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Studies on length and weight relationship of Indian snakehead *Channa striatus*

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Abstract
There has been interest in raising native predator fish species because of their enormous potential for aquaculture. A description of the length-weight relationship for 60 wild and 120 cultivated *Channa striatus* is also included. It is determined that the fish species did not experience weight increases greater than the cube of their total lengths if the length coefficient values in the length-weight relationship are static. There was a substantial (p<0.05) difference in the length between the wild *C. striatus* from Nagercoil and the wild *C. straitus* from Melapalayam (43.3 cm). There was a remarkable (p<0.05) difference found between the wild *C. striatus* from Melapalayam (651.5 gm) and the wild *C. striatus* from Nagercoil. The present study will find the baseline data on the length-weight connection for *Channa striatus* provided by this study relevant in the future.

Keywords: *Channa striatus*, melapalayam, nagercoil, length-weight relationship

1. Introduction
Fish length-weight relationships are established, and these relationships are a helpful indicator for fishery biology (Mendes *et al.*, 2004) [1]. Although taking direct weight measurements in the field can be time-consuming, there are significant benefits in that it allows one to create a mathematical relationship between length and weight, which allows one to estimate the average weight of fish in a given length group (Beyer, 1987) [2]. (Sinovcic *et al.*, 2004) [3]. The length-weight relationship, like any other morphometric characteristic, can be used to compare populations and differentiate taxonomic units in fish sampling programs (Beverton and Holt, 1957) [5]. It has been observed that this relationship changes in response to several life developmental events, including growth, and the arrival of maturity. In addition, yield calculations and population comparisons as a function of time and space can be performed using the length-weight relationship (Morato *et al.*, 2001) [6]. Length usually contributes more in fish than age because of several ecological and physiological factors that are more size-dependent than age-dependent. Accordingly, size variation has significant effects on various facets of population dynamics and fisheries research (Erzini, 1994) [8]. Fish length and weight have a mathematical relationship that serves as a useful indicator for evaluating any animal's growth, maturity, reproduction, and overall health (Le Cren 1951) [4].
According to the theory that heavier fish of a given length are in better condition, condition factor compares the wellbeing of fish (Bagenal and Tesch, 1978) [11]. Growth and feeding intensity have been measured using condition factor (Fagade, 1979) [20]. As length increases, condition factor reduces (Bakare, 1970; Fagade, 1979) [20, 9]; it also affects the fish reproductive cycle (Welcome, 1979) [19].
Because natural predator fish species have great potential for aquaculture, there has been interest in farming these species. The flavor, excellent nutritional content, restorative properties, and therapeutic properties of *C. striatus* are widely known (Haniffa *et. al.*, 2014) [24]. It is particularly given to the elderly and those undergoing convalescence because of its delicate white flesh, lack of intramuscular bones, and its purported recuperative and strength-giving properties (Ling, 1977) [23]. Because snakehead contains specific fatty acids, including prostaglandin and thromboxin, it can speed up the healing of wounds and internal traumas, according to Yaakob and Ali (1992) [21].

As a result, this species is becoming more well-known in the Asian market as a freshwater fish raised for medical uses. The objective of this study is to collect information on the length-weight relationship of harvested and cultivated *C. striatus*.

2. Materials and Methods

Cultured *C. striatus* were obtained from CARE Aquafarm, St. Xaviers College, Tirunelveli, Tamilnadu, India and Arasan Aqua Farm, Araikulam, Tirunelveli, Tamilnadu, India. The wild samples were collected from Nagercoil, Tamilnadu, India and Melapalayam Fish Market, Tirunelveli, TamilNadu, India.

Using a meter rule calibrated in centimeters, the fish's Total Length (TL) was determined by measuring from the tip of its snout to the end of its tail fin (Haniffa *et al.*, 2006) [24]. Fish were measured with a centimeter accuracy. Once the fish had been blotted dried with a fresh hand towel, its weight was determined. A tabletop weighing balance was used to weigh the material to the closest gram. Fish length-weight relationships are typically shown to be exponential. The equation is written as (WT) = a (TL) b. where a and b are constants, WT stands for total weight (grams), and TL for total length (cm). The relationship provided an estimate of the experimental fish's condition factor (K):

$K = \frac{100\ W}{L^3}$ Where, K = condition factor; W = weight of fish (gm); L = length of fish (cm)

3. Results

The one-way Analysis of Variance (ANOVA) was used to examine the weight and length data, and the Tukey test was used to compare the mean values (P<0.05) using statistical package SPSS (11.5 version).

