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# Diversity and Distribution Pattern of Fish Fauna of River Jhelum, Kashmir Himalayas

Javaid Hussain[1*], Gowhar Rashid[2]

*[1*,2]Govt. Degree College (Boys) Anantnag 192101, Jammu & Kashmir (UT), India*

*Email: [1*]Syedjavaidang@gmail.com*

***Abstract: Ichthyofauna form an integral part of aquatic ecosystems and any physiochemical variation taking place in the medium can affect their productivity, diversity, distribution and behavior. In the present study (15 March 2020 to 14 March 2021), five sites were selected for sampling viz. Site-I (Zaldora), Site-II (Ashajipora) and Site-III (Bijbehara), Site IV (Dogripora) and Site V (Kursu Padshahi Bagh). A total of nine species of fishes viz., Schizothorax plagiostomus (Heckel 1838), Schizothorax esocinus (Heckel 1838), Schizothorax labiatus (McClelland 1842), Schizothorax curvifrons (Heckel 1838), Crossocheilus diplochilus (Heckel 1838), Glyptosteron reticulatum McClelland, 1842, Cyprinus carpio communis Linnaeus, 1758, Triplophysa marmorata (Heckel, 1838), Triplophysa kashmirensis (Hora, 1922) were collected. Among these nine species s. palgiostoms was found most dominant. Our results indicate that the fish fauna of the river Jhelum has declined over a period of time indicating some stress or abnormal external influences which are altering the health of this vital economic-ecologic lotic water body. Thus in order to conserve the fish diversity in this riverine ecosystem, it is imperative that monitoring should be carried out on regular basis and immediate steps should be undertaken to conservation ecology.***

## 1. INTRODUCTION

The Kashmir valley, nested in the north western folds of the Himalaya with marked seasonality resembling sub-Mediterranean type characterized by the varying rainfall occurring throughout the year (Rashid & Singh 2020). The valley is endowed with enormous potential of aquatic resources in terms of upland rivers, streams, high and low altitude natural lakes. The biological productivity of these aquatic resources are quite high, which can suitably be harnessed for fish culture. By virtue of this fish farming has tremendous potential for rationalizing natural resource to the social and environmental demand. These lentic and lotic habitats comprise chiefly of indigenous and exotic food fishes which play an important role in the development of a national economy (Rashid & Singh 2020; Sultan & Kant 2016; Sikoki & Otobotekere 1999).

Fish is a very essential source of animal protein consumed by humans globally. Apart from being cheap source of highly nutritive protein, it also contains other essential nutrients required by the body (Sikoki & Otobotekere, 1999). The importance of fish as a source of high quality, balanced and easy digestible protein, vitamins and polyunsaturated fatty acids is well understood now (Ojewola & Annah, 2006).
The Kashmir valley is well-known all over the world for its fresh water reservoirs ranging from high altitude to low lying aquatic ecosystems which has an incredible potential for the

growth and expansion of fisheries particularly in the cold waters (Khan and Ali, 2013). Ample literature has emanated on the ichthyofauna of the Kashmir valley (Heckel, 1844; Hora, 1936; Yousuf, 1996). All these freshwater aquatic bodies are serving as a valuable habitat for a number of native fishes like Schizothorax spp., *Glyptothorax* spp., *Triplophysa* spp., *Barbus* spp., *Crossocehilus* spp., *Nemacheilus* spp. etc as well as the exotic trout viz., *Oncorhynchus mykiss* and *Salmo trutta fario*. The streams have unique fish fauna at different regions from source to mouth due to distinguished characters, topography, zonation and morphology. Fish diversity can flourish and typically depends on the geographical location, diverse aquatic ecological conditions, awareness amongst the inhabitants about the importance of fish diversity, health of aquatic bodies, optimum exploitation of the commercial fish species, enforcement of legal laws and the implementation of fish habitat restoration programmes in case of ecologically degraded fish habitats (Joshi, 2005; Badoni, 2018). Documentation of fish diversity is vital for conservation (Brraich & Malik, 2016). The present study on fishes has been carried out with the aim document fish fauna of the river Jhelum.

