Stomach Content of the Large Pelagic Fishes in the Bay of Bengal

Montri Sumontha[1], Praulai Nootmorn[1], Pornanan Keereerut[1], Rangkiri P.P. Krishantha Jayasinghe.[2], Nalla Jagannath[3] and Manas Kumar Sinha[4]

[1] Andaman Sea Fisheries Research and Development Center,
Department of Fisheries, Phuket 83000, THAILAND
[2] National Aquatic Resource Research and Development Agency,
Crow Island, Colombo 15, SRI LANKA
[3] Office of the Zonal Director, Visakhapatnam Base of Fishery Survey of India,
Fishing Harbor, Beach Road, Vusakhapatnam-530001, INDIA
[4] Port Blair Base of Fishery Survey of India, P.O.Box 46, Phoenix Bay, Port Blair, INDIA

Abstract

Investigation of stomach contents of apex predator; frigate tuna (*Auxis thazard*), skipjack tuna (*Kasuwonus pelamis*), yellowfin tuna (*Thunnus albacares*), bigeye (*Thunnus obesus*) and swordfish (*Xiphias gladius*) were undertaken during November to December 2007. These fishes were caught in the Bay of Bengal with pelagic longline and drift gillnet from the survey cruise by MV. SEAFDEC.

Thirty five percent of 68 stomach samples of tuna and tuna-like species were found diet. The diet content were reported cephalopod (60.70% by weight and 44.83% by number), fish (38.85% by weight, 5.75% by number), and parasite (0.45% by weight, 49.42% by number). Prey fish composed of 3 families; Ostraciidae, Bramidae and Diretmidae, and 1 unidentified fish. Cephalopod was represented by Teuthoidea and *Histioteuthis celetaria pacifica*, Octopoda. Parasite was reported Nematode (black and white) and Digenea. Diet data were compared between surface and deep swimmer predators, the result showed higher the number of prey fish and parasite from deep swimmers (4.79 prey fish and 5.07 parasite per stomach) than that from surface swimmers (1.62 prey fish and 1.15 parasite per stomach).

Community of predator, prey and parasite was categorized into 3 assemblages upon species of such components and habitat (depth of water) of those species. It was found significant differences between groups. Groups B and C had the highest total number of taxon whilst the highest average number of parasite was found in group B, followed by groups C and A.

The preliminary structure of tuna trophic ecology in the Bay of Bengal was explained from the result of the present study. Future development on commercial deep-water fisheries and the taxonomy and field guide of deep-sea fishes and cephalopod beak have been suggested for the study in the Bay of Bengal.

Introduction

The predator-prey interactions play an important part in the structure and the dynamics of multispecies communities. Facing the dramatic increase of the catches of tuna and related species in the Indian Ocean, especially the eastern Indian Ocean, it becomes necessary to assess the impact of the fisheries on the pelagic ecosystems. The implement of research activities leading to a better knowledge of trophic ecology of apex predators will provide such an ecosystem point of view that has to be considered nowadays in the high seas fisheries management.

Feeding studies of tunas and sharks have already been conducted in the western Indian Ocean during the THETIS program (Potier *et al.*, 2004) whereas the tunas feeding habit in the eastern Indian Ocean is still rarely studied, only the reports on stomach content of tropical tunas in the Andaman Sea (Nootmorn *et al.*, 2007 and Panjarat, 2006) are available.

. The purpose of this study considers on the stomach content of large pelagic fish, apex predator, in the Bay of Bengal.

Materials and Methods

On Board

During M.V. SEAFDEC cruise two fishing gears, namely pelagic longline and drift gillnet, were operated for large pelagic fish catching in 3 areas of the Bay of Bengal (Fig. 1); area A (Bangladesh, latitude 16°N-19°N, longitude 88°E-91°E), area B (Indian, latitude 9°N-14°N, longitude 82°E-85°E) and area C (Myanmar, latitude 9°N-13°N, longitude 95°E-97°E). Large pelagic fish sample from pelagic longline and drift gillnet fishing were collected where the sampling sites are presented in table 1. Sixty eight fish samples comprised mainly 28 skipjack tuna (*Kasuwonus pelamis*), followed by 15 swordfish (*Xiphias gladius*), 10 frigate tuna (*Auxis thazard*), 7 kawakawa (*Euthynnus affinis*), 5 yellowfin tuna (*Thunnus albacares*) and 3 bigeye tuna (*Thunnus obesus*). The entire stomach was removed from the freshly caught fish when hauled on board. Sizes of the predator in fork length (FL,cm) and weight (kg) were recorded for each fish. The collected stomach was put in a sealed plastic bag and stored in M.V.SEAFDEC's freezer at -20°C. A label with the main characteristics was enclosed with the bag.

