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The usage of freshwater fishes in cultural and folklore therapies among the people along river Jhelum, Punjab, Pakistan

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SUMMARY

Like plants, fauna is also utilized in folklore as well as modern medicine. Current research was planned with intend to note the folklore utilizes of freshwater fish fauna among the people in surrounding area of the Jhelum river, in province of Punjab, Pakistan. Folklores of fishes were analyzed utilizing various indices. During research, 15 species were documented, Out of total 3 species were documented first time, while *Labeo rohita*, *Channa marulius, Channa punctata, Oreochromis niloticus, Bagarius bagarius, Mastacembelus armatus,* and *Wallago attu* have "zero" similarity index. Out of total, 5 species viz. *Cyprinus carpio, Labeo rohita*, *Channa punctata, Oreochromis niloticus* and *Wallago attu* having RPL = 1.0, these are the most popular species. Almost half of the examined fish species has "zero" similarity index, which shows strong links of native people with fish species, specifically for medicinal purpose. Comprehensive research on fish species with the highest utilize reports may add in fish fauna based new medicines discovery.

Keywords: Pakistan, medicinal, Raho, folklore, ethnozoology

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INTRODUCTION

The fauna is used for various purposes viz. as art, entertainment, food, magic, medicine, music, religion, tools and trade (Enge, 1993; Altaf *et al.*, 2017; Altaf *et al.*, 2020). Almost 8.7% chemicals are obtained from Parts of animals and utilized as folk medicines (Santos-Fita *et al.*, 2009). Plants species are more utilized in ethnomedicine as compared to animal species. People of rural as compared with urban areas are more preferred to products of animals as medicines, and having vital information about folklore medicine (Santos-Fita *et al.*, 2009; Alves and Souto, 2015; Hajdari *et al.*, 2018).

Fishes are renowned as imperative and charming species (Khan, 1999; Alves and Rosa, 2007; Hussain *et al.*, 2015). Various fish species are utilized in folklore medicine in many societies (Alves and Rosa, 2007; Ferreira *et al.*, 2009; Rômulo *et al.*, 2012). Ichthyologists (Kottelat and Whitten, 1996; Dudgeon, 2002; Froese and Pauly, 2017) have identified more than 32943 species of fishes from Asia and 905 species from Pakistan. Folklore uses of fauna, specifically to cure ailments for humans and veterinary have rarely been published in Pakistan. Folklore uses of species of freshwater fishes have never been documented separately before in river Jhelum, according to our information. So, this study was designed to know species of freshwater fishes utilized to cure different illness by the native societies living the Jhelum riverine areas, Punjab, Pakistan.

MATERIALS AND METHODS

STUDY AREA

The public of Jhelum is agropastoralist, living in villages and growing crops, as well as using pastures for grazing livestock. Jhelum has no plain land. Wheat, maize and Bajra are observed in the main crops of Jhelum. Jhelum agriculture is dependent on irrigation from Tube-well water. Jhelum houses are built from mud and mud-bricks. Jhelum has very rich reserves of mineral resources i.e. rock salt, brine, gypsum, coal and silica sand. Khewra Salt mine in Jhelum is the biggest in Pakistan and the world second largest (Ahmad, 1963; Sheikh, 2012). The language of the local people is Punjabi and Pothohari (PIPS, 2011).

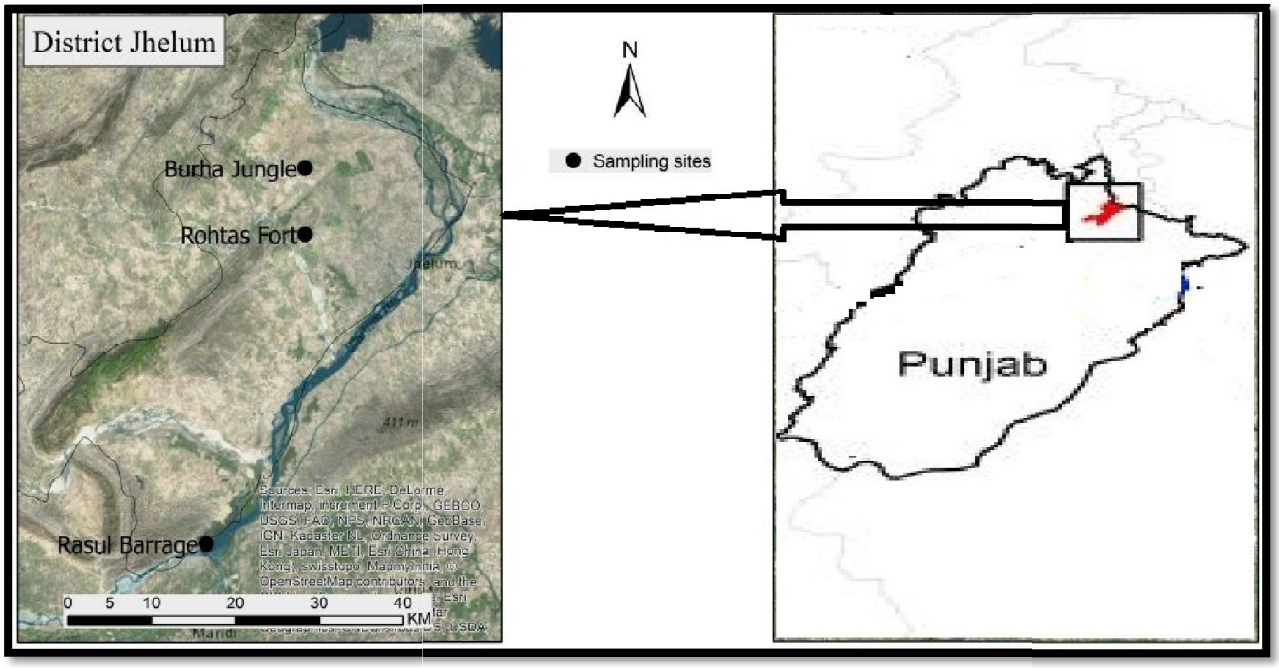

Figure 1: Map of river Jhelum alongwith study areas.

FISH IDENTIFICATION AND DOCUMENTATION

Fish data were collected from January 2016 to December 2016 and selected sub areas as Burha jungle, Rohtas fort and Rasul barrage (Table 1 and Figure 1). The questionnaire has following main points i.e. profile of respondents, local names of fishes, folklore of fishes and ethnopharmacological applications of species of fishes. Book of "Freshwater Fishes of Pakistan" was studied for identification of species of fishes along river Jhelum (Mirza, 2004).

