Biology Fisheries of Threadfin Bream Fish (Family: Nemipteridae) Landed at Oeba Fish Landing Site and Oesapa Fish Market, Kupang City

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Abstract

The threadfin bream fish from the Nemipteridae family is a demersal species and an economically significant commercial fish. It is widely used for personal consumption and sold in markets. The capture of threadfin bream fish at the Oeba Fish Landing Site and Oesapa Fish Market has been increasing. Continuous high-intensity fishing will likely negatively impact the threadfin bream fish population, leading to stock depletion and reduced catch production. Research on threadfin bream fish in East Nusa Tenggara has yet to be reported, particularly in Kupang Bay and Rote Ndao waters. This study aims to investigate the fisheries biology of threadfin bream fish landed at the Oeba Fish Landing Site and Oesapa Fish Market. A total of 84 threadfin bream fish were sampled from both locations. The length-weight relationship of threadfin bream fish at these sites is negatively allometric with value b < 3, indicating that length growth is more dominant than weight gain. The gonad maturity stages of male and female threadfin bream fish range from GSM I-III. The size distribution of threadfin bream fish ranges from 173-295 mm at the Oeba Fish Landing Site and from 173-245 mm at the Oesapa Fish Market. Most of the threadfin bream found are still in the early stages of gonadal maturity, indicating that these fish are young and not yet ready to spawn. Implementing Sustainable fishing management practices is crucial, including setting catch quotas and minimum catch sizes and educating fishermen to ensure the sustainability of threadfin bream fish stocks.

Keywords: Threadfin bream fish, fisheries biology, fish growth, Oesapa and Oeba, Kupang

INTRODUCTION

The threadfin bream, belonging to the Nemipteridae family, is classified as a demersal fish (El-Ganainy *et al*., 2018). The perciform fish family Nemipteridae comprises 69 presently acknowledged species distributed among five genera. These genera include Nemipterus, housing 26 species known as threadfin breams, Pentapodus with 12 species referred to as whiptail breams, Scolopsis featuring 18 species recognized as monocle breams, Parascolopsis consisting of 12 species identified as dwarf monocle breams, and Scaevius, encompassing one species recognized as coral bream (Russell 1990; Hung *et al*., 2017). These fish exhibit diverse habitat preferences within the Indo-West Pacific region (Supmee *et al*., 2021). Their distribution spans mud and sand bottoms in coastal and offshore shelf waters, coral reefs, and shallow muddy or sandy inshore areas. The depth ranges vary significantly among genera, from around 60 meters to 500 meters (Russell 1990, 1993; Russell & Golani 1993; Shen 1997; Malau *et al*., 2022).

Threadfin breams typically have a moderately compressed, oval-shaped body. The size of threadfin breams can vary, but they are generally of moderate size, with some species reaching lengths of 35 cm (Russel, 1993). Their body is covered in cycloid scales, which are smooth and round. Threadfin breams usually have relatively large eyes, indicating their reliance on vision for locating prey and navigating their environment. Threadfin breams generally have small mouths with fine

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teethit adapted for grasping small prey items such as fish, crustaceans, mollusks (especially cephalopods), polychaetes, and echinoderms (Özvaro, 2016).

Threadfin breams, with monocle breams playing a relatively minor role, constitute a significant aspect of commercial and artisanal fisheries in the Indo-West Pacific region. Nemipterus species hold economic significance, with several being actively sought after by local fisheries, particularly in catches using bottom trawls, handline, longline, gill nets, lift nets, surrounding nets, drive-in nets, fish stakes, and traps (Russel, 2001). It stands out as one of the extensively captured fish species, catering to local consumption and export production such as surimi (Pangsorn *et al*., 2007). Nemipterids are well-liked as a food choice and are sold fresh, dry-salted, dry-smoked, fermented, and steamed in the market (Russel, 1990). In Indonesia, threadfin bream is commonly sold fresh, and due to rising consumer demand, it is caught at a high rate (Sen *et al*., 2014; Oktaviyani *et al*., 2016).

