Research Article

Proximate Composition Analysis of Marine Fish, *Terapon jarbua*, from Pakistan

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Abstract | Extensive research work has been done on proximate analysis of the fish around the world but very little analysis on marine fish *Terapon jarbua* have been performed. Therefore, the current analysis was carried out to analyze the proximate composition of *T. jarbua*. 70 samples of *T. jarbua* ranging from 18.00-29.90 cm in length and 119.60-429.50 g in body weight were collected from Fisheries Harbour, Karachi Pakistan. The mean percentage of constituents were found to be for water 73.22%, ash 6.72%, fat 3.45% and protein 16.62% in the whole wet weight of body of *T. jarbua*. % water represented correlation with highly significant value ($P<0.001$) with protein, ash, fat and organic constituents in wet weight. Fish body weight represented highly significant ($P<0.001$) positive relation to all the studied body constituents in log transformed data. Total length also represented highly-significant positive relation to all the studied body constituents except for fat which showed nonsignificant correlation ($P>0.05$). Fulton's condition factor showed nonsignificant relations to whole percent (%) body constituents except percent (%) ash, which showed least significant relation ($P<0.05$) for *T. jarbua*.

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Introduction

Numerous researchwork has been performed to estimate the proximate composition of fish (Kumaran *et al*., 2012; Hernandez *et al*., 2018; Khalid and Naeem, 2018; Iqbal *et al*., 2020), and outcomes from some of these have been utilized to create the nutritional needs in fishes (Okumuş and Mazlum, 2002; Tidwell *et al*., 2007). *Terapon jarbua* fish is a widely distributed species, dispersed mostly in the region of Indo-West Pacific and exist in low coastal waters areas, freshwater and mangroves (Srikandace *et al*., 2017).

The chemical analysis of marine fish is valuable for valuable data of the innovative work in fish species investigation included physiology, environment, biochemistry and protection (Stobutzki *et al*., 2013).

The chief body constituents of the fishes include H_2O, lipids, ash and proteins. non-proteinaceous contents and carbohydrates are as well as significant contents, apart from this found to be in little quantities therefore, are typically neglected throughout experiment (Wootton, 1990). Moreover, these amounts can differ considerably in and among the species and as well as with size, feeding and breeding season time and physical activities. The fluctuation in these substances between different tissues and organs of body might also showed substantial disparity (Weatherley and

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Gill, 1987).

Fish is thought to be the one of inexpensive fountain head of animal's protein and another vital constituent needed for human food (Sadiku and Oladimeji, 1991). Quality and nature of constituents in the uttermost animals depend on the kinds of food. Proximate composition analysis is the determination of H_2O, fats, proteins and ash content in living organisms. The results of the analysis vary significantly dependent on species, age structure, sexes, habitat, seasons of feeding and physical activities (Aberoumand, 2010). Percentage of protein in fish are typically greater than those of fat (Skalli *et al*., 2004; Erchao *et al*., 2010); these arrangements ease the effective exploitation of both body needs (Miller *et al*., 2005). In fishes, difference in chemical body composition narrates prudently to feed consumption (Oyelese, 2006).

The aim of study was to evaluate the proximate composition of a marine fish, *Terapon jarbua,* from Pakistan.

Materials and Methods

Total seventy (70) fish samples of various weight and length were randomly collected from the Fisheries Organization Karachi (Sindh), Pakistan which were capture from the Arabian Sea, Karachi Fish Harbour (Karachi, Pakistan) in September, 2018 for research analysis. These specimens were shifted in insulated plastic packings to the Laboratory of Institute of Pure and Applied Biology, Bahauddin Zakariya University, Multan (Pakistan). These specimens were blot dried, utilizing soft paper towel subsequently withdrawing from box. Wet body weight (W) of 70 specimens of *Terapon jarbua* were weighed by utilizing digital electronic balance closest to 0.01 g. After that TL for specimens were determined closest to the 0.01 cm with help of wooden-measuring apparatus. Proximate composition analysis of fish samples was performed. In order to estimate H_2O contents each whole fish specimen was dried in oven (Incucell MMM: Memmert West Germany) at 50-60°C until the consistency in weight is obtained. Each of the dried fish specimen was grinded to powder for further analyses. One gram powdered sub specimen of each fish was converted into ash by utilizing the muffle furnace (RJM 1.8-10 China) for one day (24 hrs.) at 450-500°C to evaluate contents of ash. The entire lipid constituents were analyzed through extraction method in proportion of 1:2 combinations of trichloro methane (chloroform) and methanol following Blight and Dyer (1959) and Naeem and Salam (2010). The protein constituents of fish were calculated through subtraction of mass of other major contents, H_2O, ash and fats, (Caulton and Bursell, 1977; Dawson and Grimm, 1980; Weatherley and Gill, 1987; Salam and Davies, 1994). Carbohydrates were not measured in the present work, as carbohydrates exist in neglected quantities and therefore do not constitute as a main fish content (Elliott, 1976; Caulton and Bursell, 1977; Weatherley and Gill, 1987; Salam and Davies, 1994).

