



Research Article

Mollusca diversity in the Ora Beach ecotourism area of Saleman Village, Central Maluku District

Cornely Pary^{1,*}, Heni Mutmainnah¹, Jumiati Aloatuan¹, Tri Santi Kurnia¹

Biology Study Programme FITK IAIN Ambon, Dr. H. Tarmidzi Taher Street, Ambon 97128, Indonesia

* corresponding author: corneliapary87@gmail.com

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ABSTRACT

Maluku is an archipelago rich in natural resources. One of the areas rich in marine biota among other villages in Central Maluku is Saleman Village. In the waters of Saleman village there are abundant molluscs. Therefore, this study aims to determine the density and diversity of mollusks. The research method used was descriptive qualitative with purposive sampling. Furthermore, identification and calculation of the diversity index were carried out. The researchers identified nine species with a total of 41 individuals. The species obtained were *Anadara granosa*, *Meretrix lyrata*, *Semele cordiformis*, *Placuna placenta*, *Lambis lambis*, *Olividae*, *Tridacna maxima*, *Strombus Luhanus* L, and *Conus aulicus* L. The Diversity Index value obtained is 2.088. Therefore, the diversity index in the coastal watershed of Saleman Village is classified as medium.

Keywords: density; diversity; mollusca

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INTRODUCTION

Maluku is an archipelagic region with an area of 581,376 km² consisting of 90% sea area with a land area of 54,185 km² and sea area of 527,191 km². Maluku is located between latitude 230°-9° South Latitude and longitude 124°-136° East Longitude. This region is surrounded by a vast sea with varied topography (Perkim, 2020). Maluku is one of the provinces in the eastern part of Indonesia which has 12 groups of small islands with diverse natural marine, socio-cultural, historical, and culinary tourism potential (Talaohu, 2023). The Maluku Sea is known for its high biodiversity. This can be seen from the very diverse coastal ecosystems from mangrove forests, coral reefs, and seagrass beds on several beaches in Maluku. One of the areas with beautiful sea and beaches is Ora Beach which is located in Sawai Bay, Saleman Village on the edge of the Manusela National Park forest (Romeon & Sukmawati, 2021).

Ora Beach is known as an eco-tourism spot located on Seram Island, North Seram District, Central Maluku Regency. The characteristics of this region include having a narrow land area because it is directly bordered by steep and towering rock cliffs, white sandy beaches with very clear and calm water, and a fairly high diversity of coral reefs, fish, and other marine biota. Various tourist activities commonly carried out on Ora Beach include nature tourism, water tourism, snorkeling, diving, culinary tourism, cave exploring, and photography (Talaohu, 2023). Using beaches as ecotourism areas will have an impact on damaging the natural ecosystem. An environment that experiences disturbance and pressure will cause a reduction in biodiversity in an ecosystem

(Romdhani et al. 2016). One of the biotas that have a direct influence on reducing the quality of the coastal environment is mollusks. This is because mollusks, especially gastropods and bivalves, generally live by settling in their environment and are filter feeder animals (eat by filtering the solution around them) (Amin et al. 2012); (Bachok et al. 2006).

Molluscs are among the most diverse categories of invertebrate animals with over 100,000 species having been described. Molluscs are soft animals that have shells or don't have shells. Mollusks can be divided into five main classes, namely Gastropods, Bivalves, Scaphopoda, Polyplacophora, and Cephalopoda (Herbert & Atkinson, 2018). One of the large groups of mollusks that are often found on Ora Beach is the Bivalvia and gastropod groups. Bivalves include types such as clams, oysters, mussels, and so on. The characteristic of Bivalves is that their bodies are flat on one side (laterally compressed) and their shells are composed of strong calcium carbonate so that they function to protect their soft bodies from their external environment. Shellfish habitats include all types of waters, both freshwater, estuaries, and sea, including tidal areas, shallow waters, and even deep sea waters.