Several studies on threadfin bream fish in Indonesia have been conducted, such as the one in Brondong, East Java (Widagdo *et al*., 2019), addressing the sustainable potential of threadfin bream fish. Additionally, research has been carried out on the heavy metal content of threadfin bream fish in Banten Bay Waters (Hapsari *et al*., 2017; 2021; Ubay *et al*., 2022), the fecundity of four-tailed threadfin bream fish in Bangka Belitung (Utami *et al*., 2018), and the reproductive aspects of threadfin bream fish in Southern Java waters (Lisamy *et al*., 2023). Hence, it is claimed that threadfin bream resources in the waters of Banten Bay have been excessively exploited (Irnawati & Surilayani, 2021). However, research on threadfin bream fish in East Nusa Tenggara has yet to be extensively reported, particularly in the waters of Kupang Bay and Rote Ndao waters. Recently, a study on DNA barcoding of threadfin breams at these locations was published (Wora *et al*., 2024), marking a significant step in understanding the genetic diversity and population structure of these fish in this region. Information regarding the fisheries biology of threadfin bream fish is crucial for sustainable management (Rapita *et al*., 2020). This study aims to describe the fisheries biology of threadfin bream fish. ,specificallythose landed at Oeba Fish Landing Site and Oesapa Fish Market. The study's findings can aid in maintaining a balance between economic interests and ecological sustainability, fostering a healthier and more resilient marine ecosystem in the region.

MATERIAL AND METHODS

This research was conducted at the Oeba Fish Landing Site and the Oesapa Fish Market in Kupang City over a two-mounth period. The threadfin bream fish used in the study were caught by local fishermen using bottom gillnets and drift gillnets. The fishing areas included various locations such as the waters of Kupang Bay, Kupang City, its surroundings, andthe waters of Rote Ndao, Rote Ndao Regency.

Fish sampling was conducted eight times at intervals of 1-2 weeks. A total of 84 individuals were collected, consisting of 62 individuals from the Oeba Fish Landing Site and 22 individuals from the Oesapa Fish Market. The collected samples were taken to the Eksakta Laboratory at Artha Wacana Christian University for length and weight measurements with an accuracy of 1 mm and body weight with an accuracy of 0.1 grams.

Length-Weight Relationship

The length-weight relationship was analyzed following Effendie (1979). The coefficient b obtained from this regression provided information about the fish’s growth pattern. When $b = 3$, the fish exhibited isometric growth, meaning that length growth was equal to weight growth. However, if $b > 3$, the fish showed positive allometric growth, indicating that weight growth was more dominant. Conversely, if $b < 3$, the fish exhibited negative allometric growth, meaning that length growth is more dominant than weight growth.

Gonad Maturity Stages

The determination of gonad maturity stages was conducted using a visual method. This involved observing the shape, color, and development of the gonads based on five maturity stages, as meticulously outlined by Kantun & Moka (2022) Table 1.

Length Distribution

The length distribution was obtained by organizing all the total length measurement data (mm) and then determining each length group's class intervals, midpoints, and frequency. the class intervals, midpoints, and frequency were analyzed using Microsoft Excel. The number of classes was calculated following the rule referenced by Aprilla *et al*. (2021)with the following equation where K represents the number of classes and N denotes the total number of samples:

$$K = 1 + 3{,}3\ Log\ N$$

RESULT AND DISCUSSION

The length and weight measurements of threadfin bream fish landed at the Oeba Fish Landing Site yielded a regression equation of Y= 0,0027x1,9933 with R2 = 0,6245 (Figure 2). In comparison, the regression equation for threadfin bream fish landed at the Oesapa Fish Market was Y = 0.0002x2.4737 with an R2 value of 0.495 (Figure 3). This indicates that the growth patterns of threadfin bream fish at both the Oeba Fish Landing Site and Oesapa Fish Market sites exhibit negative allometric growth ($b < 3$), meaning that length increases are more dominant than weight gains. Thus, threadfin bream fish at these two locations tend to grow in length more rapidly than in weight.

