

Insights into the fishing gear and ichthyofauna of major lentic water bodies of Kashmir Valley

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Bag net being operated in Wular Lake by a group of fishermen.

The Himalayas are a colossal, uneven, and resource rich region with abundant flora and fauna, extending for over 2,500 km. Capture fisheries for subsistence are a common form of exploitation in upland areas (DCFR, 2015). Being landlocked, fishes in the streams, lakes, rivers serve as a valuable and efficient source of animal protein for rural populations. However, there are certain constraints in the cold water fisheries sector, including accessibility problems due to hilly terrain, and marketing (CMFRI, 2015).

The abundant aquatic resources of Jammu and Kashmir harbour a wide variety of indigenous and exotic fish species make it one of the promising areas for coldwater and hill stream fisheries (Qadri et al., 2018). Though the fisheries sector in Kashmir valley has huge potential and could contribute significantly to the GDP of the valley, it is yet to gain momentum. While fishing is limited to harvesting and

sale, culture fisheries do exist although they are at their infancy stage (Malik et al., 2018). Natural water resources, such as lakes, streams, rivers and springs covering a total area of 40,000 hectares, play a compelling role in the socio-economic and cultural development of the valley population (Malik et al., 2018). 70% of the total population in Kashmir valley has adopted agriculture as a primary occupation, of which 15% substantially have fisheries as a principal source of income (Qureshi et al., 2013).

The invigorating climate of the region suits aquatic life. Kashmir is one of the premier fishing destinations in the world, with a tremendous number of streams and a considerable number of high altitude snow-fed lakes full of brown and rainbow trout. Jammu and Kashmir is one of the most

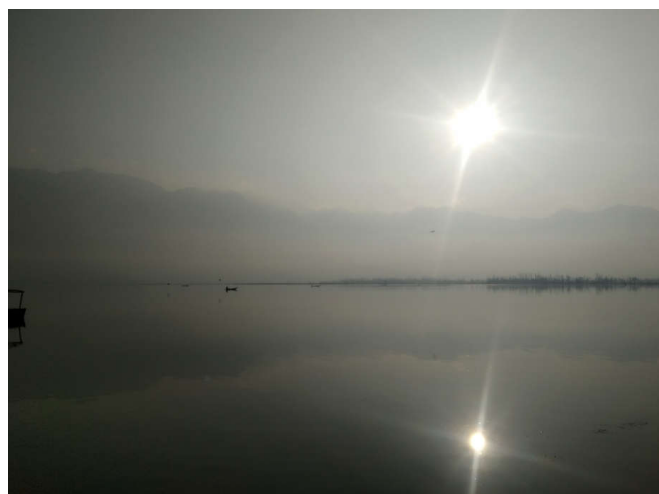
avored angling sites in the world (Ahmad, 2016), providing indispensable opportunities for anglers with its varied types of fish resources, especially trout and mahseer.

The fish fauna of Kashmir Valley is mainly represented by the families Cyprinidae, Cobitidae, Siluridae, Poeciliidae, Sisoridae and Salmonidae (Yousuf, 1996; Balkhi, 2005; Bhat et al., 2012).

The current fish production from Jammu and Kashmir is 20,700 metric tonnes. The volume of fish production over the last decade has varied between 19,000 to 20,000 metric tonnes (Statista, 2019). The fisheries sector contributes a total revenue of Rs. 56,012,000 in Jammu and Kashmir (Economic survey, 2017).

Although fisheries have a burgeoning potential in the valley, it is generally considered a low-income profession in the valley and is mainly practiced by the poor.

The critical factor that has influenced the profession in the valley is the socio-economic condition of the fisher communities. For the proper development of the fishing industry, the socio-economic improvement of the fisher communities is necessary (Quyoom et al., 2016).



Dal Lake.

Lakes and their fish fauna

Kashmir valley is spread over an area of 1,594,800 hectares, with lakes covering about 32,765 hectares (Raina, 2002; Sodhi et al., 2013). The vital water bodies of Kashmir include Dal, Wular, Manasbal, Anchar, Khushalsar, Malpursar, Nilnag, Alapathar, Loolgul, Badsar, Kishansar, Vishansar, Gadsar, Gangabal, and River Jhelum. These glistening water bodies of Kashmir valley boast an intriguing assortment of fish species. These water resources possess great potential for



Table 1: Typical specifications of long lines in Dal and Wular lakes.

Specifications of the long line	Wular lake	Dal lake
Material of main line and branch line	PA multifilament	PA multifilament
Length of the mainline (m)	1000±125	431.25 ± 107.71
Length of a branch line (m)	55±1.88	20 ± 0
Distance between the branch line	2.75±1.75	1.62 ± 0.12m
Material and type of hook	Stainless steel and barbed hook	Stainless steel and barbed hook
Hook no.	No. 5, No. 6	No.3, No.4

Table 2: Typical specifications of spears in Dal and Wular lakes.