QUANTITATIVE ANALYSIS

The folklore fish data were examined utilizing different indices: "Principal Component Analysis", "Relative Frequency Citation", "Fidelity Level", "Relative Popularity Level", "Rank Order Priority" and "Similarity Index". The fish data were documented utilizing percentages as well as proportions. All fish fauna documented by respondents with local knowledge was analyzed as "frequency of citation".

The role of various species of fishes part usage and diseases were shown in "chord diagrams" with "circlize package" in "R statistical software 3.6.1" (Gu *et al.*, 2014).

Principal Component Analysis (PCA)

Principal Component Analysis (abbreviated as PCA) was analyzed through Past (Version 3.20) statistical software (Hammert *et al.*, 2001).

Relative frequency of Citation (RFC)

The RFC presents the value of all fish fauna along district Jhelum (Ilker *et al.*, 2009; Vitalini *et al.*, 2013). The "RFC" is attained by dividing the no. of participants (noted as FC) by whole number of respondents in the present research noted as "N" (Tardío and Pardo-de-Santayana, 2008).

"RFC= FC/N (0<RFM>1)"

Relative Popularity Level (RPL)

The "RPL" is the proportion of the cultural use no. of informants divided by the mean value of informants' numbers. A scale was used as all the fishes were separated into two groups known as i) popular as well as ii) unpopular. The RPL presumes a value "zero" to "one" with "one" being total popularity of a definite species of fishes and "zero" no cultural uses by a definite fishes. For species of fishes in "unpopular group", and "RPL" value is less than "1.0" (Friedman *et al.*, 1986a; Ali-Shtayeh *et al.*, 2000).

Fidelity level (FL)

This index is analyzed the formula given below (Friedman *et al.*, 1986a; Alexiades and Sheldon, 1996).

"$FL\ (\%) = N_p/N \times 100$"

The "N_p" is the respondent no. for particular ethnomedicinal utilize of species of fishes as well as "N" is the total no. of respondent that noted the fish species for

any utilize. A High "FL" index noted the value and high rate of utilize of fish fauna for traditional utilize by respondent of along river Jhelum.

Rank Order Priority
This index was analyzed by written formula (Friedman *et al.*, 1986a; Ali-Shtayeh *et al.*, 2000).

"ROP=FL × RPL"

Similarity Index (SI)
SI is analyzed by the formula given below (Altaf, 2016);

"SI= S_a/T_a (0<RFM>1)"

Note:
S_a = Similar noted illness in previous and present study
T_a = Total noted illness in present study

RESULTS AND DISCUSSION

DEMOGRAPHY
Information of fish was gathered from 102 respondents with age from 18 to 70 years (Figure 2). Approximately 76.5% respondents were educated, and informants having primary, SSC, HSSC, Graduate and master education (46, 17, 8, 85 and 2, respectively). The most of the respondents (79.4%) were belong to rural areas.

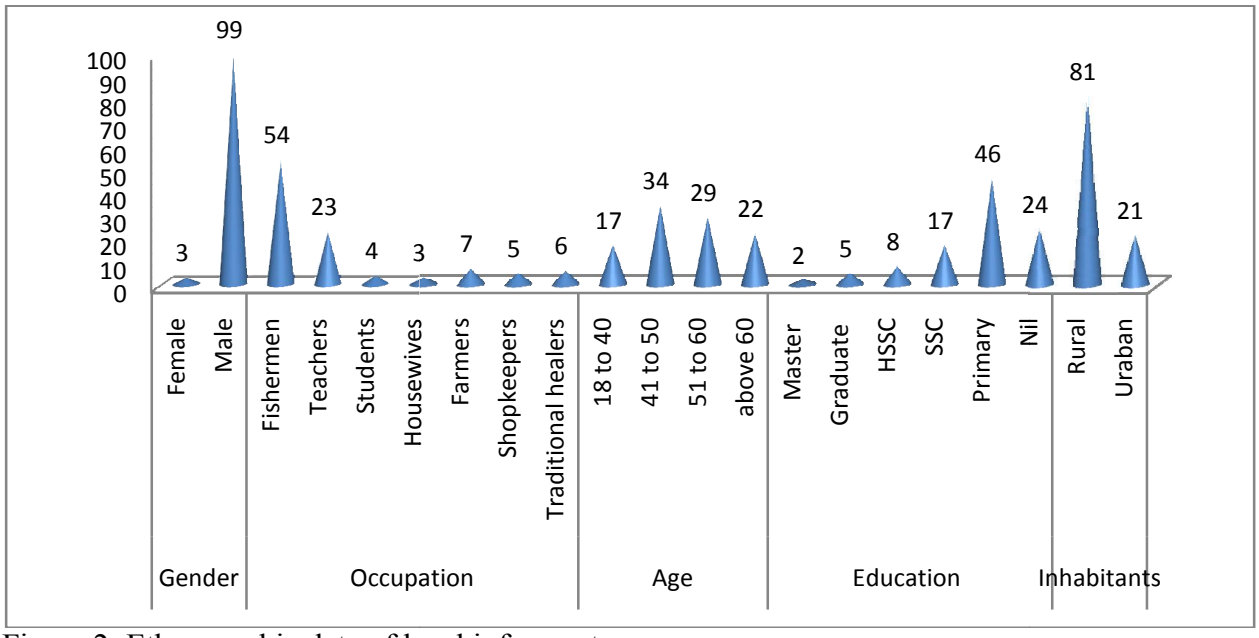

Figure 2: Ethnographic data of local informants.

LOCAL NOMENCLATURE
Local names of fauna generally depend upon associations, ecology, habitat, morphology and myths of species with humans. Total 15 species of fishes are documented. Out of total, vernacular names of two species the same suffix "carp"

such as; *Ctenopharyngodon idella* (grass carp), and *Hypophthalmichthys molitrix* (silver carp). Similarity, two species of fishes had the similar suffix "machhali" viz. *Oreochromis niloticus* (tilapia/chira machhli), and *Mastacembelus armatus*, (baam machhali) (Table 1).

The English as well as vernacular names of *H. molitrix* were the same "silver carp" and *C. idella* were the identical "grass carp". Name of 2 species depend upon their color: *C. idella* has grass color, thus called as "grass carp" and *H. molitrix* has silver color and thus called as "silver carp. On the other hand, some fishes were locally classified on the basis of structure, viz. *Oreochromis niloticus* (tilapia/chira machhli), mass same as and look-like "house sparrow" and thus the species was named "chira machhli" (chira is house sparrow), and the shape of *Channa punctata* is identical to "arm muscle" therefore this species was called "dola" (mean is bicep muscle) (Table 1).

CULTURAL VALUES OF HERPTILES AND FISH

Fish fauna were not only utilized in the therapy of diseases but also used in different purposes. Local people utilized meat of fish species from rivers (Table 2), as reported earlier by del Valle *et al.* (2015). People along river Jhelum utilized various species of fish for commercial purposes.