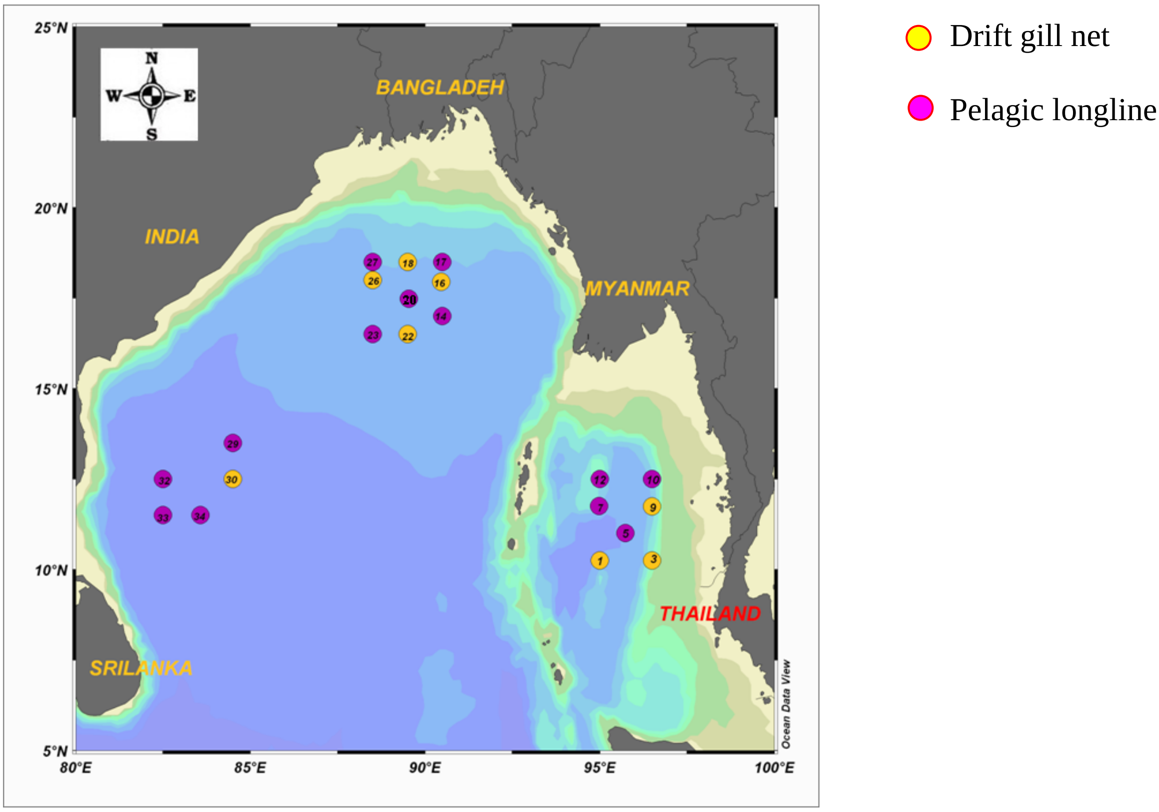

Figure 1 Map of pelagic longline (PLL) and drift gill net (DGN) operated in the Bay of Bengal.

Table 1 The sampling site in the Bay of Bengal.

Station	Operation	Date	Time	Lat	Long
5	PLL1	10-11/Nov/07	18.20	11°05'.80 N	095°41'.80E
7	PLL2	11-12/Nov/07	18.20	11°46'.00 N	094°58'.90E
10	PLL3	13-14/Nov/07	17.46	12°34'.30 N	096°26'.70E
12	PLL4	15-16/Nov/07	17.31	12°30'.30 N	094°59'.70E
14	PLL5	17-18/Nov/07	17.31	16°55'.60 N	090°25'.90E
17	PLL6	19-20/Nov/07	17.32	18°31'.10 N	090°26'.70E
20	PLL7	21-22/Nov/07	18.00	17°31'.50 N	089°28'.20E
23	PLL8	23-24/Nov/07	17.31	16°30'.70 N	088°24'.50E
27	PLL9	25-26/Nov/07	17.30	18°30'.40 N	088°28'.30E
29	PLL10	28-29/Nov/07	18.03	13°30'.00 N	084°30'.10E
32	PLL11	1-2/Dec/07	18.27	12°32'.90 N	082°24'.90 E
33	PLL12	2-3/Dec/07	18.00	11°31'.80 N	082°26'.10 E
34	PLL13	3-4/Dec/07	18.28	11°29'.60 N	083°28'.10 E
1	DGN1	6-7/Nov/07	17.55	10°18'.60 N	095°00'.30 E
3	DGN2	7-8/Nov/07	18.21	10°14'.80 N	096°29'.40 E
9	DGN3	12-13/Nov/07	18.54	11°45'.20 N	096°30'.00 E
16	DGN4	18-19/Nov/07	18.49	17°59'.30 N	090°32'.00 E
18	DGN5	20-21/Nov/07	17.45	18°28'.00 N	089°29'.00 E
22	DGN6	22-23/Nov/07	18.38	16°30'.00 N	089°30'.90 E
26	DGN7	26-27/Nov/07	17.30	18°03'.10 N	088°27'.40 E
30	DGN8	29-30/Nov/07	17.57	12°27'.40 N	084°23'.70 E

Remark: PLL= Pelagic longline, DGN= drift gill net

At the Laboratory

The stomachs were defrosted before analysis in three steps.

1. The stomach content was sorted into large categories as fishes, cephalopods or parasite.

2. The different items constituting the categories were sorted and counted for each, remarkable organ are used to determine the number of item in the stomach such as upper or lower beaks of cephalopods. Specimens of fish were preserved in a 10% buffer formalin solution for 24 hour then change to 70% alcohol. However the beaks of the cephalopods were kept in 70% alcohol at the initial step to prevent decalcification.

3. Prey and other item were identified to group, family and, whenever possible, to species level. The identification of fishes was based on descriptions given in a variety of FAO Volume 2, 4, 5 and 6 (2001a, 2001b, 2001c and 2001d), cephalopods and beak of cephalopod was base on Clarke (1962 and 1986) and Kubodera (2003). The parasite was identified to group based on Smith *et al.* (2007).

Analysis of full and empty stomachs was calculated in percentage of each taxon/group of tunas. Cluster analysis (Kruskal and Wish, 1978) was carried out based on a Bray-Curtis similarity matrix of appropriately transformed species abundance data (only number of prey taxon/group). Analysis of similarities (ANOSIM) and Similarity percentages (SIMPER) were used for analysis of tunas and prey species similarity and species ranking of average dissimilarity between assemblages, respectively (Carr, 1997).

