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Length-weight relationships (LWRs) and gut analysis of fresh water shark (*Wallago attu*) collected from local fish market of Quetta City, Pakistan

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Abstract

Wallago attu (Bloch and Schneider, 1801) is a freshwater catfish of Siluridae family. A total of 250 including 159 female and 91 male samples were collected during the months of April 2016 till March 2017. The length of collected fishes was calculated 10.0-45.5 cm and weight ranged in 90-833g. The values of b for combined, female and male were 3.07, 3.15 and 3.11 respectively showed positive allometric growth in *Wallago attu*. All fish specimens dissected and examined their gut contents. The main gut contents were *Chela phulo* (20.51, 16.97), *Puntinus sophore* (15.21, 13.4), *Labeo gonius* (11.32, 9.51), *Puntius ticto* (10.64, 9.86), *Glossogobius giuris* (9.33, 8.74), *Keratela* (7.35, 6.95), *Ambass nama* (6.54, 5.87), miscellaneous (4.53, 8.94), crustaceans (4.51, 7.54), mollusks (3.97, 4.66), insects (3.82, 3.97), Plant matter (2.12, 2.83), and algae (0.51, 0.81) by volumetric and occurrence method. GaSI was classified as out of 250 18.01, 7.21, 34.02, 22.11 and 18.64 percent were empty, very less, half, quarter and full. The highest value of gut fullness was noticed in month of August, while lowest value was observed in July. In conclusion, *Wallago attu* showed positive allometric in growth and carnivorous in nature.

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Introduction

Wallago attu the most important member of siluriformes considered as enormous carnivore fresh water catfish. It is commonly known as mulle and found in stream, lakes. It is distributed in Pakistan, Nepal, India and Indonesia (Giri *et al.,* 2002). *Wallago attu* possess enormous digestible characteristics of its meat (Lilabati and Viswanath, 1996), while examining the different health risks, fish mineral and their health condition, large sized species given priority utilization (Fawole *et.al.,* 2007) and the ecological situation (Weatherly and Gill, 1987; Tang *et al.*, 2009).

Flesh eating fishes directly affects the shape and size of the carnivorous population (Menge and Sutherland, 1987). Fishes like *Wallago attu* also affects the primary productivity of aquatic ecosystem of vegetarian fishes (Lathrop *et al.,* 2002).Though culture of *Wallago attu* is impossible because of its high predatory nature (Anwar and Siddiqui, 1992) and (Dutta-Munshi *et al.*, 1990) reported its predatory habit. Its distribution habit and habitat, biology and nutritional value have been studied by several workers (Khawaja, 1966; Lilabati and Vishwanath, 1996).

Growth is significant physiological parameter with increase of age occurs in length or weight. Growth of fish determined through specific parameters such as length and weight and their importance is equally significant as both of these parameters are highly correlated (Prasad *et al.*, 2012) and estimate weight from length frequency distributions. Analysis of stomach content provides essential insight in fish feeding methods and quantitative evaluation of food habits is an essential result of fisheries management. Analysis of stomach content is based on the study of fish feeding habit which has developed into a standard practice (Hyslop, 1980).

The purpose of paper is to estimate length-weight relationship (LWRs) and gut content analysis of a cat fish *Wallago attu* collected from local fish market of Quetta City, Pakistan.

Material and methods

Sampling site

A total of 250 fish specimens were collected April 2016 till March 2017 from local fish market of Quetta City, Pakistan Apparatus used included; scissors, sharp knives, bowl, measuring tape, digital balance, dissecting kits, cotton wool, hand towels, safety and protection wears, binocular microscope 5% formalin solution, soap and tap water.

Length Weight Measurement

Body length of fish was measured nearest to 0.1cm with help of measuring tape and weight was measured nearest to 0.1g with digital balance. The fish was dissected and the gut content was removed, transferred to the container and preserved in 5% formalin fixative, and transported to Laboratory immediately.

