# Species Composition of Aquatic Resources in Lantebung Mangrove Ecotourism Area Makassar, Indonesia


## ABSTRACT

The mangrove ecotourism area is an alternative place for recreation for the community so that it is thought to disturb the presence of aquatic resources. This study aims to analyse the species composition of aquatic resources in the Lantebung mangrove ecosystem. Data collection used survey method and the research was conducted from October to November 2023 in Lantebung mangrove ecotourism area Makassar, Indonesia. The results showed that the composition of fish species consisted of five dominating fish species, namely Tawes (*Garresabbreviatus)* 3904 fish (39.40%), Peperek (*Nuchequulanuchalis*) 2389 fish (24.11%), Peperek (*Eubleekeria splendens*) 1021 fish (10.30%), Rejung fish (*Sillago robusta*) 975 fish (9.84%) and Peperek (*Leiognathuslongispinis*) 910 fish (9.18%). The diversity of aquatic resources included 29 species of fish with 9985 individuals, 19 species of crustaceans with 117 species, 10 species of mollusca with one species each and one species of cnidaria with one species. The highest fish species composition is Tawes (*Garresabbreviatus*) and the diversity of aquatic resources is dominated by fish, crustaceans, mollusca, and the lowest type of cnidaria.



*Keywords: ecotourism; species composition; aquatic resources; mangrove*


## 1.INTRODUCTION

Mangrove forests in Indonesia are scattered in several provinces, one of which is in Makassar, South Sulawesi Province. Makassar City as one of the cities that holds mangrove potential with an area of 25 ha. The northern area is approximately 1,000 x 250 m and the southern area is approximately 700 x 50 m [1]. The mangrove area provides ecological benefits as a spawning, nurturing and feeding location for a variety of fish, shrimp, crabs and other marine life [2].

Mangroves have ecosystem services to maintain the diversity of aquatic resources. According to [3] mangroves can also provide direct and indirect benefits such as fishing around mangrove forests. In addition to the internal value and beauty of mangroves, mangrove ecosystems provide services, such as absorbing $CO_2$ in the air, shelter for fish, crabs, shellfish, as seagrass and coral reef zones.

Mangrove ecosystems also have a wide range of physical, biological, and economic functions. In addition, mangrove ecosystems are also used by marine organisms to start the food chain by utilising mangrove litter. On the other hand, people also often use the area around mangroves as ponds, mangroves are cut down as firewood and medicinal materials [4].

However, over time the diversity of aquatic resources can be threatened by human activities and habitat factors resulting from mangrove habitat degradation, pollution, climate change, overfishing and resource extraction, mangrove diseases, and species invasions. Degraded

mangroves can threaten the survival of many species that depend on these ecosystems. This can lead to the disruption of the balance of the mangrove ecosystem.

This research is important because the diversity of aquatic resources plays an important role in natural resource conservation efforts. In addition, aquatic resources include various types of organisms, including fish, microorganisms, and aquatic plants that help maintain the balance and stability of aquatic ecosystems. In relation to this, this study aims to analyse the species composition of aquatic resources in the Lantebung mangrove ecosystem in Makassar city.

## 2.RESEARCH METHODS

### 2.1Research Location

This research was conducted from October to November 2023 in the mangrove ecotourism area.


**Fig. 1. Research Location Map**

### 2.2Data Collection Methods

Data collection methods through survey techniques and direct involvement in the fishing process. The data collected are primary data and secondary data. Primary data such as samples of aquatic resource species composition. Data collection is carried out by fishing surveys to identify types of aquatic resources. Fishing surveys are carried out in collaboration with local fishermen. Secondary data, in the form of data taken from literature studies.

Species composition of aquatic resources was done by identifying and recording species of fish and aquatic organisms using guidelines from the web pages www.fishbase.se and www.fishider.org.

