Diversity, distribution, and species status of the fish in Banten Bay, Indonesia

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Abstract. This study aims to analyze the species diversity, distribution and status of fish found in the coastal waters of Banten Bay. Samplings were carried out 7 times at three locations namely Cengklok coastal waters (on February-March 2019), Bojonegara coastal waters (January-February, August-September 2020), and Kemayungan-Linduk coastal waters (February-April 2021) of the Banten Bay, using gill nets, trammel net, cast net, hand-line, beach seine, and mini trawl. Results of this study showed that the fish caught in the Banten Bay coastal waters consisted of 111 species, distributed at the three areas, namely Cengklok (32 species), Bojonegara (58 species), and Kemayungan-Linduk coastal waters (51 species). The diversity, evenness, and dominance indices were 2.185 - 3.763, 0.630 - 0.781, and 0.072 - 0.233 respectively, indicating the medium-high species diversity. These fish were spreading in marine water, fresh water, estuary, freshwater and estuary, marine and estuary, and marine, estuary and freshwater. The common species found at the study location were *Ellochelon vaigiensis*, *Planiliza subviridis*, and *Leiognathus equula*. In general, most of the fish found in Banten Bay were classified as least concern (LC), while two species were vulnerable (VU), one species was near threatened (NT), and one species was endangered species (EN).

1 Introduction

Banten Bay is located in the west of Java Island in the northern part of Serang City [1]. The bay covers area about 150 km² [2], which is part of the Java Sea, with relatively shallow water conditions. The oceanographic conditions of these waters are influenced by a number of freshwater inputs, originating from rivers that empty into the waters of the bay [3], including the Cibeureum River, Cibanten River, and Cikadueun River [4]. Banten Bay has experienced various environmental pressures from anthropogenic activities [5-6], which includes various activities around the area, such as industry, shipping and fishing ports, housing, and aquaculture [4]. Various anthropogenic activities of the surrounding community may have an impact on the existence of fish resources [7].

The coastal waters of Cengklok, Bojonegara, and Kemayungan-Linduk are three areas in Banten Bay, which have quite large potential of fishery resources. Several fishing ground were found in these areas, either in the fish, shellfish or shrimp resources, and location of green mussel cultivation. Cengklok Beach, is a coastal area located in the middle of Banten Bay. This beach is adjacent to Gopek beach (in the west) as the centre of

port and tourism activities in the region. Bojonegara Beach is a coastal area located in the western part of Banten Bay. This coastal area is quite dense with industry and large ship ports. There is also a fishing port (on the Wadas River and the Terate River), but it is not as big as the fishing port in Karangantu (Gopek beach). Meanwhile, Kemayungan-Linduk beach is one of the beaches located in the eastern region of Banten Bay. Many aquaculture and agriculture of local community are found in this coastal area.

Several study activities in Banten Bay waters were carried out and published, including study on water quality [2, 8-9], hydrodynamics [5], fish biology [10-11], and heavy metal content in aquatic biota [12-13]; [14-15]. However, to date there have been few publications or study activities related to the status of fish caught in this area. Therefore, this study aims to examine the diversity and status of fish caught in the coastal waters of Banten Bay. This study is necessary as a basis information for better management of the fisheries resources.

2 Materials and Methods

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2.1 Time and sampling location

Sampling stations were chosen based on the character of the ecosystem, namely rivers, estuaries, and seas. Fish sampling was carried out nine times, Mar-Apr 2019 (Cengkok, C1-C5), Jan-Feb and Aug-Sep 2020 (Bojonegara, B1-B6), and Feb-Apr 2021 (in Kemayungan-Linduk, KL1-KL6), of Banten Bay, (Figure 1).

2.2 Data collection

2.2.1 Fish sampling

Fish were collected using gill nets (1-3 inches), trammel nets (1.5; 6 inches), hand-lines, beach seines, mini trawls (>1 inches), and cast nets. The gill nets and trammel nets used were operated as fixed gillnets or set gillnets. The fishing gear was operated in the coastal areas by placing it along the surface of coastal waters and rivers in accordance with the sampling point. The gill and trammel net were left for about 30 minutes to 1 hour. In shallow water, gill nets and cast net were usually used. Fish samples were also obtained from fishermen who caught in the area around the study location. Fish samples were sorted and preserved with 10% formalin, and brought to the Bio-Macro Laboratory of IPB University for identification.

