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# Preliminary Assessment on Autecological Studies of Beardless Barb, *Cyclocheilichthys apogon* (Valenciennes, 1842) from Muda Reservoir of Kedah, Malaysia

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**Abstract:** Like many other countries, reservoirs in Malaysia are primarily built for various functions such as hydroelectric power generation, drinking water supply, flood mitigation and irrigation for agricultural purposes. Artisanal fisheries activities were also performed in these reservoirs. The freshwater fish are a requisite source of protein for the rural population. Consequently, the fish resources in reservoirs should be carefully maintained at sustainable level. Present study elucidates the preliminary assessment on autecological studies of beardless barb, *Cyclocheilichthys apogon* as a model of fish biota in Muda Reservoir. This research investigates the growth pattern of *C. apogon* using length-weight relationship and their condition factor. A total of 307 specimens were captured using cast net for six consecutive months from March 2014 until August 2014. The growth coefficient (b) from the length-weight equation ($W = aL^b$) for male and female of *C. apogon* were 3.150 and 3.185, respectively, indicating positive allometric growth. The condition factor values of male and female of *C. apogon* were 1.023 ± 0.111 and 1.026 ± 0.100, respectively, suggesting that *C. apogon* is in good condition in Muda Reservoir. The paucity of research on the autecological study in the Muda Reservoir contributes to the main reason of performing this research. The findings will serve as baseline information of this species in Muda Reservoir, as well as for comparative study in the future.

**Keywords:** *Cyclocheilichthys apogon*, Autecological, Length-weight, Condition Factor

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## INTRODUCTION

Muda Reservoir is a man-made lake located at the northeastern part of Kedah, serves as water catchment for agricultural, domestic, and industrial usage for areas in Perlis, Kedah, and Penang. It is ecologically and economically important for the livelihood of the people that live near to the reservoir. As reported by Amir Shah *et al.* (2006) and Lee *et al.* (2013), Muda Reservoir is inhabited by more than 30 species of fishes. Lee *et al.* (2013) reported that the fish landing in Muda Reservoir increased by year 2010. This increment will negatively affect the fisheries resources via overfishing besides water pollution. Thus, fisheries activities in Muda Reservoir need to be more ecologically friendly and sustainably planned.

*Cyclocheilichthys apogon* or locally known as "ikan temperas" is an attractive coloured cyprinid fish, living mainly in Southeast Asian river systems (Zakaria-Ismail 1994). According to Lee *et al.* (2013), this species is one of the artisanal wide capture fish by the people near to the Muda Reservoir. This species also has been processed as fermented fish or "ikan pekasam" and their price may reach up to RM 20 per kilogram. *C. apogon* has been chosen for further study on length-weight relationship (LWR) and condition factors. LWR and condition factors are important to provide information on the general well-being and estimates the growth patterns of a fish population (Patel *et al*. 2014). The study on the length-weight relationship of *C. apogon* in Peninsular Malaysia was only reported by Mohd-Shafiq *et al.* (2012) from Kerian River Basin, Perak and Muzzalifah *et al.* (2012) from Temengor Reservoir and Bersia Reservoir, Perak. Thus, objective of this study is to compare the findings of present study with previous reports.

## MATERIALS AND METHODS

This study took place at Muda Reservoir and its tributaries. Five sampling stations were chosen namely Sg. Labua, Sg. Sira Jawa, Sg. Nyeh, Sg. Debu, and Sg. Teliang (Fig. 1). Fish samples were collected monthly from March to August 2014 by using cast net (9 feet height, 4 m diameter and 2 cm mesh size). The fishing operation was conducted by one skilled fisherman by randomly casting for 20 times per sampling station. Captured fish were sexed, measured, and weighted. Further extent, the length-weight relationships (LWR) of *C. apogon* were estimated using the equation $W = aL^b$ (Le Cren 1951; Ricker 1973), where W = body weight (g), $L$ = total length (cm), $a$ = constant (intercept), and $b$ = growth exponent. Then, the condition factor was calculated using Fulton's condition factor ($K$) equation; $K = 100W/L^3$ (Pauly 1983), where $K$ = condition factor, $W$ = body weight (g), and $L$ = total length (cm).

