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Length-weight relationship and condition factor of the critically endangered fish of Geso, *Hemibagrus wyckii* (Bleeker, 1858) bagridae from Kampar Kanan River, Indonesia

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Abstract
The studies on length-weight relationships (LWR) and condition factors (K) of Geso (*Hemibagrus wyckii*, Bleeker, 1858, Bagridae) in Kampar Kanan River, Riau, Indonesia was conducted from February to September 2015. A total of 99 specimens were collected from different sample stations using different types of trapsnets and fishing pole. The pooled length–weight regression equation (Log W = -6.1510+3.4536 TL, r = 0.936), and also the length-weight equations of males, females and juveniles (Log W = -4.2274+2.6646 log TL (r=0.94), Log W = -3.4342 + 2.4225 log TL (r = 0.931) and Log W = -2.1968 + 3.0405 log TL (r = 0.913) respectively), indicate positive correlation between length and weight in *H.wyckii*. The mean values condition factor were ranged from 0.692±0.06 to 2.496±0.29, variations in the condition factor were found to be influenced by the gonadal maturity and spawning season.

Keywords: Length-weight relationship, Condition factor, *Hemibagrus wyckii*, Kampar Kanan River

1. Introduction

In other natural water bodies, *Hemibagrus wyckii* is an economically important food fish [1-3]. Distribution of *H. wyckii* are known from the Mekong and Chao Phraya drainages in central Indochina. Also known from the Batang Hari, Musi River drainages in Sumatra, the Citarum drainage in Java, and the Baram, Rejang, Kapuas and Barito River drainages in Borneo, the Pahang River drainage in Peninsular Malaysia [2]. *H. wyckii* is present in Kampar Kanan River Riau Province Indonesia [4, 3] but now it is rarely found by local fishermen because of environmental changes ie sand mining in the river water bodies [5].

To prevent in order *H. wyckii* not extinct, it is very important to domestication, associated with domestication needed data about the length - weight relationship and condition factor. According to [6] study of length-weight relationship has a significant role in fishery biology and has several applications, since various important biological aspects viz., general well-being, onset of maturity and spawning, fecundity etc. can be assessed with the help of condition factor from this relationship.

Length-weight relationship and condition factor of various fishes have been reported, like as of *Ompok pabo* from Tripura India [7], *Chrysichthys nigrodigitatus* from the New Calabar River, Nigeria [8] *Lepturacanthus savala* from Ratnagiri Coast, Maharashtra [9] *Alestes baremoze*, *Brycinus nurse* and *Schilbe intermedius* from the lower reaches of White Volta River [10], *Sperata aor* and *Mystus tengara* from Gomti River Lucknow India [11] and *Clarias gariepinus* from Lake Naivasha, Kenya [12] Therefore, we also want to analyze the length-weight relationship and condition factor of *H.wyckii* from Kampar Kanan River.

The objective of the present work was to elucidate the length-weight relationship and condition factor in *H.wyckii*. Study related to length-weight relationship is also important for understanding the population dynamics. The condition factor was determined with the objective of expressing the condition of the fish in numerical terms i.e., degree of well-being, relative robustness, fatness etc.

2. Materials and Methods

The sample of *H.wyckii* for the study were collected from Kampar Kanan River upstream areas at Kouk village (0° 19' 23.44″ N and 100° 56' 40.05″ E), Air Tiris village (0° 21' 24.77″ N and 101° 06' 04.90″ E) and Tarantang village (0° 21' 05.32″ N and 101° 18' 43.96″ E) with the help of local fishermen using different type of nets namely cast nets, trapsnets and fishing pole, during the period from February to September 2015.

The total length (TL in mm) (i.e. from snout to the end of the caudal fin) of each fish was measured using a meter rule. Weight of each fish was measured using the Digitron T745 weighing balance. Length-weight relationships were calculated using the equation $W = a.L^b$ [13] where W is the body weight of fish in gram, L the total length in millimeters, *a*, the intercept and *b* the slope of the regression line.

In the present study, condition factor or Ponderal index was determined, using the formula: $K = W \times 10^5 / L^3$ where, K = Condition factor; W = weight of the fish; and L = length of the fish; the number 10^3 is a factor to bring the Ponderal index (K) near to unity [14]. Statistical analyses of the data collected were carried out with the help of the SPSS (Statistical Product and Service Solutions, Version 17).

