*Tropical Life Sciences Research, 23(2), 59–65, 2012*

# Length-weight and Length-length Relationship of Longsnouted Catfish, *Plicofollis argyropleuron* (Valenciennes, 1840) in the Northern Part of Peninsular Malaysia

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**Abstrak:** Maklumat mengenai hubungan panjang-berat (LWR) dan hubungan panjang-panjang (LLR) bagi ikan duri, *Plicofollis argyropleuron* dalam sistem lotik di utara Semenanjung Malaysia amatlah terhad. Oleh sebab itu, kajian ini penting untuk menyiasat ciri biologi *P. argyropleuron* di Kuala Muda dan Merbok untuk memantapkan pengurusan sistem perikanan pada masa hadapan dan meningkatkan pengetahuan mengenai stok ikan ini. Sampel ikan dikumpul secara rawak di Kuala Muda dan Merbok, Kedah selama 10 bulan dari Mac 2009 hingga Disember 2009. Keputusan kajian ini menunjukkan bahawa nilai eksponen *b* daripada persamaan LWR ($W=aL^b$) adalah menghampiri nilai tiga, yang bermaksud pertumbuhan ikan duri adalah secara isometrik dengan pekali korelasi ($r^2$) yang tinggi. Nilai LLR ($r^2>0.9$) menunjukkan bahawa semua jenis ukuran panjang yang digunakan adalah sangat penting dan saling berkait rapat antara satu sama lain. Justeru, parameter yang diperoleh daripada kajian ini penting untuk menganggar keadaan relatif ikan dan pengurusan spesies serta penilaian stok perikanan.

**Kata kunci:** *Plicofollis argyropleuron*, Hubungan Panjang-berat, Hubungan Panjang-panjang

**Abstract:** Scanty information exists pertaining to the length-weight relationship (LWR) and length-length relationship (LLR) parameters of longsnouted catfish, *Plicofollis argyropleuron* in lotic systems throughout the northern part of Peninsular Malaysia. It is vital to reveal these biological properties of *P. argyropleuron* in Kuala Muda and Merbok estuary for future management and to increase knowledge about this fish stocks. The fish samples were randomly collected in the estuary area of Kuala Muda and Merbok, Kedah for 10 months from March 2009 to December 2009. The values of the exponent *b* in the LWR equations ($W = aL^b$) were approximately 3, indicating an isometric growth with high correlation coefficient ($r^2$). The value of LLR ($r^2>0.9$) indicated that they are highly significant and highly correlated. These parameters are essential for evaluating the relative condition of fish and species managements as well as their fisheries and stock assessment.

**Keywords:** *Plicofollis argyropleuron*, Length-weight Relationship, Length-length Relationship

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## INTRODUCTION

*Plicofollis argyropleuron* or longsnouted catfish is locally known as *ikan duri* in Malaysia. It belongs to the order Siluriformes and family Ariidae. The Ariidae family is comprised of 14 genera and 120 species of tropical and sub-tropical marine catfishes. *P. argyropleuron* feed on detritus, prawns, soft-bodied organisms and mud (Kailola 1999). Generally, these species attain large sizes, are long living, slow growing, have low fecundity and mouth-breed their egg (Velasco & Oddone 2004). The Malaysian waters recorded 17 species of Ariidae and 10 of that those were estuarine and coastal inhabitors (Mansor *et al*. 1998).

The length-weight relationship (LWR) and length-length relationship (LLR) have been applied for basic uses in order to make fish stocks and population assessment (Ricker 1968). In fish, size is generally more biologically relevant than age, mainly because several ecological and physiological factors are more size-dependent than age-dependent. Consequently, length-weight regressions have been used frequently to estimate weight from length because direct weight measurements can be time-consuming in the field (Sinovcic *et al.* 2004).

Present research attempted to provide baseline information for the growth of *P. argyropleuron* on the basis of the LWR and LLR studies. The estimated LWR and LLR of *P. argyropleuron* in this study could provide valuable information for future research in order to make comparison between years and locations.

## MATERIALS AND METHODS

Monthly random samples of 5–7 kg of *P. argyropleuron* were collected from the fish landing sites in Northern Part of Peninsular Malaysia, specifically in Kuala Muda and Merbok, Kedah (Fig. 1). The samples were randomly collected for 10 months from March 2009 to December 2009. Fishes were caught using trammel net and barrier net.