Results and Discussion

Size Distribution

The sizes distribution (length and weight) of frigate tuna from area A and kawakawa from areas A and C, caught with drift gillnet, ranged in length 30.5 to 39.8 cm and 17.3 to 41.0 cm, respectively and in weight 0.56 to 1.15 kg and 0.07 to 1.05 kg, respectively (Figs. 1A-1D). Kawakawa in area C is smaller than fish caught from area A. Skipjack tuna caught with drift gillnet in areas A, B and C was between 17.6 to 70.0 cm in length and 0.07 to 6.35 kg in weight (Figs. 1E-1F). Skipjack tuna caught from area B is bigger sizes than areas A. Yellowfin tuna was caught with pelagic longline in area A and drift gillnet in area C, range of sizes was reported 17.30 to 129.0 cm and 0.06 to 38 kg (Figs. 1G-1H). Fish caught with longline is bigger sizes than fish from drift gillnet fishing, the stomach content was found only fish from drift gillnet fishing in area C. Bigeye tuna was caught with drift gillnet in areas A and C, range of sizes was reported 24.4 to 46.0 cm and 0.22 to 2.0 kg (Figs. 1I-1J). This species was found only juvenile fish. Size range of swordfish was 120 to 280 cm and 5 to 100 kg (Figs. 1K-1L), this species was caught with both gears in areas A, B and C. Size of fish from area C was the biggest, followed by fish from area A and B.

Stomach Content

From 68 stomach samples of tunas and tuna-like species, it was found 44 empty stomachs (Table 2). All of kawakawa (7 specimens) was found empty stomachs, the rest fish samples which constituted 35% of the total fish samples were found prey and parasite in their stomachs. The stomach content was identified to be 3 groups, namely cephalopod (60.70% by weight and 44.83% by number), fish (38.85% by weight and 5.75% by number), and parasite (0.45% by weight and 49.42% by number) (Fig. 3). This study found the percentage of prey and parasite in the stomach (35 %) less than the previous study from Nootmorn *et al.* (2007) in the Andaman Sea. They reported 94% of non-empty stomach of tunas and tuna-like species from tuna longline fishing in the Andaman Sea, the main forage of tuna were reported cephalopods, followed by fishes and deep-sea shrimps.

Usually it is difficult to collect tuna's stomach content from commercial fisheries, especially in the eastern Indian Ocean. As tunas from longline fishing were eviscerated, and from the purse seine fishing most of tunas's stomach samples were empty this might be due to that the fishing times were in very early morning when tunas had not yet feeding (Panjarat, 2006; Nootmorn *et al.*, 2001).

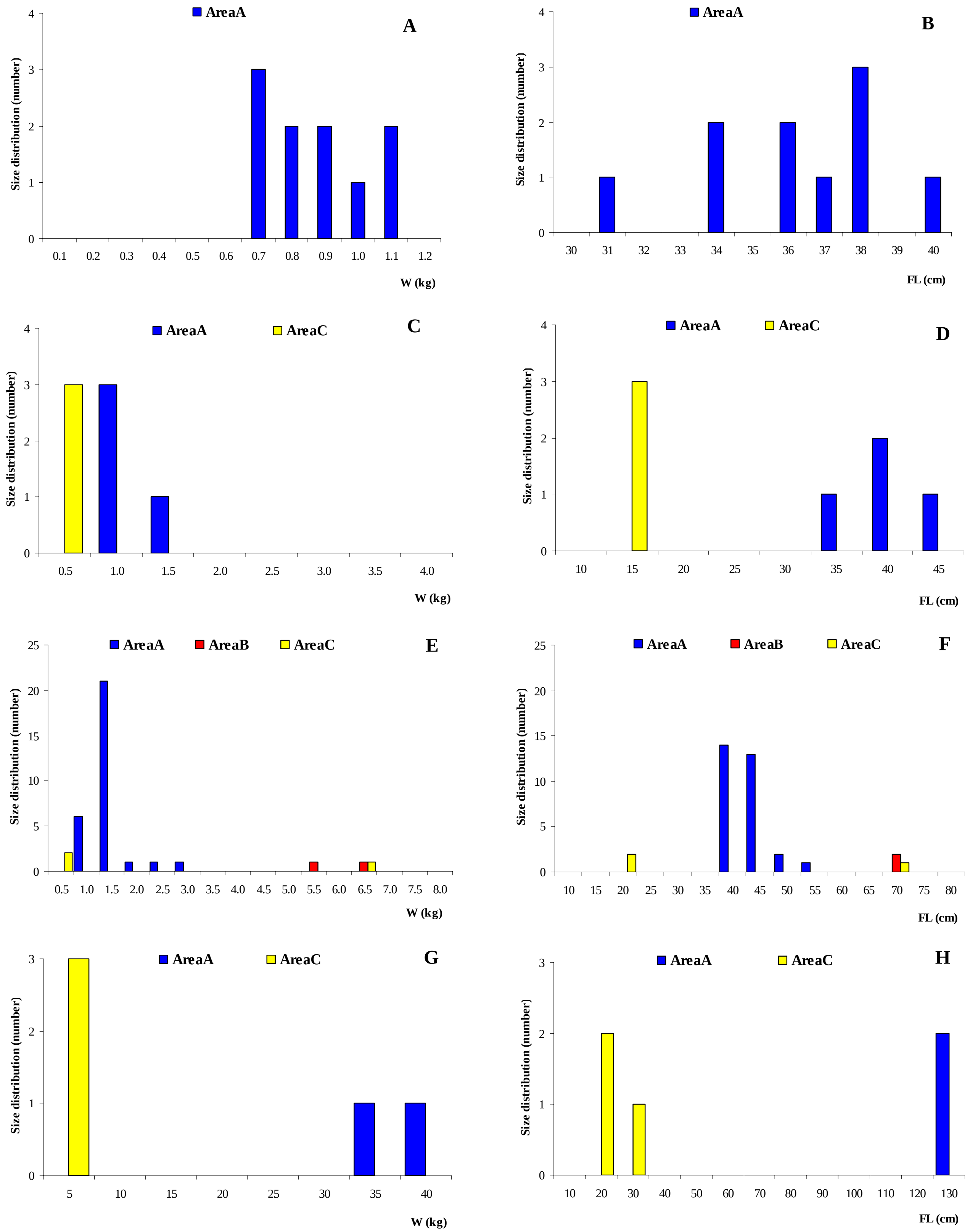

Figure 2 Size distribution of frigate tuna (A and B), kawakawa (C and D), skipjack tuna (E and F), yellowfin tuna (G and H), bigeye tuna (I and J) and swordfish (K and L).

