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Exploring marketing channels and market margins of tuna species: A case study of Negombo fishery harbour in Sri Lanka in 2018

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Abstract This study was carried out to determine the domestic level marketing channels, marketing cost, and marketing margin for four commercially important marine fish species in Negombo fishery harbour, Western Province, Sri Lanka, with a focus on marketing efficiency. Data related to fish catch and prices were collected by direct observation during the period of January to December 2018. About 80 to 105 tons of fish catch per day were being landed. The annual average wholesale prices of fish (kg^{-1})g varied from LKR 450 to 670 for Yellowfin tuna, LKR 233 to 414 for Skipjack tuna, LKR 320 to 385 for Frigate tuna, and LKR 140 to 190 for Indian scad, which is typical market behaviour. Though the net profit per 100 kg of fish received by the wholesaler was higher than the assembler, the retailer has made a significant amount of profit, nearly six times higher than the assembler. Ten marketing channels were identified from fish producers to the ultimate consumer and some channels involved more than three intermediaries. As typical for long marketing channels, high prices were paid by the consumer for the low freshness quality of fish. Though, the retail price of skipjack tuna at the Negombo landing center is moderately correlated (r=0.634), the other three fish species did not give a clear indication. Thus, the price factor of selected marine fish at the landing site was not having a significant impact on the market integration. Consumers were concerned about both price and quality when purchasing the fish. To improve the marketing efficiency of the marine fish market, it is recommended to implement shortening of the fish market channel with less involvement of intermediaries and to develop the fish market facilities appropriately.

Keywords: Consumer preference, fish price, market efficiency, Negombo harbour.

1 Introduction

The fisheries sector of Sri Lanka plays an important role in the national economy generating considerable income with its contribution to gross domestic product

(GDP) in 2018 of approximately 1.2% (MFARD 2018). Sri Lanka has 15 fishing grounds and 22 fishing ports. Most fishing ports have a set of facilities that can be used as an interface between fishing and consumption (MFARD 2019).

Total fish production of Sri Lanka in 2018 was 527,060 metric tons, of which total marine fish production was 439,370 metric tons, whereas the remainder (87,690 metric tons) was attributed to inland fisheries and aquaculture (Table 1). Marine offshore fish production shows some growth over the years 2013-2018, whereas tuna fishing in this sector also shows growth in harvest, export and processing. Tuna fishery is the mainly focused marine fish of the export market with high commercial value (Yamao and De Silva 2006).

Table 1: Annual fish production in Sri Lanka by sub-sectors (Mt).

Sector	2013	2014	2015	2016	2017	2018
Marine Coastal	267,980	278,850	269,020	274,160	259,720	249,020
Marine Offshore/deep sea	177,950	180,450	183,870	182,830	189,720	190,350
Inland & Aquaculture	66,910	180,450	183,870	73,930	81,870	87,690
Total	512,840	535,050	520,190	530,920	531,310	527,060

(Source: MFARD 2019)

According to 'Sri Lanka Fishery Development Strategy', the average daily fish consumption per capita is sufficient to ensure adequate nutrition (MRI 2010). Fish products are an important source of animal protein accounting for about 70% of the country's animal protein intake (Food Balance Sheet 2017). Currently, the average supply of seafood is 668,000 tons, and the average supply of seafood per capita is 32 kg per capita per year (Food Balance Sheet 2017). Livelihoods for most people in coastal areas are provided within the fisheries sector, which currently provides direct employment for approximately 650,000, including 150,000 in fisheries, 10,000 in related service activities and 400,000 in fish trade (Weerasekara *et al.* 2015, MFAR 2019).

Fish prices are highly dependent on fish quality, fish species and size, supply/ demand, market distance, weather/ climate change, and lack of long-term sales channels (Hossain *et al*. 2015, Perera *et al.* 2016). Therefore, typical characteristics of fish supply chains include uncertainty, such as assembling fish from many fish landings ashore, the commodity and demand patterns of different types of fish, numerous marketing channels and intermediaries, and price fluctuations (Alhassan *et al*. 2012, Aswathy and Abdussamad 2013, Begum *et al*. 2014). Currently, a business transaction can be done through fish markets, retail markets, fishing ports or online ordering. The scope of services at a fishing port has been expanded to provide for loading and unloading services, and logistics (ice, fuel, water, etc.) for fishing vessels. Some studies on seafood sales include marketing channels (Madugu and Edward 2011, Alhassan *et al.* 2012, Rabby *et al.* 2015), sales patterns and trends (Abila 1998), and sales systems (Flowra *et al.* 2012, Akhtar *et al.* 2013, Jamali 2013),

economic analysis of fresh fish sales (Ali *et al.* 2008), marketing management (Sathiadhas and Kanagam 2000), market intermediary and marketing profit (Hussain *et al.* 2003), typical transportation systems used (Rokeya *et al.* 1997) and marketing strategy (Mutambuk 2014, Hossain *et al*. 2015). Distribution channels in consumer marketing including fish products play a heavy role in the flow of goods and services from producers to consumers (Gorchels 2004, Gorchels *et al*. 2004). Even for fish products, the distribution channels consist of one or more organizations or individuals who participate in the process of goods, services, information and finance from the consumers or producers (Coyle *et al.* 2003).

Sri Lankan tuna species have the market popularity as a delicacy and a highly nutrient seafood in both local and foreign markets. Tuna exports as fresh and processed foods have a sizeable market share for Sri Lanka in the world market. The export market is relatively intensive, and as a result, good quality tuna became expensive commodity in Sri Lanka. These facts reflect the socio-economic sensitivity and importance of tuna as a marine product. Studying and exploring marketing channels and the market margin of tuna may provide directions to improve the socio-economic advantage related to tuna fish industry and the marketplace.

