Assessment and Composition of Fish in the River District Maro Merauke

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Abstract. Maro River is one of the major rivers in Merauke Regency that has a width of about 43-900 m and length of 300 km. The purpose of this study is to find out the type and composition of fish caught using gill net in Maro River, Merauke Regency. This study was conducted in Maro River, Merauke Regency from May to June 2014. It was conducted using survey method. The data analysis included: species composition, relative abundance, availability frequency, diversity index and dominance index. The results of showed 1,084 fish in 17 species with the following composition; 490 of Kurtus gulliveri species (37,01%), 212 of Eleutheronema tetradactylum species (20,33%), 170 of Polydactylus plebeius species (16,30%), 75 of crassilabris Cinetodus species (7,19%), 64 of Cinetodus froggatti species (6,14%), 37 of Argyrosomus amoyensis species (3,55%), 20 of Mugil cephalus species (1,92%), 15 of Megalops cyprinoides species (1,53%), 15 of Thryssa scratchleyi species (1,4%), 12 of Lebtobrama sp species (1,15%), 9 of Laties calcarifer species (0,86%), 7 of Marilyna meraukensis species (0,67%), 7 of Scomberomorus commerson species (0,67%), 5 of Nibea squamosal species (0,48%), 4 of Rhinoptera javanica species (0,38%), 3 of Harpadon microchir species (0,29%) and 1 of Datnioides campbelli species (0,10%). Based on the availability frequency, there are 37 species with a percentage of 100%, 37 species with 67% and 7 species with 33%. The diversity of fish has a moderate value of 1<H'<3. The obtained dominance index value is close to 0, then it is stated that there is no species found to be dominant.

Keywords: River; Species Composition; Abundance; Availability; Diversity and Dominance.

1. INTRODUCTION

Merauke Regency has a brackish water resources potential of 22.204 Kg [1]. The data concerning the number of potential local consumption of fish/Kg by type per District in Merauke Regency showed a total of 4,094,426 Kg [11]. The abundant natural resources are strongly supported by many rivers that flows into the Arafura sea, such as, Digul river, Bin river, Maro river and others. [2]

Maro River is one of the great rivers in Merauke that has a width of about 43-900 m and a length of 300 km. This river has a historical value for Merauke, because the name Merauke derives from the name of this River. It can be interpreted that the characteristics of the area around the river is highly fertile, as it has great mangrove forests, and has mud substrate, so that the water turbidity is fairly high and has a relatively high water acidity as it is a meeting point between the freshwater and seawater along the river that becomes a unique habitat for fish and other living organisms contained in this river [3]. Based on the research conducted by [4], there are many species of fish that exist in this Maro river, among others, eel tail catfish (Neolisurhus sp), fly river gizzard shad (Nematolosus flyensis), oxeye herring (Megalops cyprinoids), nursery fish (Kurtus gulliveri), Belanak (Mugil sp) and fly river thryssa (Thryssa rastrosa).

13% of the people in Gudang Arang, Maro Village, are fisherman who actively fishing. Fishing in the Maro River, especially for the Gudang Arang area, in the upstream, is an activity that has been done by people, especially for those living along the river [5]. Nevertheless, there is no available data in Merauke Regency about the composition of fish species caught, especially for Maro River in Gudang Arang. Therefore, it is necessary to conduct a study on the types and composition of fish to maintain and pay attention to its sustainability in nature and to be the basis of information about the types and composition of fish and sustainable management of fish resources.

Knowing the right to find out the types and composition of fish caught using gill net in Maro River in Gudang Arang, Maro Village, Merauke Regency.

2. RESEARCH METHOD

2.1. Location and Time of Research

The research is conducted from May to July 2014 at the Maro River in Gudang Arang, Maro Village, Merauke Regency.
2.2. Tools and Materials

The tools used in this study were gill net (with a mesh size of 1 and 2 inch), boats, cool box, thermometer, pH meter, salinometer, analytical scales, hanging scales, plastic jars, plastic tray, tweezers, tissue, bucket, camera, stopwatch, fit bottle, raffia string, GPS, calculator, ruler, stationery, notebook and identification book. The materials used were ice cubes and types of caught fish.

