The Potential Of Mollusca Communities In Seagrass Ecosystems On Buntal Island Waters West Seram Regency, Maluku Province

Masudin Sangaji[1], Mahriyana Hulopi[2], Jacqueline M.F Sahetapy[3], Nur Tasmiah Sirajuddin[4], Frijona F. Lokollo[5], Febrianti Lestari[6]

[1,2,3,4,5] Faculty of Fisheries and Marine Sciences, Pattimura University, Indonesia
[6] Faculty of Fisheries and Marine Sciences, Raja Ali Haji Maritime University, Indonesia
*Corresponding Author :
Email: ms.unpatti@gmail.com

Abstract.

Molluscs, especially bivalves and gastropods, make an important contribution to the formation of food chains in seagrass ecosystems. In addition, bivalves and gastropods are often used as biological indicators of aquatic environmental quality in seagrass ecosystems. The close relationship between seagrass beds, bivalves and gastropods can be seen in the expanse of seagrass ecosystems found on Buntal Island which is located in Kotania Bay, West Seram Regency. The potential of bivalves and gastropods, such as the diversity and community structure found in Buntal Island waters, is very important to study because the information is limited. This study aims to determine the diversity of bivalves and gastropods in the seagrass ecosystem of Buntal Island and to determine the community structure of bivalves and gastropods which include; density and relative density, abundance and relative abundance, and frequency of presence and relative frequency of presence. The research method used is quantitative. The results of the analysis of the potential of molluscs showed that the diversity of the composition of mollusc taxa found in seagrass ecosystems on Buntal Island was divided into 2 classes, 25 families, 37 genera, 52 species with a total of 3291 individuals. The mollusc with the highest score in terms of density, abundance, and frequency of presence belonged to Nassarius globossus.

Keywords: *Potential, molluscs, bivalves, gastropods, and seagrass ecosystem.*

I. INTRODUCTION

Molluscs are soft-bodied animals, which can be found in inland waters, marine waters and brackish waters. Molluscs are part of the benthic macrofauna, which have an important role in the intertidal region's ecological cycle of seagrass ecosystems. Molluscs play an important role in the food chain process for the continued functioning of seagrass ecosystems and the surrounding waters. Molluscs play an important role as a component in the food chain in seagrass ecosystems, both as predators (predators) and prey. The way of life of molluscs which attaches immerses in the shell or settles on the substrate (sessile), makes its presence and distribution greatly influenced by changes that occur in the environmental ecosystem (Hartoni and Agussalim, 2013), and is often used as an indicator in determining the level of pollution of water (Rachmawaty, 2011; Mendes et al., 2007).Molluscs have several known species such as bivalves, gastropods, cephalopods, and scaphoda, one of the marines and coastal biological resources with high economic value. Two classes of molluscs have important values both from an ecological and economic point of view, namely the bivalves and gastropods. Communities often use bivalves and gastropods directly, both the meat as a source of protein and the shells used as decoration or raw materials for crafts and accessories. From an ecological perspective, bivalves and gastropods play an important role in the food chain and are used as bioindicators (biological indicators) of the quality of the aquatic environment in an area of aquatic ecosystems. Despite having an important role, efforts to manage molluscs have not received much attention from the government or the community when compared to other fishery resources.

