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FEEDING HABIT AND LENGTH-WEIGHT RELATIONSHIP OF A MUDSKIPPER *APOCRYPTES BATO* (HAMILTON, 1822) FROM THE COAST OF CHITTAGONG, BANGLADESH

MOHAMMED SADEQUER RAHMAN, MOHAMMAD MIZANUR RAHMAN*, MD. SOHEL PARVEZ[1] AND MD. RASHED-UN-NABI

Institute of Marine Sciences and Fisheries, University of Chittagong, Chittagong-4331, Bangladesh

ABSTRACT

Diet analysis revealed that *Apocryptes bato* is a carnivorous fish. It depends on shrimps and non-shrimp crustaceans mainly. Shrimps include *Acetes*, penaeid and metapenaeid juveniles, whereas non-shrimp crustaceans include copepods, crab larvae, mysids and amphipods predominantly. The total body lengths (TL) varied between 11.20 and 22.20 cm and weight 16.70 to 43.50 g in male fish. The form of the equation for TL and weight relationship was $W = 0.44TL^{2.57}$ and for standard length (SL) it was $W = 1.009SL^{2.66}$. Condition factor (K) ranged from 0.87 to 1.23. The TL was 15.00 to 26.00 cm and weight as 25.1 to 38.50 g in female. The equation was $W = 1.001TL^{2.52}$ for TL and $W = 1.003SL^{2.63}$ for SL and K value ranged from 0.95 to 1.106. The coefficient of correlation was tested with t test and found highly significant at the 5% level of significance for TL and SL both in the case of male and female.

Key words: Food and feeding, Carnivorous, Condition factor

INTRODUCTION

Apocryptes bato (Hamilton, 1822), a mudskipper popularly known as 'Chiring' or 'Dali Chewa' is one of the common coastal fishes of Bangladesh found throughout the year, mostly in dry season (Islam *et al*. 2006). It is distributed in the coastal shallow water of the Bay of Bengal from the east coast of India to Myanmar and the Malay Archipelago (Day 1958, Day 1878, Murdy 1989).

Food and feeding habits of the fish were studied with a view to determining annual and the stage-wise requirement of food to develop its aquaculture and augmenting its production throughout the country. Growth in terms of length and weight is a continuous process with fluctuating velocity in fishes. This fluctuation is more frequent in case of fishes of tropical water due to variation in seasons multiple and spawning variations in food composition (Rounsefell and Everhart 1953, Lagler 1956, Bashirullah and Kader 1970). Length and weight of fishes bear a specific relationship, if there is no significant

* Corresponding author: <mizan@cu.ac.bd>.
[1] National Oceanographic Research Institute (NORI), Ramu, Cox's Bazar, Bangladesh.

change in form and specific gravity throughout life and from this relationship the physical well-being of a fish can be ascertained for a given body of water at a given time (Doha and Dewan 1967). Knowledge of length-weight relationship is essential for growth equation in production computation (Rao 1974). As no work has been done on length-weight relationship of *Apocryptes bato*, attempts have been made to establish the length-weight relationship of this marine mudskipper to find out the physical well-being of the fish and to establish the fact whether the fish is ideal in its growth or not as knowledge regarding growth is essential in its farming and marketing.

MATERIALS AND METHODS

Fishes were collected from Firingi Bazar-Fisheries Ghat Landing Centre and three local markets of Chittagong, namely Kazir Dewri Bazar, Karnafully market and Riazuddin Bazar during June 2009 to February 2010. In all 132 samples were collected of which 72 were males and 60 females. After collecting the specimens, they were brought to the laboratory for further analysis. After washing the specimens in the laboratory, lengths and weights were measured. The dissected stomach of each specimen was placed in a glass Petri dish and the content removed by scrapping the inner mucosa with a spatula. The weight of the contents was taken and food items identified.

Gut contents were analyzed according to the gravimetric method after Lagler (1956). The numbers of stomach with and without food were numbered month-wise and their percentage occurrences were calculated for both male and female separately. For identifying the gut contents the work of Wickstead (1965), Khan (1976), Tirmizi (1967), Menon (1965) and Newell and Newell (1973) were followed. The length-weight relationship was obtained using the widely used formula, $W = CL^n$ (Hile 1936, LeCren 1951, Rounsefell and Everhart 1953, Doha and Dewan 1967) where 'C' is a constant, 'n' is an exponent, 'W' is the weight and 'L' is the corresponding length.