Specification of panzri	Wular lake	Dal lake	Specification of narchoo	Wular lake	Dal lake
Total length (m)	3.51 ±0.05	3.57 ± 0.14	Total length (m)	3.53 ± 0.06	3.59 ± 0.09
Material of pole	Wood	Wood	Material of pole	Wood	Wood
Length of a pole (m)	3.16 ± 0.08	3.25 ± 0.14	Length of pole (m)	3.26 ± 0.08	3.38 ± 0.12
Diameter of the pole (mm)	20 ± 0	22 ± 2	Diameter of pole (mm)	22.42 ± 2	21 ± 1.5
Length of prongs (m)	0.35 ± 0.04	0.28 ± 0.07	Length of prongs (m)	0.19 ± 0.02	0.17 ± 0.03
Barb length (mm)	4.42 ± 0.20	5.2 ± 2.5	Barb length (mm)	5.7 ± 0.2	5.8 ± 0.25
Number of barbs	2 ± 0	2 ± 0	Number of barbs	-	-

Table 3: Typical specifications of scoop nets in Dal and Wular lakes.

Specification	Wular lake	Dal lake
Material of webbing	Polyethylene	Polyethylene
Mesh size (mm) of webbing	12.14 ± 1.0	10.74 ± 3.8
Material of frame	Steel/iron	Steel/iron
Diameter (m) of frame	0.4 to 1.5	1.84 ± 0.08
Depth (mm) of frame	0.64	1.1
Material of pole	Wood	Wood
Length (m) of pole	0.83 ± 0.08	0.87 ± 0.05

Below: Manasbal Lake.





Mixed catch of small fish.

the improvement of different type of fisheries sectors such as cold water, warm water, sport, and reservoir fisheries, etc. (Ahmad, 2016).

Wular Lake is one of the largest in Asia and is known to be the fishing bowl of Kashmir (Shah et al., 2017; Malik et al., 2018). This lake is located at a distance of 50 km away from Srinagar at an average altitude of 1570 m AMSL. It is balloon-shaped with a maximum length of 16 km and breadth of 7.6 km and an average depth of 5.8m. With an enormous surface area of about 112.77 (Rashid et al., 2014) it possesses an immense potential to sustain the fisheries of the valley. It alone contributes 60% to the total fish production of Jammu and Kashmir (Rumysa et al., 2012). Both culture and capture mode of fisheries are being carried out in the lake. A total of 9 species, 7 of which are native to the valley

and two being exotic, are of commercial importance. The exotic species (*Cyprinus carpio* var. *communis* and *C. carpio* var. *specularis*) predominate the fisheries of the lake contributing 52-67% of total fish production while schizothoracids (*Schizothorax esocinus*, *S. curvifrons*, *S. micropogon*, *S. niger*, *S. longipinnis*, *S. richardsonii*) and other miscellaneous species of less economic importance such as *B. conchoniis*, *Gambusia affinis*, *Carassius carassius* contribute 25-30% to the total fish production (Qureshi et al., 2013).

Dal lake is the Himalayan urban lake located in the heart of Kashmir valley. It is Kidney-shaped and has an area of 11.20 , which was determined through the satellite imageries of the years 1994 and 1995. Owing to its valuable fisheries resources and being a famous tourist attraction spot, it has a prodigious significance from a socio-economic and ecological



Narchoo.

perspective (Bhat et al., 2005). The mainstay of fish and fisheries of Dal upto mid-twentieth century was schizothoracine species, however, with the introduction of exotic fish, common carp, schizothoracine fisheries gradually declined and common carp dominated the commercial catches (Das and Subla, 1964). In the current scenario as well, the fish catches in Dal are ruled by exotic carps. The majority of fish caught in Dal is contributed by mirror carp, followed by common carp. However, a total of 9 species are reported from Dal, two being exotic (*Cyprinus. carpio* var. *communis* and *C. carpio* var. *specularis*) and 7 being native species (*Crossocheilus diplochilus*, *Carassius carassius*, *Puntius conchonius*, *Gambusia holbrooki*, *Botia birdi*, *Schizothorax curvifrons*, *Schizothorax niger*) (Imtiaz et al., 2017).