Fig. 1. Location of fish sampling in the Cengkok (C1-C5), Bojonegara (B1-B6), and Kemayungan-Linduk Coastal Waters (KL1- KL6)

Note: B1 (5.984096S, 106.090157E), B2 (5.983031S, 106.110909E), B3 (5.97762S, 106.12730E), B4 (5.991025S, 106.126765E), B5 (5.99523S, 106.10731E), B6 (6.00047S, 106.09703E), C1 (6.031318S, 106.173411E), C2 (6.02659S, 106.17492E), C3 (6.013604S, 106.177051E), C4 (6.01174S, 106.18898E), C5 (5.99988S, 106.15621E), KL1 (6.02402S, 106.22164E), KL2 (6.015710S, 106.216530E), KL3 (6.001726S, 106.208904E), KL 4 (5.994793S, 106.218296E), KL5 (6.002112S, 106.227292E), KL6 (6.00593S, 106.23437E)

2.2.2 Fish observation and fish conservation status (IUCN)

Fish samples of each station were distinguished by species, and identified to the lowest taxon, using the books of [16-20]. Fish status was based on the status

criteria from International Union for Conservation of Nature (IUCN).

2.3 Data analysis

Fish data were analyzed using diversity, evenness and dominance indices, and fitted descriptively based on conservation status.

2.3.1 Diversity Index

Calculations of the diversity index (H) can be made using the Shannon-Wiener diversity index [21].

$$H' = -\sum_{i=1}^S (p_i) (\log_2 p_i)^k; p_i/N$$

$$H' = -\sum_{i=1}^S (p_i) (\log_2 p_i)^k; p_i/N \quad (1)$$

Information:

H = diversity index
 p_i = i-th type ratio
 n_i = number of i-th individual species
 N = number of individuals of all types
 S = number of taxa (type)

2.3.2 Evenness Index

Calculations of the evenness index (E) can be done using the evenness index formula, and the magnitude of the species evenness index ranges from 0 to 1 [21]:

$$E = \frac{H'}{H_{\max}} \quad (2)$$

Information:

E = evenness index
 H = diversity index
 H_{max} = Log₂ S
 S = number of taxa (species)

2.3.3 Dominance Index

The calculation of the dominance index uses the Simpson dominance index formula [22]. The value of the dominance index (C) ranges from 0 to 1. If the value of C is close to 0, then no individual dominates, whereas if the value of C is close to 1, then there is an individual who dominates in a community [23].

$$C = \sum_{i=1}^S \left(\frac{n_i}{N} \right)^2 \quad (3)$$

Information:

C = dominance index
 n_i = number of i-th individual species
 N = total number of individuals

3 Results and Discussion

3.1 Results

3.1.1 Fish Diversity

The total number of fish caught during the research activity was 1277, consisting of 111 species, and divided into 51 families and 29 orders (Table 1). These fish species caught in the Cengkok coastal waters consisted of 32 species (and 349 individuals), in the Bojonegara coastal waters consisted of 58 species (and 473 individuals), and in Kemayungan-Linduk coastal waters consisted of 51 species (and 455 individuals). The fish caught in Cengkok Beach consisted of 23 families (18 orders), with the most numerous families being Mugilidae, followed by Sciaenidae, Mulidae, Gobiidae, Gerreidae, and Carangidae. In the Bojonegara, the fish consisted of 37 families (22 orders) where the Clupeidae family was the most common family found on the beach, followed by the Mugilidae, Leiognathidae, Carangidae, and Ariidae. Meanwhile, 34 families (21 orders) were found in the Kemayungan-Linduk beach, where the Sciaenidae is the most common family found on this beach, followed by the Clupeidae, Carangidae, Butidae, and Gobiidae. Results from the three sampling locations showed that the Sciaenidae and Clupeidae families (with 4 members each) are the families that have the most members found in the waters of Banten Bay, followed by Carangidae, Mugilidae, Leiognathidae, Butidae and Gobiidae.

