South East Asian Marine Sciences Journal (SEAMAS)
Journal Homepage: https://journal.stedca.com/index.php/seamas

Morphometric Analysis of Ponyfish (*Leiognathus daura*) Landed at the PPI Cituis, Tangerang, Banten

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Article Info
Keyword:
Leiognathus daura, Morphometric analysis, Length–Weight, Allometric growth

Received:
24 July 2025
Accepted:
31 August 2025
Published:
30 September 2025

Abstract
Leiognathus daura is a small pelagic fish that plays an important role in coastal ecosystems and has economic value for local communities. This study aimed to analyze the length–weight relationship, condition factors, and morphological characteristics of *L. daura* as a basis for fisheries biology information. A total of 30 specimens were examined morphometrically and meristically. The length–weight regression produced the equation y = 0.9073x + 0.2776 with a coefficient of determination (R^2) of 0.2595. The value of b = 0.9073 (< 3) indicates a negative allometric growth pattern, meaning that length increases faster than body weight. Condition factors showed a Fulton's K value of 3.8036 and a relative condition factor (Wr) of 101.0081, suggesting that the fish population is healthy and supported by a favorable aquatic environment. Morphologically, *L. daura* has a laterally compressed body, small terminal mouth, large eyes, silvery scales, and a forked caudal fin, all of which support schooling behavior and adaptation to shallow coastal waters. The low R^2 value implies that body weight is influenced by length and environmental conditions, food availability, reproductive status, and fishing pressure. These findings highlight the importance of understanding the biological aspects of *L. daura* as a foundation for sustainable fisheries management in coastal ecosystems.

1. INTRODUCTION

Indonesia is an archipelagic country with extensive marine waters covering approximately 7.7 million km², consisting of 2.8 million km² of inland waters, 0.3 million km² of territorial seas, and 2.7 million km² of the Exclusive Economic Zone (Asror & Puspoayu, 2023). With this vast potential, the fisheries sector plays a strategic role in supporting the national economy, providing food, and improving the welfare of coastal communities. One of the key infrastructures supporting fisheries activities is the fishing port, which functions as a center for services, production enhancement, processing, distribution, and monitoring of fish resource utilization (Machdani et al., 2023). Cituis Fish Landing Port (PPI Cituis) in Tangerang, Banten, is among the fishing ports with promising prospects. Every day, fishermen land fresh marine catches, while part of the catch is further processed into salted fish, supporting the local community's economy (Iskandar et al., 2024). This condition makes PPI Cituis one of the strategic locations for studying the biological characteristics of economically important fish species.

One species frequently landed at PPI Cituis is *Leiognathus daura*, commonly known as ponyfish. This demersal fish from the family Leiognathidae is widely distributed in tropical waters and plays an important role in the marine ecosystem food chain. Ponyfish have a short life cycle, act as predators, and reach gonadal maturity at a size of about 10–15 cm (Awwali et al., 2024). Due to its abundance, ponyfish has become one of the main fishing targets for direct consumption and as raw material for processing industries. However, information on the biology and growth of ponyfish, particularly those landed at PPI Cituis, remains limited. This has become an obstacle in managing and utilizing ponyfish resources sustainably.

One of the methods that can be used to understand the biological aspects of fish is the length–weight relationship analysis. This method provides an overview of fish growth patterns and allows the estimation of body weight based on length. Parameters derived from the length–weight relationship can also indicate the condition of fish populations in a particular water body (Napisah & Machrizal, 2021). Several studies on the relationship between the length and weight of ponyfish have been conducted in other waters, but specific studies in PPI Cituis have rarely been reported. Therefore, this study aims to analyze the morphometric characteristics of *L. daura* through a length–weight relationship approach, thereby contributing to biological information of this species as a basis for sustainable fisheries management.

2. RESEARCH METHODS

The research method employed was the traditional morphometric character measurement technique, using nine morphometric character measurements from the sampled fish (Fadhil et al., 2016). The morphometric characters measured are shown in Figure 1, with the addition of fish body weight. Total length was measured from the tip of the mouth or snout to the end of the caudal fin, while standard length was measured from the tip of the mouth to the end of the dorsal base of the fish.