2.3. Research Method

The method used in this research was survey method. Soehartono (1995) [6] suggests that the survey method is a method to obtain the existing data at the time of research conducted. This survey method can be a descriptive survey which aims to collect information a number of samples of people, object and others [7]. Such descriptive research uses survey method, while the data collection techniques used were as follows.

2.3.1. Observation

Sampling was conducted every Monday, Wednesday and Friday with 3 repetitions. The sampling technique used was purposive random sampling [8].

2.3.2. Interview

Interview is a data collection technique in survey methods that uses verbal questions to research subjects, which is conducted if the researcher needs communication to the respondents [6].

2.4. Research Procedures

2.4.1. Measurement of physical factors, water chemistry

Measuring the water temperature, flow velocity, salinity and water pH.

2.4.2. Collection of specimens or samples

Sampling was done every Monday, Wednesday and Friday with 3 repetitions. The sample of fish was taken at low tide at three locations or stations, namely station 1 located in Estuary which is ± 5 km away before the meeting point with location II in Floodgate which is ± 5 km away after the meeting point with location III which is on the Cape. Fish sampling at each location was done at three points, i.e., the right, middle, and left bank of the river. In the right and left bank, fish sampling was conducted by using the gill net with a mesh size of 1 inch and in the middle bank by using the gill net with a mesh size of 2 inches.

The samples were collected in mesh pockets at each of the three stations: station I (Estuary), station II (Floodgate) and station III (Cape).

2.4.3. Identification of Fish

The identification was conducted by using manual identification (Allen, 1989, and Allen 1991) [9,10] to determine the name of the collected species.

2.5. Data Analysis

The data analysis used descriptively is to process data obtained in field and compare with literature study. [16]

2.5.1. Type Composition

The type composition was obtained from the data of the size and number of nekton species obtained from each location with a predetermined station [12].

2.5.2. Relative Abundance

The calculation of relative abundance of each species was conducted by calculating the percentage of the number. The equation used was [13]

\[
Kr = \frac{ni}{N} \times 100\% 
\]

Information:
Kr = relative abundance
ni = i-th individual species
N = total number of individuals of all species

2.5.3. Availability Frequency

Availability Frequency was used for showing the spread of local distribution of certain species. This is evident from the frequency (%) of fish caught by using the following equation [14]

\[
Fi = \frac{ti}{T} \times 100\% 
\]

Information:
Fi = availability frequency of i-th caught species (%)
ti = the number of stations in which the i-th species is caught
T = the number of all stations

2.5.4. Diversity Index

In order to determine the diversity of fish, it used the Shannon-Wiener index [15]:

\[
H' = -\sum_{i=1}^{N} \left( \frac{ni}{N} \ln \left( \frac{ni}{N} \right) \right) 
\]

Information:
H’ = Sahnnon-Wiener Diversity Index
ni = i-th individual species
2.5.5. Determination of Criteria:

The ranges of diversity index value, according to Kreb (1989) are as follows: (1). $H' < 1$ : low diversity, narrow spread of individual species and low community stability. (2). $1 < H' < 3$: moderate diversity, moderate spread of individual species and moderate community stability. (3) $H' > 3$ : high diversity, high spread of individual species and high community stability.

2.5.6. Dominance Index

In order to determine whether the fish are available, the Simpson’s dominance index was used, as follow (Odum, 1996):

$$ C = \sum \frac{n_i^2}{N} $$

Information:

- $C$ = Simpson’s Diversity Index
- $n_i$ = i-th individual species
- $N = \text{total number of individuals of all species}$

Legendre, (1983) states the value of dominance index ranges from 0-1; index 1 indicates very high dominance by one species (there is only one type in one station). While index 0 indicates that there is no dominance among the species found.

