The Growth Pattern of Nyale Worm (*Eunice, sp.* Polychaeta) From Pahiwi Coastal, Sumba Island, Indonesia

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Abstract

Nyale (Eunice sp) is a polychaeta worm that belongs to the Phylum Annelids. Nyale (Eunice sp) appeared only once on Pahiwi Beach, West Sumba. Its appearance is often associated with the traditions of te west Sumbanese people. Nyale's growth pattern is not yet known, so this research aims to determine Nyale's growth pattern. Nyale samples were taken in the morning before sunrise by hand picking at the location of Pahiwi Coastal Waters, West Sumba. Based on the analysis results, the growth pattern of the Nyale is negative allometric, with a value of b=1.05. the correlation value obtained from the relationship between length and weight is 0.68. this also shows that an increase in length and weight.

***Keywords**: Eunice sp; Nyale; Pahiwi; Length and weight*

INTODUCTION

Nyale worm (*Eunice sp.*) belongs to phylum Annelida, class Polychaeta, Order Eunicaida family Eunicidae, genera Eunice. The existence of this worm, which occurs once a year on Lombok Island and Sumba Island, asually occurs during the full moon. The Nyale worm (*Eunice sp.*) appears in the transition season west monsoon to east monsoon. This year the appearance of the Nyale worm on Sumba Island occurred on 29-2 march 2024. On Sumba Island, the Nyale worm called "Bau worm" occurred on Pahiwi Coastal Waters, Wanokaka District. Meanwhile, the appearance of Nyale worm (*Eunice siciliensis*) at Seger Beach, Kuta Lombok Islan has been reported every year in February after the 20th (Jekti, *et al.,* 2008). The appearance of the Nyale worm (*Eunice siciliensis*) is predicted due to a spawning event at Seger Beach, Kuta Beach, Lombok (Bachtiar & Bachtiar, 2019). Research on predicting the time for Nyale worms to spawn was conducted from 2015-2018 in the Seger Beach area, Kuta Lombok (Bachtiar & Bachtiar, 2019).

Length-weight Polychaeta have an allometric pattern, meaning that their growth rates in length and weight are not always proportional, especially at different stages of development. Several environmental factors, such as temperature, salinity, pH, dissolved oxygen, and food quality, can affect this length-weight relationship. For example, very high or low temperatures can slow metabolic rates and affect the efficiency of energy conversion, which can alter the length-weight relationship. In addition, extremes in salinity and pH can affect osmoregulation and inhibit growth, while abundant food availability can accelerate growth and produce heavier bodies Denny (1980).

Polychaeta on sediment substrates tolerate contaminants from organism that live inside and the substrate's surface. Bentic ecosystem have complex biological and chemical activities, such as decomposition, mineralization, and biomagnification (Gesteira, 2003). Therefore, polychaeta are often used as biomonitoring of marine environmental health, namely as indicators of organic pollution (jayaraj *et al.,*2007).

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Water and substrate quality factors strongly influence the existence of polychaeta populations. Moreover, the abundance of polychaeta is greatly influenced by the type of silt-clay substrate (Junardi & Wardoyo, 2008; Sahidin & Wardiatno, 2016). As benthic organisms, polychaetes have habitats in almost all marine ecosystems. Living polychaetes dominate 80% of other benthic animal communities (Shou *et al.,* 2009). As benthic animals, Polychaetes have an important role in nutrient cycling, pollutant metabolites, sediment stability, and secondary productivy. Furthermore, as benthic organisms, Polychaetes play an important role in the food chain as food for basic organisms such as botton fish and some mammals (Herman *et al.,* 2000). The important role of Polychaeta organisms, especially *Eunice sp,* in the benthic ecosystem. this research aims to determine the growth of the marine worm *Eunice sp*. In Pahiwi Coastal Waters, West-South of Sumba Island.