Length-Weight Relationship

The LWRs of fish was calculated using by the equation $W= aL^b$ given by Achakzai *et al.*, 2013 where, W; Weight (g), L; Length (cm), a; Constant, b; an exponent.

Gut content analysis

In the laboratory, the specimen containers were brought and laid down on to the clean and disinfected benches. The stomach contents were emptied into Petri dish and each food item was counted under microscope.

Estimation of gut contents

The gut contents were estimated by using the point volumetric method given by Pillay, (1952) and frequency of occurrence method of Hynes, (1950).

$$\text{Point volumetric method} = \frac{No\ of\ points\ allocated\ to\ component}{Total\ points\ allocated\ to\ sub-sample} \times 100$$

$$\text{Frequency of occurrence } P = \frac{b}{a} \times 100$$

Where a; total No of fish examined with food in gut, b; number of fish containing particular food item and P; percentage of occurrence of each food item.

Gastro-somatic index (GaSI)

The GaSI was calculated as per formula given by Dadzie *et al.*, (2000).

$$\text{GaSI} = 100\ \frac{SW}{BW}$$

In the above mentioned equation SW is gut content and BW is body weights (g). Gastrosomatic index (GaSI) was calculated by using the formula given by Desai (1970).

$$\text{GaSI (\%)} = \frac{\text{Weight of gut (g)}}{\text{Weight of fish (g)}} \times 100$$

Gut fullness

Guts fullness was determined by gravimetric method (Hynes, 1950).

$$\text{Gravimetric method} = \frac{\text{Total gut contents weight}}{\text{Total fish weight}} \times 100$$

Index of preponderance

For evaluating the relative importance of all food items, the index of preponderance (Natarajan and Jhingran, 1961) was obtained using formula:

$$\text{I} = \frac{\text{Vi Oi}}{\sum \text{Vi Oi}} \times 100$$

Where I; for Index of preponderance, VI; volume percentage, Oi; Occurrence percentage, ∑; Summation.

Data Analysis

Data of length-weight, food and feeding habit were analyzed. For food and feeding frequency of occurrence and point volumetric method was used Microsoft excel computer analysis package was used in the data analysis of the study as described by Stroud and Booth, (2001).

Results

Length-weight relationships (LWRs)

A total of 250 fish specimens were collected from local fish market of Quetta City and determined the *Wallago attu* (LWRs) were ranged 10-45.5cm. The (LWRs) was calculated applying the formula: $W = aL^b$. In the equation a and b are constant, length is (L) and the weight is (W) of fish.

Diet habit

About 250 of *Wallago attu* fish specimens were dissected to determine food and feeding habits. This fish showed great variations in gut contents. Based on the frequency of occurrence and volumetric method dominant food items in the diet of *Wallago attu* were *Chela phulo* 20.51% by volume and 16.97% by occurrence method, *Puntius sophore* comprises 15.21% by volume and 13.4% by occurrence and, *Labeo gonuis* 11.32% by volume and was 9.51% by occurrence *Puntius ticto* were 10.64% by volume and 9.86% by occurrence. *Glossogobius giuris* were 9.33% by volume and 8.74% by occurrence, *Keratela* was7.35% by volume and 6.95% by occurrence. *Ambass nama* was 6.54% by volume and 5.87% by occurrence, Miscellaneous were 4.53% by volume and 8.94 by occurrence, Crustaceans were 4.51% by volume and 7.54% by occurrence. Mollusks were 97% by volume and 4.66% by occurrence. Insects were 3.82% by volume and 3.97% by occurrence, and last food contents were recorded very less amount mentioned in Table 2 and Fig 1.

Table 1. Descriptive statistics and estimated parameters of length-weigh relationships (LWRs) of *Wallago attu* male (M), female (F) and combined sexes (C) during April 2016 to March 2017.

Sex	N	Length range (cm)	Weight range (g)	*a*	*b*	r^2
M	91	10-40.1	90-690	0.00211	3.15	0.982
F	159	11-45.5	127-833	0.00208	3.07	0.969
C	250	10-45.5	90-833	0.00210	3.11	0.983

Table 2. Grading of various gut contents in *Wallago attu* from local fish market of Quetta City, Pakistan.