3. RESULT AND DISCUSSION

3.1. Types of Fish Caught

Table 1. Number of Species Caught per Station in The Research Location in Maro River, Gudang Arang, Maro Village, Merauke Regency

| No | Number of Species Caught in The Research Location |
|----|-----------------------------------------------|
| 1  | Cinetodus froggatti                        |
| 2  | Cinetodus crassilabris                     |
| 3  | Kurtus gulliveri                           |
| 4  | Argyrosomus amoyensis                      |
| 5  | Polydactylus plebeius                      |
| 6  | Eleutheronema tetradactylum                |
| 7  | Marilyna merakensis                        |
| 8  | Mugil cephalus                             |
| 9  | Megalops cyprinoides                       |
| 10 | Thryssa scratchleyi                        |
| 11 | Harpodon microchir                         |
|    |                                              |
|    | Station I (Estuary)                        |
|    | Station II (Floodgate)                     |
|    | Station III (Cape)                         |
| 1  | Cinetodus froggatti                        |
| 2  | Cinetodus crassilabris                     |
| 3  | Kurtus gulliveri                           |
| 4  | Argyrosomus amoyensis                      |
| 5  | Polydactylus plebeius                      |
| 6  | Eleutheronema tetradactylum                |
| 7  | Marilyna merakensis                        |
| 8  | Mugil cephalus                             |
| 9  | Megalops cyprinoides                       |
| 10 | Thryssa scratchleyi                        |
| 11 | Harpodon microchir                         |

Based on Table 1, there were 17 fish species caught in Maro River in Gudang Arang. Based on Table 1, there were 17 fish species found in station I, 7 species found in station II and 10 species found in station III.

3.2. Composition of Species

Based on the results of research conducted in Maro River, Gudang Arang, Maro Village, Merauke Regency, there were 17 species with total composition of fish caught can be seen in Table 2.

Table 2. Total fish caught in Maro River, Gudang Arang, Maro Village, Merauke Regency

| No | Species in Research Location | Station I (Estuary) | Station II (Floodgate) | Station III (Cape) | Total |
|----|------------------------------|---------------------|------------------------|--------------------|-------|
| 1  | Lizardfish (Harpodon microchir) | Flathead grey mullet | 3                      | 0                  | 0     | 3     |
| 2  | Nibea squamosal              | 8                   | 0                      | 8                  | 12    | 20    |
| 3  | Lates calcarifer             | 32                  | 12                     | 20                 | 54    | 64    |
| 4  | Rhinoptera javanica          | 40                  | 12                     | 23                 | 55    | 75    |
| 5  | Scomberomorus commerson      | 248                 | 37                     | 101                | 386   | 386   |
| 6  | Datnioides campbelli         | 1                   | 0                      | 1                  | 2     | 2     |
| 7  | Barbouni                     | 5                   | 0                      | 0                  | 5     | 5     |
| 8  | Leptobrama sp                | 9                   | 0                      | 0                  | 9     | 9     |
| 9  | Scomberomorus commerson      | 27                  | 2                      | 8                  | 37    | 37    |
|    | Striped threadfin (Polydactylus plebeius) | 116             | 16                     | 38                 | 170   | 170   |
| No | Species | Number of Fish Caught in Research Location | Percentage (Kr) of Fish Caught in the Research Location (%) |
|----|---------|------------------------------------------|----------------------------------------------------------|
|    |         | Station I (Estuary) | Station II (Floodgate) | Station III (Cape) | Total (%) |
| 1  | Lizardfish (Harpadon microchir) | 0,44 | 0 | 0 | 0,29 |
| 2  | Flathead grey mullet (Mugil cephalus) | 1,16 | 0 | 4,71 | 1,92 |
| 3  | Smallmouthed salmon catfish (Cinetodus froggatti) | 4,66 | 11,88 | 7,84 | 6,14 |
| 4  | Thick-lipped catfish (Cinetodus crassibaris) | 5,82 | 11,88 | 9,02 | 7,19 |
| 5  | Nurseryfish (Kurtus gulliveri) | 36,10 | 36,63 | 39,61 | 37,01 |
| 6  | New Guinea Perch | 0,15 | 0 | 0 | 0,10 |

Based on the results (Table 2), the number of fish caught in 3 months (May to July 2014) in the Maro River, Gudang Arang, Maro Village, Merauke Regency, there were 1043 fish from 17 species spread over three research locations or stations. Where Station I (Estuary) is the location with the most fish caught of 687 and Unit III (Cape) is the location with the 2nd most fish caught of 101 and Unit II (Floodgate) is the location with the third most fish caught of 225. Moreover, Kurtus gulliveri is the most type of fish caught in three stations with a total of 386.

