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Study of Composition and Growth Performance of Catfishes of Nai Gaj Mountain Torrent, Khirthar Range, Sindh, Pakistan

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Abstract. The present study was carried out to estimate the composition and length weight relationship of catfish from Nai Gaj, the largest mountain torrent that originates in the Khirthar range. Fish sampling was conducted from January to December 2017. A total of 177 specimens of five catfish species were recorded during the study, including *Rita rita* (83); *Mystus bleekri* (55); *Wallago attu* (25); *Ompok pabda* (10) and *Bagarius bagarius* (4). *R. rita* was found with maximum percentage (47%), while *B. bagarius* was observed with lowest percentage (1.7%). Calculations of length weight relationship data for *R. rita*, *M. bleekri* and *W. attu* were done using equations, log w=–2.4+2.22; log L, log w=–2.66+2.22; log L and log w=–3.94+2.76 log L, respectively. Calculated slope of regression "b" values for three species were 2.22, 2.22 and 2.76 which is suggested for the negative allomatric growth pattern, while the correlation between length and weight derived is R^2 values for *R. rita*, *M. bleekri* and *W. attu* were strong (0.97, 0.85 and 0.91) is highly significant. As the fish diversity of this area had never been studied before, therefore our study would also provide new information about the bio-diversity of catfishes for the fisheries biologists.

Keywords: Nai Gaj, Khirthar range, catfish, length-weight relationship, Pakistan

Introduction

Nai Gaj is the mountain torrent, originates in Khirthar range district Dadu, located about 65 Km north-west of Khirthar ranges. After the flows of Indus river Nai Gaj carries the second highest flow in Sindh province, however, due to the arid zone, these flows are occasional. Along with Indus river, Nai Gaj is also the water source of Manchar lake. Nai Gaj ends in Manchar lake after flooding the Kacho area in Tahsil Johi during the rainy season. Though, large flows are dependent on floods intensity but many depressions along the base of Khirthar range remain filled with water throughout the year. These depressions are locally called as KUMBH. This water body however, is untouched due to difficult accessibility, harsh weather and security reasons (due to tribal origin/dacoit hidings). Hence the sampling from the area it self is a big task. Fish bio-diversity of Nai Gaj is declining due to human activities over there because of dam construction, which is a big threat to the bio-diversity and growth of the fish fauna. Quantifying patterns of bio-diversity is important aspect for environmental conservation and restoration (Stranko *et al*., 2011; Palmer *et al*., 2010). Freshwater bodies occupy only 0.8% of total water present on earth, however large number of fish species (10000 species) inhabit the freshwater (Dudgeon *et al*., 2006; Lundberg *et al*., 2000).

The declination rate of freshwater bio-diversity is faster than either marine or terrestrial diversity, which is attributed to the alteration of natural water bodies, pollution, increasing demand of for freshwater due to increase in human population. Nai Gaj mountain torrent is yet an untouched water body however, eco-geographical region of the water body (Pakistan) is one of the badly effected by climate change. Furthermore, the Nai Gaj dam is under construction in the area. Both of these factors are critical for reshaping the fish bio-diversity in future. Catfish belong to order Siluriformes. Most of larger sized freshwater fishes are catfishes (Hogan, 2011). They are top predators and play important role in stability of ecosystem (Vejøík *et al*., 2017). Moreover, catfish in all sizes are utilized as food.

Calculations of the length weight relationship through regression equation is the important tool in fisheries management, especially the production and biomass of a population. Generally increase in length and weight is considered the tool to measure the fish growth for

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the determination of population development (Oliveria *et al*., 2020). Fish growth is generally measured by the increase of length and weight, which are used to determine population development. Moreover, it also helps for the comparative study of different populations of same species (Soomro *et al*., 2007; Moutopoulos and Stergiou, 2002). Previously no work has been reported from this important water body, thus the current work will provide baseline data of catfish composition and their population status in Nai Gaj. This study aims to present the composition and length-weight relationship of catfishes in Nai Gaj.

Materials and Methods

This study was conducted in Nai Gaj Taluka Johi district Dadu, Sindh (latitude: 26° 56′20.44″N, longitude 67° 9′35.34″), studied area, point latitude 26° 52′33.75″N, longitude 67° 19'11.09″E shows the actual area of the Nai Gaj (Fig. 1).