Molluscs are a group of animals that have been very successful in adapting to a diversity of tidal zones with extreme temperature changes and are found living in various types of habitats ranging from the deep sea, intertidal zone, fresh water and land (Vaghela and Kundu, 2011).One of the important ecosystems in coastal areas that has a close association with molluscs is the seagrass ecosystem. Molluscs especially bivalves and gastropods play a role in the food chain in seagrass ecosystems. In addition, bivalves and gastropods are often used as biological indicators of the quality of the aquatic environment in seagrass ecosystems. The interaction of molluscs with seagrass communities is very important for the assessment of seagrass ecosystem water quality indicators. Seagrass meadows have limited diversity but are one of the most productive ecosystems (Short et al., 2007). Although seagrass ecosystems have limited diversity compared to coral reefs and mangroves, seagrass ecosystems are one of the most productive ecosystems. About aquatic biota, seagrass meadows play an important role in maintaining the sustainability and diversity of marine biota, as spawning grounds, nurturing areas and places for foraging for various types of biota such as molluscs (Bivalvia and gastropods). The seagrass ecosystem also functions as a substrate for attached biota and macrofauna. Molluscs are one of the main components in seagrass beds, together with polychaeta, crustaceans, echinoderms and another macrofauna (Unsworth et al., 2007a, b; Adulyanukosol and Poovachiranon, 2006), have very high species diversity, reaching more than 50,000 species (Khanna and Yadav, 2004).

Various environmental factors in seagrasses cause differences in the way of life and distribution of molluscs. Seagrass rhizomes, leaves and roots can provide different microhabitats for other organisms, as well as protection from predators (Attrill et al., 2000).Seagrass meadow ecosystems have enormous ecological and economic functions in the food chain in coastal aquatic ecosystems because they can supply organic carbon to the surrounding ecosystems, act as habitats for living and forage for various biota, maintain sediment stability, and act as a barrier against shoreline erosion. With its cross-root system, physically seagrass plays an important role as a coastal protector from abrasion caused by large waves and ocean currents (Koch et al., 2006), maintains environmental stability, and provides important physical and biological support for other communities. (Gillanders, 2006). Several types of molluscs found in seagrass ecosystems have important economic value, whose existence depends on seagrass conditions and the type of substrate. Fredriksen et al. (2005); Hilly et al. (2004) stated that many organisms and molluscs feed on organic matter and detritus resulting from the decomposition of plants and supporting epiphytes and particles found between seagrass leaves. Until now, various studies on molluscs have been carried out in Indonesia so that the existence of species and the structure of the mollusc community in some coastal areas can be identified. Several studies on the structure of the Maluku community were conducted in several places, such as on the island of Pary, the Thousand Islands by Cappenberg and Panggabean (2005); at Carita Pandeglang Banten Beach by Dibyowati (2009); in the waters of Ambon Maluku Bay by Islami and Mudjiono (2009); in the waters of the Lembe strait, North Sulawesi by Arbi (2010); in Merta Segara waters Sanur Denpasar by Istiqlal, Yusuf, and Suartini (2013).

Even though research on molluscs has been carried out a lot, there is still a wide distribution of molluscs that has not been covered by researchers, one of which is the waters of Buntal Island.Buntal Island is one of the islands in Kotania Bay, West Seram Regency, Maluku Province. From the results of the initial survey, it appears that the distribution of seagrass vegetation in the waters of Buntal Island is quite wide with water conditions that are favourable for the spread of bivalves and gastropods. In addition, the presence of bameti activity in the seagrass bed ecosystem of Buntal Island indicates that the seagrass bed of Buntal Island has an abundance of various types of bivalves and gastropods. Bameti is a traditional activity of taking marine biota in aquatic ecosystems. Although information about bivalves and gastropods resources in the seagrass ecosystem of Buntal Island is known, data on bivalves and gastropods resources found in seagrass ecosystems is still very limited. Bivalvia and gastropods in the seagrass ecosystem on Buntal Island are often used by the community as a source of protein and various equipment and accessories. It is feared that the uncontrolled use of molluscs (bivalves and gastropods) will have an impact on decreasing mollusc resources and environmental damage to the seagrass ecosystem. For this reason, information and data collection on potential mollusc resources is needed as basic data in carrying out sustainable protection and preservation of molluscs in the seagrass bed ecosystem on Buntal Island.The purpose of this study was to determine the potential of Buntal Island molluscs such as; 1) the diversity of the composition of bivalve and gastropod taxa found in seagrass ecosystems, 2) knowing the community structure of bivalves and gastropods which include; density and relative density, abundance and relative abundance, and frequency of presence and relative frequency of presence.