### 3.3. Relative Abundance

Table 3. Percentage of Relative Abundance

| No | Species | Percentage (Kr) of Fish Caught in the Research Location (%) |
|----|---------|----------------------------------------------------------|
|    |         | Station I (Estuary) | Station II (Floodgate) | Station III (Cape) | Total (%) |
| 7  | Scale Croaker (Nibea squamosal) | 0,73 | 0 | 0 | 0,48 |
| 8  | Barramundi (Lates calcarifer) | 1,31 | 0 | 0 | 0,86 |
| 9  | Amoy Croaker (Argyrosomus amoyensis) | 3,93 | 1,98 | 3,14 | 3,55 |
| 10 | Striped threadfin (Polydactylus plebeius) | 16,89 | 15,84 | 14,90 | 16,30 |
| 11 | Fourfinger threadfin (Eleutheronema tetradactylum) | 21,25 | 19,80 | 18,04 | 20,33 |
| 12 | Oxeye Herring (Megalops cyprinoides) | 2,04 | 0 | 0,78 | 1,53 |
| 13 | Chinese Herring (Lebtobrama sp) | 1,75 | 0 | 0 | 1,15 |
| 14 | Flapnose ray (Rhinoptera javanica) | 0,58 | 0 | 0 | 0,38 |
| 15 | Puffer fish (Marilyna meraukensis) | 0,44 | 1,98 | 0,78 | 0,67 |
| 16 | Narrow-barred Spanish mackerel | 1,02 | 0 | 0 | 0,67 |
| 17 | Freshwater Anchovy (Thryssa scratchleyi) | 1,75 | 0 | 1,18 | 1,44 |

Total (%) | 100 | 100 | 100 | 100 |
Total (fish) | 687 | 101 | 255 | 1043 |

Based on the results in Table 3, the highest relative abundance is found in Nurseryfish (Kurtus gulliveri) in Station III with a percentage of 39,61%. From the data in Table 3, the highest number of fish species caught is in station I with a total of 687 fish and the lowest is in station II with a total of 101 fish.

### 3.4. Availability Frequency

The Availability Frequency based on location of observation can be seen in Table 4.

Table 4. Percentage of Availability Frequency

| No | Species | Availability Frequency |
|----|---------|------------------------|
|    |         | Station I (Estuary) | Station II (Floodgate) | Station III (Cape) | Fi (%) |
| 1  | Lizardfish (Harpadon microchir) | ✓ | - | - | 33 |
| 2  | Flathead grey mullet | ✓ | - | ✓ | 67 |
### 3.5. Diversity

The diversity based on the observation location can be seen in Table 5 below.

#### Table 5. Diversity Index

| No | Species | Statio I (Estuary) | Statio II (Floodgate) | Statio III (Cape) | Total (H') |
|----|---------|-------------------|----------------------|-------------------|------------|
| 1  | Lizardfish (Harpadon microlepis) | 0.23 | 0 | 0 | 0.168 |
| 2  | Flathead grey mullet (Mugil cephalus) | 0.23 | 0 | 1.438 | 0.0758 |
| 3  | Salmon catfish (Cinemus cassiobra) | 0.23 | 0.253 | 1.96 | 0.1713 |
| 4  | Thick-lipped catfish (Cinetodon crassilabris) | 0.165 | 0.253 | 0.21 | 0.1893 |
| 5  | Nurseryfish (Kurtus gulliveri) | 0.367 | 0.367 | 0.368 | 0.3679 |
| 6  | New Guinea Tiger (Datnioides campbelli) | 0.009 | 0 | 0 | 0.0067 |
| 7  | Scale Croaker (Nibea squamosa) | 0.35 | 0 | 0.0 | 0.0256 |
| 8  | Barramundi (Lates calcarifer) | 0.056 | 0 | 0 | 0.0410 |
| 9  | Amoy Croaker (Argyrosomus amoyensis) | 0.127 | 0.077 | 0.1086 | 0.1184 |
| 10 | Striped threadfin (Polydactylus plebeius) | 0.30 | 0.291 | 0.2837 | 0.2957 |
| 11 | Fourfinger threadfin (Eleutheronema tetradactylum) | 0.29 | 0.32 | 0.309 | 0.3238 |
| 12 | Oxeye Herring (Megalops cyprinoides) | 0.079 | 0 | 0.038 | 0.0641 |
| 13 | Chinese Herring (Lebtolemona sp) | 0.07 | 0 | 0 | 0.0514 |
| 14 | Flapnose ray (Rhinoptera javanica) | 0.03 | 0 | 0 | 0.0213 |
| 15 | Puffer fish (Marilyna merakensis) | 0.023 | 0.077 | 0.038 | 0.0336 |
| 16 | Spanish mackerel (Scomberomorus commerson) | 0.046 | 0 | 0 | 0.0336 |
| 17 | Freshwater Anchovy (Thryssa scratchleyi) | 0.07 | 0 | 0.052 | 0.0610 |
| **Jumlah (H')** | **1,931** | **1,641** | **1,7568** | **1,8973** |