Research conducted by Paul *et al*. (2015) found that the b value for threadfin bream fish varies according to sex and species, ranging from 2.0362 to 3.252. Most species exhibit allometric growth patterns (both negative and positive). According to Paul *et al*. (2015), the b value among various fish species, including threadfin bream fish, can differ due to several factors, such as environmental factors (habitat, season), biological factors (sex, gonadal maturity, feeding patterns, type of food, growth phase), and the range of size, quantity, and type of fish.

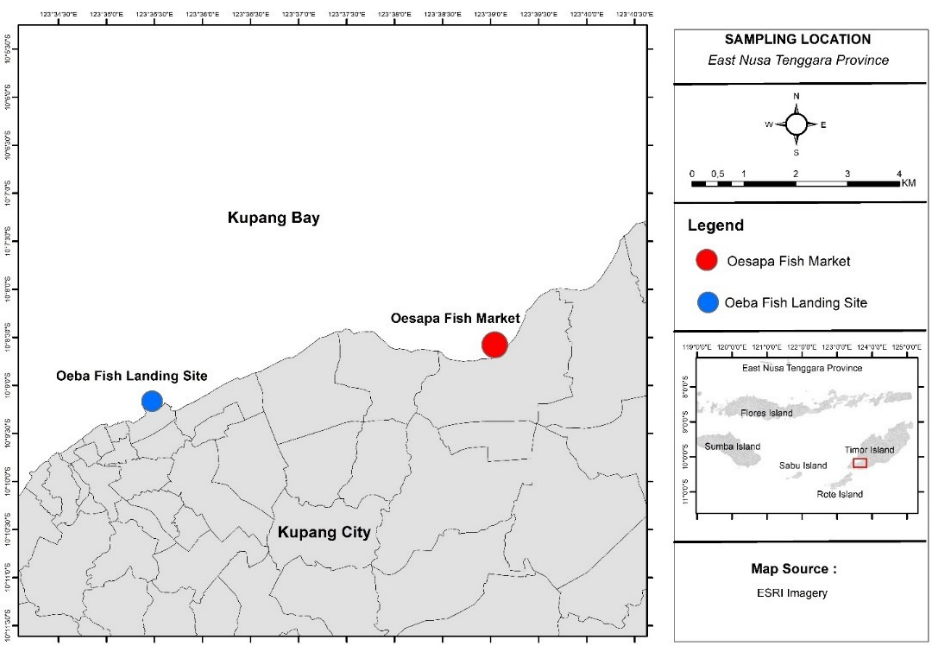


Figure 1. Map of sampling location

Table 1. Characteristics of gonad maturity stages (Effendie, 1997)

Gonad Maturity	Female	Male
I	The ovaries appeared as thread-like structures extending into the body cavity. They were transparent with smooth surfaces.	The testes appeared as thread-like structures with shorter ends located in the body cavity. They were transparent with smooth surfaces.
II	The ovaries were larger in size, darker yellowish in color, and the eggs were not yet visible to the naked eye.	The testes were larger in size, milk-white in color, and more distinct than in stage I.
III	The ovaries were yellow, and morphologically, the eggs began to show granules visible to the naked eye.	The surface of the testes appeared serrated, morewhite in color, and more prominent. When preserved, they were easily damaged.
IV	The ovaries became larger, the eggs were yellow and easily separated, and oil droplets were not visible. They filled 1/2 to 2/3 of the abdominal cavity, causing the intestines to be compressed.	At this stage, the testes became more distinct and thicker.
V	The ovaries were shriveled, the walls thickened, and residual eggs appeared near the release (urogenital opening).	The back of the testes shriveled, and the release section began to fill.