In the marine offshore sector, there is a consistent and slower growth in terms of tonnages of harvest (Dissanayake and Sigurdsson 2005). Here also, the major commodity is the tuna species. The consistency in growth is most likely driven by tuna demand, while the slow growth is due to challenges in marketing channels and market margins. This study focuses to identify the marketing channel pattern of the marine fishery based on the Negombo fish landing site (7.2040° N, 79.8277° E), marketing margin for selected tuna fishes, and how price impacts the market integration and consumer's role of the marketing channel with reference to the domestic level of the marketing.

2 Material and Methods

2.1 Study sites

Negombo fishery harbour is located in the Gampaha district of the Western Province of Sri Lanka (7.2040° N, 79.8277° E). It was selected as the fish landing site on focus as it is one of the main fishery harbours that supply food fish in the province. The average annual fish supply from Negombo is around 41,000 metric tons (Ariyawansa *et al.* 2016). Peliyagoda fish economic center (7.0147° N, 79.8997° E) at the suburbs of Colombo city is chosen as the marketing center as it directly connects with the Negombo fishery harbour landing site, and it is the largest for fish sales catering for Colombo as well as for other inland areas, including mainly the Central, Sabaragamuwa and North-Western provinces.

At the start of the marketing channel, the Negombo harbour and the subsequent Peliyagoda Central fish market were identified as the first two elements. Beyond that,

till the end-user, there can be variants in marketing channel aspects. Some channels may have more intermediatory elements. In the Negombo fish landing, mostly large fish supplied by multi-day and one-day boats are landed at fishery harbour landing center. Other fishing crafts are landed at the shore in Negombo and reach the main landing area.

Table 2: Sampling frame related to the marketers of Negombo landing site and Peliyagoda fish economic center, Sri Lanka (Total 42).

Marketing chain element	Sampling number	Real-time total
Offshore fisherman	05	25
One day fishermen	05	Around 50
Assemblers/beach collectors	05	Around 10 at a time
Wholesalers of Negombo fishery harbour	05	Around 10
Wholesalers of Peliyagoda Central fish market	05	Around 10
Retail retailers	05	Around 25
Fish vendors	05	Around 45
Sales outlets of the supermarket chain	05	Around 08
Online traders	02	Only 2 available

In marketing channels, though the first two elements are common, there are quality, quantitative, value, and timing variations along the channels. Because some channels may have more quantities of fish flow (vs. less), take longer time (vs. shorter), carry more value (vs. less value), have better-assured freshness (vs variable freshness), more marketing chain elements were considered at the starting point as shown in Table 2. The period of data collection was one year (January-December 2018).

2.2 Selecting consumers for the study

Thirty consumers were randomly selected by representing each market during marketing time. Information was collected from the consumers who purchased fish from suburbs of Colombo representing the associated market areas of Negombo fish market (n=5), central Peliyagoda fish market (n=5), Ceylon Fisheries Corporation (CFC) outlet (n=5), supermarket (n=5), retail stall (n=5) and fish vendors (n=5).

2.3 Analyzing prices of selected marine fish species

Considering commercial value, fishing gear, availability throughout the year and marketing demand, this study selected yellowfin tuna (*Thunnus albacares)*, skipjack tuna (*Katsuwonus pelamis*), frigate tuna (*Auxis thazard*), and Indian scad (*Decapterus russelli*). Fish prices from producer to consumer end were collected by secondary data of relevant authorities, by discussing with stakeholders and onsite visits.

When analyzing marketing margin, the fish price of mean values of all selected fish species were clustered together and average values were calculated. Average retail prices were calculated from mean values of all categories such as supermarket retailers, retail outlets, and fish vendors.

2.4 Analysis of marketing channels

Due to a lack of previous studies and knowledge about activities within the logistic chain of Sri Lankan fisheries, primary data was gathered from stakeholders involved directly and indirectly in the fisheries logistic chain, i.e., fishermen, traders, processors, government officials and other informed groups. They were interviewed by on-site visits to Negombo harbour, wholesale markets (Negombo & Peliyagoda) and retail markets. Secondary data were obtained from organizations associated with fishery industry, community-level organizations, and the Ministry of Fisheries. Structured interviews were used with groups with an adequate number of participants, such as assemblers, export assemblers, wholesalers/commission agents and retailers.

Table 3: Key factors considered for designing framework to analyse fish marketing channels.

Key Factor	Expected output	Element
The structure of the value chain and the main actors and activity	This is focused to identify the structure of the value chain and the participants and activities of the system	a. The value addition in the value chain b. Key actors c. Main activity
Relationship within the value chain	This may include a description of the product's capacity, quantity, and price, including the value-added in the value chain.	a. Collaboration between actors b. Flow of information and knowledge c. Power and trust d. Governance
The strategic position within the value chain	This may include relationships within the value chain and how the collaboration between the actors	a. Driving forces within the industry b. Competitive advantage

Source: Gestsson *et al.* 2010

The questionnaire framework in this study was designed and used based on the value chain concept (Porter 1985, Segetlija *et al.* 2011, Gestsson *et al*. 2010, Perera *et al*. 2016) to investigate three key factors (Table 3) affecting Sri Lankan marine fishery within the domestic (local) value chain.