Length and weight comparison between captured and cultured *C. striatus*

Experiment: I

Length of captured *C. striatus* (Nagercoil) in comparison to captured *C. striatus* (Melapalayam) and cultivated *C. striatus* (Care, Araikulam, Kaliyavoor, and Veeralaperunselvi)

When the length of a wild *Channa striatus* taken from Nagercoil was compared to all four cultured *C. striatus* of CARE, Araikulam, Kaliyaoor, and Veeralaperunselvi, significant (p<0.05) variances were noted. The maximum length of the wild *C. striatus* Nagercoil was 40.36 cm, and it differed from the CARE sample length (32.9 cm) (DF=29; F=9.744; p=0.005), Araikulam (38.03 cm) (DF=29; F=3.202; p=0.04), Kaliyavoor (35.56 cm) (DF=29; F=1.872; p=0.03), and Veeralaperunselvi (39.13 cm) (DF=29; F=4. 010; p=0.03) all significantly (p<0.05). Likewise, there was a significant (p<0.05) difference between the wild *C. striatus* in Nagercoil and the wild *C. striatus* in Melapalayam (43.3 cm) (DF=29; F=2.306; p=0.03).

Weight of captured *C. striatus* (Nagercoil) in comparison to captured *C. striatus* (Melapalayam) and cultured *C. striatus* (Care, Araikulam, Kaliyavoor and Veeralaperunselvi)

When the weight of the wild *Channa striatus* taken from Nagercoil was compared with all four of the farmed *C. striatus* of Care, Araikulam, Kaliyavoor, and Veeralaperunselvi, significant (p<0.05) variances were noted. Nagercoil wild *C. striatus* had a maximum weight of 653.5 gm, which differed considerably (p<0.05) from Araikulam (583.50 gm) (DF=29; F=3.404; p=0.001) and CARE (501.16 gm) (DF=29; F=1.816; p=0.057), Veeralaperunselvi (579.50 gm) (DF=29; F=4.564; p=0.000) and Kaliyavoor (410.05 gm) (DF=29; F=1.792; p=0.067). Likewise, there was a significant (p<0.05) difference between the wild *C. striatus* Nagercoil and the wild *C. striatus* Melapalayam (651.5 gm) (DF=29; F=4.330; p=0.000).

Experiment: II

Length of captured *C. striatus* (Melapalayam) in comparison to captured *C. striatus* (Nagercoil) and cultured *C. striatus* (CARE, Araikulam, Kaliyavoor, and Veeralaperunselvi)

When the length of a wild *Channa striatus* obtained from Melapalayam was compared to all four cultured *C. striatus* of CARE, Araikulam, Kaliyaoor, and Veeralaperunselvi, significant (p<0.05) variances were noted. The longest recorded length of Melapalayam wild *C. striatus* was 43.3 cm; this was significantly (p<0.05) longer than the longest recorded lengths of CARE (32.9 cm; DF=29; F=1.622; p=0.123), Araikulam (38.03 cm; DF=29; F=2.897; p=0.005), Kaliyavoor (35.56 cm; DF=29; F=2.323; p=0.022), and Veeralaperunselvi (39.13 cm) (DF=29; F=2.487; p=0.015). Likewise, there was a significant (p<0.05) difference between the wild *C. striatus* from Melapalayam and the wild *C. striatus* Nagercoil (40.36 cm) (DF=29; F=2.130; p=0.036).

Weight of *C. striatus* captured (Melapalayam) in contrast to captured *C. striatus* (Nagercoil) and Cultured *C. striatus* (Care, Araikulam, Kaliyavoor, and Veeralaperunselvi)

When the weight of four cultured *C. striatus* from CARE—Araikulam, Kaliyavoor, Veeralaperunselvi, and Melapalayam was compared with that of wild *C. striatus*, significant (p<0.05) differences were found. The weight of CARE (501.16 gm) (DF=29; F=4.152; p=0.000) was considerably (p<0.05) different from the weight of Melapalayam wild *C. striatus*, which weighed 651.5 gm. Three samples were analyzed: Veeralaperunselvi (579.50 gm), Kaliyavoor (410.05 gm) (DF=29; F=5.059; p=0.000), and Araikulam (583.50 gm) (DF=29; F=4.533; p=0.000). Likewise, there was a substantial (p<0.05) difference between the captured *C. striatus* Nagercoil (653.5gm) and the wild *C. striatus* from Melapalayam (DF=29; F=8.346; p=0.000).