NARRATIVE STORY ABOUT FISH

Common myth about fish species was documented during the survey as "all fish species have a human- like head and fish-like a body, which locally called as Jal Pari". Same myth is written by Altaf *et al.* (2020) from along the river Chenab.

PRINCIPAL COMPONENT ANALYSIS (PCA)

The cultural information were examined with "principal component analysis", which permissible for the plots ordination in conditions of six variables i.e. medicinal use (MU), narrative (NR), commercial (CC), tool (TOL), entertainments (ETT), food (FD).

The outcome of the "principal component analysis" showed the total of all the "Eigen values" with total value of 924.57. The first Eigen value was the highest (620) which showed the highest gradient power in distribution of local information along the component 1 abbreviated as C 1. The first 2 component of the "principal component analysis" noted 84.06% variations in samples (C 1: 67.063%; component 2 abbreviated as "C 2": 16.997%) so only 2 components were measured in Figure 3. These variables MD (r = 0.83195), NR (r = 0.38358), CC (r = 0.92813), TL (r = 0), ET (r = 0.70564), and FD (r = 0.834) was positively related with first component while MD (r = 0.51267), NR (r = -0.13881), CC (r = -0.25134), TL (r = 0), ET and FD (r = -0.47465) was negatively related with "C 2" and (r = 0.39521) was positively related with "C 2" (Figure 4), which were analogous with published research (Altaf, 2016).

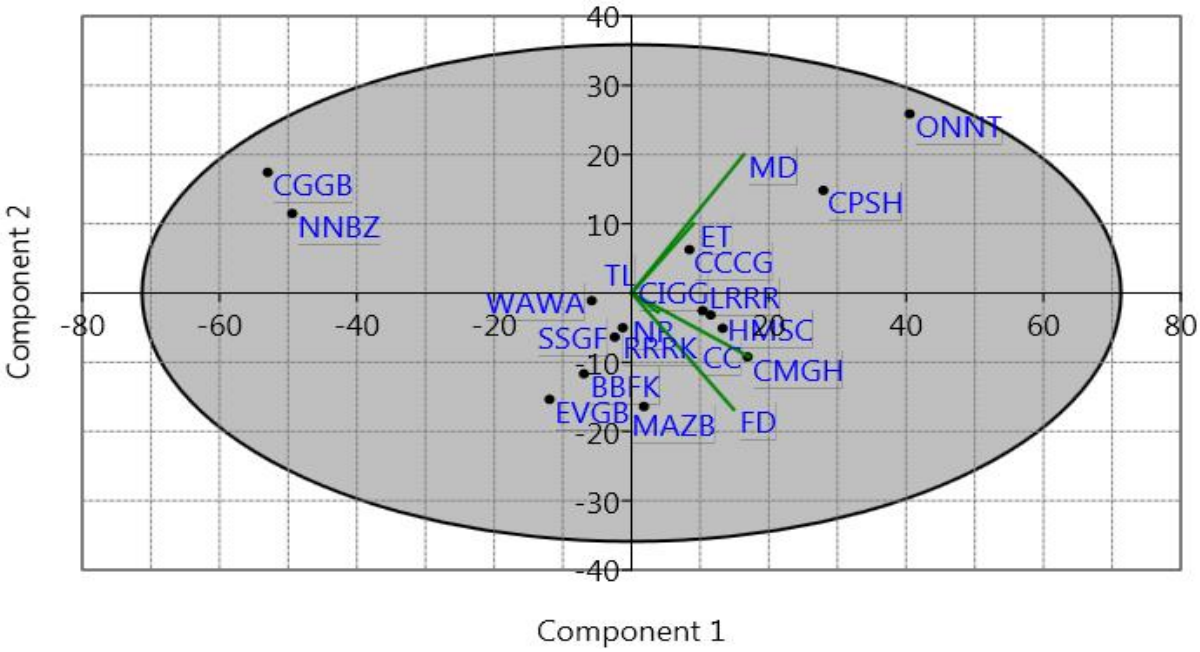

Figure 3: Principle Component Analysis is showing correlation among different factors in cultural uses (code present in Table 1).

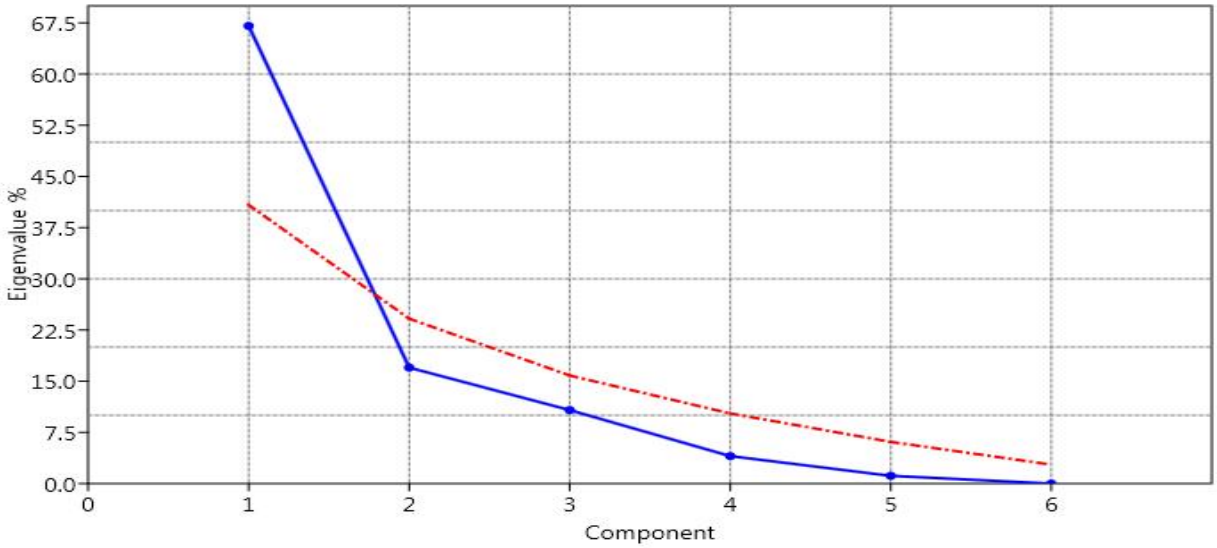

Figure 4: PCA is showing comparison between Component and Eigenvalue

ETHNOMEDICINAL USES OF FISHES

Respondents along river Jhelum have noteworthy information about cultural as well as folklore medicine uses of fish species. Total 15 species of fishes were utilized to treat a variety of illness such as eyesight, cough, cold, night blindness, joint and backbone pain, impotency, weakness, skin burn, hepatitis and chicken pox (Table 2).

