

The Morphological Variance Polymesoda Erosa and Polymesoda expansa (Mollusc; Corbiculidae) In the Laguna Segara Anakan , Cilacap, Indonesia

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The morphological variance *Polymesoda erosa* and *Polymesoda expansa* (Mollusc; Corbiculidae) in the Laguna Segara Anakan, Cilacap, Indonesia

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Abstract There are two species of mangrove clam (*Polymesoda erosa* and *Polymesoda expansa*) belong to family Corbiculidae). Morphological variance between *Polymesoda erosa* and *Polymesoda expansa* is important to study detail in order to make understand taxonomy study of family Corbiculidae. The research purpose is to study detail about the morphological of *Polymesoda erosa* and *Polymesoda expansa*. Randomly sampling was used to get samples of mangrove clam. There are three sites of sampling to take mangrove clam such as Panikel, Klaces and Ujung Alang. According to the research sampling, *Polymesoda erosa* from Panikel, Klaces and Ujung Alang has same ratio value between LCT/SL is 0.16 ± 0.035 . Whereas, for *P. expansa* has value LCT/SL 0.14 ± 0.025 . Furthermore, *P. erosa* has value VPM/SL 0.32 for three location (Panikel, Klaces, and Ujung Alang). The value of VPM/SL for *P. expansa* is 0.30 ± 0.02 for three location (Panikel and Ujung Alang). In conclusion, different species of mangrove clam is difference value ratio of LCT/SL and VPM/SL.

1. Introduction

In the world, ecosystem mangrove have a distribution from 30° Northern Hemisphere till 30° Southern Hemisphere and the largest mangrove forest is in the tropics area. Mangrove ecosystem has brackish waters and an important role for many benthic organisms such as shell, gastropod, bivalve, crab, fish and others organisms [1][2]. Therefore, mangrove forests have an ecologically important role for the economic benefits of coastal communities. In addition, mangrove forests also have an important role in protecting coastal areas because the role of mangrove roots can prevent coastal erosion [3].

Segara Anakan is one of the largest estuaries in Java Island, located in the Southern Central Part of Java Island. There are many rivers having recharges into the Segara Anakan Lagoon and there are three big rivers such as Cintaduy, Cikonde and Cimeneng, Cibereum, Ujung Alang, Sapuregel and Donan [4][5][6]. Facing serious degradation due to land conversion, illegal logging and sedimentation rate in Segara Anakan Lagoon [4] can devastate ecosystem of mangrove forest in the Segara Anakan Lagoon.

The existence of large rivers that flow into Segara Anakan Lagoon results in high sedimentation rates and the decreasing extent of Segara Anakan [4]. The supply of sea water from the Indonesian Ocean through two canals (East and West part), as well as the Donan River flow through quite dense industries such as oil refining activities, the cement industry, loading and unloading of coal raw material as PLTU (Power



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Electricity Centre) raw material, the presence of anthropogenic material input of several major rivers will certainly pollute the estuary waters of Segara Anakan [6]. This will certainly endanger the existence of population of organisms which will certainly cause habitat destruction in the waters of Segara Anakan. Damage to mangrove forest habitat in Segara Anakan will affect the lives of benthic organisms, especially such as mangrove clams, mud crabs and several species of gastropods.

Polymesoda expansa and *Polymesoda erosa* are well known as the mangrove clams that live in association with the mangrove forests. Mangrove clam *P. erosa* and *P. expansa* are belong to class Bivalvia, Phylum Mollusc. A lot of study on mangrove clam is about the content of Omega-3 fatty acids (Linolenic Acid) in *P. erosa* which is given natural food *Tetraselmis chuii* and *Skeletonema costatum* [7][8], Histology of *P. erosa* gonads [5], the distribution pattern of *G. erosa* (*P. erosa*) in Ujung Alang Segara Anakan [9]. All of the above studies certainly require morphological data to identify mangrove clams. The similarity of shell shapes between species will be very difficult to identify morphologically. Therefore, efforts are made to conduct research on mangrove clam morphology for more details.