The number of fish trade retailers is spread all over the country and can be divided into several categories such as supermarkets, retail outlets and fish vendors (including motor-bike retailers, bicycle retailers and food peddlers). Details of the quantity and prices of the fish caught were gathered from relevant organizations, such as the Department of Fisheries, National Aquatic Resources Research and

Development Agency (NARA), Sri Lanka Custom and Fishermen's Federation. For analyzing the value chain, prices were considered as an important indicator, more specifically how sellers and buyers meet and agree on quality and prices of fishes were indicated. All prices used for the study are in US dollars (USD) and data in Sri Lankan Rupees (LKR) have been converted to USD, using the exchange rate in July 2018.

2.5 Data collection

Purposive and simple convenient sampling techniques were used to collect the necessary data. Structured interview schedules were used to collect information from five markets, namely, the major Negombo fish landing center, wholesale, Central fish market, supermarket, and retail fish markets through key informant surveys and focused group discussions with officials and members of fish trader associations/ cooperative societies. This was done after verifying the source of the fish from Negombo fishery harbour by interviewing the marketer.

2.6 Data analysis

The average prices for selected fish species were computed for the period of study. The marketing margin at fishermen and consumers was calculated as per the formula described by (Rahman *et al.* 2012), as

$$\text{Marketing margin (\%)} = \frac{\text{(Selling price- Purchase price)}}{\text{Selling price}} \times 100$$

The cost-profit and marketing efficiencies of different marketing channels were also observed. Descriptive statistics were analyzed using SPSS 23.00 and MS Excel 2010.

3 Results

3.1 Status of the fish landing center and marketing destination

Table 4 shows the general information about different places in the fish market chain. The average operating duration of the fish auction in Negombo fishing harbour is 5 hours, starting from 1.00 am to 6.00 am. At the auction market, all products were sold locally without weighing as fresh (without chilling). The traditional sales system in the Negombo landing center is to sell whole fish in bulk without weighing.

Table 4: General information about the fish market chain studied in Negombo and Colombo suburb areas.

Market characteristics	Negombo Fishery habour		Central fish market (Peliyagoda)	Super Market (private)	Ceylon Fisheries Corporation (CFC) Stall	Stall 01	Stall 02
	Auction market	Open market					
Market type	Wholesale	Retail	Wholesale/ retail	Retail	Retail	Retail	Retail
Market time	1.00 am-6.00am	6.00 am -10.00 am	4.00 am-10.00 am	8.00 am-10.00 pm	9.00 am-4.00 pm	9.00 am- 3.00 pm	10.00 am –4.00 pm
Platform	Cemented with tile	Cemented/ Damaged	Cemented with Top cover tile	Chilled display cabinet	Chilled display cabinet	Cemented Damaged tile	Cemented Damaged tile
Roof (shade) cover	Building	Building	Building	Building	Building	Rooftop cover	Asbestos sheet cover
Drainage facility	Present	Present	Present	Present	Present	Present but poor	Poor
Electricity supply	Present	Present	Present	Present	Present	Present	present
Icing facility	Present but poor usage	Present but poor usage	Present but poor usage	Present chill storage condition to maintain	Present chill storage condition to maintain	Very poor Not adequate ice	Very poor Not adequate ice
Sanitation facility	Poor	Poor	Good	Good	Good	Very poor	Very poor
Water supply	available	available	available	available	available	available	available
Hygienic practices	Very poor	Very poor	Very poor	Good	Good	Very poor	Very poor
Routine maintenance	Poor	Poor	Poor	Good	Good	Poor	Poor

About 100 ±12 tons of marine fish were being landed using the fishing boats/ vessels per day. Two types of marketing systems have been identified in the Negombo harbour area as auction market and open market. Auctions usually sell all the caught fish in bulk, and fishermen place the caught fish on the floor alone instead of weighing it. Each fish loading is usually composed of a mixture of species. The deep-sea catch landings include much low-priced fish and some high-priced fish. When low-priced fish are mixed with high-priced fish, fishermen not only expect the price of low-priced fish to increase but also ensure timely disposal. Due to the wide variety of precious fish such as Seer fish (*Thora*) and Sail fish (*Thalapath*) species, buyers are forced to buy the whole bulk of fish on auctions, but some studies have shown that ratings increase the overall fishing revenue. Bidding is open and done in ascending order simply by verbally announcing the bids of all the approaching buyers for a certain fish lot. The highest bidder obtains the fish lot and that practice is allowed a price increase through trader competition. Normally 1% of the total fish sales are reserved as auction charges for the registered people. Payment is made at the point of sale and is guaranteed that the settlement is made at the bid price.

Though adequate infrastructure facilities are established in the Negombo harbour, poor routine maintenance and inadequacy of hygienic practices seem to be problems also because of marketers' improper use of the auction place. Most of the fish were kept without adequate icing at the peer after unloading, before and after the auction affecting the freshness of fishes.

The open market operation of the Negombo fishery harbour is held for about four hours of average duration from 6.00 a.m. to 10.00 a.m. on regular landing days. The condition of the open market environment of the Negombo fishing harbour is also the same as the auction site. Considering the icing facility, only some of the marketers stored fish in the rigid foam boxes with ice. Usage of lagoon water was observed for cleaning and washing purposes instead of pipeline (potable) water. The damages of the platform were observed in both auction and open market places with dull colours.

