The condition and composition of seagrass and mollusca on Biak island, Papua

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Abstract. This research was purposed to assess coverage and species distribution of seagrass as well as mollusca in Biak Island, Biak Numfor Regency, Papua. Field sampling was conducted in February, March and September 2017 at 18 observation stations. Eight seagrass species were recorded during the sampling period namely Thalassia hemprichii, Enhalus acoroides, Halodule uninervis, Halodule pinifolia, Syringodium isoetifolium, Cymodocea rotundata, C. serrulata, and Halophila ovalis. The highest coverage was T. hemprichii, followed by C. rotundata and the least was C. serrulata. The range of seagrass coverage from 5.11% (St.1) to 75.76% (St.17) with the average of coverage in Biak was 35.7%. Furthermore, there were 4 groups based on Bray-Curtis similarity according to the seagrass assemblage in the research area. In addition, a total of 156 molluscan species were recorded consisted of 123 species from gastropod and 33 species from bivalvia. The most distributed species from gastropod were Conomurex luhuanus and Canarium urceus, while from bivalvia was Anadara antiquata. Station 15 has the highest species number with 33 species and the lowest, with just 9 species, were found at station 1 and 7.

Keywords: bivalvia, coverage, gastropoda, seagrass, species distribution

1. Introduction

Seagrass is a flowering plant found in shallow marine waters and submerged in seawater. The vast collection of seagrasses and their abiotic and biotic factors will form a seagrass ecosystem. Seagrass beds are commonly found in tidal areas and are a habitat for many marine biotas (Vizzini 2009). Rhizome, leaves, and roots of seagrass can role as microhabitat of various organisms. For some marine biota, seagrass beds may have functioned as nursery ground and protection from predatory animals (Blandon and Ermgassen 2014). Seagrass beds are areas with high productivity in estuarine and coastal regions (Unsworth et al 2012). Many organisms get their food from organic matter, detritus as a result of decomposition of seagrass and epiphyte or particles that attach to seagrass leaves. The vast expanse of seagrass beds also acts as a trap for sediments so that it can clear shallow waters and reduce erosion (Widdows et al 2008). Although the ecological importance of seagrass meadow, their coverage shows declining pattern around the world (Short et al 2011). The seagrass coverage in Biak and surrounding waters have been reported previously by Dharmawan et al (2017) at around 56% with consisted of 7 species and Aji et al (2018) at approximately 42% with comprised of 8 seagrass species.
Biota such as nekton, plankton, and benthos are easily found in seagrass ecosystem. Benthos invertebrate commonly found in area are mollusk, echinodermata, crustacea, and polychaeta. Mollusks are soft-bodied animals and the major component of the composition of benthic biota in seagrass beds. They have been classified based on their morphological and anatomical features (Wilson 1993). Mollusks represent one of the largest phyla in the marine environment and are both ecologically and economically important (Sturin et al. 2006). There are some reports that the number of Mollusca species from Biak waters at about 94 species (Aji and Widyastuti 2017) and 177 species (Aji et al. 2018). In Biak island Papua, Mollusks is utilized by local people for food and handicraft.

However, with the increase in the human population and the progress of developments in coastal regions such as fisheries, housing construction, ports, and other civilized activities directly or indirectly will affect the condition of the seagrass ecosystem as well as the association fauna of mollusks. The development of this coastal area does not only occur in the western part of Indonesia but also in eastern Indonesia, for example Biak Island, Biak Numfor Regency, Papua Province. Biak has good access because it has a port and an airport that support the local economic growth. Biak is one of the island districts in Papua Province which is located in the northern part of Papua Island and is geographically located at 134°47'-136°48' BT and 0°21'-1°31' LS. The district is bordered by the Pacific Ocean in the north and east, with Supiori District in the west, and in the south bordering the Yapen Strait.

The aim of this study was to determine the condition of seagrass meadow and its association to mollusk in the Biak waters. The target of this study is to meet the expectations of stakeholders in obtaining adequate data and information regarding the condition of coastal ecosystems in this area so that it can be utilized in determining sustainable development policies. Therefore information about the status of seagrass beds and the biota associated with seagrasses especially mollusks on Biak Island needs to be studied.

