

The Growth Pattern of Sea Cucumber *Acaudina* sp from The Delta Wulan, Demak, Central Java, Indonesia

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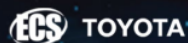
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The growth pattern of sea cucumber *Acaudina* sp. from the Delta Wulan, Demak, Central Java, Indonesia

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Abstract. Sea cucumber *Acaudina* sp. is one of the many benthic organisms found in the Wulan Delta ecosystem, Demak. *Acaudina* sp. plays an important role in the benthic ecosystem. Therefore, a study on the population of *Acaudina* sp. is necessary. The purpose of this study was to determine the growth pattern of sea cucumber *Acaudina* sp. Sea cucumber samples were taken in May, June, and July 2020 during the new moon and full moon phase. Based on the statistical test, it was found that there is no significant different the mean of total weight (gram) between new moon and full moon (t-test two paired; df= 2; t count = -1.481; P=0.05). Likewise, there is no different in the average value of sea cucumber length in the full moon and new moon phases (t-test two paired; df= 2; t count = 0.353; P=0.05). The average of total weight value of *Acaudina* sp. on full moon had range 15.21–27.5 gram, is lower than on new moon (20.47–32.11 gram). The growth pattern of sea cucumber *Acaudina* sp. on full moon and new moon are negative allometric.

1. Introduction

In Indonesian Waters, there are many sea cucumbers (trepang) have economic value which in world trade such as *H. scabra*, *H. edulis*, *H. Vagabunda*, *H. Vatiensis*, *H. Etmarmorata*, *Actinopyga echinites*, *A. mauritiana*, *A. miliaris*, *Bohadschia subrura*, *B. vitiensis*, *Holothuria atra*, *H. edulis*, *H. fuscogilva*, *H. fuscopunctata*, *H. nobilis*, *H. scabra*, *H. coluber*, *Stichopus chloronotus*, *S. hermanni*, *Thelenota ananas*, *T. Anax*, *Paracaudina*, sp., *Phyllophorus* sp [1-3]. Not only in Indonesia, but also in all of countries such as Singapore, Malaysia, Philippines, Thailand, Sri Lanka, the low economic value species of sea cucumber are more abundant than medium and high economic value [4]. *Acaudina* sp. is classified low economic value.

Acaudina sp. is sea cucumber that has similar morphology *Paracaudina* sp, because they are belong to Family Caudinidae, Order Molpadida and class Holothuroidea [5-7]. Even though, *Acaudina* sp. are found abundant in Delta Wulan Waters, but no fishermen catch this organism. Because fishermen in Delta Wulan Waters do not eat this animal. In contrast, at the Langkawi Island, Malaysia, *Acaudina* sp. have been eaten as kerabu boronok (*Acaudina salad*) [8].

Delta Wulan Waters, Demak is a mangrove area that is very fertile because it has supplies nutrient from land and sea. So it is a fertile habitat and also has function as a nursery ground for several others benthic animals such as bivalve, gastropods, and sea cucumber especially *Acaudina* sp. In the benthic ecosystem, sea cucumber *Acaudina* sp. is one of benthic animals which important roles in benthic ecosystem. One of its roles is to maintain sediment stability and is also known as a bioturbation animal which will certainly create aerobic in benthic



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condition. That way, the benthic ecosystem will rich dissolve oxygen and the condition will be good for living benthic animals and others biota. Recently, the study of bioactive compound such as triterpene glucosida, condroitin sulfat, sterol, and soon has been conducted [9]. Another, study about content of vitamin, and mineral [10], and others study about bioactivity of fucoidan polysacharida to preventive mucositis chemotherapeutich on mouse has been conducted [11]. Seeing the importance of the compound content in *Acaudina* sp., it is also important to determine the population through growth patterns in the nature. Therefore, this study has a purpose to know growth pattern sea cucumber *Acaudina* sp. in Delta Wulan Waters.

2. Material and Method

2.1. Location and Time

This research has been done in the Delta Wulan Waters, Demak. GPS (*Global Positioning System*) was used for location determination exactly (Figure 1.). There are 6 stations for sampling *Acaudina* sp. and measurement water quality. Morphometry *Acaudina* sp. were done in the Laboratorium of Marine biologi, Department of Marine Sciences. Sampling was carried out for 3 months, namely May, June, and July 2020 during the new and full moon phases.

