Neritic tuna fishery in Sri Lankan waters: An update

K.R. Dalpathadu & S.S.K. Haputhantri.

National Aquatic Resources Research and Development Agency (NARA), Crow Island, Colombo 15, Sri Lanka.

Abstract

Neritic tuna is one of the major components in the coastal and offshore fisheries catch in Sri Lanka. This group mainly consists of *Auxis thazard* (frigate tuna), *Auxis rochei* (bullet tuna), *Euthynnus affinis* (kawakawa) and *Scomberomorus commerson* (narrow- barred Spanish mackerel). This study attempts to understand the status of neritic tuna fishery in Sri Lankan waters with comparing the status in last two decades especially referencing to years 1997, 2007 and 2017. The data for this audit was obtained from the Indian Ocean Tuna Commission (IOTC) database. The relative contribution of the neritic tuna catch in the total production of tuna and tuna like species was markedly reduced from about 20% in 1997 to 4% in 2017. The percentage representation of the Frigate tuna catch in neritic tuna production showed a considerable decline from 42% in 1997 to 28% in 2017while showing a remarkable declining not only the frigate tuna annual catch but also total neritic tuna annual catch in Sri Lanka. The percentage of the immature fish in the frigate tuna catch also exhibits an increment form about 5.8% in 1997 to 18.4% in 2017. The declining catch and inclining trend in immature percentage could probably be attributed to increased fishing pressure on the frigate tuna stock in the Indian Ocean region. Thus, the study emphasizes the importance of carrying out periodical stock assessments and research studies especially focusing to biological and fisheries aspects of neritic tuna species in order to ascertain a sustainable fishery for neritic tuna species in the Indian Ocean.

Introduction

Sri Lanka is an island located in the Indian Ocean, south-east of the Indian subcontinent between latitudes 6-10° N longitudes 80-82° E (Pernetta, 1993; Wijayaratne, 2001). As an island nation, marine fishery sector plays a major role in the Sri Lankan economy. The marine fishery sector of Sri Lanka can further be sub-divided into two major components: costal fishery and offshore/deep sea fishery (Wijayaratne, 2001). The tuna which is an important food

fish for Sri Lankan nation contributes largely in marine fishery of Sri Lanka. The tuna resources of Sri Lanka are mainly comprised of Yellow fin tuna (*Thunnus albacares*), big eye tuna (*Thunnus obsesus*), skipjack tuna (*Katsuwonus pelamis*), kawakawa (*Enthynnus affinis*), frigate tuna (*Auxis thazard*) and bullet tuna (*Auxis rochei*) (Jayasooriya & Bandara, 2013). Among these species, neritic tuna is a major component in the coastal fishery. This group mainly consists of *Auxis thazard* (frigate tuna), *Auxis rochei* (bullet tuna), *Euthynnus affinis* (kawakawa) and *Scomberomorus commerson* (narrow- barred Spanish mackerel) (Bandaranayake, et al., 2015; Haputhantri, 2016). Though several single gear types and gear combinations are used, gillnet (GN) and ring net (RN) are the two major fishing gears in use for catching neritic tuna species (Perera et al, 2014).

The tuna fishery in Sri Lanka was developed rapidly with the expansion of offshore and deep sea /high sea fishing (Jayasooriya & Bandara, 2013). However, neritic tuna is mostly taken a by-catch in other fisheries in particular gillnet and ring net fisheries operate within the Exclusive Economic Zone (EEZ) of Sri Lanka. The scientific research on neritic tuna species has been started in Sri Lanka in late nineteen sixties (Maldeniya et al, 1988). Since there is an increasing fishing pressure on neritic tuna stocks in the Indian Ocean (IOTC–WPNT09, 2019) it is imperative to carry out periodical stock assessments on key neritic tuna species. However, this paper attempts to update the status of neritic tuna fishery in Sri Lankan waters in the last two decades.

Data source

Data for this study was obtained from Indian Ocean Tuna Commission (IOTC) database. The catch data was extracted from the 'Nominal catch by species and gear, by vessel flag reporting country' (IOTC-2020-DATASETS-NCDB) and the size frequency data for neritic tuna species in Sri Lankan waters was extracted form 'Size frequency data - neritic tunas' (IOTC-2019-WPNT09-DATA09).

Results

Neritic tuna production trends

A declining trend in the contribution of the neritic tuna to the total tuna and tuna like species fishery production could be identified (Table 1).