### 2.3Data Analysis

The species composition of aquatic resources in mangrove ecotourism LantebungMakassar City can be calculated based on the equation [5]:

$$Ks = \frac{ni}{N}\ x\ 100\%$$

Description:
Ks : fish species composition (%)
Ni : number of individuals of each fish species
N : number of individuals of all fish species

## 3. RESULTS AND DISCUSSION

Lantebung mangrove forest provides an environment for a variety of fish and other aquatic resources. During the study, various species of fish, crustaceans, mollusca and cnidaria were obtained. The following aquatic resource analyses were conducted, with fish species composition as the representative.

### 3.1 Composition of Fish Species

Fish collected during the study from various fishing gear (Gill nets, Rakkang and Bubu) totalled 9985 fish consisting of 29 fish species. Of the 29 species recorded, only one type of fish is classified as cartilaginous fish, namely stingray (*Hypanus sp.*) while the other 28 fish species are classified as true bony fish. The types of fish recorded from various types of net catches, rakkang and bubu gear during the study are shown in Figure 2.

The top five fish species were tawes (*Garresabbreviatus*) with 3904 fish (39.40%), Peperek (*Nuchequulanuchalis*) with 2389 fish (24.11%), Peperek (*Eubleekeria splendens*) with 1021 fish (10.30%) and Rejung (*Sillago robusta*) with 975 fish (9.84%) and Peperek (*Leiognathuslongispinis*) with 910 fish (9.18%).

Meanwhile, the least number of fish caught were grouper (*Epinephelussexfasciatus*), puffer fish (*Arothronmanilensis*), Jangki Timun fish (*Scolopsisvosmeri*), Hayam fish (*Aluterus scriptus*), Stingray fish (*Hypanussp*), glass fish (*Ambassisinterrupta*), Mud Stargazer fish (*Uranoscopusscaber*) and Glodok fish (*Boleophthalmusboddarti*).

The most fish samples collected in this study were Tawes (*Garresabbreviatus*). However, when viewed from the species based on the family, the peperek species from the Leiognathidae family dominates the species composition with four species. According to [6] that this species prefers the waters of river estuaries and inhabits shallow waters, and can also be found in estuary areas. Then [7] added that the Leiognathidae tribe is dominant in the waters around Jakarta Bay.

The species composition of Peperek fish was 2389 (24.11%), *Eubleekeria splendens* (1021 (10.30%)), *Leiognathuslongispinis* (910 (9.18%)) and *Gazza minuta* (368 (3.71%)) with the total number of Peperek fish species being 4688 (47.30%) of the total catch.

The diversity of fish caught around the Lantebung mangrove has a good impact on the ecosystem, both ecologically and economically on fishermen. [5] argues that the diversity of species and wide distribution of fish provides an important role in the ecosystem in maintaining the balance of the food chain cycle in the waters.

The presence of mangrove forests around these water areas causes the environment to be fertile, because mangroves provide organic matter that supports the life of aquatic biota in the ecosystem. This condition makes mangroves a good habitat for biota to find food. Peperek fish utilise zooplankton, molluscs, crustaceans, nemathodes and phytoplankton as food [8]. Meanwhile, Tawes or Selanget fish inhabit habitats at the bottom of coastal and estuary waters. They obtain their food from bottom organisms and detritus, with bacillariophyceae as the main food, microcrustaceans as supplementary food, and mollusc larvae as supplementary food [9].

