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Length-Weight Relationship and Condition factor of *Notopterus Notopterus* (Pallas, 1769) from East Pedamaran Floodplain, Ogan Komering Ilir, South Sumatra, Indonesia

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Abstract

The study of length-weight relationships and condition factors is a fundamental component of fisheries management. *Notopterus notopterus* (Pallas, 1769) is a fish species native to Indonesia. They are utilized as a side dish, in the culinary and snack industries, and as ornamental fish. This study aimed to analyze the length-weight relationship and condition factors of *N. notopterus* from the East Pedamaran Floodplain, Ogan Komering Ilir, South Sumatra,

Indonesia. A total of 108 *N. notopterus* samples were used in this study. The results showed that the length-weight relationship of *N. notopterus* was negatively allometric, with the regression equation $W = 0.0948.L^{2.2012}$ ($R^2 = 0.5332$). The condition factor value was 1.02, indicating that the *N. notopterus* population was in good condition. The data from this study are very useful for the sustainable management of *N. notopterus* in the future.

Keywords: Fish Resource, Marsh, Knifefish, Native Species, Swamp

Introduction

The length-weight relationships (LWRs) are important and fundamental components of fisheries management tools (Kumari *et al.*, 2019) ^[11]. It is highly crucial for several biological aspects of the species (Freitas *et al.*, 2017) ^[6], ecological assessments and monitoring (Orlov & Binohlan, 2019) ^[24], the life history of fishes (Ferdaushy & Alam, 2015) ^[5], population stock assessment studies (Augustina *et al.*, 2022) ^[2], understanding maturity and reproduction (Soni & Ujjania, 2017) ^[29], growth and body condition (Zuchi *et al.*, 2020) ^[32], and geographic and seasonal (Lima *et al.*, 2021) ^[13]. The LWRs are an important tool in aquaculture management as they provide information on survival, mortality, growth, and total production (Kaur & Rawal, 2017) ^[9]. The condition factor provides information on the physiological condition of the fish in terms of its well-being (Ighwela *et al.*, 2011) ^[8], overweight status (Ouabb *et al.*, 2021) ^[25], gonadal development, and maturity status (Pathak *et al.*, 2022) ^[26]. It is an index reflecting interactions between biotic and abiotic factors in the physiological processes of fish (Lizama & Ambrosio, 2002) ^[14].

The bronze featherback, or Asian knifefish, *Notopterus notopterus* (Pallas, 1769), is a species of fish native to Southeastern Asia. Its natural habitats are located in Pakistan, India, Bangladesh, Thailand, Myanmar, Malaysia, Laos, the Philippines, Cambodia, Vietnam, and Indonesia (Achakzai *et al.*, 2015; Kyaw *et al.*, 2020; Mohanty & Samanta, 2016; Mustafa *et al.*, 2014; Naeem *et al.*, 2010; Winn *et al.*, 2021) ^[1, 12, 15, 22, 23, 31]. In Indonesia, it has been documented in South Sumatra, Bangka Island, Jambi, Riau, Riau Island, and Kalimantan (Mulyani & Budijono, 2014; Muslim & Syaifudin, 2022; Rapita *et al.*, 2021; Wibowo *et al.*, 2009) ^[17, 19, 28, 30]. The species is reported to inhabit rivers, floodplains, reservoirs, and lakes (Achakzai *et al.*, 2015; Mulyani & Budijono, 2014; Muslim & Syaifudin, 2022; Naeem *et al.*, 2010; Rapita *et al.*, 2021) ^[1, 17, 19, 23, 28]. It feeds on fish, crustaceans, insects, microalgae, nematodes, annelids, macrophytes, detritus, and some young roots of aquatic plants (Achakzai *et al.*, 2015; Rapita *et al.*, 2021) ^[1, 28]. This fish can easily adjust to the conditions of cultivation. As a result, it may one day become a commodity for aquaculture (Muslim *et al.*, 2020) ^[18]. This species is adaptable in aquariums, box containers, and buckets (Muslim *et al.*, 2023; Muslim & Simanjuntak, 2023) ^[21, 20]. The present study was designed to explore length-frequency distributions, length-weight relationships, and condition factors of *N. notopterus* in the East Pedamaran Floodplain, Ogan Komering Ilir, South Sumatra. Findings from the present study will significantly contribute to the successful management of *N. notopterus* to preserve it from possible depletion in the wild.

