



# Diversity of Mollusks and Herpetofauna along River Beas in Punjab, India

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**Abstract:** The diversity of herpetofauna and mollusks along the river bank can act as bioindicator of the ecological environment. The faunal diversity was studied from 2019 to 2021 along the bank of River Beas during the spring, summer, and autumn seasons. In 2019, four mollusks, and six reptilian species were recorded along the river bank. However, in 2020, six mollusks species and two amphibians were observed. Mollusks of eight different species, Indian bullfrog, and freshwater turtles were observed in 2021. An increase in the number of mollusk species along River Beas from 2019 to 2021 indicated an improvement in the quality of water. Two amphibian species namely *Hoplobatrachus tigerinus* and *Rana limnocharis* were predominant in the study area. These were not seemed to be affected by changes occurring along the river because of the presence of alternate habitats in the form of large tracts of land under paddy cultivation in the study area. Large groups of turtles near the river bank in 2021 indicated an improvement in water quality.

**Keywords:** River Beas, Mollusks, Herpetofaunal diversity, Bioindicators

For in situ conservation of biological diversity, Punjab has created Protected Area Network (PAN) to accord protection to its wildlife and associated habitat. The state has a PAN consisting of 13 wildlife sanctuaries, five wildlife Conservation Reserves, four Community Reserves, and six Ramsar Sites. River Beas has been notified as Conservation Reserve by the Government of Punjab, Dept. of Forests and Wildlife Preservation (Forest Branch) in 2017 and the Ramsar site in 2019 (Anonymous 2019). The River Beas rises from the Himalayas in Himachal Pradesh and flows 185 km across Punjab State from Talwara, Hoshiarpur, and merges with Sutlej River at Harike, Tarntaran, Punjab. The Beas Conservation Reserve hosts the only population of Indus River dolphins (*Platanista gangetica* minor) in India. Ninety-four gharials were also introduced near the village Gagdewal in Beas. The smooth-coated otter (*Lutrogale perspicillata*) was also reported in River Beas along with freshwater turtles like the Indian softshell turtle, Indian flapshell turtle, narrow-headed softshell turtle, spotted pond turtle, crowned river turtle and brown roofed turtle, and more than 90 fish species. A wide variety of avian species (about 500 species) were also reported (Kanwar et al 2013, Kanwar 2019, Kanwar and Lomis 2020, RIS 2020). Regular monitoring of faunal diversity is essential especially when anthropogenic activities disturb the ecosystem. In May 2018, the accidental release of molasses in River Beas from a sugar mill near Gurdaspur District severely impacted the aquatic life and the ecological environment of the river. The

diversity of herpetofauna and mollusks along the river bank can act as an index of bio-indicator of the ecological environment. They also form an important link in the food chain. Keeping this in view, surveys were conducted from 2018-19 to 2020-21 along river Beas to study herpatofauna and molluskan diversity.

## MATERIAL AND METHODS

This study was conducted from 2019 to 2021 during the autumn and spring seasons. Faunal diversity at different sites along river Beas bank in village Dhilwan, Amritsar district, villages Chambha and Harike, Tarntaran district and villages Alampur and Bhait, Gurdaspur district were recorded (Plate 1). Both live and dead mollusk species were collected by hand picking method along the bank of river Beas as well as in paddy crop fields, brought to the laboratory, washed, and then identified (Patil et al 2011). Amphibian and reptiles were also photographed and identified (Ali et al 2016, Ali et al 2017). A Cannon Powershot camera was used for the photography of animals along the river bank.

## RESULTS AND DISCUSSION

In 2019, four mollusks i.e. *Indoplanorbis exustus*, *Gabbia orcula*, *Lymnaea*, *Corbicula*, and one amphibian *Hoplobatrachus tigerinus* were observed along the river bank in Dhilwan, and six reptilian species *Varanus varius*, *Craspedocephalus gramineus*, *Eutropis macularia*, *Gerarda prevostiana*, *Fowlea piscator* and rat snake were observed in

Talwara, and Harike, near the river bank (Plates 2 and 3). However, in 2020, two new molluskan species i.e. *Bellamya bengalensis*, and *Cryptozона semirugata*, were observed near the river bank in Chamba and Harike, and one new amphibians, *Rana limnocharis* was observed in the village Dhilwan (Plates 2 and 3). In 2021, two more mollusks i.e. *Gyraulus*, and *Bithynia tentaculata* were observed in paddy

crop fields and near the river bank in Bhait, Alampur, Dhilwan, Chamba, and Harike. Indian bullfrog and groups of freshwater turtles were also observed near the river bank in village Harike during this year (Plates 2 and 3). Classification of mollusks, reptiles, and amphibians spotted along River Beas from 2019 to 2021 is given in Tables 1-2.