2. Materials and methods

2.1. Study site
Data collection in the field was carried out on 2-9 September 2017 in the district of Padaido, East Biak, Oridek, and South Biak which were covering of 9 stations which are Paidiori (Station 1), Auki (Station 2), Mnrwar (Station 3), Norem (Station 4), Adorbari (Station 5), Orwer (Station 6), Ruar (Station 7), Ambroben (Station 8), Sorido (Station 9). Furthermore, the next data collection was done on 27 February 2017 – 8 March 2017 in South Biak and West Biak District which includes 9 stations which are Inggiri (Station 10), Adoki (Station 11), Urfu (Station 12), Samber (Station 13), Karnindi (Station 14), Sopen (Station 15), Mamoribo (Station 16), Yembepioper (Station 17) and Orkdori (Station 18) (figure 1). The physical data such as salinity, pH, temperature and substrate were measured directly in each station. Salinity, pH, and temperature were measured using Horiba LaQUAact PC110 Dual Channel pH/ORP/Cond/TDS/Res/Sal/Temp, while Dissolved Oxygen was measured using DO meter.

2.2. Seagrass
Seagrass data were obtained based on the Seagrass Monitoring Guide (Rahmawati et al. 2014) using the method of line transects and quadrate transects, and was carried out when the water was approaching low tide so making it easier to conduct data collection. The roller meter was spread out 100 meters along the sea, perpendicular to the coastline. Square frames with size of 50x50 cm² were placed from the starting point of 0 m and was continued in every 10 m distance until the transect point reached 100 m. At each station, three transects were carried out with a distance range of 50 m between transect. Seagrass species
that were found in the frame was identified by reference to seagrass identification book (McKenzie 2008) and the percentage of its cover was determined. All information such as location, station, date, time of observation, and general information such as the type of substrate and profile of the research location were also recorded. The results of seagrass cover conditions as mollusk habitats were processed to produce an average value of seagrass cover per station and the percentage of seagrass species at each station used the equation according to the Seagrass Monitoring Guide. Multivariate analyses were performed using the PRIMER v7.0 software package. The similarity between stations was analyzed by cluster and ordination techniques (non-metric MDS) based on the Bray-Curtis similarity coefficient after log(x-1) transformation of the seagrass data. Group-average linkage method was applied for cluster analysis.

Figure 1. Study area in Biak Island, Papua Province.

2.3. Mollusca
A sampling of mollusks gastropoda and bivalvia was carried out in the same time with the seagrass data collection. Data collection for mollusks is carried out by search all mollusk in the seagrass sampling area. Furthermore, each type of mollusk with the size more than 1 cm or that can be seen was collected and preserved in ethanol. Then, samples were brought to the Technical Implementation Unit for Marine Life Conservation Biak, Papua to be identified and stored in the room of marine biota collection. The reference book used to identify mollusks were Abbott and Dance (1990), Wilson (1993), Dharma (2005), Huber (2010), Tucker and Tenorio (2013), and Poppe et al (2014). The physical data such as salinity, pH, temperature, and substrate were measured directly in the location. Salinity, pH, and temperature were measured using Horiba LaQUAact PC110 Dual Channel pH/ORP/Cond/TDS/Res/Sal/Temp, while Dissolved Oxygen was measured using DO meter. Moreover, the similarity of composition between stations according to present or absent of mollusk species was analyzed through Bray-Curtis similarity by using the PRIMER v7.0 software package. Furthermore, relationship among mollusk distribution and seagrass coverage from each station were determined by using regression analysis.

3. Results and discussions
Water quality conditions of the research areas are indicated in table 1. Water temperature ranged between 21.5°C in station 16 and 33.9°C in station 15. Salinity ranged between 15ppt (station 6) and 34ppt (station 14, 17 and 18). The pH ranged from 7.46 (station 12) to 8.94 (station 18) and the DO ranged from 5.1%
(station 4) to 21.6% (station 13). While, the substrate in the location was mostly sand, muddy sand, sandy mud, and coarse shell/coral. In addition, the profile of the beach was covered by mangrove, coconut trees and also a residential area.

