Egyptian Journal of Aquatic Biology & Fisheries
Zoology Department, Faculty of Science,
Ain Shams University, Cairo, Egypt.
ISSN 1110 – 6131
Vol. 29(2): 1209 – 1220 (2025)
www.ejabf.journals.ekb.eg

Study on Biological Aspects of *Priacanthus tayenus* Landed at Branta Pesisir Fish Landing Port in Pamekasan, East Java, Indonesia

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ARTICLE INFO

Article History:
Received: Dec. 23, 2024
Accepted: Feb. 27, 2025
Online: March 26, 2025

Keywords:
Biological aspects,
Length-weight relationship,
Priacanthus tayenus,
Sex ratio,
Gonad maturity level

ABSTRACT

Branta Pesisir Fish Landing Port is one of the main landing sites for various types of fresh fish. One of the fish species diversity found there is *Priacanthus tayenus*, a fish that has very high economic and ecological value. This research aimed to determine the biological aspects of *Priacanthus tayenus*, including the length-weight relationship, sex ratio, and the gonad maturity level (GML). This study was conducted in November 2024. The sampling method used was random sampling. The results of the study on 200 *Priacanthus tayenus* (102 females and 98 males) showed that the growth pattern of the fish is negative allometric, with the equation W = 0.94L 1.59. The sex ratio of *Priacanthus tayenus* during the research period, based on the Chi-Square test, was 1:1.1. The gonad maturity level (GML) of *Priacanthus tayenus* was dominated by Stage II (61%) and the lowest was Stage IV (7%), indicating that the captured fish were mostly immature.

INTRODUCTION

The Branta Fisheries Port, located in Branta Coastal Village, Tlanakan District, Pamekasan Regency, Madura, East Java, is the main center of economic activities for coastal communities. The Fish Auction Place (TPI) is the center of activities for fishermen who rely on marine products for their livelihood **(Kholizah *et al.*, 2023)**. TPI Branta is also known for providing various types of fresh fish that are directly landed by fishermen. *Priacanthus tayenus*, a key fishery commodity in this region, showed variable annual production at TPI Branta: 181,942kg (2017), 317,160kg (2018), 204,330kg (2019), and 201,976kg (2020) **(Qodrunnada & Hafiludin, 2023)**.

Priacanthus tayenus is one of the most widely consumed marine commodities at an affordable price of around Rp. 20,000/kg **(Anindhita *et al.*, 2014)**. In addition to consumption, this fish is also a raw material for various processed products, such as dried fish, fish crackers, fish petis, and rujak kelang, which are managed by many fishermen's wives in Branta Pesisir Village **(Anang *et al.*, 2022)**. *Priacanthus tayenus* is rich in

protein (13.3%) and low in fat (8.77%), making it an ideal raw material for the food industry **(Anasri *et al*., 2022; Hasanuddin & Jaziri, 2024)**. At first it was not the main catch, now *Priacanthus tayenus* has become an important export commodity with commercial value **(Sivakami *et al*., 2001)**. In addition, these fish play an ecological role as zooplankton predators in coral ecosystems, maintaining the balance of marine ecosystems **(Powell, 2000)**.

Fishing *Priacanthus tayenus* is carried out throughout the year using cantrang fishing gear. At TPI Branta, a new regulation has been enacted that requires the modification of cantrang fishing gear into a Pocket Pull Net (JTB), with a bag size that is enlarged from 1 inch to 2 inches. However, overfishing, without taking into account biological conditions such as gonad maturity levels, can reduce the quality and quantity of fish stocks, especially if the number of catches exceeds 5,000 fish per year **(Sadewi *et al*., 2018)**.

Sustainable management of fish resources requires a deep understanding of biological aspects of *Priacanthus tayenus*. With demand continuing to increase, catch production can exceed the limit, which risks leading to a drastic decline in stocks of *Priacanthus tayenus*, even overfishing. Therefore, proper management based on scientific data is essential to prevent future declines in fish populations. Population monitoring through the analysis of length-weight relationships, sex ratios, and gonad maturity levels is essential to determine the number of fish that can be caught sustainably **(Pamungkas *et al*., 2014; Flores *et al*., 2019)**. The purpose of this study was to analyze the biological aspects of swanggi fish, including the length-weight relationship, sex ratio, and gonad maturity level, as a basis for sustainable management in the waters of Branta Coastal Village **(Prihatiningsih *et al*., 2021)**.