Mollusks were more in areas where the water current was

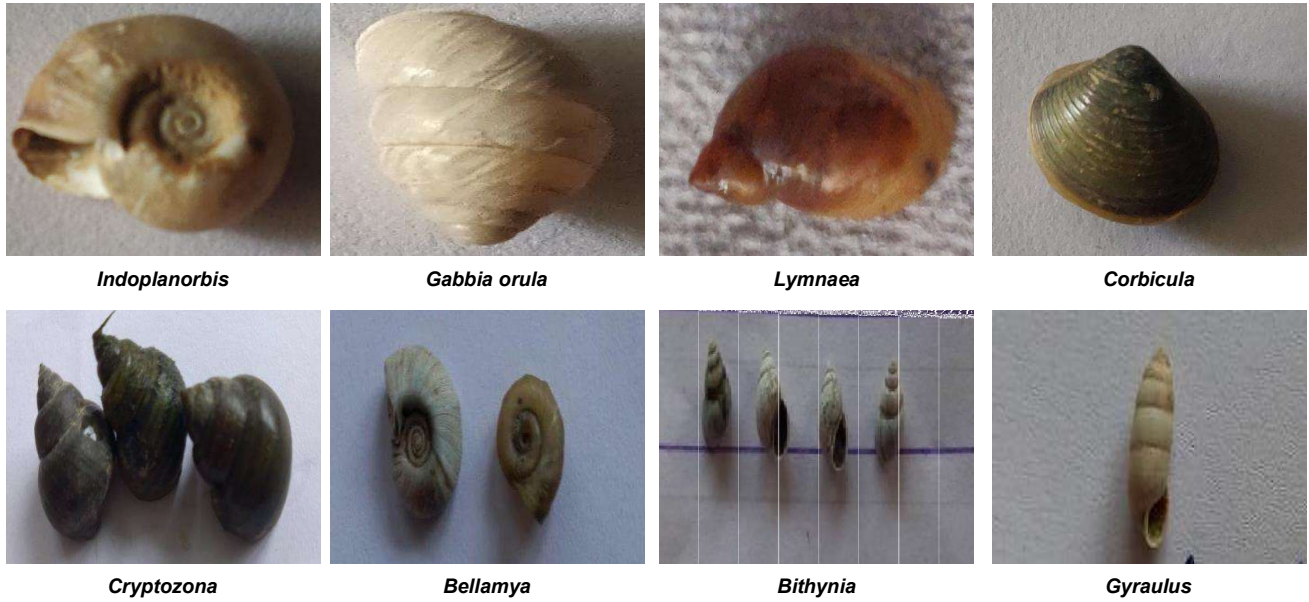


Plate 1. GPS Map showing selected villages

Table 1. Classification of mollusk spotted along river Beas from 2019 to 2021

Kingdom	Animalia	Animalia	Animalia	Animalia	Animalia	Animalia	Animalia	Animalia
Phylum	Mollusca	Mollusca	Mollusca	Mollusca	Mollusca	Mollusca	Mollusca	Mollusca
Class	Gastropoda	Gastropoda	Gastropoda	Gastropoda	Gastropoda	Gastropoda	Gastropoda	Bivalvia
Order	Basommatophora	Littornimorpha	Basommatophora	Architaenioglossa	Basommatophora	Littornimorpha	Stylommatophora	Venerida
Family	Planorbidae	Bithyniidae	Lymnaeidae	Viviparidae	Planorbidae	Bithyniidae	Ariophantidae	Cyrenidae
Genus	<i>Indoplanorbis</i>	<i>Gabbia</i>	<i>Lymnaea</i>	<i>Bellamya</i>	<i>Gyraulus</i>	<i>Bithynia</i>	<i>Cryptozона</i>	<i>Corbicula</i>
Species	<i>Exustus</i>	<i>Orcula</i>		<i>Bengalensis</i>			<i>Semirugata</i>	
Binomial name	<i>Indoplanorbis exustus</i> (Deshayes 1834)	<i>Gabbia orcula</i> (Frauenfeld 1862)	<i>Lymnaea</i> (Lamarck 1799)	<i>Bellamya bengalensis</i> (Lamarck 1822)			<i>Cryptozона semirugata</i> (Beck 1837)	<i>Corbicula</i> (Muller 1774)
Common name	Freshwater snail	Freshwater snail	Freshwater snail	Freshwater snail	Freshwater snail	Freshwater snail	Land snail	Freshwater clam
Already reported	In Pothwar, Pakistan Chandigarh (Afshan et al 2013, Maansi et al 2021)		In Madhya Pradesh, Assam, Jammu, Pothwar, Pakistan, (Garg et al 2009, Roy and Gupta 2010, Sharma and Chowdhary 2011, Afshan et al 2013)	In Gujarat, West Bengal, Narmada River, Assam, Rajasthan (Bhalodia et al 2001, Roy and Nandi 2008, Pir et al 2010, Roy and Gupta 2010, Vyas et al 2012, Sharma et al 2013)	In Pothwar, Pakistan, Chandigarh (Afshan et al 2013, Maansi et al 2021)	In Pothwar, Pakistan, Chandigarh (Afshan et al 2013, Maansi et al 2021)		





**Plate 2.** Different mollusk species observed along River Beas



Fresh Water Turtles and their foot marks along River Beas Bank

**Plate 3.** Reptiles and Amphibians observed along River Beas

**Table 2.** Classification of Amphibians and Reptiles spotted along river Beas from 2019 to 2021

Kingdom	Animalia	Animalia	Animalia	Animalia	Animalia	Animalia	Animalia	Animalia	Animalia
