

# Abundance and Length-Weight Relationship of Fishes from Sungai Sepang Besar, Selangor

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## Abstract

This study was conducted to determine the abundance and the length-weight relationship of fishes of Sungai Sepang Besar (SSB), Selangor. A total of 832 individuals from 32 families comprising 50 species were collected from April 2014 to February 2015 by utilizing gill nets of various mesh size (1.25, 2.25, 2.50, 2.75, 3 and 4.5 inch) and long lines. The family Toxotidae was most abundant with a total of 474 individuals sampled comprising 2 species namely, *Toxotes jaculatrix* (n=288) and *Toxotes chatareus* (n=186). The Shannon-Weiner Index (2.37) and the Pielou Evenness (0.21) was low but the Margalef's richness (7.29) was relatively high. *Arius sagor*, *Photopectoralis bindus*, *Toxotes jaculatrix*, *Thryssa dussumieri*, and *Stolephorus indicus* demonstrated positive allometric growth ( $b > 3$ ) while *Plotosus lineatus* and *Toxotes chatareus* showed negative allometric growth ( $b < 3$ ). Understanding abundance and the length-weight relationship of fish is important not only for species conservation and management, but also their habitat use.

**Keywords:** Fish diversity; fish communities; length-weight relationship; fisheries management; Sungai Sepang Besar

## 1. Introduction

Fish are important source of nutrition and livelihoods for people around the world. Global total capture fishery production in 2014 was 93.4 million tonnes, of which 81.5 million tonnes was from marine and 11.9 million tonnes from inland waters [1]. Besides marine waters and freshwater, estuaries are important breeding and nursery grounds for a wide variety of fishes [2]. Migratory fish species use this habitat during part of their life cycle but permanent residents complete their life cycle within estuaries [3].

Approximately 413 freshwater species, 1636 marine species, 116 species that migrate from marine to freshwater and vice versa, and 78 species adapted to brackish and freshwater environments have been recorded in Malaysia [4]. Fishes may serve as efficient bio-indicators and are useful in assessing environmental quality as they are sensitive to changes in water chemistry [5].

Length-weight relationship of fish can be indicator of health, productivity, gonadal development [6], fish condition factor [7], fish stock assessment and management [8] [9] [10] [11] and fishery biology [12]. Studies of length-weight relationship of fish in Malaysia are known [7] [13] [14] [15] [16] but needs further work. Fish communities of larger estuaries like Matang, Merbok, Pulau and Pahang [17] have been reported but there is less interest on smaller estuaries for example, the Sepang River. This paper reports on the diversity and the length-weight relationship of the fishes of the Sepang River which in the past, has been heavily disturbed by anthropogenic activities [18]. The length-weight relationships for the fish species generated can be used as baseline data useful for future comparison.

## 2. Methodology

### 2.1. Study Area

This study was conducted in Sungai Sepang Besar (SSB) in Selangor (N 2°35'30" and E 101°43'1"). SSB faces the Straits of Malacca, is situated next to a recreational beach (Bagan Lalang) and is lined with mangroves (*Rhizophora mucronata*, *R. apiculata*, *Avicennia alba*, *Sonneratia alba*, *Bruguiera gymnorhiza*, *Ceriops tagal* and *Xylocarpus granatum*) at its mouth and along the river. The abundant mangrove is *R. mucronata* with a density of 350 trees per hectare [19]. The river runs through the Sepang and Sungai Pelek towns before reaching the Straits of Malacca. Along SSB within a 5km radius lies fishing villages, aquaculture sites, settlements and a charcoal fired power plant [18].

### 2.2. Sampling Procedure

Fish samples were collected in SSB from April 2014 to February 2015 employing gill nets (mesh sizes of 1.25, 1.5, 2.25, 2.50, 2.75 and 3.0 inch and with dimensions of 92 m in length and 2.6 m in width) and long lines from 9 stations (Fig. 1). The coordinates for the sampling locations are shown in Table 1. The nets were set perpendicular to the river bank and left for 5 to 6 hours before hauling. Fish total length (cm) and body weight (g) was determined [20]. Fishes were identified by taxonomic keys in [21] and [4]. Voucher specimens were deposited at the General Biology Laboratory, Universiti Teknologi Mara (UiTM) Negeri Sembilan.