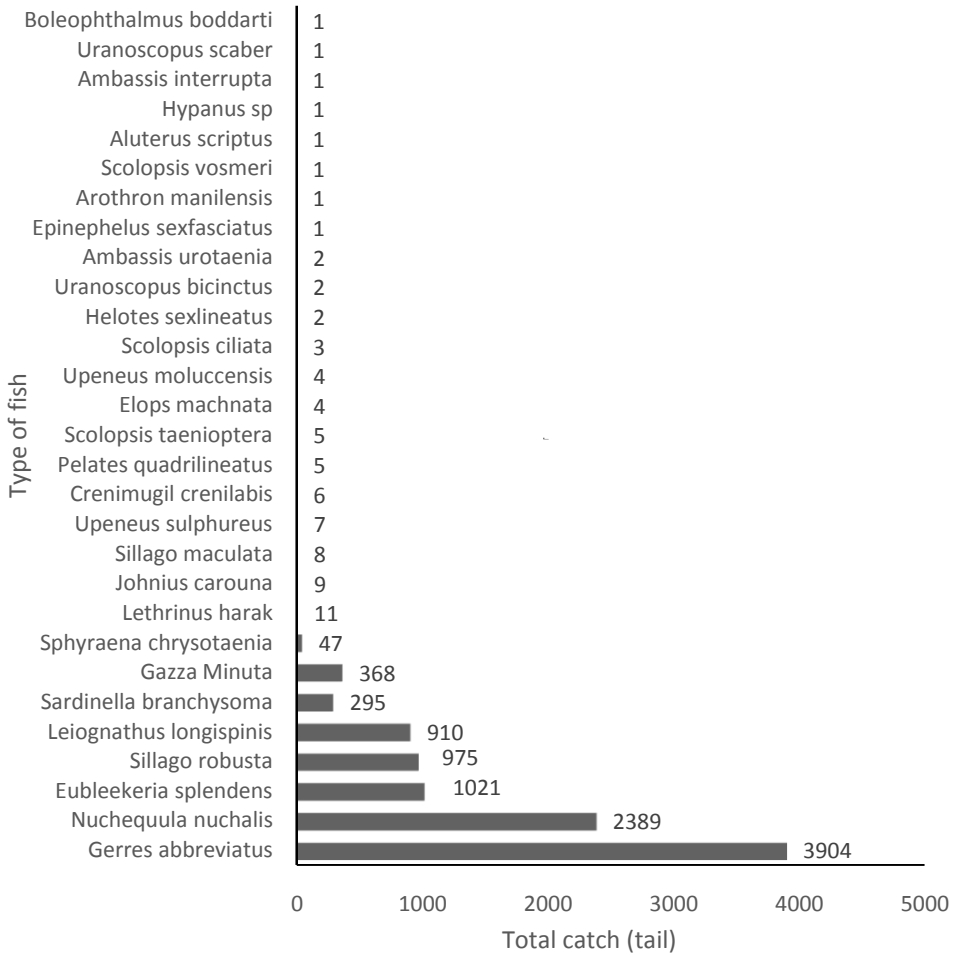


**Fig. 2. Types of fish caught in Lantebung**

The abundance of Peperek fish and Tawes fish is thought to be influenced by the availability of food in their habitat in the mangrove ecosystem. [10] stated that the availability of fish food in a habitat will affect the individual, then will have an impact on higher trophic levels, such as populations and finally communities and this relationship contributes to species interactions [11]. Even [12] found a positive relationship between food availability with individual growth and abundance.

Some other fish species caught with low species composition entered the mangrove ecosystem for several reasons. According to [13], these are: (1) protection against predators, prey fish will enter mangrove areas to shelter from predators. This situation arises due to the

complex root structure of mangroves, which inhibits the movement of predators, and the high level of turbidity reduces the visibility of predators; (2) food-related, which indicates that this ecosystem provides a variety of food as it is associated with high productivity. This leads to high abundance and diversity of fish in the mangrove ecosystem.

Fish diversity in the Lantebung mangrove ecosystem is quite high when compared to the results of research from the Ciporeang River in LeuweungSancang Nature Reserve, which only obtained 6 species of fish [14]. While research conducted [15] managed to collect 15 species of fish in the mangrove waters of the Donan River and Sapuregel River, Cilacap.

## 3.2 Diversity of Aquatic Resources

The diversity of aquatic resources in Lantebung mangrove ecotourism waters consists of 29 species of fish, 19 species of crustaceans, 10 species of mollusks, and one species of cnidaria. Overall, there are 59 types of resources with a total number of 10113 species in the mangrove ecotourism waters, with the following description.