Phylum	Chordata	Chordata	Chordata	Chordata	Chordata	Chordata	Chordata	Chordata	Chordata
Class	Amphibia	Amphibia	Reptilia	Reptilia	Reptilia	Reptilia	Reptilia	Reptilia	Reptilia
Order	Anura	Anura	Squamata	Squamata	Squamata	Squamata	Squamata	Squamata	Testudines
Family	Dicroglossidae	Dicroglossidae	Varanidae	Viperidae	Scincidae	Homalopsidae	Colubridae	Colubridae	
Genus	<i>Hoplobatrachus</i>	<i>Rana</i>	<i>Varanus</i>	<i>Craspedocephalus</i>	<i>Eutropis</i>	<i>Gerarda</i>		<i>Fowlea</i>	
Species	<i>H. tigerinus</i> (Daudin 1803)	<i>R. limnocharis</i> (Gravenhorst 1829)	<i>V. varius</i> (Merrem 1820)	<i>C. gramineus</i> (Shaw 1802)	<i>E. macularia</i> (Blyth 1853)	<i>G. prevostiana</i> (Gray 1849)		<i>F. piscator</i> (Schneider 1799)	
Common name	Indian bull frog	Frog	Monitor lizard	Indian green pit viper	Bronze grass skink	Glossy marsh snake	Rat snake	Asiatic water snake	Fresh water turtle
Already reported	In Kasur, Pakistan, Kalbagh Game Reserve, Indus River, Pakistan (Ali et al 2016, 17)	In Ropar Wetland (Ladhar 2000)				West Coast, Maharashtra (Prabhakar et al 2020)		West Coast, Maharashtra (Prabhakar et al 2020)	Kalbagh Game Reserve, Indus River, Pakistan (Ali et al 2017)

slow. These animals depend upon this habitat for feeding and breeding. Species diversity recorded along River Beas indicated good water quality to support biodiversity. Freshwater mollusks (mussels and snails), like other macro-invertebrates, are vital components of any aquatic ecosystem. Their sensitivity to the habitat's conditions allows them to act as biological indicators of the health of the ecosystem. Out of the various mollusks recorded during the present study *Indoplanorbis exustus*, *Gabbia orcula*, *Lymnaea*, *Corbicula* are the most resistant species. These species were reported to thrive well in polluted waters and during dry phases (Gnatyshyna et al 2011, Sharma et al 2013, Guo and Feng 2018, Kavitha et al 2018). Gupta et al (2015) reported the maximum variety and number of gastropods in upstreams and the lowest variety and number in downstream near wastewater discharge areas. An increase in the number of molluscan species along River Beas from 2019 to 2021 indicated an improvement in the quality of water.