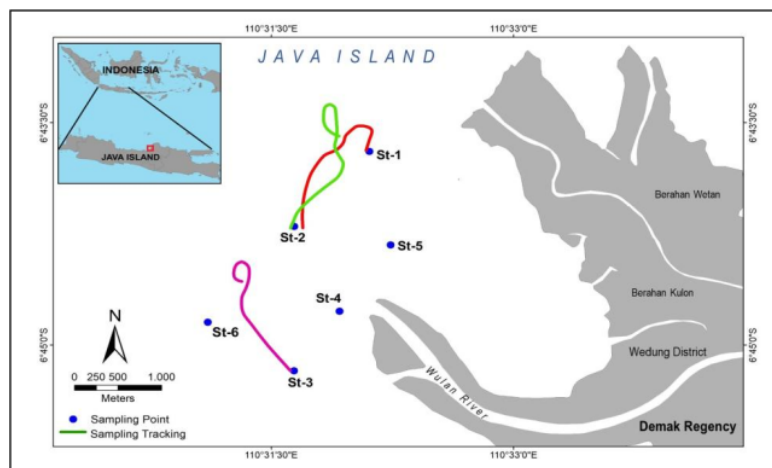


Figure 1. Map of sampling location in Delta Wulan Waters, Demak, Central of Java

2.2. Data Collection

In this research, we used boat, water quality checker, camera, digital balance (0.1 gram accuracy), Ekman grab, Scratching bottom trawl, and bucket sample. Sampling *Acaudina* sp. were conducted by dredge scratching bottom trawl at the Delta Wulan Waters. Water quality checker was used to measure Salinity, DO, pH, and Temperature. Ekman grab was used to take sediment samples. Grain size analysis was conducted by method from [12]. The body length of *Acaudina* sp. was measured by scopel Image measurement programme and the total weight was measured by electric balance with accuracy 0.1 g.

2.3. Data Analysis

To determine the growth pattern of *Acaudina* sp., a power curve regression analysis was performed between the total weight and length [13] as followed: $W = a L^b$, where: W = Total weight(g); L = Total Length(cm). The growth pattern is determined by b value. The value of $b = 3$ indicate the growth pattern isometric. The value of $b >$ or $b <$ 0 indicated the growth pattern positive allometric or negative

allometric. Statistic t-test was applied to know difference mean of length and total weight between new moon and full moon.

3. Result and Discussion

3.1. The Condition of Water Quality in Delta Wulan Waters

Based on result, the average salinity value has range 29–32 ppt (Table 1.) from station 1 to 6. Furthermore, the average temperature has range 29.20–29.37°C. The result of this study are fit with the results of temperature measurements in Kenjeran waters which show a range of 29.07–31.80°C. [14]. Relationship between temperature and salinity could not be separated each other. This is because the distribution aspect of chemical parameters and biological process is a function of temperature, and the temperature is a function of determinant while salinity is a function of limiting the distribution of marine organisms [15].

Table 1. The average water quality parameters from May till July 2020 in Delta Wulan waters

Station	Salinity (ppt)	Temperature (°C)	DO (ppm)	pH
1	29	29.20	6.23	6.95
2	31	29.33	6.43	6.56
3	33	29.27	6.76	6.52
4	30	29.37	7.4	6.17
5	32	29.20	7.28	6.94
6	30	29.27	6.76	6.76

The average salinity value has range 29–33 ppt. This salinity value was higher than salinity value in Kenjeran Waters (29–30,7 ppt) [14]. This is a suitable with the opinion [16] that In the Singapore Strait has salinity range 29–33 ppt. However, the salinity value can still support the life of *Acaudina* sp. in the Delta Wulan Waters. Furthermore, the average DO value in the Delta Wulan has a range 6.23–7.4 ppm (Table 1). The DO value measured in the Delta Wulan waters still supports living organisms. Even though, the pH value has a range less than 7 (6.17–6.95), living organisms in the Delta Wulan Waters is still good. The range of values is different from the range of pH value in the habitat of *Holothuria atra* in the Thoothukudi, Mannar Bay, Southeast Coast of India with a pH value range of 7.90±0.12 [17].