**Study Area & Sampling sites**

Kashmir Valley, a separate geographical entity, is one of the three Meso regions (Jammu, Kashmir and Ladakh) of the Union territory of Jammu & Kashmir which are separated by the Himalayan mountain ranges from one another. The valley is mainly drained by river Jhelum and its tributaries and has passed through various geological successions ranging from the oldest Archean to the recent Alluvium (Figure 1)

A total of five study sites (Table 1) were selected for the sampling. Fish specimens were collected on seasonal basis from 15 March 2020 to 14 March 2021 with the help of fishermen. The specimens were preserved in 10% formalin and brought to the laboratory for further studies. Fish specimens were identified with the help of the standard taxonomic works (Kullander et al., 1999). Fishing was usually carried out during morning hours.

**Table 1.** Study sites used for fish sampling

| Site | Elevation | Latitude | Longitude |
|---|---|---|---|
| Zaldora | 5475ft | 33°383 N | 75°1023 E |
| Ashajipora | 5255ft | 33°472 N | 75°0624 E |
| Bijbehara | 5210ft | 34°081 N | 74°4942 E |
| Dogripora | 5206ft | 34°088 N | 74°4536 E |
| Kursu Padshahi Bagh | 5223ft | 34°506 N | 74°8346 E |

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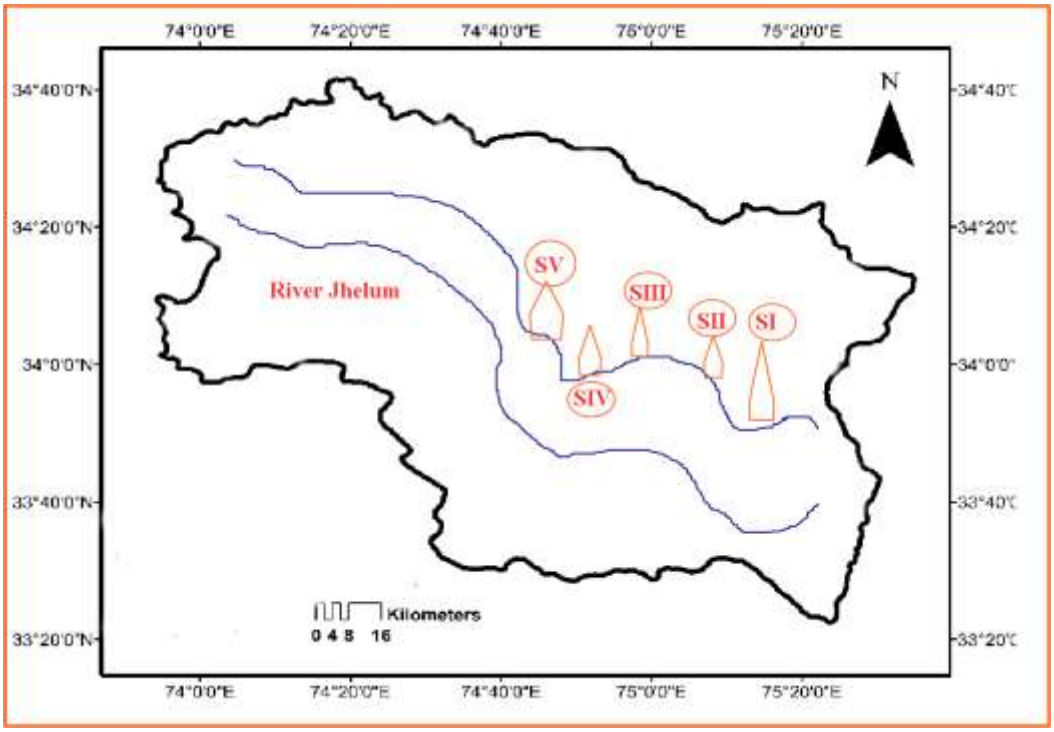