BODY PARTS USED

In fishes, as shown in Figure 5, meat was the most regularly consumed part and was utilized in 11 recipes to heal diseases, followed by "oil", "brain", and "skin", utlized in 6, 3 and 1 recipes, respectively. These all body parts were used to treat various diseases viz. eyesight, cough, cold, joint pain, backbone pain, night blindness, impotency, weakness, skin burn, chicken pox and hepatitis (Figure 6).

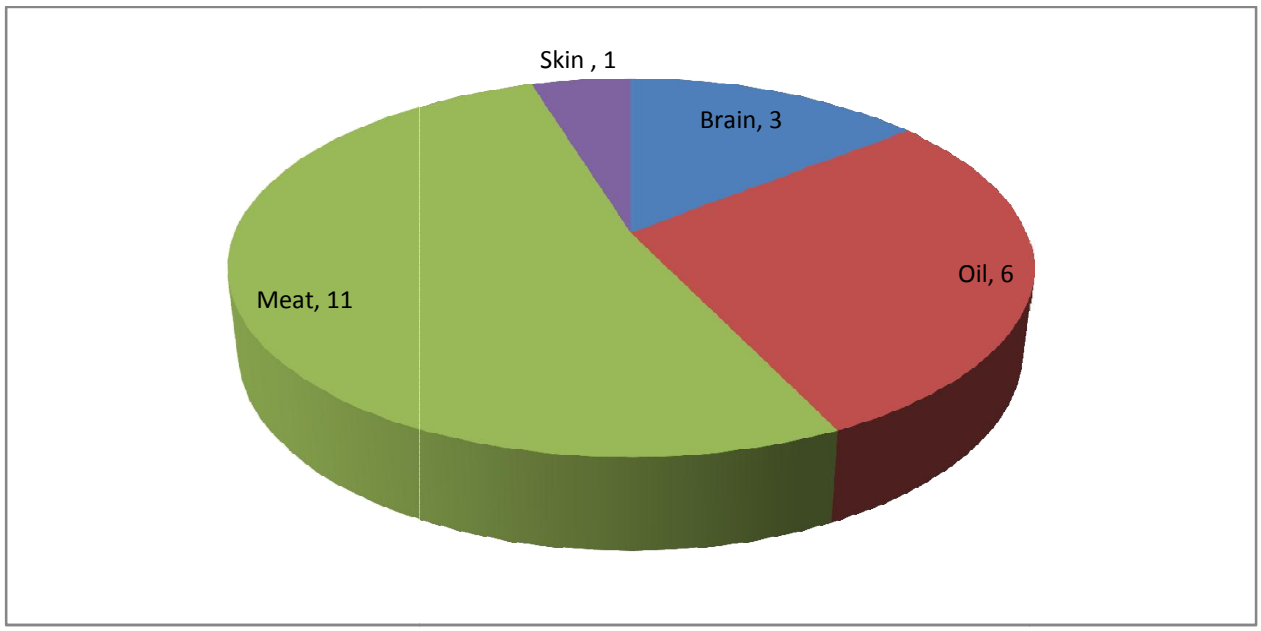

Figure 5: Body parts of fish used in various recipes.