In general, the most common species of fish found in those location were *Ellochelon vaigiensis*, *Planiliza subviridis*, and *Leiognathus equula*, followed by *Trichopodus trichopterus*, *Ambassis cf kopsii*, *Eleutheronema tetradactylum* and *Scatophagus argus* (Table 1). Based on the calculation of the biological indices, the diversity index ranged from 2,185 to 3,763, the evenness index ranged from 0.630 to 0.781, and the dominance index ranged from 0.072 to 0.233. These values indicated that the diversity of fish in this area was classified as medium-high, uniform, and there is no dominant fish.

3.1.2 Fish Distribution

The distribution of various species of fish was found in river, estuary, and marine waters. In addition, there were several species of fish found in the freshwater and estuary, sea and estuary, as well as fresh, estuary and marine locations. Three commonly fishes found in those areas are presented in Figure 2. In Cengkok coastal waters, *Oxudercus dentatus*, *Glossogobius giuris* and *Planiliza planiceps* were group of fish that are quite commonly found in rivers (C1). In the estuary (C2), the most common species of fish found were *Ellochelon vaigiensis*, *Glossogobius giuris*, and *Atule mate*. Meanwhile, in marine waters, the most common fish species found were *Ambassis cf kopsii* (C3), *Planiliza subviridis* and *Ellochelon vaigiensis* (C4), and *Ellochelon vaigiensis*, and *Ambassis cf kopsii* (C5). In this study, fish caught in fresh water and estuaries were also found, namely *Ambassis cf kopsii*, *Escualosa*

thoracata, and *Oxudercus dentatus*. *Ellochelon vaigiensis* was found in seawater and estuarine, while *Butis butis*, *Hexanemalichthys sagor*, and *Glossogobius giuris* were found in marine, estuary and freshwater areas.

Sampling in the Bojonegara coastal waters was carried out in the two river watershed areas (Wadas and Terate Rivers), including the estuary and the adjacent sea (Figure 2). At the freshwater station of the Wadas River (B1), this study found *Ellochelon vaigiensis*, *Planiliza subviridis*, and *Mystus gulio*. At the estuary station (B2), the fish species commonly found were *Leiognathus equula*, *Scomberoides commersonianus* and *Pomadasys argenteus*. While at the sea station (B3), the species of fish that are commonly found were *Leiognathus equula*, *Nuchequula gerroides* and *Siganus javus*. At the freshwater station in the Terate River (B6), *Trichopodus trichopterus*, *Ellochelon vaigiensis*, and *Planiliza subviridis* were the most common fish found in that location. At the estuary station (B5), the species of fish commonly found were *Chanos chanos*, *Siganus javus* and *Nibea soldado*. While at the sea station (B4), the species of fish that are commonly found were *Leiognathus equula*, *Siganus javus*, and *Anodontosoma chachunda*. In these waters were found several species that inhabit more than one waters. *Hexanemalichthys sagor* and *Barbonymus gonionotus* were found in freshwater and estuary areas. *Johnius belangeri* and *Tetraodon lineatus* were found in marine and estuary areas. While *Arius maculatus*, *Planiliza subviridis*, and *Scatophagus argus* were found in river, estuary and marine areas.

Observations made in the Kemayungan-Linduk coastal waters were also carried out in two watersheds, namely the Kemayungan River and the Linduk River (Figure 2). In the Kemayungan watershed, the common fish species found at the freshwater station (KL1), the most common fish species found were *Planiliza subviridis*, *Barbonimus gonionotus* and *Chana striata*. At the estuary (KL2), the common fish species found were *Thryssa mystax*, *Scatophagus argus*, *Planiliza subviridis*, and *Eleutheronema tetradactylum*. Meanwhile, in the sea (KL3), the common fish found were *Eleutheronema tetradactylum*, *Osteomugil cunnesius*, *Johnius belangeri*, and *Scomberomorus commerson* (Figure 2). In observations in this area, *Glossogobius giuris* was found in freshwater and estuary areas, while *Eleutheronema tetradactylum*, *Hyporhamphus dussumieri*, *Johnius belangeri*, *Osteomugil cunnesius* and several other species were found in marine and estuary areas, while *Planiliza subviridis* were found in fresh water, estuaries and seas. Observation conducted in Linduk River (KL6), the most common species of fish found were *Glossogobius giuris*, and *Planiliza subviridis*. At the estuary (KL5), the fish species commonly found were *Arius maculatus*, *Planiliza subviridis*, *Scatophagus argus* and *Johnius belangeri*. While at the sea (KL4), the species of fish that are commonly found were *Thryssa mystax*, *Eleutheronema tetradactylum* and *Hypoatherina temminckii*. In this area, fishes of *Butis butis* and *Hexanemalichthys sagor* were found in fresh water and estuaries, *Johnius belangeri* and *Tetraodon lineatus*

