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BIOLOGY ASPECT OF MANGROVE SNAILS (*Telescopium telescopium*) AT LANTEBUNG MANGROVE ECOTOURISM MAKASSAR CITY

Aspek Biologi Keong Bakau (*Telescopium telescopium*) di Ekowisata Mangrove Lantebung Kota Makassar

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ABSTRACT

Mangrove snails (*Telescopium telescopium*) is one of the biota that plays a role in the process of litter decomposition and mineralization of organic matter in mangrove plants. The purpose of this study is to determine the abundance, size structure, growth pattern of mangrove snails (*Telescopium telescopium*) and water quality in the Lantebung Mangrove Ecotourism in Makassar City. The method of collecting mangrove snails by purposive sampling uses a quadrant transect measuring 1x1 m^2 with three repetitions at three observation stations. The water quality parameters measured were temperature, salinity, pH, and sediment. The results showed that the abundance of mangrove snails was 45 individuals (Station I), 46 individuals (Station II), and 45 individuals (Station III) respectively. The length of the mangrove snail (*Telescopium telescopium*) of station I ranged from 55.5-78.1 mm, station II 52.9-72.6 mm and station III 55.3-77.1 mm. The weight structure of the mangrove snail (*Telescopium telescopium*) of station I ranged from 17.0-37.4 g, station II 17.0-30.3 and station III 17.0-41.0 g. The growth pattern of mangrove snails based on the weight length relationship at the three stations showed a negative allometric equation (b<3), i.e. the length increase was faster than the weight increase. The highest abundance of mangrove snails is found at station II and the lowest abundance is at stations I and III. The size of the mangrove snail in terms of shell length at station I is longer than that of stations II and III and in terms of weight at station III is heavier than stations I and station II. The quality of the waters refers to Government Regulation no. 22 of 2021 attachment VIII for marine life that still supports the life of mangrove snails.

Keywords: Abundance, Allometric Negative, Lantebung, Size Structure, *Telescopium telescopium*

ABSTRAK

Keong bakau (*Telescopium telescopium*) adalah salah satu biota yang dapat berperan dalam proses mineralisasi materi organik dan dekomposisi serasah pada tanaman mangrove. Tujuan penelitian ini adalah mengetahui kelimpahan, struktur ukuran, pola pertumbuhan keong bakau (*Telescopium telescopium*) dan kualitas perairan di Ekowisata Mangrove Lantebung kota Makassar. Metode pengumpulan keong bakau secara *purposive sampling* menggunakan

transek kuadran ukuran 1x1 m^2 dengan tiga kali pengulangan pada tiga stasiun pengamatan. Parameter kualitas air yang diukur yaitu suhu, salinitas, pH, dan sedimen. Hasil penelitian menunjukkan kelimpahan keong bakau berturut-turut 45 individu (Stasiun I), 46 individu (Stasiun II), dan 45 individu (Stasiun III). Struktur ukuran panjang keong bakau (*Telescopium telescopium*) stasiun I berkisar antara 55,5-78,1 mm, stasiun II 52,9-72,6 mm dan stasiun III 55,3-77,1 mm. Struktur ukuran bobot keong bakau (*Telescopium telescopium*) stasiun I berkisar antara 17,0-37,4 g, stasiun II 17,0-30,3 dan stasiun III 17,0-41,0 g. Pola pertumbuhan keong bakau berdasarkan hubungan panjang bobot pada ketiga stasiun menunjukkan persamaan allometrik negative (b<3) yakni pertambahan panjang lebih cepat daripada pertambahan bobot. Kelimpahan keong bakau tertinggi terdapat pada stasiun II dan kelimpahan terendah pada stasiun I dan stasiun III. Ukuran keong bakau dari segi panjang cangkang pada stasiun I lebih Panjang daripada stasiun II dan III dan dari segi bobot pada stasiun III lebih berat daripada stasiun I dan stasiun II. Kualitas perairan mengacu Peraturan Pemerintah no 22 tahun 2021 lampiran VIII untuk biota laut masih mendukung kehidupan keong bakau.