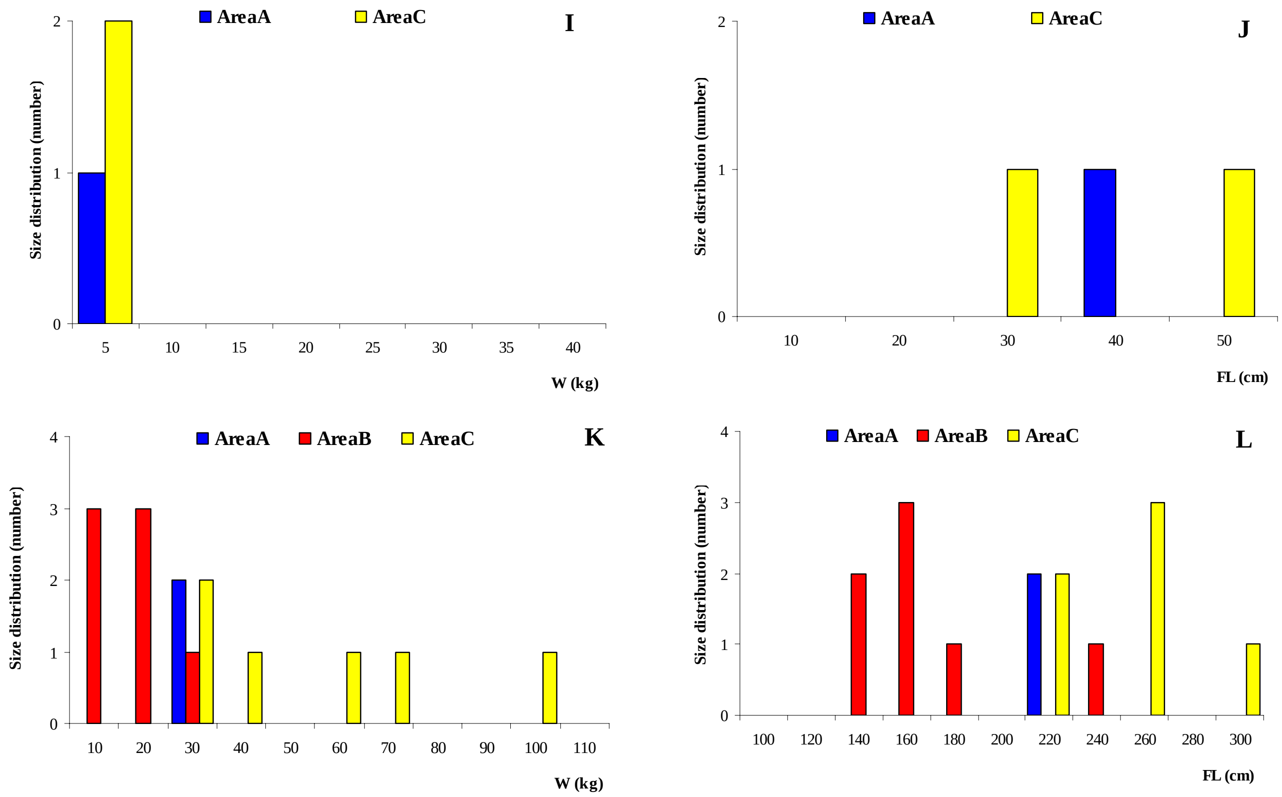

Figure 2 cont.

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Table 2 Tunas and tuna like species samples with stomach content observation.

Tunas and tuna like species	Stomach		Total
	Non-empty	Empty	
Auxis thazard	5	5	10
Euthynnus affinis	0	7	7
Kasuwonus pelamis	3	25	28
Yellowfin Tuna	4	1	5
Bigeye Tuna	1	2	3
Swordfish	11	4	15
Total	**24**	**44**	**68**

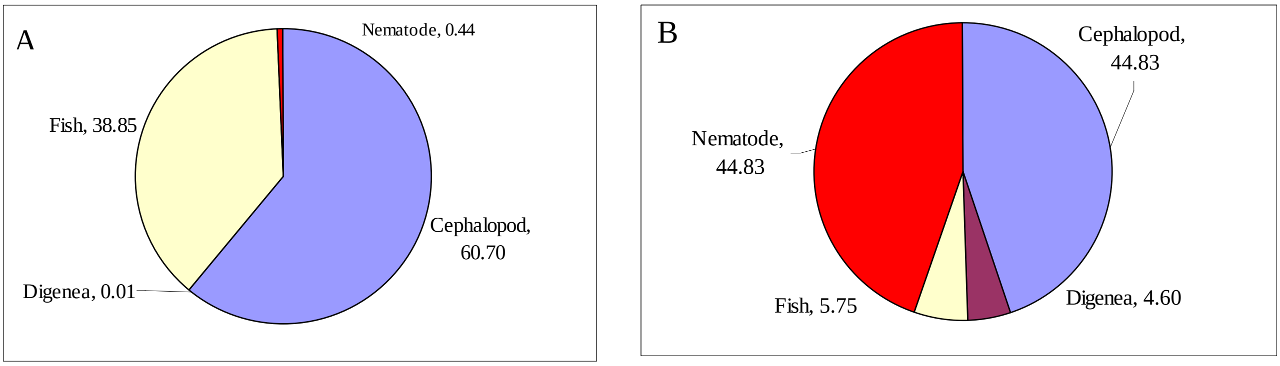


Figure 3 Percentage of prey and parasite composition of tunas and tuna-like species in the Bay of Bengal (A = in weight and B = in number).

