

Fish diversity in Sepang Besar estuary – a preliminary analysis

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Abstract— A study conducted was a preliminary analysis to determine the distribution of fish in Sepang Besar estuary. Surveys on the distribution of fish fauna in the study was conducted from April to June 2014. Collection was made at stations divided into 3 different zones. The fishes were collected using variety sizes of gill nets and long lines. Shannon-Weiner Index, Richness Index, and Evenness Index were used in the analysis. A total of 29 fish species belonging to 23 families were identified. Analyses based on the number of individuals caught showed that 20% of total catch was represented by Toxotidae. The most dominant species recorded were *Toxotes chatareus* and *Thryssa dussumieri*. Highest index value of Shannon-Weiner Index and Margalef's Index were obtained at Station 9 which were 2.098 and 3.119 respectively. This study can be regarded as the initial significant contribution to the understanding of ichthyofauna in Sepang Besar.

Keywords— fish diversity, estuary, mangrove, Sepang

I. INTRODUCTION

FISH is important in ecologically and economically as source of protein. According to Ref [1], the demand is increasing year by year in fishing industries. Fish also often to be used as bio indicator for assessment of river network community, flow regime and water quality [2].

Mountain streams, lakes, rivers, estuaries, swamp, and canal are types of fish habitat. Estuaries are known as breeding and nursery grounds for wide variety of fishes. Many of them are migratory species which use this habitat in their early life cycle. Some of them are permanent residents of the estuaries, which spend their whole life cycle in this ecosystem [3]. Even though estuaries provide harsh environment because of change

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in salinity, many species of fishes found estuaries was their ideal place for spawning [4].

Most countries were suffered from insufficient knowledge of estuarine ecology and management activities. The best tool to understand the fish populations in particular area is we need to do fisheries assessment. Besides that, this study will provide many benefits such as to maintain, improve or create the habitat to species that lived in the estuary and protect the undisturbed habitat [5] [6].

Although there is much information about fish diversity, but there is limited information about fish distribution in estuary area specifically in Sepang. Therefore, this study was done as a preliminary analysis to determine the distribution of fish in Sepang Besar estuary.

II. METHODOLOGY

A. Sampling area

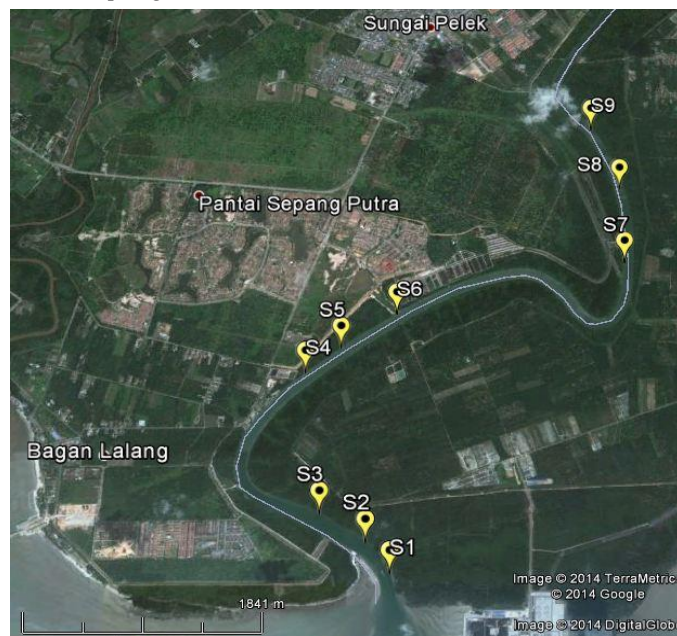


Fig. 1 Map showing nine stations along Sepang Besar Estuary

This study was done in Sepang Besar mangroves area (Figure 1), in Selangor. Sepang Besar estuary was situated near Bagan Lalang beach. It lies between latitude 2°35'30" N and 101°43'1" E longitude seawards, facing the Straits of Malacca. Sampling was done at 9 stations at 3 different zones

which are lower, middle and upper zones. All coordinates for the sampling locations were recorded by global positioning system (GPS) as shown in Table 1. Sepang Besar estuary runs from Sepang town through Sungai Pelek town before flowing out to Straits of Malacca. It has diverse ecosystem and also rich with natural resources. This estuary is situated near the fisherman villages, aquaculture sites, charcoal power plants, and development area.

