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Length-Weight Relationship and Condition Factor of Stingray *Himantura uarnacoides* Landed at TPI Dumai Riau Province, Indonesia

Hubungan Panjang-Berat dan Faktor Kondisi Ikan Pari Himantura uarnacoides didaratkan di TPI Dumai Provinsi Riau, Indonesia

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Abstract

Stingrays are a type of fish that has experienced a reasonably high population decline in nature due to their relatively low reproduction, overfishing, and habitat degradation, so it is feared that they could become extinct. This study analyses the length-weight relationship, condition factors, and growth patterns of *Himantura uarnacoides* stingrays landed at TPI Dumai Riau Province. This study was conducted in May–July 2023 and June–July 2024. The number of samples analyzed was 48 (24 females and 24 males). The results showed that the length of *H. uarnacoides* stingrays that landed at TPI Dumai ranged from 32.5–78 cm. The smallest fish size was in the 27.5–35.5 cm class range. The size of the fish most often caught was in the 51.5–59.5 cm class range. The highest condition factor value of 1.40 was found in the 28–25 cm class range. The length-weight relationship shows the equation $W = 0.000059L^{2.869}$ with a coefficient of determination (R^2) value of 0.911. The growth pattern of the *H. uarnacoides* stingray is negative allometric.

Keywords: Tanjung stingray, Chondrichtyes, Landed, Bycatch

Abstrak

PanIkan pari merupakan salah satu jenis ikan yang mengalami penurunan populasi yang cukup tinggi di alam akibat reproduksinya yang relatif rendah, penangkapan yang berlebihan, serta degradasi habitat sehingga dikhawatirkan dapat mengalami kepunahan. Penelitian ini bertujuan untuk menganalisis hubungan panjang berat, faktor kondisi, dan pola pertumbuhan ikan pari *Himantura uarnacoides* yang didaratkan di TPI Dumai Provinsi Riau. Penelitian ini dilaksanakan pada bulan Mei–Juli 2023 dan Juni–Juli 2024. Jumlah sampel yang dianalisis sebanyak 48 ekor (24 ekor betina dan 24 ekor jantan). Hasil penelitian menunjukkan bahwa panjang ikan pari *H. uarnacoides* yang didaratkan di TPI Dumai berkisar antara 32,5–78 cm. Ukuran ikan terkecil berada pada kisaran kelas 27,5–35,5 cm. Ukuran ikan yang paling sering tertangkap berada pada kisaran kelas 51,5–59,5 cm. Nilai faktor kondisi tertinggi sebesar 1,40 terdapat pada kisaran kelas 28–25 cm. Hubungan panjang-berat menunjukkan persamaan W = 0,000059L2,869 dengan nilai koefisien determinasi (R^2) sebesar 0,911. Pola pertumbuhan ikan pari *H. uarnacoides* bersifat allometrik negatif.

Kata kunci: Pari tanjung, Chondrichtyes, Pendaratan, Tangkapan sampingan

1. Introduction

Indonesian waters have abundant natural resources, including marine fishery resources. Today, Indonesia faces a trend of shark and ray overfishing (Sukmaningrum & Suryaningsih, 2022). Dumai City is one of the cities in Riau Province that has a vital role in marine fisheries. Dumai City is one of the cities in Riau Province that has a significant role in the sea fisheries sector (Djunaidi et al., 2023). Its strategic location on the edge of the east coast of Sumatra Island makes this city the main gateway, with the most extensive port facilities in Riau. The fisheries sector is one of the sectors contributing to the regional economic growth of Dumai City. Every year, Dumai City's fishery production tends to increase, 95% of which comes from the marine fisheries sector (BPS, 2024).

Stingrays are a demersal fish commodity in Indonesian waters, and their catch is decreasing. Dent & Clarke (2015) stated that Indonesia is recorded as the world's largest producer and catcher of sharks and rays. Sharks' vulnerability to extinction is caused by low growth and reproductive rates characterized by late maturity, low reproductive rates and low fecundity. Shark fins are of such high economic value that they are worth more than other shark products, including meat, cartilage, oil, skin, jaws and teeth (Carlson et al., 2007). Other causes of substantial decline are habitat degradation and climate change (Musick et al., 2000). This resulted in a decrease in the shark and ray population. The extinction of sharks and rays will majorly impact the marine food chain. If sharks become extinct, the fish population that is their usual prey (such as tuna) will increase. So, the availability of fish commonly eaten by tuna will also decrease in a short time. The unavailability of food allows these fish to gradually become extinct. In this research, sharks were obtained from fish landings at TPI Dumai.