Table 1. Percentage contribution of the neritic tuna catch to the total tuna and tuna like species fishery production.

year	Production (mt)						% of neritic tuna production
	Bullet tuna	Frigate tuna	Kawakawa	Narrow-barred Spanish mackerel	Total neritic tuna	Total tuna and tuna like species	
1997	1688.56	11496.90	11060.54	2812.65	27058.65	134537.70	20.11
2007	1595.79	7188.35	10184.21	2452.79	21421.14	134841.30	15.89
2017	1323.22	1837.692	1742.61	1620.60	6524.12	156067.50	4.18

Source: IOTC-2020-DATASETS-NCDB

In 1997, the neritic tuna contributed 20.11% to the total tuna and tuna like species production and this was 15.89% in 2007. But there was a significant further reduction in the percentage contribution in 2017 (4.18%). The total annual production of all the four neritic tuna species has largely decreased over the period. The decline in the production is sharp for frigate tuna and kawakawa than bullet tuna and narrow-barred Spanish mackerel.

A marked alteration in the percentage contribution of the neritic tuna species in the neritic tuna production could be identified (Figure 1). An increasing trend in the percentage contribution of both narrow-barred Spanish mackerel and bullet tuna could be observed though annual catches of both species were considerably decreased.

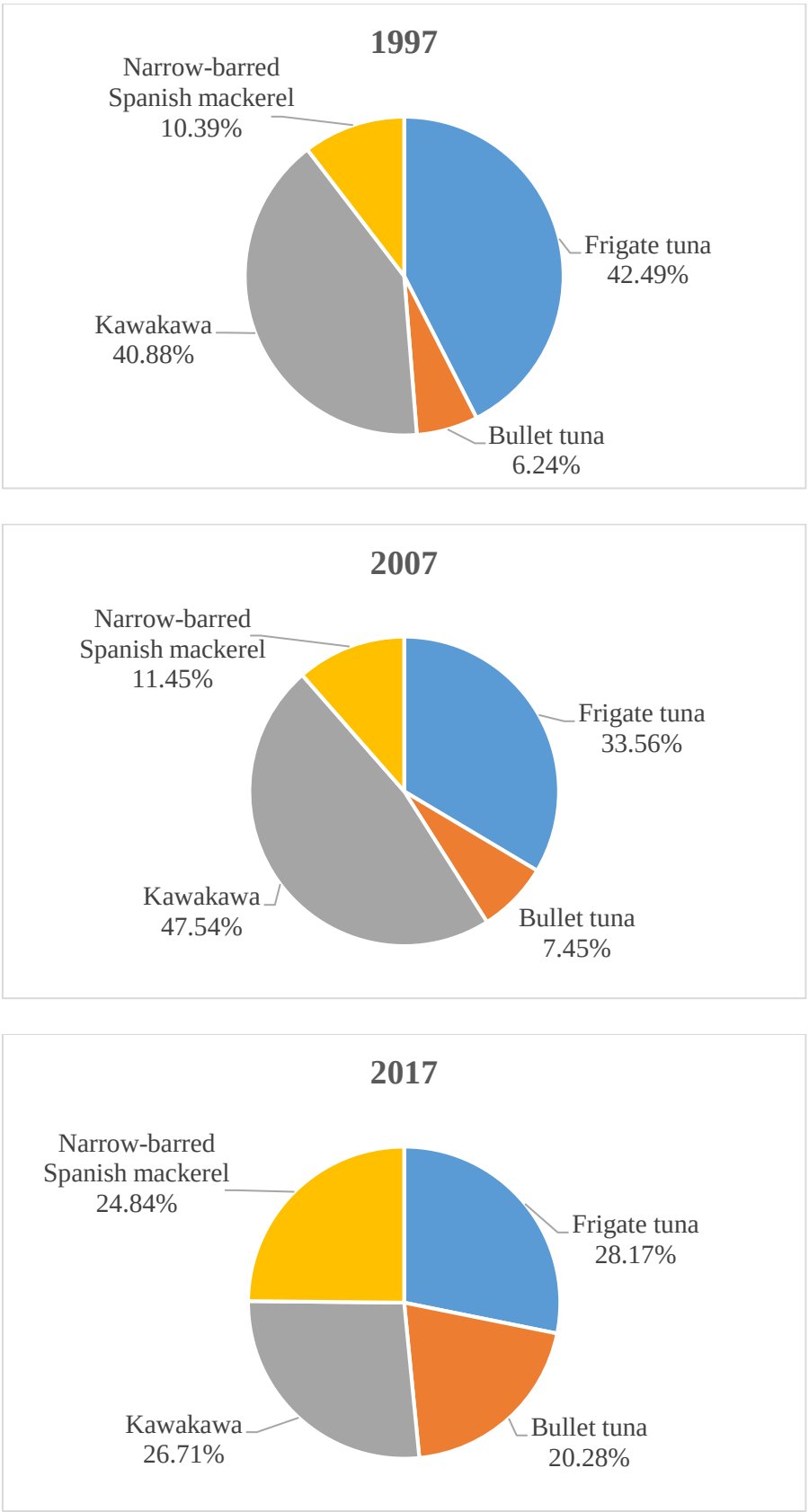
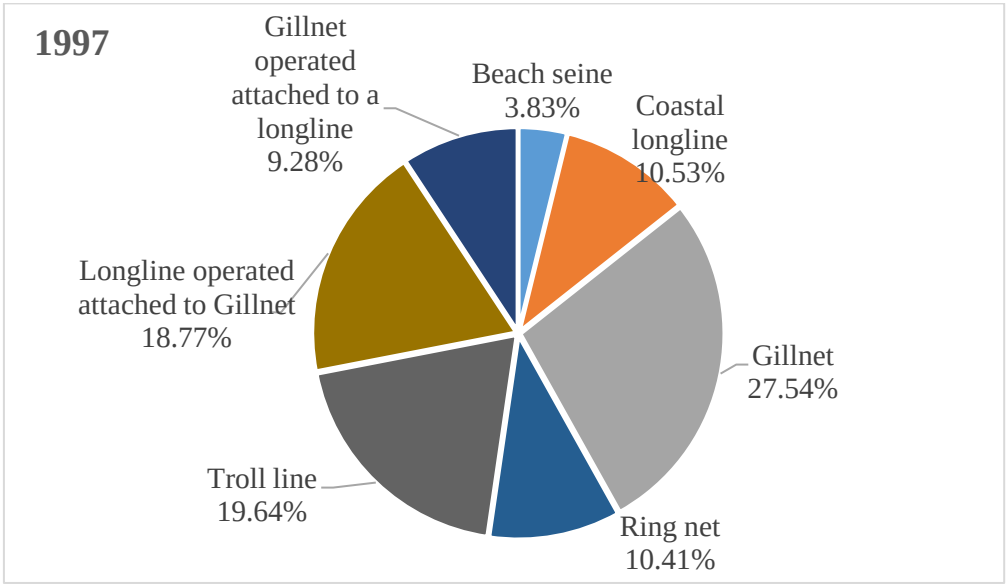
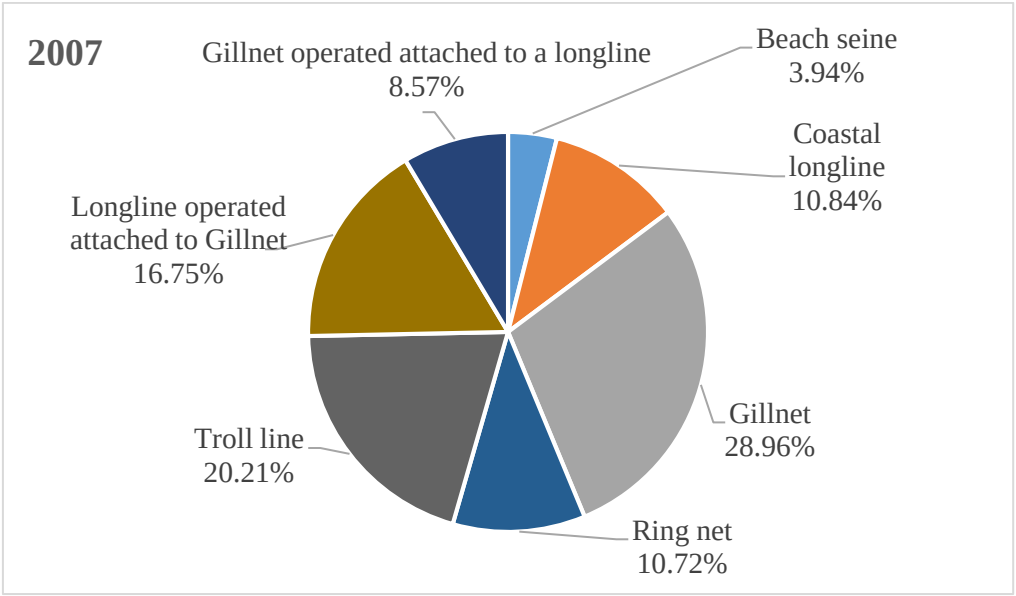


Figure 1. Percentage contribution of the neritic tuna species in to the total annual neritic tuna production.