TABLE I
SAMPLING COORDINATES ALONG SEPANG BESAR

ZONE	STATION	GPS LOCATION
Lower zone	S1	02°35'51.00"N
		101°42'49.00"E
	S2	02°35'59.00"N 101°42'42.00"E
Middle zone	S3	02°36'6.51"N 101°42'29.87"E
	S4	02°36'45.00"N
		101°42'23.97"E
S5	02°36'52.00"N 101°42'33.00"E	
Upper zone	S6	02°37'1.68"N
		101°42'47.44"E
	S7	02°37'16.88"N 101°43'48.30"E
S8	02°37'38.93"N	
	101°43'47.02"E	
S9	02°37'57.47"N 101°43'39.13"E	

B. Sampling activity and identification of fishes

Fish samples were collected from Sepang Besar estuary in April to June 2014 using gill nets and long lines. The nets were set by fisherman with measurement about 92 m long and 2.6 m deep with different mesh sizes (1.25, 2.25, 2.50, 2.75, 3 and 4.5 inch). The nets were set perpendicular to the rivers in the morning and lift in the evening. Standard length, total length and weight of each individual fish caught were measured and recorded. The fishes were fixed and preserved in 10% formalin solution to maintain the physical condition of samples. A picture of the alive fish was taken immediately before the preservation process took place [7]. Fish identification process was done by referring to book with title Freshwater Fishes of Western Indonesia and Sulawesi by [8], and book title Fishes of Malaysia written by [9]. Voucher specimens were deposited at General Biology Laboratory, Universiti Teknologi Mara (UiTM) Negeri Sembilan.

C. Diversity analysis

The diversity, evenness, and richness indices were calculated for understanding the status of diversity using the following formula.

$$\text{Shannon- Wiener Index, } H' = -\sum pi \ln pi \quad [10]$$

$$\text{Pielou's Index, } J = (H'/\ln S) \quad [11]$$

$$\text{Margalef's Index, } D = (S-1)/\ln N \quad [12]$$

Where H' is the diversity index, P_i is the proportional abundance of the species i , N is the total number of individuals. D is the richness index, S is the total number of species, J is the similarity index and \ln is the natural logarithm.

III. RESULTS AND DISCUSSION

A total of 120 fishes were collected comprising of 29 species belonging to seven Orders (Perciformes, Clupeiformes, Siluriformes, Tetraodontiformes, Acanthuridae, Elopiformes, and Mugiliformes) and 24 families. From the data obtained, 26 individuals of fish were collected from Station 2 and none was collected at station 3. *Toxotes chatareus* and *Thryssa dussumieri* were the dominant species which both value of percentage 12.5 % followed by *Arius sagor* (11.67%), *Scatophagus argus* (9.17%), and *Ambassis nalua* (7.5%) as stated in Table 2.

Based on the Table 2, 29 species were found and total of 120 individuals were obtained. Highest fish abundance was observed at Station 2 with 26 individuals followed by Station 5 (23 fishes), Station 4 (17 fishes) and none individuals have been recorded at Station 3. This is due to the development of fish cage culture which can contribute to water pollution. So that, these area not favorable area for fish to live. *Scatophagus argus* with 10 individuals was recorded the highest number of individuals at Station 2. This station was surrounded by dead mangrove trees resulting the suitable environment for their habitat. As stated by [13], this species can be found at lower zone of fresh water streams, especially those with high mineral concentrations and preferred to feed benthic algae, plant matter, and small benthic invertebrate.

The fish fauna in the lower zone of Sepang Besar estuary was dominated by *Scatophagus argus*, *Nematalosa come* and *Toxotes jaculatrix*. These species were anatomically live in coastal area. At middle zone, fish composition was mainly dominated by *Toxotes chatareus*, *Arius sagor*, *Thryssa dussumieri* and *Ambassis nalua*. *Thryssa dussumieri* and *Arius sagor* were found to be dominant at the upper zone. The distribution and composition of species in each habitat were closely related to various factors such as water current, depth, food availability, breeding sites, water chemistry, and topography [14].