Maansi et al (2021) studied the diversity of molluscan fauna from freshwater bodies of Chandigarh and River Ghagar. They reported minimum molluscan diversity in polluted water bodies (Ghaggar River, N-Choe, and Dhanas Lake) and maximum molluscan diversity in Sukhna Lake, Chandigarh. Singla et al (2017) reported the presence of five species of snails, *Indoplanorbis exustus*, *Radix luteola*, *Melanooides tuberculata*, *Bithynia tentaculata*, *Kashmiriensis*, and *Cryptozona bistrialis* belonging to families, Planorbidae, Lymnaeidae, Thiaridae, Bithyniidae, and Ariopahntidae in paddy crop fields in Punjab State. Out of these 7 species, 3

species were also recorded along river Beas during the present study. *Lymnaea* and *Gyraulus* species were also reported in the Ropar wetland, Punjab (Brraich and Saima 2018). Jamwal et al (2017) reported three mollusk species (*Digoniostoma pulchella*, *Bellamya bengalensis* and *Lymnaea acuminata*) in River Beas near Indore, district Kangra, Himachal Pradesh.

Punjab biodiversity board had earlier reported 85 mollusk, 35 reptiles, and 15 amphibian species in Punjab. Rais et al (2012) reported 35 species of herpetofauna, amphibians (5 species), and reptiles (30 species) in selected areas of North Punjab, Pakistan. Out of these, three reptiles, a monitor lizard, Asiatic water snake, and fresh water turtles, and two amphibians, *Hoplobatrachus tigrinus*, and *Rana limnocharis* were recorded along River Beas during the present study. Ali et al (2016) reported three amphibian species *Bufo stomaticus*, *Hoplobatrachus tigrinus*, and *Euphylyctis cyanophlyctus*, and 4 reptilian species *Lissemys punctata*, *Varanus bengalensis*, *Xenochrophis piscator*, and *Kachuga smithi* from water catchment area in Kasur dist., Punjab. *Xenochrophis piscator* (Asiatic water snake), and *Nilssonina gangetica* (Indian softshell turtles) were also reported earlier in River Beas. The River Beas was also earlier reported to support seven species of freshwater turtles (Kanwar et al 2013).

## CONCLUSIONS

An increase in the number of molluscan species along River Beas from 2019 to 2021 indicated improvement in the quality of water. Two amphibian species were predominant in

the study area. These were not seemed to be affected by changes occurring along the river because of the presence of alternate habitats in the form of large tracts of land under paddy cultivation in the study area. Large groups of turtles near River Bank in 2021 also indicated an improvement in water quality. The increase in the area under agriculture along the river bank and human activities disturb their habitat. Therefore, there is a need to conserve these areas well for long-term sustainability of animal diversity.

#### ACKNOWLEDGEMENT

Authors are grateful Punjab Pollution Control Board for financial support.