Anchar Lake is a shallow freshwater lake located 10 km northwest of Srinagar city at an altitude of 1585 amsl. This lake has an area of about 680 hectares, half of which has now ultimately become marshland. Anchar is a typical suburban eutrophic lake with both rural and urban characteristics in an ideal rural environment. Lake fisheries of Anchar are mainly contributed by 15 species belonging to 4 orders; Cypriniformes, Siluriformes, Cyprinodontiformes, and Salmoniformes. Cypriniformes being dominant accounts for 12 of the 15 species caught from this lake. *Schizothorax* spp. forms the mainstay fisheries of Anchar lake, mainly dominated by *S. esocinus* followed by *S. plagiostomus* (Bashir et al., 2016)

Manasbal lake, also known as “gem of lakes,” is the deepest freshwater lake of Asia. The lake is situated about 30 kilometers northwest of Srinagar city in the direction of Wular Lake and is connected with river Jhelum by a canal. It has an oblong shape in an east-west direction. Manasbal lake has a total length of about 4.5 km and a width of about 300 meters. Seven fish species, namely *Schizothorax esocinus*, *S. curvifrons*, *S. niger*, *S. plagiostomus*, *Trypophysa* sp., *Cyprinus carpio* var. *communis* and *C. carpio* var. *specularis* and *Ctenopharyngodon idella* contribute to the commercial fisheries of this lake. *Schizothorax* species dominate the catches in the winter season (January and February), contributing 71% to the total catches while the exotic carps viz., *Cyprinus carpio* and *Ctenopharyngodon idella* contribute about 69% of the total catch in March and April (Mehraj et al., 2013).

Indigenous fishing gears employed for lake fisheries

To identify the Indigenous fishing gear employed for capture fisheries in different lakes of valley various studies have been carried out by Dar et al., 2012; Mehraj et al., 2013 Nimat et al., 2016; Malik et al., 2018 and have reported the following gears operated in Dal, Manasbal and Wular lake.

Cast net: locally known as zaal, cast net forms one of the dominant fishing gear in Dal, Wular, and Manasbal lake. It is the most commonly operated gear because of the apparent reason that it is operated single-handed though it requires expertise and skilled person for operation. The net is made up of nylon and cotton thread. Generally, the fishermen use nylon made cast net. It is circular, having the shape of an umbrella. The size range used is between 1.0 to 2.0 m in diameter. The mesh size varies between 1.2 to 3.0 cm bar to



Panzri.

bar (Malik et al., 2018). In Dal Lake, two types of cast nets are operational based on mesh size, i.e., cast net with large mesh (4.55 ± 0.21 m total length) and the other with small mesh (4.13 ± 0.31 m total length) for capturing different size groups of the fish (Nimat et al., 2016).

Long lines: It is the primitive type of fishing gear employed in lentlic waterbodies of the valley where the method of capture is based on the feeding and hunting behavior of targeted species. In this method the gear, here long line is spread over certain stretch of the water body at dusk with food laden on the hooks. It is then collected either on next morning or after 2-3 days depending upon the numbers of fish caught. In the local language, it is commonly known as ‘Walraaz’ and is operated in Dal to catch *Cyprinus* spp. and Manasbal and Wular to catch *Schizothorax* and *Cyprinus* spp. respectively. The detailed specifications of the gear employed in Dal and Wular lakes is hereby given in table 1.

Pole and line: This method of fishing is operational in Dal, Wular, and Manasbal lakes for capturing *Cyprinus* and *Schizothorax* spp. However, its economic importance is

comparatively less than other fishing methods. In both the lakes, the material of twine is of PA multifilament. However, the length of the twine differs in both lakes, with 4 to 6 m in Wular Lake and 3.5 to 5 m in Dal Lake. The higher length measurements in Wular Lake may be attributed to the more depth of water in this lake. Hook no. 5 and 6 are mostly used and are generally available in the local markets of these villages.

Bag net: Locally known as Kochibi/Sagean/Khurjaal, this fishing gear is operated in Wular and Manasbal lakes to catch fishes near waterfalls. It is known as Kochibi when the diameter of the mouth, depth of pouch, and the length of the bamboo handle are 1 meter each and is the common type. Any other kind with a larger diameter and the deeper bag is called "Sagean".

Spears: It is one of the ancient fishing gears used to catch fishes. This gear is being employed in Dal and Wular lake. Multiple headed spears are commonly known as *panzri*, and a double-pronged spears as *narchoo* in the local Kashmiri language. This type of gear requires skill and expertise for operation and is mainly operated in clear waters to catch big fishes like *Cyprinus* spp. The detailed specifications of the gear employed in Dal and Wular lakes are given in table 2.

Scoop net: This is commonly operated in Dal and Wular lake and is locally known as khashiv and kranzall. This is being used as a secondary gear to collect fishes caught from other gears like cast net, longline, lift net, or to draw fishes from storage boxes.

The detailed specifications of the gear employed in Dal and Wular lakes are given in table 3.

Gill nets: Commonly called Thani/ptaji, gill net forms suitable gear to catch fishes from deeper waters. The use of gill nets in wular lake has significantly affected the regenerative capacity of ichthyofauna of this lake. Gill nets are 15 to 40 m long and 1.5 to 3 m wide with mesh size ranging between 45 mm and 75 mm. Observing the negative impacts on the fish catches, fishers of Bandipora and Ganderbal have themselves imposed the ban on the use of this gear. However, fishers of Srinagar use it without any mesh size regulation.

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