MATERIALS AND METHODS

This research began in November 2024, and it was conducted at WPP NRI 712 Java Sea in the northern part of Pamekasan Regency. The location used as a sampling site is TPI Branta, Pamekasan Regency, East Java. The map of the research location is presented in Fig. (1), as follows:

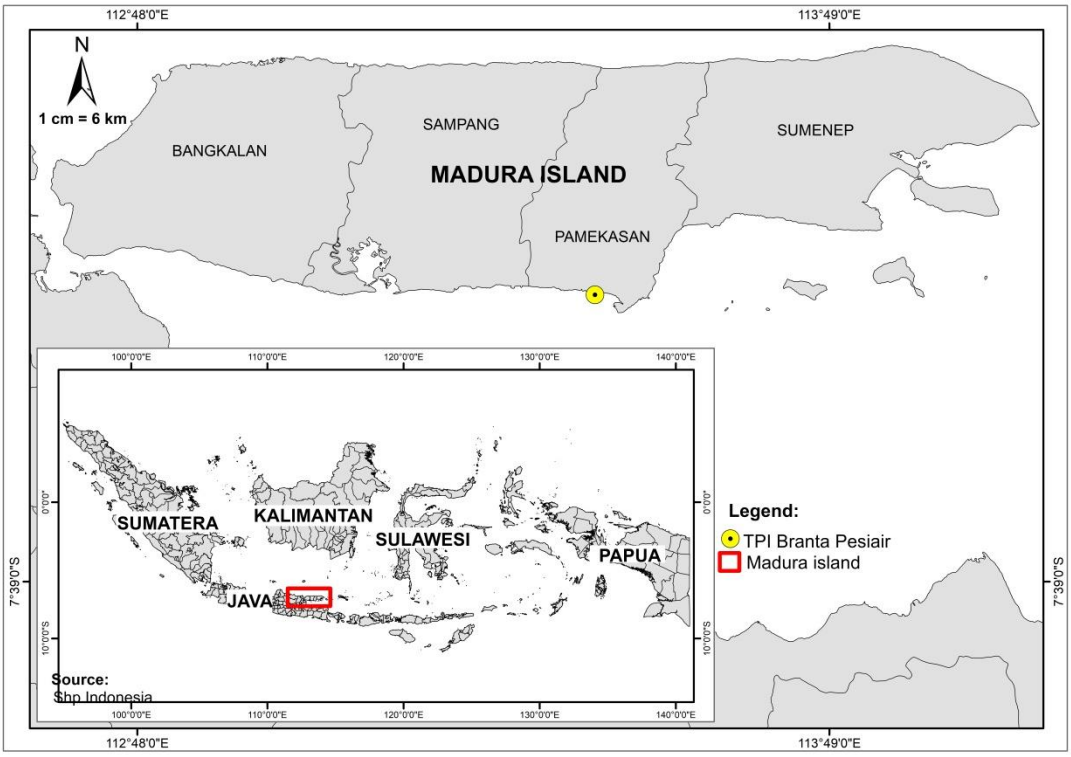

Fig. 1. Map of the research location

Tools and materials

Table (1) shows the tools and materials used in this study.

Table 1. Tools and materials and their functions

Number	Tool	Function
1.	Digital scales	As a tool to weigh fish (*Priacanthus tayenus*)
2.	Stationery	As a tool to record research results
3.	Ruler	As a tool for measuring fish (*Priacanthus tayenus*).
4.	Disseting set	As a tool for dissecting fish (*Priacanthus tayenus*).
5.	Tray	As a tool for the dissection of fish (*Priacanthus tayenus*).
6.	Mobile	As a research documentation tool.
7.	Laptop	As a data analysis tool.
8.	Latex gloves	As a hand guard
9.	(Priacanthus tayenus).	As a sample of the observed research.
10.	Tissue	As a cleaning tool.

Data collection methods

This study used a qualitative descriptive method to analyze the biological aspects of *Priacanthus tayenus* landed at Branta Port, Pamekasan. The sampling technique used is random sampling or simple randomization, where each *Priacanthus tayenus* landed at

Branta Port has an equal chance of being selected. The data in this study were collected through two approaches: primary and secondary. Primary data were obtained through direct observation and measurement of swanggi fish samples at the landing site, while secondary data were obtained through literature studies relevant to the research topic.