Five hours of average duration was noticed for market operation in the Negombo fishery harbour, and Central supermarket located closed to the Colombo city. Though all infrastructures are well-established at the central supermarket, usage of adequate icing facility, hygienic practices and routine maintenance have remained at a poor level. The Sanitary facility of the central market was more satisfactory than the Negombo. As a governmental trader, Ceylon Fisheries Corporation (CFC) is actively engaged in the fish market chain distributing fish through their own sales outlets. Around eight hours of marketing duration was noticed in CFC outlets, which is used with adequate icing. Required infrastructure facilities were fulfilled in both supermarket outlets and CFC market outlets adhering to proper hygienic practices. Both outlets were used to display fish in the chilled condition and the chilling temperature level was well maintained. Except for these outlets, sanitation facilities, hygienic practices, routine maintenance (Cleanliness), and usage of adequate ice were observed at a poor level in the other sales outlets.

3.2 Marketing channels

Kohls and Uhl (2005) described marketing channels/ value chains as the alternative routes of product flows from producers to consumers. In this study, ten marketing channels were identified in the flow of the selected fish market as given in Figure 1.

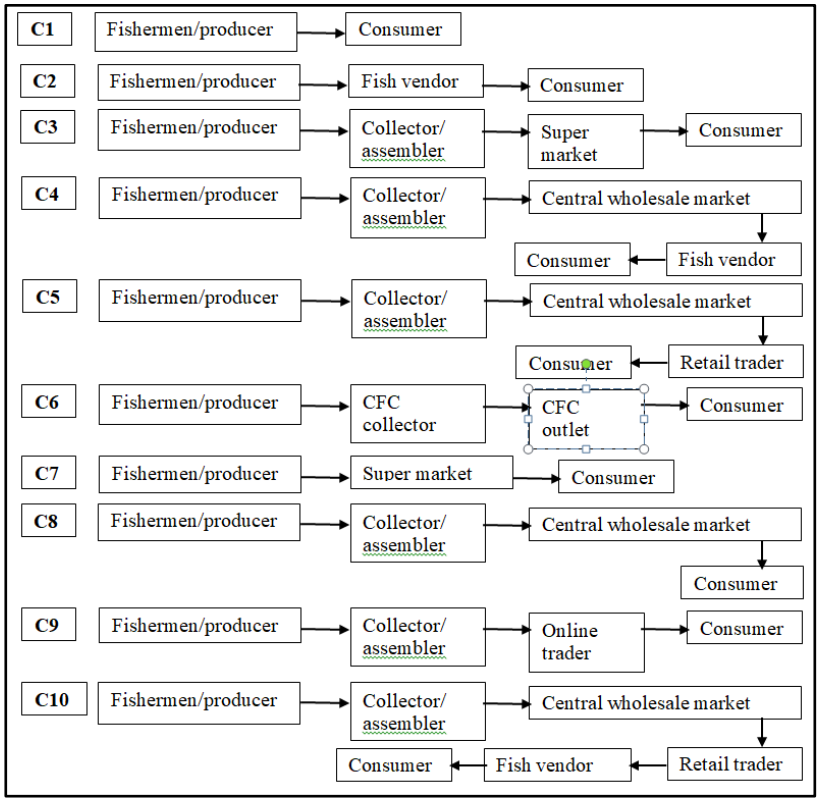

Fig 1: Identified fish marketing channels for marine fishes in Negombo and Colombo suburb areas.

Assembler is the first intermediator in the value chain and can have a variety of functions within the chain. Retailers buy fish from auction markets, assemblers or wholesalers, and then resell them to consumers. The added value of the system is the purchase of large quantities of products from wholesalers.

Based on the surveyed data, the total marine fish catch from Negombo fishery harbour is around 29,234 Mt ±1,234 Mt per annum. The catch was dispatched both to domestic and export markets, with the domestic fraction alluring around 59±6% of the marine fish production. In 2018, the export market accounted for 15±3% and the balanced percentage was used for dried fish production. The domestic fish market is

composed of a number of diverse end markets including urban wholesale fish markets, retailers, fish vendors, CFC and supermarket outlets. An online trading system is a newly added component to the value chain recently.