### 3.4.1Fish Species

Figure 2 shows that during the study 29 types of fish samples were found with a total of 9985 fish. Samples of various fish species were obtained through fishing gear used by fishermen in the waters around the Lantebung mangrove, except for Glodok fish (*Boleophthalmusboddarti*), which was obtained through hand-catching at the Lantebung mangrove site. At low tide, Glodok fish species are often found around mangrove forest habitats. [16] noted that Glodok fish, or commonly known as mudskipper, is one of the bioindicator fish species in mangrove ecosystems.

### 3.4.2Types of Crustaceans

Crustaceans were caught using two types of fishing gear, Rakkang and Bubu. Some crustaceans were also caught by hand around the mangrove habitat. The total number of crustacean species identified was 19 species, with 117 individuals (Figure 3). Gazami crab (*Portunustrituberculatus*) was the most dominant species with 30 species, then the second most species was king crab (*Portunuspelagicus*), followed by the third most species wasVaname shrimp (*Litopenaeusvannamei*) with 17 species. Samples found in the mangrove forest included several species, including: Biola crab (*Uca annulipes*), Biola crab (*Uca acuta*), Biola crab (*Uca tetragonon*), Beach crab (*Metopograpsus frontalis*), Beach crab (*Metopograpsusthukuhar*), and Krama crab (*Episasermasp*), each with one species.

In crustacean catches, dominated by crabs because sandy and muddy habitats are habitats favoured by crabs. According to [17], crabs prefer sand and muddy sand substrate types. Sand substrates tend to make it easier to move and move to other places, while mud substrates usually contain little oxygen, so the organisms that live in them must be able to adapt to this situation. As for the opinion of [18], it strengthens the assumption that the Portunus clan lives in a variety of habitats, namely: sandy mud, sand, and muddy sand.