The study area is not under the practice of fishermen's activities the local peoples use to catch fish from the depressions and during flood season large number of fishes are caught by the native peoples. However, practice of sports fishing is common. Most common method for sports fishing is gun fire. Samples for the current study were collected with the help of seine net, and mosquito netting with the support of local people on monthly basis from January to December 2017. Larger sized fishes were gun fired (Rifle 303).

In total 177 fish samples were examined for taxonomical identification at spots by using taxonomic keys by Mirza (2004) and Talwar and Jhingran (1991). Initially, unidentified fish samples were preserved in 10% formalin in jars and brought to the Vertebrate Zoology Laboratory, University of Sindh, Jamshoro for Taxonomic identification.

Length weight and composition studies were undertaken at the laboratory of Freshwater Biology and Fisheries, University of Sindh, Jamshoro. Total length of fish and weight was measured by using portable electric balance (0.01 g). The data was used to compute the relationship between length and weight by using equation $w = aL^b$ (Le Cren, 1951), where w is weight in grams, L is length (cm), a is coefficient and "b" is exponent. Linear regression was used to calculate the values a and b by log transformed equation $w = a+b \log L$.

The composition of all species were estimated by calculating their percentages.

Data analysis tool pack (Excel: MS office 2010) was used for the regression analysis of log transformed data of length and weight, where length was used as independent variable and weight as dependent variable.

Results and Discussion

A total of five catfish species in three families were observed during the study period, including Bagiridae (*Rita rita* and *Mystus bleekri*), Siluridae (*Wallago attu* and *Ompok Pabda*) and Sisoridae (*Bagarius bagarius*).

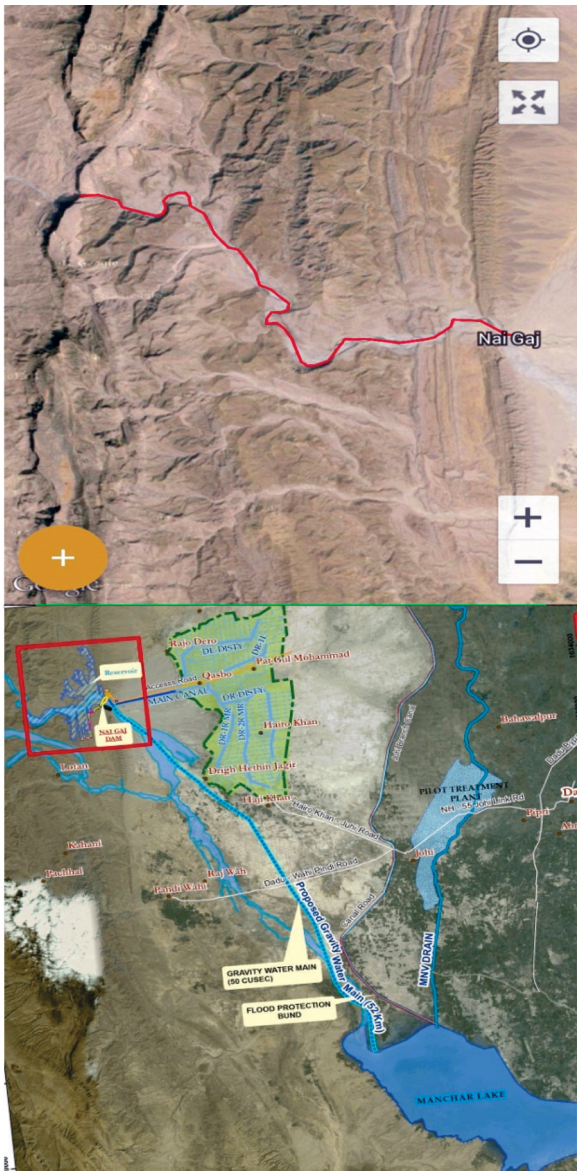

Fig. 1. Map showing the study area.

Percentage composition *R. rita* was (47.16%), *M. bleekri* was (21.25%), *W. attu* was (14.20%), *O. pabda* was (5.68%) and *B. bagarius* was (1.70%) shown in Fig. 2.