Tables 2.3 and 2.4 show the sample size, weights, and lengths and weights of both captured and cultured *C. striatus*, along with their lowest and maximum means and standard deviations. In every sample, the sample size varied from thirty. The caught sample obtained from Nagercoil has an R2 value of 0.745 (Fig. 2E), while the *C. striatus* sample taken from Melapalayam Fish Market (Fig. 2F), Tirunelveli, has an R2 value of 0.532. The R2 values for the cultured samples obtained from CARE are 0.797 (Fig. 2G), 0.368 (Fig. 2I), 0.807 (Fig. 2J), and 0.801 (Fig. 2H) for veeralaperumselvi, kaliyavoor, and *C. striatus* cultivated at Arasan Aqua Farm, Araikulam, Tirunelveli. When compared to all other b values, the value of b for *C. striatus* cultivated in Kaliyavoor was likewise extremely low (0.359). The growth of three grown samples (CARE, Araikulam, and Veeralaperumselvi) and two caught samples (Nagercoil and Melapalayam) was positively allometric, whereas the *C. striatus* cultured at Kaliyavoor was negatively allometric. Haniffa *et al.*, 2006 [24] have observed a negative allometric growth pattern in *C. punctata*. Fig. 2K displays a graphic representation of the condition parameters of *C. striatus* that has been captured and cultured.