Prey fishes were identified 3 families, Bramidae, Ostraciidae, Diretmidae and 1 unidentified fish (Figs. 4A-4D). They contributed, respectively, 13.49, 0.37, 0.11 and 24.88% by weight to the total content.(Remarkable, this study found Indo Pacific mackerel and round scad in stomach of tunas; we checked from the fishing operations, these fishes were used as bait for catching pelagic fishes and so they were excluded from calculation of diet composition.) Cephalopod was identified 2 families and 1 species, namely Teuthoidea and Octopodidae. Their compositions were Teuthoidea (include beak, pen and eye) 60.69% and beak of *Histioteuthis celetaria pacifica*, Octopoda 0.01% of the total sample weight (Figs. 4E and 4F).

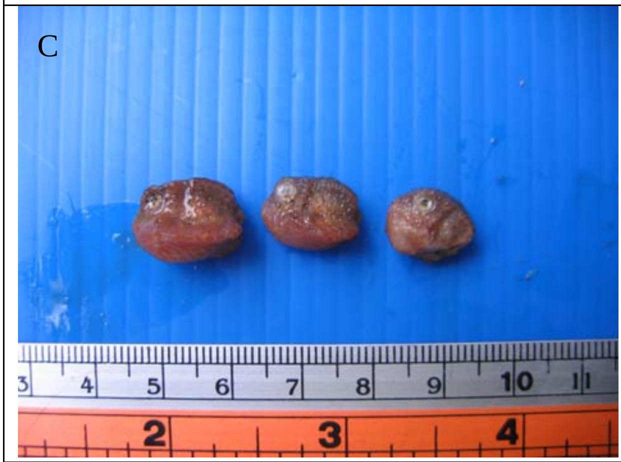
Parasite was identified to be 2 groups, namely Nematode (black and white Nematodes) and Digenea which constituted 0.44% and 0.01% of the total sample weight. Figs. 5A, 5B and 5C are illustration of parasites.

The diet composition in number was found cephalopod as the main composition, followed by fishes and Nematode (Fig. 3B). Cephalopod was observed beak of Tuethoidae as the main composition, followed by beak of *Histioteuthis celetaria pacifica*, Octopoda (count all upper and lower beaks). Whilst, the fish component was represented by Ostraciidae, Bramidae, Diretmidae and 1 unidentified fish (1.72, 0.57, 0.57 and 2.87 % of total number of samples, respectively).

The result from this study showed that cephalopod (in number and weight) and fish (in number and weight) were the main prey of tunas in the Bay of Bengal, the same as the previous study in the Andaman Sea (Nootmorn *et al.*, 2007).

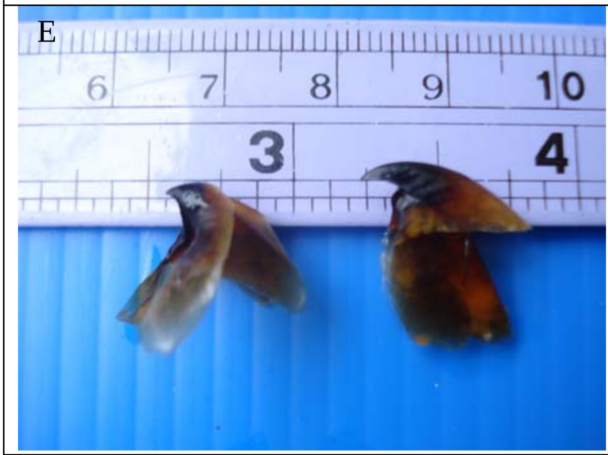
Bramidae

Diretmidae

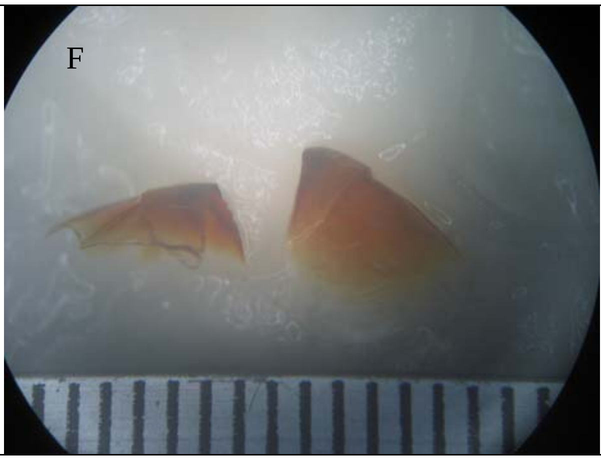


Ostraciidae

Piece of fish



Beak of Teuthoidea



Beak of *Histioteuthis celetaria pacifica*, Octopoda

Figure 4 Fish and cephalopod found in stomach content of tunas and tuna-like species in the Bay of Bengal.

Black Nematode

White Nematode

Digenea

Figure 5 Parasite of tunas and tuna-like species in the Bay of Bengal.

Table 3 show the stomach content of frigate tuna, skipjack, yellowfin tuna, bigeye tuna and swordfish.

Frigate tuna caught in area A, stomach content was found 2 groups, namely Teuthoidea and fish. This species is epipelagic in neritic and oceanic waters. Feeds on small fish, squids, planktonic crustaceans (megalops), and stomatopod larvae. Because of their abundance, they are considered an important element of the food web, particularly as forage for other species of commercial interest. Preyed upon by larger fishes, including other tunas (Fishbase, 2008).