MATERIAL AND METHOD

Nyale worms appear yearly on Pahiwi Beach, the southem coats of the westem island of Sumba. The existence of the Nyale worm (*Eunice sp*) on 2 March 2024 on Pahiwi Beach in the morning before sunrise. The appearance of the Nyale worms is associated with the "Bau Nyale" ceremony. Nyale worms are collected by hand picking, and then the worms are identified to genera level by referring to identification books (Fauchald, 1977; Bessley, 2000; Zanol *et al.,* 2021). After separating the types of worms, length and weight were measured. Measurements of salinity, temperature, and dissolved oxygen were carried out using a water quality checker. Water quality measurements were conducted in situ at Pahiwi coastal waters (Figure 1).

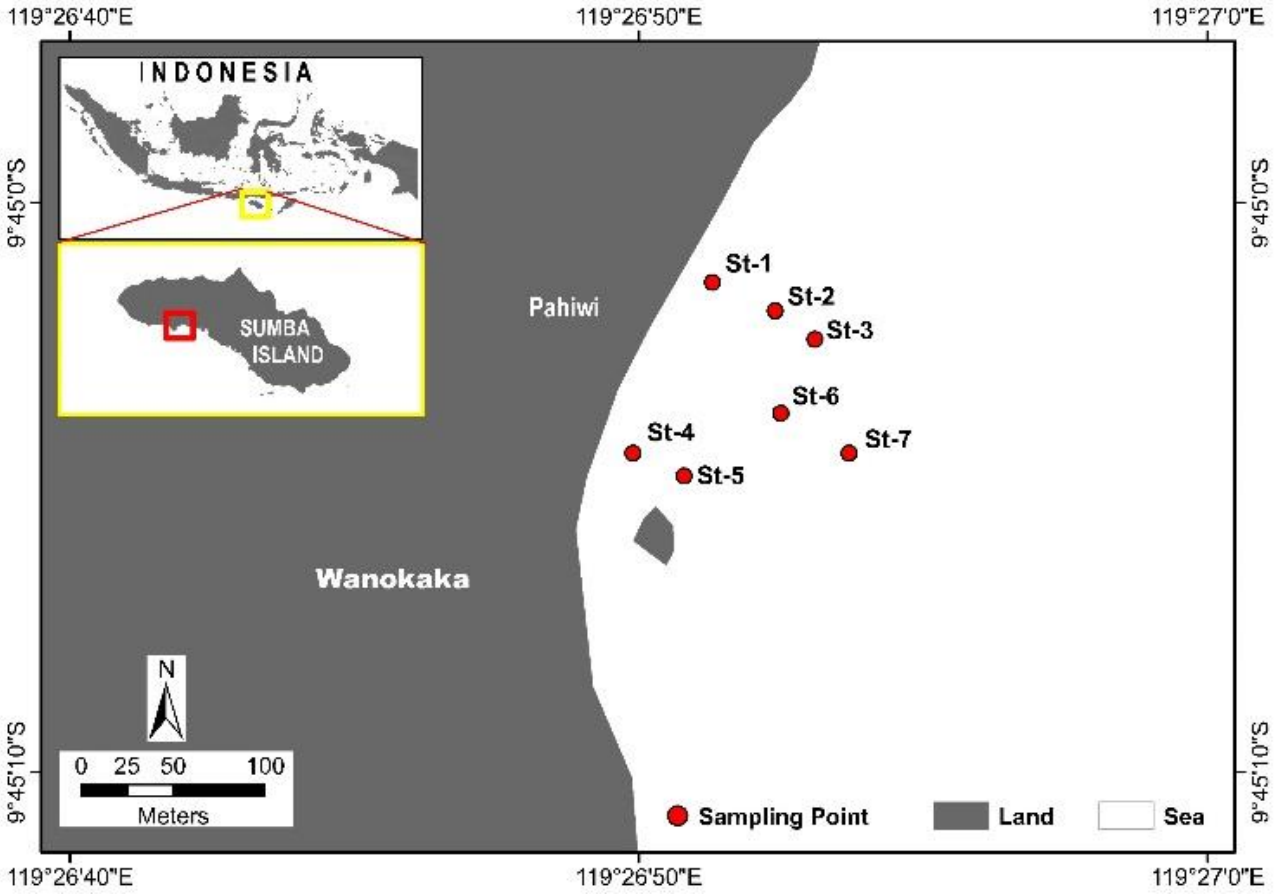

Figure 1. Location sampling at Pahiwi Coastal Waters, Wanokaka District, Sumba Island