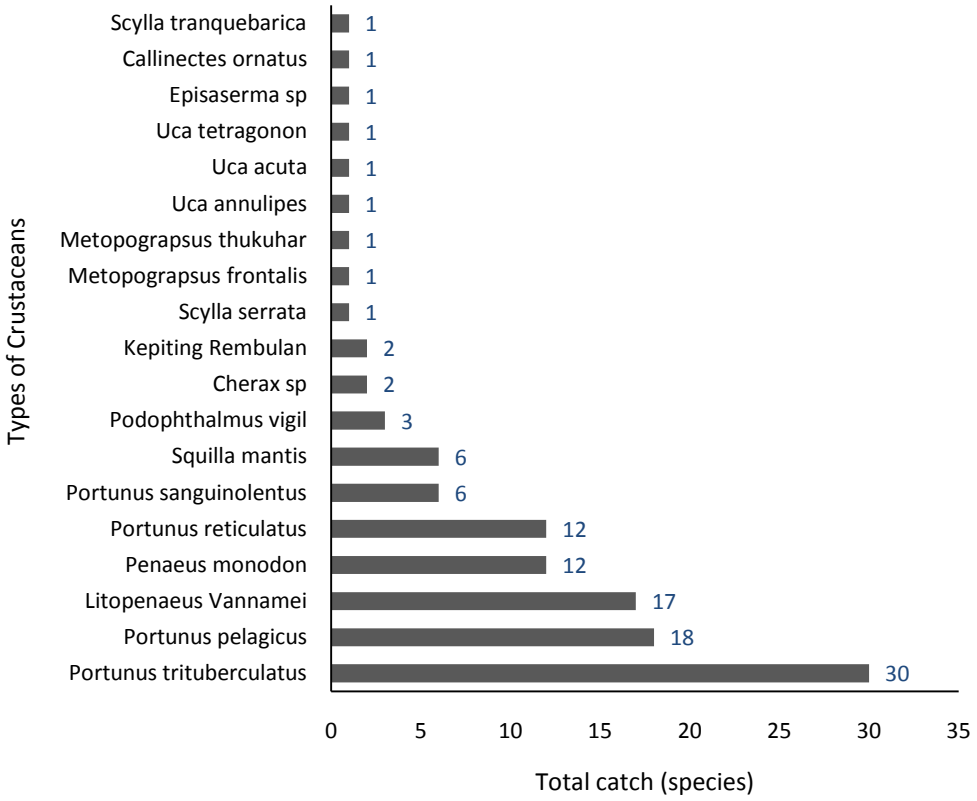


**Fig.3. Crustacean species caught during the study**

The catch is Vaname shrimp (Litopenaeusvannamei) around the Lantebung mangrove. The results of research [19] state that mangrove leaf litter is able to increase the immune response and survival of Vaname shrimp (*Litopenaeusvannamei*). While the samples obtained in the mangrove forest habitat of one tail each, among others: Biola crab (*Uca annulipes*), Biola crab (*Uca acuta*), Biola crab (*Uca tetragonon*), Beach crab (*Metopograpsus frontalis*), beach crab (*Metopograpsusthukuhar*) and Krama crab (*Episasermasp*).

Many types of crustaceans are found during low tide, such as the type of Biola crab which consists of three types, namely, Uca annulipes, Uca acuta and Uca tetragonon. According to [20] revealed that several types of Uca can live together in the same habitat, but these types usually have different behavioural patterns and have different microhabitats so that the ecological niches of these crabs can be separated. The density of Biola crab species, namely Uca tetragonon, can be found near the mouth of the river towards the sea at low tide. [21] stated that the density of Uca tetragonon species is influenced by the high frequency of submerged habitats.

While in mangrove trees, beach crabs or crabs of the species Metopograpsus frontalis and Metopograpsusthukuhar were found. Among the mangrove trees found krama crabs (Episasermasp) and holes in the muddy soil as habitat and shelter. [22] argues that substrate grain size determines crab distribution because crabs have shown morphological adaptations to substrate conditions.

### 3.4.3Types of Mollusca and Cnidaria

There are 11 species of Mollusca and Cnidaria, divided into 10 species of Mollusca and one species of Cnidaria (Figure 4). Each resource totalled one species. The Cnidaria species, Jellyfish (*Aurelia aurita*), was found during high tide and entered the mangrove area.

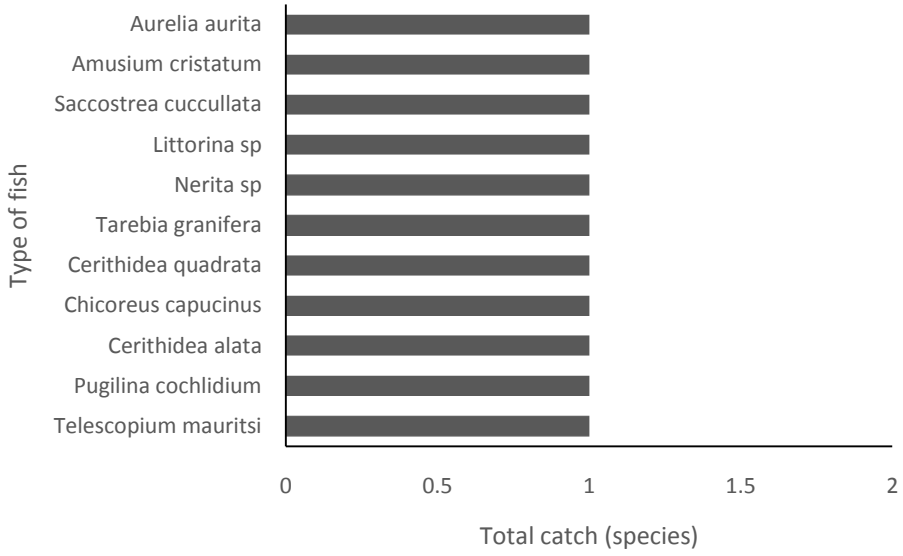


**Fig. 4. Types of Mollusca and Cnidaria caught**

The types of mollusks caught include Telescope snail (*Telescopium mauritsi*), Unam snail (*Pugilinacochlidium*), Belitung snail (*Cerithideaalata*), Unam snail (*Chicoreus capucinus*), Belitung snail (*Cerithidea quadrata*), Belitung snail (*Tarebiagranifera*), Sea snail (*Nerita sp*.) and Sea snail (*Littorina sp*.). While 2 types of oysters, namely Batu oyster (*Saccostrea cucullata*) and Simping oyster (*Amusiumcristatum*).