TPI Dumai is one of the fish landing centres in Riau Province. The landed catch has crucial economic value (Mardiah et al., 2022). TPI Dumai is a place where fish caught by fishermen are landed. The fish that landed consisted of various fish types, including sharks and rays. The activities occur across numerous districts of Dumai City. The landed catches came from sondong fishermen, gill nets, longlines and splint fishing gear (Mardiah et al., 2022). The fishing fleet used by the fishermen consists of boats with engines measuring 3-5 GT. The size of the ship to be used is 10-11 m, with a 2,5 m width and a height of 2 m, and made of wood (Djunaidi et al., 2023). There is still little information and knowledge regarding rays caught by fishermen who landed at TPI Dumai. This encourages the need to research the Length-Weight Relationship and Condition Factor of Stingray *Himantura uarnacoides* Landed at TPI Dumai Riau Province, Indonesia, considering that this species plays a vital role in the balance of the marine ecosystem.

2. Material and Method

2.1. Time and Place

This study was conducted at TPI Dumai, Dumai City, Riau Province, Indonesia (Figure 1), a landing place for fish caught from Dumai waters to the Strait of Malacca in May - July 2023 and June 2024. The research was carried out using a survey method.

Figure. 1. Research site (Google Earth)

2.2. Methods

The data collected in this study were derived from research conducted in the Dumai Waters, Rupat Waters and around the Malacca Strait from May to July 2023 and June to July 2024. Observations were made on a regular monthly basis from the catches of gillnet fishermen who landed their catches at the Dumai Fishing Port. A total of 48 stingray fish were measured for their length distribution.

2.3. Data Analysis

The collected data were tabulated into Microsoft Excel 2020 and analyzed descriptively. The size of the fish class interval with the frequency distribution formula:

$$K = 1+3.32 \log n \quad (1)$$

$$i = (N\ max - N\ min)/K \quad (2)$$

Description:

K	= Number of classes
n	= Number of data
i	= Class interval
N max	= Highest value
N min	= Lowest value

In this study, the relationship between weight and length is defined by two constants: "a" (the coefficient for weight about fish length) and "b" (a parameter describing fish body shape) that follows the general equation as follows:

$$W = aL^b$$

Description:

W : body weight (kg)
L : length (cm)

In the equation above, the parameters "a" and "b" are constants based on the measured length-weight relationship; the measurement of model fit is evaluated by coefficient determination (r2). The t-test was used to examine the difference value of b.

The growth would be isometric (b=3), positive allometric (b>3), or negative (b<3). It is also applied to test the significant differences between males and females. The formula calculates the fish condition factor if the fish growth pattern is isometric. Meanwhile, if the growth pattern is allometric, the condition factor can be calculated using the formula:

$$Kn = W/(aL^b)$$

Description:

K : condition factor
W : body weight (kg);
L : total length (cm)
a,b are constant values

3. Result and Discussion

In this study, the measurement results of *H. uarnacoides* stingrays landed at TPI Dumai (Figure 2) obtained data on varying length and weight. The smallest length was 32.5 cm, and the largest was 78 cm. The smallest weight was 1.3 kg, and the largest was 15.5 kg. The number of *H. uarnacoides* stingrays obtained was 48 (24 females and 24 males). The most fish caught were in the 52-59 class range (19 individuals), and the least was seen in the 76-83 class range (1 individual).