Identification of the genus *Polymesoda* has been carried out with regard to hinge characters [10] because species identification based on morphological characters is very cheap, easy and fast compared to genetic identification. Many studies have been carried out based on morphological characters to identify bivalvia species [11]. However both the characteristic are not enough to differentiate Corbiculidae species because of the environment variables effect [12] [11]. This research has purpose to study detail about the morphological of *Polymesoda erosa* and *Polymesoda expansa* from Segara Anakan Lagoon.

2. Material and Method

Sampling mud clams were conducted on 5 – 7 April 2019 in 3 areas, namely Panikel, Klaces and Ujung Alang (Figure 1.). Collecting mud clams were conducted by hand picking. In the Panikel area, mud clams were picked 131 clams. In the Klaces area, mud clams were taken 60 individuals. In the Ujung Alang area, we took 111 mud clams samples. When clams sampling, mangrove species were observed and identified at the Klaces, Panikel and Ujung Alang locations.

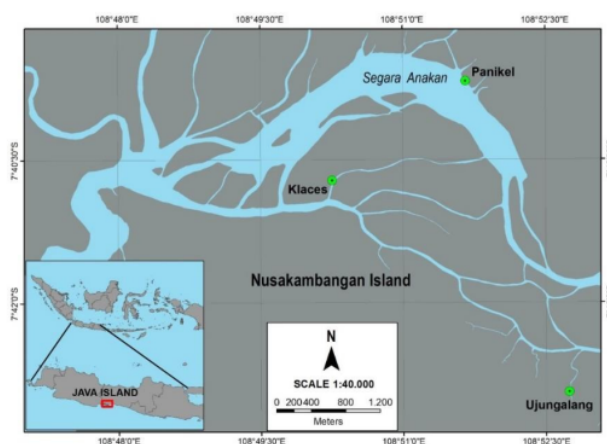


Figure 1. Map of Sampling Location Klaces, Panikel and Ujung Alang in Segara Anakan Lagoon, Central Java.

The average value of salinity has range from 2.5 - 6 ppt. In the Panikel area, the average value of salinity is lowest (Figure 3 a). The average value of DO has range from 6.6 - 7.3. Klaces area has the lowest average value of DO (6.6 ppm) (Figure 3 b)

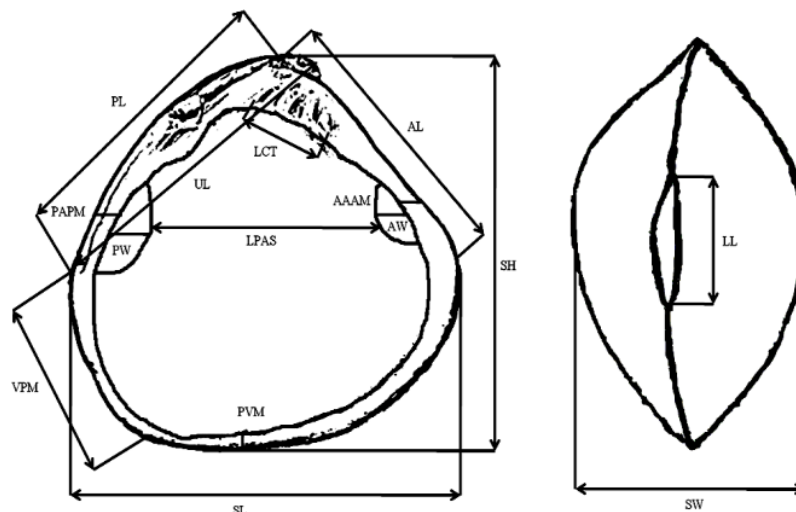


Figure 2. Characteristics of morphology mud clam (*Polymesoda* sp.) ; keterangan (SH) shell height; (SW) shell width; (UL) umbo length; (AL) anterior length; (PL) posterior length; (LL) ligament length; (LCT) cardinal tooth length; (AW) anterior adductor muscle scar width; (PW) posterior adductor muscle scar width; (LPAS) length from anterior adductor muscle scar to posterior adductor muscle scar; (AAAM) length from anterior adductor muscle scar to anterior margin; (PAPM) length from posterior adductor muscle scar to posterior margin; (PVM) length from ventral margin to pallial line; (VPM) ventral posterior margin length [16].

