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Research Paper

Fishing gear practices in the water of Kashmir: a comparative analysis

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ABSTRACT

This study examines the different types of fishing gears operating in four major lakes, of Kashmir *viz.*Wular, Dal, Manasbal and Anchar. These lakes are inhabited by variety of native and exotic fish species, are vital to the ecological and economic point of view. The study documents the types of fishing gears and craft operating in different lakes, such as cast nets, long lines, lift nets, gill nets, and spears, by combining field surveys and interviews with local fishers. Each lake has unique ecological and socioeconomic factors influence the fishing techniques used there. The results emphasize the importance of conventional fishing techniques and the need for sustainable approaches to preserve lake ecosystems while sustaining local economies. The findings highlight the importance of traditional fishing methods and emphasize the need for sustainable approaches to conserve lake ecosystems and to maintain the sustainability.

Key words: Anchar lake**,** Dal lake, fishing gears, Manasbal lake, Wular lake

Kashmir, an agricultural region, relies heavily on its precious water resources. The region's lakes, rivers, streams, and springs support its social, cultural, and economic well-being. Notably, the Kashmir Valley is home to numerous native and exotic fish species. Geographically, Kashmir boasts several significant water bodies, including the River Jhelum, Dal, Wular, Manasbal, Anchar, Badsar, Kishansar, Vishansar, Gadsar, and Gangabal. This study focuses on fishing techniques of four primary lakes: Wular, Manasbal, Dal, and Anchar. Wular Lake is one of the largest freshwater lakes in Asia, located in the Bandipora district of Jammu and Kashmir at an altitude of 1,580 meters above mean sea level, between 34°16′–34°20′N latitude and 74°33′–74°44′E longitude (Bhat & Pandit, 2014). Covering an area of approximately 130 square kilometers, the lake's size varies seasonally and it is primarily fed by the River Jhelum (Wetlands International South Asia, 2007; Ramsar Convention Secretariat, 1990).Wular Lake plays a vital role in flood control and water regulation, functioning as a natural flood basin during the monsoon season (Anon., 2012). It also provides livelihoods for local communities through fishing, agriculture, and tourism. The lake, along with its extensive adjoining marshlands, serves as a crucial natural habitat for diverse wildlife, especially avifauna.From a fisheries perspective, Wular Lake is a major contributor to Jammu and Kashmir's inland fish production, accounting for nearly 60% of the total output (Rumysa et al., 2012). It supports a wide range of fish species, including seven native and two exotic species of commercial importance. Among these, exotic carp species such as *Cyprinus carpio var. communis* and *Cyprinus carpio var. specularis* dominate the commercial catches, contributing approximately 52–67% of the total yield. Indigenous species, particularly *Schizothorax* spp., along with other native fishes of lesser economic value-such as *Puntius*

conchonius, *Gambusia affinis*, and *Carassius carassius*—constitute about 25–30% of the catch (Qureshi *et al*., 2014).Traditional fishing in Wular Lake employs a variety of gear types, with commonly used methods including cast nets, lift nets, multiple-head spears, long lines, and scoop nets. Manasbal Lake is one of the deepest freshwater lakes in Jammu and Kashmir, situated at an altitude of 1,583 meters above mean sea level, between 34°15′–34°17′N latitude and 74°40′–74°42′E longitude covering an area of approximately 2.81 square kilometers, the lake is fed by springs and precipitation, with seasonal fluctuations in water levels (Yousuf & Qadri, 1985).Mansbal lake supports a moderate diversity of fish species, with a notable presence of both exotic and indigenous varieties. The dominant commercial species include *Cyprinus carpio* var. *communis* and *Cyprinus carpio* var. specularis, together forming around 60–70% of the annual catch (Rashid *et al*., 2013). Indigenous species such as *Schizothorax niger*, *Schizothorax curvifrons*, and *Triplophysa* spp. also inhabit the lake, contributing to biodiversity and sustaining traditional fisheries. The fishing practices in Manasbal are largely artisanal, involving the use of gill nets, cast nets, long lines, and drag nets, operated mainly by local fisher folk (Bhat *et al*., 2010).