**Figure 1:** Sungai Sepang Besar and its Estuary Showing Sampling Locations

**Table 1:** Sampling Coordinates along Sungai Sepang Besar

STATION	LATITUDE	LONGITUDE
Station 1 (S1)	2°35'49.01"N	101°42'49.00"E
Station 2 (S2)	2°36'01.00"N	101°42'39.00"E
Station 3 (S3)	2°36'09.07"N	101°42'22.00"E
Station 4 (S4)	2°36'59.06"N	101°42'49.04"E
Station 5 (S5)	2°37'09.79"N	101°43'09.09"E
Station 6 (S6)	2°37'14.00"N	101°43'25.89"E
Station 7 (S7)	2°37'15.00"N	101°43'49.00"E
Station 8 (S8)	2°37'31.43"N	101°43'47.44"E
Station 9 (S9)	2°37'53.11"N	101°43'43.00"E

### 2.3. Data analysis

#### 2.3.1 Diversity measures

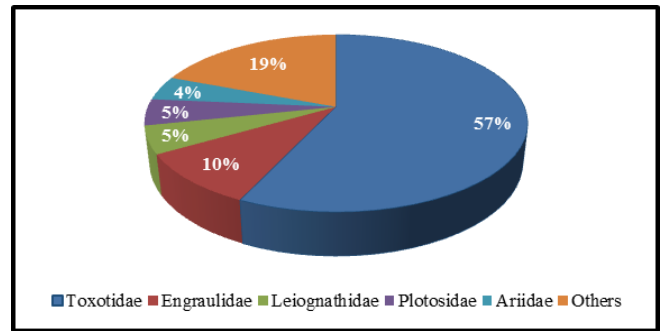
Diversity was determined via the Shannon-Wiener Index,  $H' = -\sum p_i \ln p_i$  [22], evenness via the Pielou's Index,  $J = H'/H \max$  [23], and richness via the Margalef's Index,  $D = (S-1)/\ln N$  [24].

#### 2.3.2 Length weight relationship

Length-weight relationship (LWR) (where  $n > 30$ ) was determined via  $W = aL^b$  [25] [ $W$  is fish weight (g),  $L$  is fish total length (cm),  $a$  is the intercept and  $b$  is the growth factor or slope].

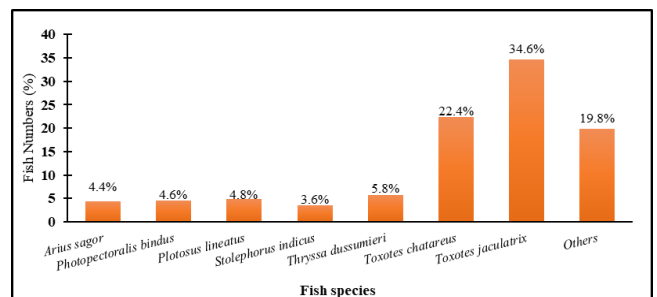
## 3. Results and Discussion

A total of 832 individual fish from 32 families comprising 50 species were sampled from SSB. The Toxotidae was the most abundant (56.97%) followed by the Engraulidae (9.62%), Leiognathidae (5.05%), Plotosidae (4.81%), and Ariidae (4.45%) while other families made up the remaining 19.11% (Fig. 2). *Toxotes* ( $n = 474$ ), *Thryssa* ( $n = 50$ ), *Plotosus* ( $n = 40$ ), and *Photopectoralis* ( $n = 38$ ) were the abundant fish genera sampled.



**Figure 2:** Percentage fish abundance by family sampled in Sungai Sepang Besar

*Toxotes jaculatrix* ( $n=288$ ; 34.6%) and *Toxotes chatareus* ( $n=186$ ; 22.4%) (Toxotidae) were the abundant species sampled from SSB. This was followed by *Thryssa dussumieri* ( $n=48$ ; 5.8%) (Engraulidae), *Plotosus lineatus* ( $n=40$ ; 4.8%) (Plotosidae), *Photopectoralis bindus* ( $n=38$ ; 4.6%) (Leiognathidae), *Arius sagor* ( $n=37$ ; 4.5%) (Ariidae) and *Stolephorus indicus* ( $n=30$ ; 3.7%) (Engraulidae), while other individual fish species showed low abundance (< 3%) (Fig 3).