Materials and Methods

This research was conducted in the Floodplain area of Kayu Labu Village, East Pedamaran Sub-district, Ogan Komering Ilir District, South Sumatra, Indonesia (Fig 1). East Pedamaran Sub-district is one of subdistricts in Ogan Komering Ilir Regency which distance about 72 km to capital of regency. It is located in south east capital of regency. East Pedamaran Sub-district has 10 meters from surface of sea level, and total area is 671.11 km².

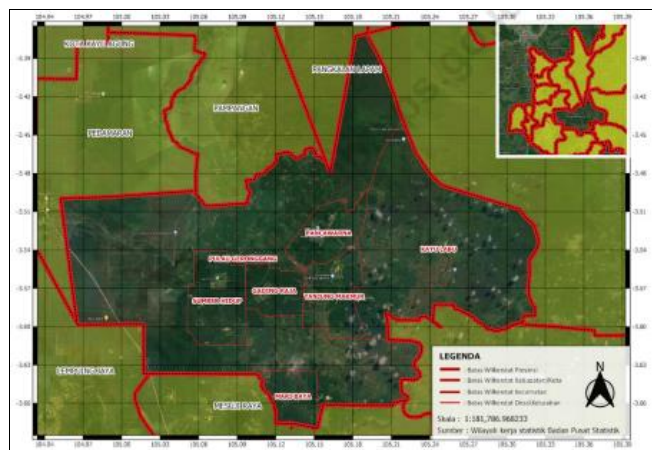


Fig 1: Map of the study site for the length-weight relationship and condition factor of *Notopterus notopterus* (Pallas, 1769) from East Pedamaran Sub-district, Ogan Komering Ilir Regency, South Sumatra, Indonesia

A total of 108 *N. notopterus* were collected from local fishermen at the study site. Traditional fishing gear (gill nets, hand lines, bamboo traps, and fish barriers) was found to be used by fishermen to catch the fish. The fish samples were transported to the UPR Batanghari Sembilan Indralaya, and preserved in 10% formalin until the measurement was taken. In the laboratory, the total length (TL) and body weight (BW) of each specimen were measured to 0.1 cm and 0.1 g accuracy with calipers and an electronic balance, respectively.

The length-weight key of Soni & Ujjania (2017) [29] and the parabolic equation of Froese (2006) [7] were used for the statistical relationship between length and weight. $W = a.L^b$, where W and L are the body weight (g) and total length (cm) of the fish, and a and b are the regression and allometric constants, respectively. The equation has been transformed into the following logarithmic form: $\log W = \log a + b \log L$, and the values of 'a' and 'b' were determined empirically. In the present study, Fulton's condition factor was determined using the formula: $K =$

$W/a \times L^b$, where K is the relative condition factor, W and L are the body weight (g) and total length (cm) of the fish, and a and b are the regression and allometric constants, respectively. The data obtained was tabulated using the Microsoft Excel program. The statistical analysis of the collected data was done with the help of the SPSS program.

Results and Discussion

This study provides information on the length-weight relationship and condition factors of *N. notopterus* from the East Pedamaran Floodplain. The total number of *N. notopterus* samples collected was 108. The total length of the fish ranged from 19 to 26 cm (22.94 ± 1.59 ; $AVG \pm SD$) and body weight ranged from 60 to 162 g (95.24 ± 20.43 ; $AVG \pm SD$) (Fig 2). Four total length class intervals were obtained from the results of the length frequency distribution analysis. The most frequent total length class interval was 21-22.29 cm, and the least frequent was 19-20.99 cm. Seven body weight class intervals were also obtained. The most frequent body weight class groups were 90-104.99 g, the least frequent was 150-164.99 g (Table 1).

