Family and Species Composition of Fishes Caught from Marudu Bay, Sabah, Malaysia

Abstract

A study was conducted on family and species composition of fishes caught from the estuarine area of Marudu Bay, Sabah, Malaysia from October 2012 to September 2013. Fish samples were collected by using gill nets. In total, 40 species of fish belonging to 29 families were identified. In terms of species diversity, Carangidae (3 species) and Leiognathidae (3 species) were amongst the most dominant families. Seven families (Portunidae, Terapontidae, Serranidae, C Ludapeidae, Sciænidae, Engraulidae and Scombridae) consisted of two species while the other 20 families (Ardilidae, Centriscidae, Peneæidae, Gerreidae, Paralichthyidae, Nemipteridae, Dasyatidae, Sillaginidae, Belonoida, Mugilidae, Mullidae, Scatophagidae, Lutjanidae, Tetraodontidae, Eleotridae, Soleidae, Cynoglossidae, Squalidae, Sphyraenaïdae and Atherinidae) had only one species per family. From this study, it is suggested that further detailed studies on the family and species composition of the fish and crustacean are needed from more geographical locations of Malaysia for sustainable fisheries management.

Keywords: Family; Species; Fish composition; Marudu bay; Sabah

Introduction

Currently, there are various definition for estuaries, but generally, they are partially enclosed bodies of water where freshwater mixes with oceanic saltwater to produce a mixed and fluctuating salinity environment [1-3]. The estuaries can be perceived as an ideal environment for numerous aquatic species despite a constant change in salinity, temperature and turbidity [4-8]. Estuaries are recognized worldwide as main breeding centers and nurseries many fish species due to their highly diverse and productive macrofauna [9-12]. Hence, specific areas in estuaries such as mangrove forests and seagrass meadows are favorite places for estuarine fishes to spawn as they can ideally be used as sheltered areas for juvenile fishes [13-16].

For the record, there had been several studies on fish identification and composition in the estuaries of Peninsular Malaysia [17-23]. The findings from those studies can be used to help researchers and government authorities in finding better ideas and actions in improving estuine ecosystem management in Peninsular Malaysia. Unfortunately, the information and studies about fish composition in the estuarine areas of Sabah and Sarawak are still scarce due to the lack of funding, logistic and expertise [24-26]. Realizing this, for the past few years, the government reacts by beginning extensive fisheries research in Sabah and Sarawak. As a result, Marudu Bay, one of well-known estuary in Sabah, had been selected for the study of fish composition.

The role of Marudu Bay as one of important fishery areas in Sabah cannot be denied as nowadays, many fishery activities such as capture fishery, cage aquaculture, mollusk culture and fish-product processing are operated there [27]. As a result, adequate and update information about fisheries status in Marudu Bay are needed in order for the authorities to manage the fish stocks effectively. Unfortunately, recent records showed that there was very little or no comprehensive information about fish composition in Marudu Bay [24]. The knowledge and identification of fish assemblage in Marudu Bay is quite essential as the study of fish diversity at there cannot be executed unless the study of fish composition had been done first. Hence the objective of this chapter was to identify and find the composition of fishes, up to the species level, found in the estuaries from Marudu Bay, Sabah, East Malaysia. This study will provide first sufficient and comprehensive data about fish composition in Marudu Bay, thus enabling further studies about fish diversity in the later chapter.

Materials and Methods

The study was conducted at Marudu Bay in the coastal waters of Kota Marudu, Sabah, East Malaysia (Figure 1). The coastline of Kota Marudu is short (70 km) compared to the other districts in Sabah, with only 4 km along the mainland, 33 km along lagoons and 33 km along islands. Monthly samplings were conducted between October 2012 and September 2013. The sampling activities were carried out during daylight when the tides were high. A medium sized motor boat with a 14 horse power engine was used as transportation to the sampling stations. Fish samples were collected by using gill nets. Upon being ready, the specimens were brought onto land and kept on crushed ice until analysis. The family and species identifications of the sample began by carefully looking at their morphological appearance. The fishes were identified by using a reference book [28] and fisheries manual [29]. The samples were then sorted according to the family and species level.
Results and Discussion

In total 40 species of fish and crustaceans belonging to 29 families were identified from the estuary and coastal area of Marudu Bay, Sabah, East Malaysia (Table 1). In terms of species diversity, Carangidae (3 species) and Leiognathidae (3 species) were amongst the most dominant families. Seven families (Portunidae, Terapontidae, Serranidae, Clupeidae, Sciaenidae, Engraulidae and Scombridae) consisted of two species while the other 20 families (Ariidae, Centriscidae, Penaeidae, Gerreidae, Paralichthyidae, Nemipteridae, Dasyatidae, Sillaginidae, Belonidae, Mugilidae, Mullidae, Scatophagidae, Lutjanidae, Tetraodontidae, Eleotridae, Soleidae, Cynoglossidae, Squillidae, Sphyraenidae and Atherinidae) had only one species per family.