Measurement of environmental parameters was done by insitu. The measurement of temperature, salinity and DO were used by water quality checker. Niskin bottle was used to take water for phosphate and nitrate analysis. Furthermore, phosphate and nitrate analysis was carried out by spectrophotometric method [13].

Morphology measurements were then performed on the shells using an electric caliper with an accuracy of 0.01 including shell length, shell width, cardinal tooth length (LCT), ventral posterior margin (VPM) (Figure 2.). Electric balance was used to measure total weight (gram) with an accuracy of 0.1 gram.

3. Result and Discussion

Based on research, there are mangrove species such as *Avicenia marina*, *Avicenia alba*, *Sonneratia caseolaris*, *Sonneratia alba*, *Rhizophora apiculata*, *R. mucronata*, *Bruguiera* sp, *Nypa fruticans*, *Aegiceras corniculatum*, showed that in the Segara Anakan Lagoon. However, in the area of Klaces and Panikel are dominated by *Acanthus* sp and *Aegiceras corniculatum*. The mangrove conditions are still good, although in Klaces Area was found more plants Jeruju (*Acanthus* sp). This is consistent with the results of the study [9][14] that in Segara Anakan, the mangrove associate were more dominant, such as *Acanthus ebracteatus*, *Acanthus ilicifolius*, *Acrosticum aureum*, *Acrosticum speciosum* and *Aegiceras corniculatum*.

The average value of temperature for the Panikel and Ujung Alang areas are as large as 29.9 °C. Contrarily the lowest is 28.4°C in Klaces area (Figure 4 a). Nitrate concentrations for the three study sites were higher than Phosphate. The average value of phosphate has range from 0.06 to 0.10 ppm. While the average value of nitrates ranges from 0.21 - 0.57 ppm (Figure 4 b).

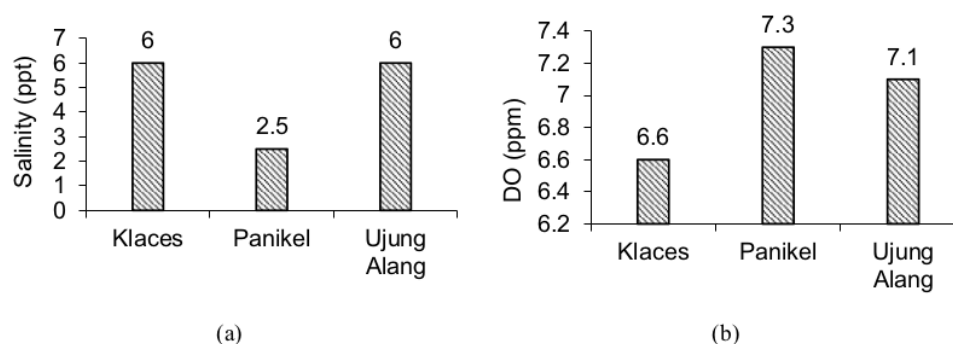


Figure 3. The average salinity (a) and DO (b) values measured in April in Segara Anakan, Cilacap.