Data analysis

Length and weight relationship

The relationship between length and weight in fish was calculated using the formula according to **Bintoro *et al*. (2020)**, **Prihatiningsih *et al*. (2021)** and **Lelono *et al*. (2023)**, as follows:

$$W = a.L^b$$

W = Weight (grams)
L = Length (cm)
a & b = Constant of the relation of the length of weight.

The interpretation of the weight length relationship can be seen based on the constant b, i.e. with the hypothesis:
H0 : b = 3, i.e. growth is isometric (the growth pattern of length is equal to the growth of weight).
H1 : b ≠ 3, i.e. allometric growth, where b > 3 is positive allometric which means weight gain is more dominant compared to length gain (fat) and b < 3 is negative allometric which means length gain is more dominant than weight growth (thinness) **(Agustiari *et al*., 2018)**.

Sex ratio

The sex ratio of *Priacanthus tayenus* was calculated using the formula of **Bintoro *et al*. (2019)**, as follows:

$$NK = \frac{J}{B}$$

NK = Proportion of fish (male or female)
J = Number of male fish (tails)
B = Number of female fish (tails).

The calculation between males and females in a population was set by analyzing the sex ratio to find out whether the ratio of males or females was equal to 1.00 : 1.00 or not, then the Chi-square test equation ($\chi 2$) **(Omar *et al*., 2015)** was used:

$$\chi 2 = \frac{\sum(o_i - e_i)^2}{e_i}$$

$\chi 2$ = The value for a random variable whose drawdown spread is for example approaching the spread when squared (Chi-square)

oi = Number of observed frequencies of male and female fish (ind)

ei = Number of expected frequencies of male and female fish (ind)

The hypothesis used is: Ho=0; The proportion of males and females is 1:1 in H1=1 waters; The ratio of males and females is not 1:1 in the waters.

Gonadal maturity level (GML)

Classification of gonadal maturity level (GML) based on **Holden and Raitt (1974)** research in **Taylan *et al*. (2018)**, **Bintoro *et al*. (2021)** and **Lelono *et al*. (2023)** are presented in Table (2), as follows:

Table 2. Classification of gonad maturity level (GML)

Stage	Condition	Description
I	Immature	Ovary and testis about 1/3rd length of body cavity. Ovaries pinkish, translucent; testis whitish. Ova not visible to naked eye.
II	Developing	Ovary and testis about 1/2 length of body cavity. Ovary pinkish, translucent; testis whitish, more or less symmetrical. Ova not visible to naked eye.
III	Ripening	Ovary and testis is about 2/3rds length of body cavity. Ovary pinkish-yellow colour with granular appearance, testis whitish to creamy. No trans-parent or translucent ova visible.
IV	Ripe/Fully Mature	Ovary and testis from 2/3rds to full length of body cavity. Ovary orange-pink in colour with conspicuous superficial blood vessels. Large transparent, ripe ova visible. Testis whitish-creamy, soft.
V	Spent	Ovary and testis shrunken to about 1/2 length of body cavity. Walls loose. Ovary may contain remnants of disintegrating opaque and ripe ova, darkened or translucent. Testis bloodshot and flabby.

RESULTS

Size structure

The number of samples used to measure the length and weight of fish was 200 fish with a range of length ranging from 17 to 23.7cm and body weight ranging from 65 to 112 grams. The graph of the length structure (*Priacanthus tayenus*) can be seen in Fig. (2).

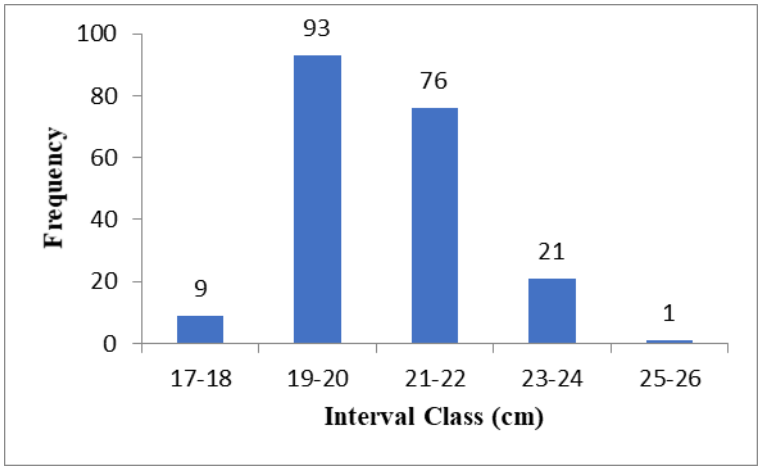

Fig. 2. Structural graph of the length size of *Priacanthus tayenus*

The graph shows that fish with a length range of 19 - 20cm are the most caught size during the study with a total of 93 fish. Meanwhile, the size of fish with a length range of 25 – 26 fish is the least caught, which is as many as 1 fish.

