

Length Weight Relationship and Diet Composition of Yellowfin Tuna (*Thunnus albacares*) Landed in Negombo Fishery Harbour, Sri Lanka.

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Abstract Yellowfin tuna (*Thunnus albacares*) is the second most economically important tuna species in Sri Lanka. Present study was focused on the determination of length-weight relationship and analysis of stomach contents of yellowfin tuna landed in Negombo fishery harbour. A total of 174 stomachs of yellowfin tuna (*Thunnus albacares*) were analyzed. The total length range of the observed yellowfin tuna was 50-169 cm and weight range was 10-86.5 kg. The diet of yellowfin tuna comprised of a variety of food items such as fish (55%), squids (30%), crabs (6%), shrimps (8%) and others (1%) indicating that it is a non-selective predator. The observed length weight relationship for yellowfin tuna was $W = 0.000104 TL^{2.6892}$.

Keywords: Large pelagic fish, drift gillnet, longline, food and feeding

INTRODUCTION

Pelagic tuna resources in Sri Lanka mainly consist of yellowfin tuna (*Thunnus albacares*), big eye tuna (*T. obsesus*) and skipjack tuna (*Katsuwonus pelamis*). Yellowfin tuna (*Thunnus albacares*) is the second most economically important species in the landings of large pelagic fishes in Sri Lanka. The predatory behaviour of yellowfin tuna is reported to be dependent on the abundance of prey organisms in their environment (Sund et al. 1981; Bertrand et al. 2002). Numerous studies on food and feeding habits of yellowfin tuna have been carried out from longline catches in the Indian waters (Sudarsan et al. 1991; Rohit et al. 2010), Andaman Sea and in the western Indian Ocean (Bram et al. 2012), and those caught from gillnets and longline gears in Sri Lanka (Maldeniya, 1996; Dissanayake et al. 2008). Tuna catches have increased recently in the Indian Ocean. Present study was undertaken to obtain information about feeding habits and to estimate

the length weight relationship of yellowfin tuna landed in Negombo fishery harbor, Sri Lanka.

METHODOLOGY

Stomach samples of yellowfin tuna (sample size: 174) were collected from January to August 2015 during processing at the Ceylon Fresh Sea Food Private Limited (49 samples) and Negombo fish landing site (125 samples). Stomachs of yellowfin tuna caught from both gillnet and longline were transported to the Marine Biological Resources Division laboratory on ice and stored in a -20°C freezer until further analysis. Before collecting the stomach samples at the fish processing factory and fish landing site, total length (TL) and standard length (SL) of each individual were measured to the nearest 0.1 cm using a measuring tape and the total weight of stomach contents was determined to the nearest 0.1 g using an electronic balance. The stomach fullness was visually categorized into five groups as full (1), three-fourth full ($\frac{3}{4}$), half full ($\frac{1}{2}$),



one-fourth ($\frac{1}{4}$) full and empty (0), based on the enlargement of the stomach due to the presence or absence of food; The recognizable prey items were categorized into several prey classes such as fishes, crustaceans, squids and others, their proportions by dry blotted weight was taken and percentage occurrence of each food category was estimated.

The prey items were identified and categorized to the lowest possible taxon and measured using standard length (SL in cm) for fishes, carapace width for crabs and the mantle length (in cm) for cephalopods. Partially digestible food items were pooled together. The length-weight relationship was estimated for the 55 specimens in the sample using TL by linear regression analysis of log-transformed data, which was of the form, $\text{Log}_{10} W = a + b \text{Log}_{10} \text{TL}$.

RESULTS

The TL of *T. albacares* in the present study ranged from 50 cm to 169 cm, and the weight range was 10-86.5 kg. Of the observed specimens in all the 174 tuna stomachs analyzed, 28 (16%)

were empty while 146 (84%) stomachs were with food. Visual inspection of the distension of tuna stomachs showed that proportions of full, three fourth full, half full, one fourth full and empty were 45%, 12%, 8%, 20%, 15% respectively (Figure 1).

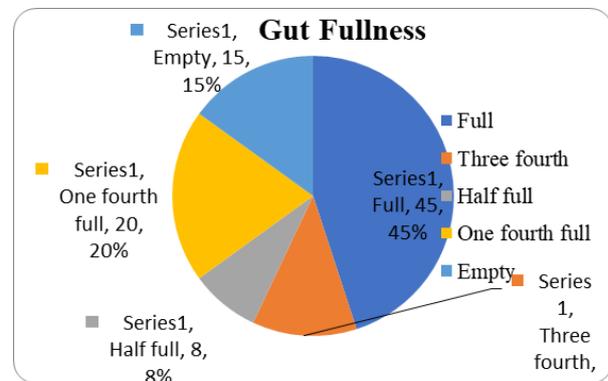


Figure 1 Gut fullness of the Yellowfin tuna

The average length and weight of each food item of the stomach contents of *T. albacares* are shown in Table 1.