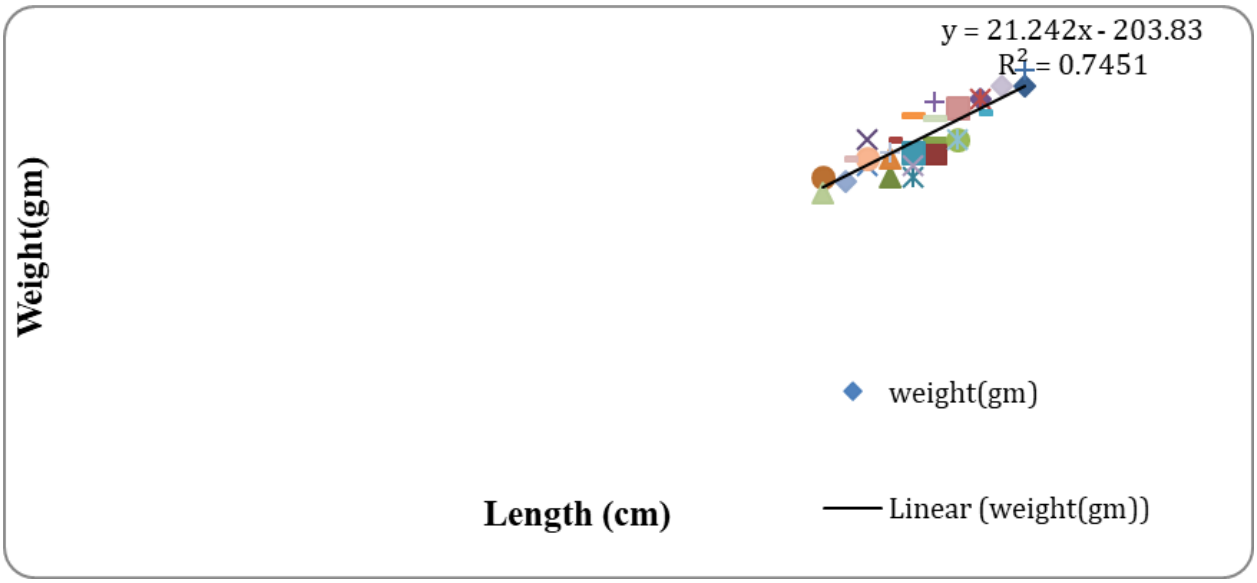

Fig 2E: Lenth - Weight relationships of captured *C. striatus* at Nagerkoil

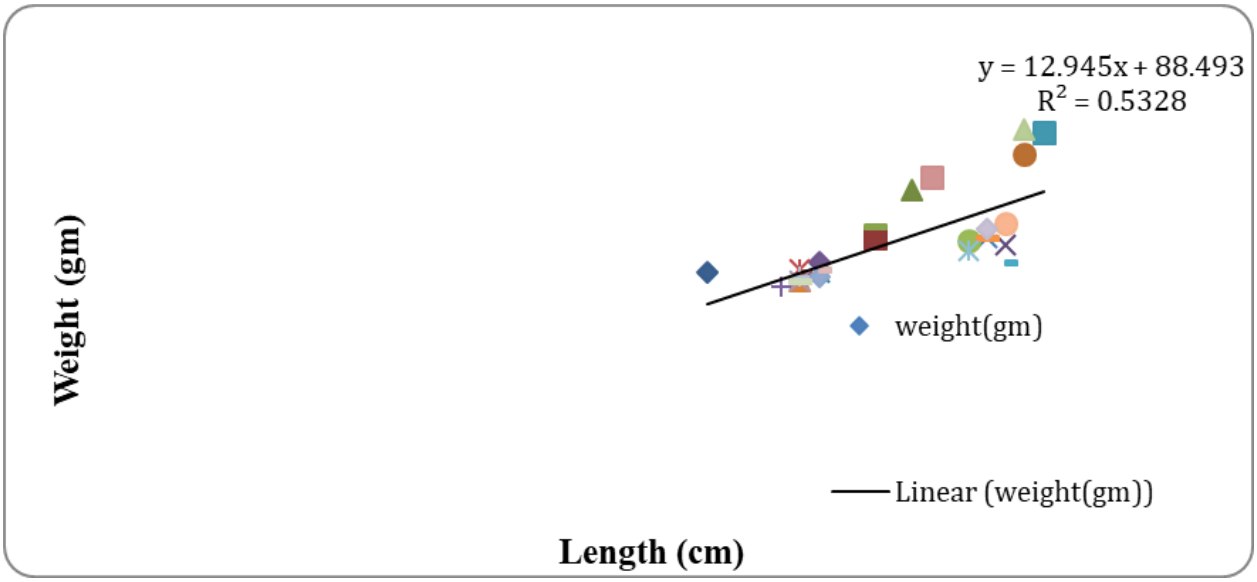

Fig 2F: Lenth - Weight relationships of captured *C. striatus* at Melapalayam

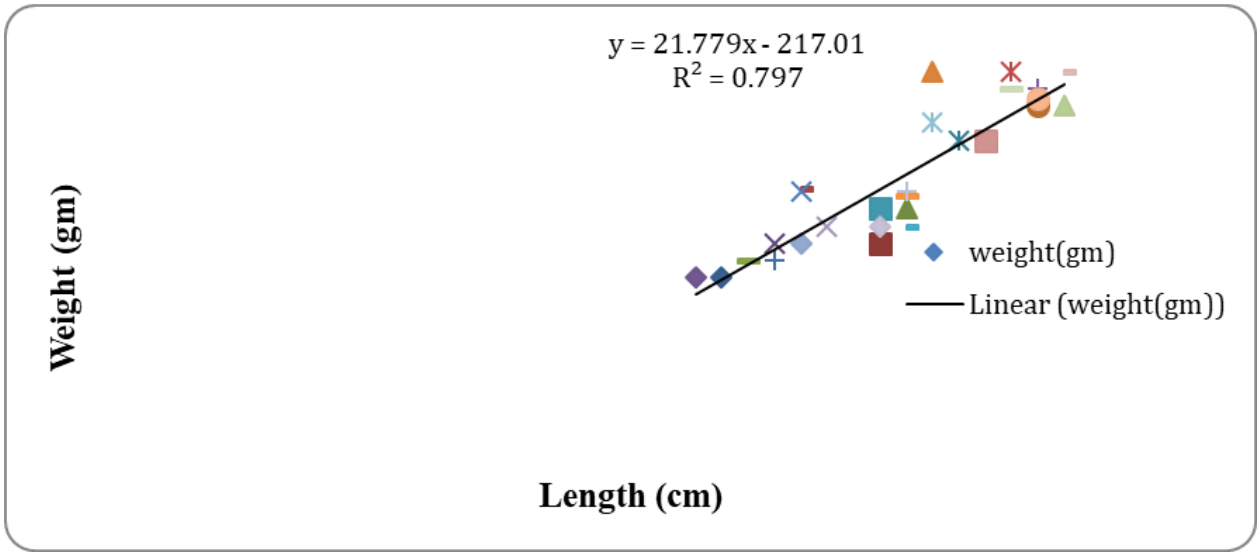

Fig 2G: Lenth - Weight relationships of captured *C. striatus* at CARE Aquafarm