Neritic tuna production by fishing gear.

Several fishing gears and gear combinations catch neritic tuna species in the Sri Lankan waters mainly as a by-catch (Figure 2).





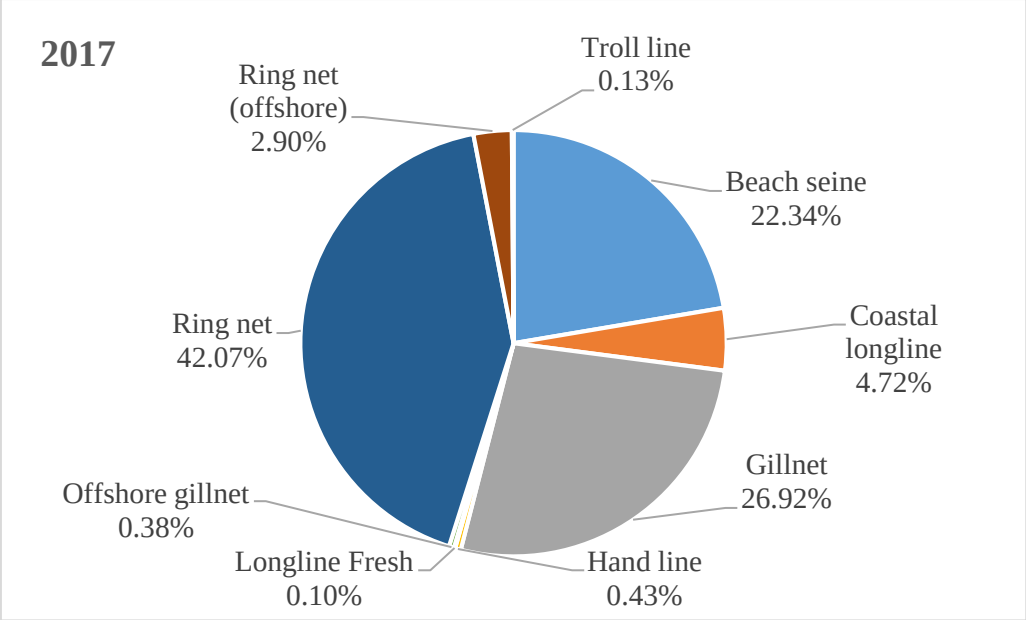


Figure 2. Neritic tuna production by fishing gear.

When comparing with 1997 and 2007 production data, the relative contribution of beach seine and ring nets in neritic tuna production show a significant increment in 2017. The percentage contribution of the gill net along remain almost unchanged during the assessed years which was at around 27%. However, the percentage contribution of the troll lines has significantly declined from 19.64% in 1997 to 0.43% in 2017. Though the percentage contribution of several gear had changed during the period of assessment, neither the usage pattern nor the specifications of these gears had altered during this period.

Length composition.

Bullet tuna (*Auxis rochei*)

The reported length range in cm (FL) in the commercial catch of bullet tuna in 1997, 2007 and 2017 were 11 – 40; 21 – 40 and 21 – 49 respectively. According to the results of the length frequency analysis for bullet tuna in the Sri Lankan waters, the dominant length class in the catch was 25 – 29 cm (FL) in 1997, 2007 and 2017 (Figure 3). The length at 50% maturity for bullet tuna in the Indian Ocean close to Sri Lanka was 23.6 cm (FL) (Jasmine, et al., 2013). According to the analysis, the highest immature percentage in the catch was recorded in 1997 which was 37.47% (Table 2). The lowest value was recorded in 2007 which was 1.80%. The average size (FL) in the catch decreased in 2017 than that in 2007.