Kata Kunci: Allometrik Negatif, Kelimpahan, Lantebung, Struktur Ukuran, *Telescopium telescopium*

INTRODUCTION

Makassar City, South Sulawesi Province has potency source power high coast including mangrove forest. One of area mangrove forests that have benefit in a way ecology and economics for public surrounding is mangrove forest Lantebung which is located in Lantebung Bira Village, District Biringkanaya. Currently, the Lantebung mangrove ecosystem own 25 hectares of mangrove forest dominated by mangrove species *Avicennia* sp. and *Rhizophora* sp. good natural or results planting. Lantebung mangrove area has become area protect area coast based on Makassar City Long Term Development Plan (RPJPD) 2005-2025 (Batara *et al.*, 2020). Apart from that, the Lantebung mangrove ecosystem has developed become area ecotourism (Nurdin *et al*., 2021) and becoming the only one mangrove ecotourism in the city of Makassar with superiority like bridge color colorful throughout road enter to in mangroves, availability the dock that if seen from on will looks like crab so that become place favorite for visitors while enjoy view mangrove forests and sun sink.

Mangrove forest with its ecosystem can adapt in tidal and ebb conditions physique role as silencer wave, anchoring seawater intrusion, and traps sediment, as well can minimize pollution (Kurniawan *et al.,* 2014). Apart from that, mangrove forests can be works as place spawning, place care, and habitat for organism in gather nutrients, include gastropods (Salim *et al*., 2017). Mangrove forests are also community coast with high productivity (Oche *et al*., 2021). Some biota become characteristic typical of the region that is crab, squid fish as well as snail mangroves.

Family Potamididae is the only one family all gastropods its members only found in mangrove ecosystems (Arbi *et al*., 2014). Mangrove gastropods are found in various part Mangrove trees, start from roots, stems and leaves mangrove trees (Budiawan & Ardiansyah, 2020). Gastropods utilise type mangrove trees for various activity his life is good as place stay, take refuge, and thrive breed, as well as source food. Mangrove snails (*Telescopium telescopium*) include organism class gastropods family Potamididae live in waters brackish and influenced by tides (Radjasa *et al*., 2011). Mangrove snail (*Telescopium telescopium*) as decomposer own role in the decomposition process litter and mineralization material organic matter in mangroves (Efriyeldi & Zulkifli, 2014).

Mangrove snail (*Telescopium telescopium*) which lives in the mangrove ecosystem is one commodity it's important to have mark economical for fishermen and communities living in coastal areas (Oche et *al*., 2021). Mangrove snail (*Telescopium telescopium)* own potency for developed become bioindicators waters, in fact economy can also be used for sold and

consumed Because content nutrition (Kusuma *et al*., 2022). Based on observations made at the location research, lots of it snail mangroves taken by the community local and also from outside area Lantebung for consumed, besides that emergence trash was also visible in some the point that becomes the photo spot visitors. This allegedly will influence existence and size from snail mangrove the so that study This important for done. This study aim for know abundance, structure size, pattern growth snail mangrove (*Telescopium telescopium)* as well condition waters in mangrove habitats.

METHODS

Time and Place

Study implemented from May to July 2023 in the region Lantebung Mangrove Ecotourism which is administrative located in Lantebung Bira Village, District Tamalanrea, Makassar City, South Sulawesi Province (Figure 1).

Figure 1. Research Location Map

Tools and Materials

Equipment research used including roll meters measuring 50 m for measure long transect and distance between transect, transect 1x1 m^2 quadrant as the collection area sample snail mangrove, logbook for take notes results research, digital cameras for document results research, caliper for measure long snail mangroves, digital scales 0.01 gr for weigh weight sample, sieve for separate sample snail with substrate, thermometer for measure temperature, pH meter for measuring the pH of water, hand refractometer for measure salinity, gloves for protect hands and boots for protect your feet when study. Temporary that, material research used including snails mangroves (*Telescopium telescopium*) and sediments as studied sample, bag sample for keep sample, alcohol 70% as preservatives and label paper for give mark on the sample.

Research Procedure

Research data collected use method survey on Lantebung mangrove ecotourism. Station study determined according to consideration certain. Consideration intended form location installation transect square size 1x1 m^2 on three station that is station I is close with residential area, station II near with estuary river and station III in the middle Visually abundant mangrove forests there is snail mangrove (*Telescopium telescopium*) with 3 repetitions, sample snail mangroves obtained Then cleaned, counted the amount, measured long shell and weighed its weight.

Taking sample substrate and measurement of oceanographic parameters waters like temperature, salinity, and pH were carried out simultaneously with taking sample snail mangroves on each station. For sample substrate analyzed in the Laboratory Productivity and Management Quality Waters Major Fishery Faculty Knowledge Maritime Affairs and Fisheries Hasanuddin University Makassar.