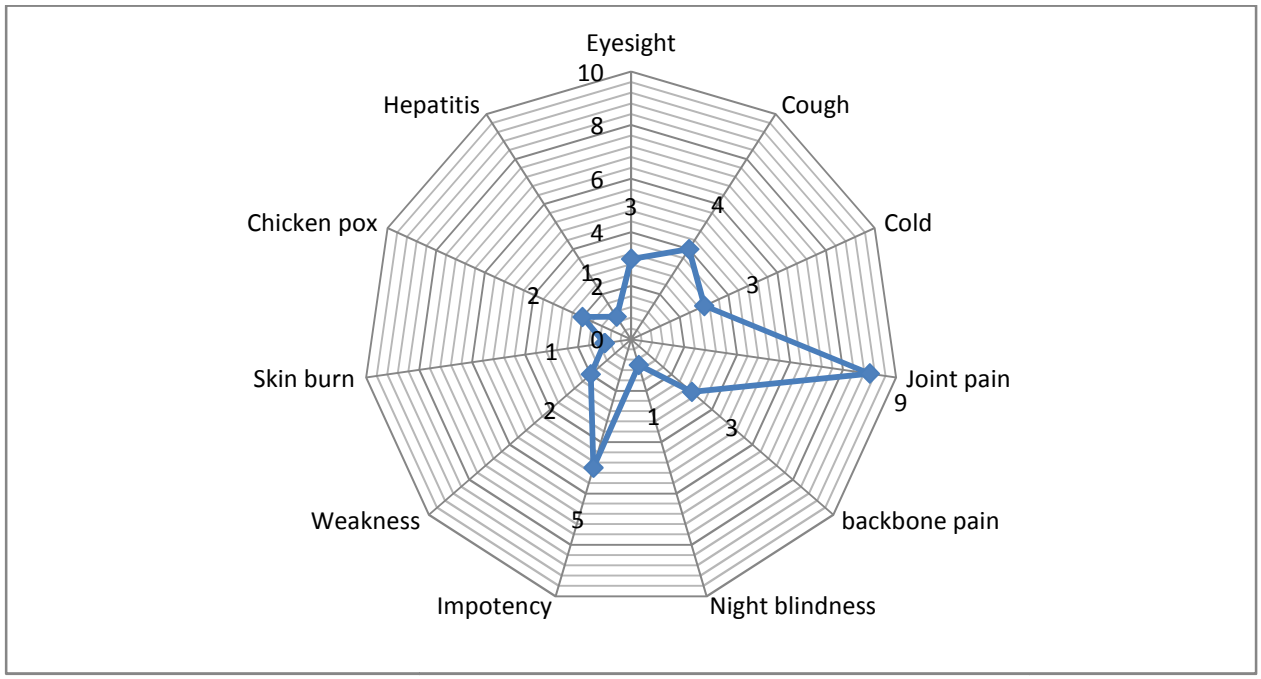

Figure 6: Number of diseases treated

During present study meat is used to cure eyesight, cough, cold, night blindness, joint pain, backbone pain, impotency, chicken pox and hepatitis (Figure 7). Meat has approximately 75% water, round about 21% nitrogenous compounds, almost 5% lipids, 2% vitamins, carbohydrates and ash (calcium, chlorine, iron, magnesium, phosphorus, potassium and sodium) (Keeton and Eddy, 2004; Hui, 2012). Meat composition is variable due to the impacts of various external and internal factors like feeding, muscle, animal species, breed sex, etc (Cheung and Mehta, 2015). Meat of different species i.e. *Acridotheres ginginianus, Acridotheres tristis, Ammoperdix heyi, Anas platyrhynchos, Aratinga cactorum, Bagarius bagarius, Bos taurus, Bubalus bubalis, Calotes versicolor, Camelus dromedaries, Capra aegagrus hircus, Channa marulius, Cirrhinus mrigala, Columba livia*, *Columba rupestris*, *Coturnix Coturnix, Ctenopharyngodon idella, Cyprinus carpio, Dicrurus macrocercus, Egretta garzetta*, *Equus caballus, Eudynamys scolopaceus, Francolinus francolinus, Funnambulus pennant, Gallus gallus domesticus, Hystrix indica, Labeo rohita, Lepidocephalichthys thermalis Lepus nigricollis, Macaca mulatta, Mimus saturninus, Nothura boraquira, Oreochromis niloticus, Ovis aries, Passer cinnamomeus, Passer domesticus, Pterocarpus giganteus, Rana clamitans, Rana clamitans, Rita rita, Serpentes* spp., *Spilopelia chinensis, Streptopelia orientalis, Suncus murinus, Trochalopteron lineatum, Upupa epops, Vulpes vulpes* and *Wallago attu* are utilized in different folk therapies wound healing, whooping cough, urine problem, tuberculosis, pile, nourishing food, paralysis, muscular pain, muscle fatigue , morning sickness, menstrual disorder, Menorrhagia, lungs infection, kidney problems, joint pain, jaundice, infertility, impotency, immune enhancer, hepatitis, fractures, flu, fever, eye-problems, eye tonic, erysipelas, eruption of new teeth in children, erectile dysfunction, epilepsy, edema, dysentery, diarrhea, diabetes, constipation, cold, CNS, carbuncle, bronchitis, breathing trouble, body strength, blindness, asthma, aphrodisiac, anemia, allergy, acidity, abscesses, (Lev, 2006; Mishra and Rout, 2009; Haileselasie, 2012; Bezerra *et al.*, 2013; Arshad *et al.*, 2014; Chellappandian *et al.*, 2014; Kim and Song, 2014; Mootoosamy and Mahomoodally, 2014; Vallejo and González, 2014; Bagde and Jain, 2015; Vats and Thomas, 2015; Vijayakumar *et al.*, 2015a; Vijayakumar *et al.*, 2015b; Aloufi and Eid, 2016; Altaf, 2016; Borah and Prasad, 2017a; Chattha *et al.*, 2017; Muhammad *et al.*, 2017a; Ali *et al.*, 2018; Altaf *et al.*, 2020).

In the present study the uses of body fat/oil of fish served to treat eyesight, cough, cold, night blindness, joint pain and backbone pain (Figure 7). Omega-3 and 6 fatty acids might be health beneficial metabolites and used to treat thrombotic, neurological disorders, atherosclerosis, anti-aging chemicals (Wilson, 2015), anti-atherogenic, anti-inflammatory effects (Esposito *et al.*, 2004; Morgan *et al.*, 2006; Kabir *et al.*, 2007), enhancement of atherogenic lipid profile, autoimmunity and maintenance of insulin in body (Mori *et al.*, 1999; Esposito *et al.*, 2004).

The α1 and α2 collagen (I) proteins (Kimura, 1992), vitamins (FAO, 2001), and amino acids i.e. Aspartic acid, Cysteine, Arginine, Alanine, Histidine,

Glutamic acid, Glycine, Lysine, Tyrosine, Methionine, Hydroxylysine, Leucine, Serine, Threonine, Phenylalanine, Proline, Valine and 4-hydroxyproline, (Sivakumar *et al.*, 2000) have also been documented in the skin of fishes. Collagen involved for tissue regeneration (Raman and Gopakumar, 2018), and amino acids of fishes are necessary to humans for balanced diet (Erkan and Bilen, 2010).

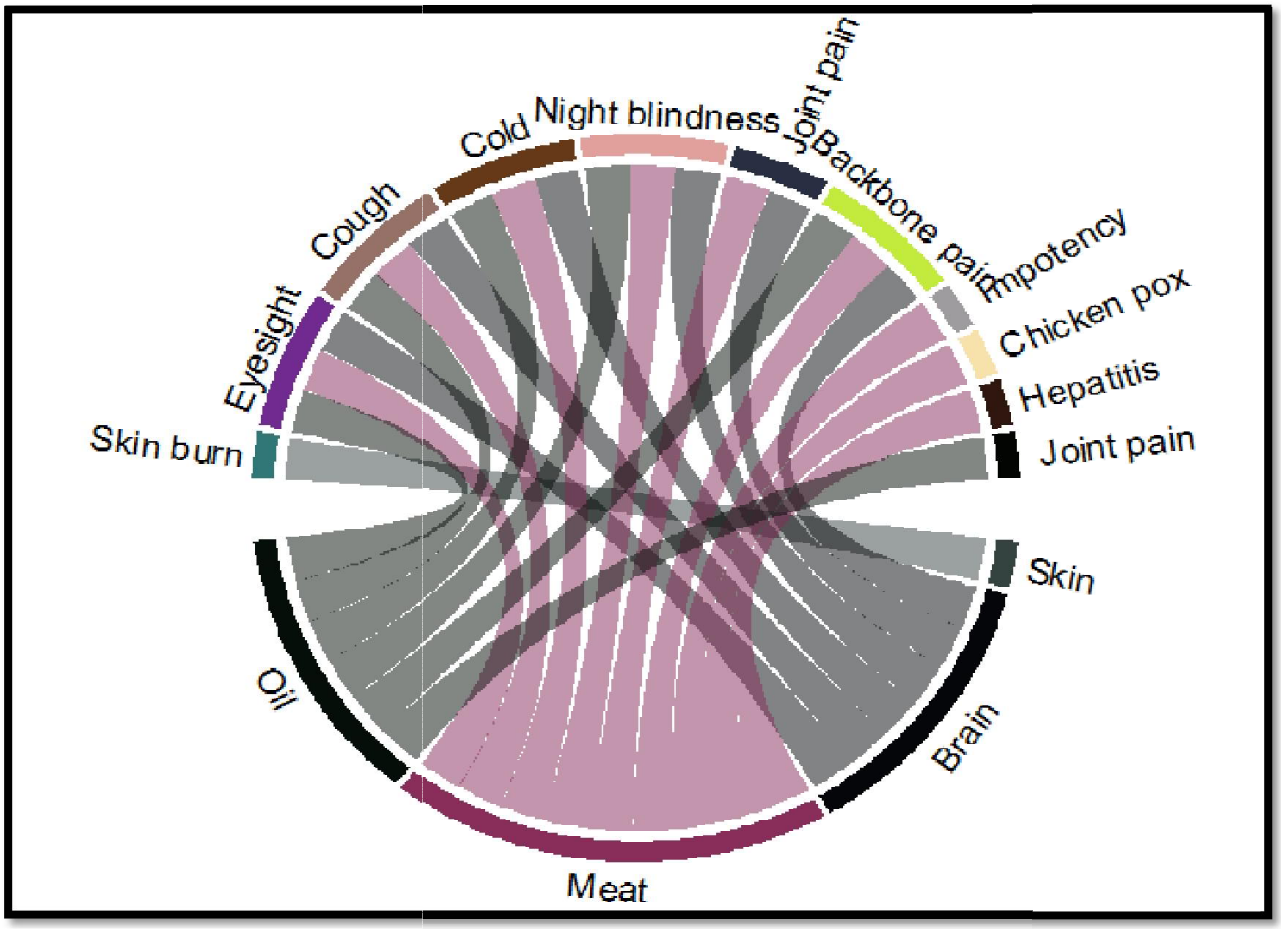

Figure 7: The relationship between diseases and fish body parts.