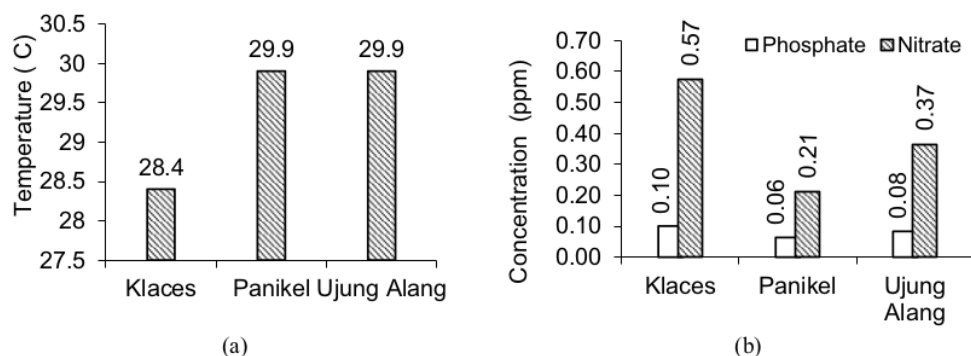


Figure 4. The average temperature (a) and phosphate and nitrate (b) content measured in April 2019 in Segara Anakan Cilacap

Based on research the temperature range in the study area measured 28.4 - 29.9 ° C, that the waters of Segara Anakan have a water temperature range of 27 - 30.3 ° C [14][9]. The temperature range in the waters of Segara Anakan is still at an appropriate level for the life of organisms such as mangrove clams and various types of gastropods and other benthic animals. This is also supported by high phosphate and nitrate concentrations in the waters of Segara Anakan.

The number of *P. erosa* is more than *P. expansa* for the Panikel, Klaces and Ujung Alang areas, Segara Anakan. (Figure 5). The highest number of *P. erosa* was found in the Panicle area (98 individuals), while the smallest was found in the Klaces area (49 ind). Whereas in the Ujung Alang area the number of *P. erosa* is not much different from *P. expansa* (Figure 5).

Based on research that in the Klaces area shows a smaller number of mangrove clam individuals which is less than Panikel and Ujung Alang. In the Klaces area only found *P. erosa* 49 individuals and *P. expansa* 11 individuals. This is also reinforced by the low average salinity value in the Klaces region of 2.5 ppt. Mangrove clam is an organism that can survive low salinity [9]. In territorial waters with salinity above 13 to 15 ppt, the number of mangrove clams is obtained more than those in low salinity (near bargaining) waters or salinity higher than 30 ppt [9]. This is also seen in the Segara Anakan for *G. erosa* (*P. erosa*) shells where in high salinity areas there are many variations in the size of shellfish [9]. Optimal salinity levels for growth are 15-25 ppt [15].

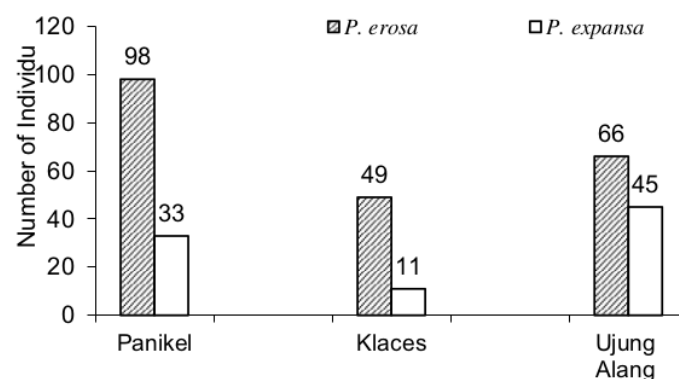


Figure 5. Number of *P. erosa* and *P. expansa* on April 2019 in Segara Anakan, Cilacap.