were found in sea and estuaries, while *Arius maculatus*, *Planiliza subviridis* and *Scatophagus argus* were found in sea, estuaries and fresh water.

Fig. 2. Distribution of three commonly fish found in Banten

3.1.3 Species status.

The International Union for the Conservation of Nature and Natural Resources (IUCN) performs categorization based on the IUCN Red List conservation status in classifying the status of various species of living organisms that are threatened with extinction. From this conservation status, the IUCN issued the IUCN Red List of Threatened Species or abbreviated as IUCN Red List, which is a list of the rare status of a species. Based on the IUCN Redlist version 3.1, the conservation category consists of Extinct (EX; Extinct); Extinct in the Wild (EW; Extinct in the Wild); Critically Endangered (CR; Critical), Endangered (EN; Critical or Endangered), Vulnerable (VU; Vulnerable), Near Threatened (NT; Near Threatened), Least Concern (LC; Low Risk), Data Deficient (DD; Lack of Information), and Not Evaluated (NE; Not yet evaluated).

Fig. 3. Status of fish found on the coastal waters of Banten Bay according to IUCN. Note: EW: Extinct, CR: Critical, EN: Endangered, VU: Vulnerable, NT: Near Threatened, LC: least concern, DD: Data deficient, NE: Not Evaluated.

Based on checking the status of these fish at the IUCN, it was found that almost 64% of fish in the coastal waters of Banten Bay are classified as least concern-low risk (LC), followed by 26% not evaluated-

not yet evaluated (NE), 10% data deficient-less information (DD), 2% near threatened-endangered (NT), and 2% vulnerable-extinct (VU). The results of the grouping the species status based on the IUCN is presented in Figure 3. From these results, there were four species that are quite worrying, namely *Brevitrygon cf walga*, *Scomberoides commerson* (NT), *Oreochromis mossambicus*, (VU) and *Maculabatis gerrardi* (EN)(Figure 3).

3.2 Discussion

Banten Bay, as one of the areas that has potential for fish resources, has currently developed into an industrial area. Such conditions became challenges for regional managers to be able to carry out activities that are not contradictory to one another. Industries that are estimated to produce waste may certainly affect the fish resources found in the area around the industry. Therefore, important scientific information is needed as a basis for carrying out development policies in the region. The watershed (DAS-Indonesian) that leads to the waters of Banten Bay has a variety of designations. In this study, samples were taken which were estimated to have designation characteristics in the surrounding area, namely the Cengklok (center), Bojonegara (west), and Kemayungan-Linduk coastal waters (east).

Based on the results of observations in the three coastal areas of Banten Bay, it was found about 111 species, which were spread on the cengklok beach (32 species), Bojonegara coastal waters (58 species), and Kemayungan-Linduk beach (51 species). The number of fish species found on the Cengklok, Bojonegara and Kemayungan-Landik beaches was greater, compared with number of species found in the mangrove ecosystem of Ujung Kulon National Park, Pandeglang (Banten Province) [24], in several estuaries in Banten Bay [4], in Kumbe River estuary, Merauka Regency (Papua Province) [25], in Sembilang River estuary, Banyuasin (South Sumatra Province) [26], in Bojong Langkap River estuary, Segara Anakan (Central Java Province) [27], in the mouth of the Musi River (South Sumatra Province) [28], and in the Sembilang River estuary (South Sumatra Province) [29]. However, the results of this study are similar to those conducted in the Mayangan estuary of West Java [30].