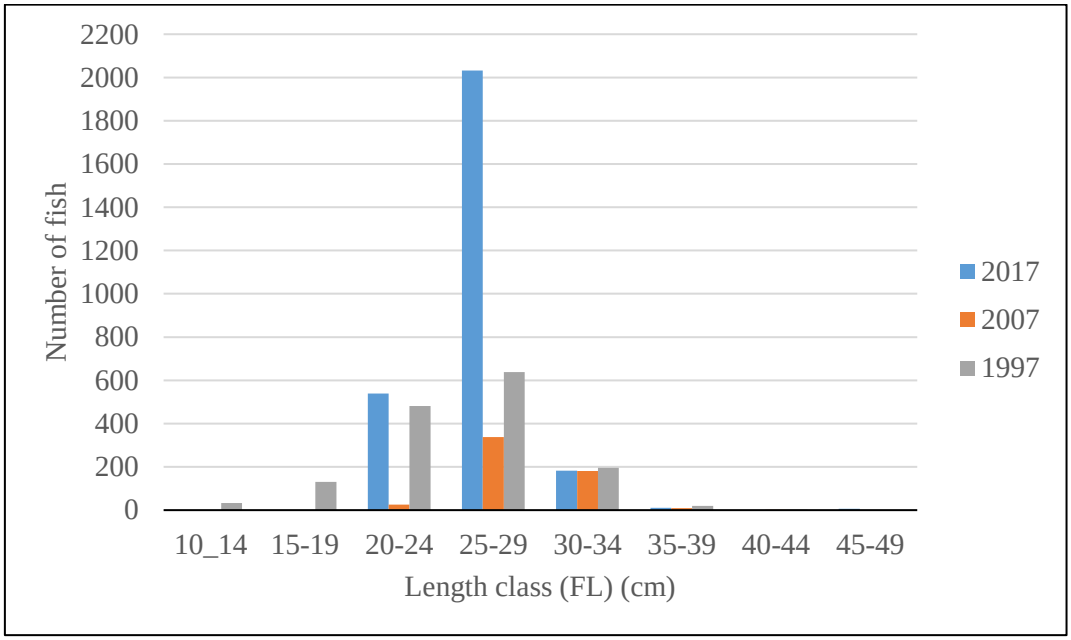


Figure 3. Length frequency distribution of bullet tuna.

Table 2. Percentage of immature fish and average size in the catch of bullet tuna.

Year	1997	2007	2017
% of immature	37.47	1.80	11.40
Average size (FL)(cm) ±SD	25.13 ± 4.60	28.72 ± 2.34	26.71 ± 2.49

Frigate tuna (*Auxis thazard*)

Length distribution (FL) in cm of the frigate tuna in the commercial catch was ranged 22 – 54 in 1997; 23 – 50in 2007 and 21 – 48 in 2017. The dominant length (FL) class in the catch was 35 – 39 in all three assessed years (Figure 4). The length at 50% maturity for Frigate tuna in the Indian Ocean close to Sri Lanka was 29.7 cm (FL) (Ghosh, et al., 2012). According to the analysis the highest immature percentage in the catch was recorded in 2017 which was 18.40% (Table 3). The lowest value was recorded in 1997 which was 5.81%. An increasing trend in the immature percentage in the catch could be identified in assessed years. The average size (FL) in the catch decreased in 2017 than that in 2007.

Table 3. Percentage of immature fish and average size in the catch of frigate tuna.

Year	1997	2007	2017
% of immature	5.81	8.30	18.40
Average size (FL)(cm) ±SD	35.52 ± 3.64	35.66 ± 3.90	34.86 ± 5.27