According to analysis of particles size, in the station 1 to 6 were found silt type of sediment. The average of silt has range 88.36 % till 95.44% (Tabel 2). This fit with research which showed that habitat *Acaudina molpadidoides* is muddy shores in the area of Peninsular, and Langkawi Island, Malaysia [8, 18, 19]. Compared with data from Kenjeran Waters in Surabaya, the habitat of *Paracaudina* sp (Order Molpadida) is dominated by clay and silt [14]

Table 2. Grain size analysis of sediment from Delta Wulan Waters, Demak

Station	Gravel (%)	Coarse (%)	Sand Fine (%)	Silt (%)	Clay (%)
1	0.00	0.16	1.58	94.26	4.00
2	0.00	0.26	1.30	95.44	3.00
3	0.00	0.28	1.12	94.60	4.00
4	0.00	0.16	0.84	92.00	7.00
5	0.00	0.20	3.44	88.36	8.00
6	0.00	0.25	2.55	89.85	7.35

3.2. Relationship Total Weight and Length

According to the research result, the average of total weight value *Acaudina* sp. in new moon phase (20.47–32.11 g) is higher than in full moon (15.21–27.50 g). This indicates that the growth in the new moon phase is better than the full moon phase (Fig.2.). However, based on the statistic test the result showed that there is no significant different the mean of total weight (gram) between new moon and full moon (t-test two paired; df= 2; t count = -1.481; P=0.05).

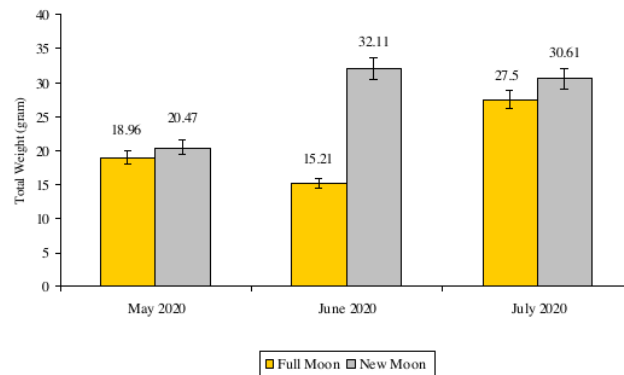


Figure 2. The Mean of total weight (gram) *Acaudina* sp. on full moon and new moon.

Based on the results of research, the average length of *Acaudina* sp. are more fluctuating not only in the new moon phase but also in the full moon phase (Fig.3.). The largest mean length value is found at full moon phase on May 2020 as amount 13.6 cm and the smallest mean length is 8.02 cm at the full moon phase. Likewise, there is no different in the average value of *Acaudina* sp. length in the full moon and new moon phases ((t-test two paired; df=2; t count = 0.353; P=0.05). The mean of length value of *Acaudina* sp on new moon had range 10.52–13.16 cm. On the June and July 2020 observation, the average of length on new moon is longer than on full moon. This is fit with the observation from [20] that the length size of *H. scabra* on new moon is better than on full moon.

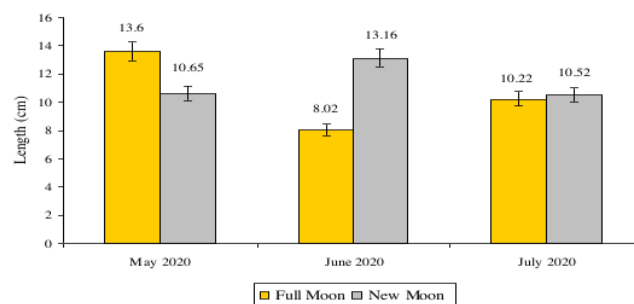


Figure 3. The Mean of total weight (gram) *Acaudina* sp on full moon and new moon.