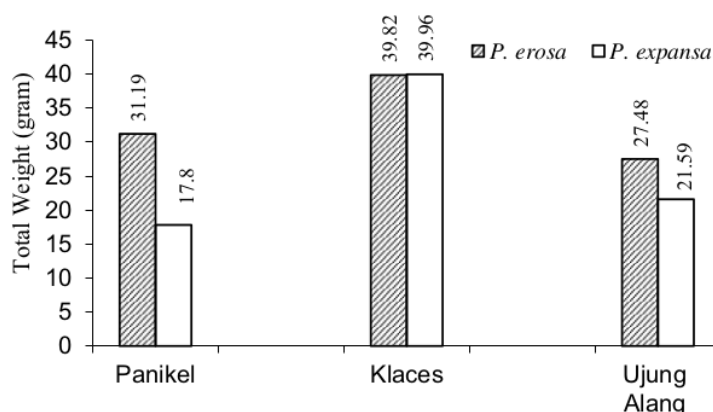


Figure 6. The average weight of *P. erosa* and *P. expansa* shells in April, in Segara Anakan, Cilacap,

At the Panikel and Ujung Alang area, the average total weight of *P. erosa* is greater than *P. expansa*. Whereas at the Klaces area, the average total weight of *P. erosa* and *P. expansa* was the same (Figure 6). At the Panikel and Ujung Alang areas, *P. erosa* shell height is greater than *P. expansa*. Whereas in Klaces shows that the average value shell height of *P. expansa* is more than *P. erosa*. (Figure 7a).

At the Panikel and Ujung Alang areas, the average value shell width of *P. erosa* is greater than *P. expansa*. Whereas in Klaces shows the average value shell width of *P. expansa* is more than *P. erosa*. (Figure 7 b). At the Panikel and Ujung Alang areas, the average Cardinal Tooth Length (LCT) of *P. erosa* is greater than *P. expansa*. Whereas in Klaces shows that the average Cardinal Tooth Length (LCT) of *P. expansa* is slightly greater than *P. erosa*. (Figure 8).

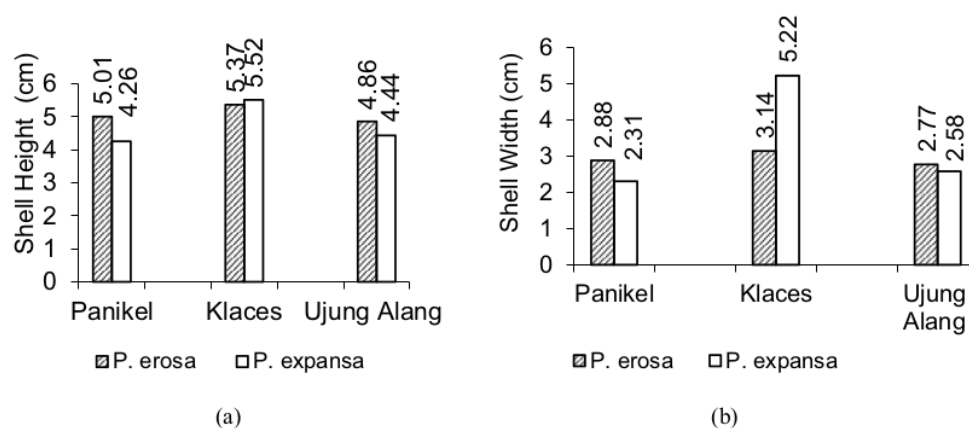


Figure 7. The average value of shell height (a) and shell width (b) on the shells measured in April 2019 in the Segara Anakan .