**Figure 1.** Map of River Jhelum showing study sites

## 2. RESULTS AND DISCUSSION

The fish species (Figure 2) collected during the experimental period (15 March 2020 to 14 March 2021) from different collection sites (Site Ito Site V) are summarized in table 1. The relative dominance of fish species at sampling sites are shown in tables 2 to 6. As shown in Table 2 *S. plagiostomus* was found to be the most dominant species (22.11 %) at site I (Zaldora) followed by *T.* marmorata (14.07 %), S. *curvifrons* (12.06 %), *C. carpio communis* (11.55 %), S. esocinus (11.05 %), *T. kashmirensis* (9.54%), *S. labiatus* (7.53 %), *C. diplochilus* (6.53 %), *G. reticulatum* (5.52 %).

At site II (Ashajipora) *S. plagiostomus* was found to be the most dominant species (22.02 %) at site I followed by *S. curvifrons* (14.02 %), *C. carpio communis* (11.86 %), *S. labiatus* (10.73 %), *C. diplochilus* (10.16 %), *S. esocinus* (09.60 %), *G. reticulatum* (8.87%), *T. kashmirensis* (7.73%), *T. marmorata* (5.56 %) (Table 3)

At site III ( Bijbehara) *S. plagiostomus* was found to be the most dominant species (21.05%) at site I followed by, *S. labiatus* (16.37 %), C. carpio communis (15.20 %), S. curvifrons (13.45 %), S. esocinus (10.52 %), G. reticulatum (8.77 %), C. diplochilus (7.01 %), T. marmorata (4.09 %), *T. kashmirensis* (3.50 %) (Table 4)

At site IV (Dogripora ) *S. labiatus* was found to be the most dominant species (22.72 %) at site I followed by *S. curvifrons* (20.77 %), *S. esocinus* (20.12 %), *C. carpio communis* (14.93 %), *S. plagiostomus* (6.49 %), *T. kashmirensis* (5.19%), *G. reticulatum* (4.54 %), *T. marmorata* (3.34 %), *C. diplochilus* (1.94 %) (Table 5)