Previous research regarding mollusk diversity was conducted by Septiana (2017), with the title Mollusk Diversity (Bivalvia and Gastropoda) at Pasir Putih Beach, South Lampung Regency, and it was found that the diversity index of bivalves and gastropods was in the low category. In this study, 48 individuals from 8 gastropod families and 1 bivalve family were found. The calculation result of the Shannon-Wiener diversity index at the highest coastal location is 0.152 and the lowest is 0 which is included in the low diversity index category. In addition, research Athifah et al. (2019), entitled Mollusca Diversity as a Bioindicator of Water Quality in the Kebon Kongok Landfill Area, West Lombok concluded that the quality of the waters around the Kebon Kongok Landfill is polluted with moderate diversity criteria ($H' = 1.0 - 2.0$). Meanwhile, research related to the diversity of mollusks in the Maluku region was carried out by Islami et al. (2018), with the title Gastropod (Mollusca) Community in the waters of Inner Ambon Bay, Maluku. The research results found 32 species of gastropods with a total of 223 individuals, with diversity index values between 1.68 and 2.29. However, there is still very little information regarding data on the diversity and types of mollusks (gastropods and bivalves) on Ora Beach, so it is necessary to research the diversity of mollusks found on the coast of Ora, Saleman Village, Seram Island, North Seram District, Central Maluku Regency, Maluku Province.

METHODS

The type of research used is descriptive qualitative with a field experimental approach to describe information about the diversity and variation of mollusks in the Ora coastal area, specifically in Saleman Village, North Seram District. This research was carried out in November-December 2022. The research began by observing the areas where the highest tides and lowest tides were, then divided the mollusk sampling area into 9 parts. The transect location that has been determined is installed on the coast with a length of 400 meters a distance between the transects of 50 meters and a width of 10 meters. In each section of the transect, 5 quadrants measuring 1x1 m² were placed with a distance of 5 meters between each quadrant. Then, mollusk samples contained in the observation quadrant were taken and the type and number were observed. Environmental variables such as temperature, salinity, dissolved oxygen (DO) level, and acidity level (pH) were also measured at the observation location as complementary data.

Mollusk samples that have been found from each transect are then counted and identified to determine the species of mollusk referred to (Herbert & Atkinson, 2018). Data from the identification of mollusk samples from each transect were analyzed using the diversity formula to determine the diversity of mollusk types on the coast of Ora, Saleman Village, West Seram District. The Shannon-Wiener diversity index uses the following formula (Wahyuni et al. 2017).

$$H' = - \sum_{i=1}^s (P_i) (\ln P_i)$$

Description:

$P_i = \sum n_i / N$

H' : Shannon-Wiener diversity index

P_i : Number of individuals of a species/total number of all species

n_i : Number of individuals of i-th species

N : Total number of individuals

Shanon-Wiener diversity index value range (1949) in (Athifah et al., 2019)

$H < 1$ = Low diversity

$1 < H < 3$ = Medium diversity

$H' > 3$ = High diversity

RESULTS AND DISCUSSION

General Condition of the Location

Saleman Village is located in North Seram District and has a position directly facing Saleman Bay, Seram Island. Its geographical coordinates are between 2.77°-3.120 South Latitude and 129.04°-129.66° East Longitude, and its area has an area of approximately 1,082.2 km². Topographically, most of the North Seram District consists of mountains and hills (Romeon & Sukmawati, 2021). The length of the research area starting from the coastline is 400 meters, and this location is divided into nine transects. The research was carried out on transects 1 to 9, all of which are located west of Ora D Saleman Beach. The substrate in this research area includes sand, rock, and mud. Sampling was carried out in the afternoon at low tide.

Number and Species of Mollusks on Ora Beach

Based on the results of research conducted, it is known that there are 9 species of mollusks (gastropods and bivalves) found on Ora Beach, Saleman Village, North Seram District. The complete mollusks found are presented in Table 1.