**Figure 3:** Percentage abundance of abundant fish species sampled in Sungai Sepang Besar

The different composition and distribution of fish species is related to various factors such as depth, food availability, breeding sites, water chemistry, water current, and topography of river habitat [26]. Most fish species sampled from SSB were mainly marine euryhaline species able to tolerate wide range of salinities [27] and are commonly found in rivers, estuaries and coastal waters in Peninsular Malaysia [4]. The Toxotidae (archer fish) are mainly found in the brackish waters of mangrove-lined estuaries [27] and can tolerate a wide range of salinities (0-35 ppt) [28] [29]. The Engraulidae usually inhabit the pelagic zone of marine waters [30] but do migrate into brackish and freshwater. The Ariidae or the marine catfish can tolerate both marine and freshwater [31] [17] although some are mainly estuarine. The Leiognathidae are also marine species but do enter brackish and freshwater rivers [32]. The Shannon-Weiner (2.37) and the Pielou (0.21) indices were generally lower as compared to other estuaries in Peninsular Malaysia (Table 2). The lower value of the indices, especially the Pielou was related to the large number of the Toxotidae sampled (*Toxotes jaculatrix* and *Toxotes chatareus*). Diversity is a measure of the relationship between the number of species and their individual numbers [25] and dominance by a few species would tend to suppress the index. The fish species richness in SSB was also lower than other estuaries and this is reflected in the value of the Margalef's index (7.29) as it measures the total number of the species (SSB=50) in a community [33]. The coefficient of determination ( $R^2$ ) of the LWR ranged from 0.32 for *Stolephorus indicus* to 0.97 for *A. sagor* (Table 3). The high value of the coefficient of determination ( $R^2$ ) indicates strong and significant relationship ( $p < 0.05$ ) between the length and weight [34]. The lowest  $b$  value recorded was 2.76 for *P. lineatus* and highest was 3.83 for *S. indicus*. *Plotosus lineatus* and *T. chatareus* recorded negative allometric growth ( $b < 3$ ) while *A. sagor*, *P. bindus*, *T. jaculatrix*, *S. indicus*, and *T. dussumieri* re-

corded positive allometric growth ( $b > 3$ ) (Fig. 4). A high  $b$  value indicates fish in good condition [35] where environmental conditions are ideal for growth and reproduction [36]. The  $b$  values may also vary according to sex and phase of growth [37]. Low  $b$  values may be attributed to environmental factors such as food competition and food availability, season, temperature, salinity, time of maturity and sex [38] [39]. Biotic and abiotic factors such as water temperature, predation, dissolved oxygen, and phytoplankton abundance among others may influence fish survival and growth [40]. The variability of  $b$  may also be attributed to seasonal fluctuations reflected in change of weight over the course of a year or by variability in sampling site conditions [41]. The  $b$  value is also affected by fish behaviour; for example, active swimming fish may show lower  $b$  values as compared to passive swimming fish [42]. This is probably related to the energy allocation for swimming and growth. [39]. Besides biological and environmental conditions, geographical, temporal and sampling techniques may also affect the growth pattern of the fish [43]. The variability of the  $b$  value of the fishes of SSB may indicate the health status of the river. SSB was polluted by heavy metals in 1990's originating from pig farming activities [44]. At present SSB also receives anthropogenic waste from residential, aquaculture, agriculture, ecotourism, and power plant activities [45] [46] such as effluent

from shrimp ponds, surface run-off, fertilisers and herbicides from oil palm plantations which may affect its water quality [47] and hence, fish health.

## 4. Conclusion

The Toxotidae (*T. jaculatrix* and *T. chatareus*) were the most abundant and dominant fish sampled from SSB. The lower value of the diversity indices of the SSB as compared to other estuaries in Peninsular Malaysia was probably related to impacts of past and present anthropogenic activities. *A. sagor*, *P. bindus*, *T. jaculatrix*, *S. indicus*, and *T. dussumieri* exhibited positive allometric growth while *P. lineatus* and *T. chatareus* showed negative allometric growth.

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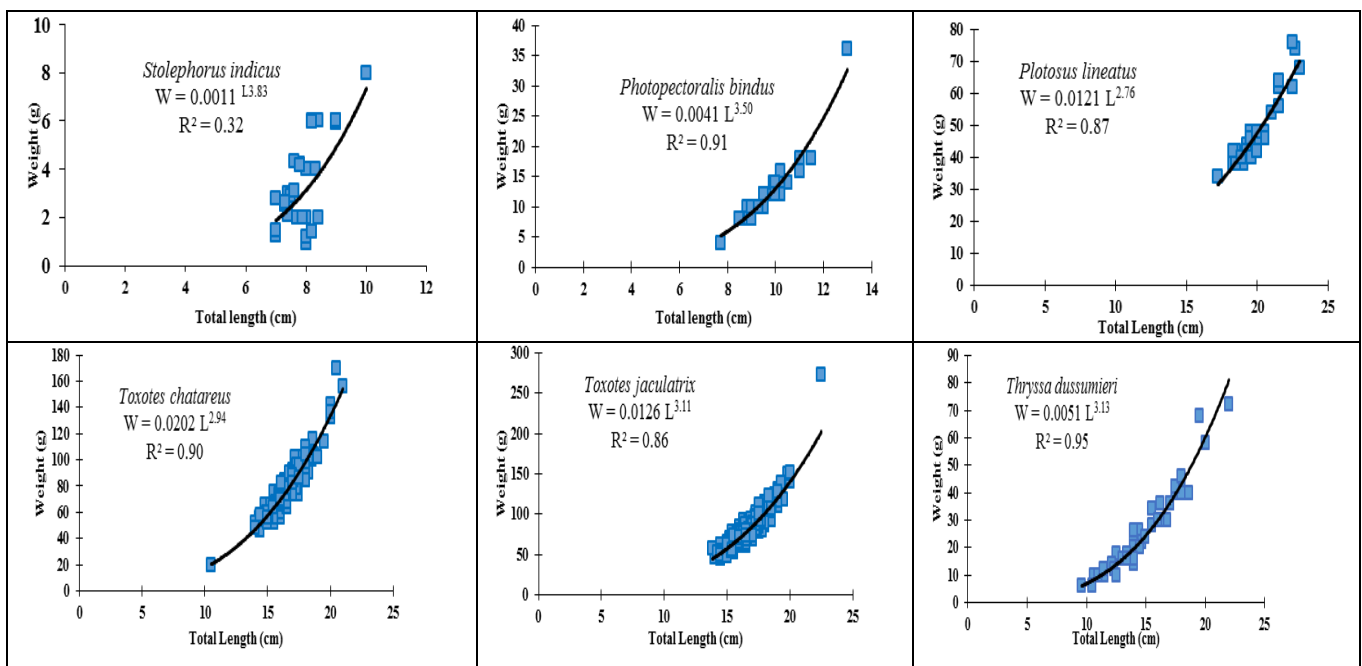
**Table 2:** Comparison of diversity indices from estuaries in Peninsular Malaysia