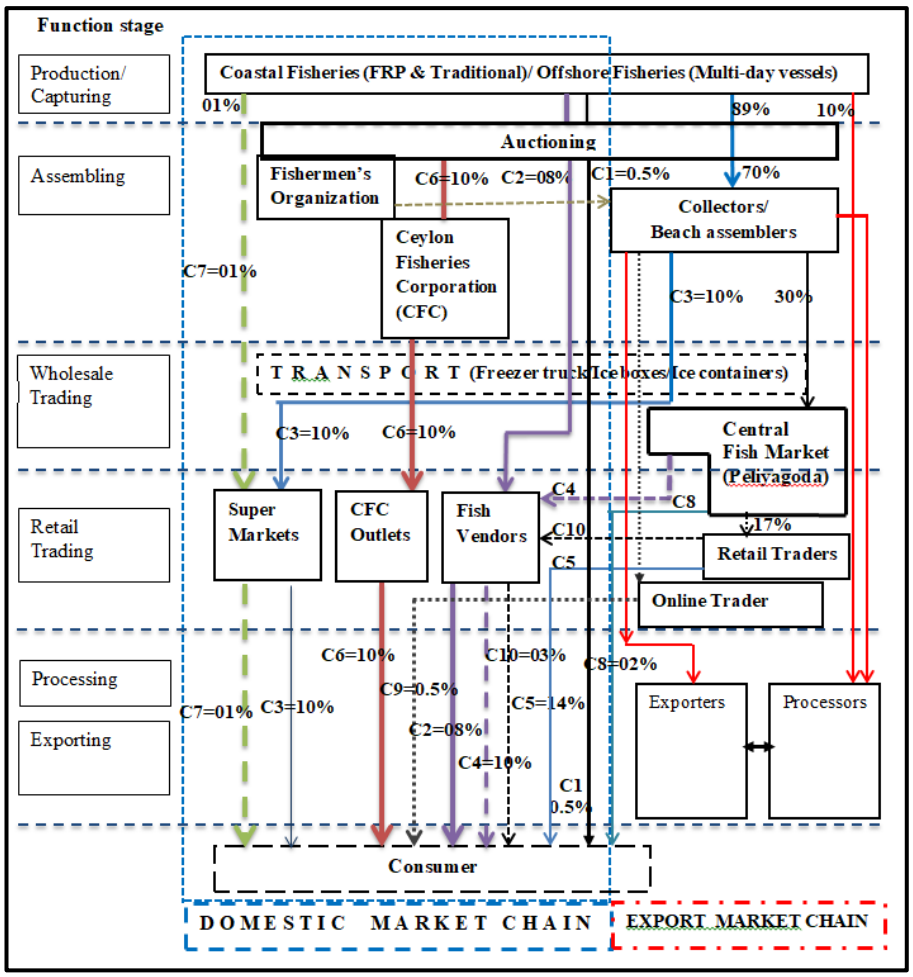

Fig 2: Marketing channels (C1 to C10) of marine fish landings in the Negombo fishery harbour

This added value is mainly due to selection, transportation and sales. The general flow is from fishermen to auction markets, local assemblers, wholesalers and retailers. Pricing is mainly based on the free marketing system of the auction market, with a few exceptions. The auction market has different market segments and different customer needs. The cost of these changes has been integrated into the price of fish, and is ultimately reflected in the price consumers are willing to pay.

The fisheries value chain is dominated by the private sector at all levels. The value chain map shown in Figure 2 (the state-owned trader CFC) is a single channel that actually manages nearly 10% of the Negombo-based marketing chain. Obviously, with the dynamic changes in this sector, the structure of the fishery supply chain and the roles and responsibilities of its multiple stakeholders are changing rapidly.

In emerging markets, some participants play multiple roles at different levels of the supply chain, and they are promoting system development. For instance, coastal operators engaged in deep-sea fisheries are shifting from local market suppliers to export market suppliers, which is particularly helpful in expanding the export processing industry. In some cases, the recent rise of fisheries cooperatives has created horizontal and vertical links, enhancing the bargaining power of small businesses, while keeping pace with industry trends. Due to economic and practical barriers to entry into the fish trade, producers still cannot obtain fair prices for their products. However, CFC is stepping up its efforts to compete with the private fish trade, including buying fish at competitive prices through auctions with private merchants. Scale is not important yet, but various types of CFC outlets are involved in the fish trade and various supermarket chains (such as Cargills, Keels, Arpico) represent emerging markets.

3.3 Prices of selected marine fish

Table 5: Summary of average wholesale and retail price ranges of selected fish species in 2018 around Negombo market chain.

Fish Species	wholesale price range LKR /kg	retail price range LKR /kg	Price Difference LKR /kg
Yellowfin tuna	450 to 670 (US$2.50 – 3.72)	722 to 1000 (US$4.01 – 5.55)	272-330 (1.51-1.83) 60% increased
Skipjack tuna	233 to 414 (US$1.29 - 2.30)	372 to 592 (US$2.01 – 3.29	133-178 (0.73-0.99) 57% increased
Frigate tuna	320 to 385 (US$2.13 - 2.13)	440 to 600 (US$2.44 – 3.33)	120-215 (0.31-1.2) 38% increased
Indian scad	140 to 190 (US$0.78 - 1.05)	200 to 250 (US$1.11 – 1.39)	60-60 (0.33-0.34) 42% increased

(US$ 1= LKRs.180)

Prices of the fishes, namely Yellowfin tuna Skipjack tuna, Frigate tuna, and Indian scad varied as per the species, sizes, freshness, market demand, weather, and seasonal changes (Table 5). The highest price difference (around 60% increased) was observed from yellowfin tuna. The least differences were recorded for Frigate tuna and Indian scad.

Figure 3 shows the monthly average prices of selected fish species in Negombo wholesale market, Central supermarket, retail outlets of supermarkets and retail

outlets in suburb areas in Negombo without considering fish vendors (mobile) prices. The higher prices were indicated in May, June and July at the entire market chain, which may be the results of changing weather and rough sea conditions, thus the inadequate supply for the market, and then price factor goes up in the season. From September to November, the overall prices were considerably lower than in the other periods of the year. But in December, a recorded high price in the market was remained, which may be affected by seasonal demand.