The growth pettern of Nyale wa analyzed using the exel power curve. The equation used to analyze the length-weinght relationship in Polychaeta is $Y = a.X^b$. (Rosati *et al.,* 2012; Paavo *et al.,*2018). Determining the relationship between length and weinght variables is formulated as follows (Widianingsih *et al.,*2021).

$$W = aL^b$$

Wehre is W (Total weight), L (Length) dan a,b adalah Constants obtained from the equation data. The value b = 3 indicates an isometric growth pettern, b < 3 indicates a negative allometric growth pattern, while b > 3 indicates a positive allometric growth pettern (Widianingsih *et al.,* 2021). The water parameters observed during the research were temperature, salinity, pH and dissolved oxygen.

RESULT AND DISCUSSION

Based on the results of in situ salinity measuarements at the time of the emergence of Nyale (*Eunice sp*). In Pahiwi Coastal Waters, the results obtained at slations 1 to 7 were that at station 3, 4, and 5, the salinity value was 28 ppt, while at station, the salinity value was 31 ppt. meanwhile, at station 1 and 2, it was 29 and 30 ppt (Figure 2.); this is also by research by Sarker *et al.,* (2024), that the increase in demand increased with an average salinity value of 29.75 ppt. Salinity has a significant effect on the growth of Polychaeta because it affects osmotic balance and various other physiological processes. These organisms must maintain an osmotic balance between their bodies and their environment, so changes in salinity can cause osmotic stress. Salinity that is too high or too low can disrupt the metabolism and physiological activities of Polychaeta, reducing the energy available for growth. At optimal salinity, metabolic processes can proceed efficiently, supporting healthy body growth and feeding activities. Conversely, inappropriate salinity can reduce appetite or even stop feeding activities, inhibiting the intake of nutrients needed for growth. In addition, salinity also affects the reproduction and development of Polychaeta larvae. Many Polychaeta species have a certain salinity range required for healthy reproduction, and inappropriate salinity can interfere with egg production or larval development. Some species also have limited tolerance to salinity fluctuations, which limits their distribution to areas with stable salinity conditions. Some Polychaeta have even developed adaptations to survive in environments with highly variable salinities, such as the ability to perform active osmoregulation. Overall, appropriate salinity is essential to support optimal growth and survival of Polychaeta, Sanchez & Jimenez (2011a).

The result of temperature measurements at stations 1 and 2, it was values 29.4, 29,5 and 29°C. meanwhile, stations 4, 5,6, and 7 show a value range of 31°C. this shows that the range of temperature values in surface water is quite high. (Figure 3.). the range of water temperature values at Pahiwi Coastal Waters is still the same as the measurement results at Tahura Beach, Ngurah Rai, namely around 29,1-30,0°C (Priyandayani, *et al.,* 2018). Temperature conditions in Pahiwi Coastal Waters, Wanokaka are sill sustable for the life of Polychaetes (Romadhoni & Aunurohim, 2013). Water temperature greatly influences Polychaeta populations. The peak reacrutment of the marine worm *Namalycastis favela* on the East Coast of Bangladesh in March 2021 had an average water temperature of 28.93°C (Sarker, 2024). This shows that the water temperature at Pahiwi Coastal Waters is still suitable for living, and developing well. Temperature has a significant influence on the growth of Polychaeta because it affects metabolic rates, enzyme activity, and other physiological processes. Suitable temperatures allow Polychaeta to maintain optimal metabolism, supporting healthy growth and reproduction. Most Polychaeta species have an optimal temperature range of 10–30°C, although this range may vary depending on the species and its habitat. Temperatures that are too high can increase the metabolic rate beyond the body's physiological capacity, leading to thermal stress, reduced activity, and even death. Conversely, temperatures that are too low can

slow down metabolic processes and feeding activity, thus hindering growth Baker & McCauley (2005)