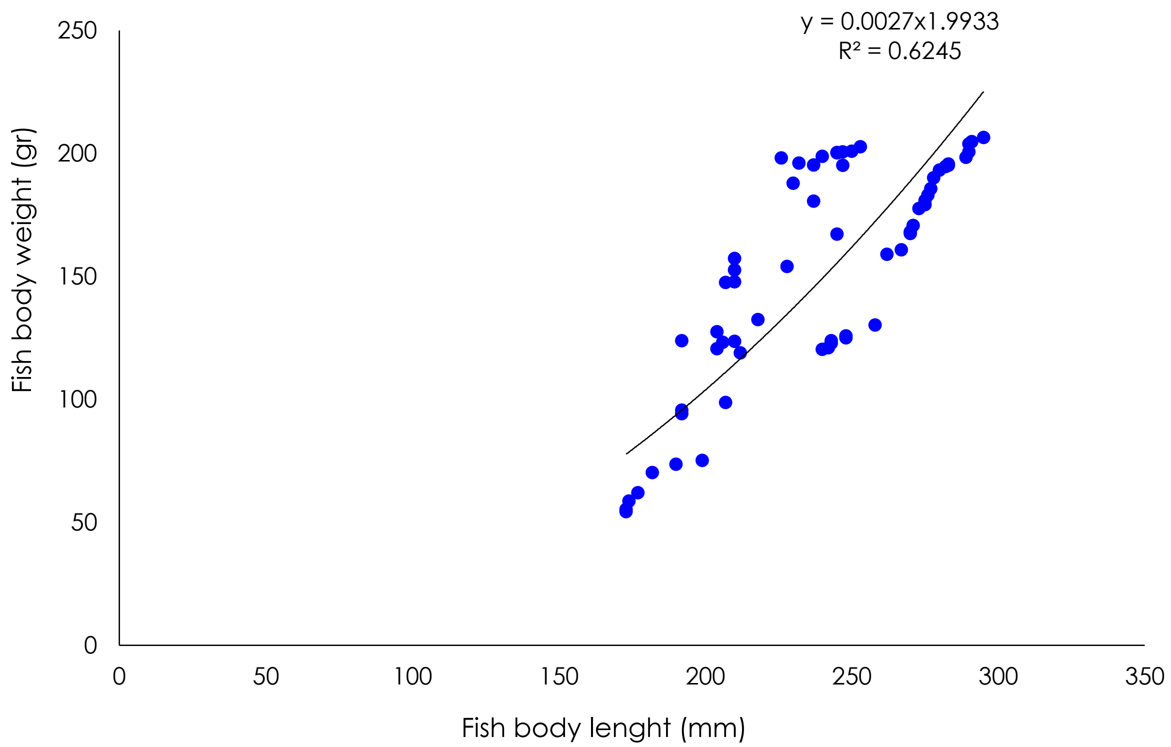


Figure 2. Length-weight relationship of threadfin bream fish at Oeba Fish Landing Site

Environmental factors can influence fish growth by altering habitat conditions and food availability (Moyle and Cech, 2004). For example, seasonal changes can affect water temperature and plankton availability, impacting fish growth. Biological factors such as sex and gonadal maturity also play a significant role, as mature female fish may allocate more energy to reproduction than somatic growth (Helfman *et al*., 2009). Additionally, feeding patterns and the types of food available can affect the growth rate of fish (Stickney, 2000).

Gonad maturity stages (GMS) represent the phases of gonadal development in fish before and after spawning (Effendie, 2002). Based on the research findings (Table 2), the gonad maturity stages of both male and female threadfin bream fish are within stages I-III. A total of 84 threadfin bream fish were studied, consisting of 50 males and 34 females. The collected threadfin bream fish were predominantly male at GMS I, while females dominated GMS II. The threadfin bream collected during the study had not yet reached gonadal maturity, indicating that the fish were still relatively small or young. Fish are considered to have mature gonads and be ready to spawn at GMS IV. These fish spawn throughout the year, with a peak in November. Sarman (2018) reported that the spawning season of threadfin bream fish in Indian waters occurs in October. This species breeds twice yearly, from December to February and from June to July. In the South China Sea, spawning begins in May and continues until October. Hasyim (2010) reported that several factors, including enviromental factors and seasonal changes, influence gonadal development in fish. The most influential environmental factors are temperature and food availability. Optimal temperatures and sufficient food availability allow fish to allocate more energy to gonadal development, increasing the likelihood of reaching gonadal maturity and readiness to spawn.