Abundance snail mangrove (*Telescopium telescopium*) calculated use formula (Haryoardyantoro *et al.,* 2013):

$$K = \frac{Di}{A}$$

Information:
K = Abundance of types (individual)
Di = Number of individuals of the ith species (individuals)
A = Area observation (m^2)

Analysis snail mangrove (*Telescopium telescopium*) is carried out based on size shell length and weight body. Research data is grouped to in a number of class then creates a distribution of size classes. The size structure is analyzed based on a formula from Uneputty & Tala (2011) as following:

$$J = X\ max - X\ min$$

Information:
J = Range (individual)
X max = Long Maximum
X min = Minimum Length

$$K = 1 + 3.3 \log n$$

Information:
n = Many data
K = Lots class

Growth pattern snail mangrove (*Telescopium telescopium)* analyzed based on connection long weight referring to (Effendi, 2003):

$$W = aL^b$$

Information:
W = Weight total
L = Long shell
a and b = Mark constant

RESULT

From research abundance snail mangroves (*Telescopium telescopium*) were obtained results in (Figure 2).

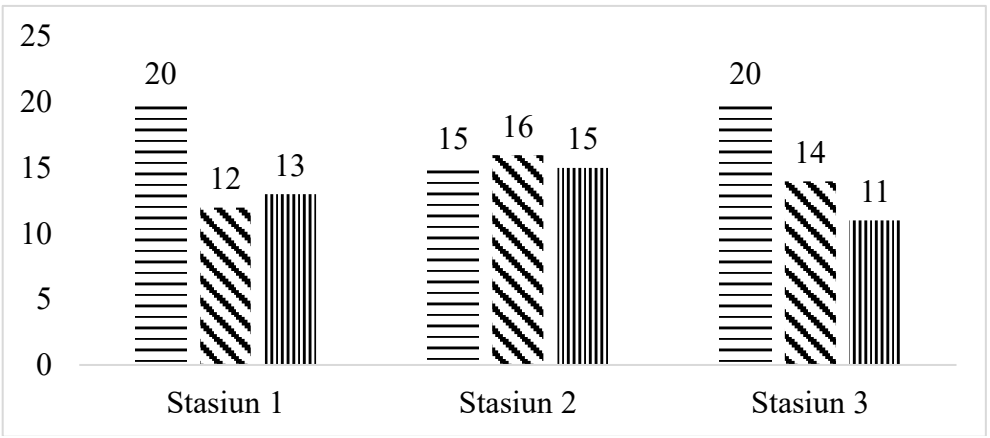

Figure 2. Abundance Snail Mangroves on Every Station

Abundance snail mangrove (*Telescopium telescopium*) on the third station total snails were obtained mangrove as many as 136 individual for 3 repetitions. Abundance snail mangrove (*Telescope telescopium*) The highest was at station II as many as 46 individuals and the lowest was at station I And III each as many as 45 individual. Range Length of snail mangroves (*Telescopium telescopium)* at station I are seen in Figure 3.

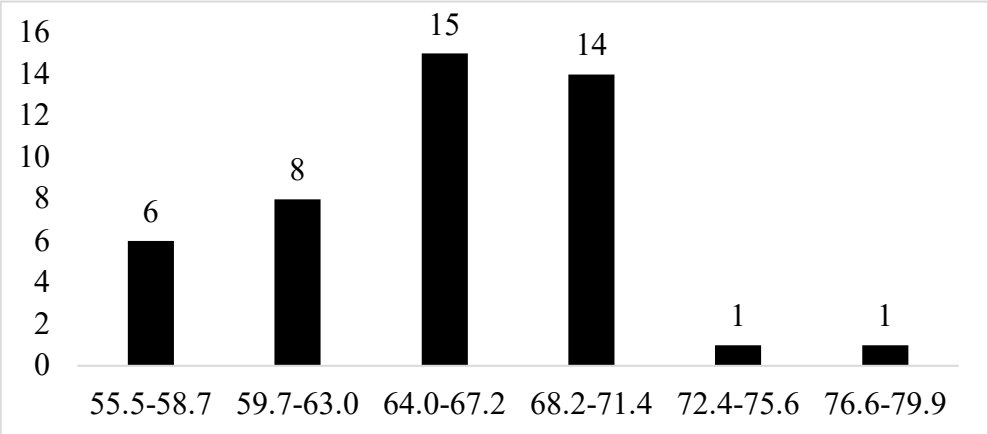

Figure 3. Range Size Long Snail Mangroves at Station I

Structure size long snail mangroves at station I are in the range of 55.5-79.9 mm with amount the highest was in the range of 64.0-67.2 mm, namely 15 individuals and numbers lowest in the range of 72,475.6 and 76.6-79.9 mm for 1 individual each. Range size long snail mangroves at Station II are seen in Figure 4.