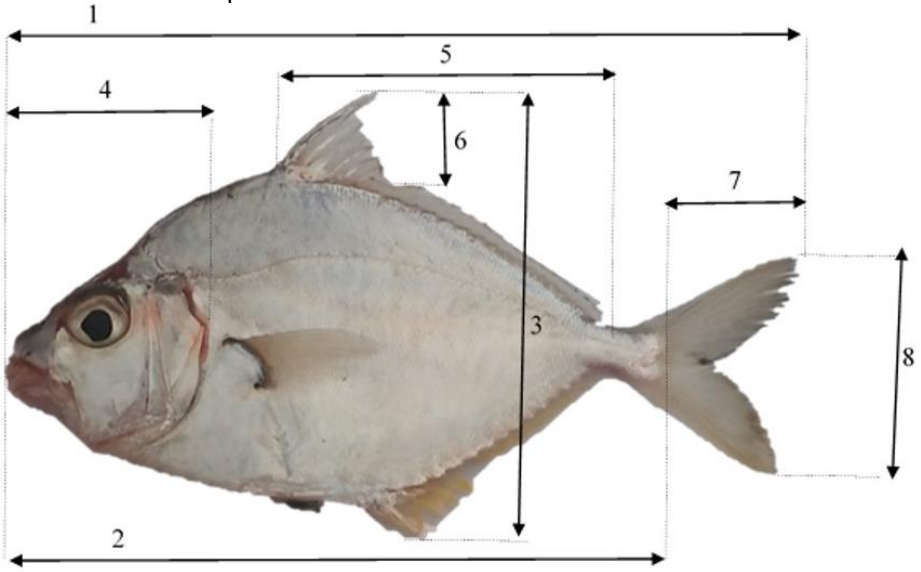

Figure 1. Morphometric character measurements of ponyfish (*Leiognathus daura*)

Description: 1. Total length, 2. Standard length, 3. Total height, 4. Head length, 5. Dorsal fin length, 6. Dorsal fin height, 7. Caudal fin length, 8. Caudal fin height

Data on length and weight were analyzed using regression analysis. The length–weight relationship regression was calculated with length as the independent variable and weight as the dependent variable (Fauzi et al., 2013). The mean weight transformation in logarithmic units, corrected for bias, was used to predict body weight based on length parameters in the adjusted allometric equation. The formula used is as follows:

$$W = e^{0.56} aL^b$$

Where: W = fish weight (g), L = total length of the fish (mm), a = regression intercept, b = regression coefficient, e = residual variance of the regression model, and 0.56 is the correction factor (Fadhil et al., 2016).

3. RESULTS AND DISCUSSION

Morphology of Ponyfish

The ponyfish or *Leiognathus daura* has a laterally compressed body with a relatively large body depth compared to its length. Its body shape, which tends to be oval to short-rounded, gives the impression of a flattened profile, with a slightly curved back and a straighter belly. Such morphology is commonly found in fish inhabiting shallow coastal waters, where manoeuvrability is more important than sustained swimming speed over long distances. With their compressed and deep bodies, ponyfish are able to move swiftly among currents and waves and are more efficient when living in large schools (Ali, 2024).

The head of the ponyfish is relatively large, with prominent, rounded eyes. These large eyes represent an adaptation to coastal waters, which are often turbid and have low light intensity, allowing the fish to detect prey and predators. Its small, terminal mouth reflects a planktivorous–benthivorous feeding habit. This mouth position lets ponyfish seize plankton, small crustaceans, or benthic organisms drifting in the water column. This is consistent with the findings of Yunita et al. (2023), who noted that most members of the Leiognathidae family feed on plankton and small organisms in shallow waters. Regarding locomotory organs, the ponyfish has a dorsal fin composed of anterior spines and posterior soft rays, which maintain stability during swimming. The caudal fin is forked and symmetrical, enabling sudden bursts of movement over short distances. This adaptation is essential for schooling fish such as ponyfish, which often swim in large aggregations to avoid predators (Ramadhanti, 2021). The ventral fins are small and positioned close to the pectoral fins, aiding in maintaining body balance in shallow waters.