The frequency distribution analysis of the length of threadfin bream landed at the Oeba Fish Landing Site and the Oesapa Fish Market shows relatively similar length distributions. The total length of threadfin bream fish landed at the Oeba Fish Landing Site ranges from 173 to 295 mm. Meanwhile, the threadfin bream at the Oesapa Fish Market ranges from 173 to 245 mm (Figure 4).

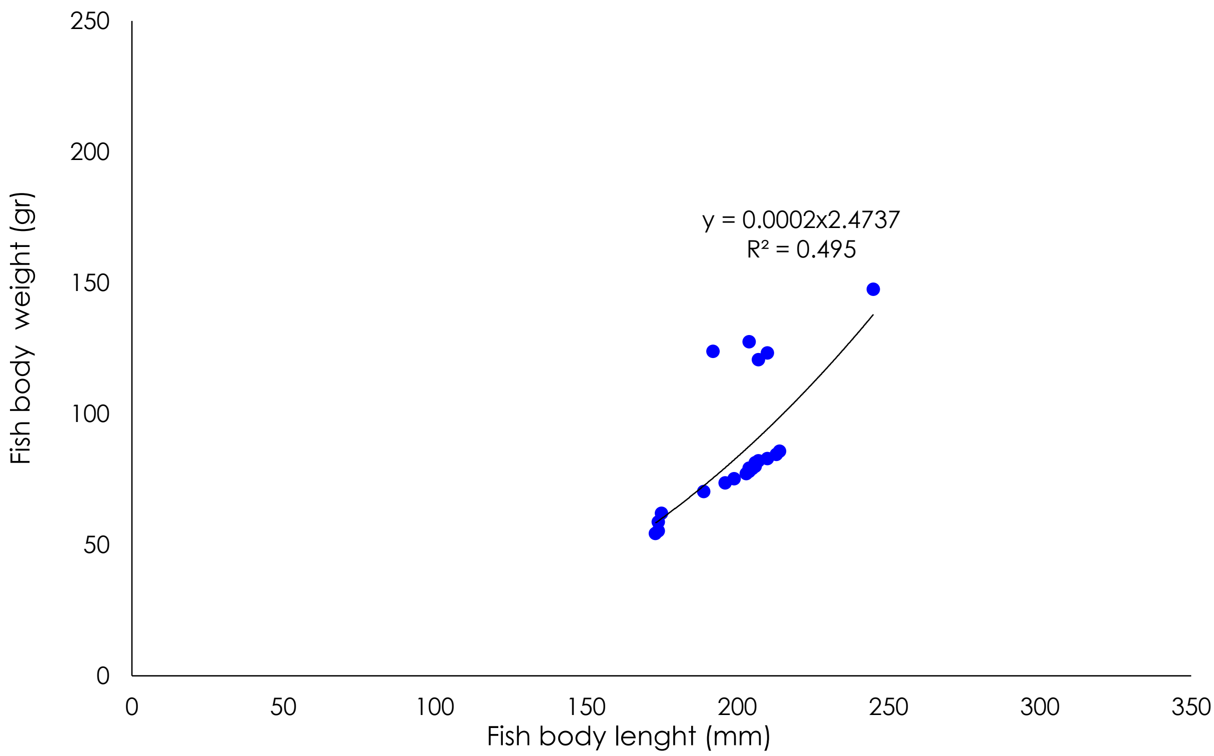
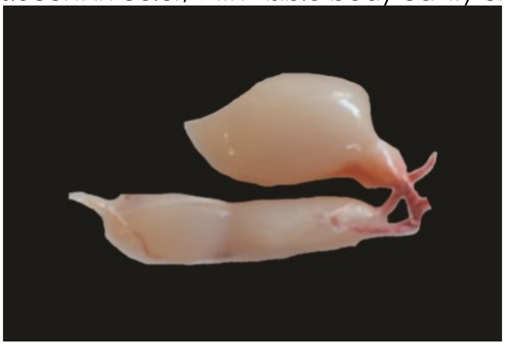