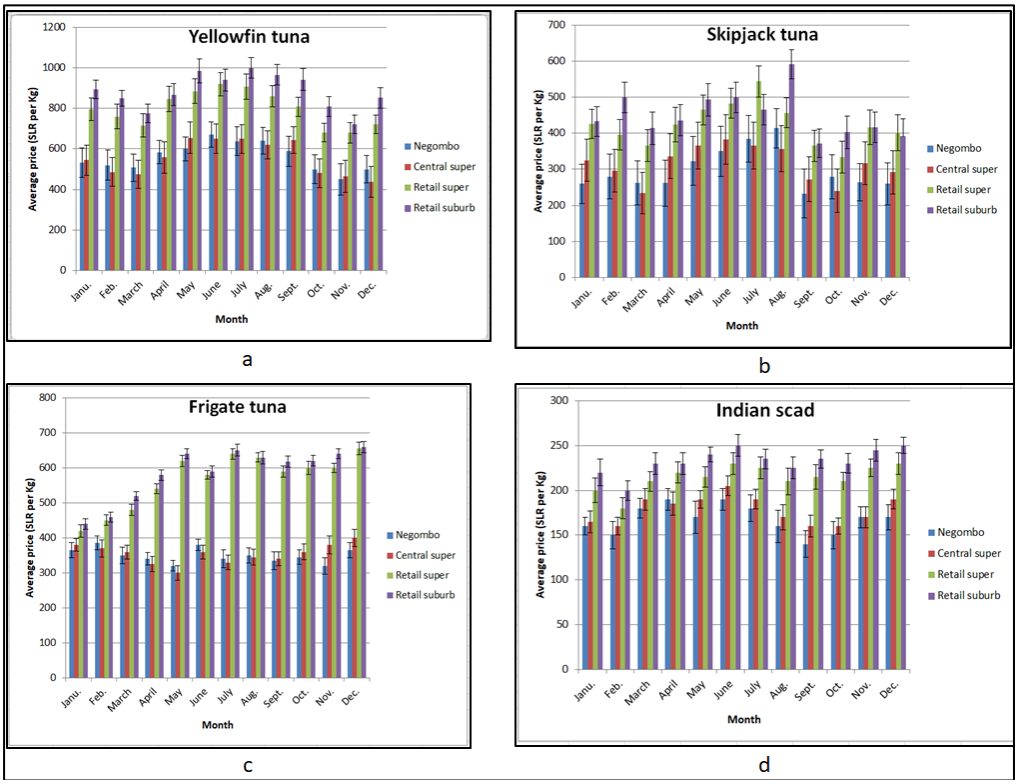

Fig 3: Monthly average prices of fish species in Negombo and Colombo suburb areas. a) yellowfin tuna, b) Skipjack tuna, (c) Frigate tuna (*Auxis thazard)*, and d) Indian scad (*Decapterus russelli*).

Average prices of the four fish species in the retail suburb areas (Figure 4) were recorded higher than the other places over the year and the lowest value was observed in the Negombo fish market. It was a fact that the fish price of retail suburb areas may add to the charges for handling, packing, icing, and transportation.

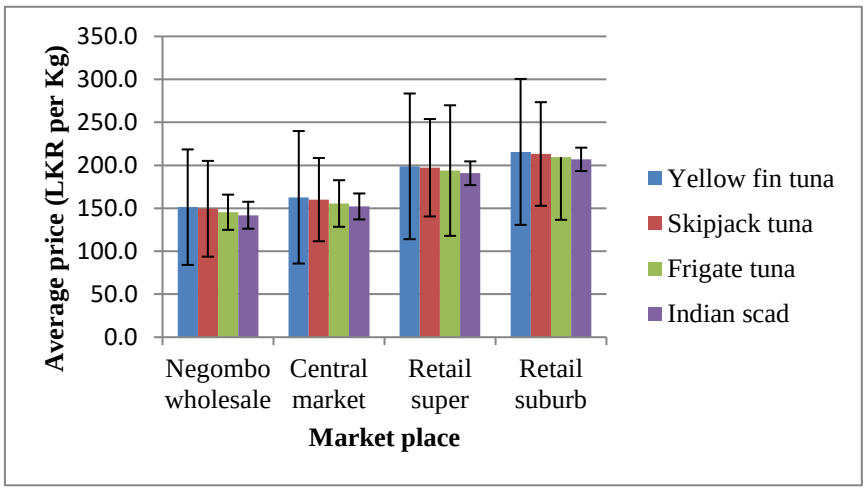

Fig 4: Average Prices of selected marine fishes in Negombo and Colombo suburb areas.

Table 6 shows the summary of the average annual prices of the four fish species through different stages of the marketing channels. The retail prices of the supermarket outlets were higher than the prices of fish vendors for all fish varieties. That may include the employee wages and maintenance cost of the supermarket level. The fish prices at the consumer level were less than the vendors' prices, which may happen due to the less involvement of intermediates of the marketing channel. Some fish species like Indian scad was not ordered online in this study period.

Table 6: Average annual price (LKR per Kg) of selected marine fish in different stages of marketing channel.

Mediator	Yellowfin tuna	Skipjack tuna	Frigate tuna	Indian scad
Producer	550.10 ± 50.50	275.15 ± 42.80	330.00 ±18.40	150.50 ±12.50
Assembler	560.83 ± 67.20	297.67 ± 55.70	349.58 ± 20.50	167.50 ±15.70
Wholesaler	798.42 ± 84.70	315.25 ± 48.4	354.17 ± 27.10	177.92 ±15.10
Retailer super	883.83 ± 84.90	451.50 ± 60.30	587.33 ± 72.90	232.50 ±13.60
Fish vendor	708.33 ± 77.00	415.83 ± 39.00	580.00 ± 60.60	215.83 ±11.40
Online trader	710.00 ±83.10	409.17 ±36.00	523.33 ±72.60	Not available

3.4 Marketing cost and net marketing margin

The cost of marketing a product refers to the expenses acquired by various sets of mediators in the process of achieving different marketing functions to reach the

product from the producer to the end-users. Various components of fish marketing costs were recorded during this study period such as transportation cost, cost of fuels and lubricants, cost of storage and pack icing, cost of wastage, cost of fresh/ potable water, cost of other utilities, cost of wages and other miscellaneous expenditures.