Table 1 The observed stomach content of *Thunnus albacares*

Prey category	Species	Average length of prey item (cm \pm SD)	Average weight of prey item (g \pm SD)
Fish			
Caesionidae	<i>Caesio</i> sp.	10.5 \pm 0.75	30 \pm 1.0
Carangidae	<i>Decapterus</i> sp.	14.25 \pm 3.75	75.5 \pm 3.25
Clupeidae	<i>Amblygaster sirm</i>	14.2 \pm 1.2	75.25 \pm 2.5
	<i>Sardinella</i> sp.	10.5 \pm 1.0	43.5 \pm 2.2
Engraulididae	<i>Stolephorus</i> sp.	3.5 \pm 0.45	2.0 \pm 0.25
	<i>Stolephorus indicus</i>	11 \pm 2.5	15 \pm 1.75
Exocoetidae	<i>Exocoetus</i> sp.	14.2 \pm 2.25	27.75 \pm 7.5
Leiognathidae	<i>Leiognathus</i> sp.	7.5 \pm 2.5	5.5 \pm 2.2
Lethrinidae	<i>Lethrinus</i> sp.	12.5 \pm 3	17 \pm 3.5
Lutjanidae	<i>Lutjanus</i> sp.	17.5 \pm 0.6	23.5 \pm 4.0
Scombridae	<i>Rastrelliger kanagurta</i>	15 \pm 3.5	75.5 \pm 4.5
	<i>Katsuwonus pelamis</i>	14.5 \pm 2.0	57.53 \pm 2.5
	<i>Auxis thazard</i>	20.5 \pm 3.2	82.5 \pm 5.9
Sphyraenidae	<i>Sphyraena jello</i>	40.5 \pm 3.5	64 \pm 3.2
Tetradontidae	<i>Arothron</i>	5.5 \pm 4	7.5 \pm 2
Trachiuiridae	<i>Trichurus</i> sp.	17.9 \pm 1.5	37.5 \pm 2.5
Cephalopoda			
Teuthoidea	<i>Loligo</i> sp.	10.25 \pm 2.0	75.05 \pm 9
Sepiidae	<i>Sepia</i> sp.	10 \pm 1.0	10 \pm 5
Crustacea			
Peneaidae	<i>Penaeus indicus</i> sp.	5 \pm 0.5	3.54 \pm 1.1

Percentage stomach contents of *T. albacares* showed that the main prey item was fish (55%). Of the observed prey items hurulla (*Amblygaster sirm*) and flying fish (*Exocoetus* sp.) were the most preyed species recorded as a proportion by weight. The other significant prey fish by occurrence were kumbalawa (*Rastrelliger kanagurta*) and Indian scad (*Decapterus* sp.). The other food item found in *T. albacares* was squids

(30%). In addition, a specimen of *Sepia pharaonis* was identified. Also shrimp (*Penaeus indicus*) and crabs were found among the food items of the observed stomachs of the *T. albacares* (Appendix 1). A great diversity of food items was evident representing 12 families of teleost fishes, crustaceans and cephalopods indicating that yellowfin tuna is a non-selective carnivore feeder (Figure 2).