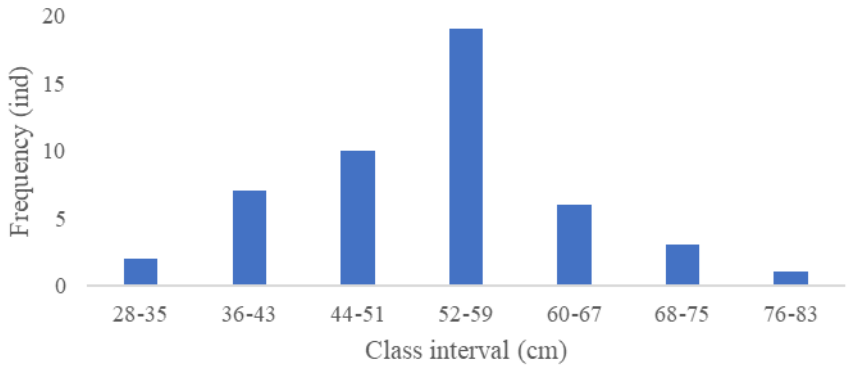

Figure 2. Length Distribution *H. uarnacoides* stingrays landed at TPI Dumai

The catch of *H. uarnacoides* stingrays landed at TPI Dumai came from gillnet fishing gear, similar to research (Aminah & Pratiwi, 2022). The catch of gillnet fish species caught were Snapper *(Lates calcarifer*), Pomfret (*Pampus argenteus*), senangin (*Eleutheronema tetradactylum*), Mackerel (*Scomberomorus guttatus),* Manyung (*Arius thalassinus*), Shark (*Carcharhinus* sp), and Stingray (*Dasyatis* sp). According to fishermen who landed *H. uarnacoides* stingrays, this type is a bycatch. They catch *H. uarnacoides* stingrays because they have economic value. The main types of fish caught at Dumai TPI are senangin fish, biang, shrimp, and crabs, which are not much different from previous research conducted by (Mardiah et al., 2022), types of fish that have important economic value are senangin (*Eleutheronema tetradactylum*), biang (*Setipinna* sp) and manyung (*Arius thalassinus*). In contrast, the types of shrimp consist of white shrimp (*Penaus merguininsis*), striped shrimp

(*Parapenaeopsis sculptilis*) and crab (*Portunus pelagicus*). At the same time, sharks and rays are included in the bycatch, the same as the results of the study (Novianto & Nugraha, 2016) that the bycatch results are successively dominated by dragon fish (*Alepisaurus* spp.), lemer rays (*Pteroplatytrygon violacea*), devil (*Lepidocybium flavobrunneum*) and sickle pomfret (*Taractichthys steindachneri*), then long-beaked species were also caught (billfish), types of sharks and rays (*elasmobranch*), types of teleosts (bony fishes) and olive ridley turtles (*Lepidochelys olivacea*).

The length and weight of *H. uarnacoides* fish obtained in May to July 2023 and June to July 2024 at TPI Dumai (Figure 3) ranged from 32.5-78 cm in length and 1.3 - 15.5 kg in weight. The length-weight relationship calculation results were obtained using equation $W = 0.000059L^{2.869}$. The t-test results performed on the length and weight data with a 95% confidence interval obtained a calculated t value ($t_{count} = 1.33$) greater than the t table ($t_{table} = 0.68$), meaning that the increase in weight is slower than the increase in length.

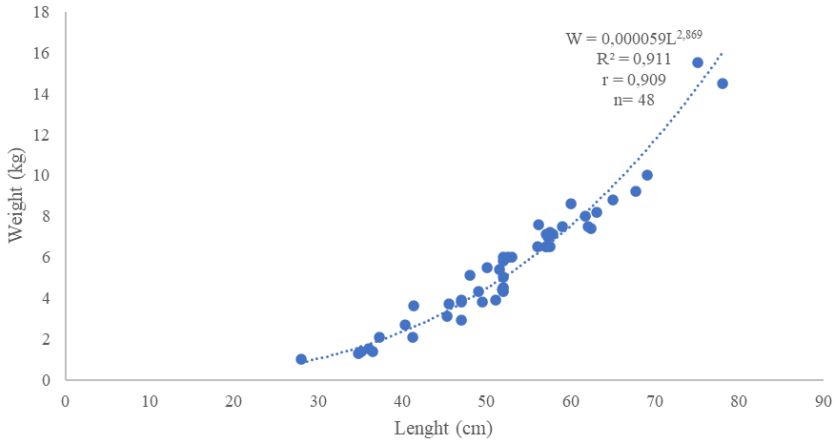

Figure 3. Length and weight relationship

Based on the calculation of length and weight data, the exponential equation $W = 0.000059L^{2.869}$ is obtained. This equation shows that the (intercept) value is 0.000059, and the regression coefficient (slope) is 2.869. The regression coefficient (b) results in less than 3, indicating that H. uarnacoides stingrays in Dumai, Rupat, and around the Malacca Strait are negative allometric. Negative allometric means that *H. uarnacoides* stingrays grow faster in length than in weight.

The results of the condition factor analysis of *H. uarnacoides* stingrays landed at TPI Dumai in May to July 2023 and June to July 2024 obtained a value of 1.40. The lowest condition factor was in the 76-83 cm interval, which was 0.91, while the highest value was in the 52-59 cm interval, with an FK value of 1.06. The results of the condition factor of *H. uarnacoides* stingrays ranged from 0.91 to 1.40. The condition factor values obtained from *H. uarnacoides* stingrays varied for each length size.

4. Conclusions

The conclusions of this study found that the highest condition factor value of 1.40 was found in the 28–25 cm class range. The length-weight relationship shows the equation $W = 0.000059L^{2.869}$ with a coefficient of determination (R^2) value of 0.911. The growth pattern of the *H. uarnacoides* stingray is negative allometric

5. Acknowledgement

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