According to [23] that the mangrove ecosystem area is one of the habitats for mollusc groups. In addition to being a habitat, mangroves also function to provide food and other organic sources. [24] added that environmental factors that affect the distribution of molluscs include air temperature and water temperature, water pH and soil pH and salinity. According to [25] molluscs can generally tolerate a temperature range of 0-48°C. Another type of resource is the type of Cnidaria, namely jellyfish species (*Aurelia aurita*). One of the factors causing the discovery of this type of resource is thought to be due to tidal factors. When the tide occurs, jellyfish species enter around the mangrove habitat along with the rising water level. According to [26], Aurelia aurita is found more near the coast than in the middle of the sea. Jellyfish are more commonly found in shallow waters and the presence of freshwater flow from rivers or mangrove swamps [27].

The function of mangrove ecosystems as a feeding ground, spawning ground, and nursery ground will make various types of resources gather and make mangroves a suitable habitat. According to [28], the influx of nutrients from mangrove leaf litter is one of the factors that affect the productivity of aquatic biota in coastal areas. Fish resources that are in the ecosystem, either sedentary or just transit to spawn and raise their young, further add to the diversity of aquatic resources in the area. According to [29], the distribution of aquatic resource diversity in mangrove ecosystems varies temporally, influenced by water temperature and tides.

## 4. CONCLUSIONS

1. The highest fish species composition is Tawes (*Garresabbreviatus*), but in terms of numbers it is dominated by the peperek fish family.
2. The diversity of aquatic resources is dominated by fish species, then crustaceans, mollusca, and the lowest is the type of cnidaria.

## REFERENCES


1. Rusti. Estimation of Carbon Stored in Lantebung Mangrove Forest Area, Makassar City. Thesis. FIKP Hasanuddin University; 2022.
2. Rodiana, L. Suitability and Supportability of Ecotourism Based on Mangrove Ecology in Pangpang Bay, Banyuwangi. JFMR-Journal of Fisheries and Marine Research. 2019;3(2), 77-88.
3. Duke NC, Meynecke JO, Dittmann, S, Ellison, AM, AngerK, BergerU, CanniccviS, DieleK, EwelKC, FieldCD, KoedamN, Lee SY, MarchandC, NordhausI, DahdouhGF. A World Without Mangroves?. Science. 2007;317:41–42.
4. Imamsyah A, Bengen DG, Ismet MS. Structure and Distribution of Mangrove Vegetation Based on Biophysical Environmental Quality in Ngurah Rai Grand Forest Park Bali. ECOTROPHIC: Journal of Environmental Science. 2020;14(1), 88.
5. Fachrul MF. Bioecological Sampling Methods. Jakarta; 2007.
6. KottelatM, Whitten WJ. Freshwater Fishes of Western Indonesia and Sulawesi. Jakarta: Periplus Editios (HK);1993.
7. Djamali A, Parino. Fish species from Jakarta Bay in: Assessment of Ecological Changes in the Waters of Jakarta Bay. Oceanographic Research Centre of LIPI. 2008;135 - 175.
8. AcharyaKV,Naik SD. Food and Feeding Habit of Ponyfish, Leiognathus splendens (Cuvier, 1829) off Ratnagiri coast, Maharashtra. International Journal of Scientific and Engineering Research.2016;7(9), 122–133.
9. Ravita. Food Habits of Selanget Fish (Anodontostomachacunda) in Mayangan Beach Waters, Subang, West Java. Thesis. Bogor: Bogor Agricultural University; 2004.
10. PietGJ. Impact of EnviromenatPertubation on a Tropical Fish Community. Can. Journal Fish Aquatic Science.1998;55: 1842-1853.
11. McCannK, Hastings, Huxel GR. Week Trophic Interaction and The Balance of Nature. Nature. 1998;395: 794-797.
12. AndersonTW, SabadoBD. Correspondance Between Food Availability and Growth of a Planktivorous Temperate Reef Fish. Journal Exp. Mar. Biol. Ecol, 1995;189: 65-76.
13. LaegdsgaardP, JohnsonC. Why do Juvenile Fish Utilise Mangrove Habitats?. Journal of Experimental Marine Biology and Ecology. 2001;257: 229-253.
14. Dewantoro GW, Santoso E, Zulham, Mulyana AR. Comparative Study of Downstream to Upstream Fish and Shrimp Communities in Two Rivers in the LeuweungSancang Nature Reserve Area, Garut. West Java. Journal of Biosphere. 2005;22(1), 39-45.
15. Djamali A. Fish communities in waters surrounding mangroves (Case studies in: Berau River Estuary, East Kalimantan; Cilacap, Central Java and Bintuni Bay, Irian Jaya). Proceedings of Seminar V Mangrove Ecosystem. 1995;160-167.
16. Muhtadi A, Ramadhani SF, Yunasfi. Identification and Habitat Type of Gelodok Fish (Family: Gobiidae) in Bali Beach, Batu Bara Regency, North Sumatra Province. Journal of Biospecies. 2016;9(2), 1-6.
17. Kangas MI. Synopsis of The Biology and Exploitation of The Blue Swimmer Crab, Portunuspelagicus, in Western Australia. Perth, Australia: Fisheries Research Report No. 121;2000.