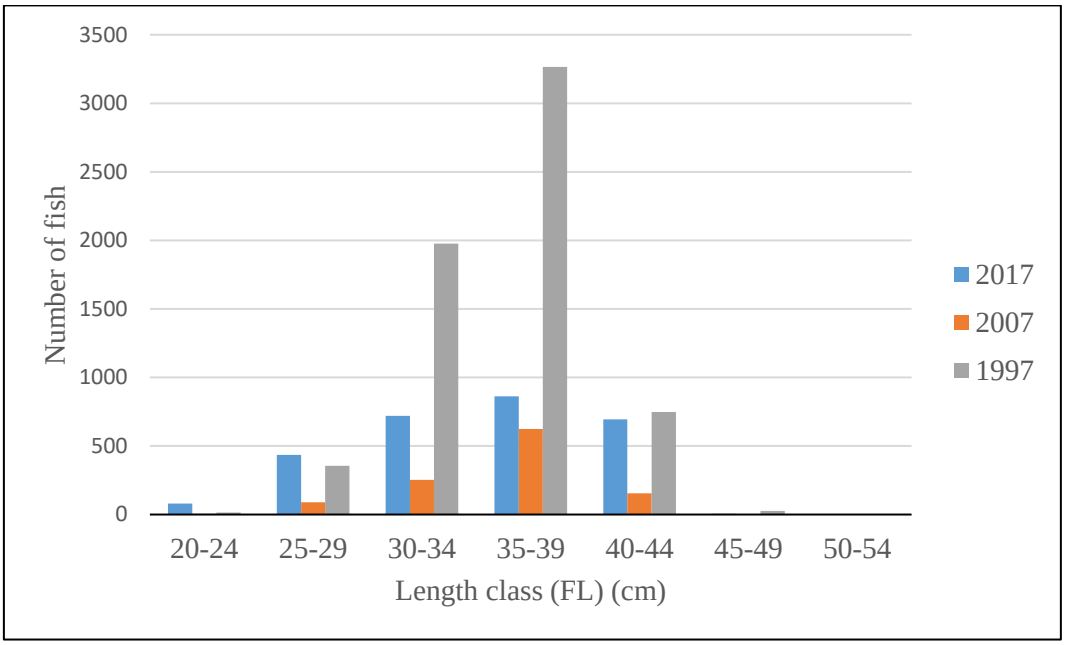


Figure 4. Length frequency distribution of frigate tuna.

Kawakawa (*Euthynnus affinis*)

Length distribution (FL) of the kawakawa in cm in the commercial catch was ranged 22 – 72 in 1997; 21 – 68 in 2007 and 21 – 71 in 2017. The dominant length (FL) class in the catch was 40 – 44 in 1997; 50 – 54 in 2007 and 40 – 44 in 2017 (Figure 5). The length at 50% maturity for Kawakawa in the Indian Ocean close to Sri Lanka was 37.7 cm (FL) (Rohit, et al., 2012). According to the analysis, the highest immature percentage in the catch was recorded in 1997 which was 27.77% (Table 4). The lowest value was recorded in 2017 which was 14.76%. A declining trend in the immature percentage in the catch could be identified in assessed years. The average size (FL) in the catch decreased in 2017 than that in 2007.

Table 4. Percentage of immature fish and average size in the catch of kawakawa.

Year	1997	2007	2017
% of immature	27.77	25.39	14.76
Average size (FL)(cm) ±SD	43.21 ± 10.94	44.18 ± 8.58	44.07 ± 6.97

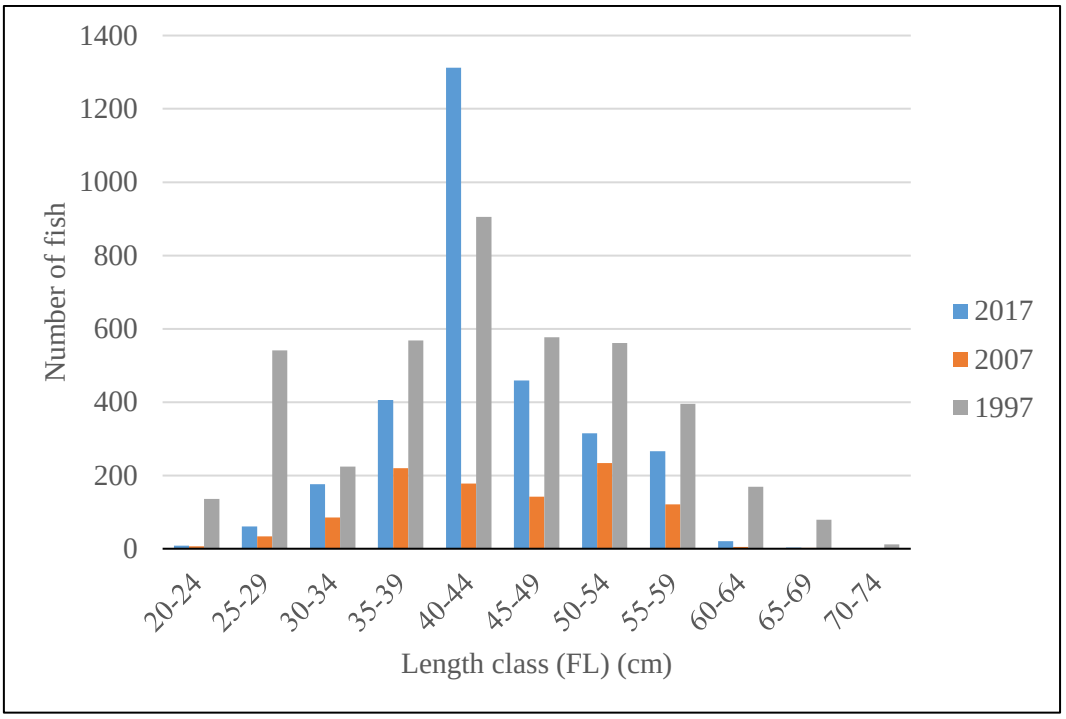


Figure 5. Length frequency distribution of kawakawa.