DISEASES TREATED

People of river Jhelum liked *Ctenopharyngodon idella* for the ailments of cough, cold, eyesight, joint and backbone pain, while the this fish species was documented to cure sexual power, joint pain, enhance memory, and energy; and 0.20 similarity index (SI) was noted when, it was compared with previous studies (Muhammad *et al.*, 2017b; Altaf *et al.*, 2018; Altaf *et al.*, 2020). During study noted that people of local areas used *Hypophthalmichthys molitrix* for the cure of cough, cold, eyesight, night blindness, joint pain, backbone pain; and this species was documented in previous studies to cure Eyesight, cough, cold, night blindness, fever (Altaf *et al.*, 2020) and has depicted similarity index = 0.84. Our findings revealed that *Cyprinus carpio* was used against eyesight, cough, cold, and joint and backbone pain. In previous studies (Vallejo and González, 2014;

Altaf *et al.*, 2018; Altaf *et al.*, 2020), this species has been documented as utlized for sexual power, overweight, lumbago, erysipelas, enhance memory, cold and CNS and has shown similarity index = 0.20. Likewise, *Rita rita* was effective for the ailment of impotency and joint pain, is documented in previous studies for the treatments of illness viz. cold, sexual power, Joint pain, joint pain, energy and CNS (Arshad *et al.*, 2014; Altaf *et al.*, 2018; Altaf *et al.*, 2020); and has 0.50 SI.

During this study noted that *Labeo rohita*, *Channa marulius, Channa punctata, Oreochromis niloticus, Bagarius bagarius, Mastacembelus armatus,* and *Wallago attu*, have "zero" similarity index and treated to cure cough, impotency , weakness, skin burn, chicken pox, joint pain and hepatitis, while these species were treated to cure different diseases in previous studies viz. Abscesses, appetite, blood purification, body pain, carbuncle, CNS, cold, depression, dysentery, energy, hemoglobin, Impotency, Joint pain, liver diseases, malaria, memory, pile, rheumatic pain, scorpion bite, sexual power, stomachache, tonic, urine problem, vision and weakness (Mahawar and Jaroli, 2008; Benítez, 2011; Deb and Emdad Haque, 2011; Barros *et al.*, 2012; Mawla *et al.*, 2012; Saikia and Ahmed, 2012; Teronpi *et al.*, 2012; Arshad *et al.*, 2014; Vallejo and González, 2014; Borah and Prasad, 2017b; Muhammad *et al.*, 2017a; Altaf *et al.*, 2018; Altaf *et al.*, 2020). *Sperata seenghala, Eutropiichthys vacha* and *Clupisoma garua* were reported first time, all have also "zero" similarity index and oil of these species effective against joint pain.

FREQUENCY OF CITATION (FC)

The species of fishes documented by the highest number of participants, were commonly utilized to cure illnesses, and showed FC ranging from 54 to 100 (Table 1) i.e. *Ctenopharyngodon idella*, *Hypophthalmichthys molitrix, Cyprinus carpio, Labeo rohita*, *Channa marulius, Channa punctata, Oreochromis niloticus, Rita rita, Bagarius bagarius, Mastacembelus armatus, Sperata seenghala, Wallago attu* and *Eutropiichthys vacha* had a maximum FC (100), followed by *Notopterus notopterus* and *Clupisoma garua* (Reba carp) (61 and 54, respectively).

RELATIVE POPULARITY LEVEL (RPL)

The RPL of the documented fauna is present in Table 2. The species of fishes were divided into "popular" and "unpopular" groups based on RPL (Figure 8), which were similar to Ali-Shtayeh *et al.* (2000) and Friedman *et al.* (1986b). During the survey noted that *Cyprinus carpio, Labeo rohita*, *Channa punctata, Oreochromis niloticus* and *Wallago attu* were with RPL = 1.0 and these species were the most popular; while remaining were categorized as "unpopular". The high popularity of the documented fish fauna might be recognized to their high effectiveness used as culture and folklore values.

FIDELITY LEVEL (FL)

The FL is use to distinguish species of fishes that are generally liked by local people to cure different illness (Srithi *et al.*, 2009; Bibi *et al.*, 2014). And "FL" of fish fauna in this research ranged from 20.83 to 98.51%, shown in Table 2. Five

species of fishes viz. *Ctenopharyngodon idella*, *Hypophthalmichthys molitrix, Cyprinus carpio, Channa punctata* and *Oreochromis niloticus* which were applied for backbone pain, cold, joint, cough, eyesight, impotency, joint pain, night blindness, skin burn, and weakness, depicted more than 80% FL (Figure 9). These results point out the prevalence of specific illnesses along river Jhelum that were treated with documented fish fauna having the highest FL value.