#### REFERENCES

- Afshan K, Beg MA, Ahmad I, Ahmad M and Qayyum M 2013. Freshwater snail fauna of Pothwar region, Pakistan. *Pakistan Journal of Zoology* **45**(1): 227-233.
- Ali W, Javid A, Hussain SM, Azmat H and Jabeen G 2016. The amphibians and reptiles collected from different habitat types in district Kasur, Punjab, Pakistan. *Pakistan Journal of Zoology* **48**(4): 1201-1204.
- Ali W, Javid A, Khan WA, Hussain A, Rizwan M, Ameer M and Sajid AQ 2017. Diversity and habitat preferences of herpetofauna at Kalabagh game reserve, District Mianwali, Punjab, Pakistan. *Russian Journal of Herpetology* **24**(4): 267-274.
- Anonymous 2019. *Action Plan for Clean River Beas*, Directorate of Environment and Climate Change, Department of Science, Technology and Environment, Government of Punjab, pp. 5-83.
- Braich OS and Saima A 2018. Seasonal variation of benthic macro-invertebrate diversity of Ropar Wetland (Ramsar stie), Punjab India. *Journal of Environment and Bio-Sciences* **2**(32): 217-226
- Garg RK, Rao RJ and Saksena DN 2009. Correlation of molluscan diversity with physicochemical characteristics of water of Ramsagar reservoir, India. *International Journal of Biodiversity and Conservation* **1**(6): 202-207.
- Gnatyshyna L, Fal Fushinskaya GI, Golubev OP, Dallinger R and Stoliar OB 2011. Role of metallothioneins in adaptation of *Lymnaea stagnalis* (Mollusca: Pulmonata) to environment pollution. *Hydrobiological Journal* **47**(5): 56-66.
- Jamwal S, Jamwal M and Sharma A 2017. Macroinvertebrate Faunal Diversity of Beas River near Indora, H.P. *Proceedings of National Conference*, Arni University, Indora, Kangra (H.P.).
- Guo X and Feng C 2018. Biological toxicity response of Asian clam (*Corbicula fluminea*) to pollutants in surface water and sediment. *Science of the Total Environment* **631**: 56-70.
- Gupta K, Nandy A, Banerjee K and Talapatra SN 2015. Biomonitoring of river Ganga bank by identifying mollusc species as an indicator. *International Letters of Natural Sciences* **37**: 71-77
- Kavitha M, Mahilini HM and Rajendran A 2018. Assessment of fresh water quality Usinga Gastropod Snail *Indoplanorbis exustus* (Dehayes, 1834) Mollusca: Pulmonata. *International Journal of Current Research and Academic Review* **6**(6): 49-52.
- Kanwar G and Lomis K 2020. *Status of the reintroduced Gharial in Beas Conservation Reserve, Punjab, India*. Technical report of the Department of Forests and Wildlife Preservation, Punjab and World-Wide Fund for Nature, India, New Delhi.
- Kanwar G 2019. *Short Communication on water bird census in wetlands of Punjab to Asian Water bird Count*, Published by Wetland International.
- Kanwar G, Khan MS and Pant A 2013. *Bio-monitoring of freshwater resources in Punjab: A river watch concept*. Report of World-Wide Fund for Nature, India, New Delhi.
- Ladhar S 2000. *Reports on Harike and Kanjli Wetlands*. Punjab State Council for Science and Technology, Chandigarh.
- Maansi K, Jindal R and Wats M 2021. Systematic descriptions and seasonal variations of mollusc in Chandigarh (UT, India) and its surrounding freshwater bodies. *International Journal of Fisheries and Aquatic Studies* **9**(3): 165-173
- Patil SG, Talmale SS and Venkatamaran K 2011. Land and freshwater Mollusca. *Fauna of Madhya Pradesh (including Chhattisgarh), State Fauna Series* **5**(3): 1-30.
- Pir Z, Imtiyaz M, Tali LK and Seddique A 2010. Distribution of Molluscans in Narmada river, India. *Researcher* **2**(10): 41-46.
- Prabhakar RI, Rokade AG, Supnekar SP, Meshram LN, Pawar NB and Gavhane UV 2020. Diversity and distribution of snakes in adjoining areas of Panvel, Navi Mumbai, West Coast of India *International Journal of Zoological Investigations* **6**(2): 289-300
- Rais M, Baloch S, Rehman J, Anwar M, Hussain I and Mahmood T 2012. Diversity and conservation of amphibians and reptiles in North Punjab, Pakistan. *Herpetological Bulletin* (122): 16-25.
- RIS 2020. *RIS for Site no. 2408*, Beas Conservation Reserve, India, Ramsar Information Sheet, pp. 1-15
- Roy M and Nandi NC 2008. Macrozoobenthos of some Lacustrine wetlands of West Bengal, India. *Proc. Of Taal: 12th world lake conference*. **23**: 506-513.
- Roy S and Gupta A 2010. Molluscan diversity in river Barak and its tributaries, Assam, India. *Assam University Journal of Science and Technology: Biological and Environmental Sciences* **5**(1): 109-113.
- Sharma A, Lata P, Rathore NS and Thakur R 2013. A study on variations in population density of gastropods in a village pond near Bikaner, Rajasthan. *Journal of Experimental Biology and Agriculture Sciences* **1**(3): 181-185.
- Sharma KK and Chowdhary S 2011. Macroinvertebrate assemblages as biological indicators of pollution in a Central Himalayan River, Tawi (J&K). *International Journal of Biodiversity and Conservation* **3**(5): 167-174.
- Singla N, Islam S, Kaur R and Singla LD 2017. Studies on snails inhabiting rice crop fields in Punjab state. *Journal of Veterinary Parasitology* **31**(01): 40-42.
- Vyas V, Bharose S, Yousuf S and Kumar A 2012. Distribution of Macrozoobenthos in River Narmada near water intake point. *Journal of Natural Sciences Research* **2**(3): 18-24.