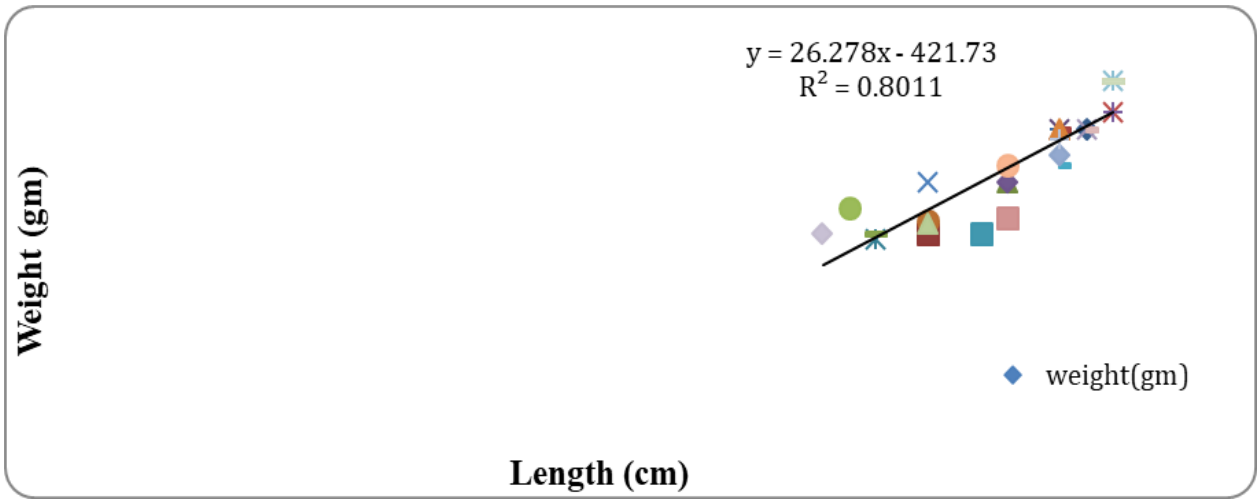

Fig 2H: Length - weight relationship of cultured *C. striatus* at Araikulam

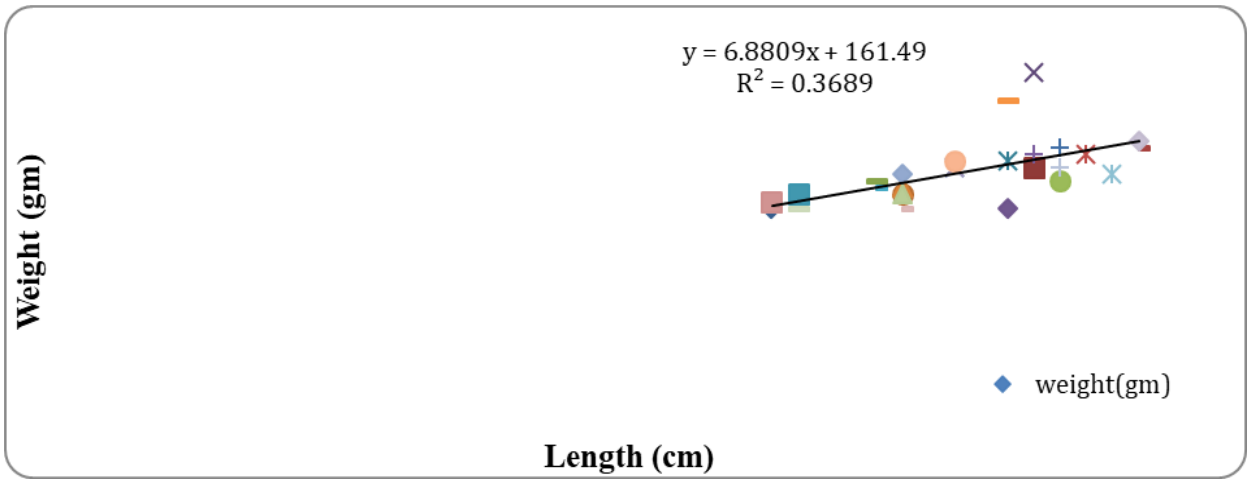

Fig 2I: Length - weight relationship *of* cultured *C. striatus* at Kaliyavoor

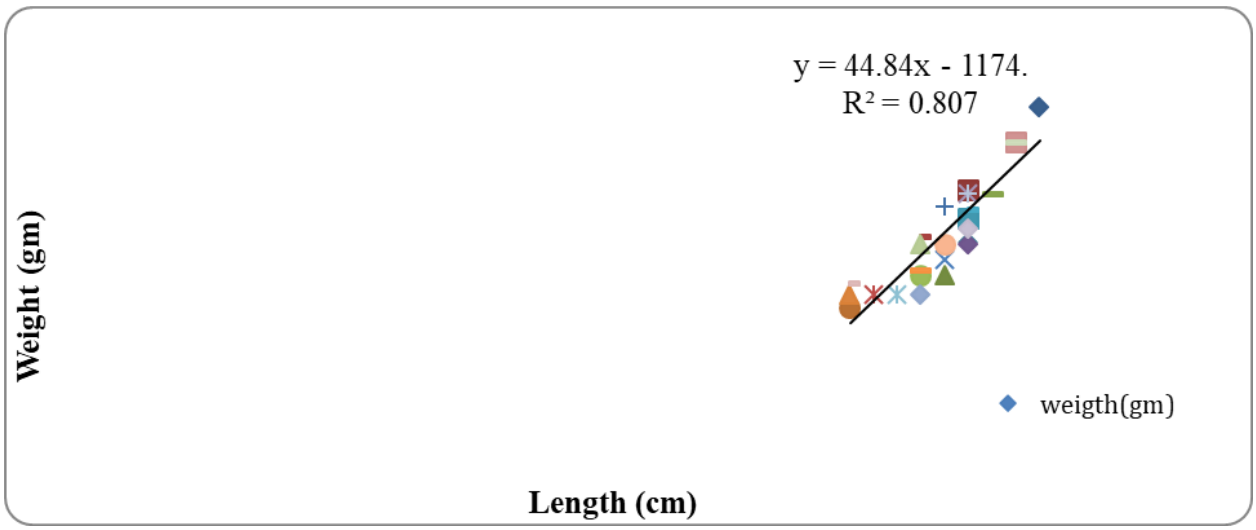

Fig 2I: Length - weight relationship of cultured *C. striatus* at Veeralaperunselvi

Table 1: Length of the captured and cultured *C. striatus*

Place	N	Mean	Min.	Max.	Std. Dev.
Nagerkovil (wild)	30	40.36	36.99	45.17	2.45
Melapalayam (wild)	30	43.3	33.06	51.04	5.35
Care (cultured)	30	32.9	26.34	39.08	4.24
Araikulam (cultured)	30	38.03	31.05	42.25	3.38
Kaliyavoor (cultured)	30	35.56	28.27	42.05	4.10
Veeralaperumchelvi (cultured)	30	39.13	31.07	42.23	2.08