Table 7 shows the average values of the marketing margin of LKR per 100 kilograms of all four species of fish within the study period. The marketing margin was computed (formula given by Rahman *et al.* 2012) as the difference between the price obtained by the producers and the price paid by the consumers. Net marketing margins consist of marketing costs and profits or losses earned by all intermediaries. The wholesalers (Table 8) sold to the retailer gained a gross margin of LKR 6,800 (US$ 37.70) per 100 kgs and then, the net margin was received around LKR 4,800 (US$ 26.60) including marketing cost of LKR 2,000 (US$ 11.11) per 100 kgs. The retailer sold to the consumer to earn a gross margin of LKR 12,700 (US$ 70.50) and then the net margin reached up to LKR 7,200 (US$ 40.00) after deducting the marketing cost (LKR 5,500 US$ 30.50) per 100 kgs of fish.

Table 7: Marketing margin of intermediaries (average price LKR per 100 kg) of fishes.

Intermediary	Purchase price (B)	Selling price (A)	Gross margin (C) =(A- B)	Marketing cost (D)	Net margin (E) = (C- D)
Assembler	32,600.00 US$ 181.10	34,300.00 US$ 195.50	1,700.00 US$ 9.44	500.00 US$ 2.70	1,200.00 US$ 6.60
Wholesaler	34,300.00 US$ 195.50	41,100.00 US$	6,800.00 US$ 37.70	2,000.00 US$ 11.10	4,800.00 US$ 26.60
Retailer	41,100.00 US$ 228.30	53,800.00 US$ 298.80	12,700.00 US$ 70.50	5,500.00 US$ 30.50	7,200.00 US$ 40.00

3.5 Analysis of retail prices

The linear regression analysis was used to estimate the relationship between the prices of the Negombo fish landing center and the retail price in the suburb area for the above-mentioned marine fishes. The strength of the relationship between the average weekly prices during 12 months period of fish landing center and retail outlet (Figure 5) for the four selected high-value fishers ($p<0.05$ for rejecting H_o of no relationship).

Weak relationship was indicated (Figure 5a) for Yellowfin tuna ($r = 0.906$, $Y=125.21+1.2004x$, $p=0.009$), and it was significant. For Skipjack tuna, the relationship has a significant strength (Figure 5b), ($r = 0.634$, $Y=324.230+0.47x$, $p<0.001$) and the relationship has a significant strength. Both Frigate tuna (Figure 5c, $r = 0.172$, $Y= 207.836+0.137x$, $p = 0.121$) and Indian scad (Figure 5d, $r = 0.169$, $Y= 824.312-0.871x$, $p = 0.126$) were recorded very weak relationship between landing price and retail price.

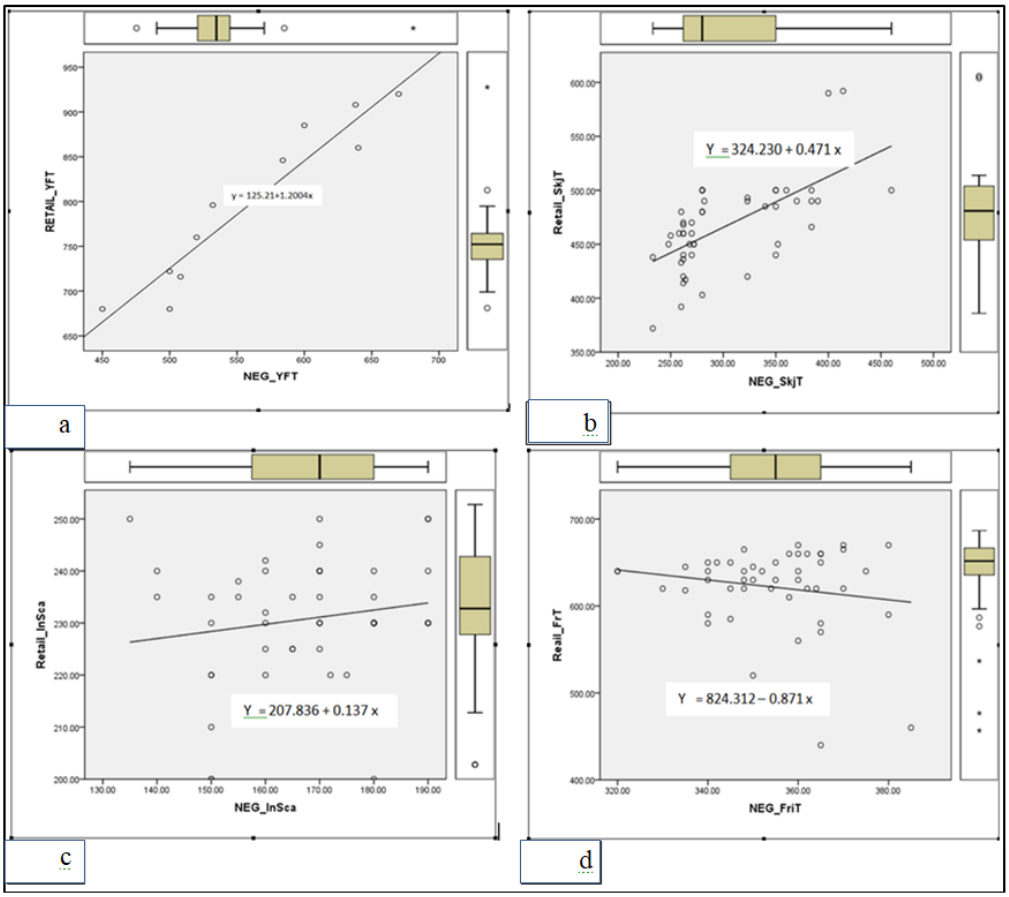

Fig 5: Regression analysis of weekly average prices of fish between fish landing center and retail stall (January to December 2018). (a) Yellowfin tuna, (b) Skipjack Tuna, (c) Frigate Tuna, (d) Indian Scad (Y = Retail price, X= Landing center price, r= Correlation coefficient)

The retail price of skipjack tuna at the Negombo landing center is moderately correlated (r = 0.634) which indicates considerable influences of market integration. But other three fish species did not give any clear indication. Thus, the price factor of selected marine fish at the landing site was not a significant impact to the market integration except Skipjack tuna fishery.