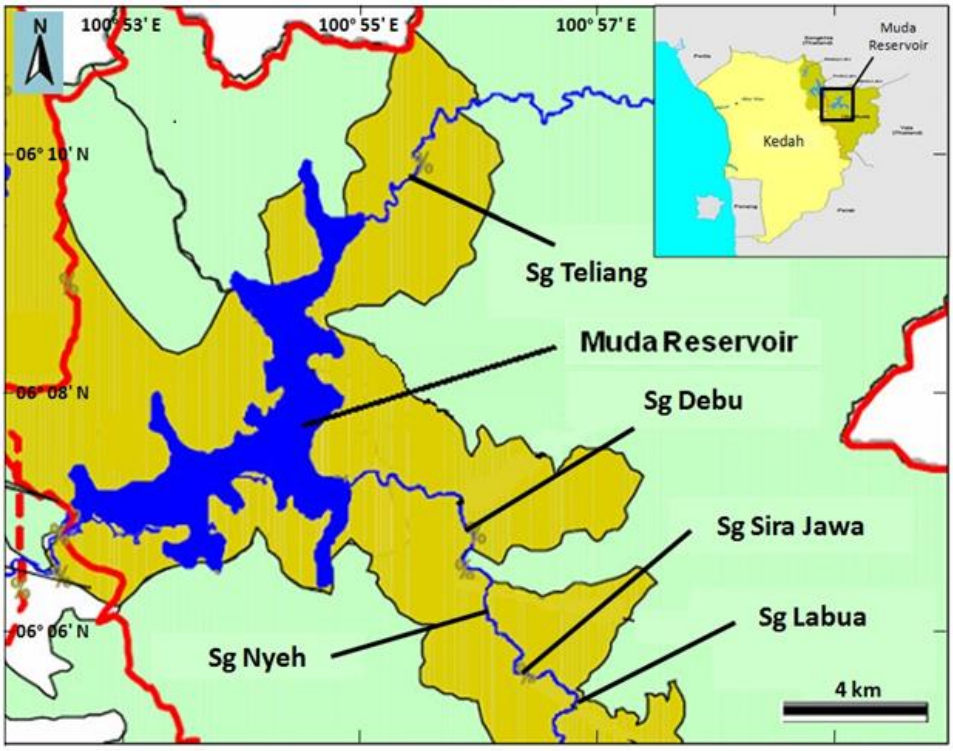


**Figure 1:** Map of Muda Reservoir, Kedah, Malaysia (modified from WWF-Malaysia Project Report; Lee *et al.* 2013).

## RESULTS

A total of 307 of *C. apogon* specimens were collected during the study period which comprised of 166 males and 141 females. The range of total length and body weight of males and females *C. apogon* from Muda Reservoir is shown in Table 1. The highest total length and body weight was recorded by the female and the lowest total length and body weight was recorded by the male. The regression analysis yielded higher values of *a* for male compared to female. Female gives greater values of *b* and regression coefficient ($r^2$) compared to males. The average condition factor for male and female of *C. apogon* in Muda Reservoir, Kedah is shown in Table 2. The male recorded greater condition factor value compared to female. However there were no significant differences of condition factor between male and female.

**Table 1:** Length-weight parameters of *C. apogon* in Muda Reservoir, Kedah.

| Sex | n | Range | | Length-weight parameters | | | | $r^2$ |
|---|---|---|---|---|---|---|---|---|
| | | Total length (cm) | Body weight (g) | a | b | ±95% Cl of a | ±95% Cl of b | |
| Males | 166 | 5.7–13.0 | 1.7–24.8 | 0.007 | 3.150 | 0.0057–0.0088 | 3.0202–3.2801 | 0.945 |
| Females | 141 | 6.0–14.0 | 2.4–32.6 | 0.006 | 3.185 | 0.0059–0.0091 | 3.0424–3.3295 | 0.958 |

*Notes:* n = total samples, a = constant (intercept), b = growth exponent (slope), Cl = confidence level.