The productivity of seagrass can be controlled by physiological processes, including several abiotic and biotic factors which influence their metabolism. Temperature, inorganic nutrients, light, DO and salinity affect biochemical processes of organisms and are regarded as prominent factors which are influencing seagrass growth. The optimum temperature for the growth of seagrass is between 23°C -32°C (Lee et al 2007). The water temperature on the sampling location ranges from 21.5°C to 33.9°C. This range is in the ideal temperature for seagrass life. The temperature has role by affecting photosynthesis process that is conducted by seagrass for making nutrient and if the temperature range is outside the optimum range, the seagrass would be stress and may not grow well. Therefore, the seagrass meadow coverage in that area would be decreased. Moreover, according to Banne (2005) the range of temperature that can be tolerated by macrobenthos in tropical area is 25°C -36°C. Thus, the temperature in this research area is suitable for benthos animal especially mollusks. In addition, water’s salinity in the sampling area ranged from 15 to 34 ppt and it is still in the range that can be tolerated by mollusks and seagrass as the habitat. Changes or fluctuation in salinity can affect the distribution of marine organisms and may indirectly reshape the composition of benthic as well as nekton organisms. The optimum salinity for marine life is at a value between 31-33 ppt (Rattanachot and Prathep 2011). Furthermore, the measured pH in Biak ranged from 7.46-8.94 and the DO ranged from 5.1-21.2%. It shows a relatively low environmental variation for all stations, which is a good condition for marine organisms (Kodama et al 2012). Overall, the environmental parameter that has been measured in situ from research sites are suitable for seagrass and mollusks.

| Station | Location | Temp (°C) | pH  | Sal (ppt) | DO (%) | Substrate                        |
|---------|----------|-----------|-----|-----------|--------|----------------------------------|
| 1       | Paidori  | 33.1      | 8.61| 30        | NA     | sand,                            |
| 2       | Auki     | 31.5      | 8.2 | 32        | 7.9    | sand, muddy sand                 |
| 3       | Mnurwar  | 35        | 8.5 | 30        | 20.0   | muddy sand                       |
| 4       | Norem    | 30.8      | 8.4 | 20        | 5.1    | muddy sand                       |
| 5       | Adorbari | 33.8      | 8.1 | 32        | 9.0    | sand, muddy sand                 |
| 6       | Orwer    | 29.5      | 8.7 | 15        | 6.1    | muddy sand                       |
| 7       | Ruar     | 27.6      | 8   | 29        | 6.1    | muddy sand                       |
| 8       | Ambroben | 32.9      | 8.94| 26        | 8.7    | sandy mud                        |
| 9       | Sorido   | 29.6      | 7.9 | 32        | 7.5    | sand                             |
| 10      | Inggiri  | 27.5      | 7.71| 15        | 20.9   | sand, muddy sand, coarse shell/coral |
| 11      | Adoki    | 27.9      | 7.48| 19        | 20.1   | sand, muddy sand, coarse shell/coral |
| 12      | Urfu     | 26.5      | 7.46| 16        | 20.0   | muddy sand, coarse shell/coral   |
| 13      | Samber   | 29.5      | 7.86| 33        | 21.6   | sand, coarse shell/coral         |
| 14      | Karnindi | 30.3      | 8.14| 34        | 20.6   | muddy sand, coarse shell/coral   |
| 15      | Sopen    | 33.9      | 7.85| 32        | 19.9   | sandy mud                        |
| 16      | Mamoribo | 21.5      | 8.34| 33        | 21.2   | muddy sand                       |
| 17      | Yembepioper | 29.8 | 8.23| 34        | 19.4   | muddy sand                       |
| 18      | Orkdoi   | 28.1      | 7.89| 34        | 19.5   | muddy sand                       |
The productivity of seagrass can be controlled by physiological processes, including several abiotic and biotic factors which influence their metabolism. Temperature, inorganic nutrients, light, DO and salinity affect biochemical processes of organisms and are regarded as prominent factors which are influencing seagrass growth. The optimum temperature for the growth of seagrass is between 23°C-32°C (Lee et al 2007). The water temperature on the sampling location ranges from 21.5°C to 33.9°C. This range is in the ideal temperature for seagrass life. The temperature has role by affecting photosynthesis process that is conducted by seagrass for making nutrient and if the temperature range is outside the optimum range, the seagrass would be stress and may not grow well. Therefore, the seagrass meadow coverage in that area would be decreased. Moreover, according to Banne (2005) the range of temperature that can be tolerated by macrobenthos in tropical area is 25°C-36°C. Thus, the temperature in this research area is suitable for benthos animal especially mollusks. In addition, water’s salinity in the sampling area ranged from 15 to 34 ppt and it is still in the range that can be tolerated by mollusks and seagrass as the habitat. Changes or fluctuation in salinity can affect the distribution of marine organisms and may indirectly reshape the composition of benthic as well as nekton organisms. The optimum salinity for marine life is at a value between 31-33 ppt (Rattanachot and Prathep 2011). Furthermore, the measured pH in Biak ranged from 7.46-8.94 and the DO ranged from 5.1-21.2%. It shows a relatively low environmental variation for all stations, which is a good condition for marine organisms (Kodama et al 2012). Overall, the environmental parameter that has been measured in situ from research sites are suitable for seagrass and mollusks.