The diversity index value (Table 5) of species of fish caught for three months in Maro River, Gudang Arang, is 1,8973. This result indicates moderate diversity, moderate distribution of individual number of each species, and moderate community stability.

### 3.6. Dominance

The dominance index based on the observation location can be seen in Table 6 below.

#### Table 6. Dominance Index

| No | Species | Statio I (Estuary) | Statio II (Floodgate) | Statio III (Cape) |
|----|---------|-------------------|----------------------|------------------|
| 1  | Lizardfish (Harpadon microlepis) | 0.23 | 0 | 0 |
| 2  | Flathead grey mullet (Mugil cephalus) | 0.23 | 0 | 1.438 |
| 3  | Salmon catfish (Cinemus cassiobra) | 0.23 | 0.253 | 1.96 |
| 4  | Thick-lipped catfish (Cinetodon crassilabris) | 0.165 | 0.253 | 0.21 |
| 5  | Nurseryfish (Kurtus gulliveri) | 0.367 | 0.367 | 0.368 |
| 6  | New Guinea Tiger (Datnioides campbelli) | 0.009 | 0 | 0 |
| 7  | Scale Croaker (Nibea squamosa) | 0.35 | 0 | 0 |
| 8  | Barramundi (Lates calcarifer) | 0.056 | 0 | 0 |
| 9  | Amoy Croaker (Argyrosomus amoyensis) | 0.127 | 0.077 | 0.1086 |
| 10 | Striped threadfin (Polydactylus plebeius) | 0.30 | 0.291 | 0.2837 |
| 11 | Fourfinger threadfin (Eleutheronema tetradactylum) | 0.29 | 0.32 | 0.309 |
| 12 | Oxeye Herring (Megalops cyprinoides) | 0.079 | 0 | 0.038 |
| 13 | Chinese Herring (Lebtolemona sp) | 0.07 | 0 | 0 |
| 14 | Flapnose ray (Rhinoptera javanica) | 0.03 | 0 | 0 |
| 15 | Puffer fish (Marilyna merakensis) | 0.023 | 0.077 | 0.038 |
| 16 | Spanish mackerel (Scomberomorus commerson) | 0.046 | 0 | 0 |
| 17 | Freshwater Anchovy (Thryssa scratchleyi) | 0.07 | 0 | 0.052 |
| **Jumlah (H')** | **1,931** | **1,641** | **1,7568** | **1,8973** |
There were 17 fish species caught in Maro River, Gudang Arang, Maro Village, Merauke Regency, namely: Kurtus gulliveri, Eleutheronema tetractylum, Polydactylus plebeius, Cinetodus crassilabris, Cinetodus froggatti, Argyrosomus amoyensis, Mugil sp. Megalops cyprinoides, Thryssa scratchleyi, Lebtobrama sp. Lates calcarifer, Marilyna meraukensis, Scomberomorus commerson, Nibea squamosal, Rhinoptera javanica, Harpadon microchir, Datnioides campbelli.

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