Several species found in the coastal area of the Banten Bay are also similar to those found in the mangrove ecosystem of the Ujung Kulon National Park such as *Planiliza subviridis*, *Planiliza planticeps*, *Mystus gulio*, *Leiognathus equula*, *Gerres oyena*, *Terapon jarbua*, *Butis butis*, *Scatophagus argus*, *Strongylura leiura*, *Chelonodon patoca*, *Lutjanus russeli*, and *Caranx sexfasciatus* [24]. The species of fish from the results of this study are also similar to the results of previous research conducted in 2013 in several estuaries of the Wadas, Cibanten, Cengklok, and Pamong Rivers of Banten Bay. In that previous study, there were 17 species of fish (Estuary of Wadas), 20 species of fish (Estuary of Cibanten), 15 species of fish (Estuary of Cengklok), and 1 species of fish (Estuary of Pamong). Some of these species of fish are also similar to the fish found in this study, i.e. *Scatophagus argus*,

Scomberomorus commersoni, *Mugil cephalus*, *Sardinella fimbriata*, *Eleutheronema tetradactylum*, *Rastrelliger* sp., *Leiognathus* sp., and *Ambassis* sp [11].

In the current study, it appears that the fish species found in the Cengkok coastal waters (32 species) were fewer than in other locations (51 species in the Kemayungan-Linduk coastal waters, and 58 species in the Bojonegara coastal waters). This condition is thought to be due to the sampling frequency which is less than the other locations and requires further observations. The species of fish found in the three locations were similar, but there were several species of fish that were only caught in certain locations. Species of *Ambassis cf kopsii*, *Atherinomorus lacunosus*, *Atule mate* were only found at the Cengkok coastal waters. *Albula argentea*, *Allenbatrachus grunniens*, *Boleophthalmus boddarti*, *Brevitrygon cf wedga*, *Hyporhamphus quoyi*, and *Lagocephalus lunaris* were only found in the Bojonegara coastal waters. Meanwhile, *Chirocentrus dorab*, *Platycephalus indicus*, *Pseudotriacanthus strigilifer*, *Tetraodon lineatus*, and *Trichiurus lepturus* were only found in Kemayungan-Landik coastal waters. In these observations, it is not known with certainty the parameters that distinguish the diversity of species found, but if sampling activities can be carried out with the same frequency, it is estimated that the species of fish found are more similar. In this study, no invasive species were found, but introduced species of fish (Chiclid) was found. According to the biological indices, similar condition was also conveyed [11], who conducted research in estuaries, and showed that the diversity of fish in some of these estuaries (Wadas, Cibanten, Cengkok) was moderate, and study conveyed the diversity of fish in the mangrove ecosystem of Ujung Kulon National Park, Pandeglang (Banten) [24]. However, the conditions on the Bojonegara coast and the Kemayungan-Linduk coast are somewhat different from the observations made show higher diversity [11]. The evenness index value also shows a medium-high value (0.630-0.781), and there is no particular species that dominates (0.072-0.233) in the area.

The status of fish species found in Banten Bay waters is generally least concern (LC), and only a few are found in near threatened (NT), vulnerable (VU), and endangered (EN) status. Two species of fish belonging to the NT species are *Himantura cf walga* and *Scomberoides commerson*, one species of fish that classified as vulnerable is *Oreochromis mossambicus* and one endangered species (EN) is *Maculabastis gerrardi*. Such conditions are similar to those found in several coastal areas in Indonesia. This condition is a common condition in estuarine and coastal areas, as is the case with estuarine fish species in the Kayan-Sembakung Delta which are generally also in LC status [31].