Table 1. Types of molluscs (bivalves and gastropods) found in the waters of Ora Beach

Species	Class	Ordo/Family	Habitus	Total
<i>Anadara granosa</i> (Blood Clams)	<i>Bivalvia</i>	Arcida/ Arcidae		4
<i>Maretrix lyrata</i> (Kepah tahu Clams)	<i>Bivalvia</i>	Venerida/ Veneridae		5
<i>Semele cordiformis</i> (Sand Clams)	<i>Bivalvia</i>	Cardiida/ Semelidae		6
<i>Placuna placenta</i> (Glass Oyster)	<i>Bivalvia</i>	Pektinida/ Placunidae		4
<i>Lambis lambis</i> (Spider Clams)	<i>Gastropoda</i>	Littorinimorpha/ Strombidae		3

<i>Oliva tricolor</i> (Sea Snail)	<i>Gastropoda</i>	Neogastropodha/ Olividae		2
<i>Tridacna maxima</i> (Big Clams)	<i>Bivalvia</i>	Cardiida/Cardiidae		5
<i>Strombus luhuanus</i> L. (Gonggong Snail)	<i>Gastropoda</i>	Littorinimorpha/ Strombidae		10
<i>Conus aulicus</i> L. (Poisonous Slug)	<i>Gastropoda</i>	Neogastropodha/ Conidae		2

Table 1. shows that the types of mollusks found on Ora Beach consist of six orders, eight families, and nine species, namely, *Anadara granosa*, *Maretrix lyrata*, *Semele cordiformis*, *Placuna placenta*, *Lambis lambis*, *Oliva tricolor*, *Tridacna maxima*, *Strombus luhuanus* L. and *Conus aulicus* L (World Register of Marine Species, 2023). The type that is most often found is *Strombus luhuanus* L. while the type of mollusk that is least found is *Conus aulicus* L. The type of *Strombus luhuanus* L. is most often found because this species can live in various habitats such as sandy, rocky, muddy, coral-rubble, seagrass beds, and coral flats. Coastal communities use *Strombus* as a source of protein in their daily menu (Uneputty et al. 2018). Meanwhile, the *Conus* group is rarely found because this species generally lives around coral reefs or shallow waters (Muttenthaler et al. 2012). Local people call *Conus aulicus* L. a poisonous snail and should not be consumed. *Conus aulicus* L. is a carnivorous mollusk that can release bioactive toxins to weaken its prey. These bioactive poisons are called conopeptides or conotoxins, which can cause paralysis, trembling, and even death of prey within seconds (Fu et al. 2018).

The total number of gastropods and bivalves found from 9 transects was 41 individuals. According to Odum (1993), the low population density is caused by various activities such as land reclamation, industry, shipping, and dumping waste from settlements into the waters. All of these activities have an impact on the physical, chemical, and biological aspects of water. These changes have the potential to change the balance of important components in aquatic ecosystems, which can ultimately disrupt aquatic ecosystems and affect the community composition of benthic organisms, including gastropods and bivalves (Odum, 1993).

Mollusca Species Diversity Index on Ora Beach

Ora Beach in Saleman Village is one of the leading marine tourist attractions in Maluku Province which attracts domestic and foreign tourists. This beach offers a diversity of marine biota in the form of coral reefs, fish, and other biota (Romeon & Sukmawati, 2021). The results of the analysis of gastropod and bivalve diversity index values obtained from Ora Beach are presented in Table 2 below.

Table 2. Diversity index of molluscs in Ora Beach

No.	Species	Ni	Pi = ni/N	ln Pi	Pi ln Pi
1	<i>Anadara granosa</i>	4	4/41=0,097	ln 0,097 = -2,333	-0,226
2	<i>Meretrix lyrata</i>	5	5/41=0,122	ln 0,122 = -2,104	-0,257
3	<i>Semele cordiformis</i>	6	6/41=0,146	ln 0,146 = -1,924	-0,281
4	<i>Placuna placenta</i>	4	4/41=0,097	ln 0,097 = -2,333	-0,226
5	<i>Lambis lambis</i>	3	3/41=0,074	ln 0,074 = -2,604	-0,193
6	<i>Olividae</i>	2	2/41=0,049	ln 00,49 = -3,015	-0,152
7	<i>Tridacna maxima</i>	5	5/41=0,122	ln 0,122 = -2,104	-0,257
8	<i>Strombus sp</i>	10	10/41=0,244	ln 0,244 = -1,410	-0,344
9	<i>Conus sp</i>	2	2/41= 0,049	ln 0,049 = -3,015	-0,152
Σ					-2,088
H'					2,088