Statistical analysis

Different computer packages such as Microsoft spreadsheet and Mini-Tab were applied for regression, to determined coefficient of correlation (r) and t-test.

Results and Discussion

The Mean concentrations as well as low and high ranges for the different contents of body are given in Table 1. Percentage H_2O showed highly significant interrelation with wet weight of different body contents like protein, fat, ash and organic constituents, on the other hand, %age water represented nonsignificant inter relation with dried weight of different body constituents as shown in Table 2.

Table 1: *Mean concentrations and range of different contents in whole body of Terapon jarbua.*

Body constituents	Mean ± S.D	Range
Contents of H_2O (%)	73.22 ±5.242	57.37-84.61
Contents of ash (%Wet weight)	6.72±2.024	2.46-11.00
Contents of ash (%dry weight)	25.34±7.316	9.27-44.46
Contents of fat (%wet weight)	3.45±2.011	0.73-9.71
Contents of fats (% dry weight)	12.80±6.657	3.00-30.99
Contents of protein (%wet weight)	16.62±4.432	8.03-32.80
Contents of protein (%dry weight)	61.86±9.549	40.02-77.24

S.D: Standard deviation.

When the total values of each variables of proximate composition that is water, ash, fat and protein constituents were transformed into logarithm and regression were performed against log wet body weight and log total length, strong correlation were found, except for log fat contents which displayed non-significant relation with total length. The regression parameters of these relationships are shown in the Tables 3 and 4. Water and organic contents increased isometrically (b value close to 3), fat and ash contents negative allometrically (b value less than 3) while protein content increased positive allometrically (b value more than 3) with an increase in body weight of wild *T. jarbua* (Table 4).

Condition factor was found 1.69 in the present study and showed positive impact on all body contents except % protein and % ash. Fulton's condition's factor displayed non-significant relation to all percent (%) body constituents except % ash which showed least significant relation (Table 5).

The major constituent of the body of *Terapon jarbua* was being water with mean value of 73.22% (Table 1), this finding is nearly in consistent with investigation of Osibona *et al*. (2009) in *Clarias gariepinus*, reported 74.3% water contents. Ash displayed a very small portion of the body composition of fishes. The value for ash contents in *T. jarbua* was observed 6.72% and

Table 2: *Interrelationship between percent H_2O (x) and percent body contents (y) for whole body of T. jarbua.*

Interrelation	r	a	b	S. E. (b)	t value when b=0
Percent (%) H_2O vs percent (%) wet weight of fat	0.431***	15.5553	-0.17	0.04	-3.94
Percent (%) H_2O vs percent (%) dry weight of fat	0.065ns	18.8545	-0.08	0.15	-0.54
Percent (%) H_2O vs percent (%) wet weihgt of protein	0.806***	66.5156	-0.68	0.06	-11.23
Percent (%) H_2O vs percent (%) dry weight of protein	0.098ns	74.9200	-0.18	0.22	-0.81
Percent (%) H_2O vs percent (%) wet weight of ash	0.397***	17.9291	-0.15	0.04	-3.56
Percent (%) H_2O vs percent (%) dry weight of ash	0.187 ns	6.2256	0.26	0.17	1.57
Percent (%) H_2O vs percent (%) wet weight of organic contents	0.922***	82.0709	-0.85	0.04	-19.70
Percent (%) H_2O vs % organic contents dry weight	0.187 ns	93.7744	-0.26	0.17	-1.57

*S.E: Standard Error; *** P<0.001; a: Intercept; b: slope; r: correlation coefficient.*

Table 3: *Statistical variables of log wet weight of body (g) versus log body components (wet weight, g) of wild T. jarbua (n = 70).*

Relationships	r	a	b	S E (b)	"t" value when b=1
Log weight of body (x) vs Log H_2O contents (y)	0.969***	-0.2151	1.03	0.03	-32.3033
Log weight of body (x) vs Log fat contents (y)	0.182***	-0.0887	0.383	0.250	-3.617
Log weight of body(x) vs Log protein contents(y)	0.785***	-1.1973	1.17	0.11	-7.92091
Log weight of body (x) vs Log ash contents (y)	0.445***	-0.1010	0.53	0.13	-7.16231
Log weight of body (x) vs Log organic contents (y)	0.780***	-0.7919	1.04	0.10	-8.96

Table 4: *Statistical parameters of log total length (cm) versus log total body constituents (g) of wild T. jarbua (n = 70).*

Relationships	r	a	b	S E (b)	"t" value when b=3
Log total length (x) vs Log water content (y)	0.891***	-1.4404	2.62	0.16	-16.13
Log total length (x) vs Log fat content (y)	0.103 ns	-0.0171	0.59	0.70	-3.69571
Log total length (x) vs Log protein content (y)	0.747***	-2.7292	3.08	0.33	-6.01091
Log total length (x) vs Log ash content (y)	0.511***	-1.2043	1.69	0.35	-6.88143
Log total length (x) vs Log organic contents (y)	0.726***	-2.0642	2.66	0.31	-7.01742

