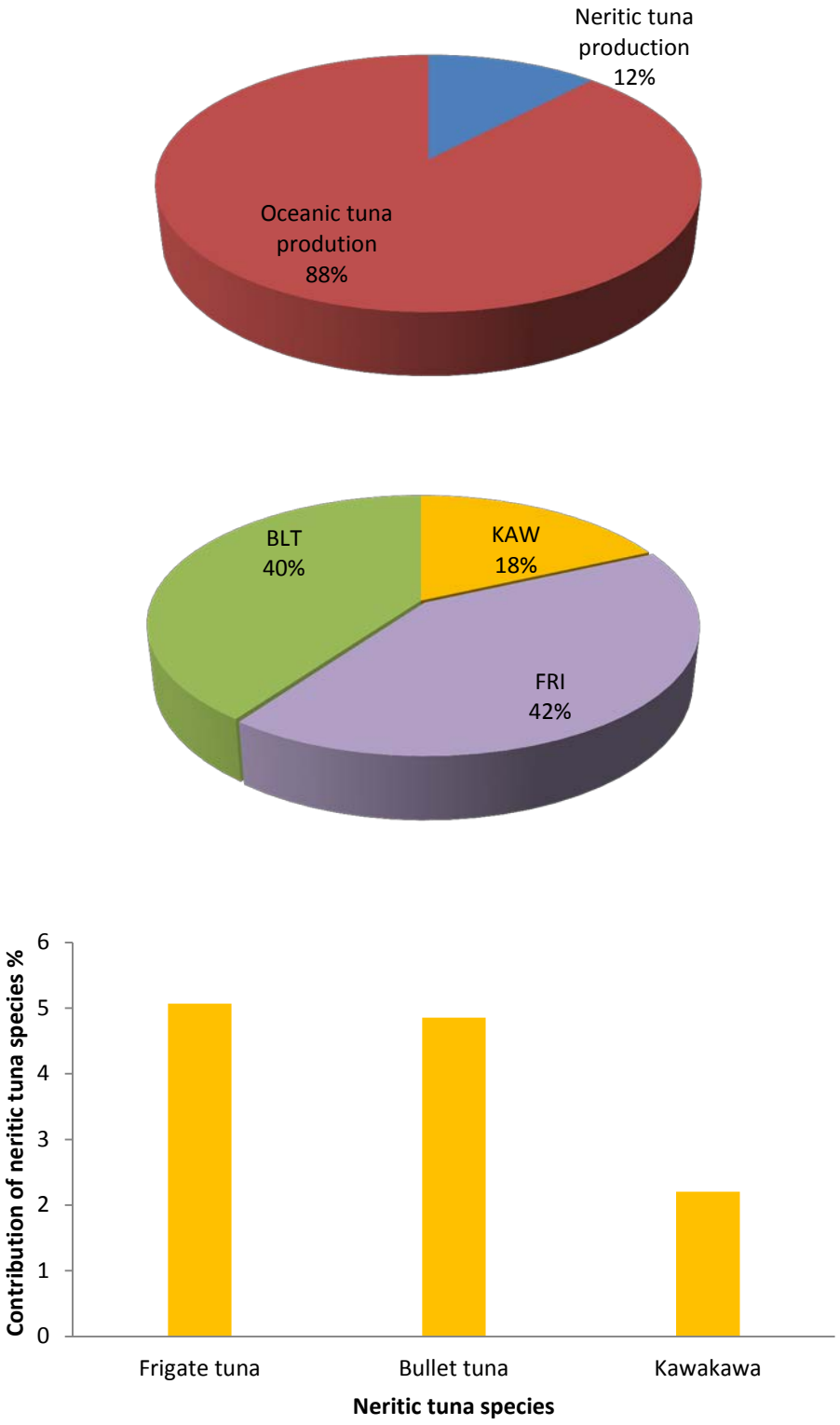

Figure 2.Neritic tuna production by species in 2013 (Source: PELAGOS, 2014)

Fishing crafts and catch rate

The fishing fleet involved in different fisheries in Sri Lanka consists of different types of fishing crafts. A range of fishing crafts which includes both single day and multiday fishing crafts catch frigate tuna while they target oceanic tuna. However, few single day boats seasonally engage in tuna fishery targets frigate tuna. A classification of single day and multiday vessels which may catch frigate tuna is shown in Table 1. UN1 and UN2A are single day boats whereas others are multiday boats. UN2A boats are mainly operated in shallow waters while UN3A within Exclusive Economic Zone (EEZ). UN3B category can be operated within EEZ or beyond the EEZ. A considerable variation in the frigate tuna catch was noted among the different vessels. The vessels mostly operated in continental slope and bordering areas of offshore (UN 2B and UN 3A) reported higher catches than the vessels operated in shallow waters and high seas (Table 2). The highest catch rate by UN3A boats can mainly because of the ring nets they utilized for obtaining bait.