II. METHODS

This research was carried out in seagrass ecosystems in the waters of Buntal Island, West Seram District, West Seram Regency, Maluku Province. To obtain data on molluscs (bivalves, gastropods) and seagrasses on Buntal Island, the Quadrant Linear Transect method was used. Mollusc data collection at each station was carried out using a 100 meter long quadratic transect adjusted to the length of the reef flat. The collection was carried out at low tide on the north (station 1), south (station 2), east (station 3) and west (station 4) of Buntal Island. At each of these stations, three transect lines are placed perpendicular to the shoreline, with a distance of 50 m between transects. Each transect is placed in a quadrant with a distance of 10 m between quadrants. The transect is placed perpendicular to the shoreline and starts from the beach to the shore at low tide. Mollusc sampling was carried out using a square measuring 50 cm x 50 cm. Observation plot points (squares) were made at every 10 m distance along the transect line. Observations and data collection for gastropods and bivalves were carried out in the same quadrant. Bivalvia and gastropod samples taken were attached to seagrass plants, namely on rhizomes, roots, leaves and on the substrate. All molluscs contained in the quadrants were taken and put in plastic bags and preserved in a 75% alcohol solution. The type and cover of seagrass and the type of substrate along the transect line were also recorded. Mollusc samples were identified up to the species level based on identification books Abbott and Dance (1990), and Dharma (2005). Measurements of the physical condition of the waters were carried out at each transect and then recorded on the available data sheets.

Potential molluscs analyzed were density, relative density, abundance, relative abundance, frequency of presence, the relative frequency of presence, and index of diversity of gastropods and bivalves. This analysis uses the formula proposed by Krebs (1978) as follows:

$$\text{Density (ind./m}^2\text{)} = \frac{\text{number of individuals of a species}}{\text{total abundance of all species}}$$

$$\text{Relative density (\%)} = \frac{\text{density of a species}}{\text{sum of the densities of all species}} \times 100$$

Abundance = Number of individual species found

$$\text{Relative abundance (\%)} = \frac{\text{total abundance of a species}}{\text{total abundance of all species}} \times 100$$

$$\text{Frequency of occurrence} = \frac{\text{frequency of occurrence of a species}}{\text{total quadrants observed}}$$

$$\text{Frekuensi kehadiran(\%)} = \frac{\text{frekuensi kehadiran suatu spesies}}{\text{total frequency of occurrence of all species}} \times 100$$

III. RESULTS AND DISCUSSION

Based on the research results in the waters of Buntal Island, it was found that there was a community of molluscs associated with 5 species of seagrass which were classified into 2 families, namely *Cymodoceaceae* and *Hydrocharitaceae*. The *Cymodoceaceae* family consists of 2 species namely *Cymodocea serrulata* and *Cymodocea rotundata* while the *Hydrocharitacea* family consists of 3 species namely *Enhalus acoroides, Thalassia hemprichii, Halophila ovalis*.

Table 4. Composition of seagrass species

Divisi	Class	Family	Genus	Species
Anthophyta	Angiospermae	Cymodoceaceae	*Cymodocea*	*Cymodocea rotundata*
				Cymodocea serrulata
		Hydrocharitaceae	*Enhalus*	*Enhalus acoroides*
			Thalassia	*Thalassia hemprichii*
			Halophila	*Halophila ovalis*

Based on data on the composition of the seagrass community in the waters of Buntal Island as shown in Table 4 above, when compared with data on the composition of seagrass species from research in Kotania