Based on the measurement results, the pH value at stations 1-7 has a values in the range of 7,89- 7,97. The range of pH values shows normal values. The measurement results at Pahiwi Beach are stil higher than the measurement result in the Tahura mangrove ecosystem, Ngurah Rai, Bali, namely ranging from 7,0-7,5 (Priyandayani, *et al.,* 2018). The condition of the pH value measured at Pahiwi Coastal Waters stil supports the life of Polychaeta (Mustofa, *et al.,* 2012). pH has a significant effect on Polychaeta growth because it affects various physiological processes, including metabolism, respiration, and osmoregulation. Ideal pH supports optimal enzymatic activity, which is essential for energy metabolism, protein synthesis, and growth. However, pH that is too low (acidic) or too high (alkaline) can affect enzyme activity, slow down metabolic processes, and increase physiological stress, which inhibits growth rates. In addition, inappropriate pH can affect the ability of Polychaeta to maintain ion balance in the body, which can disrupt osmoregulation and burden the body's energy, thus inhibiting growth. Extreme pH fluctuations can cause additional stress to Polychaeta, reducing their growth rates, and increasing their susceptibility to disease or predators. However, some Polychaeta species have different levels of tolerance to pH changes, and species that live in environments with pH fluctuations tend to have better adaptation mechanisms. Overall, proper water pH is essential to support the healthy growth and survival of Polychaeta Miranda & Paiva (2017).

The highest dissolved oxygen level measurement results were at stations 1, with a value of 6,19 ppm, and the lowest was measured at station 6m with a value of 4,15 ppm. The dissolved oxygen level values for stations 5, 6 and 7 are close to the normal threshold. Dissolved oxygen in the Pahiwi Coast is still in the conducive and optimal range for the life of bantic biota (Witasari et al., 2003). The optimum and appropriate DO concentration value for the life of Polychaeta is in the range of 4.0-6.6 mg/L. Dissolved oxygen (DO) plays an important role in the growth of Polychaeta, because oxygen is an element needed for aerobic metabolic processes in their bodies. Oxygen supports efficient cellular respiration, allowing Polychaeta to obtain the energy needed for metabolic activities, growth, and reproduction. At optimal dissolved oxygen concentrations, Polychaeta can grow well, digest food efficiently, and maintain important physiological processes. However, decreased dissolved oxygen levels in water can cause oxygen stress, reducing metabolic rates, and slowing Polychaeta growth. Under conditions of oxygen deficiency, Polychaeta can experience decreased physical activity, slowing down the feeding process, and increasing their susceptibility to disease. Conversely, too high dissolved oxygen levels, although rare, can also cause physiological