Table 1 Classification of single day and multiday fishing vessels in Sri Lanka

Boat category	**Boat Description**
UN1	5.5 - 7.2 M (17' - 21') FRP dinghy Outboard engine - 8-40 HP (usually 15 - 25 HP) Single day boats - assumed to be fishing in coastal waters
UN2A	8.8 - 9.8 mm (28' - 34') displacement hull. FRP or wooden. Inboard engine (single) - 40 HP No ice box or insulated fish hold, no gear hauler, navigational or acoustic equipments. Single day boats - assumed to be fishing in coastal waters
UN2B	8.8 - 9.8 m (28' - 34'). FRP or wooden, Inboard engine (single) - 40 HP Insulated fish hold - no gear hauler, may have GSP/sounder/fish finder
UN3A	9.8 - 12.2 m (34' - 40'). FRP or wooden. Inboard engine (single) - 60 HP Insulated fish hold and may have gear- hauler/ GSP/sounder/fish finder
UN3B	12.2 m – 15.2 m (40' - 50'). FRP or wooden. Inboard engine (single) - 60 + HP. Insulated fish hold and may have freezer facilities. Gear Hauler/GSP/sounder/fish finder

UN4	15.2 - 18.3 m (50' - 60') Inboard engine, fish storage facility, may have RSW or CSW or freezing facility, gear hauler, GPS, echo-sounder/fish finder, radio communication

Table 2 Frigate catch rates (catch in kg per trip) by different craft types

Boat category	Average of Weight (kg)
UN1	28
UN2A	125
UN2B	164
UN3A	277
UN3B	65

Fishing gear and catch composition

Due to the multispecies nature of large pelagic fishery in the country, various types of gears including traditional fishing methods such as trolling, pole and line are being utilized to catch neritic tuna. Earlier gillnet, pole & line and trolline for some extent were effective for catching of frigate tuna (Maldeniya et al., 1988). However, Pole and line fishery declined partly due to problems associated with the supply of live bait while trolline declined due to fuel crisis (Joseph and Moyiadeen, 1985). Motorization of crafts together with introduction of synthetic nets resulted gillnet to become key fishing gear in the tuna fishery and thereby gillnet has firmly been established as the dominant gear for tuna including frigate (Joseph and Moyiadeen, 1985 and Joseph and Moyiadeen, 1986).

Relative importance of fishing gear has changed time to time. Trolline fishery is employed traditionally and is confined to specific sites. The contribution of the fishery is comparatively low. Popularity of ring nets immerged as a seasonal activity since 1990s in certain localized areas. Ring nets appear as a more efficient and year round than the rest of gear. Ring nets are mostly operated in coastal waters during the day time targeting small, localized free mixed schools of carangids and

small tuna varieties mainly frigate. Until 2010, the ring net operations were discouraged by the Sri Lankan Government due to the social unrest (Bandaranayake and Maldeniya, 2012). However, government restrictions on ring nets were loosen after. As a result, contribution of ring nets accounted more than 60% in 2012 and 2013 (Perera et al, 2014 and Figure 3).

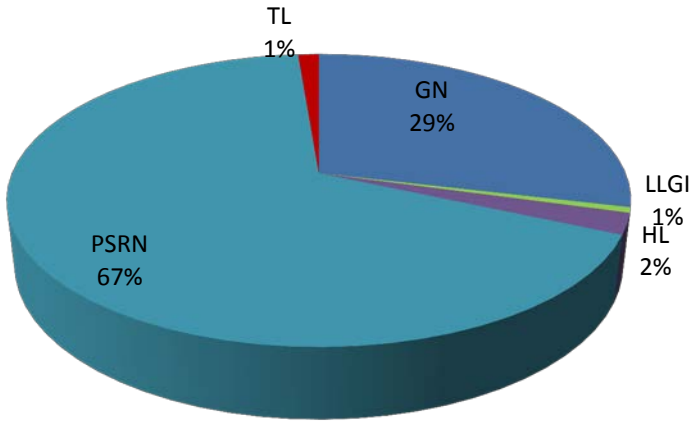

Figure 3. Percentage landings of frigate by major gear, 2013 (PSRN-Ringnet, LL- Longline, LLGI- Longline/Gillnet combination, GN- Gillnet, HL-Handline, TL- trolline) (PELAGOS, 2014)

Note: There is no any consistency in the catches made annually by pole and line fishery. The fishery is highly depended on bait availability, thus successful fishing operations depend on spatial and temporal conditions. It results sporadic nature in the pole and line landings.