TABLE II
LIST OF FISH SPECIES IDENTIFIED FROM VARIOUS STATIONS IN SEPANG BESAR ESTUARY

Family	Species	S1	S2	S3	S4	S5	S6	S7	S8	S9	Total	Percentage (%)
Toxotidae	<i>Toxotes chatareus</i>	1			1	8	3		1	1	15	12.50
	<i>Toxotes jaculatrix</i>	2	2		3			1		1	9	7.50
Engraulidae	<i>Thryssa dussumieri</i>				1		3	8	1	2	15	12.50
	<i>Thryssa setirostis</i>		2								2	1.67
	<i>Stolephorus indicus</i>		1			2			1	1	5	4.17
Carangidae	<i>Scomberoides tala</i>					1					1	0.83
	<i>Carangoides malabaricus</i>						1				1	0.83
	<i>Alepes djedaba</i>	1									1	0.83
Menidae	<i>Monodactylus argenteus</i>		3								3	2.50
Clupeidae	<i>Nematalosa come</i>		5								5	4.17
Gerreidae	<i>Gerres oyena</i>				3						3	2.50
Sparidae	<i>Acanthopagrus</i> sp.				1						1	0.83
Lutjanidae	<i>Lutjanus johnii</i>									1	1	0.83
Plotosidae	<i>Plotosus lineatus</i>									3	3	2.50
Tetraodontidae	<i>Tetraodon kretamensis</i>									1	1	0.83
Serranidae	<i>Epinephelus coioides</i>	2									2	1.67
Apogonidae	<i>Apogon</i> sp.	1									1	0.83
Haemulidae	<i>Pomadasys</i> sp.	4							2		6	5.00
Acanthuridae	<i>Naso hexacanthus</i>		1								1	0.83
Siganidae	<i>Scatophagus argus</i>		10					1			11	9.17
Elopidae	<i>Elops machnata</i>		1								1	0.83
Mullidae	<i>Upeneus</i> sp.		1								1	0.83
Mugilidae	<i>Liza macrolepis</i>				1						1	0.83
Ariidae	<i>Arius sagor</i>				7	2	2		2	1	14	11.67
Gobiidae	<i>Periophthalmodon schlosseri</i>					2					2	1.67
Latidae	<i>Lates calcarifer</i>					1					1	0.83
Leiognathidae	<i>Leiognathus fasciatus</i>					2			1		3	2.50
Eleotridae	<i>Butis gymnopus</i>						1				1	0.83
Ambassidae	<i>Ambassis nalua</i>	2				5				2	9	7.50
TOTAL	29	13	26	0	17	23	10	10	8	13	120	100.00