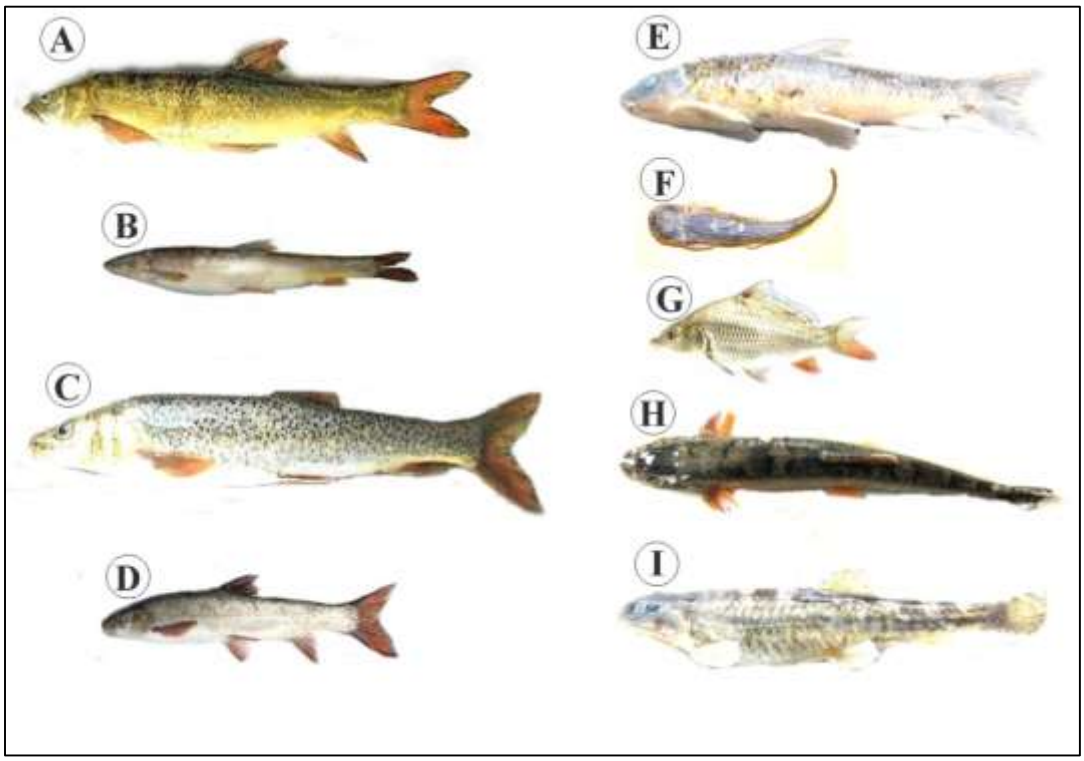


**Figure 2.** Fish species collected at sampling sites (SI to SV) during the study period (2020-2021)

At site V ( Kursu Padshahi Bagh) *S. curvifrons* was found to be the most dominant species (28.44 %) at site I followed by *S. labiatus* (25.0 %), *S. esocinus* (23.27 %), *C. carpio communis* (9.48 %), *S. plagiostomus* (6.03 %), *C. diplochilus* (4.31 %), *T. marmorata* (0.86 %) (Table 6).

During the experimental period the total fish catch found is shown in figure 3
Kullander et al. 1999 who made a regular fishing along the Jhelum River and associated lakes in Kashmir valley obtained fourteen native and four introduced fish species over a period of eight years, five species of Schiozothorax, four of which are specialized lotic forms and one of which (S. niger) is chiefly found in lentic.

Similarly, Yousuf et al., 2006 reported eleven species of fishes in the river Jhelum. Khan and Ali (2013) also reported six species of fishes from the same river viz., S. esocinues, S. palgiostoms, C. carpio communius, S. labitus, S. niger & S. curviforns. Sultan and Kant,( 2016 ) reported nine fish species which are in line with our studies, although distribution pattern was found to be different. In Kashmir valley cold water Schizothoracine are the main group of fishes and it has been seen that few of the schizothorax species have disappeared from the current scenario (Rumysa et al., 2016). Bhat et al. (2013) collected seven species of fishes from Lidder stream, an important right bank tributary of river Jhelum viz, S. plagiostomus, S. labiatus, S. esocines, S. trutta fario, C. diplochilus, G. reticulatuma Triplophysakashmirensis. From the last few years fishery resource of the River Jhelum has turned down which indicates some stress and external pressure which are changing the health of important ecological and economical lotic aquatic body (Khan & Ali, 2013). Similarly

(Acharjee & Barat, 2010) states that, fishing endeavour is a sign of fish formation in a water body, it emerges that the fish population in the stream has somewhat reduced with the passage of time, due to various threats like overexploitation, habitual devastation, interruption of breeding grounds, growing level of pollution, etc and indiscriminate and hysterical fishing, anthropogenic pressure in the hilly stream has recorded a rapid decline of fish diversity.

**Table 2. Relative dominance (%) of Collected fish samples at site I (Zaldora)**

| S.No. | Fish species | No. of Samples Collected | | | | | Relative dominance (%) |
|---|---|---|---|---|---|---|---|
| | | S* | S** | A* | W* | Total | |
| 1. | *Schizothorax plagiostomus* (Heckel 1838) | 10 | 8 | 12 | 13 | 44 | 22.11 |
| 2. | *Schizothorax esocinus* (Heckel 1838) | 4 | 5 | 6 | 7 | 22 | 11.05 |
| 3. | *Schizothorax labiatus* (McClelland 1842) | 5 | 3 | 4 | 3 | 15 | 7.53 |
| 4. | *Schizothorax curvifrons* (Heckel 1838) | 7 | 6 | 4 | 7 | 24 | 12.06 |
| 5. | *Crossocheilus diplochilus* (Heckel 1838) | 4 | 2 | 3 | 5 | 13 | 6.53 |
| 6. | *Glyptosteron reticulatum* McClelland, 1842 | 3 | 2 | 4 | 2 | 11 | 5.52 |
| 7. | *Cyprinus carpio communis* Linnaeus, 1758 | 4 | 5 | 8 | 6 | 23 | 11.55 |
| 8. | *Triplophysa marmorata* (Heckel, 1838) | 7 | 10 | 5 | 6 | 28 | 14.07 |
| 9. | *Triplophysa kashmirensis* (Hora, 1922) | 4 | 4 | 2 | 9 | 19 | 9.54 |
| *S-Spring, **S- Summer, *A – Autumn, *W - Winter | | | | | | | |