3. Results

Data for all *H. wyckii* (N =99) with a length ranging between 200 to 792 mm and weight between 58.4-4.170 g, collected into a single equation which was calculated as: Log W = -6,1510+3,4536 log TL (r = 0.95)

Where, W = total weight, TL = total length, r = correlation coefficient

A positive correlation between length and weight has been indicated by the correlation coefficient (0.907). The parabolic equation derived is: $W= 0.0000006\, L^{3.4782.}$

The exponential value 'b' obtained was 3.1013, indicated that the length-weight relationship followed the cube law, but based on t test, the value of 'b' did not differ from 3 which applies to all fish (pooled, male, female and juvenile), the growth model of the *H. wyckii* was isometric. Curve length and weight relationships for pooled, male, female and juvenile (Figure 1, 2, 3 and 4). The various regression equations on length-weight relationship of *H.wyckii* are presented in Table 1.

Table 1: Length-weight regression equations of *H.wyckii*

Category	Logarithmic equations	Correlation coefficient	Parabolic equations
Pooled	Log W= -6.1510+3.4536 log TL	0.936	$W = 0.0000006\, L^{3.4782}$
Male	Log W= -4.2274+2.6646 log TL	0,826	$W = 0.000006\, L^{2.7922}$
Female	Log W= -3.4342+2.4225 log TL	0,931	$W = 0.000005\, L^{2.7535}$
Juvenile	Log W= -2.1968+3.0405 log TL	0,913	$W = 0.0000007\, L^{3.1013}$

Length-weight relationship in males and females

The total length of males was based on the examination of specimens ranging from 335 to 663 mm and weight 1237 to 3296 g (N=36), while the total length of females between 546 to 792 mm and weight ranging from 1910 to 4710 g (N= 30). The regression equation for male *H.wyckii* was estimated to be Log W= -4.2274+2.6646 log TL (r = 0.826). The parabolic equation for males obtained was: $W = 0.000006\, L^{2.7922}$. While the regression equation for female *H.wyckii* was estimated to be Log W = -3.4342+2.4225 log TL (r = 0.931). The parabolic equation for females obtained was : $W= 0.000005\, L^{2.7535}$.

Length-weight relationship in juveniles

The length-weight relationship in juveniles was based on the examination of specimens ranging from 200 to 360 mm in total length and ranging from 58.4 to 297.7 g in body weight (N=33). The regression equation for juvenile was estimated as: Log W = -2.1968+3.0405 log TL (r = 0.913) and the parabolic equation for juvenile was found to be : $W = 0.0000007\, L^{3.1013}$.

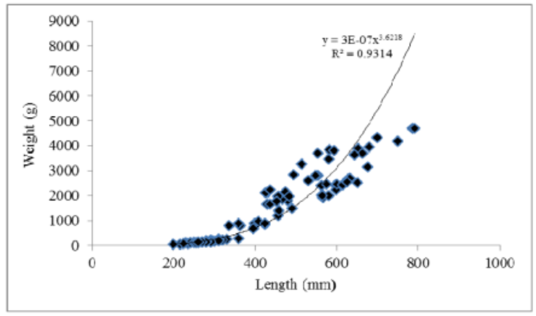

Fig 1: Length-weight relationship pooled of H. *wyckii*

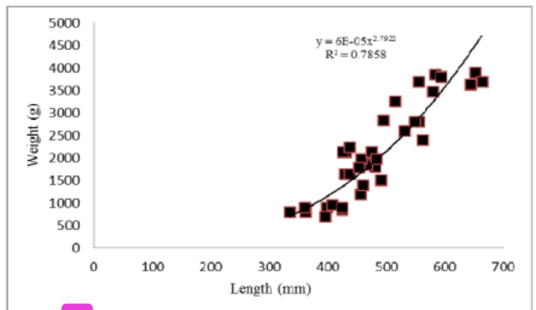

Fig 2: Length-weight relationship of male H. *wyckii*

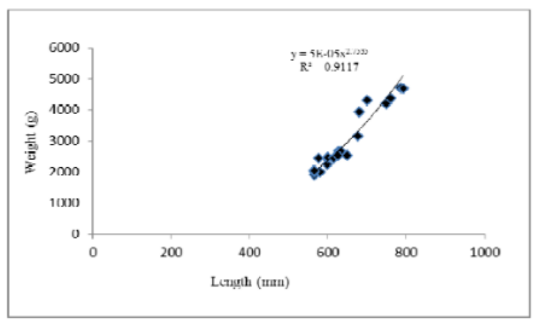

Fig 3: Length-weight relationship of female H. *wyckii*

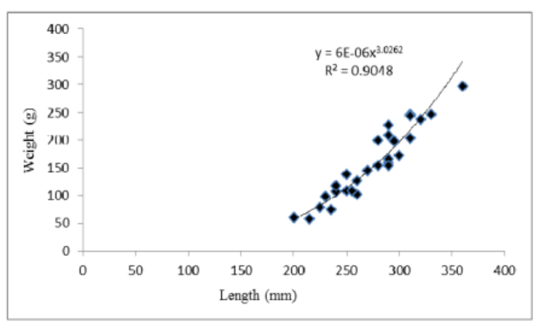

Fig 4: Length-weight relationship of juvenile H. *wyckii*

Condition factor (K)

The condition factor (K) have been calculated for each 40 mm length groups and the results are presented in Table 2.