Table 5: *Interrelationship between Fulton' condition factor and percentage body contents of T. jarbua (n = 70).*

Relation	r	a	b	S. E. (b)	t value when b=0
Fulton's condition factor percent (%) Water	0.098 ns	68.4253	3.19	3.92	0.81
Fulton's condition factor percent (%) Fat	0.207 ns	-0.4268	2.58	1.48	1.74
Fulton's condition factor percent (%) Protein	0.084 ns	20.0821	-2.31	3.32	-0.70
Fulton's condition factor percent (%) Ash	0.276*	11.9194	-3.47	1.46	-2.37
Fulton's condition factor percent (%) Organic contents	0.009 ns	19.6553	0.27	3.62	0.08

is in general agreement with the work of Gunther *et al.* (2005). In the current analysis, value found for fats concentration (% wet body weight) in the fish *T. jarbua* was 3.45 % that is in the overall consistent with findings in other fishes such as Jamuna ailia (*Ailiichthys punctate)* describe by Begum and Minar (2012), same results have been reported by the conclusion of Abimbola *et al.* (2010). In the current analysis, value found for protein concentration (% wet body weight) in the fish *T. jarbua* was 16.62 % that is in the overall consistent with findings of Dayami and Sarojnalini (2019) in *Labeo rohita.* In other fishes such as Indian river shad (*Gadusia chapra*), Indian potasi (*Pachypterus atherinoides*), Olive barb (*Cyprinus sarana*) and Ganges River Spart (*Corcia soborna*) testified by Begum and Minar (2012). These existing discoveries are also in the over-all accordance with the findings in Flathead mullet (*Mugil cephalus*) reported by Kumaran *et al.* (2012). Such a conclusions were approximately agreed with the fish species of blackchin tilapia (*Sarotherodon melanotheron*) reported by Abimbola *et al.* (2010). Results are also comparable to those reported by Naeem and Ishtiaq (2011) who evaluated the body composition of wild *Mystus bleekeri* from Sialkot, Pakistan and noted mean (%) moisture, protein, fat and ash contents to be 77.87%, 15.01%, 3.26% and 3.87%, respectively, in the whole wet body weight of the fish. However, variations might be due to fact that proximate composition of fishes vary with species, body size, condition factor and feed provided (Naeem and Salam, 2010; Ishtiaq and Naeem, 2019; Iqbal *et al.*, 2020).

Significant positive correlation in log-log regressions between total body constituents and body weight or length is in general agreement with those reported by Salam and Davies (1994), Naeem and Salam (2010) and Khalid and Naeem (2018). While allometric approach applied here represent that the slope (*b*) of the log-log relationships between body constituents and body weight or length is a good predictor for isometric or allometric increase of these constituents with increasing weight or length, when compared with b= 1 for weight or b= 3 for length (an isometric slope) (Tables 3 and 4), as also documented by Naeem and Salam (2010).

Fulton's condition factor (K) has non-significant (P>0.05) correlation with %water, % fat and % organic contents as shown in Table 5. These non-significant (P>0.05) relationships are comparable with those reported by Naeem and Ishtiaq (2011). However, Naeem and Salam (2010) have documented significant correlation between condition factor and body constituents in *Aristichthys nobilis.* The correlation found between K (condition factor) and % body constituents can be significant or non-significant for the different species of fish. The fish which is being very small found to have the rapidest reconstruction of their energy store in spring season that can be predictable on the basis of their smaller size of body (Jobling, 1995), however the larger fish species enhance their fat constituents incessantly.

Conclusions and Recommendations

Terapon jarbua is generally low-cost fish in coastal areas and marine water body of Pakistan and having capacity to contendand grapple with most of the commercially consumed fishes of the studied region in sense of having more protein contents and low-fat constituents. Hence, these current analyses not only deliver the nutritional value of the species but also provide the valuable chemical profile of different body constituents of *T. jarbua*. Moreover, fish size definitely effected on the various body contents of fish, while body contents remained constant with condition factor in the present study. Since there is a valuable nutritional and mineral profile of fish in this study and very little work has been done on this marine fish previously, therefore there is need for more work on this fish.

Novelty Statement

This study provided nutritional composition of a valuable and low-cost marine fish (*Terapon jarbua*) first time, found in coastal areas of Pakistan.

Author's Contribution

Vijay Lal: Conducted research experiment, collected the data, did statistical analysis and wrote the paper. This manuscript is part of his Ph. D research work.
Muhammad Naeem: Supervisor has provided guideline to complete research experiment and resources for completion of research and also helped in writing and reviewing the manuscript.

Conflict of interest
The authors have declared no conflict of interest.

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