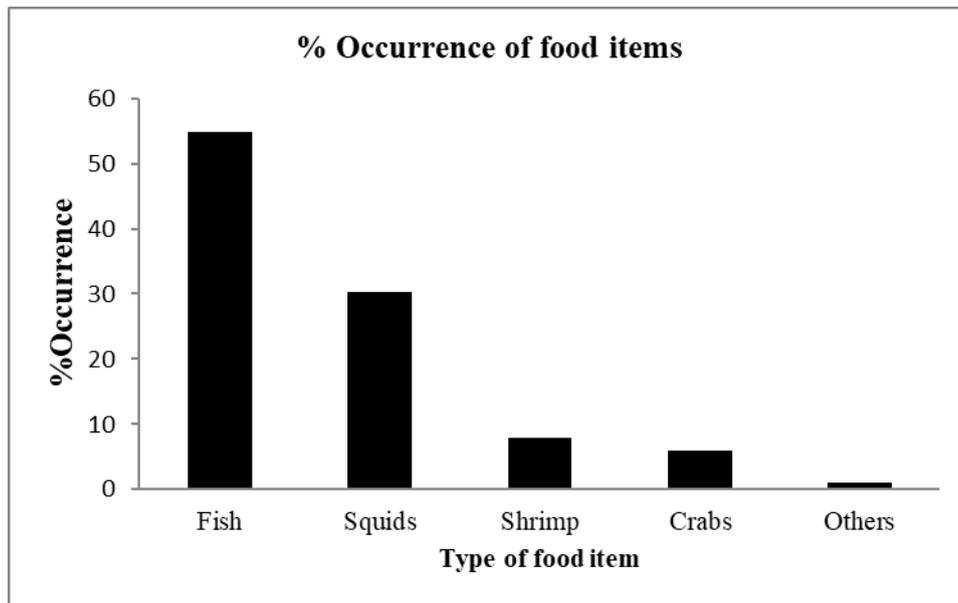


Figure 2 Percentage occurrence of food items

The length-weight relationship observed for *T. albacares* was determined to be $W = 0.000104 TL^{2.6892}$ ($R^2 = 0.856$; Figure 3).

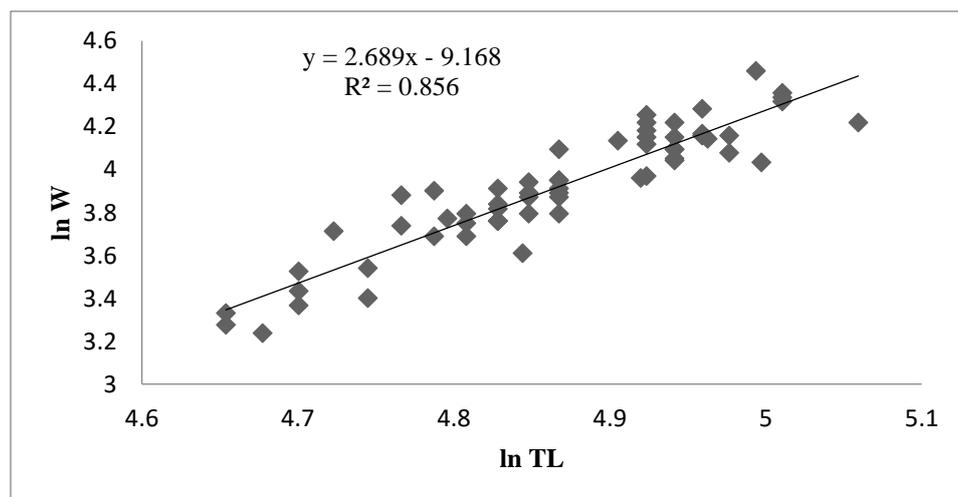


Figure 3 Length weight relationship of the yellowfin tuna, *Thunnus albacares*

DISCUSSION

Bram et al. (2012) have shown that yellowfin tuna was opportunistic predators feeding on a great variety of fishes, crustaceans and squids. Studies carried out in the equatorial zone of the Indian Ocean showed that fishes were the most important prey by weight in yellowfin tuna (Kornilova 1981). Moreover, from a study in the eastern tropical Pacific region, it was also evident that the major food items found in the stomach contents of yellowfin tuna consisted of fish (46.9%), crustaceans (45.4%) and cephalopods (Alverson 1963). Present study also found the presence of squid beaks in stomach contents of *T. albacares*. Rohit et al. (2010) indicated that squid beaks are resistant to digestion by apex predators and would be retained in their stomachs for a long period. The observed 'b' value being 2.689 in this study indicated probably a negative allometric growth pattern for yellowfin tuna. Yosua et al. (2018) also observed negative allometric growth pattern for yellowfin tuna. Another important finding of the present study was accumulation of polythene and plastic materials within the stomach contents.

Presence of plastics ingested along with food might block the intestinal tract of the fish making adverse impacts on fish stocks. Therefore, more research towards the effects of plastic/synthetic debris on marine environment and fishes is recommended.

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Appendix 1 Major food items and plastic material observed in the stomach contents of *T. albacares*.



Rastrelliger kanagurta (x1)



Auxis thazard (x1)



Sepia pharaonis (x1)



Penaeus sp (x1)



Cephalopod beaks (x1)



Exocoetus sp (x1)

Polythene and plastic found in Yellowfin tuna gut