Bay and Pelita Jaya, the potential richness of seagrass species in the waters of Buntal Island reaches 71.42% of seagrass species richness. in Kotania Bay and Pelita Jaya Bay. Seven species of seagrass were found throughout the waters of Pelitajaya and Kotania Bay, namely *Thalassia hemprichii*, *Enhalus acoroides*, *Halodule uninervis*, *Halophila ovalis*, *Syringodium isoetifolium*, *Cymodocea rotundata* and *Cymodocea serrulata* (Supriyadi, 2009). Of the seven species that exist, only *Thalassia hemprichii* and *Enhalus acoroides* are often found or dominate in the shallow waters of Pelita Jaya and Kotania Bays, the same conditions as in the waters of Buntal Island which are included in the Kotania Bay area.From the results of research in Kotania Bay and Pelita Jaya Bay, it turns out that the seagrass species *Halodule uninervis* and *Syringodium isoetifolium* are not found in the waters of Buntal Island. This fact is closely related to the two limiting factors for seagrass growth, namely the area of the water and the water substrate. The water area of Buntal Island occupied by seagrass beds is smaller or narrower, and the condition of the bottom substrate in the seagrass beds area does not support the presence of the two seagrass species. This condition causes only 5 species of seagrass to be found in the waters of Buntal Island. In addition, the presence of 3 species of seagrass *Halophila ovalis*, *Cymodocea rotundata* and *Cymodocea serrulata* in Buntal Island waters is very important because these three species of seagrass are an important source of food for the organisms around them.

Composition of Mollusc Taxa

The composition of the mollusc taxa found in the seagrass ecosystem on Buntal Island is divided into 2 classes, 25 families, 37 genera, and 52 species with a total of 3291 individuals where the gastropod class consists of 14 families, 22 genera and 32 species with a total of 2735 individuals while the bivalves class consists of 11 families, 15 genera and 20 species with a total of 556 individuals. At the research location, it was found that the gastropod class mollusc phylum had the largest composition. Species from this class are found living attached to leaves, seagrass rhizomes and on the substrate. This condition indicates that around 20% to 60% of the epiphytic biomass in seagrass beds is utilized by the epifauna community which is dominated by gastropods.The results of this study found that the western, northern and eastern parts of Buntal Island had the same taxa composition consisting of 25 families, 37 genera and 52 species but had a different number of individuals. While the composition of the mollusc taxa found on South Buntal Island only consisted of 11 families, 13 genera and 13 species with a total of 173 individuals. This is because the area of seagrass meadows on southern Buntal Island is much narrower than the area of seagrasses on other parts of Buntal Island, so the number of gastropods and bivalves found is also less.

Density and Relative Density

The results showed that the overall density of the molluscs was 29.91 ind/m^2. The highest density value was represented by *Nassarius globossus* from the *Nassariidae* family, namely 2.35 ind/m^2 (7.87%) followed by *Columbella scripta* 2.19 ind/m^2 (7.32%), *Strombus urceus* 2.17 ind/m^2 (7.26%), *Pyrene testudinaria* 1.99 ind/m^2 (6.65%), *Anadara antiquate* 0.76 ind/m^2 (2.55%), *Strombus luhuanus* 0.70 ind/m^2 (2.37%), *Strombus gibberulus* 0.60 ind/m^2 (2%), *Atrina vexillum* 0.2 ind/m^2 (0.66%), *Trachycardium subrugosum* 0.18 ind/m^2 (0.6%), *Trachycardium rugosum* 0.15 ind/m^2 (0.51%), *Pinna muricata* 0.13 ind/m^2 (0.45%), and the species with the lowest density was *Spondylus squamosus*, which was 0.06 ind/m^2 (0.21%). In general, species that have high-density values are because individuals of these species at the study site also have high numbers. Conversely, species that have low densities are due to the low number of individuals found. In addition, the highest density of molluscs on Buntal Island was found in seagrass beds with a very large area. This condition shows that the level of density of molluscs is largely determined by how much seagrass cover is owned in an area. Density and relative density more complete can be seen in the following table.

Table 6. Density and relative densities between parts of Buntal Island.