Dal Lake is a well-known freshwater lake located in the Srinagar district of Jammu and Kashmir at an altitude of approximately 1,583 meters above mean sea level, situated between 34°6′N–34°9′N latitude and 74°48′E–74°53′E longitude (Khwaja & Rather, 2015). It covers a surface area of around 11.45 square kilometers and is divided into four distinct interconnected basins: Hazratbal, Lokut Dal, Gagribal, and Nigeen (Sofi *et al.*, 2014). .The key fish species contributing to the commercial fishery of Dal Lake are *Cyprinus carpio communis* and *Cyprinus carpio specularis*, which together make up 60-70% of the total catch. Both of these species are exotic to the region. The native species include *Schizothorax niger*, *Schizothorax esocinus*, *Schizothorax micropogon*, and *Schizothorax plagiostomus* (Zutshi & Vas, 1982). Anchar Lake is a shallow basin lake located near Soura, approximately 10 km northwest of Srinagar city. It lies within the geographical coordinates of 34° 20′ to 34° 26′ N latitude and 74° 82′ to 74° 85′ E longitude, at an elevation of 1583 meters above sea level, situated in a semi-urban area (Ahangar *et al.,* 2012). Anchar Lake supports a diverse fish population, including both native and exotic species. The indigenous fish species, such as *Schizothorax niger, Schizothorax esocinus*, and *Schizothorax micropogon,* are vital to the local fisheries. Additionally, the lake has seen the introduction of several exotic species, including *Cyprinus carpio* (common carp), *Ctenopharyngodon idella* (grass carp), and *Hypophthalmichthys molitrix (*silver carp), which have become dominant in the fishery. Despite this diversity, the lake's aquatic ecosystem and fish populations have been negatively impacted by human activities, including pollution, encroachment, and the spread of invasive species, which have altered the natural habitat (Ahangar et al., 2012; Zutshi & Vas, 1982; Khan & Yousuf, 2011; Khan, 2004). This study aims to document current fishing gear practices, analyze ecological and socioeconomic factors influencing fishing techniques, and identify sustainable approaches for protecting Kashmir's lake ecosystems.

MATERIALS AND METHODS

Study area: Fishers villages around Wular lake, Dal lakes, Manasbal lake and Anchar lake were selected for the present research work.

Data collection: A Field surveys and interviews with local fishermen were conducted during the study period. Five fishers from each of the four lakes' banks (total 20) were selected. This selection was made to ensure a manageable, diverse, and representative sample, allowing for detailed data collection on fishing practices. All physical measurements of fishing gears were taken on the field itself and some of the information regarding the methods of fishing practices were gathered from the fishermen by a set of pre-tested questionnaire. Besides, other relevant data were collected from the Department of Fisheries, Government of Jammu & Kashmir. The materials used during the survey includes measuring taps, measuring scales, one digital camera, fish identification field book and drawing paper during the survey. The fishing gears were classified according to the FAO

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catalog of fishing gear designs (Nedelec, 1975). Descriptive statistics were applied to analyze the collected data, providing an overview of the fishing gear types and their usage patterns.

RESULTS AND DISCUSSION

This study provided a thorough operating details about different types of gears operating in Wular, Dal, Manasbal and Anchar lake. Each lake is rich in biodiversity inhabits many commercially important species.The commercially important species found in these lakes are summarized in Table 1 below. The use of various types of fishing gears in these lakes reflects a long history of fishing that have affected fish diversity, catch composition and Gear design over decades. The following headings provide a summary of the current study's findings along with relevant discussion:

Table 1: List of commercially important species

Lake Name	Commercially Important Fish Species
Wular Lake	*Cyprinus carpio*, *Cyprinus carpio specularis*, *Schizothoraxniger*, *Schizothoraxesocinus*, *Puntius conchonius*
Manasbal Lake	*Cyprinus carpio*, *Cyprinus carpio specularis*, *Schizothoraxniger*, *Schizothoraxcurvifrons*, *Triplophysa spp.*
Dal Lake	*Cyprinus carpio*, *Cyprinus carpio specularis*, *Schizothoraxniger*, *Schizothoraxesocinus.*
Anchar Lake	*Cyprinus carpio*, *Ctenopharyngodonidella*, *Hypophthalmichthys molitrix*, *Schizothoraxniger*, *Schizothoraxesocinus*

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Cast net: The cast net consists of a cone-shaped net. Weights connect the conical-shaped cast nets at regular intervals to a lead line ranging in length from 4.20 to 7.11 meters (Azeez, 1997). To cover a huge area of water, these nets are narrow at the top and wider at the bottom. Generally, the weight on the net is between 5 and 7 kg. The net materials were polyester (PES), nylon monofilament, and polyethylene (PE), all of which are white in colour. In Kashmir, cast net is locally known as *zaal, golzaal, naushathzal, or bahshathzal*. (Syed *et al*., 2016). The cast net is one of the most common types of active fishing gear in the valley's Wular, Dal, Manasbaland Ancharlakes. The net had a conical shape and was made of polyamide multifilament PA 210D×2×2 or 210D×6×3.The length of the cast nets used at Wular Lake vary from 4.34 to 5.00 meters. In Manasbal, the lengths ranges from 4.16 to 4.77 meters.Fishermen in Wular use longer, heavier cast nets to exploit its vast, dynamic waters, while Manasbal's fishers opt for shorter, adaptable nets suited to its depth and stable conditions. These adaptations reflect species availability, hydrology, and traditional knowledge.Depending on the mesh size, Dal Lake uses two distinct types of cast net v*iz;*large mesh and small mesh. Large mesh cast nets have length between 4 and 5 meters, while small mesh cast nets have dimensions between 3 and 4.3 meters. The cast net is used throughout the year.One fisherman operates the net on a small to medium-sized fishing vessel. Using a pulling cord, the net is thrown and hauled as soon as it made contact with the ground. 5 to 10 kilograms of fish were typically caught each day using a cast net. The table 1 depicts information on the size, duration of operation cast net in the lakes of Kashmir Valley, specifically Wular, Dal, Manasbal and Anchar and lakes.