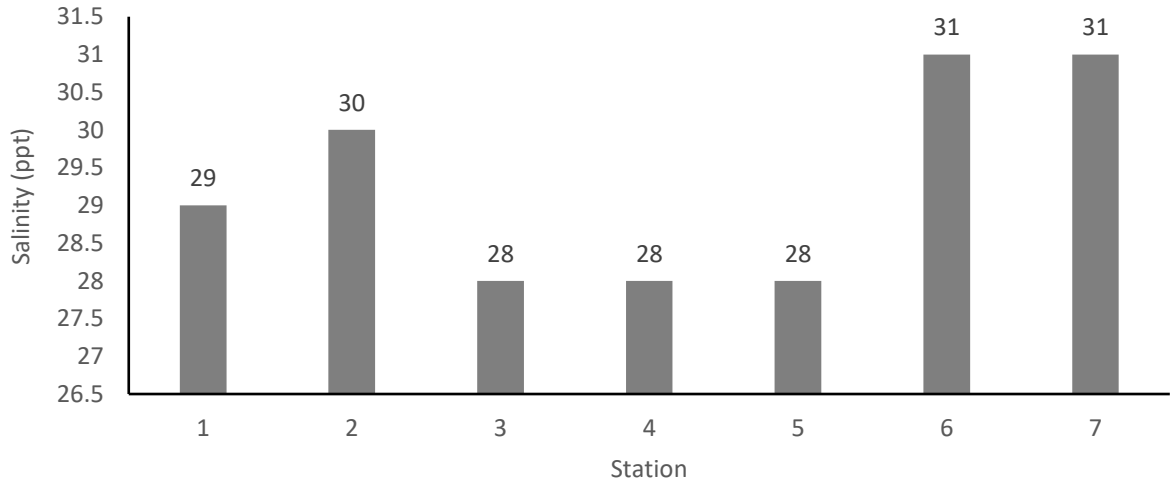

Figure 2. Salinity (ppm) on stations 1 to 7 at the Pahiwi coastal waters, Wanokaka, Sumba Island

stress. Thus, the right balance of dissolved oxygen is essential to support the healthy growth and survival of Polychaeta, because fluctuations in dissolved oxygen can affect the metabolism, reproduction, and survival of these organisms Sanchez & Jimenez (2011b).

The Growth Pattern Nyale worm (*Eunice sp.*)

According to the research result, the value of the growth pattern of Nyale worm is negative allometric (b = 1,1601). This is following research by Sarker, *et al*. (2024) that the growth pattern value of *Namalycastis faufeli* is negative allometric (b<3). The equation of the growth pattern is Y = $0{,}023X^{1{,}1601}$. Based on the equation obove, it can be seen that the increase in body length of the Nyale worm is followed by an increase in body mass/weight of the Nyale worm (Figure 6) the value r of the terminant (r^2) is 0,6755. This shows that the correlation value between worm body length and worm weight is moderate. The r2 value for the Nyale sp worm is 0,7633 and the results of this study are still within the range of values obtained by Sarker, *et al.,* (2024) regarding the growth of Namalystis fauveli with an r2 value 0,43-0,94.

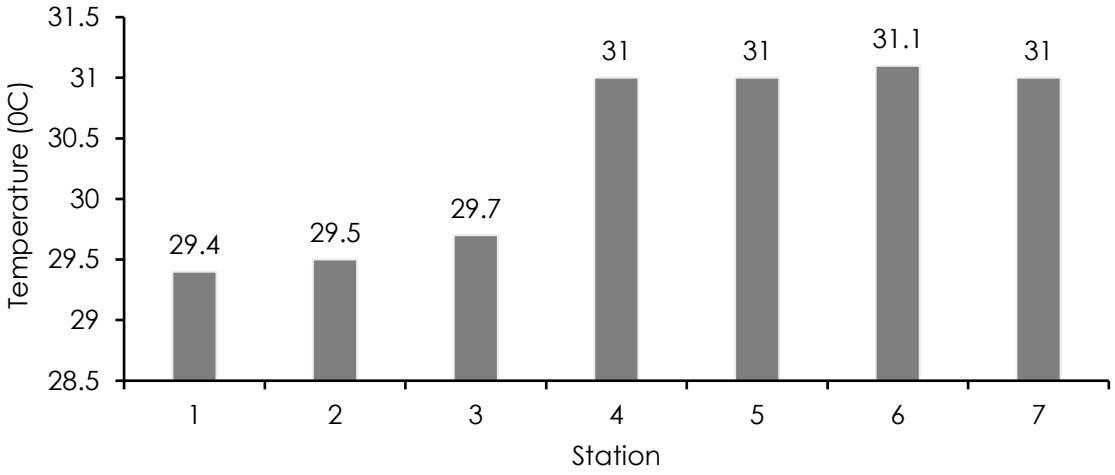

Figure 3. Sea surface temperature (°C) on station 1 to 7 at Pahiwi coastal waters, Wanokaka, Sumba Island