The body of the ponyfish is covered with thin, silvery scales. This silvery coloration provides ecological camouflage, as the reflection of light on its body makes the fish difficult to distinguish from its surroundings. Such a defensive strategy is commonly found among small pelagic schooling fish, as the shimmering effect of synchronized scales can confuse predators (Tamsil et al., 2021). When compared with other species in the Leiognathidae family, such as *Leiognathus equulus* or *Gazza minuta*, the ponyfish shares similarities in its compressed body and silvery coloration, but is relatively smaller in size and has a more deeply forked caudal fin. These differences reflect morphological diversification within the Leiognathidae family, shaped by environmental pressures and the types of food resources available in each habitat (Alija, 2024).

Overall, the morphology of the ponyfish illustrates its distinct adaptations to productive yet challenging shallow coastal ecosystems. Its compressed body supports rapid manoeuvrability, its small mouth indicates a selective feeding strategy on plankton and small organisms, its large eyes aid survival in turbid waters, and its silvery scales serve as natural protection against predators. Collectively, these traits ensure the survival of the ponyfish and establish it as an important component in the trophic chain of tropical coastal waters.

Length–Weight Relationship

This study used 30 individuals of ponyfish (*Leiognathus daura*), measured based on nine morphometric characters. The measurements were then analyzed to determine the length–weight relationship. Regression analysis produced the equation $y = 0.9073x + 0.2776$ with a regression coefficient (b) of 0.9073 and a coefficient of determination (R^2) of 0.2595. Since $b < 3$, the growth pattern indicates negative allometric growth, meaning that an increase does not proportionally follow the increase in body length in body weight. In other words, ponyfish tend to grow longer more quickly than they gain weight (Ali, 2024).

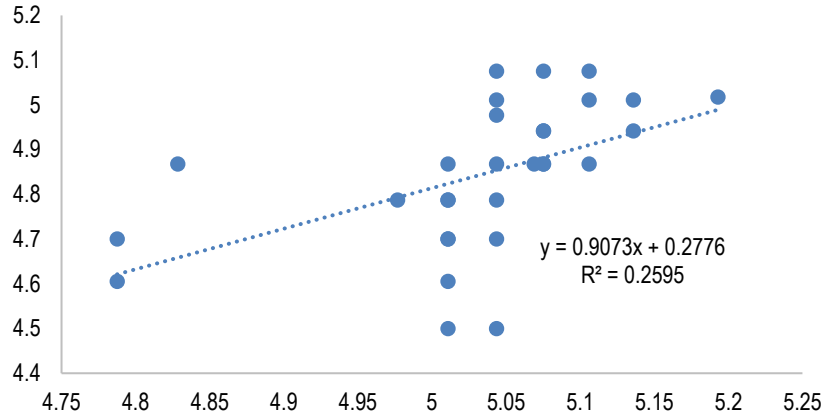

Figure 2. Regression of the Length–Weight Relationship

The relatively low R^2 value (0.2595) indicates that only 25.95% of the variation in fish weight can be explained by increased body length, while other factors influence the remaining 74.05%. These factors may include food availability, environmental conditions, gonadal maturity, metabolic activity, and sex differences (Fadhil et al., 2016). The negative allometric growth pattern obtained differs from isometric growth (b = 3), representing a balance between length and body weight. In many fish species, isometric growth usually occurs when the habitat provides optimal conditions, including sufficient food and a stable environment. Several studies on the Leiognathidae family fish have shown growth pattern variations depending on habitat conditions. For example, Haslina (2024) reported that ponyfish (*Leiognathus equulus*) in highly productive waters tend to exhibit positive allometric growth, where weight gain is more dominant than length increase. These differences emphasize that aquatic environmental factors determine fish growth patterns.