In total 83 specimen of *R. rita* observed the length and weight ranged between 11-33 cm and 15-210 g, respectively. Total number of *M. bleekri* found during the study period was 55 with length 9-15.4 cm and weight ranges of 7.9-30.8 g. Twenty-five specimen of *W. attu* were observed during the survey with size 14-34 cm and mass ranges 16-310 g. Only four specimens of *B. bagarius* were caught throughout the study, size ranging from 91-154.2 cm and weight between 4200-28000 g shown in Table 1. All the specimens of *B. bagarius* were of larger size.

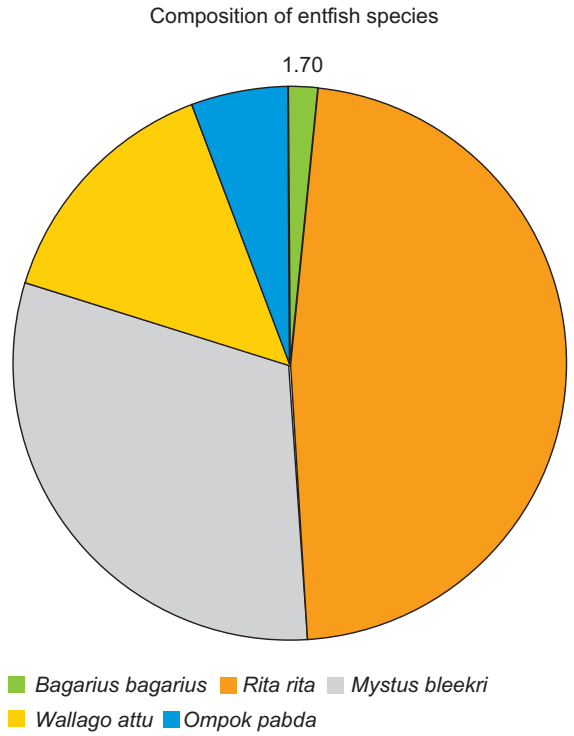

Fig. 2. Composition (%) of catfishes in Nai Gaj.

Length weight relationships of three catfish (*R. rita*, *M. bleekri* and *W. attu*) was calculated which is based on the sufficient data. The length weight data of *O. pabda* and *B. bagariu*s was too small to be used for the derivations of length weight relationships.

Length weight equations derived for all three species are:

Rita rita Log w =–2.4+2.22 Log L
Mystus bleekri Log w =–2.66+2.22 Log L
Wallago attu Log w =–3.94+2.76 Log L

Value of slope regression "b" for *R. rita*, *M. bleekri* and *W. attu* were 2.22, 2.23 and 2.76 respectively, suggesting the negative allometric growth in all species. Coefficient of determination R^2 for *R. rita*, *M. bleekri* and *W. attu* was calculated 0.97, 0.85 and 0.91, respectively shown in Table 2.

The small number of specimens of all five species can mainly be attributed to difficulties in fishing due to unavailability of professional fisherman in the area and because of the depth and connectivity of water depressions with mountain through caves. Maximum length of *W. attu* observed during the study was 33 cm, its maximum length (TL) recorded ever is 240 cm (Thella *et al*., 2018; Pethiyagoda, 1991). Sampling of *B. bagarius* has large size (91-154.2 cm) and this species is famous as game fish and the reckless fishes species might have decreased the population in Nai Gaj. *M. bleekri* and *O. pabda* are categories as small indigenous fishes (Hossain *et al*., 1999), while *R. rita* is categorized as intermediate in length. Value of "b" near to 3.0 indicates isometric growth in the fish by Dubey *et al*. (2012).

Tables 1. Statistical description of growth parameters (length and weight) of Siluriformes species found in Nai Gaj

Family	Species	No	Length		Weight	
			Min-Max	Ave±STD	Min-Max	Ave±STD
Bagiridae	*Rita rita*	83	11-33	17.58±6.86	15-210	62.62±37.9
	Mystus bleekri	55	9-15.4	10.98±1.77	7.9-30.8	14.98±6.01
Siluridae	*Wallago attu*	25	14-34	21.63±6.05	16-310	110±87.28
	Ompok pabda	10	16.7-22.5	18.77±2.18	52-85	65.3-12.97
Sisoridae	*Bagarius bagarius*	4	91-154.2	169.25±96.91	4200-28000	15300±10169

Ave = average; STD = standard deviation; Min = minimum; Max = maximum.