In the full moon phase, b-value for *Acaudina* sp with no identity sex, female and male look fluctuating. Furthermore, all of b-value in the full moon phase have a range 0.74–1.44 (Table 3) and in this phase b-value <3. Its mean that the Growth Pattern is allometric negative. Additionally, in the new moon, b-value for *Acaudina* sp. has a range 0.75–1.55 (Table 3) and in this new phase b-value <3, and its mean that the growth pattern is allometric negative. This research fit with the research genera *Paracaudina* sp. from Kenjeran Waters had allometric negative for growth pattern [14].

Table 3. b-value on Full Moon and New Moon

Date	b-value on Full Moon			b-value on New Moon		
	No Identity	Female	Male	No Identity	Female	Male
May 2020	0.86	0.76	0.81	0.85	1.13	1.07
June 2020	1.43	0.74	0.94	1.06	1.46	1.55
July 2020	1.09	1.44	1.12	1.19	0.75	0.97

According to result, there is correlation positive between total weight and length *Acaudina* sp. only in full moon (r-value: 0.66 -0.90) but also in new moon has a range 0.71–0.91 (Table 4). This is fit with observation by [14] which showed that there was correlation positive between total weight and length *Paracaudina* sp. from Kenjeran Waters.

Table 4. Correlation (r) Value on Full Moon and New Moon

Date	Correlation (r) value in Full Moon			Correlation (r) value in New Moon		
	No Identity	Female	Male	no identity	Female	Male
May 2020	0.83	0.66	0.72	0.79	0.71	0.9
June 2020	0.75	0.84	0.82	0.73	0.82	0.91
July 2020	0.9	0.84	0.82	0.85	0.75	0.88

Table 5. Equation of Power Curve on Full Moon

Date	Equation of Power Curve		
	No Identity	Female	Male
May 2020	$W_n = 1.85 L^{0.86}$ $R^2 = 0.69$	$W_f = 2.81 L^{0.76}$ $R^2 = 0.43$	$W_m = 2.39 L^{0.81}$ $R^2 = 0.52$
June 2020	$W_n = 0.86 L^{1.43}$ $R^2 = 0.57$	$W_f = 2.75 L^{0.74}$ $R^2 = 0.70$	$W_m = 1.66 L^{0.94}$ $R^2 = 0.75$
July 2020	$W_n = 1.63 L^{1.095}$ $R^2 = 0.81$	$W_f = 0.85 L^{1.44}$ $R^2 = 0.71$	$W_m = 2.00 L^{1.12}$ $R^2 = 0.68$

Table 6. Equation of Power Curve on New Moon

Date	Equation of Power Curve		
	No Identity	Female	Male
May 2020	$W_n = 2.39 L^{0.85}$ $R^2 = 0.63$	$W_f = 1.88 L^{1.13}$ $R^2 = 0.49$	$W_m = 1.39 L^{1.07}$ $R^2 = 0.81$
June 2020	$W_n = 1.51 L^{1.06}$ $R^2 = 0.53$	$W_f = 0.71 L^{1.46}$ $R^2 = 0.68$	$W_m = 0.65 L^{1.55}$ $R^2 = 0.82$
July 2020	$W_n = 1.72 L^{1.19}$ $R^2 = 0.72$	$W_f = 5.44 L^{0.75}$ $R^2 = 0.56$	$W_m = 3.12 L^{0.97}$ $R^2 = 0.77$

Furthermore, all of regression line between total weight and length have positive correlation (Table 4), but b-value for observation on full moon and new moon have value less than 3. Its mean the length growth is not followed by increase in total weight of *Acaudina* sp. and the growth pattern is negative

allometric. Additionally, the Power curve relationship between total weight (gram) and length (cm) of *Acaudina* sp. not only for full moon has positive correlation but also for new moon. (Table 5 and 6)

4. Conclusion

The growth pattern for *Acaudina* sp. on full moon and new moon phase is negative allometric, because of b-value less than 3. According to the result, there is no significant different the mean of total weight (gram) between new moon and full moon (t-test two paired; df= 2; t count = -1.481; P=0.05). Furthermore, there is no different in the average value of sea cucumber length in the full moon and new moon phases ((t-test two paired; df= 2; t count = 0.353; P=0.05). Although the allometric growth pattern was negative, the correlation between total weight and body length of *Acaudina* sp. was positive. This indicates that the increase in body length is followed by the total weight.