Food items	% composition food items		ViOi	Index of preponderance $I = \frac{ViOi \times 100}{\Sigma ViOi}$	Grade by Volume
	Volume (Vi)	Occurrence (Oi)			
Chela phulo	20.51	16.97	348.05	33.14	I
Puntinus sophore	15.21	13.4	203.81	19.41	II
Labeo gonius	11.32	9.51	107.65	10.25	III
Puntius ticto	10.64	9.86	104.91	9.99	IV

Food items	% composition food items		ViOi	Index of preponderance $I = \frac{ViOi \times 100}{\Sigma ViOi}$	Grade by Volume
	Volume (Vi)	Occurrence (Oi)			
Glossogobius giuris	9.33	8.74	81.54	7.76	V
Keratela	7.35	6.95	51.08	4.86	VI
Ambass nama	6.54	5.87	38.38	3.65	VII
Miscellaneous	4.53	8.94	40.49	3.85	VIII
Crustaceaan	4.51	7.54	34.00	3.23	IX
Mollusks	3.97	4.66	18.50	1.76	X
Insects	3.82	3.97	15.16	1.44	XI
Plant matter	2.12	2.83	5.99	0.57	XII
Algae	0.51	0.81	0.41	0.03	XIII

∑ ViOi = 1049.97

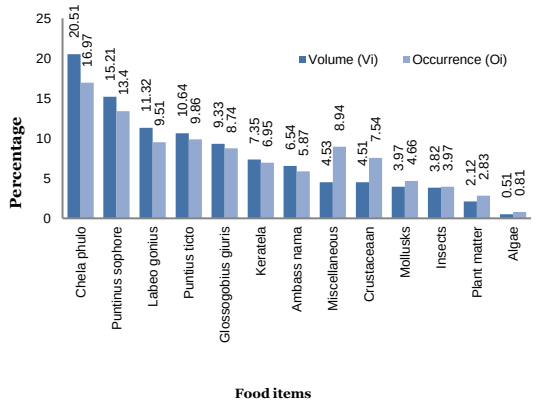

Fig. 1. Food items by volume and occurrence of *Wallago attu*.

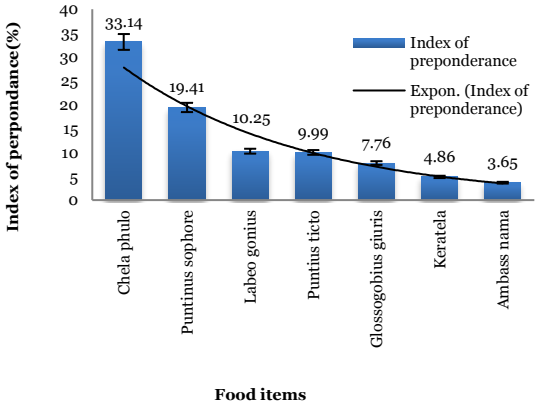

Fig. 2. Index of Preponderance of Gut food items of *Wallago attu*.

Gastro-Somatic Index (GaSI)

GaSI show differentiation in all months (Table 3). During March and August higher values of gut fullness were recorded. While, lower values of GaSI and gut fullness were recorded in July is mentioned in Fig 3.

Table 3. Monthly gut fullness and Gastrosomatic index (GaSI) of *Wallago attu* collected from local fish market of Quetta City, Pakistan.

Months	Gut fullness	GaSI
April	87	3
May	15	1.4
June	25	1.7
July	20	1.3
August	93	3.4
September	85	3.1
October	95	2.4
November	85	2.5
December	87	2.3
January	83	3
February	90	3.1
March	91	3.2
Average	71.33	2.53

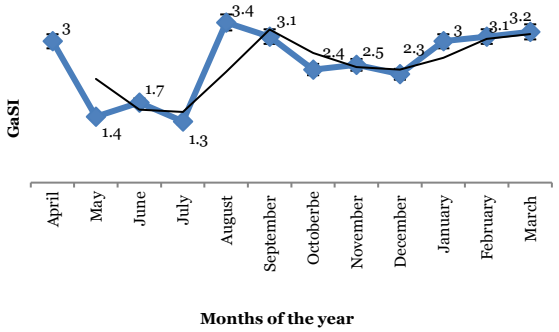

Fig. 3. Gut fullness of *Wallago attu*.