RESULTS AND DISCUSSION

The stomach contents of 132 fishes in general showed the items of food both in male and female fishes as the shrimps and other crustaceans. No fish, fish larvae, even any partially digested fish remains were found in any stomach of both male and female in this investigation. The number of fishes with empty stomach were highest (75%) in September and lowest (14.29%) in July in male. But in female the number of fish with empty stomach were highest (66.67%) in August and lowest (20%) in June (Fig. 1).

Maximum (64.53%) shrimps were found in October and minimum (40.81%) in January in male. But in female these were found highest (75.47%) in September and lowest (40.53%) in June (Fig. 2).

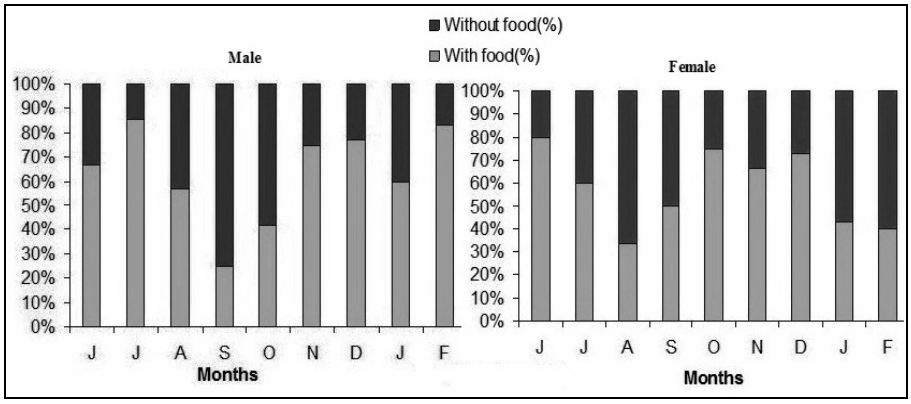

Fig. 1. Percentage of stomachs with food and without food.

Crustaceans (other than shrimps) were found maximum (26.18%) in January and minimum (13.76%) in June in male, whereas in female fish the highest (22.92%) value was found in June and the lowest (0.88%) in November.

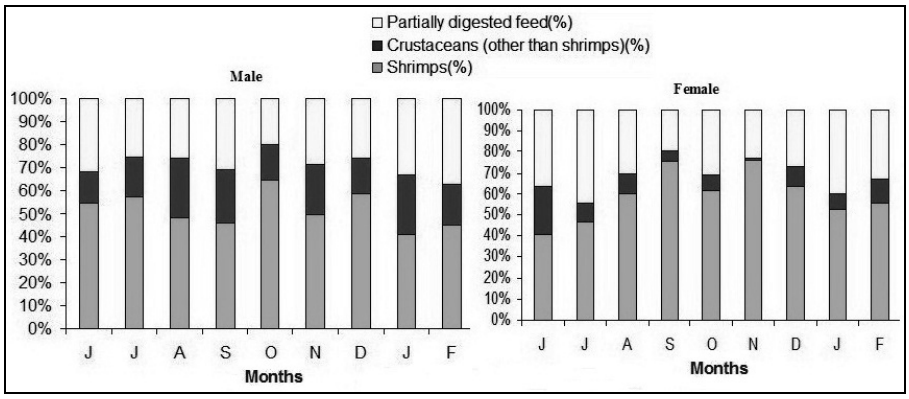

Fig. 2. Monthly weights (%) of the major food items in gut contents**.**

Assessment of the gut contents in the present study showed that *A. bato* is a carnivorous fish. This agrees with the report of Day (1871) who commented that the *Apocryptes* are carnivorous. In the examination of stomach contents of the *A. bato* it was found that the food of this fish was mainly composed of crustaceans. The fish is reported as an omnivorous fish feeding on benthic invertebrates (Rahman 1989, Arabi and Goksøyr 2002). Hida (1967) studied the stomach contents of *A. bato* and reported that the stomach contents mainly composed of fish and crustaceans. This disagrees with the present work as no fish or fish larvae, even their remains were found in the present investigation. But in the same study Hida (1967) found crustaceans as the most important food of the *A. bato* on the samples from another station. Rahman (1989) also reported crustaceans as the most important food of the *A. bato.* Chukwu and Deekae (2013)