3.6 Characteristic of respondents

One part of this study concerned the status of the consumers related to the purchasing of fish from the market. 50% of the consumers were in the 30-39 years of age group and about 75% of them were employed with completing secondary education. Based

on the descriptive statistics analysis, 73% of the consumers were concerned about both price and quality when purchasing the fish. About 60% of the consumers were selected to purchase from retailers considering the mode of purchasing fish (Table 8 and 9).

Table 8: Consumer's priority factors when purchasing fish.

Criteria	Frequency	Percentage
Quality is ensured	2	6.7
Price considered	5	16.7
Quality and price considered	22	73.3
Taste considered	1	3.3
Total	30	100.0

Table 9: Consumer preferences when buying fish.

Place	Frequency	Percentage	Cumulative Percentage
Fish port (landing)	2	6.7	6.7
Wholesaler	4	13.3	20.0
Supermarket	6	20.0	40.0
Retailer	11	36.7	76.7
Mobile	5	16.7	93.3
Online	2	6.7	100.0
Total	30	100.0	

4 Discussion

Though the required infrastructure facilities were fulfilled at the Negombo fish landing site (including auction marketplace and open market) the maintenance work, cleanliness, and hygienic practices of the marketers were noticed as very poor. The overall characteristics of the marketplace related to infrastructure, maintenance, and hygienic practices were kept in good condition functioning under the Ceylon Fisheries Corporation retail outlets.

At the Negombo auction market, the site visits confirmed that certain handling behaviour of personnel involved may affect the quality and freshness of the fish. Most of the time, the cleanliness of the auctioning area was not up to a satisfactory level. When unloading the fish from fishing vessels and handling the fishes were dragged on the floor affecting the appearance and freshness, before and after auctioning unloaded fishes were kept for more than one hour without putting the ice affecting the freshness. It was noticed that poor handling practices when washing the fish, like using lagoon water instead of potable water.

In this study, ten marketing channels were identified between producer and consumer when purchasing or buying fish at the domestic market. Some channels were involved with more than three intermediaries within a short time of period. Those involvements were finally affected the purchasing price of the consumer. Even freshness, quality of the fish is deteriorated due to less consideration of maintaining the minimum criteria such as inadequate ice, exposure to sunlight, improper packing and packaging, improper storing, and poor hygienic practices. Most of the retail outlets were observed to have the routine maintenance of the working environment. Channel 06 has been identified as having significant variations when compared with other channels because Ceylon Fisheries Corporation was (CFC) involved as a wholesaler to their retailer shops and to the consumer. At this channel, prices of the fish were also considerably lower than the other channels, as well as freshness qualities of the fish were maintained by dedicated staff members. Therefore, the demand of the consumer was also higher than the other retailers. Marketing channel 9 also shows some peculiarity, due to the inclusion of a new market trend like online marketing, although that system is somewhat new to the consumers yet. Communication with online customers showed that online mode is needed to be popularized in society. It may create a significant change in the efficiency of domestic fish marketing in Sri Lanka. Up to now, very few online traders were involved from the city area of the Western province.

5 Conclusions

The marine fish marketing channels associated with the national level are characterized by a large number of intermediates and redundant participants, ultimately increasing consumer costs. When distributing fresh fish from producers at the Negombo fishery harbour to end consumers; ten short-run to long-run marketing channels are identified. In particular, longer channels (more steps in the channels) indicate higher retail prices due to lower fish freshness and quality, increased costs for handling, transporting, unloading, loading, packing, and storage activities. Thus, the cost paid by consumers exceeds the actual value of low-quality fish. The profits of income are not absorbed by fishermen and the fishermen's community, and intermediates are making profits.

The presence of collectors and assemblers as intermediates would be the cause for the longer length of the channels, also the presence of intermediates caused the delay in product delivery with additional transit points. Unless there is an effective cold chain, the freshness and the quality of the fish at the customers' end would not be achieved for such longer channels, but the prices would be still higher than the expectation. Such situations were in practice for decades and because of this unsustainable business model and culture, many benefits were not provided to both the fisher community and the end consumer. Especially the shorter marketing

channels involving CFC plays a great role compared to the other longer marketing channels. The higher prices reflected in the supermarket would be inevitable considering the overheads, cold chain, investments and expenses, and wastages due to the expiry of the product within their outlets.

Sustainability in consumption, food security, and production associated with marine fish marketing channels and consumers' consumption may be achieved through innovations in terms of technology interventions, the productivity of business and marketing channels, and national-level involvement. Among the identified ten marketing channels the marketing channel involved in CFC could be identified as relatively the best, and hence the popularization of this marketing channel could be consequently nationally important. The less productive marketing channels with many intermediates should be rectified or discouraged as such models noted with banned business models and cultures challenge the sustainable consumption and production in the marine fishery sector.

Information flow from up and down the marketing channels could be used as an effective tool for improving the market and marketplaces. This serves the consumers for being able to understand the necessary information in selecting fish. In the upstream of the marketing, consumers need a proper upward flow of information along with the marketing channels. Other aspects of information flow can be linked to the strategic minimization model, post-harvest losses, knowledge, technology management, and the swift transfer and delivery of products and thereby improving marketing channel cultures, practices, and values.

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