Wirakusumah stated that diversity is a measure of the integration of a biological community by calculating and considering the number of populations that form it with their relative abundance (Wirakusumah, 2003). Table 2. showed that the diversity index (H') value of bivalves and gastropods on Ora Beach is 2.088. Based on the Shanon-Wiener diversity index value, the diversity of gastropods and bivalves on Ora Beach is in the medium category. According to Athifah et al. (2019), the moderate diversity index illustrates that the number of individuals is almost uniform, and several species dominate. The diversity and uniformity of marine biota in a body of water depends on the number of species in the community. The more species found, the greater the diversity, even though the number of individuals of each species is not large (Insafitri, 2010). The value of the diversity index is influenced by several factors including the conditions of wind direction, waves, currents, and tides at the research location which can influence the number of bivalve species that inhabit the location (Nur, 2017). This research was carried out in November-December 2022 where the dominant wind direction was blowing from the west which caused the wave intensity to be quite large because it was blowing from the sea towards the coast. Apart from that, in 2022 there will be a big wave disaster and tidal floods on the coast of Ora, so this may affect the number of mollusk species that inhabit coastal areas.

Physical and Chemical Quality of Water in Mollusk Habitats on Ora Beach

As supporting data, an analysis of the physical and chemical quality of the waters was carried out at each research transect at Ora Beach, Saleman Village, North Seram District, as shown in Table 3 below.

Table 3. Physical chemical quality of waters in the research transect

Transect	Environmental Parameters		
	Temperature (°C)	pH	Salinity (‰)
1	27,2	8,18	24
2	27,5	8,20	24
3	27,8	8,22	27
4	28,0	8,22	27
5	28,1	8,24	28
6	28,1	8,26	28
7	28,2	8,30	30
8	28,3	8,32	32
9	28,6	8,35	33
Average	27,9	8,25	28,1

Ora Beach is a tourist attraction where tourists come from within the country and abroad. The interviews with the management of the Ora Beach resort and the local community revealed that visitors are not permitted to throw rubbish/waste carelessly or directly into the water, but the management says that the collected waste will be burned. The waste-burning process does not affect the seas. Judging from the environmental conditions in this study, it still supports the survival of mollusks with temperatures between transects being in the range of 27.2 °C-28.6 °C, salinity being in the range of 24‰ - 33‰, and a pH range of 8. 18 – 8.35. The temperature at this research location can still support the life of marine biota, where the good temperature range for marine biota is between 25°C-35°C. The results of salinity measurements between transects were in the range of 27-320/00. Optimal

salinity for mollusk survival ranges from 27-340/00. Water with a salinity higher than the normal salinity of seawater will affect the spread of marine biota and can even inhibit the spread of certain marine biota (Aziz, 1994).

The pH range between observation transects was between 8.18-8.35. The pH of the water is still in the ideal seawater pH range, namely 7-8.5 (Hamuna et al. 2018). Based on the Decree of the state minister for the Environment Number 51 of 2004 concerning Sea Water Quality Standards. The standard pH value for seawater quality for marine biota is in the range of 7 – 8.5. The degree of acidity (pH) shows the number of hydrogen ions in seawater which is expressed in hydrogen activity. The pH value of water shows a picture of the balance of acids and bases (Hamuna et al. 2018).

CONCLUSION

From the results of research that has been carried out on the study of mollusk species diversity (bivalves and gastropods) on the Coast of Ora Beach, Saleman Village, North Seram District, Central Maluku Regency, it is concluded that 6 orders and 8 families of 9 species were found, namely *Anadara granosa*, *Marchix lyrata*, *Semele cordiformis*, *Placuna placenta*, *Lambis lambis*, *Oliva tricolor*, *Tridacna maxima*, *Strombus luhuanus* L., and *Conus aulicus* L. The diversity of bivalve and gastropod species in Ora Beach, Saleman Village, North Seram District, Central Maluku Regency is classified as moderate. and *Conus aulicus* L. The diversity of bivalve and gastropod species at Ora Beach, Saleman Village, North Seram Sub-district, Central Maluku Regency is classified as moderate with a diversity index of 2.088.

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