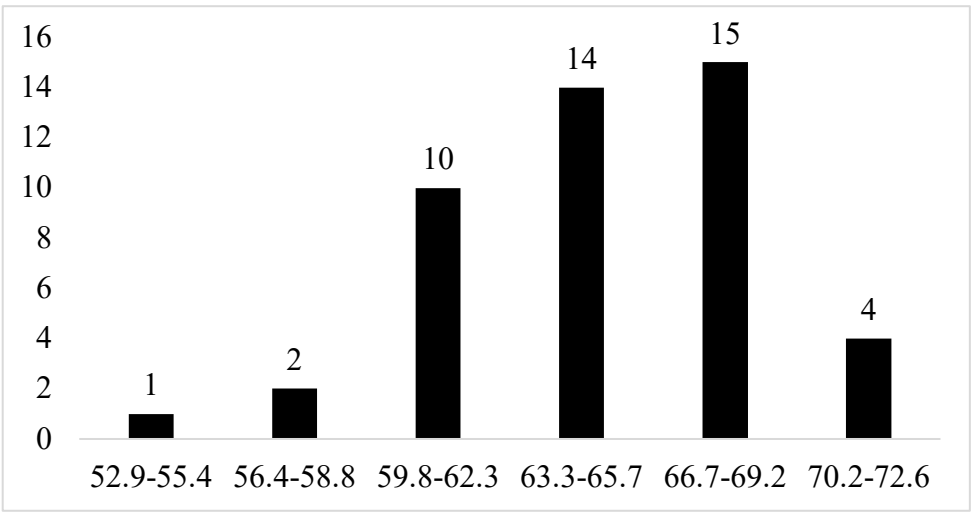

Figure 4. Range Size Long Snail Mangroves at Station II

Structure size long snail mangroves at station II are in the range of 52.9-72.6 mm with amount the highest was in the range of 66.7-69.2 mm, namely 15 individuals and numbers the lowest was in the range of 52.9-55.4 mm, namely 1 individual. Structure size long snail Mangroves at station III are seen in Figure 5.

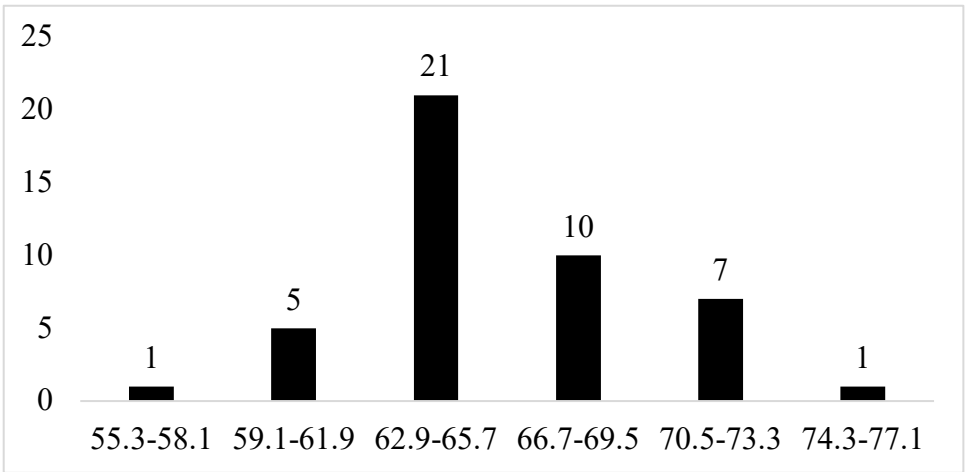

Figure 5. Range Size Long Snail Mangroves at Station III

Structure size long snail mangroves at station III are in the range of 55.3-77.1 mm with amount the highest was in the range 62.9-65.7 mm, namely 21 individuals and the lowest was in the range 55.3-58.1 mm and 74.3-77.1 mm, each 1 individual. Research result connection long weight snail mangroves on third station can seen in Figure 6, Figure 7 and Figure 8.