3.1. Seagrass components
The seagrass coverage ranged from 5.11% in St.1 to 75.76% in St.17 and the average of seagrass cover in the sampling location is 35.7%. There were 4 stations that had coverage higher than 50% which were station 6, 9, 10 and 17. Meanwhile, seagrass coverage that was lower than 30% can be found in station 1, 2, 5, 7, 14, 15 and 18 (figure 2). There were 8 species of seagrass found in the research area which were Thalassia hemprichii, Enhalus acoroides, Halodule uninervis, H. pinifolia, Syringodium isoetifolium, Cymodocea rotundata, C. serrulate and Halophila ovalis. Two seagrass species which were T. hemprichii and C. rotundata have experienced high coverage compare to others. As can be seen from figure 2, the coverage of T. hemprichii was high in St.1 (24.34%), St.3 (24.91%), St.12 (29.45%) and St.17 (43.37%). While, high coverage of C. rotundata can be found in St.6, St.10, and St.17 which the value of percent cover was 29.97%, 35.39%, and 32.39% respectively.

The difference of seagrass species and their coverage found in each location are caused by several factors such as physical condition, topography, substrate, and human activities around the seagrass meadow. Predation and associated biota of seagrass also have influence in the distribution of seagrass. For example, the composition of seagrass species and its coverage in Caribbean are influenced by megaherbivore especially sea turtle (Christianen et al 2018). T. hemprichii and C. rotundata is the commonly found in each station and has a high coverage as it can adapt and tolerate a wide range of environmental parameter. Moreover, it is presumably because the substrate is sandy that is suitable for that type of seagrass.

From the figure 3, it can be seen that the dominance of seagrass species was diverse at each station. Seagrass T. hemprichii was dominant in St.1, St.3, St.4, St.7, St.8, St.9, St.11, St.12, St.13, St.15, and St.17, whereas C. rotundata was dominant in St.5, St.6, St.10, and St.18. While the other stations such as St.2 was dominated by E. acoroides, St.14 by H. uninervis and St.16 by H. pinifolia. In average, the most dominated seagrass species was T. hemprichii and it was followed by C. rotundata.
The number of seagrass species that are found in Indonesia is 15 species consisted of 2 families and 7 genera but the most commonly found just 12 species (Sjafriz et al 2018). In Biak waters, the number of seagrass species is 8 species which is more than half of the number of that in Indonesian’s coastal area. From table 2, it can clearly be seen that the average species number of surveyed areas in Eastern Indonesia is 8 species. The more diverse seagrass species in one location is the better to form the seagrass community as each species has different role. Some species are good for sediment trap, current or wave barrier, and the other may act as food source for endangered species such as dugong and sea turtle (Christianen et al 2018).
According to the decision of Keputusan Menteri Negara Lingkungan Hidup No. 200 year 2004, the percent coverage of seagrass beds in Biak is 35.7% which are categorized as fair (30-59%). According to Rahmawati et al (2014), it can be categorized as medium (26-50%). The percent cover of seagrass beds in Biak is below the average of that coverage in all COREMAP location of Indonesian seagrass monitoring in year 2015 (46%), 2016 (37.58%) and 2017 (42.23%) (Sjafrie et al 2018). Moreover, the seagrass coverage in eastern part of Indonesia also showed higher coverage compare to the seagrass coverage for this research in Biak (table 2). The main problem that causing damage in seagrass ecosystem in Biak is due to human activity such as coastal development, the use of destructive fishing gear, tourism, pollution, and etc. Therefore, these anthropogenic impacts resulting to the decreasing of seagrass coverage. According to Waycott et al (2009), seagrass beds have decreased in all areas of the worldwide based on the result that 58% of site declined from the total of 215 sites around the globe covering the time period from 1879 to 2006. The majority of this seagrass loss because of coastal development, dredging activities, declining water quality and natural processes such as storm damage or biological disturbance.