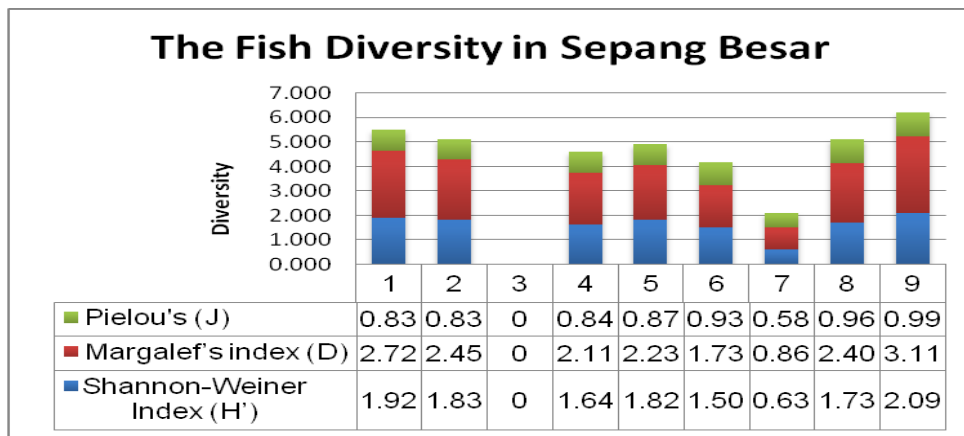


Fig. 2 Fish Diversity in Sepang Besar estuary

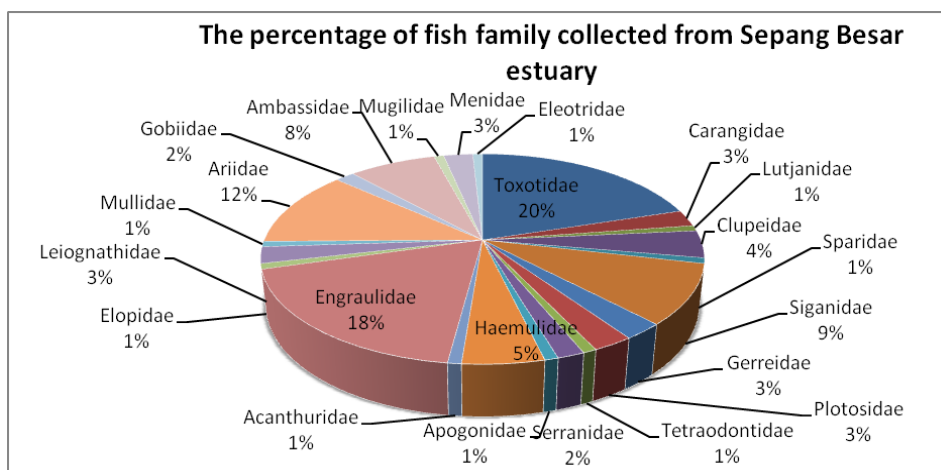


Fig.3 The percentage of fish family collected from Sepang Besar estuary

The index values of Shannon-Weiner (H'), Margalef's (M), and Pielou's (J) are shown in Figure 2. Shannon-Weiner diversity value ($H' = 2.89$) for all specimens studied during the study, show that Sepang Besar estuary was quiet diverse with fish species. The value of Shannon-Weiner diversity index ranged from 0.639 (Station 7) to 2.098 (Station 9), richness index ranged from 1.737 (Station 6) to 3.119 (Station 9) and evenness index ranged from 0.582 (Station 7) to 0.995 (Station 9).

Most of species that were collected in Sepang Besar estuary were commonly found in rivers, estuaries and coastal waters in Peninsular Malaysia [9]. Among of the fish caught, some of them have their commercial importance. All species caught were euryhaline which can tolerate wide range of salinities and most of the fishes were from marine taxa [15].

Referring to Figure 3, highest percentage of family caught was Toxotidae (20 %), followed by Engraulidae (18 %) and Ariidae(12 %). Many species caught under Family Toxotidae, Engraulide and Carangidae were found common along the lower zone as these families were important for commercial and game fish [9]. While the lowest percentage of family observed with 0.83 % each family were Sparidae, Lutjanidae, Tetraodontidae, Apogonidae, Acanthuridae, Elopidae,

Mullidae, Mugilidae, Latidae, and Eleotridae.

Toxotes chatareus become to be the highest number founds because this species tends to swim near the water surface to get their food by spit the water droplet to the insects [16]. So it easy to them to catch by gillnets. It also native to mangroves, estuaries and freshwater streams of Southeast Asia [17]. Next, *Thryssa dussumieri* was from marine, pelagic and sometimes forming schooling of fishes. This species like to entering river mouths, some temporary or even permanent residents in rivers. Both species can be found in the all zones of rivers [9].

During this study, there are two species that have been caught using long lines which were *Arius sagor* and *Epinephelus coioides*. *Epinephelus coioides* was found at the river mouth. Ref [13] stated that, it assessed as being the near threatened because the overall decline of imports number of fish from South East Asia. Adult's can be found in estuaries and juveniles are commonly found in estuaries over sand, mud, gravel and among mangroves [18]. Ref [19] was claimed that March to June is the best period for the spawning species process.

Other major species found was *Arius sagor* as it known as marine catfish from Family Ariidae. The higher diversity of this species due to the muddy bottom of the estuary area as

they are carnivorous type of fish. During high tide, this species will move in large schools, tends to make them easy to be caught due to availability of the food from the longlines [15].

IV. CONCLUSION

In summary, Sepang Besar estuary provides a habitat, feeding, and nursery space to 120 individual's fish. Fish diversity in the Sepang Besar estuary can be considered high. Highest diversity of fish was found at Station 9 that shows the highest Shannon-Weiner Index with 2.89. To ensure the steady economic value for the local people it is necessary to have frequent monitoring of fish diversity. Further studies should be done in order to conserve the fish in this area by referring to the type of tidal phase which can be affected the diversity of fish that will be caught. It is also recommended that study on the water quality parameters should be done to enhance the accuracy in investigating the factors of fish diversity related to the environment.

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