**Table 2:** Condition factor of *C. apogon* in the Muda Reservoir, Kedah.

| Sex | Minimum | Maximum | *K* (mean ± SD) |
|---|---|---|---|
| Male | 0.744 | 1.588 | 1.023 ± 0.111 |
| Female | 0.746 | 1.509 | 1.026 ± 0.100 |

## DISCUSSION

Generally, the growth pattern of fish can be estimated by using the length-weight relationship (LWR). The LWR of fishes are vital in population assessment (Ricker 1968; Khaironizam & Norma-Rashid 2002) and can be time-consuming in the field sampling (Sinovcic *et al*. 2004). Froese (2006) and Mansor *et al.* (2012) divided the growth pattern using *b* value from LWR equation ($W = aL^b$) into three; $b = 3$, isometric; $b > 3$, positive allometric; and $b < 3$, negative allometric. In this study, the *b* value for male and female *C. apogon* were 3.150 and 3.185, respectively, indicating positive allometric growth pattern. Similar growth pattern were found from the study by Mohd-Shafiq *et al.* (2012) and Muzzalifah *et al.* (2012) as tabulated in Table 3. However, variations in growth pattern for other cyprinid species were reported by Mansor *et al.* (2010). The variations are mainly due to the differences in length and weight, food availability, and other environmental conditions.

**Table 3:** The length-weight relationship (LWR) of *C. apogon* in the Muda Reservoir, compared to other locations.

| Location | LWR ($W = aL^b$) | Reference |
|---|---|---|
| Kerian River Basin, Perak | Unsexed: $W = 0.002L^{3.623}$ | Mohd-Shafiq *et al.* (2012) |
| Temengor Reservoir, Perak | Unsexed: $W = 0.004L^{3.363}$ | Muzzalifah *et al.* (2012) |
| Bersia Reservoir, Perak | Unsexed: $W = 0.002L^{3.414}$ | |
| Muda Reservoir, Kedah | Female : $W = 0.007L^{3.150}$ | This study |
| | Male : $W = 0.006L^{3.185}$ | |

Pervin and Mortuza (2008) investigated that *b* value may range from 2.5 to 4.0, which corroborates the result of this study. Nevertheless, there were variations in the *b* exponents for the different sex of *C. apogon*. The *b* value of male *C. apogon* was slightly less than the females because the females were heavier than the males for any given length, which is in agreement with studies by Hossain *et al*. (2008) and Miranda *et al.* (2009). Generally the allometric growth for fish was influencing by factor of areas, habitats, seasons, stomach fullness, preservation techniques, sexes, gonadal maturity, and health (Tesch 1971).

The correlation coefficients ($r^2$) calculated from the data were significant ($p<0.001$), suggesting that length and weight were highly correlated. The condition factor (*K)* is usually used to exemplify the general well-being or fitness of a fish stock (Bolger & Connoly 1989). In this study, the *K* values between the male and the female *C. apogon* were almost the same. However, the *K* values may vary among species. This is probably because the *K* value may be affected by feeding intensity and spawning cycle (Shabir *et al*. 2012). Le Cren (1951) stated that *K* larger than one indicates better condition of fish. Low *K* value indicates slow growing fish. This is because energy is also transferred and used for activities such as growth and emptying of ovaries (Samat *et al*. 2008). There was no significant difference in the *K* values between male and female of

*C. apogon*. The *K* values in this study were greater than one, indicating that the condition *C. apogon* in the Muda Reservoir is good.

## CONCLUSION

The growth pattern of *C. apogon* in Muda Reservoir was found to be positive allometric. The condition factor value showed that *C. apogon* in Muda Reservoir is in comparatively good condition and conducible for their optimum growth. Hopefully this preliminary baseline information will be useful for future comparison in other localities.

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