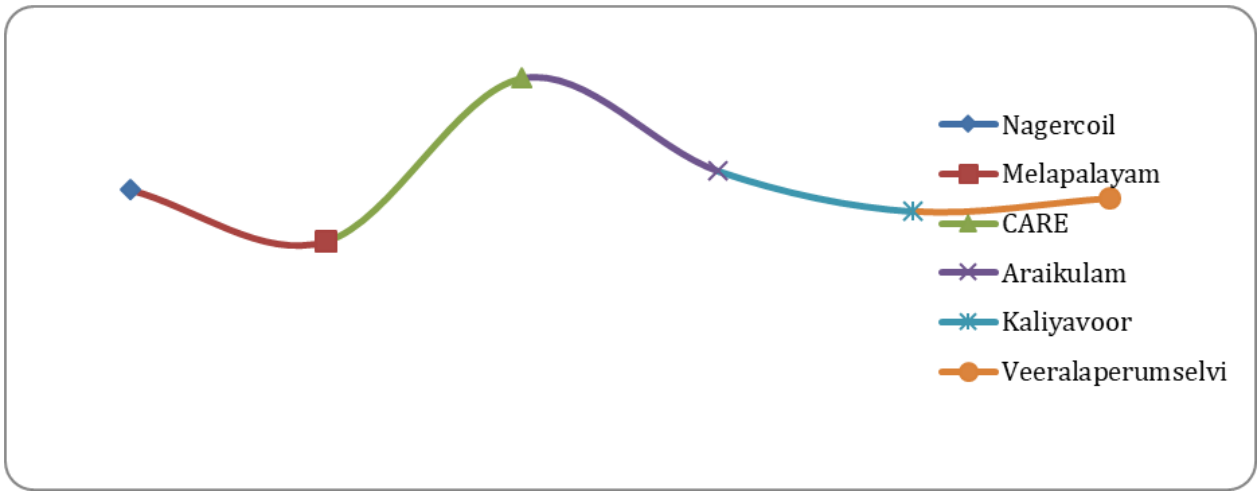

Fig 2k: Condition factor for captured and cultured *C. striatus*

Table 2: Weight of the captured and cultured *C. striatus*

Place	N	Mean	Min.	Max.	Std. Dev.
Nagerkovil (wild)	30	653.5	550.47	780.02	59.79
Melapalayam (wild)	30	651.5	550.99	875.53	98.14
Care (cultured)	30	501.16	350.73	650.71	100.47
Araikulam (cultured)	30	583.50	440.54	740.54	95.69
Kaliyavoor (cultured)	30	410.05	350.64	550.37	52.32
Veeralaperumchelvi (cultured)	30	579.50	450.34	747.52	102.69

4. Discussion

With the exception of *C. striatus* grown at CARE, all of the samples were positively allometric, according to the values found for the length-weight relationship. Both isometric and allometric growth for distinct fish species from different water bodies have been documented by a number of writers. Allometric growth trends for species of Tilapia from Umuoseriche Lake were described by King (1991) [10]. Isometric growth for *Pseudotolithus elongatus* from Qua Iboe Estuary was previously reported by King (1996) [11]. According to Lagler *et al.*, (1977) [12], the transformed length fitted over weight resulted in linear growth, demonstrating the three-dimensional growth structures of the majority of fish species. In the case of an isometric length-weight connection, it is inferred that the fish species did not experience weight increases bigger than the cube of their total lengths.

The weight of the remaining species did, however, rise more quickly than the cube of their combined lengths. Fish health and growth trends can be inferred from length-weight connections (Bagenal and Tesch, 1978) [11]. According to Gayando and Pauly (1997), the isometric growth regression coefficient is "3", and any result that is more than or equal to 3 denotes allometric growth.

Fish's physiological information and variances reflect the factor of condition (K). From a dietary perspective, there is gonadal growth and fat buildup (Le Cren, 1951) [4]. Certain species reach the highest K values in terms of reproduction (Angelescu *et al.*, 1958) [15]. When comparing two populations under various feeding, density, climatic, and other circumstances, K is also significant; figuring out when a population reaches gonadal maturity; and monitoring a species' level of feeding activity to make sure it is utilizing its food source to the fullest (Bagenal and Tesch, 1978) [11].

Through the work of previous authors, Braga (1986) [17] shown how the condition factor's values change with the seasons and are affected by external factors. Given that the floodplain is impacted by numerous biotic and abiotic elements that support the balance of every species in the ecosystem, the same may be happening in the research area. The mean condition factors from this study, which ranged from 0.941 to 0.985, differed slightly from the findings of earlier investigations. For *Clarotes filamentosus* in Lake Oguta, Ajayi (1982) [16] recorded K=0.77-0.81, whereas Nwadiaro and Okorie (1985) [18] found K= 0.49-1.48 in the Andoni River. When compared to *C. striatus* that had been grown, the study's results indicated that the wild samples of the species were in good condition.

5. Conclusion

In order to sum up, this research provides baseline data on the length-weight relationship for *Channa striatus*, which will be helpful to future researchers and management of fisheries.

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