After fish were collected, these samples were temporarily placed in cooling boxes filled with ice and transported to the research laboratory. The collected specimens were systematically identified using the available references (Kailola 1999; Hoese *et al.* 2006). The total length (TL) of each fish was taken from tip of snout to longest ray of the caudal fin. Then, standard length (SL) was measured from the snout to the end of the vertebral column. Caudal fork length (CFL) was measured from the tip of the snout to the end of the middle caudal fin rays. The TL, SL and CFL were measured in centimeters using a measuring board. Lastly, the body weight (BW) in grams was measured to the nearest 0.1 g using electronic weighing balance.

The LWR was determined by using the data on the measurement of length and weight of *P. argyropleuron*. The LWR is expressed by using the equation: $W = aL^b$ (Le Cren 1951; King 1995; Froese 2006), where W = weight of the samples in g, L = length of the sample in cm, a = constant (intercept), b = constant (slope of regression line). The LWR equation was then transformed

into a linear form: *ln W = ln (a) + b ln (L)* (Arshad *et al*. 2008). Furthermore, relationships were estimated for: i) CFL/TL; ii) SL/TL; iii) CFL/SL; iv) TL/BW; v) CFL/BW; vi) SL/BW.

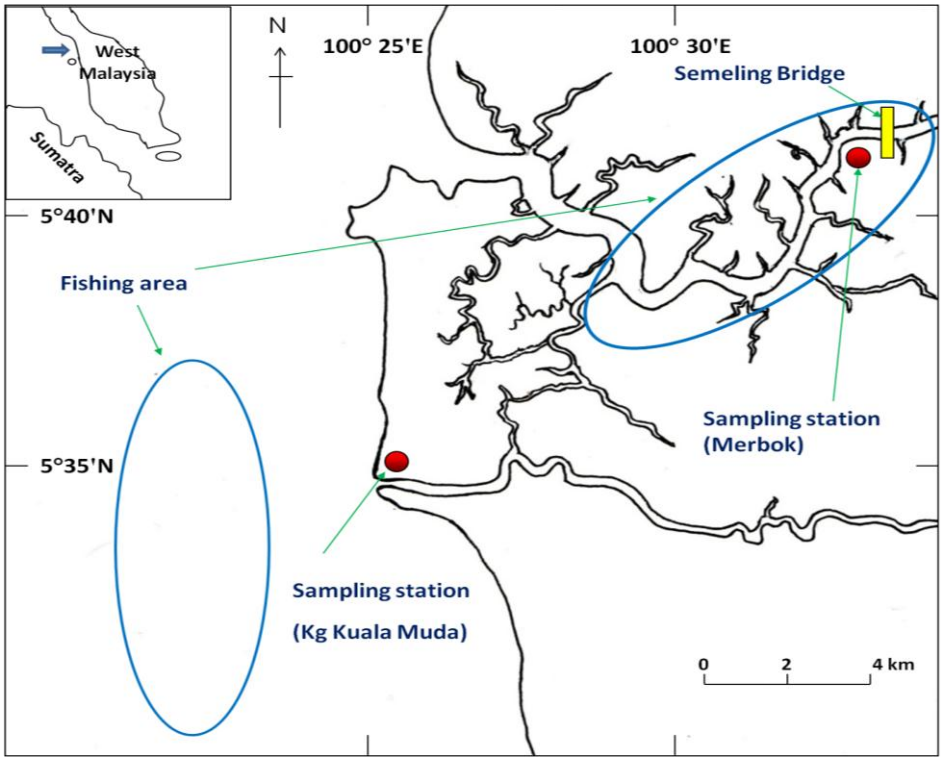


**Figure 1:** Map showing fishing area and sampling station at Kuala Muda and Merbok, Kedah.

## RESULTS AND DISCUSSION

A total of 539 specimens of *P. argyropleuron* were used in this study. The fish specimens ranged from 7.7–32.0 cm in total length and 4.0–455.3 g in body weight. The LWR was calculated by transforming the real data to the linear equation [*ln W = ln (a) + b ln (L)*]. The value of *ln a* = –4.873, –4.455, –4.109 and *b* = 3.089, 3.048, 3.015 were better fitted at $r^2$ = 0.976, 0.9783, 0.9329 respectively. Then these value were transformed into parabolic form and equations obtained were $W = 0.007L^{3.089}$, $W = 0.012L^{3.048}$ and $W = 0.016L^{3.015}$ respectively [Fig. 2(a), 2(b) and 2(c)]. The graph of linear equation of *P. argyropleuron* are shown in Figures 2(d), 2(e) and 2(f). The value of $b<3$ shows negative allometric growth, $b = 0$ shows isometric growth and $b>3$ shows positive allomeric growth (Morey *et al*. 2003). All the *b* values were almost 3,

