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Fish Diversity of Lucknow District (Uttar Pradesh), India

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Abstract: *Lucknow a capital of Uttar Pradesh has vast potential of fish faunal diversity and offers considerable scope of inland fisheries development. Aquaculture activities in rural for most of the fisherman area. In order to establish fish faunal diversity of Lucknow a preliminary, data have been collected with the help of local fish farmers and market survey. Various lentic and lotic water bodies of different locations of the district for 9 months during 2014–2015 have been collected. During the study period, 83 fish species belonging to 58 Genera, 21 Families and 8 Orders have been identified. Cypriniformes was found the dominated Order with 56 species (68%) followed by Perciformes 9 species (11%) and Clupeiformes 6 species (7%). The present study showed that Lucknow possesses rich fish diversity but proper conservation measures are required to maintain sustainability and richness of the species diversity of the district.*

Keywords: Fish diversity, Faunal, Aquaculture activities, Defragmentation.

Introduction

Fish diversity within the fresh water ecosystem has a great importance in terms of the livelihood and the economic importance of the people living around it. Accordingly the relation between the biodiversity and human well-being is interrelated and is being promoted increasingly through the concept of ecosystem services provide by the species. Biodiversity is essential for stabilization of ecosystem, protection of overall environmental quality for better understanding intrinsic species on the Earth (Vijaykumar, 2008). The lack of knowledge on the ichthyofauna is a big gap for popularizing little known fish variety in a particular ecosystem. Attempt has been made to survey fish fauna associated with habitat; this will help in planning methods for their production and effective exploitation (Renjithkumar *et al*., 2011). The objective of the study to give recent data a better knowledge of the fish diversity of the Lucknow district and a tool for conservation and planning of the aquatic environments. During the last few decades, the fish biodiversity of the state is declining rapidly due to habitat destruction defragmentation, water abstraction, industries and private use (Szollosi-Nagy 2004; Ricciardi and Rasmussen 1999; Gibbs 2000; Dawson *et al.,* 2003) exotic species introduction (Copp *et al.,* 2005), pollution (Lima-Junior *et al*., 2006) and global climate change impacts (Leveque *et al*., 2005). Thus there is an argent need for proper inventorisation and documentation of this diversity in order to develop a fresh water diversity information system (Islam *et al.,* 2013). Icthyofaunal diversity refers to variety of fish species (Johnson *et al.,* 2012) fishery plays an instrumental role in the socio-economic development of the country, as it is a valuable resource of livelihood for a huge section of economically backward population. It also generates employment, alternate income and stimulates growth of new subsidiary industries (Goswami *et al.*, 2012). Uttar Pradesh has vast potential of aquatic bioresources and offers considerable scope of inland fisheries development and aquaculture. State contributes approximately 14.68% of the total national fish diversity (Lakra, 2010) and resources are

available in the form of 28,500 km of rivers and canals, 1.38 lakh ha of reservoirs and 1.61 lakh ha of ponds and tanks as well as 1.33 lakh ha of floodplain lakes and derelict water.

Materials and Methods

Fishing was carried out with the help of local fishers using gill net, cast net, drag net, scoop net including hooks and lines (Bose *et al.,* 2013). The samples were collected from tanks, lakes, rivers (Gomti), irrigation canals and fish markets. Gomti is the main river which flows from west to east and cover entire length of the district. As soon as the small fishes were collected they were directly placed in a wide mouth jar having 2 liter capacity with 8% formalin solution (Bagra, 2010). Separate jar was used for preserving individual species and brought to the laboratory for identification.

Fresh or preserved samples were identified on the standard taxonomic keys for fishes (Day, 1996; Talwar and Jhingran, 1991). In addition various morphological characters, shape, colors etc were recorded by FAO Identification Sheets, Srivastava (2002), ITIS (Integrated Taxonomic Information System) Standard Report (http://www.itis.gov), Fish Base (http://fishbase.org). The collected fish were identified up to species level.