**Table 3. Relative dominance (%) of Collected fish samples at site 1I (Ashajipora)**

| S.No. | Fish species | No. of Samples Collected | | | | | Relative dominance (%) |
|---|---|---|---|---|---|---|---|
| | | S* | S** | A* | W* | Total | |
| 1. | *Schizothorax plagiostomus* (Heckel 1838) | 9 | 8 | 13 | 9 | 39 | 22.02 |
| 2. | *Schizothorax esocinus* (Heckel 1838) | 4 | 5 | 4 | 3 | 16 | 09.03 |
| 3. | *Schizothorax labiatus* (McClelland 1842) | 5 | 4 | 4 | 6 | 19 | 10.73 |
| 4. | *Schizothorax curvifrons* (Heckel 1838) | 3 | 5 | 6 | 9 | 23 | 14.12 |
| 5. | *Crossocheilus diplochilus* (Heckel 1838) | 6 | 2 | 2 | 8 | 18 | 10.16 |
| 6. | *Glyptosteron reticulatum* McClelland, 1842 | 4 | 5 | 4 | 3 | 16 | 09.03 |
| 7. | *Cyprinus carpio communis* Linnaeus, 1758 | 3 | 5 | 5 | 10 | 23 | 11.86 |
| 8. | *Triplophysa marmorata* (Heckel, 1838) | 2 | 1 | 4 | 3 | 10 | 5.56 |
| 9. | *Triplophysa kashmirensis* (Hora, 1922) | 3 | 3 | 2 | 5 | 13 | 7.73 |
| *S-Spring, **S- Summer, *A – Autumn, *W - Winter | | | | | | | |

| Table 4. Relative dominance (%) of Collected fish samples at site III (Bijbehara) | | | | | | | |
|---|---|---|---|---|---|---|---|
| S.No. | Fish species | No. of Samples Collected | | | | | Relative dominance (%) |
| | | S* | S** | A* | W* | Total | |
| 1. | *Schizothorax plagiostomus* (Heckel 1838) | 10 | 7 | 11 | 8 | 36 | 21.05 |
| 2. | *Schizothorax esocinus* (Heckel 1838) | 5 | 4 | 8 | 1 | 18 | 10.52 |
| 3. | *Schizothorax labiatus* (McClelland 1842) | 8 | 3 | 12 | 5 | 28 | 16.37 |
| 4. | *Schizothorax curvifrons* (Heckel 1838) | 6 | 2 | 4 | 11 | 23 | 13.45 |
| 5. | *Crossocheilus diplochilus* (Heckel 1838) | 3 | 4 | 3 | 2 | 12 | 7.01 |
| 6. | *Glyptosteron reticulatum* McClelland, 1842 | 1 | 3 | 7 | 4 | 15 | 8.77 |
| 7. | *Cyprinus carpio communis* Linnaeus, 1758 | 3 | 5 | 7 | 11 | 26 | 15.20 |
| 8. | *Triplophysa marmorata* (Heckel, 1838) | 1 | 2 | 2 | 2 | 07 | 4.09 |
| 9. | *Triplophysa kashmirensis* (Hora, 1922) | 2 | 2 | 1 | 1 | 06 | 3.50 |
| *S-Spring, **S- Summer, *A – Autumn, *W - Winter | | | | | | | |