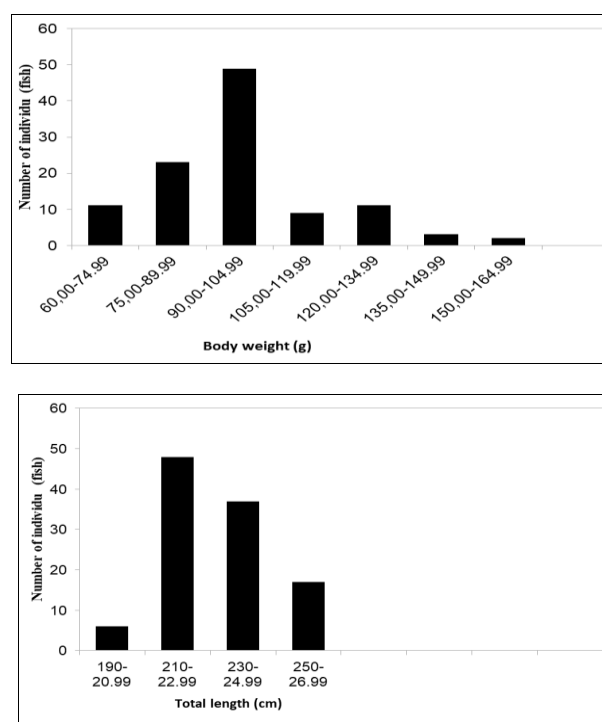


Fig 2: The total length and body weight of *Notopterus notopterus* (Pallas, 1769) from East Pedamaran Floodplain, Ogan Komering Ilir, South Sumatra, Indonesia

Table 1: Size composition of *Notopterus notopterus* collected from East Pedamaran Floodplain, Ogan Komering Ilir, South Sumatra, Indonesia

Class interval of body weight (g)	Frequency	%	Class interval of total length (cm)	Frequency	%
60.00-74.99	11	10.19	19.00-20.99	6	5.56
75.00-89.99	23	21.30	21.00-22.99	48	44.44
90.00-104.99	49	45.37	23.00-24.99	37	43.26
105.00-119.99	9	8.33	25.00-26.99	17	15.74
120.00-134.99	11	10.19			
135.00-149.99	3	2.78			
150.00-164.99	2	1.85			
Total	108	100		108	100

The length-weight relationship of *N. notopterus* in this study was formulated as $W = 0.0948.L^{2.2012}$ (Fig 3). The total length and body weight of *N. notopterus* were positively correlated, with a coefficient of determination (R^2) of 0.5332. The t-test results showed that the regression coefficient (b) was significantly different from 3 ($P > 0.05$). The b value of 2.22 means the value of $b < 3$, indicating a negative allometric growth pattern of *N. notopterus*.

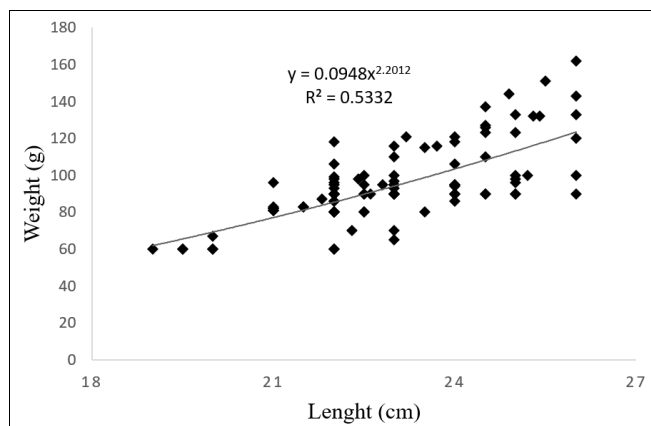


Fig 3: The length-weight relationship of *Notopterus notopterus* (Pallas, 1769) from East Pedamaran Floodplain, Ogan Komering Ilir, South Sumatra, Indonesia