Acknowledgments

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References

- [1] Hartati R, Purwati P and Widianingsih W 2009 Field Guide Timun Laut (UNDIP Press)
- [2] Pangkey H, Lantu S, Manuand L, and Mokolensang JF 2012 Prospect of Sea Cucumber Culture in Indonesia as Potential Food Sources *Journal of Coastal Development* **15** 114-124.
- [3] Winarni D, Leksana DP and Pidada IBR 2012 The Effect of Local Sea Cucumber *Phyllophorus* sp. extract on Limfe Centre Germinal Diameter of *Mus musculus* was infected by *Mycobacterium tuberculosis*
- [4] Dissanayake DCT and Stefansson G 2020 Abundance and distribution of Commercial Sea Cucumber species in the Coastal Waters of Sri Lanka *Aquatic living Resources* **23** 303-313
- [5] Pawson DL 1963 The Holothurian Fauna of Cook Strait (New Zealand: University of Wellington)
- [6] Pawson DL 2007 Phylum Echinodermata In Zhang, Z.Q., W.A. Shear (Eds). Linnaeus Tercentenary: Progress in Invertebrate Taxonomy *Zootaxa* **1668**: 749-764.
- [7] O'Loughlin P M, Barmos S and Spiegel DV 2011 Paracaudinid Sea Cucumbers of Australia and New Zealand (Echinodermata: Holothuroidea: Molpadida: Caudinidae) *Memoirs of Museum Victoria* **68** 37 – 65
- [8] Choo P S, Conand C and Vaitilingon D 2016 Kerabu boronok (*Acaudina salad*)-Signature appetizer in Langkawi Island, Malaysia. *Spc Beche-de-mer Information Bulletin* **36** 101-105
- [9] Bordbar S, Anwar F and Saari N 2011 High Value Component and Bioactives from Sea Cucumber for Functional Foods *Marine Drugs* **9** 1761-1805
- [10] Sroyraya M, Hanna PJ, Siangcham T, Tinikul R, Jattujan P, Poomtong T and Sobhon P 2017 Nutritional Components of the Sea Cucumber *Holothuria scabra* *Functional Foods in Health and Disease* **7** 168-181
- [11] Bordbar S, Anwar F and Saari N 2011 High-value Components and Bioactive from Sea Cucumber for Functional Food - A Review. *Mar. Drugs* **9** 1761-1805.
- [12] Lopez GI 2017 Grain size analysis Encyclopedia of Earth Science Series *Springer* 341-348.
- [13] Effendie MI 1979 Metode Biologi Perikanan (Bogor: Yayasan Dewi Sri)
- [14] Widianingsih 2018 *PhD Thesis* DMSDP UNDIP
- [15] Patty SJ 2013 Distribusi Suhu, Salinitas dan Oksigen Terlarut di Perairan Kema Sulawesi Utara *Jurnal Ilmiah Platax* **1**(3): 148-157.
- [16] Ong JY and Wong H 2015 Sea cucumber (Echinodermata: Holothuroidea) from the Johor Straits, Singapore. *The Raffles of Zoology. Supplement* **31**: 273-291.
- [17] Asha PS, Diwakar K, Santhanavalli G and Manissery M K 2015 Comparative Distribution and Habitat Preference of The Sea Cucumber *Holothuria atra* Jaeger at protected and Unprotected Sites in Thoothukudi, Region of Gulf of Mannar, South-East Coast of India *Indian J. Fish*

62(1) : 52 – 57

- [18] O'Loughlin M and Ong JY 2015 New tropical caudinid and synaptid sea cucumbers from Johor Straits (Echinodermata; Holothuroidea) *The Raffles of Zoology. Supplement* **31**:292-302.
- [19] Ong JY and Wong H 2015 Sea cucumber (Echinodermata: Holothuroidea) from the Johor Straits, Singapore *The Raffles of Zoology. Supplement* **31**: 273-291.
- [20] Pitogo KME, Sumin JP and Ortiz AT 2016 Effect of lunar phase in the size distribution of *Holothuria scabra* on inter ilippines *SPC Beche-de-mer Information Bulletin* **36**: 48-53

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