indicating that *P. argyropleuron* has an isometric form of growth in weight. In simple words, these fish increase in their length with increasing weight in cubic form. According to Pervin and Mortuza (2008), *b* values may range from 2.5 to 4.0 suggesting that the result of this study was valid. Furthermore, the $r^2$ value of LWR of *P. argyropleuron* was relatively high. High correlation $r^2$ proved a strong relationship between the length and weight in this species (Ahemad & Irman 2005).

The value of *b* greater than three indicates that the fish become plump as they increase in length and *b* value lower than three shows that the fish gets slimmer with increasing length (Jobling 2002). There were many factors affecting the value of *b* throughout the fish life. Several important factors such as gonad development and the availability of food in their natural habitats can greatly affect the *b* value. Froese (2006) stressed that the value of *b* can be used to compare the condition of fish at temporal and spatial level. The lotic and lentic environment, polluted and non-polluted environment would also determine the condition of the fish. Fish tend to be heavier in the lotic and lighter in the lentic environment (Mansor *et al*. 2010).

In this study LLR involved the relationships of TL, SL and CFL. The general equation is $y = a + bX$. The conversion factor of *a* and *b* was used to estimate the length needed. Regression equations for LLR are as follows:

SL = 1.106 TL + 1.667 [Fig. 3(a)]

CFL = 1.059 TL + 0.815 [Fig. 3(b)]

CFL = 0.903 SL + 0.363 [Fig. 3(c)]

Results for LLR indicated that the value of correlation coefficient ($r^2$) are highly correlated, $r^2 > 0.9$ at $p < 0.05$. Therefore, LLR is important in fisheries management for comparative growth studies (Moutopoulos & Stergiou 2002). The present study would provide baseline information for the growth of *P. argyropleuron* on the basis of length-length and length-weight. Results for all LLR indicated that the value of correlation coefficient ($r^2$) are highly correlated, $r^2 > 0.9$. The value for correlation coefficient ($r^2$) were 0.929, 0.981 and 0.940 (Fig. 3). All these value were greater than 0.9, hence it is highly significant ($p < 0.05$).

## CONCLUSION

*P. argyropleuron* inhabiting Northern Part of Malaysia was between 7.7–32.0 cm in total length. All the LWR equation of *P. argyropleuron* showed an isometric form of growth and all the LLR of *P. argyropleuron* showed that all types of length measurement was significant and highly correlated between each other, $r^2 > 0.9$ at $p < 0.05$. These information would be useful for the baseline of LWR and LLR of these fish stocks.