Results and Discussion

Lucknow has vast freshwater fisheries resources which consist of lentic and lotic water bodies exclusively of culture fishery from seasonal, perennial and culture ponds and capture fishery from rivers, nullas and irrigation canals. Present fish biodiversity in the river originate mainly from natural reproduction or escape from the numerous water bodies of the district. During the study period fish faunal diversity was noticed of which 83 fish species belong to 58 genera, 21 families and 8 orders were identified (Table1). After morphometric and meristic analysis of all specimens found the Order Cypriniformes (56 species) contributed maximum as compared to Perciformes (9 species) and Clupeiformes (6 species). Ophiocephaliformes comprise 5 species while, Mastacembeleformes shared 3 species and Mugiliformes contributed 2 species whereas Beloniformes and Tetraodontiformes shared one species. The dominant order was Cypriniformes (minnows and carps) comprising 68% of all the number of species recorded. Next to Cypriniformes, other dominant orders were Perciformes, Clupeiformes and Ophiocephaliformes constituting 11%, 7% and 6% of species recorded, respectively (Fig. 1). All others order like Mastacemleleformes shared 4% and Mugiliformes, Beloniformes, Tetraodontiformes, 2%, 1%, 1% contribute respectively. The dominant family was Cyprinidae comprising 42% of the total number of species abundancy (Fig. 2) and comprises *Amblypharyngodonmola, Amblypharyngodon microlepis, Aspidoparia jaya, Aspidoparia morar, Aristichthysnobilis, Barilius bola, Botia Dario,Catlacatla, Chaguniuschagunio, Chela atpar, Chela laubuca, Cirrhinus mrigala, Cirrihinareba, Crossocheiluslatius, Ctenopharyngodonidella, Cyprinuscarpiocommunis, Cyprinuscarpiospecularis, Cyprinuscarpionudus, Danio devario, Esomusdanricus, Hypophthalmichthys molitrix, Labeoangra, Labeobata, Labeocalbasu, Labeodero, Labeogonius, Labeorohita, Lepidocephalichthys guntea, Osteobramacotio, Oxygastergora, Puntius chola, Puntius sarana, Puntius sophore, Puntius ticto, Somileptes gongota*. Genus *Labeo* represented by 6 species was dominant followed by Genus *Puntius* with 4 species. Other diversified families were Bagridae (8% contribution) reported species are *Mystusbleekeri, Mystuscavasius, Mystusmenoda*, *Mystustengara, Mystusaor, Mystusseenghala, Rita rita.* Another family is Schilbeidae 6%, Channidae and Sisoridae 6%, Centropomidae, Anabantidae and Clupeidea 4%, Mugilidae, Nandidae, Mastacembelidae, Notopteridae share 2% and some other family like Siluridae, Chacidae, Saccobranchidae, Claridae, Belonidae,

Table 1 Fish diversity of Lucknow district (Uttar Pradesh).

Order	Family	Scientific name	Local/ common name
Clupeiformes	Clupeidae	*Gudusiachapra*	Suhia
		Gudusiagodanahiai	Godanahiasuhia
		Gonialosamanmina	Majhalisuhia
	Engraulidae	*Setipinnaphasa*	Phansi
	Notopteridae	*Chitalachitala*	Moi/ knifefish
		Notopterusnotopterus	Patra/ featherback
Cypriniformes	Cyprinidae	*Amblypharyngodonmola*	Dhawai
		Amblypharyngodonmicrolepis	Dhawai
		Aspidopariajaya	Jaya
		Aspidopariamorar	Kenwachi/ Harda
		Aristichthysnobilis	Bighead carp
		Barilius bola	Bhola/Nayer
		Botiadario	Baghaua
		Catlacatla	Bhakur/ Catla
		Chaguniuschagunio	Gelhari
		Chela atpar	Chelhwa
		Chela laubuca	Dendula
		Cirrhinusmrigala	Nain/ Mrigal
		Cirrihinareba	Raia
		Crossocheiluslatius	Petphorani
		Ctenopharyngodonidella	Grass carp
		Cyprinuscarpiocommunis	Common carp
		Cyprinuscarpiospecularis	Common carp
		Cyprinuscarpionudus	Common carp
		Danio devario	Patukari
		Esomusdanricus	Dendua
		Hypophthalmichthys molitrix	Silver carp
		Labeoangra	Thuthuniahiaraia
		Labeobata	Bata
		Labeocalbasu	Karonchh
		Labeodero	Kalabans
		Labeogonius	Kurai
		Labeorohita	Rohu
		Lepidocephalichthysguntea	Nakati
		Osteobramacotio	Gurda
		Oxygastergora	Dariaichalho
		Puntius chola	Sidhari
		Puntius sarana	Barb/ Olive barb
		Puntius sophore	Pool barb
		Puntius ticto	Ticto barb
		Somileptesgongota	Baluari

(*Continued*)