Length and weight relationship

The results of the weight length calculation using linear regression analysis with a 95% confidence interval obtained a value of 0.94 and a value of b of 1.51. The results of the data were obtained through the equation of the long-weight relationship, namely $W = 0.94L^{1.59}$. The results of the analysis of the relationship between length and weight can be seen in Fig. (3).

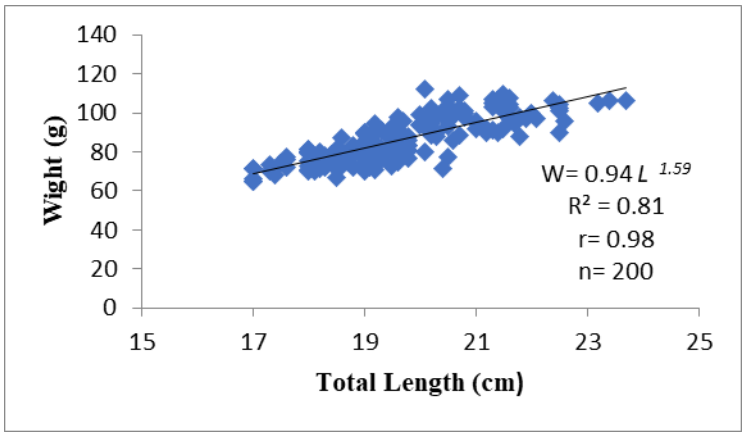

Fig. 3. Graph of the length relationship of fish weight

Sex ratio

Sex ratio is an important parameter to determine the population structure and reproductive potential of *Priacanthus tayenus* in a water. Based on observations made at TPI Branta Pesisir Pamekasan on 200 samples of *Priacanthus tayenus*, a composition of 103 males (51%) and 98 females (49%) was obtained. The total proportion of *Priacanthus tayenus* landed by TPI Branta Pesisir, Pamekasan Regency can be seen in Fig. (4).

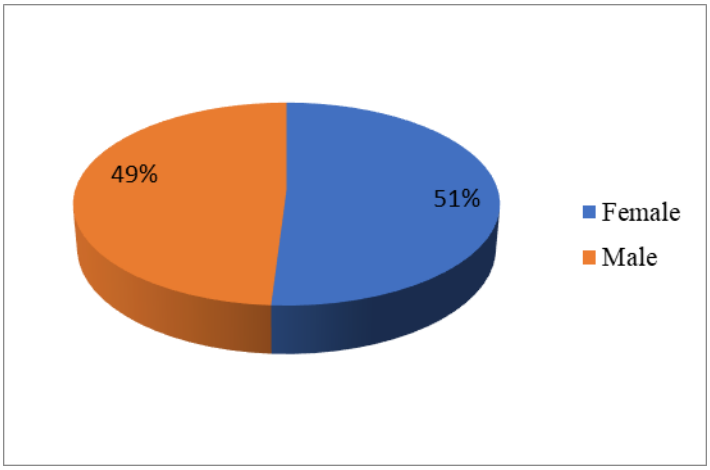

Fig. 4. Total proportion of *Priacanthus tayenus* landed at TPI Branta, Pamekasan Regency

Gonad maturity level (GML)

Based on the results of observations on 200 fish samples landed at TPI Branta, it was found that the GML distribution pattern was different between male and female fish. The majority of male fish GML is in the GML II stage with a percentage of 61% (61 fish), followed by GML I by 32% (31 fish), and GML III by 7% (7 fish). A different

distribution was seen in female fish, where GML II dominated with 37% (37 fish), followed by GML I at 31% (32 fish), GML III at 19% (19 fish), and GML IV-V at 13% (13 fish). The GML graph can be seen in Fig. (5).