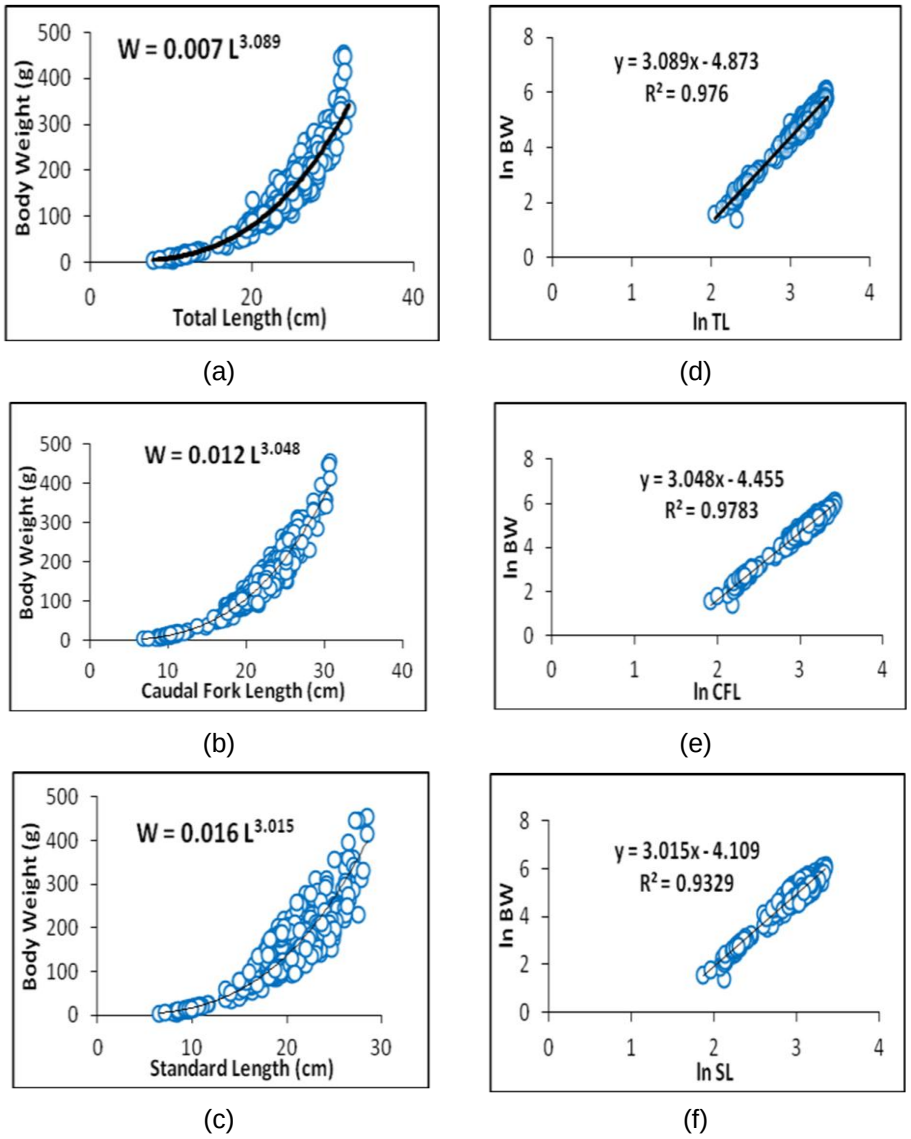


**Figure 2:** Graph of LWR of *P. argyropleuron* showing (a) $W = 0.007L^{3.089}$, (b) $W = 0.012L^{3.048}$, (c) $W = 0.016L^{3.089}$ and graph with regression equation for *P. argyropleuron* showing (d) ln BW = 3.089, ln TL – 4.873, (e) ln BW = 3.048, ln CFL – 4.455, (f) ln BW = 3.015, ln SL – 4.109.

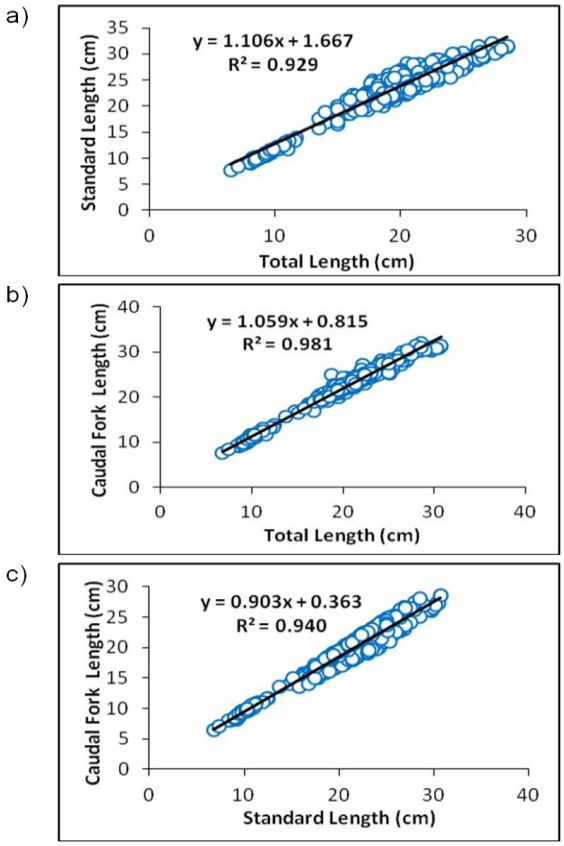


**Figure 3:** Graphs with regression equation and coefficient of determination ($r^2$) for *P. argyropleuron* showing length-length relation: (a) SL = 1.106 TL + 1.667, (b) CFL = 1.059 TL + 0.815, (c) CFL = 0.903 SL + 0.363.

## ACKNOWLEDGEMENT

Authors would like to thank the fishermen who cooperated with us. Authors also acknowledge School of Biological Sciences, Universiti Sains Malaysia, Pulau Pinang, Malaysia for providing transport to the sampling location and the facilities to conduct this study.

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