Table 1: List of fish and crustacean species recorded from estuary and coastal area of Marudu Bay, Sabah.

| Family            | Species (Scientific Name)       | Local Name                  |
|-------------------|--------------------------------|-----------------------------|
| 1. Ariidae        | Arius maculates                 | Ikan duri tompok           |
| 2. Carangidae     | Atule mate                      | Ikan pelata                 |
|                   | Scomberoides tol                | Ikan talang lampai          |
|                   | Carangoides malabrichus         | Ikan demudok cermin         |
| 3. Sillaginidae   | Sillago sihama                  | Ikan puntung-damar perak    |
| 4. Leiognathida   | Eubleekeria splendens           | Ikan kekek mahkota          |
|                   | Leiognathus equulus             | Ikan kekek gedahbang        |
|                   | Secutor ruconius                | Ikan sekiki india           |
| 5. Tetraodontida  | Lagocephalus gloveri            | Ikan buntal pisang-perang   |
| 6. Paralichthyida | Pseudorhombus cinnamoneus       | Ikan sebelah kayu manis    |
| 7. Centriscidae   | Centriscus cristatus            | Ikan pisau lipat            |
| 8. Gerreidae      | Gerres oyena                    | Ikan kapas laut             |
| 9. Serranidae     | Epinephelus coiodes             | Ikan kerapu bintik jingga   |
|                   | Epinephalus sexfasciatus        | Ikan kerapu bebeh           |
| 10. Sciaenidae    | Otolithes ruber                 | Ikan tengkerong panjang     |
|                   | Dendrophysa russelli            | Ikan gelama-janggut tanda   |
| 11. Nemipterida   | Nemipterus nemurus              | Ikan kerisi spina merah     |
Based on Table 2, it can be said that each study used different types of fishing gear, resulting in species diversity differences. It is understood that the types of fishing gears (depending on the manpower and logistics) and also the time of fishing (during high or low tide; day or night) can be attributed as the main reasons for this diversity [23]. The present and previous studies also showed that neither fish larvae or juveniles, which were always abundant in the estuary areas, were caught during sampling as they can simply pass through the mesh net, implying that only big and mature fish were caught during sampling. Therefore, the collection of fish larvae and juveniles for more detailed studies of fish fauna in estuary areas can only be achieved by using suitable sampling gears. For example, a plankton net or bongo net have more suitable features such as micro mesh sizes and a fixed main frame for trapping small fish [19, 23].

Table 2: Comparison table of fish classification (total number by family and species) and types of gears that were used to catch fish between the present study and previous regional studies.

| S. No | Location                        | Fish Classification | Type Of Gears | Source                         |
|-------|---------------------------------|---------------------|---------------|--------------------------------|
| 1     | Marudu Bay (Malaysia)           | 29                  | 40            | Trammel net                    | Present study |
| 2     | Sungai Pulai seagrass beds (Malaysia) | 37                  | 72            | Trammel net                    | Jimmy [23]    |
| 3     | Tanjung Pelepas (Malaysia)      | 30                  | 47            | Trammel net and cast net       | Arshad et al. [21] |
| 4     | Merchang estuary and seagrass areas (Malaysia) | 19                  | 32            | Trammel net, gill net and cast net | Suryana [20] |
| 5     | Mengkabong Bay (Malaysia)       | 40                  | 91            | Push net and Gill net          | Mazlan et al. [19] |
| 6     | Bangrong estuary (Thailand)     | 48                  | 95            | Trawl net                       | Poovichiranon & Satapoomin [30] |
| 7     | Gulf of Thailand (Thailand)     | 29                  | 38            | Beam trawl                      | Sudara et al. [31] |
| 8     | North Bais Bay (Philippines)    | 48                  | 49            |                                | Dollar [32]    |
A previous study in Mengkabong Bay, Sabah, found 91 fish species belonging to 40 families [19]. They used three types of nets including a trammel net, gill net and cast net to catch the fish while our present study sampled fish by only using a gill net. The use of multiple types of nets may have contributed to the higher occurrence of species diversity and abundance than our present study as the practice of using several fishing gears at the same time can potentially lead to a higher catch rate of fish [19]. From this, we can suggest that it is a good idea to use various net types whenever commencing fish sampling as it can yield sufficient findings in terms of fish diversity and distribution.

Trammel and gill nets are considered to be more popular than other fishing gears for fish sampling as indicated in Table 2 where five out of seven previous studies used these nets as main fishing gears [19,21,20,23,30]. The yield from using these nets can be quite good for showing fish diversity and distribution of the targeted areas. Evidence can be observed by looking at the structures of these nets, which have multiple mean mesh sizes that enable it to trap various fish species with varied body sizes. The passive principal of operation of trammel and gill nets involves casting instead of towing which can prevent much of the fish fauna from extinction as these nets only trap those that try to pass them. Instead of using small nets, the neighboring countries of Malaysia such as Thailand and Philippines use big nets like trawl nets [31] and beam trawls [32] as the main method of sampling fish. The results from those studies were not much different from the present study as observed from Table 4.2. The number of families and species obtained were 29 families, 38 species [31] and 40 families, 49 species [32], respectively, almost close to the present study in which 29 families and 40 species were obtained. The degree of fish family and species diversity that were recorded from those studies should be distinctively higher than the present study, considering the fact that gill nets are a passive fishing gear while trawl nets and beam trawls are active fishing gears. However, this was not the case as the main reason lies on the operation of those nets. The trawling operation by trawl nets and beam trawls indiscriminately sweep all forms of fishes (juveniles and adults) found in the study areas, with a high chance of getting a high catch yield of only several dominant species, thus ignoring other less dominant species that are scattered in the study areas [23]. Due to this inefficiency, it is suggested that the use of trawl nets should be limited and instead, passive fishing gears should be encouraged in any fish sampling activities to ensure better results in the observations of fish diversity. In conclusion, further detailed studies on the family and species composition of the fish and crustacean are needed from more geographical locations of Malaysia for fisheries management in these waters.

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