Four main groups of sites were determined from the dendrogram and MDS plot resulting from cluster analysis at 60% similarity level (figure 4). Group A consisted of 2 sites which were further grouped in two subgroups: A1 (Station 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17 and 18) and A2 (Station 3). Group A contained high coverage of seagrass T. hemprichii and C. rotundata. Group B comprised station 4 and 2 which had high coverage of E. acoroides. Whereas, group C and D consisted of station 14 and 1 respectively. The former group had a very high cover of H. uninervis while the latter was dominated by T. hemprichii but the overall seagrass cover was the lowest compared to other station. MDS ordination (figure 5) confirmed the groups determined from the dendrogram with the bubble plot showing the T. hemprichii coverage. T. hemprichii was the most dominant seagrass in the sampling area. It can be noticed that group A have large coverage of T. hemprichii compared to group C and D.

| Location          | Seagrass | Total spp. | Coverage | Literature               |
|-------------------|----------|------------|----------|--------------------------|
| Biak, Papua       | Th, Hu, Hp, Si, Cr, Cs, Ho, Ea | 8          | 36       | This research             |
| Padaido islands   | Th, Hu, Hp, Si, Cr, Cs, Ho, Ea | 8          | 42       | Aji et al (2018)          |
| Biak, Papua       | Th, Hu, Hp, Si, Cr, Ho, Hm, Ea | 7          | 56       | Dharmawan et al (2017)    |
| Raja Ampat, West Papua | Th, Cr, Hu, Ho, Si, Ea, | 6          | 47       | Supriyadi et al (2017)    |
| Salawati, West Papua | Th, Hu, Cr, Cs, Ho, Hp, Si, Tc, Et, Ea | 9          | 36       | Gerung et al (2017)       |
| Batanta, West Papua | Th, Ho, Tc, Hu, Cr, Cs, Si, Ea, | 8          | 32       | Gerung et al (2017)       |
| Buton             | Th, Hu, Hp, Si, Cr, Cs, Ho, Ea | 8          | 53       | Hadi et al (2017)         |
| Ternate           | Th, Ho, Hp, Hu, Cr, Cs, Si, Ea | 8          | 43       | Suyarso (2016)            |
| Padaido islands   | Th, Hu, Hp, Si, Cr, Cs, Ho, Ea | 8          | 63       | Suyarso (2015)            |
| Sikka, NTT        | Th, Hu, Cr, Cs, Ho, Hp, Si, Ea | 8          | 64       | Suharti (2015)            |
| Banda island      | Th, Hu, Cr, Cs, Ho, Hp, Si, Ea | 8          | 73       | Giyanto et al (2015)      |
| Kotania bay       | Th, Hu, Cr, Cs, Ho, Si, Ea | 7          | 64       | Supriyadi (2009)          |
Figure 4. Cluster plot based on Bray-Curtis similarity coefficient of seagrass assemblage at 18 stations.

Figure 5. Non-metric multidimensional scaling (NMDS) ordination plot of seagrass assemblage for all stations. Note: □ explained the coverage difference of seagrass *T. hemprichii*. 
**3.2. Mollusca assemblages**

Mollusca that was found in the research area comprised of two classes which were Gastropoda and Bivalvia (figure 6). A total of 156 molluscan species were recorded. The number of species from gastropod was higher with 123 species (78.9%) compared to Bivalvia with just 33 species (21.1%). Station 15 showed the highest species number with 33 species, followed by station 12 (30 species) and the lowest was found at station 1 and 7 with just 9 species. Regarding systematic families among Gastropoda; conidae (16 spp.), Strombidae (12 spp.), cerithidae (11 spp.) and Cypraeidae (10 spp.) were the most diverse. Whereas among Bivalvia; the families Cardiidae (7 spp.) and Veneridae (6 spp.) were most diverse. In relation to the frequency of occurrence, there were three species from gastropod that have a high value which was *Conomurex luhuanus* (0.56) and *Canarium urceus* (0.56) from family Strombidae and also *Monetaria annulus* from family Cypraeidae (0.44). Meanwhile, the most distributed species from Bivalvia were *Anadara antiquata* (0.33) from family arcidae and followed by *Hippopus hippopus* (0.22) from family Tridacnidae.

![Figure 6. The species number of Gastropoda and Bivalvia from each family.](image)

The number of species of mollusks that are found in seagrass beds from class Gastropoda (123 spp.) is higher compared to Bivalvia (33 spp.). This is because most of Bivalvia are burrowing in the sediment, thus Bivalvia cannot be seen easily. Meanwhile, most of Gastropoda move on the substrate and the seagrass leaf or hide below hard substrate such as coral rubble which is easier to be seen and collected.