4 Conclusion

Based on observations made in three areas of Banten Bay (Cengkok, Bojonegara, and Kemayungan-Linduk coastal waters), the diversity of fish species consists of

111 species, including 29 orders and 51 families. Common species found include *Ellochelon vaigiensis*, *Planiliza subviridis*, and *Leignathus equula*. The diversity, evenness, and dominance index values ranged from 2.185 to 3.763, 0.630 to 0.781, 0.072 to 0.233, respectively which indicated moderate-high diversity and none was dominant. Based on the IUCN status, generally the fish found were least concern (LC), but there were also one species included in the vulnerable (VU) (*Oreochromis mossambicus*, one species included Endangered (EN) *Maculabastis gerrardi*), and two species in the near threatened (NT) (*Brevitrygon cf walga*, *Scomberomorus commerson*). Therefore, fishing activities in this area are also important to maintain these species, in the context of conserving fishery resources

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Table 1. Diversity of fish found in Banten Bay

No	Ordo	Family	Species	Cengkok (C)	Bojonegara (B)	Kemayungan-Linduk (KL)
1	Acanthuriformes	Scatophagidae	<i>Scatophagus argus</i>	1	13	41
2		Siganidae	<i>Siganus javus</i>		31	
3	Albuliformes	Albulidae	<i>Albula argentea</i>		1	
4	Anabantiformes	Channidae	<i>Channa striata</i>			4
5			<i>Channa gachua</i>		3	
6	Anabantiformes	Osphronemidae	<i>Trichopodus trichopterus</i>	2	60	
7	Atheriniformes	Atherinidae	<i>Atherinomorus lacunosus</i>	2		
8			<i>Hypoatherina temminckii</i>			15
9	Aulopiformes	Synodontidae	<i>Synodus indicus</i>		1	
10	Batrachoidiformes	Batrachoididae	<i>Allenbatrachus grunniens</i>		4	
11	Beloniformes	Belonidae	<i>Strongylura incisa</i>			11
12			<i>Strongylura leiura</i>		3	
13		Hemiramphidae	<i>Hyporhamphus dussumieri</i>			5
14			<i>Hyporhamphus quoyi</i>		1	
15	Carangiformes	Carangidae	<i>Alepes kleinii</i>			4
16			<i>Atule mate</i>	4		
17			<i>Caranx sexfasciatus</i>	2	2	
18			<i>Scomberoides commersonianus</i>		5	
19			<i>Scomberoides tala</i>		12	
20			<i>Carangoides malabaricus</i>			2
21			<i>Carangoides praeustus</i>			3
22	Cichliformes	Cichlidae	<i>Oreochromis mossambicus</i>		3	
23			<i>Oreochromis niloticus</i>	2	11	1
24	Clupeiformes	Chirocentridae	<i>Chirocentrus dorab</i>			2
25		Clupeidae	<i>Anodostoma chacunda</i>		35	1
26			<i>Dussumieria elopsoidea</i>		1	
27			<i>Hilsa keele</i>		1	1
28			<i>Sardinella albella</i>			6
29			<i>Sardinella fimbriata</i>		3	
30			<i>Sardinella gibbosa</i>		1	
31			<i>Escualosa thoracata</i>	6		
32		Engraulidae	<i>Thryssa hamiltoni</i>		3	
33			<i>Thryssa mystax</i>			53
34	Cypriniformes	Cyprinidae	<i>Barbonymus gonionotus</i>			6
35			<i>Osteochilus vittatus</i>			1
36	Cyprinodontiformes	Poeciliidae	<i>Poecilia latipinna</i>		4	
37			<i>Xiphoporus helleri</i>		1	
38	Elopiformes	Elopidae	<i>Elops hawaiiensis</i>	1		1
39		Megalopidae	<i>Megalops cyprinoides</i>			2
40	Gobiiiformes	Butidae	<i>Butis butis</i>	6		4
41			<i>Oxyeleotris marmorata</i>			3
42		Eleotridae	<i>Ophiocara porocephala</i>			1
43		Gobiidae	<i>Acentrogobius caninus</i>	4		