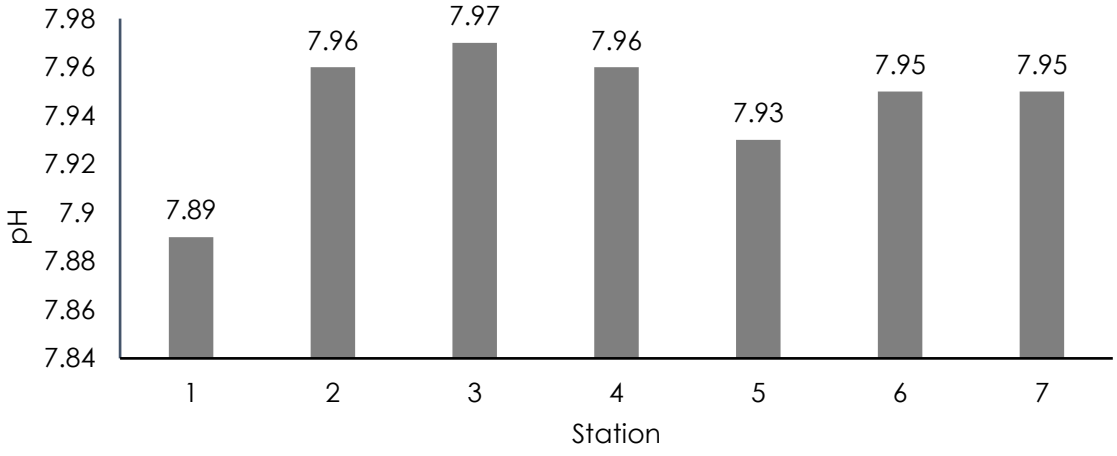

Figure 4. pH value on sations 1 to 7 at the pahiwi coastal waters, Wanokaka, Sumba Island

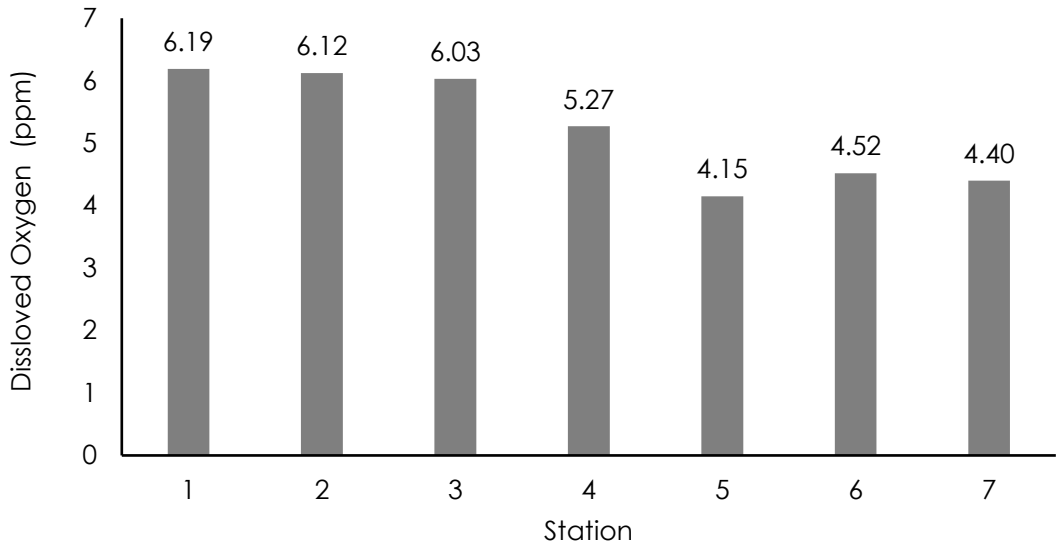

Figure 5. DO (dissloved oxygen) value (ppm) on stations 1 to 7 at the Pahiwi Coastal Waters, Wanokaka, Sumba Island