| Table 5. Relative dominance (%) of Collected fish samples at site 1V (Dogripora) | | | | | | | |
|---|---|---|---|---|---|---|---|
| S.No. | Fish species | No. of Samples Collected | | | | | Relative dominance (%) |
| | | S* | S** | A* | W* | Total | |
| 1. | *Schizothorax plagiostomus* (Heckel 1838) | 4 | 1 | 2 | 3 | 10 | 6.49 |
| 2. | *Schizothorax esocinus* (Heckel 1838) | 5 | 7 | 10 | 9 | 31 | 20.12 |
| 3. | *Schizothorax labiatus* (McClelland 1842) | 9 | 7 | 11 | 8 | 35 | 22.72 |
| 4. | *Schizothorax curvifrons* (Heckel 1838) | 8 | 7 | 6 | 11 | 32 | 20.77 |
| 5. | *Crossocheilus diplochilus* (Heckel 1838) | 2 | 1 | 0 | 0 | 03 | 1.94 |
| 6. | *Glyptosteron reticulatum* McClelland, 1842 | 1 | 2 | 1 | 3 | 07 | 4.54 |
| 7. | *Cyprinus carpio communis* Linnaeus, 1758 | 4 | 5 | 8 | 6 | 23 | 14.93 |
| 8. | *Triplophysa marmorata* (Heckel, 1838) | 2 | 0 | 1 | 2 | 05 | 3.24 |
| 9. | *Triplophysa kashmirensis* (Hora, 1922) | 3 | 2 | 1 | 2 | 08 | 5.19 |
| *S-Spring, **S- Summer, *A – Autumn, *W - Winter | | | | | | | |

| Table 6. Relative dominance (%) of Collected fish samples at site V ( Kursu Padshahi Bagh ) | | | | | | | |
|---|---|---|---|---|---|---|---|
| S.No. | Fish species | No. of Samples Collected | | | | | Relative dominance (%) |
| | | S* | S** | A* | W* | Total | |
| 1. | *Schizothorax plagiostomus* (Heckel 1838) | 1 | 1 | 2 | 3 | 7 | 6.03 |
| 2. | *Schizothorax esocinus* (Heckel 1838) | 4 | 4 | 8 | 11 | 27 | 23.27 |
| 3. | *Schizothorax labiatus* (McClelland 1842) | 7 | 8 | 5 | 9 | 29 | 25.00 |
| 4. | *Schizothorax curvifrons* (Heckel 1838) | 12 | 7 | 6 | 9 | 33 | 28.44 |
| 5. | *Crossocheilus diplochilus* (Heckel 1838) | 2 | 1 | 1 | 1 | 05 | 04.31 |
| 6. | *Glyptosteron reticulatum* McClelland, 1842 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| 7. | *Cyprinus carpio communis* Linnaeus, 1758 | 2 | 5 | 3 | 1 | 11 | 9.48 |
| 8. | *Triplophysa marmorata* (Heckel, 1838) | 0 | 0 | 0 | 1 | 01 | 0.86 |
| 9. | *Triplophysa kashmirensis* (Hora, 1922) | 0 | 0 | 0 | 0 | 0 | 0.00 |