Table 2. Descriptive statistics of estimated regression parameters between length and weight of three catfish species *Rita rita*, *Mystus bleekri* and *Wallago attu* from Nai Gaj

Species	No.	Regression parameters						R^2
		"a"	95% CL "a"		"b"	95% Cl "b"		
			Lower	Upper		Lower	Upper	
Rita rita	83	-2.4	-2.83	-1.98	2.22	2.08	2.35	0.97*
Mystus bleekri	55	-2.66	-3.41	-1.91	2.23	1.93	2.53	0.85*
Wallago attu	25	-3.94	-4.48	-3.4	2.76	2.59	2.94	0.91*

No = number of individuals; R^2 = coefficient of determination; a = coefficient; b = exponent.

Table 3. Comparative regression parameters (a, b and R^2) of some catfishes with current study

Species	No.	a	b	R^2	Area	Author
Wallago attu	251	0.0047	3.08	0.975	Manchar lake (Sindh, Pakistan)	Achakzai *et al*. (2013)
Rita rita	23	0.0063	2.5	0.96	Brahmputra River (India)	Deka and Gohain (2015)
Mystus bleekri	105	0.014	2.62	0.89	Nala Daik, Pakistan	Naeem *et al*. (2012)
Rita rita	83	0.0039	2.22	0.97	Nai Gaj, Pakistan	Current study
Mystus bleekri	55	0.0021	2.23	0.85	Nai Gaj, Pakistan	Current study
Wallago attu	25	0.00011	2.76	0.91	Nai Gaj, Pakistan	Current study

No = number of individuals; R^2 = coefficient of determination; a = coefficient; b = exponent.

Previous records of regression coefficients are given in Table 3, the "b" values of *R. rita* and *M. bleekri* were "b" < 3 indicative of negative allometric growth from different water bodies. These results are similar as current findings.

Previously slope "b" value of *W. attu* was calculated 3.08 from Manchar lake by Achakzai *et al*. (2013), which contradicts the current study. Differences in "b" values between different populations can be attributed to number of factors including; number of specimen examined in different studies; habitat/seasonal/geographical differences; variations in the length ranges (groups) observed at different locations.

Value of "b" of all studied catfishes was negativity allomatric, suggesting the poor growth of the catfishes. Habitat (Nai Gaj) is a typical torrent which connects to the mountain and caves, thus the fishes found there were swifter and faster (personal observation). Negative allometric growth of these species can also be attributed to body stoutness of species due to their mountain origin. The main attribute of allometric growth of all species in current study is the habitat type.

This statement can be further justified with the length and weight of largest specimen of *B. bagarius* given (length-154.2 cm; weight 28 Kg), however previously *B. yarrellie* by Hossain (2010) from riverine ecosystems with total length (148 cm) was observed more than 100% in weight (65 Kg).

Conclusion

Present study concludes that only five catfish species were observed, thus the catfish bio-diversity of the Nai Gaj is poor.

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Conflict of Interest. The authors declare no conflict of interest.

References

Achakzai, W.M., Baloch, W.A., Saddozai, S., Memon, N. 2013. Length weight relationships (LWRs) of *Wallago attu* (Bloch and Schneider) from Manchar Lake Jamshoro, Sindh, Pakistan. *Journal of Applied Ichthyology*, **29:** 1172.

Deka, P., Gohain, A.B. 2015. Length weight relationship and relative condition factor of *Rita rita* (Hamilton, 1822), *Pangasius pangasius* (Hamilton, 1822) and *Chitala chitala* (Hamilton, 1822) of Brahmaputra river system of Assam, India. *International Journal of Fisheries and Aquatic Studies*, **3:** 162-164.

Dubey, V.K., Sarkar, U.K., Kumar, R.S., Mir, J.I., Pandey, A., Singh Lakra, W. 2012. Length weight relationships (LWRs) of 12 Indian freshwater fish species from the Betwa (Yamuna river tributary) and Gomti (Ganga river tributary) rivers. *Journal of Applied Ichthyology*, **28:** 854-856.