Narrow-barred Spanish mackerel (*Scomberomorus commerson*)

Length distribution (FL) in cm of the narrow-barred Spanish mackerel in the commercial catch was ranged 58 – 139 in 1997 and 31 – 120 in 2007. The dominant length (FL) class in the catch was 90 – 94 cm in 1997 and 80 – 84 in 2007 (Figure 6). The length at 50% maturity for Kawakawa in the Indian Ocean close to Sri Lanka was 62.5 cm (FL) (Mahesh, et al., 2012). According to the analysis the highest immature percentage in the catch was recorded in 2007 which was 0.93% (Table 5). The lowest value was recorded in 1997 which was 0.59%. The average size (FL) in the catch decreased in 2017 than that in 2007.

Table 5. Percentage of immature fish and average size in the catch of narrow-barred Spanish mackerel.

Year	1997	2007
% of immature	0.59	0.93
Average size (FL)(cm) ±SD	96.23 ± 15.40	86.45 ± 12.41

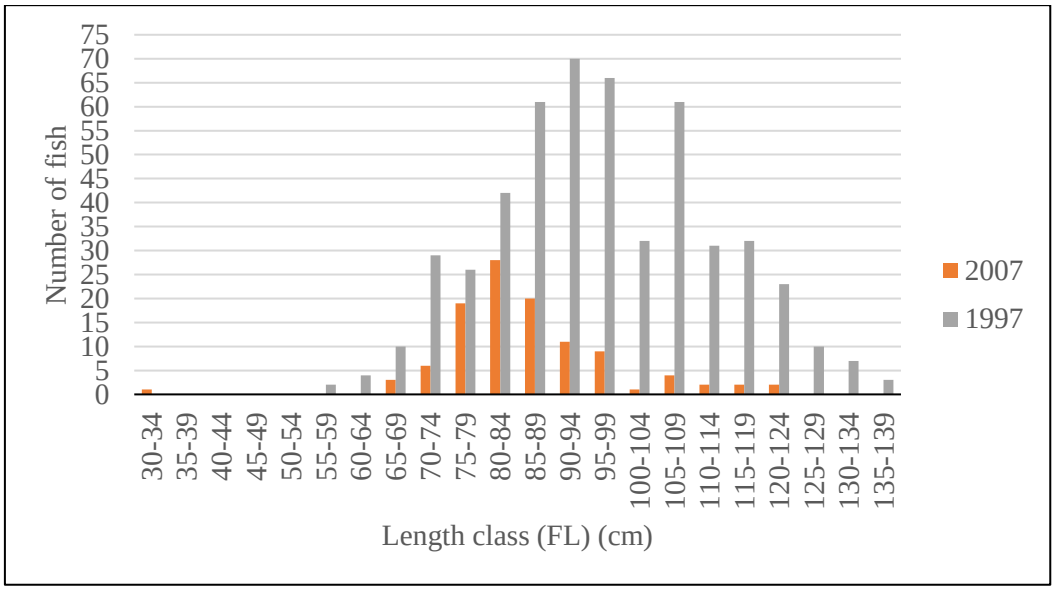


Figure 6. Length frequency distribution of Narrow-barred Spanish mackerel.

Discussion and Conclusions.

Auxis thazard (frigate tuna), *Auxis rochei* (bullet tuna), *Euthynnus affinis* (kawakawa) and *Scomberomorus commerson* (narrow- barred Spanish mackerel) are the most abundant neritic tuna species found in Sri Lankan EEZ. The neritic tuna annual catch as a group as well as individual annual catches of the four species have largely declined in last two decades. Also, the relative contribution of both frigate tuna and kawakawa in neritic tuna annual catch shows a remarkable decline. The size frequency data was moreover evident for decaling of neritic tuna stocks in the Indian Ocean. Necessary management measures should have been taken in order to rebuild the stocks and to ascertain a sustainable fishery for neritic tuna species in the Indian Ocean.

References.

Bandaranayake, K.H.K., Maldeniya, R, & Perera, H.A.C.C., (2015). *Auxis thazard; major contributor in Sri Lankan Neritic tuna fishery.* In: Fifth Session of the Indian Ocean Tuna Commission (IOTC) Working Party on Neritic Tunas (WPNT), Mahé, Seychelles Zanzibar, Tanzania, 26-29 May. (IOTC–2015–WPNT05–18).

Beverton, R.J.H. & Holt, S.J., (1957). On the dynamics of exploited fish populations. *Fisheries Investigations*, 19, pp.1-533.