44			<i>Acentrogobius viridipunctatus</i>			2
45			<i>Glossogobius giuris</i>	16	1	16
46			<i>Odontamblyopus rubicundus</i>			1
47			<i>Parapocryptes serperaster</i>			3
48			<i>Oxudercus dentatus</i>	10		
49		Oxudercidae	<i>Boleophthalmus boddarti</i>		1	
50	Gonorynchiformes	Chanidae	<i>Chanos chanos</i>	2	16	1
51	Mugiliformes	Mugilidae	<i>Planiliza planiceps</i>	6		
52			<i>Mugil cephalus</i>		3	
53			<i>Osteomugil cunnesius</i>			23
54			<i>Planiliza subviridis</i>	26	27	63
55			<i>Ellochelon vaigiensis</i>	153	42	
56	Mulliformes	Mullidae	<i>Upeneus quadrilineatus</i>	1		
57			<i>Upeneus tragula</i>	3		
58	Myliobatiformes	Dasyatidae	<i>Brevitrygon cf walga</i>		7	
59			<i>Maculabastis gerrardi</i>		1	
60	Perciformes	Ambassidae	<i>Ambassis cf kopsii</i>	61		
61		Gerreidae	<i>Gerres cf limbatus</i>		1	
62			<i>Gerres filamentosus</i>		7	
63			<i>Gerres longirostris</i>		2	
64			<i>Gerres oyena</i>	6	1	
65			<i>Pentaprion longimanus</i>	1		
66		Haemulidae	<i>Pomadasys argenteus</i>	3	6	
67			<i>Pomadasys kaakan</i>		1	
68		Lactariidae	<i>Lactarius lactarius</i>			1
69		Latidae	<i>Lates calcalifer</i>			7
70		Lutjanidae	<i>Lutjanus ehrenbergii</i>	1		
71			<i>Lutjanus russelli</i>		5	
72		Polynemidae	<i>Eleutheronema tetradactylum</i>		3	53
73			<i>Polydactylus plebeius</i>	9		
74		Serranidae	<i>Ephinephelus coioides</i>			2
75		Sphyraenidae	<i>Sphyraena barracuda</i>		4	
76			<i>Sphyraena jello</i>			2
77		Sciaenidae	<i>Dendrophysa russelli</i>		2	
78			<i>Johnius amblycephalus</i>	3		
79			<i>Johnius belangerii</i>			19
80			<i>Johnius heterolepis</i>	2		
81			<i>Johnius trachycephalus</i>		1	
82			<i>Otolithes ruber</i>			1
83			<i>Nibea soldado</i>		15	2
84			<i>Eubleekeria splendens</i>			3
85	Acanthuriformes	Leiognathidae	<i>Nuchequula gerreoides</i>		12	
86			<i>Leiognathus equula</i>	4	101	
87	Scombriformes	Trichiuridae	<i>Trichiurus lepturus</i>			1
88	Centrarchiformes	Terapontidae	<i>Terapon jarbua</i>	1	4	

89			<i>Tetraodon lineatus</i>			6
90	Tetraodontiformes	Tetraodontidae	<i>Lagocephalus lunaris</i>		1	
91			<i>Chelonodon patoca</i>	1	1	
92			<i>Takifugu oblongus</i>		4	
93	Anabantiformes	Anabantidae	<i>Anabas testudineus</i>		34	2
94	Pleuronectiformes	Psettodidae	<i>Psettodes erumei</i>		1	
95		Cynoglossidae	<i>Cynoglossus bilineatus</i>		2	
96			<i>Cynoglossus cf lida</i>	2		
97			<i>Cynoglossus cynoglossus</i>			1
98	Scombriformes	Scombridae	<i>Rastrelliger brachysoma</i>			2
99			<i>Scomberomorus commerson</i>			24
100			<i>Scomberomorus guttatus</i>		1	
101		Stromateidae	<i>Pampus argenteus</i>			1
102			<i>Pampus chinensis</i>			4
103	Scorpaeniformes.	Platycephalidae	<i>Platycephalus indicus</i>			1
104	Siluriformes	Ariidae	<i>Arius arius</i>		1	
105			<i>Arius maculatus</i>			31
106			<i>Plicofollis cf argyropleuron</i>		1	
107			<i>Hexanematichthys sagor</i>	6	1	2
108		Loricariidae	<i>Pterygoplichthys pardalis</i>	3	1	
109		Bagridae	<i>Mystus gulio</i>		12	10
110	Tetraodontiformes	Triacanthidae	<i>Pseudotriacanthus strigilifer</i>			1
111			<i>Triacanthus biaculeatus</i>		1	
			Taxon Number	32	58	51
			Abundance	350	523	452
			Diversity Index	2.185	3.763	3.055
			Evenness Index	0.630	0.763	0.781
			Dominance Index	0.233	0.078	0.072