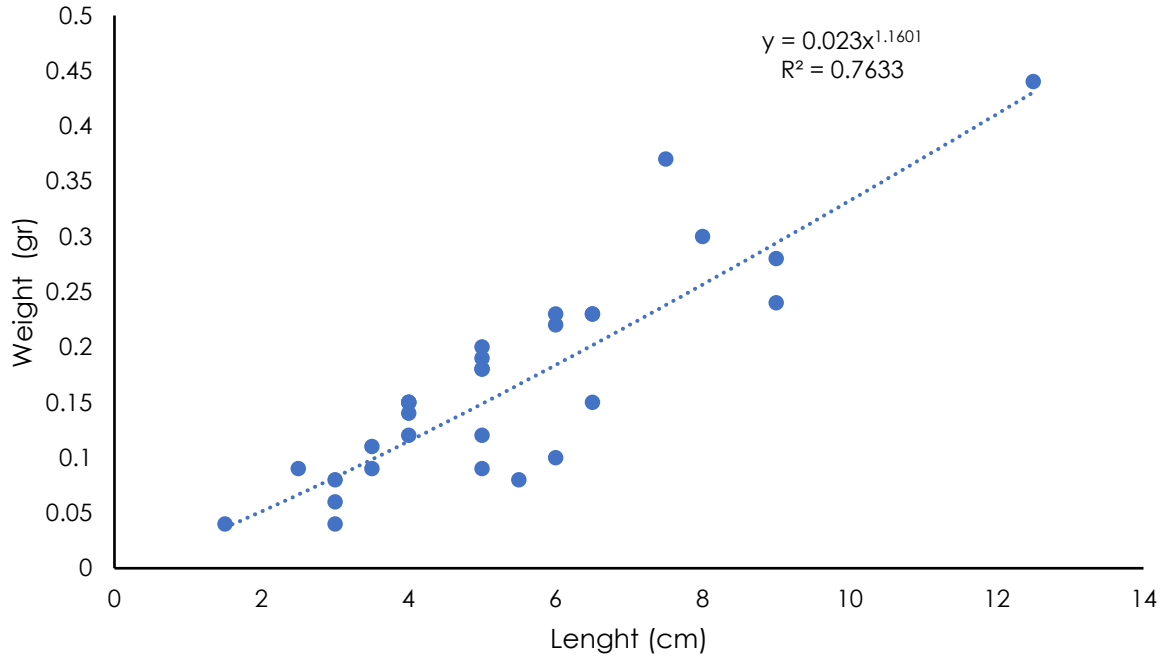

Figure 6. The relationship Length-Weight of Nyale worm (*Eunice sp*) from the Pahiwi Coastal Waters, Wanokaka, Sumba Island

Nyale worm (*Eunice sp*) populations are strongly influenced by environmental factors such as food availability (Scaps, *et al.,* 2000), copetition in searching for food (Bassed, *et al.,* 1995), water pollution (Bassed, *et al.,* 1993), temperature, salinity, substrate type (Sarker, *et al.,* 2024). The length-weight relationship of the *eunice sp* population is also influenced by food avaibility and benthic ecosystem conditions such as substrate type, dissolved oxygen levels, degree of acidity, temperature, and salinity (Sarker, *et al.,* 2024). This is also by the results of research by Peninsula (Shouthem Black Sea) are temperature, salinity, and oxygen dissolve.

Conclusion

The growth pattern of Nyale worms (*Eunice sp*) taken from Pahiwi Coastal Waters, Wanokaka was allometric negative (b<3). Compared with the results of Polychaeta research from other waters, it can be concluded that the Nyale worm (*Eunice sp*) ecosystem taken from Pahiwi Coastal Waters, Wanokaka Distric, west Sumba Regency, can still support the life of worm population.

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