The study of fish length-weight relationships is an essential tool for illustrating some biological aspects of species (Freitas *et al.*, 2017) [6]. It is used to estimate the weight corresponding to a given length, and condition factors are used to compare the "condition", "fatness", or "health" of fish (Basak & Hadiuzzaman, 2019; Froese, 2006; Soni & Ujjania, 2017) [3, 7, 29]. The condition factor indicates the fitness of the species, with the assumption being whether the species retains a reasonable balance between length and weight. The heavier fish of a certain length are in better condition.

The total length of *N. notopterus* sampled in the current study ranged from 19 to 26 cm (22.94 ± 1.59 ; $AVG \pm SD$) and body weight ranged from 60 to 162 g (95.24 ± 20.43 ; $AVG \pm SD$). In a previous study, *N. notopterus* samples from Pokoriya River, Morigaon, Assam India sized 15.4-26.1 cm (TL), 20-142 g (BW) (Kaushik *et al.*, 2019) [10], Sukhna Lake, Chandigarh India sized 21-28.3 cm, 60-240 g (Kaur & Rawal, 2017) [9], Brahmaputra River, Dhuburi, Assam India sized 17.2-25.6 cm, 48.7-151.2 g (Paul *et al.*, 2022) [27], Indus River, southern Punjab, Pakistan sized 14.4-29.4 cm (Naeem *et al.*, 2010) [23], Manchar Lake Sindh Pakistan sized 10-30 cm, 16.5-290 g (Achakzai *et al.*, 2015) [1], Kaptai Reservoir Bangladesh sized 10-33.25 cm (Mustafa *et al.*, 2014) [22], Sunye Lake, Mandalay Region, Myanmar sized 17.1-38.7 cm, 34-420 g (Winn *et al.*, 2021) [31], Sei Gesek Reservoir Indonesia sized 16.9-27 cm (Rapita *et al.*, 2021) [28], Sail River Indonesia sized 13.5-27 cm (Mulyani & Budijono, 2014) [17].

The results of this study show that the growth pattern of *N. notopterus* is negatively allometric. These results are similar to research conducted by Naeem *et al.*, (2010) [23] in the Indus River, Pakistan; the growth pattern of *N. notopterus* is negative allometric. However, in contrast to the results of Achakzai *et al.*, (2015) [1], the growth pattern of *N. notopterus* from Manchar Lake, Sindh, Pakistan, is isometric; from Pokoriya River, Morigaon, Assam, and

Sukhna Lake, Chandigarh, it is positive allometric growth (Kaur & Rawal, 2017; Kaushik *et al.*, 2019) [9, 10]. Negative allometric growth implies that the fish becomes leaner with increasing weight, while positive allometric growth implies that the fish becomes relatively fatter or deeper-bodied with increasing length (Fafioye & Ayodele, 2018) [4]. The Fulton condition factor is a method that is generally used to assess the health index of the fish, indicating the nutritional and physiological status of the fish (Muchlisin *et al.*, 2015) [16]. According to Fafioye & Ayodele, (2018) [4] a low condition factor value indicates that the fish habitat is not fully suitable for fish health. The condition factor value of *N. notopterus* in the current study was 1.02, indicating that the fish were in good condition.

Conclusions

The length-weight relationship of *N. notopterus* has a negative allometric growth pattern (b value $2.84 < 3$). The condition factor value of 1.02 indicates that the *N. notopterus* population in the East Pedamaran Floodplain, Ogan Komering Ilir was in good condition.

Conflict of Interest

The authors declare no conflict of interest.

Acknowledgments

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