Index of Preponderance

This study also showed great variations in index of preponderance (Table 2). It appears that the basic food of *Wallago attu* from local fish market of Quetta City mainly comprised of *Chela phulo* (33.14%) and *Puntinus sophore* (19.41%) followed by *Labeo gonuis* (10.25%), *Puntius ticto* (9.99%), *Glossogobius giuris* (7.88%), *Keratela* (4.86%), *Ambass nama* (3.65%),

Miscellaneous (3.85), Crustaceans (3.23%), Mollusks (1.76%), Insects (1.44%), algae (0.03%) and plants (0.57%) shown in fig 2.

Stomach categories

A total 250 guts were examined; 45 unfilled, 0% (18.01%), 18 very less (7.21%), 85 Half (34.02%), 55 Quarter (22.11%) and full 47 (18.64) were observed during entire study period (Table 4). The comparison of gut fullness is given in fig 4.

Table 4. State gut fullness of *Wallago attu*.

State	No of guts	Percentage
Empty 0%	45	18.01
Quarter 25%	18	7.21
Half 50%	85	34.02
Three Quarter 75%	55	22.11
Full 100%	47	18.64
Total	250	100

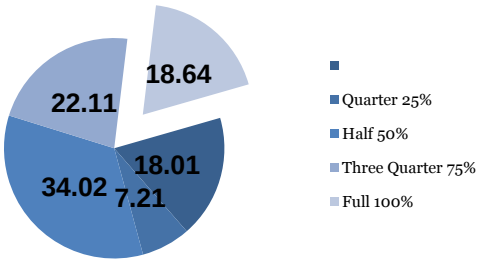

Fig. 4. State of gut fullness of *Wallago attu*.

Discussion

Wallago attu (LWRs) was discussed in (Table 1). In current studies the value of *a* was 0.00211 and *b* was 3.15 calculated for male population. Greater the value of *b* than 3.0 indicates positive allometric growth (Naeem *et al.,* 2010).

Our current finding indicates that *Wallago attu* spend throughout life as carnivorous predator (Das and Srivastava, 1979). It was also observed that adults are piscivorous in nature (Pethiyagoda, 1991). Other investigation revealed that fry of *Wallago attu* mainly consumes fish fry, insects, crustaceans (Karamchandani, 1957), while fingerlings can be used to take fry and fingerlings of other fishes (Alikunhi, 1957).

Anwar and Siddiqui (1981) have reported the similar feeding habits in carnivorous fish *Wallago attu*. This piscivorous condition is due to availability of fishes in surplus during winter and summer due to stagnant water permits it for more predation. These are stenophagic group as the food selection pattern is not varying through wide range and they manifest on gastropod and insects (Nikolskii, 1961).

Catfish *Wallago attu* stomach content in another study revealed the presence of adult crustaceans, insects and a number of small fishes (Choudhary and Singh 2005). *Wallago attu* also feeds on dead fishes and other animals and thus called as robust carnivores (Hossain *et al.*, 2008). The body size of *Wallago attu* increases with an increase in the intake of animal food, it indicates that food preference helps in identification of food preference in adults (Barbare *et al.*, 2013).

Further, this specie is currently considered as endangered species due to decline in its population, certain factors of environmental degradation, pollution and over exploitation (Hossain *et al.,* 2008).

Conclusion

Present findings on length-weight relationships and feeding habits of *Wallago attu* would be the first findings from local fish market of Quetta City, Pakistan. These findings will be baseline for young researchers and provide sufficient data to explore same output for new findings on other fishes.

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