Dudgeon, D., Arthignton, A.H., Gessner, M.O., Kawabata, Z.I., Knowlwer, D.J., Le´veˆque, C., Naiman, R.J., Richard A-l. P., Soto, D., Stiassny, M.L.J., Sullivan, C.A. 2006. Freshwater bio-diversity: importance, threats, status and conservation challenges. *Biological Reviews of the Cambridge Philosophical Society*, **81:** 163-182.

Hogan, Z.S. 2011. Ecology and conservation of large bodied freshwater catfish: a global perspective. *American Fisheries Society Symposium*, **77:** 39-53.

Hossain, M.D.Y. 2010. New maximum size record for the Goonch *Bagarius yarrelli* (Sykes, 1839) (Siluriformes: Sisoridae) from the Ganges river (Rekod Baru Saiz Maksimum bagi Goonch *Bagarius yarrelli* (Sykes, 1839) (Siluriformes: Sisoridae) dari Sungai Gangga). *Sains Malaysia*, **29:** 157-159.

Hossain, M.A., Afsana, K., Azad Shah, A.K.M. 1999. Nutritional value of some small indigenous fish species (SIS) of Bangladesh. *Bangladesh Journal of Fisheries Research*, **3:** 77-85.

Le Cren, E.D. 1951. The length weight relationship and seasonal cycle in gonad weight and condition in the perch (*Perca fluviatilis*). *Journal of Animal Ecology*, **20:** 201-219.

Lundberg, G., Kottelat, M., Smith, G.R., Stiassny, M.L.J., Gill, A.C. 2000. So many fishes, so little time: an overview of recent ichthyological discovery in continental waters. *Annals of the Missouri Botanical Gardens*, **87:** 26-62.

Moutopoulos, D.K., Stergiou K.I. 2002. Length weight and length length relationships of fish species from the Aegean sea (Greece). *Journal of Applied Ichthyology*, **18:** 200-203.

Naeem, M, Zuberi, A., Hasan Z., Salam, A., Khalid, M., Khan, M.J., Ayaz, M.M., Asraf, M., Nasir, M.F., Rasool, S.A., Aziz M., Ishtiaq, A. 2012. Length weight and length length relationships of freshwater wild catfish Mystus bleekeri from Nala Daik, Sialkot. *African Journal of Biotechnology*, **11:** 11168-11172.

Oliveria, M.S.B., Silva, L.M.A., Prestes, L., Tavares-Dias, M. 2020. Length weight relationship and condition factor for twelve fish species from the Igarapé Fortaleza basin, a small tributary of the Amazonas river estuary. *Acta Amazonica*, **50:** 8-11.

Palmer, M.A., Menninger, H.L., Bernhardt, E. 2010. River restoration, habitat heterogeneity and biodiversity: a failure of theory or practice. *Freshwater Biology*, **55:** 205-222.

Pethiyagoda, R. 1991. *Freshwater Fishes of Sri Lanka*. The Wildlife Heritage Trust of Sri Lanka, 362 pp., Colombo, Srilanka.

Soomro, A.N., Baloch, W.A., Jafri S.I.H., Suzuki, H. 2007. Studies on length weight and length length relationships of a catfish *Eutropiichthyes vacha* Hamilton (Schilbeidae: Siluriformes) from Indus river, Sindh, Pakistan. *Caspian Journal of Environment Sciences*, **5:** 143-145.

Stranko, S.A., Hilderbrand, R.H., Palmer M.A. 2011. Comparing the fish and benthic macro invertebrate diversity of restored urban stream store ference streams. *Restoration Ecology*, **20:** 747-755.

Talwar, P.K., Jhingran, A.G. 1991. *Inland Fishes of India and Adjacent Countries*. Balkema, A.A., 541 pp., Rotterdam.

Thella, R., Dahanukar, N., Eldho. P.S., Ali, A., Raghvan, A. 2018. Population dynamics of *Wallago attu* (Bloch and Schneider 1801) (Osteichthyes, Siluridae) in three small rivers of southern India. *Asian Fisheries Science*, **31:** 172-178.

Vejøík, L., Vejøíková, I, Blabolil, P., Eloranta, A.P., Koèvara, L., Peterka, J., Sajdlová, Z., Chung, S.H.T., Kiljunen, M.Š., Èech, M.M. 2017. European catfish (*Silurus glanis*) as a freshwater apex predator drives ecosystem *via* its diet adaptability. *Scientific Reports*, doi:10.1038/s41598-017-16169-9