Ghosh, S., Sivadas, M., Abdussamad, E. M., Rohit, P., Koya, K. P. S., Joshi, K. K., Chellappan, A., Rathinam, M. M., Prakasan, D. & Sebastine, M., (2012). Fishery, population dynamics and stock structure of frigate tuna *Auxis thazard* (Lacepede, 1800) exploited from Indian waters. *Indian J. Fish.*, 59(2): pp. 95-100.

Haputhantri, S.S.K., (2016). *Exploring gear-vessel catch efficiency of frigate tuna (Auxis thazard) in tuna fishery of Sri Lanka*. In: Sixth Session of the Indian Ocean Tuna Commission (IOTC) Working Party on Neritic Tunas (WPNT), Mahé, Seychelles, 21-24 June. (IOTC-2016WPNT06-20).

IOTC–WPNT09, (2019). Report of the 9 th Session of the IOTC Working Party on Neritic Tunas. Mahé, Seychelles, 1 – 5 July 2019. IOTC–2019–WPNT09– R[E]:80 pp. (pdf). Available at: https://iotc.org/documents/WPNT/09/Report_E

Jayasooriya, J.A.D.B. & Bandara, H.M.U., (2013). *Analysis of Catch Assessment of Tuna Fisheries in Sri Lanka.* In: Fifteenth Session of the Indian Ocean Tuna Commission (IOTC) Working Party on Tropical Tuna, San Sebastian, Spain, 23 -28 October. (IOTC–2013–WPTT15–15).

Jasmine S., Rohit, P., Abdussamad, E. M., Koya, K. P. S., Joshi, K. K., Kemparaju, S., Prakasan, D., Elayathu, M. N. K. & Sebastine, M., (2013). Biology and fishery of the bullet tuna, *Auxis rochei* (Risso, 1810) in Indian waters. *Indian J. Fish*., 60(2): 13-20.

Katurole, G. & Wadanya, J., (2011). *A study of impacts of fishing pressure on Nile perch fishery on Lake Victoria (Uganda) using fisher folk community collected data.* (PDF). Fisheries Resources Department, Uganda. Available at:< http://repository.eac.int/bitstream/handle/11671/725/A%20study%20of%20fishing%20prpressu%20on%20Nile%20perch%20fishery%20on%20Lake%20Victoria%20%28UgandU%29%

20using%20fisher%20folk%20community%20collected%20data.pdf?sequence=1&isAllowed=y>

Mahesh, V. U., Ghosh, S., Sreeramulu1, K., Hanumantha Rao, M. V. & Kumar, M. S., (2012). Fishery, biology and stock structure of the King seer, *Scomberomorus commerson* off Andhra Pradesh. *Journal of the Marine Biological Association of India*, 60(2), pp. 1 – 20.

Maldeniya, R., Moyiadeen, N.M. and Amarasiri, C. (1988). *Present status of the fishery for small tuna species, billfish and seer fish in Sri Lanka, Report of workshop on small tuna, seer fish and bill fish in the Indian Ocean,* pp. 24-37.

Muluye, T., Tekle-Giorgis, Y. & Tilahun, G., (2016). The Extent of Immature Fish Harvesting by the Commercial Fishery in Lake Hawassa, Ethiopia. *Momona Ethiopian Journal of Science (MEJS)*, V8(1), pp. 37-49.

Perera, H.A.C.C., Maldeniya, R. & Bandaranayake, K.H.K., (2014). *Importance of Neritic tuna in large pelagic fisheries in Sri Lanka*. In: Fourth Working Party on Neritic Tunas, Phuket, Thailand, 29-30 June 2014 (IOTC–2014–WPNT04–12).

Pernetta. J. C. (Ed). (1993). *Marine Protected Area Needs in the South Asian Seas Region. Volume 5: Sri Lanka. A Marine Conservation and Development Report*. IUCN, Gland, Switzerland.

Rohit, P., Chellappan, A., Abdussamad, E. M., Joshi, K. K., Koya, K. P. S., Sivadas, M., Ghosh, S., Rathinam, M. M., Kemparaju, S., Dhokia, H. K, Prakasan, D. & Beni, N., (2012). Fishery and bionomics of the little tuna, *Euthynnus affinis* (Cantor, 1849) exploited from Indian waters. *Indian J. Fish.*, 59(3), pp. 33-42.

Wijayaratne, B., (2001). *Coastal fisheries in Sri Lanka: some recommendations for future management.* United Nations University, Fisheries Training Programme, Reykjavik, Iceland.