Spesies	Western Buntal		North Buntal		South Buntal		East Buntal	
	K	K. Rf(%)	K	K. Rf(%)	K	K. Rf(%)	K	K. RF(%)
Strombus urceus	2,80	8,72	1,67	6,56	0	0	2,94	7,56
Strombus luhuanus	0,51	1,60	0,73	2,86	0,92	6,93	0,78	2,02

Strombus gibberulus	0,38	1,20	0,39	1,55	0	0	1,25	3,19
Columbella Scripta	2,03	6,31	2,09	8,23	1,69	12,71	2,64	6,78
Pyrene testudinaria	2,61	8,12	1,36	5,36	0	0	2,81	7,24
Nassarius globossus	2,54	7,92	1,03	4,05	2,38	17,91	3,48	8,96
Anadara antiquate	0,51	1,60	0,45	1,78	1,46	10,98	3,48	8,96
Trachycardium subrugosum	0,29	0,90	0,18	0,71	0	0	1,03	2,65
Trachycardium rugosum	0,25	0,80	0,15	0,59	0	0	0,15	0,38
Atrina vexillum	0,32	1,00	0,03	0,11	0,38	2,89	0,12	0,31
Pinna muricata	0,22	0,70	0,06	0,23	0,15	1,15	0,18	0,46
Spondylus squamosus	0,06	0,20	0,03	0,11	0	0	0,12	0,31

Based on the table above, it can be seen that the density of each species of the mollusc is directly proportional to the relative density level of each type. From 4 observation sites on Buntal Island, it can be seen that the lowest distribution of mollusc species was in the waters south of Buntal Island. This is because the condition of the seagrass beds in that location is very narrow even though the percentage of cover is higher than the other three locations. From the data above it is also confirmed that there are several species of molluscs such as; *Strombus luhuanus*, *Columbella scripta*, *Nassarius globossus*, *Nassarius globossus*, *Anadara antiquate*, Atrina *vexillum*, and *Pinna muricata* were able to live and survive in environmental conditions with a low percentage of seagrass cover in the waters of the southern island of Buntal.Of the mollusc species found on Buntal Island, several species are often consumed by local people, namely *Strombus urceus, Strombus luhuanus, Strombus gibberulus*, *Anadara antiquate*, *Trachycardium subrugosu, Trachycardium rugosum*, *Atrina vexillum*, *Pinna muricata*, and *Spondylus squamosus*.

Abundance and Relative Abundance

The abundance of molluscs as a whole in the seagrass ecosystem on Buntal Island is 3291 individuals. The highest abundance value was represented by Nassarius globossus from the *Nassariidae* family, which was 259 ind. (7.86%) followed by *Columbella scripta* 241 ind. (7.32%), *Strombus urceus* 239 ind. (7.26%), *Pyrene testudinaria* 219 ind. (6.65%), *Anadara antiquate* 84 ind. (2.55%), *Strombus luhuanus* 78 ind. (2.37%), *Strombus gibberulus* 66 ind. (2%), *Atrina vexillum* 22 ind. (0.66%), *Trachycardium subrugosum* 20 ind/m2 (0.6%), *Trachycardium rugosum* 17 ind. (0.51%), *Pinna muricata* 15 ind. (0.45%), and the species that had the lowest density was *Spondylus squamosus*, which was 7 ind. (0.21%).

Table 7. Abundance and relative abundance between parts of Buntal Island

Species	Western Buntal		North Buntal		South Buntal		East Buntal	
	K(ind.)	K. Rf(%)	K	K. Rf(%)	K	K. Rf(%)	K	K. RF(%)
Strombus urceus	87	8,72	55	6,56	0	0	97	7,56
Strombus luhuanus	16	1,60	24	2,86	12	6,93	26	2,02
Strombus gibberulus	12	1,20	13	1,55	0	0	41	3,19
Columbella Scripta	63	6,31	69	8,23	22	12,71	87	6,78
Pyrene testudinaria	81	8,12	45	5,36	0	0	93	7,24
Nassarius globossus	79	7,92	34	4,05	31	17,91	115	8,96
Anadara antiquate	16	1,60	15	1,78	19	10,98	34	8,96
Trachycardium subrugosum	9	0,90	6	0,71	0	0	5	2,65
Trachycardium rugosum	8	0,80	5	0,59	0	0	4	0,38
Atrina vexillum	10	1,00	1	O,11	5	2,89	6	0,31
Pinna muricata	7	0,70	2	0,23	2	1,15	4	0,46
Spondylus squamosus	2	0,20	1	0,11	0	0	4	0,31