Place	Number of Species	Shannon-Weiner Index (H')	Pielou's Evenness Index (J)	Margalef's Richness Index (D)	Source
Present study	50	2.37	0.21	7.29	
Klang, Selangor	119	2.59	0.55	11.82	[48]
Sg Dinding, Perak	49	2.87	0.74	-	[49]
Sg. Pulai, Johor	105	2.86	0.63	14.09	[50]
Sg. Johor, Johor	130	3.50	0.72	15.59	[50]
Pahang Estuary, Pahang	24	2.09	-	-	[17]
Matang, Perak	89	3.66	0.81	7.58	[51]

**Table 3:** Length-Weight Relationship for seven abundant Fish Species Sampled from Sungai Sepang Besar

Species	n	a	b	R <sup>2</sup>	Growth type	W = aL <sup>b</sup>
<i>Arius sagor</i>	32	0.0033	3.29	0.97	PA	W = 0.0033 L <sup>3.29</sup>
<i>Photopectoralis bindus</i>	32	0.0041	3.50	0.91	PA	W = 0.0041 L <sup>3.50</sup>
<i>Plotosus lineatus</i>	34	0.0121	2.76	0.87	NA	W = 0.0121 L <sup>2.76</sup>
<i>Toxotes chatareus</i>	178	0.0202	2.94	0.90	NA	W = 0.0202 L <sup>2.94</sup>
<i>Toxotes jaculatrix</i>	278	0.0126	3.11	0.86	PA	W = 0.0126 L <sup>3.11</sup>
<i>Thryssa dussumieri</i>	46	0.0051	3.13	0.95	PA	W = 0.0051 L <sup>3.13</sup>
<i>Stolephorus indicus</i>	30	0.0011	3.83	0.32	PA	W = 0.0011 L <sup>3.83</sup>

[NA= Negative Allometric ( $b < 3$ ), IS= Isometric ( $b = 3$ ), PA= Positive Allometric ( $b > 3$ )]



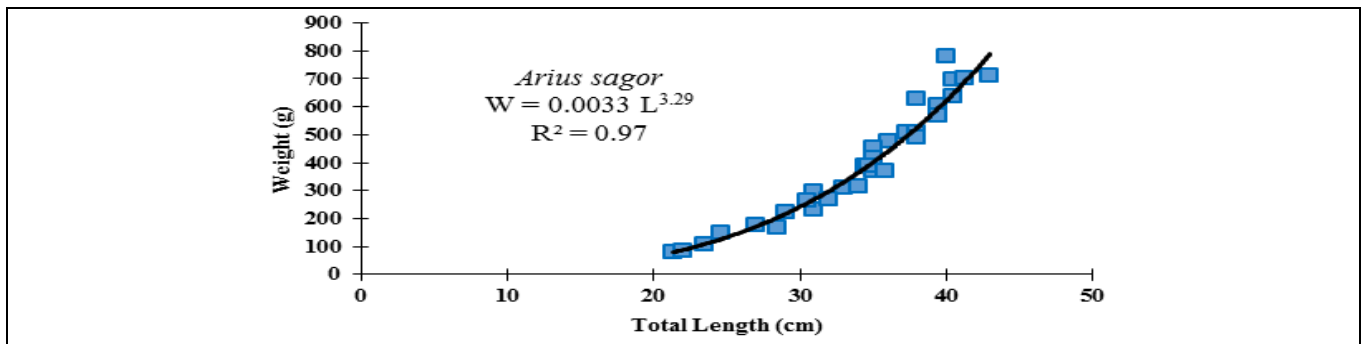


Fig 4: Length Weight Relationship of seven abundant fish species sampled from Sungai Sepang Besar

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