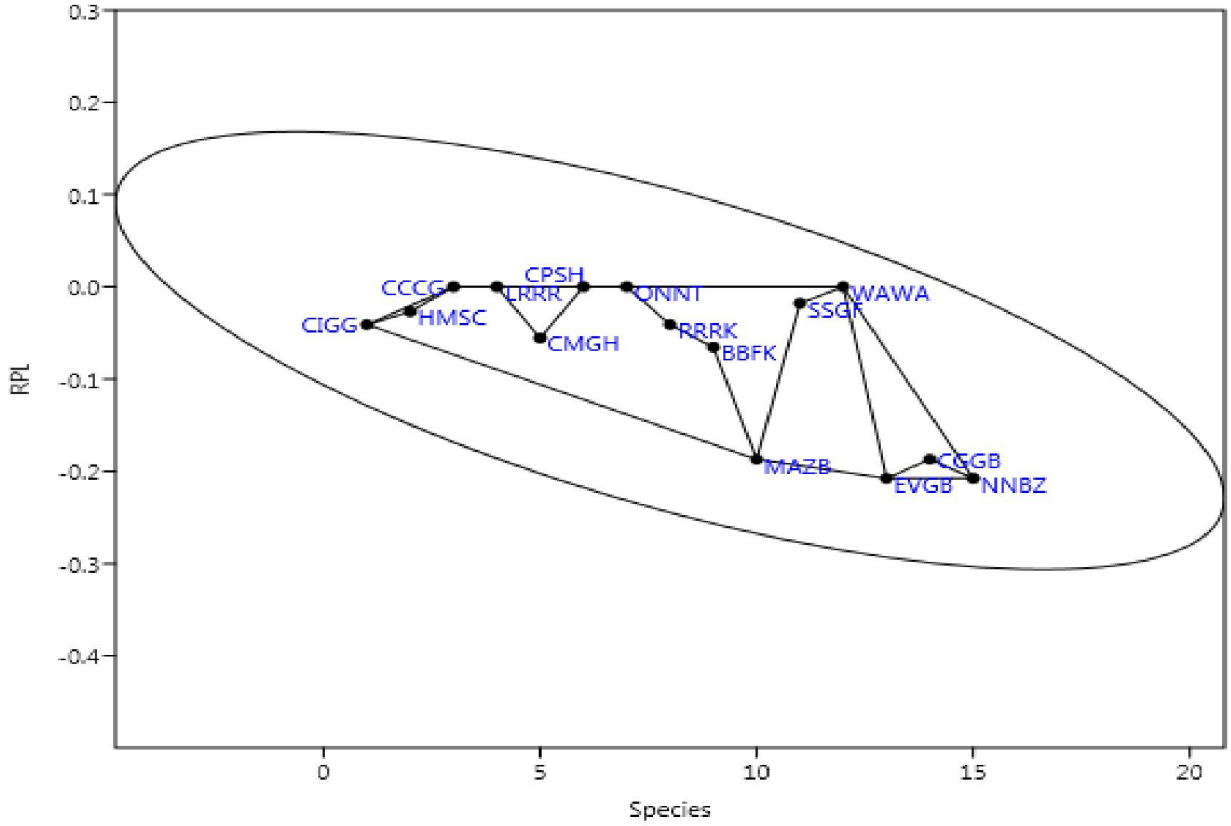

Figure 8: The relationship between species and relative popularity level (RPL) in the study area (code present in Table 1)

RANK ORDER PRIORITY (ROP)

The treating capacity of species of fishes was noted by utilizing FL values, while ROP was applied to allocate an appropriate rating to fish fauna with a range of values of FL. The calculated ROP levels of fish fauna are noted in Figure 9. The ROP of five species utilized to cure illnesses was above 80. Fish fauna i.e. *Ctenopharyngodon idella*, *Hypophthalmichthys molitrix, Cyprinus carpio, Channa punctata* and *Oreochromis niloticus* were used to treat various diseases like for backbone pain, cold, joint, cough, eyesight, impotency, joint pain, night blindness, skin burn, and weakness. Further, our findings of survey were resemble to previous study for ethnomedicinal species in Palestine (Ali-Shtayeh *et al.*, 2000).

CONCLUSION

Folklore uses of species of fishes were recorded, and to best of our information the folklore medicinal uses of 3 species of fishes were documented for the first time as well as 6 fish species have different treatment methods in our study area. Our findings showed that the respondents along river Jhelum having noteworthy folklore information due to their powerful link with the close proximity biodiversity. Our findings could be helpful for sustainable usage and conservation of fish fauna. Furthermore, comprehensive analysis on ethnopharmacologically active chemicals and *in vivo* and/or *in vitro* activities of chemicals from fish species with the highest FC as well as FL could be helpful for the preparation of new drugs to cure different illnesses.

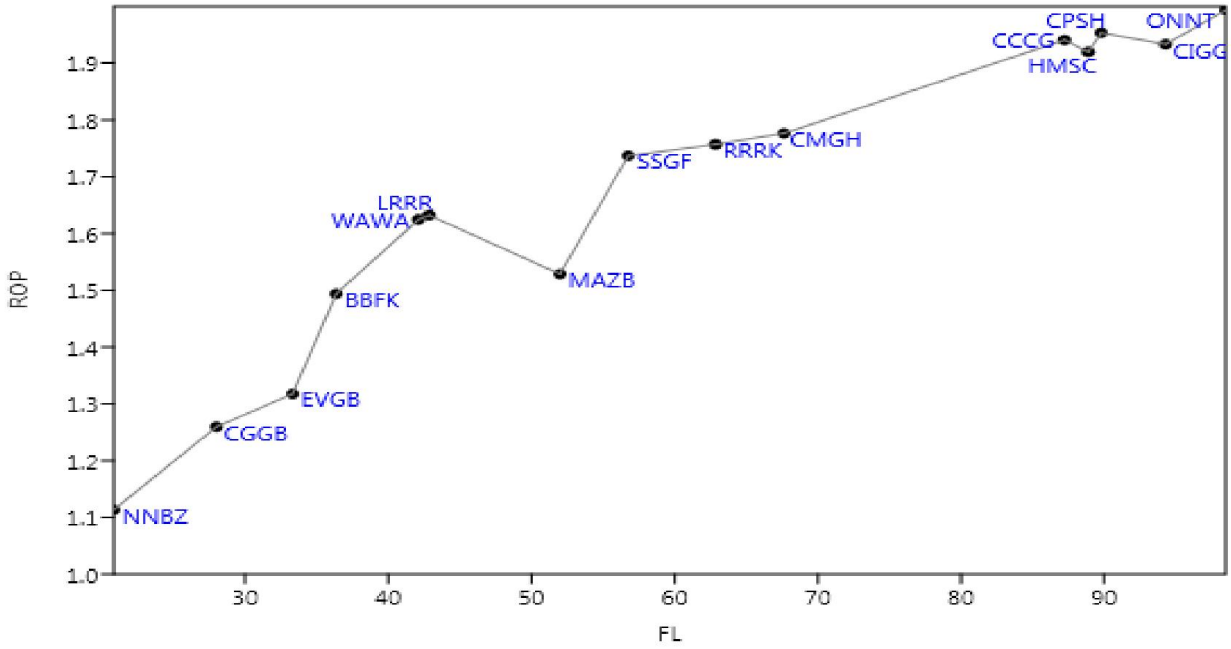

Figure 9: The relationship between ROP and FL in the study area (code present in Table 1)

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Table 1: Cultural uses of fishes along river Jhelum, Punjab, Pakistan.