Furthermore, analysis of the condition factors showed that Fulton's K = 3.8036 and the relative condition factor Wr = 101.0081 (Figure 3). A K value greater than 1 indicates that the fish are relatively plump and in good condition, while a Wr value close to 100 suggests that ponyfish in the study location still have adequate food availability and a supportive habitat (Awwali et al., 2024). In other words, although the growth pattern shows negative allometry, the fish remain in good condition. This indicates that ponyfish may have a biological growth strategy that emphasizes body length increase rather than weight gain, without compromising population health.

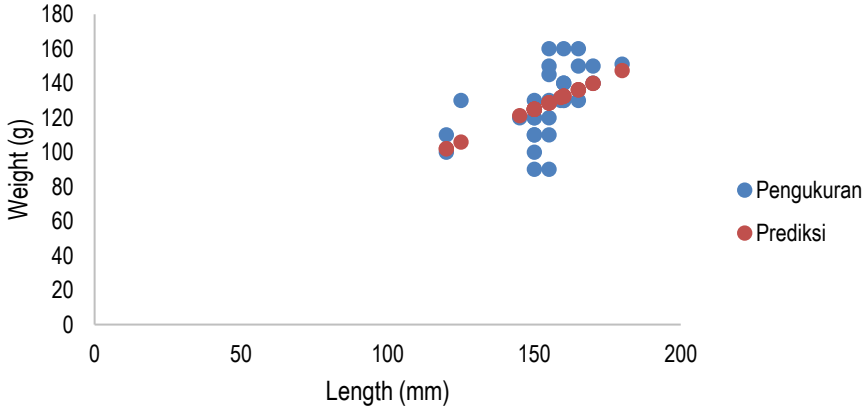

Figure 3. Length-Weight Relationship.

This phenomenon can be further explained from a fish ecology perspective. The ponyfish is a small demersal fish that lives in groups and utilizes benthic and planktonic food sources. In habitat conditions that are quite productive but may experience competition between individuals for food, fish tend to elongate their bodies as an adaptive strategy for mobility and efficient foraging. Furthermore, the

observed growth phase also plays a role. If juvenile or immature fish dominate the sample studied, more energy is allocated to increasing body length than weight. This is consistent with the theory that juvenile fish focus more on length growth to increase survival chances, while adult fish allocate more energy to weight gain and reproduction (Aristotle et al., 2020).

The low R^2 value also indicates that factors other than body length significantly influence ponyfish weight. These factors could include seasonal fluctuations in food availability, water quality conditions, or fishing pressure. If intensive, size-selective fishing occurs, the population structure can shift so that growth patterns no longer align with theoretical predictions. Therefore, the results of this study can provide important input for planning ponyfish fishery management in the region. Practically, information regarding ponyfish's length-weight relationship and condition factors is highly relevant in sustainable fisheries resource management. This data can be used to estimate population biomass, determine appropriate catch sizes, and monitor stock health over time. The negative allometric growth pattern indicates that biomass productivity may be limited, although the population remains in good condition. Therefore, fishery management must consider strategies that balance stock sustainability and fishermen's needs.

4. CONCLUSIONS

Based on the research findings, ponyfish exhibits a negative allometric growth pattern with a b value < 3, indicating that length increases faster than weight. The low coefficient of determination suggests that, in addition to body length, variations in fish weight are influenced by other factors such as food availability, environmental conditions, reproduction, and fishing pressure. Nevertheless, the high condition factor values (K = 3.8036; Wr = 101.0081) indicate that ponyfish are in healthy condition and supported by a favorable environment. Morphologically, a compressed body, small terminal mouth, large eyes, silvery scales, and forked caudal fin reflect ecological adaptations of ponyfish to shallow coastal habitats and survival strategies through schooling behavior. Therefore, understanding ponyfish's growth pattern, condition factors, and morphological characteristics is essential for sustainable fisheries management, particularly in determining catch size, biomass estimation, and coastal resource conservation strategies.

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