*S-Spring, **S- Summer, *A – Autumn, *W - Winter

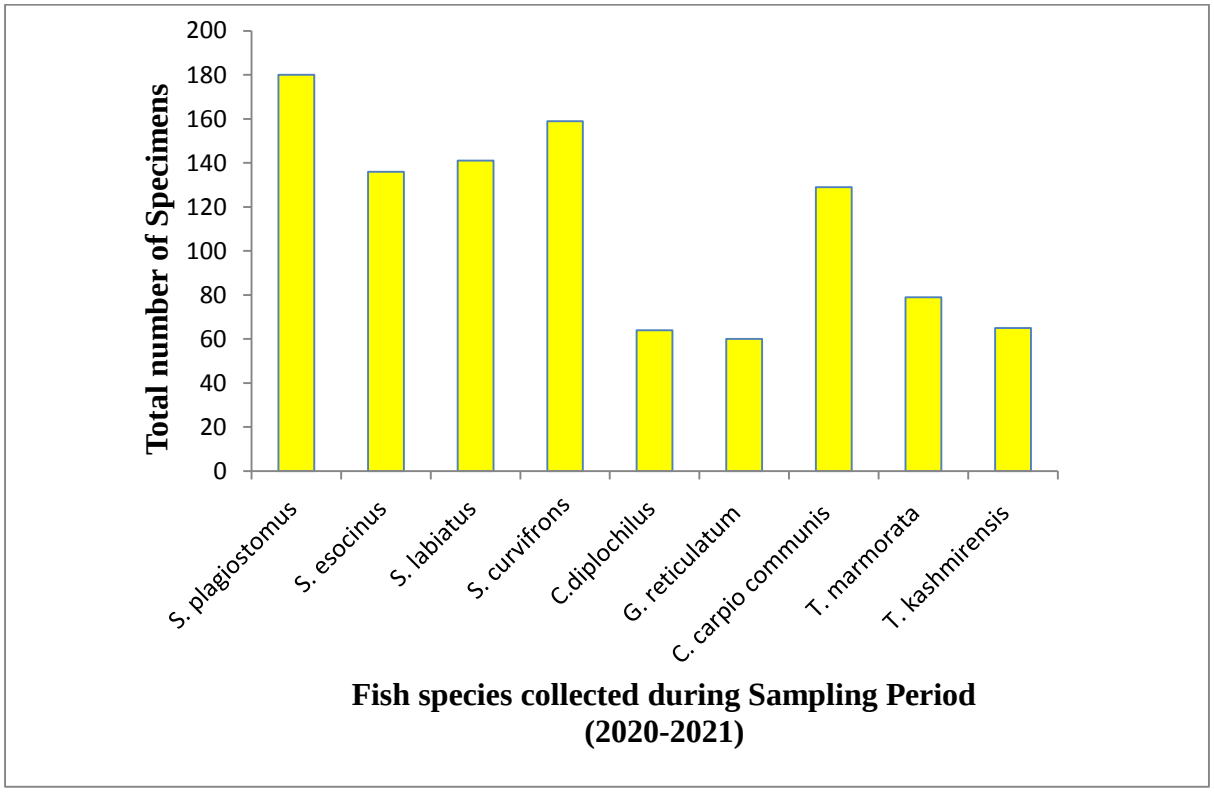


**Figure 3:** Total fish catch during sampling period (2020-2021)

## 3. CONCLUSION & RECOMMENDATION

Due to distinct topography of Kashmir valley, its ichthyofaunal diversity is different from the rest of the world and thus possesses tremendous potential to flourish the cold water fisheries. In the present study, only nine fish species were collected from the river Jhelum. But it is evident from the current study that both fish diversity and catch has got reduced in this cold water snow fed river. Most possible reason for decline (fish fauna) seems to be that the river ecosystem is not getting the adequate time to recover its natural community structure.
Fishing in the stream should be regulated to evade over exploitation of this important resource viz illegal fishing should be banned in the stream. Excavation of sand, pebbles, boulders and channelization during pre-spawning or breeding seasons should be controlled. The entry of sewage, agricultural and solid wastes into the stream needs to be controlled and properly managed. Master plan should be framed for the treatment of all point source pollution entering into the Vaishav stream especially for sewage released from the residential areas. Besides that Stream banks should not be used as garbage dumping sites and for defecation. Construction and human settlement along the banks of the stream should be prohibited and mesh dimension standards should be followed by the fisherman as envisaged in the rules. Separate authority should be constituted to monitor the ecological aspects of the stream. Environmental impact assessment should be taken periodically to ensure stream conservation and sustainable utilize of stream resources. Since the stream is owned by different government departments such as forestry, engineering, geology mining and fisheries if any project is executed by the concerned departments, they should have common consensus

and synergy, so that ecology of the stream should not be disturbed. All the stakeholders must devise a policy for conservation of fish biodiversity in this vital ecosystem.