Figure 3. Length-weight relationship of threadfin bream fish at Oesapa Fish Market

Table 2. Gonad maturity stage of male and female threadfin bream fish

GMS	Male	Female
I	 Testes appear as long, thread-like structures, translucent in color, with visible body cavity ends.	 Ovaries are elongated, thread-like, with a smooth surface and small size.
II	 Testes are larger and have a milky color.	 Ovaries are whitish-yellow, with eggs not yet clearly visible.
III	 The surface of the testes appears serrated, increasingly white, and significantly larger.	 Ovaries are yellowish, with morphologically visible and larger egg grains.

After calculating the frequency distribution, the length distribution of threadfin bream fish landed at the Oeba Fish Landing Site ranges from 173 to 309.3 mm, with the highest frequency occurring within the length range of 258.5-275.1 mm. On the other hand, threadfin bream fish landed at the Oesapa Fish Market has a length distribution ranging from 173 to 275.1 mm, with the highest frequency observed within the length range of 207.2-223.8 mm. The maximum length of threadfin bream fish is 250 mm, typically ranging around 150 mm. Male threadfin bream fish tend to be larger than females, possibly due to the faster growth rate of males compared to females. Females allocate more energy is needed for gonadal growth than for somatic growth (Oktaviyani, 2016). Fishing gear, fishing intensity, and environmental conditions can influence the length distribution (Tanke, 2014). Different fishing gear can capture fish of different sizes, and high fishing intensity may reduce the number of large fish in an area. Environmental conditions such as water quality and food availability can also affect fish growth and size.