Table 1 Continued

Order	Family	Scientific name	Local/ common name
	Siluridae	*Wallago attu*	Padhani/Barari
	Bagridae	*Mystusbleekeri*	Tengra
		Mystuscavasius	Sutahawatengra
		Mystusmenoda	Belaunda
		Mystustengara	Tengana
		Mystusaor	Dariaitengara
		Mystusseenghala	Dariaitengara
		Rita rita	Hunna/Rita
	Sisoridae	*Bagariusbagarius*	Gonch
		Erethistespussilus	Panahi
		Gangatacenia	Tinkatia
		Hara hara	Panahi
		Sisorrhabdophorus	Bistuiya
	Chacidae	*Chacachaca*	Chakawa
	Schilbeidae	*Ailiacoila*	Patasi/Minti
		Clupisomagarua	Baikari/Karahi
		Eutropiichthysvacha	Banjhoo
		Pangasiusupiensis	Payas
		Siloniasilondia	Silund
	Saccobranchidae	*Heteropneustesfossilis*	Singhi
	Clariidae	*Clariasbatrachus*	Mangur
Beloniformes	Belonidae	*Xenentodoncancila*	Kauwa
Mugiliformes	Mugilidae	*Rhinomugilcorsula*	Corsula
		Sicamugilcascasia	Yellowtail mullet
Ophiocephaliformes	Channidae	*Channagachua*	Chanaga
		Channamarulius	Saur
		Channa punctatus	Girai
		Channastriatus	Sauri
		Channastewartii	Saur
Perciformes	Centropomidae	*Chanda baculis*	Chanri
		Chanda nama	Chanri
		Parambassisranga	Chanri
	Sciaenidae	*Sciaenacoitor*	Patharchatti/ Bhola
	Nandidae	*Badisbadis*	Sumha
		Nandusnandus	Dhebri
	Anabantidae	*Anabas testudineus*	Kawai
		Colisafasciatus	Khosti
		Colisalalius	Khosti
Mastacembele-formes	Mastacembelidae	*Mastacembeluspancalus*	Malga/Barred spiny eel
		Mastacembelusarmatus	Bam/Zig-zag eel
	Synbranchidae	*Amphipnouscuchia*	Andhasanp/Cuchia
Tetraodontiformes	Tetraodontidae	*Tetraodon cutcutia*	Ocellated Pufferfish

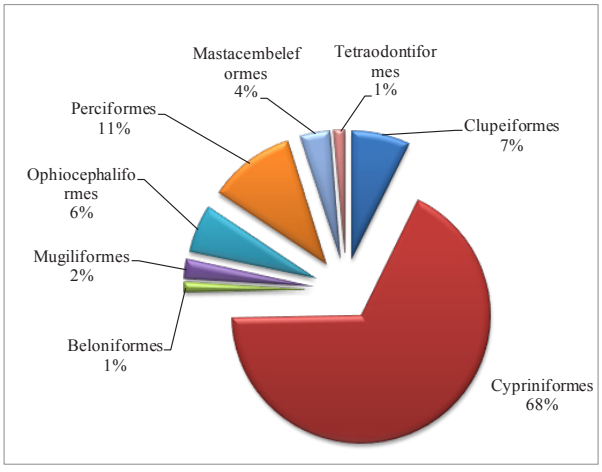

Fig. 1 Diagrammatic representation of per cent contribution in each order.

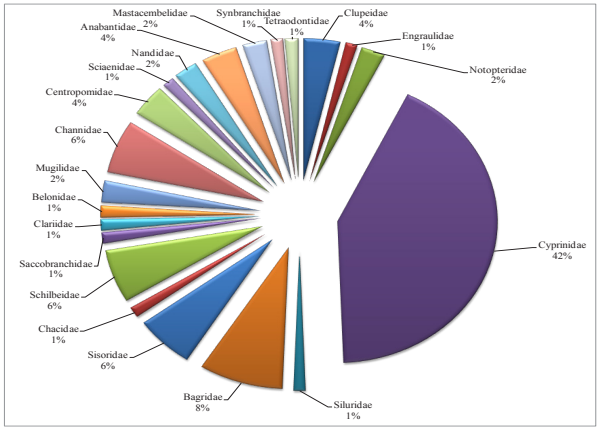

Fig. 2 Diagrammatic representation of the per cent contribution in each Family.