Skipjack tuna was found Teuthoidea as the main forage, followed by fish (unidentified species) and 2 groups of parasites, Digenea and Nematode (black). Skipjack tuna caught from area A was found only Digenea in the stomach, whereas in area B the diet composition composed of Teuthoidea and unidentified fish, in area C it was found Teuthoidea as forage and Nematode (black) as parasite. Fishbase (2008) reported that skipjack tuna was found in offshore waters; larvae restricted to waters with surface temperatures between 15°C to 30°C. Exhibit a strong tendency to school in surface waters with birds, drifting objects, sharks, whales and may show a characteristic behavior like jumping, feeding, foaming, etc. Feed on fishes, crustaceans, cephalopods and mollusks; cannibalism is common. Spawn throughout the year in the tropics, eggs released in several portions. Preyed upon by large pelagic fishes. Also taken by trolling on light tackle using plugs, spoons, feathers, or strip bait.

Juvenile of yellowfin tuna caught in area A, stomach content was found 2 groups, namely Teuthoidea and unidentified fish. FAO (2001c) reported yellowfin tuna in the western central Pacific, as oceanic species; large fish found below the thermocline. They feed on many kinds of organisms, particularly fishes, squids and crustaceans. Nootmorn *et al.* (2007) reported this species were caught in the Andaman Sea at depth of water ranging from 41-80 m. Size of fish in length and weight was 120-138 cm and 20-31 kg. Stomach content was found fish (unidentified fish (1), Ostraciidae), cephalopod (Octopoda) and deep-sea shrimp (Aritridae). Panjarat (2006) reported the diet of this species, in the same area, composed of fishes (Tetraodontidae, Priacantidae, Balistidae and Syngnathidae) and cephalopod (Loliginidae and Teuthoidea). The previous studies reported high diversities of prey than this study because those fish samples were from pelagic longline fishing.

Juvenile of bigeye tuna caught in area C, the forage comprised of Teuthoidea, Ostracidae, Diretmidae and unidentified fish. Fishbase (2008) reported that this species occur in areas where water temperatures range from 13°-29°C, but the optimum is between 17° and 22°C. Variation in occurrence is closely related to seasonal and climatic changes in surface temperature and thermocline. Juveniles and small adults school at the surface in mono-species groups or mixed with other tunas, may be associated with floating objects. Adults stay in deeper waters. Feed on a wide variety of fishes, cephalopods and crustaceans during the day and at night.

Swordfish was found 6 groups in the stomach content; the main composition was Teuthoidea, followed by Bramidae, unidentified fish, Octopoda *(Histioteuthis celetaria pacifica*), Nematode (black) and Nematode (white) in all areas. In area A the stomach content was found 4 groups; Teuthoidea, Bramidae, unidentified fish and Nematode (black), area B found 4 groups; Teuthoidea, Octopoda, Nematode (black) and Nematode (white), whilst area C found 3 groups; Teuthoidea, Nematode (black) and Nematode (white). Swordfish are widely distribution throughout the study area at water depth range 10-132 m. Nootmorn *et al.* (2007) reported the diet of this species composed of cephalopod (Teuthoidea, Argonautidae and Octopoda), deep-sea shrimp (Aritridae) and fish (*Thyrsiles atun, Cubiceps caeruleus,* Gempylidae). Their study found higher diversity of prey however the groups of prey were the same as this study. FAO (2001c) reported that swordfish in the western central Pacific are an epi- and mesopelagic, oceanic species, usually found in surface waters until 550 m. Adults are opportunistic feeders, known to forage for their food from the surface to the bottom over a wide depth range. They feed on pelagic squids wherever abundant, that is same as this study.

Table 3 Stomach content of tuna and tuna-like species by Area in the Bay of Bengal.

Tunas	Area	Group	Family	Weight (gram)	Number
Frigate tuna	**A**	Cephalopod	Teuthoidae	10	1
		Fish	Pieces of fish	40.05	-
Skipjack tuna	**A**	Digenea	Digenea	0.08	8
	B	Cephalopod	Teuthoidea	15.1	2
		Fish	unidentified	53	2
	C	Cephalopod	Teuthoidea	2.83	7
		Nematode	Nematode(black)	0.07	5
Yellowfin tuna	**A**	Cephalopod	Teuthoidea	6.67	1
		Fish	unidentified	10.3	1
Bigeye tuna	**C**	Cephalopod	Teuthoidea	25.8	2
		Fish	Diretmidae	0.68	1
		Fish	unidentified	1.07	1
		Fish	Ostraciidae	2.23	3
Swordfish	**A**	Cephalopod	Teuthoidea	57.49	26
		Fish	Bramidae	81	1
		Fish	unidentified	45	1
		Nematode	Nematode(black)	0.96	18
	B	Cephalopod	Teuthoidea	32.09	25
		Cephalopod	Octopoda	0.07	1
		Nematode	Nematode(black)	0.3	3
		Nematode	Nematode(white)	0.21	3
	C	Cephalopod	Teuthoidea	214.48	13
		Nematode	Nematode(black)	1.03	41
		Nematode	Nematode(white)	0.06	8
Total				**600.57**	**174**

Table 4 show the stomach content of tunas by type of fishing gears. Stomach content from drift gillnet fishing was found 3 families of prey and 2 groups of parasite were identified. Most of these prey items were Teuthoidea (14 individuals), followed by Ostraciidae (3 individuals), Diretmidae (1 individuals) and unidentified fish (3 individuals), whilst the parasite was found Digenea (8 individuals) and Nematode (black) (7 individuals). On average, 1.62 prey and 1.15 parasite were found per stomach. Cephalopod dominated the diet by occurrence and number. Stomach content from longline fishing was found 3 families of prey and 2 groups of parasite were identified. Most of these prey items were Teuthoidea (63 individuals), followed by Bramidae (1 individuals) and unidentified fish (2 individuals), whilst the parasite was found Nematode (black) (60 individuals) and Nematode (black) (11 individuals). On average, 4.79 prey and 5.07 parasite were found per stomach. Cephalopod dominated the diet by occurrence and number, the same as that of stomach from drift gillnet fishing.

Table 4 Stomach content of tuna and tuna-like species by fishing gears in the Bay of Bengal.