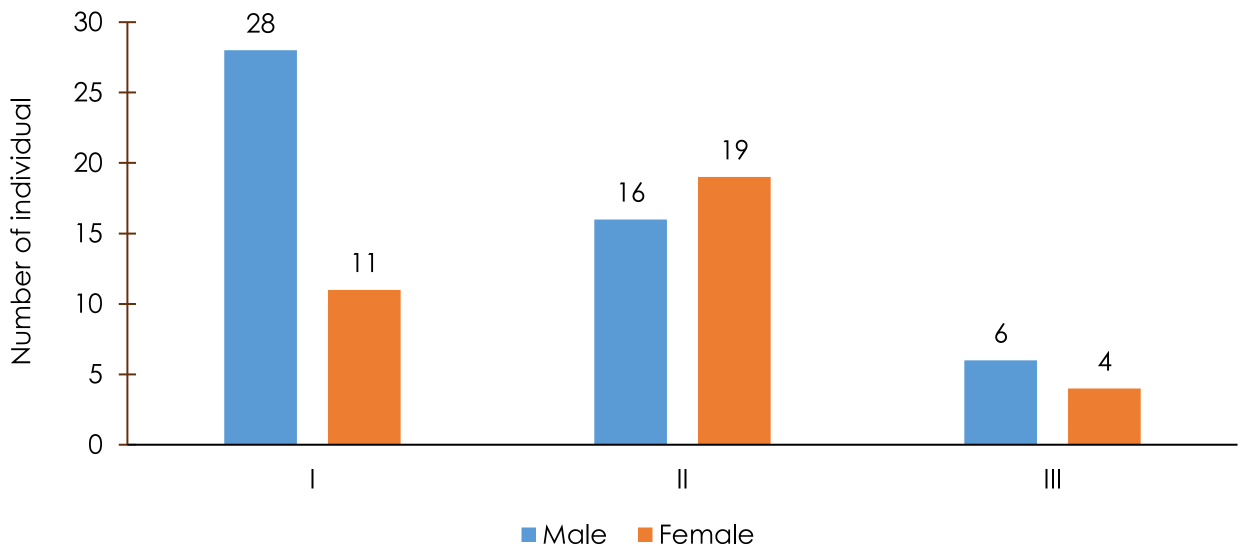


Figure 3. Gonad maturity stage based on sex

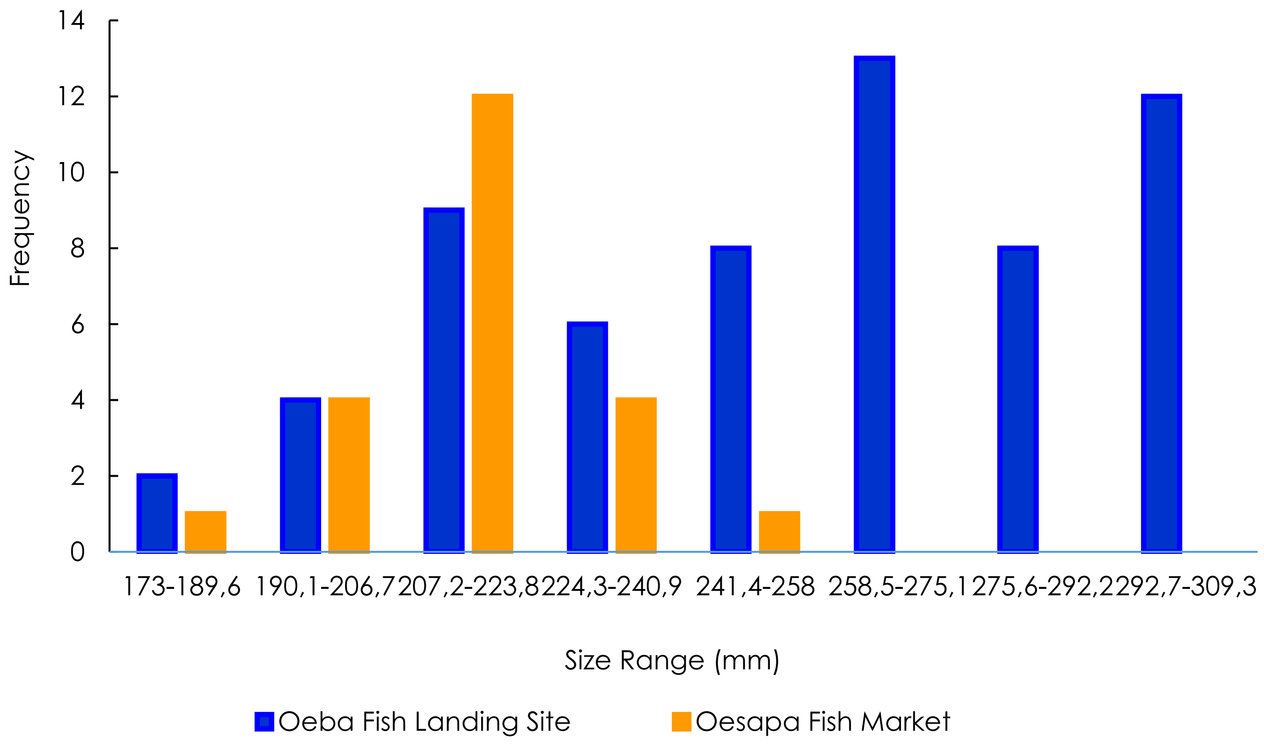


Figure 4. Length-weight distribution of threadfin bream fish at Oeba Fish Landing Site and Oesapa Fish Market

CONCLUSION

The growth of threadfin bream is negatively allometric, meaning that length increases more dominantly than weight. The size distribution of the fish at TPI Oeba ranges from 173-295 mm, while at Oesapa Fish Market it ranges from 173-245 mm. Most of the threadfin bream found are still in the early stages of gonadal maturity, indicating that these fish are young and not yet ready to spawn.

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