## 4. REFERENCES

[1] . Heckel JJ. (1838). Fischeaus Caschmirgesammelt und herausgegeben von Carl Freiherrn von Hügel, beschrieben von Joh. Jacob Heckel.

[2] . Kullander SO, Fang F, Delling B, Ahlander E. (1999). The fishes of the Kash-mir Valley. River Jhelum, Kashmir Valley: Impact on the Aquatic Environment. Swedmar, Göteborg, Sewden.

[3] . Sikoki FD, Otobotekere AJT. (1999). Fisheries. The Land People of BayelsaState Central NigerDelta, Port Harcourt, Nigeria.

[4] . Yousuf AR, Bhat FA, Mahdi MD (2006). Limnological features of river jhelum and its important tributaries in kashmirhimalaya with a note on fish fauna. Journal of Himalayan Ecology and Sustainable Development 1: 3750.

[5] . Acharjee, M.L. and Barat, S. (2010). Impact of fishing methods on conservation of ichthyofauna of river Relli in Darjeeling Himalaya of West Bengal. Journal of environmental biology, 31(4), pp.431-434.

[6] . Badoni, A.K. (2018). Fish diversity of a small hill stream Dhunteshwer-Gad of Uttarakhand (India) and need of its conservation. International research Journal of biological sciences, 7(8):16-19.

[7] . Bhat, F.A., Balkhi, M.H., Najar, A.M., Yousuf, A,R. (2013). Distribution pattern, density and morphometric characteristics of Schizothoracines (Snow trouts) in Lidderriver, Kashmir. The Bioscan, An International Quarterly Journal of Life Scieces, 8(2):363-369.

[8] . Brraich,O.S., Malik,I.A. (2016). Fish fauna of wullar Wetland (Ramsar site in Kashmir Himalayas, India). Iranian Journal of Ichthyology, 3(3): 218–221.

[9] . Hora, S.L. (1936). Yale North Indian Expedition, Article XVIII. Report on fishes, Part I, Cobitidae. Mem. Conn. Acad. Sci., 10:299-321.

[10] . Joshi, B.D. (2005). On the ecobiology and contribution of smaller mountain tributaries to the production of the major river Bhagirathi-Ganja in Himalayan region. M.S. Johal (ed.). Proceedings of the national seminar, "New trends in fishery development in India, Punjab University Chandigarh, 241-251.

[11] . Khan, I., and Ali, M. (2013). Current status of fish fauna of River Jhelum, Kashmir, J&K. Open access scientific report, 2(3):1-3.

[12] . Kullander, S.O., Fang, F., Delling, B., Ahlander, E.(1999). The fishes of the Kashmir valley. In River Jhelum, Kashmir Valley. Impacts on the aquatic environment. Nyman, L.ed.Swedmar, Gotebofrgs, Lanstryckeri AB., Swedmar, 99-162.

[13] . Ojewola, G.S. & Annah, S.I. (2006). Nutritive and economic value of Danish fish meal, crayfish dust meal and shrimp waste meal inclusion in broiler diets. International journal of poultry Science, 5: 390- 394.

[14] . Yousuf, A.R., Bhat, F.A. & Mahdi, M.D.( 2006). Limnological features of River Jhelum and its important tributaries in Kashmir Himalaya with a note on fish fauna. J. Himalayan Ecol. Sustain. Dev, 1, pp.37-50.

[15] . Sultan S. & Kant R. (2016). Survey and Study of fish fauna of River Jhelum (j&k). International journal of multidisciplinary research and development, 3:1(278-280).

[16] . Rashid G. & Singh R. (2020). Present Status of Fish Diversity and Their Conservational Measures For Sustainable Fish Production In The Vaishav Stream Of Kashmir Himalaya, India. Journal of Critical Reviews, 7:16 (3654- 3663).

[17] . Rumysa, K.1, Sharique, A. Ali., Bilal, A., Tariq, Z., and Farooq, M. (2016).On the fish diversity, conservational management and rehabilitation aspects of wuller Lake, Kashmir India. Bioscience Biotechnology Research Communications, 9(4): 872-877