Fishing Gears	Tunas	Prey						Parasite		
		Cephalopod		Fish						
		Octopodidae	Teuthodide	Bramidae	Diretmida	Ostraciida	non-identified	Nematode (white)	Nematode (black)	Digenea
Drift gillnet	Bigeye tuna		2		1	3	1			
	Skipjack		9				2		5	8
	Swordfish		2						2	
	Frigate tuna		1							
Longline	Swordfish	1	62	1			1	11	60	
	Yellowfin tuna		1				1			

Community Structure of Tunas, Prey and Parasite

Ordination analysis categorized tunas, prey and parasite taxon/group into 3 assemblages (Fig. 6 and Table 5). Group A composed of Digenea in stomach of skipjack caught with drift gillnet in water depth range 10-26 m in area A, group B found Nematode (black) in stomach of skipjack tuna and swordfish from drift gillnet fishing in water depth range 10-26 m in areas B and C, and swordfishes from pelagic longline fishing in water depth range 80-132 m in all areas. Group C found Teuthoidea from bigeye tuna caught with drift gillnet in area C (water depth range 10-20 m), frigate tuna caught with drift gillnet in area A (water depth range 10-20 m), yellowfin tuna caught with pelagic longline in area A at water depth 69 m, swordfishes from pelagic longline fishing in all areas in water depth range 60-110 m. Among these 3 groups, group C was the highest in number and diversity of predator. ANOSIM showed significant differences between groups (R =1; groups A and B, A and C ; R = 0.908 group B and C). Table 5 showed the species list and average number of prey and parasite based on a breakdown of average similarity for each assemblage. Groups B and C had the higher total number of prey and parasite group more than group A. The result present abundance in number of parasites and cephalopod, it will be one indicator for grouping the community of large pelagic fish in the Bay of Bengal. Nootmorn *et al.* (2007) reported that the community of tunas and prey taxon in the Andaman Sea was categorized into 5 assemblages, group 1 composed of unidentified fish (1), Teuthoidea, Octopoda, Gempylidae and *Cubicepe caeruleus* in stomach of swordfish and sail fish in Thai waters, group 2 found Teuthoidea, Argonautidae, Octopoda, Aristridae and Carangidae in stomach of blue marlin, sailfish, yellowfin tuna in Thai waters and swordfish in Myanmar waters. Group 3 found Aristridae, Teuthoidea, *Cubicepe caeruleus*, other cephalopod, Octopoda from swordfish in Myanmar waters and swordfish and yellowfin tuna in Thai waters. Group 4 found only unidentified fish from sailfish caught in Myanmar waters. Group 5 found *Thyrsiles atun* and *Gympylus serpens* in stomach of sail fish and sword fish in Thai waters. Their study showed higher assemblages and diversity of prey than this study. Type of prey in the previous study is key to divide the groups of fish community because the previous study didn't identify the group of parasite and so it was not included in the analysis.

Table 5 Breakdown of average similarity between group 1, 2, 3 into contributions from taxon list and average number of prey and parasite in the Bay of Bengal.

Prey Taxon	Group A	Group B	Group C
Teuthoidea		1.5	4
Nematode (black)		8.25	0.09
Digenea	1.6		
Number of predator	5	8	11

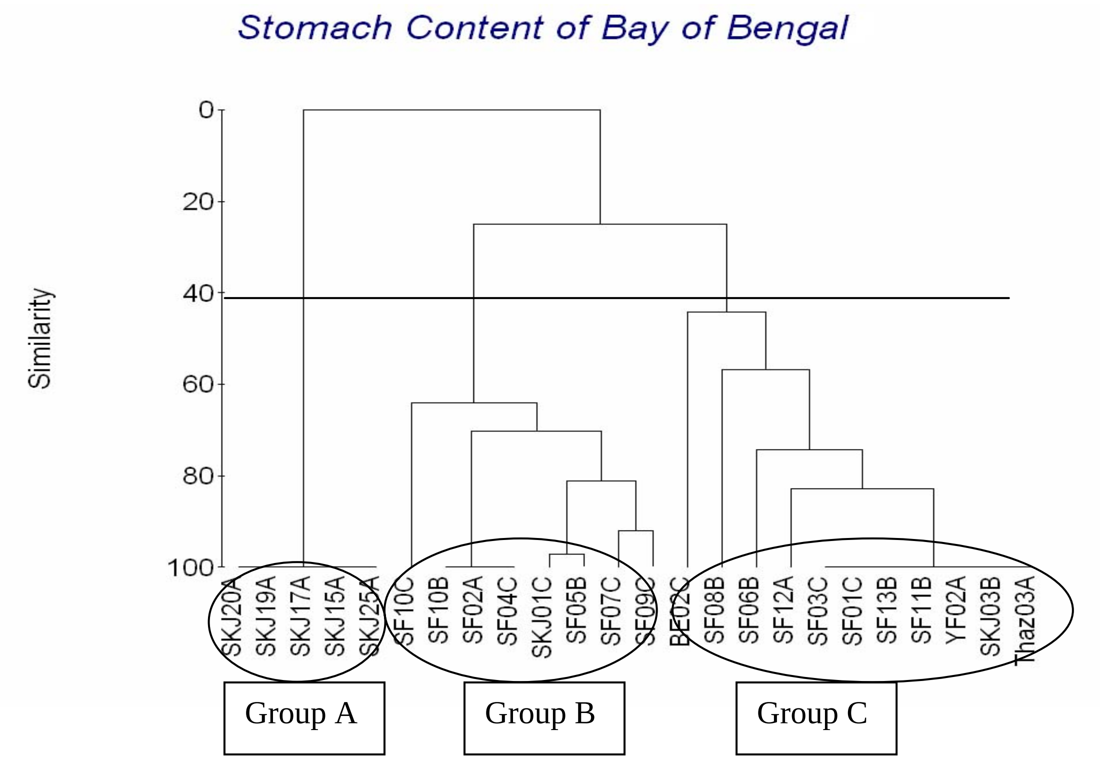


Figure 6. Dendrogram using group-average linking on Bray-Curtis taxon similarities. The 3 groups defined at arbitrary similarity level of 40 % are indicated. A, B and C fill in the behind of label samples, as Bangladesh, Indian and Myanmar waters.