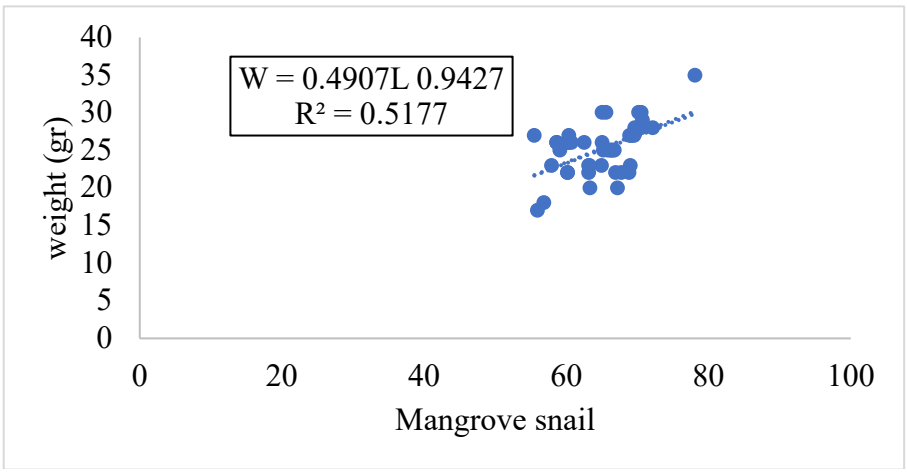

Figure 6. Relationship Between Length and Weight Snail Mangroves at Station 1

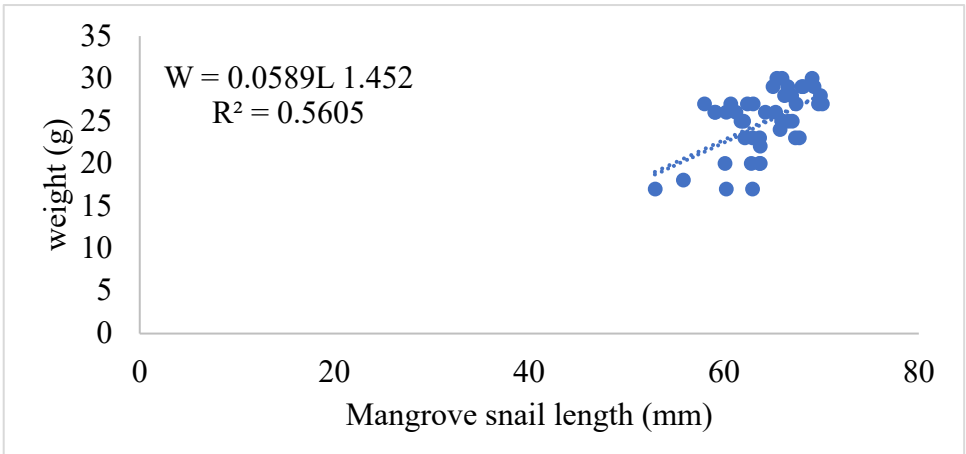

Figure 7. Relationship Between Length and Weight Snail Mangroves at Station II

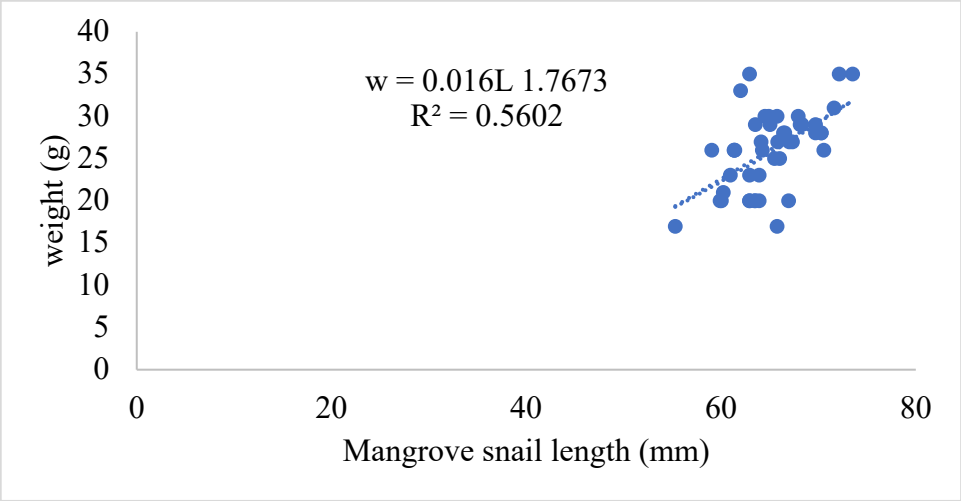

Figure 8. Relationship Between Length and Weight Snail Mangroves at Station III

Based on results calculation long weight snail mangroves on third station so obtained b and R^2 values respectively namely b = 0.9427, R^2 = 0.5177, b= 1.452, R^2 = 0.5605, b = 1.7673 R^2 = 0.5602 where b value <3 which is significant pattern growth nature allometric negative.