showed various crustaceans as dominant food items in the stomach contents of another mudskipper *Periopthalmus barbarous.* Manuel (2011) also found adult of *P. koelreuteri* had a dietary shift towards crustaceans. The distribution, migration, competition, predation pressure, stages of growth and unsuitable physico-chemical and biological parameters of a species influence feeding habit and fish may change their behavior according to the availability food items (David 1954, Chukwu and Deekae 2013).

The maximum and minimum total lengths (TL) varied between 11.20 cm and 22.20 cm and the weight between 16.70 g and 43.50 g. The minimum and maximum standard length (SL) varied between 6.50 cm and 18.1 cm. The form of the equation for the total length and body weight relationship was, $W = 0.44TL^{2.57}$ and that for standard length it was, $W = 1.009SL^{2.66}$. A slightly fluctuating positive graph was obtained for mean observed weight. The curve for calculating weight was smooth and gradually increased with increasing length (Fig. 3).

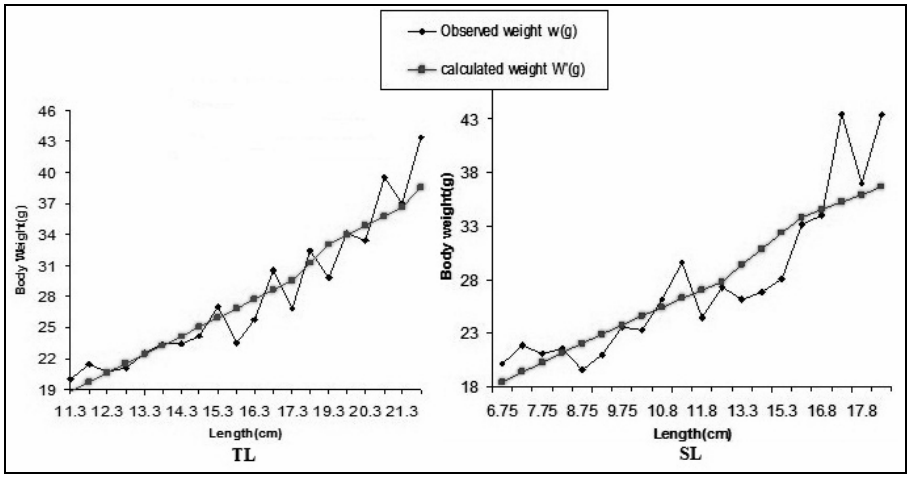

Fig. 3. Relationship between total length (TL) and standard length (SL) with body weight of male.

The equation for regression line of body weight (Y) on total length (X) is, $Y = -16.73 + 1.07X$ ($r = 0.98$, $t_{cal} = 16.35$). The equation for regression line of body weight (Y) on standard length (X) is – $Y = -16.14 + 5.6143X$ ($r = 0.98$, $t_{cal} = 12.15$). The coefficient of correlation ($r = 0.98$) was tested with't' test and found highly significant at the 5% level of significance ($t_{0.05} = 2.04$) for TL and ($t_{0.05} = 2.02$) for SL. The values of condition factor "K" ranged from 0.88 to 1.13 for total length and between 0.87 and 1.23 when studied for standard length.

The minimum and maximum total lengths (TL) varied between 15.00 and 26.00 cm and those of weight between 25.1 and 38.50 g. The minimum and maximum standard length (SL) varied between 12.00 and 22.90 cm. The exponential form of the equation for

total lengths was $W = 1.001TL^{2.52}$ and for standard length $W = 1.003SL^{2.63}$. A slightly fluctuating positive graph was obtained for observed mean weight. The curve to calculate weight was smooth and gradually increased with increasing total length (Fig. 4).