Sr.	Common, scientific and local name	Code	FC	RFC	ST	MU	NR	CC	TOL	ETT	FD
1	Grass carp *Ctenopharyngodon idella* (Valenciennes, 1844) Grass carp	CIGG	100	6.67	NE	33	3	45	19	22	100
2	Silver carp *Hypophthalmichthys molitrix*	HMSC	100	6.67	NT	32	3	51	19	22	100

	(Valenciennes, 1844) Silver carp										
3	Common carp *Cyprinus carpio* (Linnaeus, 1758), Gulfam	CCCG	100	6.67	VU	41	3	34	19	22	100
4	Rohu *Labeo rohita* (Hamilton, 1822) Raho	LRRR	100	6.67	LC	33	3	47	19	22	100
5	Great snakehead *Channa marulius* (Hamilton, 1822) Soul	CMGH	100	6.67	LC	23	23	54	19	36	100
6	Spotted snakehead *Channa punctata* (Bloch, 1793) Dola	CPSH	100	6.67	LC	44	23	43	19	55	100
7	*Oreochromis niloticus* (Linnaeus, 1758) Nile tilapia Tilapia/Chira machhli	ONNT	100	6.67	NE	66	5	52	19	47	100
8	Rita *Rita rita* (Hamilton, 1822) Khaga	RRRK	100	6.67	LC	22	4	33	19	26	100
9	Goonch *Bagarius bagarius* (Hamilton, 1822) Foji Khaga	BBFK	100	6.67	NT	12	3	33	19	26	100
10	Zig-zag eel *Mastacembelus armatus* (Lacepède, 1800) Baam machhali	MAZB	100	6.67	LC	13	24	43	19	25	100
11	Giant river-catfish *Sperata seenghala* (Sykes, 1839) Sangari	SSGF	100	6.67	NE	21	4	33	19	24	100
12	wallago catfish *Wallago attu* (Bloch & Schneider, 1801) Mali	WAWA	100	6.67	NT	24	3	24	19	25	100
13	Batchwa vacha *Eutropiichthys vacha* (Hamilton, 1822) Jhali	EVGB	100	6.67	LC	8	2	31	19	21	100
14	Garua bachcha *Clupisoma garua* (Hamilton, 1822)	CGGB	54	3.60	LC	7	2	3	19	17	54

	Bachhwa										
15	Bronze featherback *Notopterus notopterus* (Pallas, 1769) But Pari	NNBZ	61	4.07	LC	5	2	5	19	17	61

Note: FC (Frequency of citation), RFC (Relative frequency of citation), ST (Status), MU (Medicinal use), NR (Narrative), CC (Commercial), TOL (Tool), ETT (Entertainments), FD (Food).

Table 2: Comparative evaluation of present and previously documented folklore medicinal usages of fishes.

Sr.	Scientific, common and local name	Parts Use/ MOA	Diseases	RPL	FL	ROP	Reported use	References	SI
1	*Ctenopharyngodon idella*	Brain, meat, oil/Oral	Eyesight, cough, cold, joint and backbone pain	0.91	94.29	85.71	Sexual power, cold, joint pain, increase memory, energy	(Muhammad *et al.*, 2017b; Altaf *et al.*, 2018; Altaf *et al.*, 2020)	0.20
2	*Hypophthalmichthys molitrix*	Brain, meat, oil/Oral	Eyesight, cough, cold, night blindness, joint pain, backbone pain	0.94	88.89	83.12	Eyesight, cough, cold, night blindness, fever	(Altaf *et al.*, 2020)	0.84
3	*Cyprinus carpio*	Brain, meat, oil/Oral	Eyesight, cough, cold, joint and backbone pain	**1.00**	87.23	87.23	Sexual power, overweight, lumbago, erysipelas, enhance memory, cold, CNS	(Vallejo and González, 2014; Altaf *et al.*, 2018; Altaf *et al.*, 2020)	0.20
4	*Labeo rohita*	Meat/Oral	Cough, Impotency	**1.00**	42.86	42.86	Weakness, stomach pain, sexual power, rheumatic pain, depression, enhance memory, cold, urine problem, energy	(Saikia and Ahmed, 2012; Arshad *et al.*, 2014; Borah and Prasad, 2017b; Altaf *et al.*, 2018; Altaf *et al.*, 2020)	0
5	*Channa marulius*	Meat/Oral	Impotency , weakness	0.88	67.65	59.74	Sex power, rheumatic pain, memory , hemoglobin, energy, cold,	(Deb and Emdad Haque, 2011; Saikia and Ahmed, 2012; Arshad *et al.*, 2014; Muhammad *et al.*, 2017a; Altaf *et al.*, 2020)	0
6	*Channa punctata*	Meat/Oral	Impotency , weakness	**1.00**	89.80	89.80	Cold, sexual power, malaria, joint pain, enhance energy, body pain, blood purification, appetite	(Mahawar and Jaroli, 2008; Saikia and Ahmed, 2012; Teronpi *et al.*, 2012; Altaf *et al.*, 2018; Altaf *et al.*, 2020)	0
7	*Oreochromis niloticus*	Skin/Topical	Skin burn	**1.00**	98.51	98.51	Vision, sexual power, scorpion bite, enhance memory, energy, carbuncle, abscesses	(Vallejo and González, 2014; Altaf *et al.*, 2018; Altaf *et al.*, 2020)	0

8	*Rita rita*	Meat/Oral	Impotency, joint pain	0.91	62.86	57.14	Cold, sexual power, Joint pain, joint pain, energy, CNS	(Arshad *et al.*, 2014; Altaf *et al.*, 2018; Altaf *et al.*, 2020)	0.5
9	*Bagarius bagarius*	Meat/Oral	Joint pain, impotency	0.86	36.36	31.17	Body pain, burns, stomach ache	(Chakravorty *et al.*, 2011; Saikia and Ahmed, 2012)	0
10	*Mastacembelus armatus*	Meat/Oral	Chicken pox, joint pain	0.65	52.00	33.77	Impotency, weakness	(Altaf *et al.*, 2020)	0
11	*Sperata seenghala*	Oil/Topical	Joint pain	0.96	56.76	54.55			0
12	*Wallago attu*	Meat/Oral	Hepatitis	**1.00**	42.11	42.11	Joint pain, tonic, pile, dysentery, sexual power, liver diseases, cold	(Benítez, 2011; Barros *et al.*, 2012; Mawla *et al.*, 2012; Altaf *et al.*, 2018)	0
13	*Eutropiichthys vacha*	Oil/Topical	Joint pain	0.62	33.33	20.78			0
14	*Clupisoma garua*	Oil/Topical	Joint pain	0.65	28.00	18.18			0
15	*Notopterus notopterus*	Meat/Oral	Chicken pox	0.62	20.83	12.99	Pain, chicken pox	(Deb and Haque, 2011; Mukti *et al.*, 2012)	1

Note: MOA (Mode of Application), FL. (fidelity level), ROP (Rank order priority), RPL (Relative popularity level), FL (Fidelity level), SI (Similarity index)

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