A considerable variation in the catch rate could be observed as per the gear employed for catching frigate tuna (Table 3). The highest catch rate was 322.0 Kg per trip for vessels operated with ring net whereas the lowest catch rate of 30.8 Kg reported for vessels operated with handline. Among the catches recorded by long line/ gill net combination, it was noted that total amount was harvested by gillnets.

Table 3 Average catch rates of frigate tuna by gear (2010-2013)

Gear	Average catch rate (catch in kg per trip)
Ring net	322.0
Trolline	138.2
Gill net	129.5
Longline and gillnet combination	104.5
Handline	30.8

Statistical zone wise production

The coastline around Sri Lanka has been divided into seven statistical zones for large pelagic fisheries data collection: West, Southwest, South, Southeast, East and Northeast. South east zone contributed more than 60% of the total frigate tuna production followed by South region (22%) (Figure 4). In the regions of southeast, south and southwest ring net is being used for catching considerable amount of frigate tuna (Figure 5).

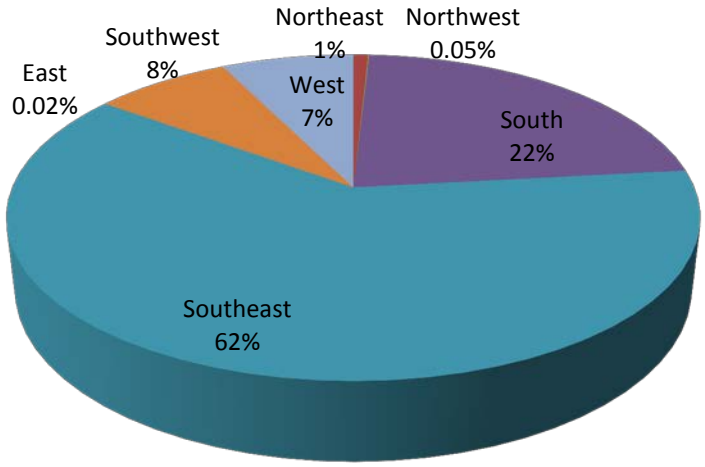

Figure 4 Fisheries statistical zone wise contribution to frigate tuna production, Sri Lanka: 2010-2013 (Source: PELAGOS, 2013)