Sciaenidae, Synbranchidae, Tetraodontidae, Engraulidae contribute only 1% of all fish species. In the culture ponds, *Catlacatla, Labeorohita, Cirrhinusmrigala, Ctenopharyngo donidella, Hypophthalmichthys molitrix* and *Cyprinuscarpio* were very common species in the district. In the seasonal ponds, *Puntius spp*., *Channa spp*., *Wallago attu, Clariasbatrachus* and *Heteropneustes fossilis* were the common fish species. In the rivers and irrigation canals, Indian major carps and catfishes was also recorded frequently. Fish diversity in terms of number (83 species) observed in Lucknow district. The fisheries of riverine system are based on relatively large number of species and a wide range of fishing gears. Fish biodiversity in the district alters by habitat degradation, invasion of exotic fishes and fishing pressure is the main cause is (Lakra *et al.,* 2008; Lakra, 2010). Environmental stress and fishing pressure are reflected in the fish community composition and biodiversity of fishes (Dwivedi and Nautiyal, 2010; Mayank *et al.,* 2011; Kumar, 2012; Tamboli and Jha, 2012). Present study indicates the changing scenario of fish diversity of Lucknow district. Reports are available on occurrence of 87 fish species from eastern part of Uttar Pradesh and 111 taxa have been notice whereas 30 species are described in stretches of river Ganga at Allahabad (Srivastava, 2002; Lakra, 2010). 63 fish species belong to 20 Families and 45 Genera were reported from river Betwa (a tributary of Ganga basin approved under First River - Linking Plan of India) in Uttar Pradesh (Lakra 2010). More recently, 92 fish species belong to 58 Genera and 24 Families were recorded by NBFGR from river Ganga in Uttar Pradesh. Another report revealed the presence of 56 species belonging to 42 Genera, 20 Families and 7 Orders from river Gomti (Sarkar *et al.,* 2010). Recent assessment by NBFGR, Lucknow revealed the occurrence of about 123 fish species (Lakra, 2010).While evaluating the utilization pattern in Uttar Pradesh, out of 123 species about 33% are considered as ornamental, nearly 57% are potential food and 10% are listed under potential sport fishes (Lakra, 2010). The environmental threats could be man-made and natural or in combination with cascading and interlinked impacts. Conservation and sustainable utilization of natural resources are issues receiving global attention after signing the Convention on Biological Diversity (CBD, 1992). Though not much published literature is available on the threat status of fish species of Uttar Pradesh, yet it is fact that population of some species is constantly going down and there is an urgent need to protect the same

for posterity. According to recent conservation assessment of NBFGR, a total of 20 freshwater fishes are categorized as threatened of which 9 under endangered and 11 vulnerable (Lakra, 2010). The Government of Uttar Pradesh has declared endangered *Chitalachitala* as a State Fish and planning for its conservation is in process (NBFGR, www.nbfgr.res.in). Due to lack of sufficient information on occurrence and abundance of fish species of Lucknow, is not possible to quantify the rate of decline in its diversity but this report would be useful as baseline data for any future assessment and conservation plan for fisheries. However, more awareness and motivation is required on the value of indigenous fish diversity and conservation of aquatic resources to ensure the sharing of benefits of its utilization in an equitable manner so that the aquatic ecosystem gets adequate time to recover its natural community structure (Lakra and Pandey, 2009; Lakra, 2010).

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References

Bagra, V. and Das, D.N. (2010) Fish Diversity of River Siyom of Arunachal Pradesh India: A Case Study. *Our Nature,* **8**, 164–169.

Bose, A.K., Jha, B. C., Suresh, V. R., Das, A. K., Parasar, A. and Ridhi. (2013) Fishes of the Middle Stretch of River Tawa, Madhya Pradesh, India. *J. Chem. Biol. Phys. Sci.,* **3**, 706–716.

Copp, G.H., Bianci Bogutskaya N.G., Eros, T, Falka, I., Ferreira, M.T., Fox, M.G., Freyhof, J., Gozlan, R.E., Grabowska, J., Kovac, V., Moreno-Amich, R., Naseka, A.M. and Wiesner, C. (2005) To be, or not to be, a non-native freshwater fish. *J. Appl. Ichthyol.,* **21**, 242–262.

Dawson, T.P., Berry, P.M. and Kampa, E. (2003) Climate change impacts on freshwater wetland habitat. *J. Nat. Conserv.,* **11**, 25–30

Dey, V.K. (1996) Ornamental fishes and Hndbook of Aqua farming. The Marine Products Export Development Authority, Cochin. Entrepreneurship Development. Central Institute of Freshwater Aquaculture, Bhubaneshwar, 1–6.

Dwivedi, A.C. and Nautiyal, P. (2010). *Population dynamics of important fishes in the Vindnyan region, India.* Lambert Academic Publication, Germany.

Gibbs, J.P. (2000) Wetland loss and biodiversity conservation. *Conserv Biol.,* **14**, 314–317.

Goswami, U.C., Basistha, S.K., Bora, D., Shyamkumar, K., Saikia, B. and Changsan, K. (2012) Fish diversity of North East India, inclusive of the Himalayan and Indo Burma biodiversity hotspots zones: A checklist on their taxonomic status, economic importance, geographical distribution, present status and prevailing threats. *Int. J. Biodivers. Conserv.,* **4**, 592–613.