Conclusion and Future Direction

The vertical distribution of large pelagic fish, tunas and tuna-like is known to differ. The depth of hook level in present study suggests that the distribution patterns of all tunas overlap considerably. Frigate tuna and kawakawa are neritic tuna, they distributed in the depth of water range 10-30 m. Skipjack tuna distributed in all areas at the depth of water range 10-30 m. Yellowfin tuna distributed off Bangladesh and Myanmar waters at depth of water range 10-69 m. Whereas, juvenile of bigeye tuna was found in the same areas of yellowfin tuna in the depth of water range 10-26 m. Swordfish exhibit horizontal and vertical distribution widely over the Bay of Bengal (10-132 m). In fact, all these species were caught with drift gillnet and pelagic longline in the Bay of Bengal, diet of these fishes occurred in 35 % of total stomach samples. The prey composition was identified to be 2 groups, namely fish and cephalopods. Parasite was identified to be 2 groups, Nematode and Digenea. The forage of tuna in the entire study area was mainly cephalopods, followed by fish. Prey fish composed of 3 families; Ostraciidae, Bramidae, Diretmidae, and 1 unidentified fish. Cephalopod was identified 1 family and 1 species, namely Teuthoidea and *Histioteuthis celetaria pacifica,* Octopoda. Diet data were compared between surface and deep swimmer predators caught with drift gillnet and pelagic longline, respectively. The result showed higher the number of prey and parasite from deep swimmers (4.79 prey and 5.07 parasite per stomach) than surface swimmers (1.62 prey and 1.15 parasite per stomach). Cephalopod dominated the diet by occurrence and number in predator stomach from both gears.

Community of predator, prey and parasite was categorized into 3 assemblages and significant differences between groups, group A composed of Digenea in stomach of skipjack caught with drift gillnet in Bangladesh waters, group B found Nematode (black) in stomach of skipjack tuna and swordfish from drift gillnet fishing in Indian and Myanmar waters, swordfishes from pelagic longline fishing in all areas. Group C found Teuthoidea from bigeye tuna caught with drift gillnet in Myanmar waters, frigate tuna caught with drift gillnet and yellowfin tuna caught with pelagic longline in Bangladesh waters, swordfishes from pelagic longline fishing in all areas. Groups B and C showed higher in total number and diversity of predator, prey and parasite groups than group A. The result from this study present abundance in number of parasites and cephalopod, it will be indicator to grouping the community of large pelagic fish in the Bay of Bengal.

The results of present study provide an example of interesting questions concerning tuna trophic ecology that may be answered. These data will provide a more complete picture of complex trophic dynamics of mixed-species tuna aggregation, as well as seasonal trends in feeding and aggregation behavior. The preliminary picture of pelagic fish ecology in the Bay of Bengal during November and December 2007 was investigated. **Predator**: frigate tuna is neritic species. The stomach content was found Teuthoidea and fish. Skipjack tuna was widely distributed throughout the study area at water depth range 10-30 m. This species was found Teuthoidea as the main forage, followed by fish (unidentified species), whereas 2 groups of parasites were recorded; Digenea and Nematode (black). Skipjack tuna caught from Bangladesh waters was found only Digenea in the stomach, in Indian waters found Teuthoidea and unidentified fish, in Myanmar waters found Teuthoidae as forage and Nematode (black) as parasite. Yellowfin tuna (juvenile fish) caught from Myanmar waters, prey was found Teuthoidea and unidentified. Juvenile of bigeye tuna caught in Myanmar waters at depth of water range 10-26 m, the forage comprised of Teuthoidea, Ostracidae, Diretmidae and unidentified fish. Swordfishes are widely distributed throughout the study area at water depth range 10-132 m. The diet was reported cephalopod (Teuthoidea and Octopoda) and fish (Bramidae and unidentified fish). **Prey:** pelagic squid, Teuthoidea was the main composition of cephalopod, it was high abundant and widely distributed in the water depth 10-120 m. *Histioteuthis celetaria pacifica*, Octopoda was distributed in water depth 60 m. Deep-sea fish: Ostraciidae showed the highest abundance in water depth range from 10-20 m in Myanmar waters, whilst Diretmidae was also found in same area as Ostraciidae. Bramidae was at water depth range 40 m in Bangladesh waters. **Parasite:** nematode (black) was the main composition, mostly found in stomach of swordfish caught with both gears at water depth range 10-132 m. Nematode (white) was found in stomach of swordfish caught from pelagic longline fishing at water depth range 60-120 m in Indian and Myanmar waters. Digenea was parasite of skipjack caught with drift gillnet at water depth range 10-20 m in Bangladesh waters.

The Bay of Bengal is recognized as one of the area where fisheries resources are under-exploited status. Lack of the field guide and taxonomy of deep-sea species, such as fishes, cephalopods (whole body and beak) is recognized in present study. The taxonomy key will be useful and support for study on the tropic dynamics of large pelagic fish in the Bay of Bengal. Up to date the knowledge of ecosystem to be based on for fisheries management is insufficient. The tropic dynamics of pelagic fish and prey will provide the information on quality of ecology. None/under-exploited tunas and pelagic squid in the Bay of Bengal are very interesting for commercial fishery because there is virtually no deep-sea fishery in the area. Nevertheless, the fact that some species reach a large size and are commonly taken on the basis of exploratory deep-water trawling, jigging and longline fishing suggests that they may have future commercial potential whenever the suitable deep-sea fishing gears are used in the area.

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