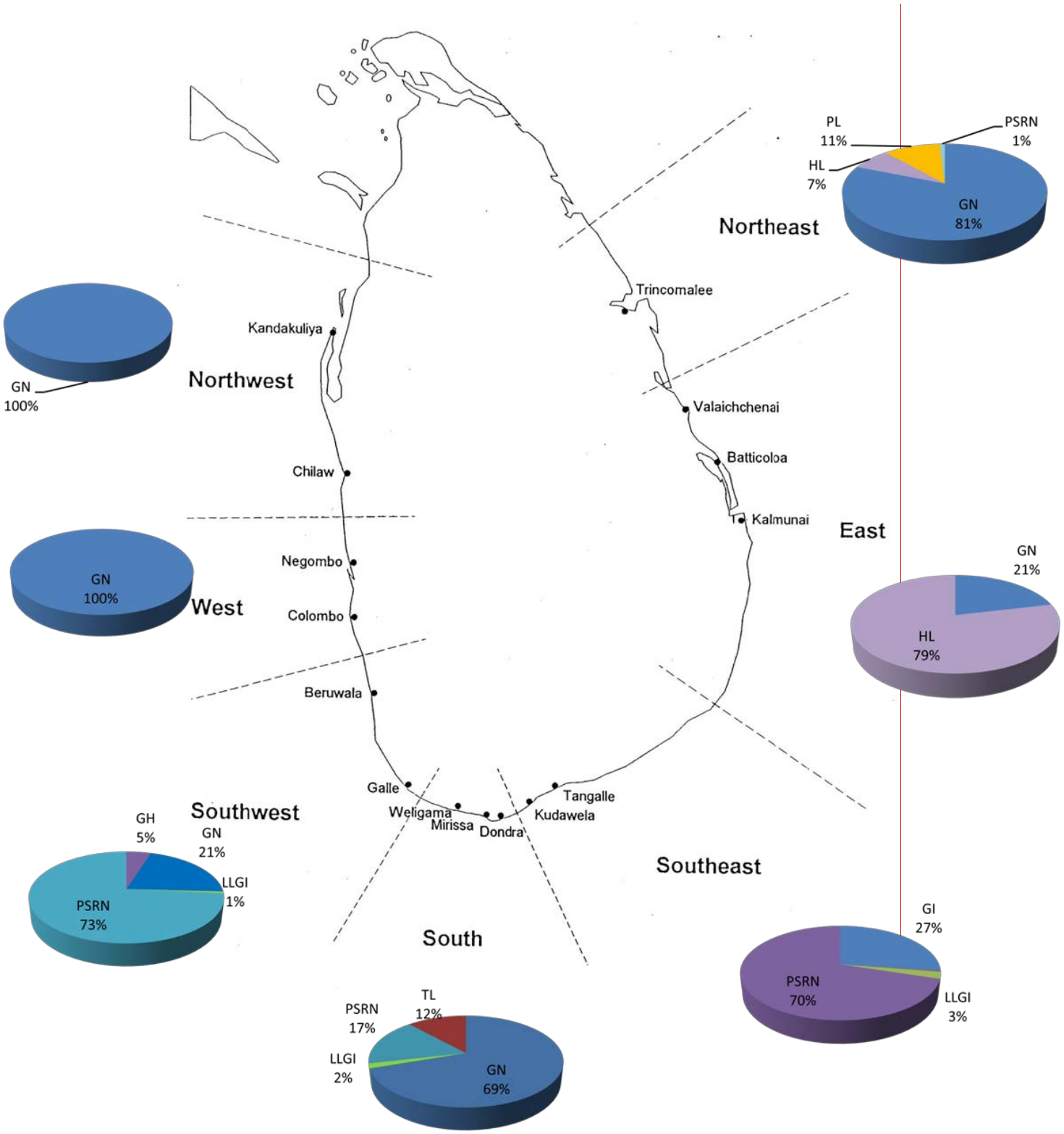

Figure 5 Relative contributions to the frigate tuna production by gear and area (2010-2013)

Length -Length relationships

Officials from different institutions are being taking different types of length measurements (total length (TL), Fork length (FL) and Standard length (SL)) for their research purposes and production estimations. It reveals the necessity of formulating relationships among different length measurements.

Length-Length relationships obtained for frigate tuna were as follows.

SL = 0.853TL (R^2 =0.955)

FL = 0.918TL (R^2 =0.974)

SL = 0.928FL (R^2 =0.972)

All Length - Length relationships were significant at 0.01.

Size composition

Length frequency analysis in recent past reveals that the fork length of frigate tuna ranged between 19 cm to 72 cm. The estimated annual mean length of frigate tuna from 2010 to 2013 was 34.07 ±5.16, 34.41±4.06, 34.15±4.06 and 34.01±3.76 respectively (Table 4). It is clear that there is a consistency in obtaining two size groups in each year. However major representation was in the second size group where most of the catches were over 35cm (Figure 6).

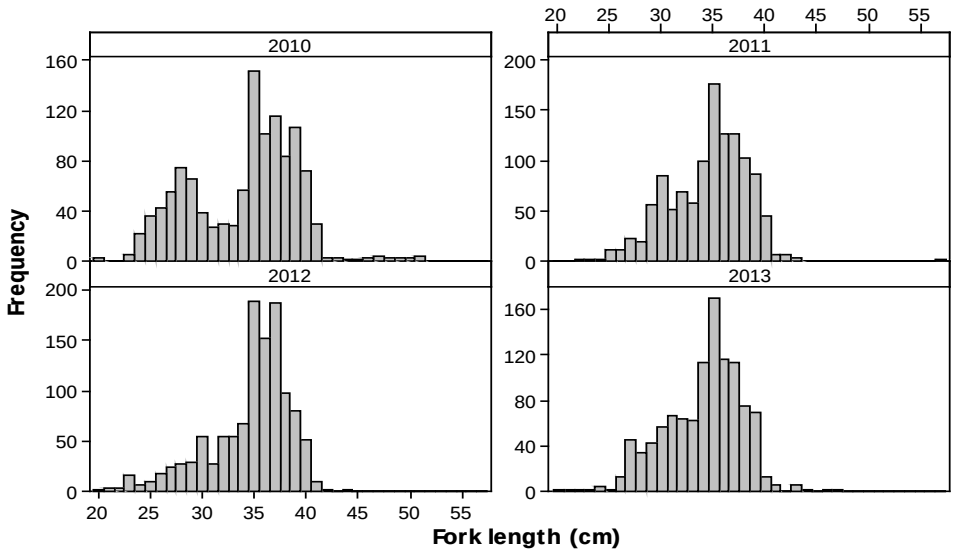

Figure 6. Length frequency distribution of frigate tuna 2010-2013

Table 4 Summary of length frequency data (length in cm): 2010-2013

Year	Average length	Minimum	Maximum
2010	34.07 ±5.16	20	51
2011	34.41 ±4.06	22	72
2012	34.15 ±4.06	19	44
2013	34.01 ±3.76	20	47

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