Islam, M.R., Das, B., Baruah, D., Biswas, S.P. and Gupta, A. (2013) Fish diversity and Fishing Gears used in the Kulsi River of Assam, India. *Annals of Biological Research*, **4**, 289–293.

Jagera, H. I., Chandlerb J.A., Leplab, K.B. and Winklec, W.V. (2001) A theoretical study of river fragmentation by dams and its effects on white sturge on populations. *Environ. Biol. Fish*., **60**, 347–361.

Jayaram, K.C. (1999) The Freshwater Fishes of the Indian Region. Delhi, Narendra Publishing House, New Delhi, India.

Johnson, J.A., Ramesh, R.K., Sen, S. and Sreenivasa, M. R. (2012) Fish diversity and assemblage structure in Ken River of Panna landscape, central India. *Journal of Threatened Taxa*., **4**, 3161–3172.

Kumar, N. (2012) Study of ichthyofaunal biodiversity of Turkaulia Lake, East Champaran, Bihar, India. *Int. Res. J. Environ. Sci.,* **1**, 21–24.

Lakra, W. S. (2010**)** Fish biodiversity of Uttar Pradesh: issues of livelihood security, threats and conservation. In: *National Conference on Biodiversity, Development and Poverty Alleviation* (May 22, 2010). Uttar Pradesh State Biodiversity Board, Lucknow, 40–45.

Lakra, W.S. and Pandey, A.K. (2009) Fish germplasm resources of India with special emphasis on conservation and rehabilitation of threatened species. In: Goswami, U.C. and Dilip Kumar, eds, Aquaculture Management. Narendra Pub. House, Delhi, 85–104.

Lakra, W.S., Singh, A.K. and Ayyappan, S. (2008) Fish Introductions in India: Status, Challenges and Potentials. Narendra Pub. House, NewDelhi.

Leveque, C., Balian E.V. and Martens, K. (2005) An assessment of animal species diversity in continental waters. *Hydrobiologia,* **542**, 32–67.

Lima-Junior, S.E., Cardone, I.B. and Goitein, R. (2006) Fish assemblage structure and aquatic pollution

in a Brazilian stream: some limitations of diversity indices and models for environmental impact studies. *Ecol. Freshw. Fish.,* **15**, 284–290.

Mayank, P., Kumar A. and Dwivedi, A.C. (2011) Alien fish species Oreochromisniloticus (Linnaeus, 1757) as a powerful invader in the lower stretch of the Yamuna river. *Bioved.,* **22**, 65–71.

Pathak, R.K., Gopesh, A. and Dwivedi, A.C. (2011) Alien fish species, *Cyprinuscarpio*var. *Communis* (common carp), as a powerful invader in the Yamuna river at Allahabad, India. *Natl. Acad. Sci. Letter.,* **34**, 367–373.

Renjithkumar, C.R., Harikrishnan, V. and Kurup, B.K. (2011) Exploited fisheries resources of the Pampa River, Kerala, India. *Indian J. Fish*., **58**, 13–22.

Ricciardi, A. and Rasmussen, J.B. (1999). Extinction rates of North American freshwater fauna. *Conserv Biol.,* **13**, 1220–1222.

Sarkar, U.K., Gupta, B.K. and Lakra, W.S. (2010) Biodiversity, ecohydrology, threat status and conservation priority of the freshwater fishes of river Gomti, a tributary of river Ganga (India). *Environmentalist.,* **30**, 3–17.

Singh, A.K. and Mishra, A. (2001) Environmental issues of exotic fish culture in Uttar Pradesh. *J. Environ. Biol*., **22**, 205–208.

Srivastava, G.J. (2002) *Fishes of U.P. & Bihar.* 9 th Edn. Vishwavidyalaya Prakashan, Varanasi (India).

Szollosi-Nagy (2004) In: Proceedings of the United Nations seminar, 25–26 November 2004, Delft, Netherland.

Talwar, P.K. and Jhingran, A.G. (1991) Inland Fishes of India and adjacent countries, Vol. 1 & 2. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.

Tamboli, R.K. and Jha, Y.N. (2012) Status of catfish diversity of river Kelo and Mand in Raigarh district, CG, India. *ISCA J. Biological Sci.,* **1**, 71–73.

Vijaykumar, K., Vijaylaxmi, C. and Parveen, Z. (2008) *Ichthyofaunal diversity of Kagina River in Gulbarga district of Karnataka*. *Ecoscan*, **2**, 161–163.