Table 2: Condition factor (K) in different length groups of *H.wyckii*

Length group (mm)		K
I	200-240	0.692±0.06
II	241-280	0.724±0.03
III	281-320	0.756±0.06
IV	321-360	1,376±1.10
V	361-400	2.496±0.29
VI	401-440	2.104±0.04
VII	441-480	1.940±0.07
VIII	481-520	1.654±0.15
IX	521-560	1.225±0.06
X	600-640	1.121±0.03
XI	641-680	1.110±0.01
XII	681-720	1.224±0.02
XIII	721-760	1.010±0.02
XIV	761-792	0.957±0.01

The 'K' value of the group I increased up to the group V (200-400 mm), there is a peak in the length group V and from group VII to XIV (401-792 mm) K value decreased, again after spawning (Figure 5).

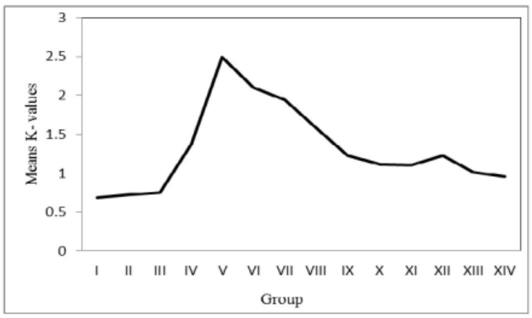

Fig 5: Condition factor in *H.wyckii* (K-values)

4. Discussion

The correlation coefficient of combined data (0.936) show a very high degree of correlation between length and weight in *H.wyckii*. The exponential value of the length – weight relationship (b) obtained in the present study is slightly greater than'3', thereby indicating isometric growth of the fish. The values 'r' and results of 't' test indicated low degree of correlation between length and weight (p<0.01). It was also observed that the length-weight relationship in *H.wyckii* followed the cube law for isometric growth.

The variations in the value of the exponent 'b' is supposed to be under the influence of numerous factors viz., seasonal fluctuations, physiological conditions of the fish at the time of collection, sex, gonadal development and nutritive conditions of the environment as reported by [6] Significant variations (p>0.01) in the values of b were found in the case of juveniles and adults of *H.wyckii*.

Exponential value of *H.wyckii* males, females and juveniles from Kampar Kanan river respectively are 2.6646, 2.4225 and 3.0405. Almost in the same as exponential value of the length-weight relationship 'b' in *Ompok pabo* males, females and juveniles of Tripura India respectively are 3.231, 3.730 and 2.836 with isometric growth pattern [7] and exponential value in *Sperata aor* and *Mystus tengara* Bagridae was 2.55 and 2.65 respectively with negative allometric growth [11] Furthermore from White Volta River, exponential value of the length-weight relationship 'b' in *Alestes baremoze* was 2.9502. In *Brycinus nurse*, the 'b' value was 3.0737 whilst *Schilbe intermedius* had a highest 'b' value of 3.4592 [10] The values of regression coefficient (b) of *H.wyckii* from Kampar Kanan River ranged was 2.7535 to 3.1013. According to [15] the values of regression coefficient (b) usually lies between 2.5 and 4.0. While Tesch [16] reported that the value of 'b' might be between 2.0 and 4.0. However, a variation in 'b' value may occur due to difference in environmental factors, notably the period during and immediately after spawning, affect the length-weight relationship [7] on *H.wyckii* difference exponential value of juveniles, males and females due to the various life stages of fish, weight of the gonads, feeding habits and the presence of small fish in the stomach.

The variations in the condition factor (K) observed in different length groups of *H.wyckii* (Table 2) may be attributed to different factors, such as environmental condition, food availability, sex, age, gonadal maturity and hence increase in body weight, as suggested by many workers [7, 17, 10, 18-20] According to them, study on the variations in the condition factor with increase in length may yield evidences concerning the size at first maturity. With respect to variation in 'K' values with increasing length, in *H.wyckii*, a peak was observed in length group V (361-400 mm) and thereafter it decreased continuously. In contrast with condition factor value of *Ompok pabo*, where the value of the condition factor (K) was higher in juveniles [7].

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