Results of physical parameter measurements chemistry waters on each station presented in Table 1.

Table 1. Physical parameters chemistry waters

Parameter	Station I	Station II	Station III	Quality standards*
Temperature (°C)	29.5	29	30.5	28-32
Salinity (ppt)	33.7	34	34	up to 34
pH	8.1	8.1	7.7	7-8.5
Substrate	Clay dusty	Clay dusty	Clay look	

*Information : Regulation Government (PP) no. 22 of 2021 for marine biota in mangroves

DISCUSSION

Abundance snail mangroves in Lantebung mangrove ecotourism at stations I, II and III were obtained abundance highest at station II which is close area with where is the mouth of the river. Genre river bring Lots particle lots of mud contain material organics that settle to the bottom waters, besides That type substrate clay dusty in accordance with the habitat preferred by snails mangroves. Whereas abundance snail mangrove the lowest at stations I and III is suspected Because station I is close with area settlement so that makes it easier inhabitant for take snail mangroves and station III, namely in section middle lots of mangrove forests there is rubbish so that the substrate closed by rubbish. Marpaung (2013) stated low amount macrozoobenthos in natural mangroves because factor anthropogenic or activity humans, that is taking or arrest macrozoobenthos especially in type snails for consumed. Study previously by Rahmawati *et al*. (2013) in the mangrove ecotourism of Mayangan Beach, West Java showed different results that is amount snail mangrove as many as 86 individuals, Datu (2021) abundance snail mangroves on Kuri Caddi Beach and Kuri Lompo Beach, Maros Regency as many as 223 individuals. Kusuma *et al*. (2022) abundance gastropods *T. telescopium* amounting to 144 individuals. According to Kurniawati *et al*. (2014) mangrove areas provide organic material for associated organisms, one of which is gastropods. At high tide, the mangrove snail (*Telescopium telescopium)* will bury itself in the substrate. Natural mangroves are used as living habitat by *Telescopium telescopium* and several other biota so that damage

to the ecosystem can have a negative impact on the performance of biota associated with mangroves (Husein *et al*., 2017).

Based on the results of measuring the length and weight of mangrove snails (*Telescopium telescopium*) in the Lantebung mangrove ecotourism at all stations with a length range of 52.9-79.9 mm and a weight of 17.0-41.0 g, it shows that the size most commonly found is small. This is thought to be due to fishing activities and the large amount of rubbish generated in the area. According to Adriansyah *et al*. (2023) plastic waste thrown into waters can affect the quality of the aquatic environment and cause the biota and plants in these waters to grow imperfectly and can even cause death, including in mangrove forest areas. Datu (2021) found a total length range for mangrove snails in Kuri Caddi of 46.30 – 93.04 mm and a body weight range of 8.41 – 42.08 g; the total length range in Kuri Lompo was 54.81 - 80.48 mm and the body weight range was 16.17 - 92 g. Purwaningsih & Triono (2019) in the mangrove ecosystem of the Pedada River, South Sumatra Province, obtained the length of mangrove snails, namely 83.40 mm. Differences in the average length of gastropod shells at each location can be caused by differences in human (anthropogenic) activities at each location which can influence their growth (Alka *et al.*, 2020).

The relationship between length and weight of an organism is an important factor that is used as an indicator in fisheries biology studies to describe changes in the size of an organism. From the results of measuring the length and weight of mangrove snails, the b value at all stations was obtained, namely b<3 with a negative allometric type of growth pattern, which means that the increase in length is faster than the increase in weight. These results are in line with research by Datu (2021) in the coastal waters of Nisombalia village that the growth type of mangrove snails is hypoallometric. A negative allometric growth pattern is a characteristic of mollusk types (including gastropods) because this type protects its body from environmental disturbances by using a shell, so that the growth of the shell takes priority over the growth of other body parts (Agustina *et al*., 2017).