The most common species found in this study are *C. luhuanus, C. urceus* and *M. annulus* from class Gastropoda; and *A. antiquata* from Bivalvia. The most common species found were similar to those found by other studies in Biak island and its surrounding waters. The study in benthic mollusk diversity in South
Biak, Papua year 2011 was high with 94 species recorded (75 gastropods and 19 bivalves). The most widespread gastropod found in all stations was *Nassarius* sp., followed by *M. annulus* while for bivalve was *Tellina* sp. (Aji and Widyastuti 2017). Furthermore, Aji et al. (2018) stated that the number of species found in Padaido and Aimando waters of Biak island in year 2014 was 177 comprised of 115 Gastropoda and 62 Bivalvia with the high distribution species were *M. annulus*, *C. luhuanus* and *C. urceus* from class Gastropoda; while from class Bivalvia was *A. antiquata*. This Mollusca species of *C. luhuanus* (Strombidae), *C. urceus* (Strombidae), *M. annulus* (Cypraeidae) from class Gastropoda; and *A. antiquata* (Arcidae) from Bivalvia have large widespread and easily found in Pacific waters especially in seagrass or reef flat area (Abbott and Dance 1990; Wilson 1993; Dharma 2005).

These mollusks groups did not show high similarity. Based on the multivariate analyses of the Mollusca data it was possible to define 4 station groups (A, B, C, and D) and station 16 (figure 7). Group A (stations 1, 3, 5, 7, 8, 13, 14 and 17) comprises stations with mollusca species associated to seagrass of *T. hemprichii*, *C. rotundata*, and *H. uninervis*. Likewise, mollusk species in Group B (stations 4 and 6) and Group C (stations 10, 11, 12, 15 and 18) have associated by *T. hemprichii* and *C. rotundata*. Whereas, the Mollusca species composition of group C with was consisted of stations 9 and 2 were determined by seagrass *T. hemprichii* and *E. acoroides*. Furthermore, station 16 was the most separated station in the multivariate analyses. This Mollusca community was mainly characterized and associated with seagrass *H. pinifolia*.

The differences of benthic mollusk species in each station are controlled by many factors such as the coverage and type of seagrass, substrate, organic matter content, human activity, seasons, tides, and other environmental factors (Aji and Widyastuti 2017, Aji et al. 2018). Seagrass meadow can provide as an ecosystem service. Decreases in seagrass coverage may reduce their service that may influence the benthic fauna communities since seagrasses are the base of many marine food webs (Christianen et al. 2018). The composition of seagrass of an area can shape local faunal assemblages particularly mollusks, as the benthic fauna has their preferred habitat of seagrass type (Kenyon et al. 1997). Decreasing of seagrass percent coverage may create a patchier landscape, thus organisms cannot move freely between fragmented seagrass patches as they would in a continuous bed. It is recognized that faunal species richness and density can be severely altered by changes in the amount of seagrass cover (Battley et al. 2011).

![Figure 7. Dendrogram obtained from hierarchical ascendant cluster analysis at 18 stations. Seagrass dominant of *T. hemprichii*, *E. acoroides*, *C. rotundata*, *H. uninervis*, *H. pinifolia*.](image-url)
Based on the regression analyses showed in general that there was no clear pattern as the highest seagrass coverage do not clearly explain the number of mollusk species ($R^2=0.0178$). It can be seen that the variety of mollusk species number was higher in the range of 25% - 40% seagrass coverage. Meanwhile, the number of mollusk species at seagrass cover less than 40% was around 15 species (figure 8). Mollusca is prominent biota not only as their role in seagrass ecosystem but also has an economic contribution to human life. For people in Biak, Mollusca is a food source and as souvenir or handy craft. When the weather condition in the sea is bad and not allowed fishermen for fishing, as a result the fishermen families such as their wife and children look for marine animals in shallow water and as a consequence plenty of shells are fished. If this action is not managed good, the population of mollusk particularly in seagrass meadow of Biak waters will decrease.

4. Conclusion

This study concluded that the coverage of seagrass is lower compared to other area but the seagrass species found is high with a total of 8 species and the most dominance was $T. hemprichii$. In term of its association biota Mollusca, the number of species that are found in Biak is relatively high. The most widespread species from class Gastropoda was $C. luhuanus$ and from Bivalvia was $A. antiquata$.

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