Frequency of Attendance and Frequency of relative attendance

The value of the frequency of presence of molluscs in the seagrass ecosystem of Buntal Island as a whole is 17.45 ind/m^2, where the highest frequency of presence is represented by *Nassarius globosus* which is equal to 0.88 ind/m^2 (5.05%), *Pyrene testudinaria* 0.8 ind/m^2 (4.58%), *Strombus urceus* 0.79 ind/m^2 (4.53%), *Columbella scripta* 0.64 ind/m^2 (3.69%), *Anadara antiquate* 0.51 ind/m^2 (2.96%), *Strombus luhuanus* 0.41 ind/m^2 (2.39%), *Strombus gibberulus* 0.24 ind/m^2 (1.4%), *Atrium vexillum* 0.18 ind/m^2 (1.04%), *Trachycardium subrugosum* 0 .16 ind/m^2 (0.93%), *Trachycardium rugosum* 0.14 ind/m^2 (0.83%), *Pinna mucirata* 0.14 ind/m^2 (0.83%) and the lowest frequency of presence, namely *Spondylus squamosus* of 0 .06 ind/m^2 (0.36%).

Table 8. Frequency and relative frequency of presence between parts of Buntal Island

Spesies	Western Buntal		North Buntal		South Buntal		East Buntal	
	FK	FK. Rf(%)	FK	FK. Rf(%)	FK	FK. Rf(%)	FK	FK. RF(%)
*Strombus urceus**	1	4,96	0.69	4.48	0,69	9,09	1	4,4
*Strombus luhuanus**	0,41	2,08	0.48	3,11	0	0	0,54	2,42
*Strombus gibberulus**	0,29	1,44	0.27	1,75	0	0	0,6	2,69
Columbella Scripta	1	4,96	0.90	5.84	0.61	8,08	1	4,4
Pyrene testudinaria	1	4,96	0.72	4.67	0	0	1	4,4
Nassarius globossus	1	4,96	0,60	3,89	1	13,13	1	4,4
*Anadara antiquate**	0,41	2,08	0,36	2,33	0,92	12,12	0,63	2,83
*Trachycardium subrugosum**	0,25	1,28	0,15	0,97	0	0	0,15	0,67
*Trachycardium rugosum**	0,22	1,12	0,15	0,97	0	0	0,12	0,53
*Atrina vexillum**	0,25	1,28	0,03	0,19	0,38	5.05	0,18	0.8
*Pinna muricata**	0,22	1,12	0.06	0,38	0,23	3,03	0,12	0,53
*Spondylus squamosus**	0,06	0,32	0,03	0,19	0	0	0,12	0,53

Note : * = species eaten

Based on the table above it is clear that in general, the species of molluscs consumed by the public have a relatively lower frequency of presence and frequency of presence compared to the species of molluscs that are not consumed by the public. If this condition is not managed properly, it will lead to the scarcity status of the mollusc species consumed.

IV. CONCLUSION

The results showed that the potential composition of the mollusc taxa found in the seagrass ecosystem on Buntal Island was divided into 2 classes, 25 families, 37 genera, and 52 species with a total potential of 3291 molluscs, consisting of 2735 potential gastropods and 556 potential bivalves. individual. The gastropod class consists of 14 families, 22 genera and 32 species while the bivalve class consists of 11 families, 15 genera and 20 species. The mollusc with the highest score in terms of density, abundance, and frequency of presence belonged to the species *Nassarius globossus* from the *Nassariidae family*, while the lowest value belonged to the species *Spondylus squamosus*.

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