Based on the results of measuring water quality parameters in the area Lantebung Mangrove Ecotourism (Table 1), the water temperature value at each station ranges between 29-30.5°C, pH ranges between 7.7-8.1, and salinity between 33.7-34 ppt. In general, this range of water quality values meets the quality standards for marine biota in mangrove areas based on Government Regulation Number 22 of 2021. Temperature is Wrong One parameter important in growth gastropods. The ideal temperature range for growth and reproduction of gastropods is generally 25°–32°C (Odum, 1993). Kurniawati *et al*. (2014) stated that the normal temperature range for mangrove snails is between 28-36°C, which means that the temperature in the Lantebung ecotourism area is still suitable for marine biota. The results of research by Oche *et al*. (2021) in the Nagari Gasan mangrove area, Padang Regency show that the temperature waters around 28-30ºC no Far different with mark temperature in ecotourism Lantebung, Makassar City.

Salinity can influence the distribution of benthic organisms both horizontally and vertically (Odum, 1993). The results obtained by Salim *et al*. (2017) mean salinity is 28-30 ppt. The temperature and salinity values in Lantebung mangrove ecotourism contribute to the existence and growth of mangrove snails (*Telescopium telescopium*). Effendi (2003) stated that the increase and decrease in water salinity is strongly influenced by the evaporation process, where the greater the level of seawater evaporation in an area, the higher the salinity and vice versa, in areas that have a low level of evaporation, the salinity will also be lower. Apart from that, rainfall and freshwater intrusion also influence the salinity levels of a body of water.

Organism waters have ability Which are different in tolerate fluctuation pH waters. Death gastropods caused by general pH conditions more more low at low pH compared to pH more tall. Oche *et al*. (2021) found the water pH to be around 7-8. Effendi (2003) states that part

large aquatic biota more like pH value ranges from 7-8.5 and Ramses *et al*. (2018) stated normal pH range for molluscs namely 6-8.4.

The substrate is a place to live and a source of food for organisms that live in the sediment, including mangrove snails (*Telescopium telescopium*) because mangrove snails are deposit feeders (Odum, 1993). Husein *et al*. (2017) stated that mangrove snails (*Telescopium telescopium)* live in mangrove forests and are mostly found on muddy substrates and are influenced by tides. From the research results, it was found that the substrate type in Lantebung mangrove ecotourism is dominated by dusty clay. In line with research by Salim *et al*. (2017), the soil substrate type in the Mangrove and Proboscis Monkey Conservation Area in Tarakan City is also dominated by dust. This indicates that the gastropod habitat with a dusty clay substrate type is the type of substrate preferred by gastropods. Apart from that, organic material originating from mangrove leaf litter found in the substrate becomes food for the mangrove snail.

CONCLUSION

1. Abundance snail mangrove *(Telescopium telescopium)* in Ecotourism Mangroves Lantebung City Makassar a total of 136 individual. The highest abundance of mangrove snails was at station II with 46 individuals and the lowest abundance was at stations I and station III, namely 45 individuals each
2. The structure of the length and weight of mangrove snails is obtained from the total length range 52.9-79.9 mm and weight 17.0-41.0 g which shows that the most commonly found are small-medium sized
3. The growth pattern of mangrove snails is negative allometric, which means that the increase in body length is faster than the increase in body weight
4. The water quality in Lantebung mangrove ecotourism still meets the water quality standards for marine biota based on PP Number 22 of 2021 and is classified as good for the life of mangrove snails.

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REFERENCES

Arbi, Y., Kawaroe, M., Marwoto, M., & Ristiyanti, M. (2014). Taksonomi dan filogeni keong famili Potamididae (Gastropoda: Mollusca) di Indonesia berdasarkan karakter morfologi. Retrieved from https://repository.ipb.ac.id/handle/123456789/73020

Andriansyah, D. M., Triajie, H., & Hafiluddin. (2023). Analisis keberadaan mikroplastik pada keong bakau (*Telescopium telescopium*), air dan sedimen di perairan Kabupaten Bangkalan. *Jurnal Perikanan*, *13*(1), 106-114. https://doi.org/10.29303/jp.v13i1.440

Batara, V. S., Salim, A., & Jufriadi, J. (2020). Strategi pengembangan kawasan wisata hutan mangrove Lantebung Kota Makassar. *Journal of Urban Planning Studies*, *1*(1), 70-79.

Budiawan, H., & Ardiyansyah, F. (2020). Keanekaragaman spesies kelas Gastropoda pada hutan mangrove Pantai Bama Taman Nasional Baluran. *Jurnal Biosense*, *3*(2), 1-13.