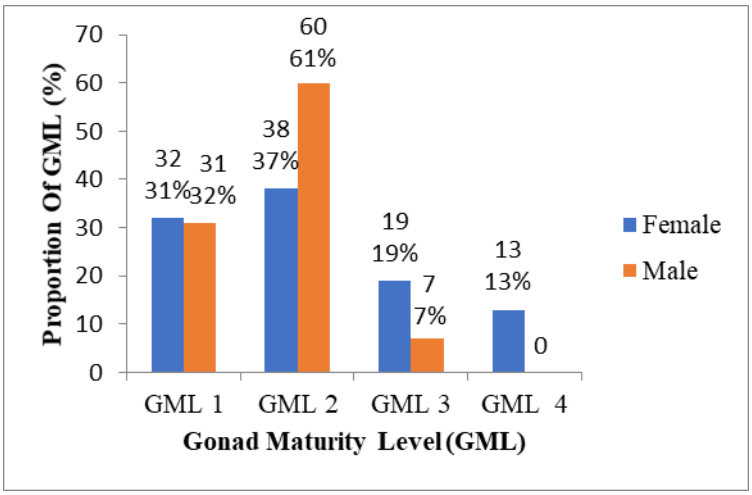

Fig. 5. Graph of maturity levels of fish gondles *(Priacanthus tayenus)*

DISCUSSION

The results of the growth pattern analysis of *Priacanthus tayenus* showed negative allometric traits, where the increase in length was faster than the increase in weight. This result is in line with the research of **Prihatiningsih *et al*. (2016)** on swanggi fish, *Priacanthus tayenus* in Tangerang waters which obtained b value of 2.467 and the research of **Putri *et al*. (2024)** at PPP Lampung obtained b value of 1.699 and **Silaban *et al*. (2024)** at the Tegalsari Fisheries Port with a b value of 1.48, all of which show a a negative allometric growth pattern. According to **Supeni and Azizah (2020)**, the difference in the length and weight of fish can be influenced by various factors, where there are two factors that can affect fish growth, namely internal factors and external factors. Internal factors are difficult to control, while external factors are easy to control. Internal factors include hereditary factors, sex, parasites and diseases. **Indrayani *et al*. (2023)** explained the external factors including temperature, pH, salinity, geographical location and sampling techniques as well as differences in seasons and gonad maturity levels. **Nugroho *et al*. (2016)** added that the difference in the length and weight of fish can be caused by environmental differences and high levels of exploitation, which changes the structure of fish population size.

The results of the Chi-square test with a confidence level of 95% showed that the sex ratio of *Priacanthus tayenus* by comparing the number of males and females *Priacanthus tayenus* produced a comparison value of 1 : 1.1. The results of this finding are different from the research of **Sadewi (2018)** and **Farid (2024)**, which showed a sex

ratio of 1.08:1 and 1:0.88. This ratio shows the dominance of male fish compared to females. **Prihatiningsih *et al*. (2016)** stated that the imbalance of fish sex ratio is often caused by the fish caught not coming from the same spawning area, so the chances of catching vary. This imbalance can occur because fish in different locations may be in different stages of development or behavior, including migration to or from spawning areas.

The results showed that male swanggi fish were dominant in GML II (61%) and females were dominant in GML II (37%), which indicates that the population is in the gonadal maturation phase. The results of this study are different from the research of **Agustiari *et al*. (2018)** at PPP Tawang, Kendal. The author reported the distribution of 100 gonads of *Priacanthus tayenus* in March and April 2016. The sample consisted of 42 male fish and 58 female fish. The dominance of GML I and III was found in males and females, with fish in the immature phase of gonads reaching 79% in males and 72% in females. The mature phase of the gonads is only 26% in males and 28% in females. **Abida e*t al.* (2023)** stated that the percentage of mature gonadal swanggi fish fluctuates monthly, indicating a complex reproductive pattern and depends on environmental conditions.

CONCLUSION

The results of this study show that *Priacanthus tayenus* landed at TPI Branta Pesisir, Pamekasan has a negative allometric growth pattern. The sex ratio in the fish is 1 : 1.1. The level of gonad maturity observed in fish samples had more dominant GML I (32%) and II (61%) in males and females.

ACKNOWLEDGEMENT

This research is part of a national collaboration research scheme funded by the Institute for Research and Community Service, University of Trunojoyo Madura. This research was partially supported by University of Trunojoyo Madura with grant number: 426/UN46.4.1/PT.01.03/RISMAN/2024.

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