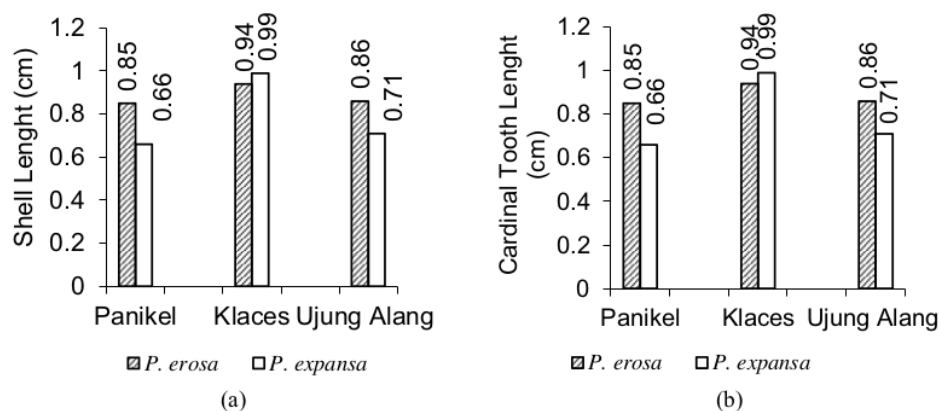


Figure 8. Average values of shell length (a) and cardinal tooth length (b) for shells in April in Segara Anakan, Cilacap.

The ratio of LCT to SL (LCT / SL) of *P. erosa* is higher than *P. expansa* (Figure 9). The ratio of VPM to SL (VPM / SL) in *P. erosa* is higher than *P. expansa* (Figure 9). .

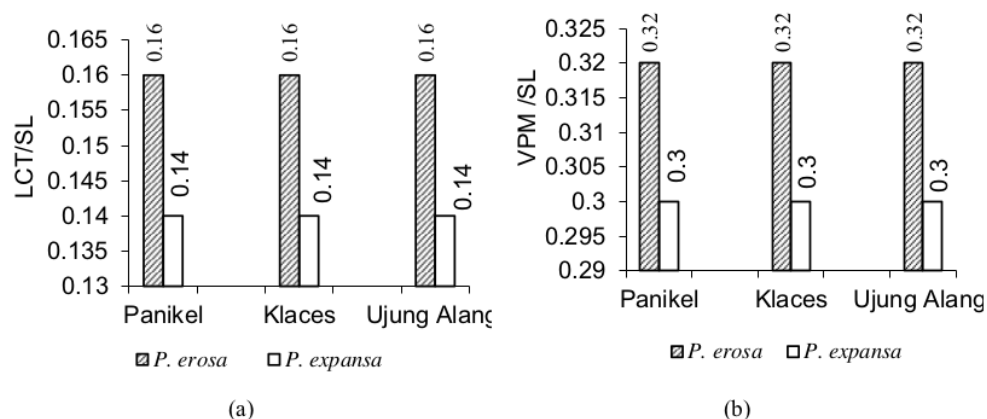


Figure 9. The average value of the LCT / SL (a) ratio and the VPM / SL (b) ratio on the shells measured in April 2019 in Segara Anakan, Cilacap.

The value of the LCT / SL ratio in *P. erosa* for the three locations (Panicles, Klaces and Ujung Alang) was 0.16. While the value of LCT / SL on *P. expansa* for three locations is 0.14. That the value of the LCT / SL ratio for *P. erosa* is equal to 0.16 while for *P. expansa* is equal to 0.14. This also proves that the shell length (SL) for *P. expansa* is greater than *P. erosa*. Research in the Serawak, Malaysia which the mangrove clam *P. erosa* and *P. expansa* were grouped in the similar cluster due to similar characteristics of LCT and VPM. This also agreed which is two species *Geloina erosa* (*P. erosa*) and *G. expansa* (*P. expansa*) were hard to be differentiated [10]. Similar abiotic property in habitat probably causes the high similarities in morphometric characteristic between two Polymesoda species of different locality [10][16]. There is only character to differentiate between *P. erosa* and *P. expansa* are by morphological observation [17]

4. Conclusion

At the three sampling sites, the ratio of LCT to SL (LCT / SL) of *P. erosa* is 0.16 higher than *P. expansa* (0.14). Furthermore, the ratio of VPM to SL (VPM / SL) at *P. erosa* is 0.32 higher than *P. expansa* (0.3). The investigation morphometric characteristic can be used to differentiate different species that known and same species of different population.

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PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9