Datu, S. T. (2021). Tipe pertumbuhan keong bakau (*Telescopium telescopium*) di perairan Pantai Kuri Caddi dan Kuri Lompo, Desa Nisombalia, Kabupaten Maros. (Skripsi, Universitas Hasanuddin). Retrieved from https://repository.ipb.ac.id/handle/123456789/114708

Effendi, H. (2003). *Telaah Kualitas Air: Bagi Pengelolaan Sumber Daya dan Lingkungan Perairan*. Yogyakarta: Kanisius.

Efriyeldi, E., & Zulkifli, Z. (2015). Kelimpahan dan nisbah kelamin siput bakau (*Telescopium telescopium*) di ekosistem mangrove Desa Darul Aman Kecamatan Rupat Kabupaten Bengkalis. *Jurnal Perikanan dan Kelautan*, *20*(1), 24-31.

Husein, S., Bahtiar, & Oetama, D. (2017). Studi kepadatan dan distribusi keong bakau (*Telescopium telescopium*) di perairan mangrove Kecamatan Kaledupa Kabupaten Wakatobi. *Jurnal Manajemen Sumber Daya Perairan*, *2*(3), 235-242.

Kurniawan, C. A., Pribadi, R., & Nirwani, N. (2014). Struktur dan komposisi vegetasi mangrove di Tracking Mangrove Kemujan Kepulauan Karimunjawa. *Journal of Marine Research*, *3*(3), 351-358.

Kusuma, B., Bengen, P. N., Zamani, D. G., & Putri, N. (2022). Biologi populasi kerang (*Telescopium telescopium* dan *Cerithidea obtusa*) dan keterkaitannya dengan karakteristik habitat mangrove di Kawasan Beejay Bakau Resort, Probolinggo. Retrieved from https://repository.ipb.ac.id/handle/123456789/114708

Marpaung, Azmita A., & Fiqriyah. (2013). Keanekaragaman makrozoobenthos di ekosistem mangrove silvofishery dan mangrove alami kawasan ekowisata Pantai Boe Kecamatan Galesong Kabupaten Takalar. Retrieved from https://repository.unhas.ac.id/id/eprint/9837/

Nurdin, N., Khumaera, N. I., & Mantu, Y. H. (2021). Analisis manfaat langsung sumberdaya mangrove pada kawasan ekowisata Mangrove Lantebung Kota Makassar. *PAPALELE. Jurnal Penelitian Sosial Ekonomi Perikanan dan Kelautan, 5*(2), 94-99.

Oche, W., Sumiarsih, E., & El Fajri, N. (2021). Distribusi dan kepadatan keong bakau (Telescopium telescopium) pada ekosistem mangrove di Nagari Gasan Kabupaten Padang Pariaman Provinsi Sumatera Barat. *Jurnal Sumberdaya dan Lingkungan Akuatik, 2*(2).

Odum, E. P. (1993). *Dasar-dasar Dkologi* (T. Samingan, Trans.). Yogyakarta: Universitas Gadjah Mada Press.

Peraturan Pemerintah No. 22 Tahun 2021 tentang Baku Mutu Air Laut Biota Laut: Lampiran VIII.

Purwaningsih, S., & Triono, R. (2019). Effects of alkaline pretreatment on the characteristics of collagen from mangrove conch (*Telescopium telescopium*). *Jurnal Pengolahan Hasil Perikanan Indonesia, 2*(2), 355-365.

Rahmawati, G., Yulianda, F., & Samosir, A. M. (2013). Ekologi keong bakau (*Telescopium telescopium*, Linnaeus 1758) pada ekosistem mangrove Pantai Mayangan, Jawa Barat. *Bonorowo Wetlands, 3*(1), 41-49.

Ramses, Syamsi, F., & Notowinarto. (2018). Karakteristik morfometrik, pola sebaran, kepadatan, dan kondisi lingkungan siput gonggong (*Strombus canarium* Linnaeus, 1758) di perairan Kota Batam. *Simbiosa, 7*(2), 95-108.

Salim, G., Rachmawani, D., & Mathius, R. K. (2017). Analisis kelimpahan Telescopium telescopium di kawasan konservasi mangrove dan bekantan Kota Tarakan. *Jurnal Harpodon Borneo, 10*(2).

Sibua, J., Nurafni, N., Wahab, I., & Koroy, K. (2021). Karakteristik morfometrik keong bakau (*Telescopium telescopium*) di ekosistem mangrove Desa Daruba Pantai Kabupaten Pulau Morotai. *Jurnal Laot Ilmu Kelautan, 3*(2), 90-98.