18. Moosa MK, Burhanuddin RH. Some Notes on Crabs from Jakarta Bay and Thousand Islands in Marine Living Resources. Jakarta (ID): Summary of Research Results of Pelita II LON; 1980.
19. Samuria SA, Nur I, Hamzah M. Effect of Mangrove Leaf Extract (Avicennia marina) on Resistance of Vaname Shrimp (Litopenaeusvannamei). Journal of Fishery Science and Innovation. 2018;2(2), 49-54.
20. Wilsey BJ. Biodiversity and Ecosystem Functioning Importance of Species Evennes in an Old Field. Ecology. 2000;81: 887 – 892.
21. Yulianto A. Crab Diversity in Mangrove Forest of Tungkal Village, West Tanjung Jabung, Jambi. Bogor Agricultural University; 2006.
22. Arsana IN. Crab communities (Brachyura: Ocypodidae and Sesarmidae) in Lembar Bay, West Lombok. Thesis. Yogyakarta: Postgraduate Programme, Gadjah Mada University; 2003.
23. Rachman BA, Arianti ND. Mollusc Species Diversity in the Coastal Mangrove Area of Teluk Uma Village, Karimun Regency. Karimun University Maritime Journal. 2020;1(2), 80-86.
24. Maturbongs MR, Mathius RS, Lantang B. Effect of Environmental Factors on the Presence of Gastropods in Mangrove Ecosystems at the Lantamal Pier, Karang Indah Village, Merauke District, Merauke Regency. Musamus Fisheries and Marine Journal. 2018;1(2): 33-48.
25. Alfitriatussulus. Distribution of Molluscs (Bivalves and Gastropods) in the Estuary of Cimandiri River, Pelabuhan Ratu Bay, Sukabumi, West Java. Thesis. Department of Aquatic Resources Management. Faculty of Fisheries and Marine Science. Bogor Agricultural University; 2003.
26. Barz K, Hirche HJ. Abundance, Distribution and Prey Composition of Scyphomedusae in The Southern North Sea. International Journal Marine Biologi. 2006;151: 1021-1033.
27. Omori M, Nakano E. Jellyfish Fisheries in Southeast Asia. Kluwer Academic Publishers. Hydrobiologia. 2001;451: 19-26.
28. Mahmudi M. Estimation of Fish Production through Mangrove Leaf Litter Nutrients in Rhizophora Reforestation Area, Nguling, Pasuruan, East Java. Indonesian Journal of Marine Sciences. 2010;15(4):231-235.
29. Patty W. Vertical Distribution of Fish Schools in Coastal Waters Around Mangroves in Bahoi Village, North Minahasa Regency, North Sulawesi. Indoesian Journal of Marine Sciences. 2008;13(3):153-158.