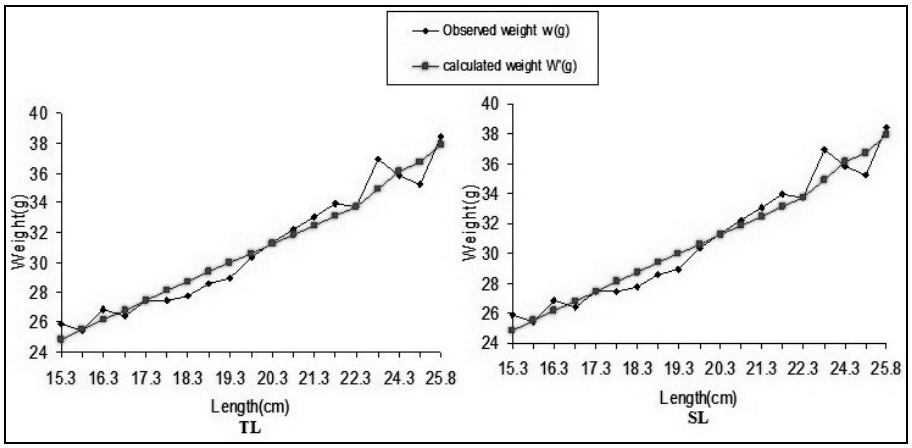

Fig. 4. Relationship between total length and standard length with body weights of female.

The equation for regression line of body weight (Y) on total length (X) is, $Y = -23.86 + 0.70X$ ($r = 0.99$, $t_{cal} = 19.96$). The equation for regression line of body weight (Y) on standard length (X) is, $Y = -24.98 + 0.65X$ ($r = 0.99$, $t_{cal} = 16.93$). The coefficient of correlation ($r = 0.99$) was tested with 't' test and found highly significant at the 5% level of significance ($t_{0.05} = 2.10$). The values of condition factor K ranged from 0.96 to 1.06 total lengths and from 0.95 to 1.10 when studied for standard length.

The difference in male and female the values of 'n' between the total length-weight and standard length-weight relationship is thought to be due to disproportionate growth in the tail of the fish. This conforms the results of Aziz (1993) in case of *Sillago domina*. The difference 0.13 in value of 'n' for total length-weight relationship of male and female indicates that growth of the female fish is slightly affected due to weight of the ripe ovary. This disagreed with another marine mudfish *A. contories* where the difference was 0.0087 (Day 1871). Hile (1936) proposed that the value of 'n' for an ideal fish may range between 2.50 and 4.00. In the present investigation all the values of 'n' for different relationships, indicate that of *A. bato* increases as the cube of the length. This agreed with the result of Day (1871) on *A. contories* in which the values of 'n' were 2.52 and 2.63 in length-weight relationship for male and female fish, respectively. It has been found in certain species that the value of n characteristically lower or higher than 3. Richardson (1846) reported the value of n as 1.14 and 1.19 for male and female of *A. serperaster*, respectively. The value of n will be exactly 3 when the growth is isometric (Ricker 1963). This cube law relationship is hardly expected as most of the species change their shape.

The value of n differs not in species but sometimes also in the stock of the same species depending on sex, maturity, seasons and even time of day length because of changes in stomach fullness (Bagenal 1978). Since the value of n of the present investigation is not significantly different from 3 it can be concluded that the isometric growth is expected in *A. bato*.

In the present study curvilinear positive relationship was found when body weights (both observed and calculated) were plotted against the total and standard length. This agreed with the results of Peters (1868) and Day (1871) on *A. variegates* and *A. contories*, respectively. The coefficient of correlation between lengths and weights for both male and female was highly significant at the 5% level of significance. This agreed with the result of Richardson (1846) on *A. serperaster* and Rahman (1989) on *A. bato*. The values of condition factor (K) showed variation which may be due to small sample size or different of maturity stages of the females or difference in weight of food content in the stomach. Values of K may also be vary because of the above mentioned causes as reported by many workers like Doha and Dewan (1967), Bashirullah and Kader (1970), Shafi and Quddus (1974a, 1974b, 1975a, 1975b), Shafi and Mustafa (1976), Das (1977) and Kader and Rahman (1978) for different fish species.

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