Long line: The length of the lines that are being used gives rise to the term "longline". In Kashmir, longline is locally referred as *Walraz*, is one of the main gears used in Dal and Wular Lakes. In general, a longline is made up of a mainline to which numerous branch lines are connected. Both of the lines are made up of polyamide multifilament. In comparison to branch line, the main line has thicker twine. Hooks are fastened at the end of the branch line, whereby the fish are captured.Typically, hook numbers 3, 4, and 5 are encountered. A 10 to 20 number hooks knotted

to the long line in streams of kumoan Himalayan region of India has been reported (Srivastav *et al*., 2002). In Wular Lake, there are roughly 1500 hooks, whereas in Dal Lake, there are 200 to 500 hooks that are connected at regular intervals of about one meter (Syed *et al.,* 2016). This variation in the number of hooks is primarily due to the differences in lake size, depth, and target species diversity. Wular Lake, being one of the largest and deepest freshwater lakes in the region, supports a wider fishing area and allows for the deployment of longer longlines with more hooks. In contrast, Dal Lake is comparatively smaller and more urbanized, limiting the operational space for longline fishing and thus requiring fewer hooks.The design and specifications are presented in Table 2.

During Walraz (longline) fishing operations, two fishermen work in coordination: one rows the boat steadily while the other sets the fishing line. Before beginning, the fishermen carefully prepare the line by assembling it in a wooden basket and attaching bait to each hook. The bait typically consists of small fingerlings, earthworms, tiny insects, or a traditional mixture of wheat flour and turmeric powder, whose yellow color helps attract fish. Alengthy immersion period ranging from 10 to 12 hours has been noted in Wular Lake, which is in line with Manipur's immersion periods (Devi *et al.*, 2013). In contrast, Dal Lake's immersion times are shorter-between two and three hours (Syed *et al.,* 2016). The longer immersion period in Wular Lake is due to its larger size and deeper waters, requiring more time for effective fishing. In contrast, Dal Lake's shorter immersion times are due to its shallower areas and localized fishing practices.

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Lift net: Lift nets, locally known as Khurizal or Zal, are widely used in Anchar and Wular Lakes. The operation of a lift net is the reverse of that of a cast net. It consists of two semicircular wooden poles fastened to each other, with a long central bisecting pole in the middle, allowing the ends to be widely spaced. A piece of netting is attached to these ends. Lift nets used in Anchar and Wular Lakes have a semicircular shape, and the webbing is made from white or off-white PA multifilament with specifications of 210 D×3×3 or 210D×6×3. After regularly submerging the net in the water, the fisherman lifts it to catch the fish. With the help of a wooden pole, the net is periodically hoisted from below the surface of the water. The immersion time typically ranges from 20 minutes to 1 hour, though it can occasionally extend up to 2 hours. The duration of immersion varies according to fish movement, ranging from fifteen minutes to over an hour, as reported by Syed *et al.* (2016) in a related study conducted in Wular Lake. Baits used include rice husk, flour, flour combined with turmeric, and tiny insects. The net is typically used at depths of 1.3 to 1.6 meters, with *Schizothorax s*pp. and *Cyprinus* spp. making up the majority of the catch. According to Syed *et al.* (2016), the lift net is operated at depths of 1 to 2.5 meters. The design and specifications are presented in Table 3.

Gill net: Gill net is considered as highly selective fishing gear and is operated in the lake's deepest depths. A gillnet can be operated actively and passively. The gill nets, known as *Thani* in the Wular Lake, have a mesh size that ranges from 45 mm to 75 mm and are 15 to 40 m long and 1.5 to 3 m wide (Dar *et al.*, 2016). In Dal Lake, gill nets vary in length between 3.05 to 6 meters. They were employed to capture sizable *Schizothorax* and *Cyprinus* species of fish (Syed *et al.*, 2017). An observations have demonstrated that because of the decline in fish catch , the communities themselves were imposing restrictions on the use of lower-mesh nets. The Department of Fisheries has banned the use of gill nets because the amount of fish being catch in the lake is decreasing.

Multiple head spears (*Panzir*): It is made up of a long wooden pole known as the *"Shum*" that is positioned radially with the aid of ropes made of sharp, straight prongs that are known locally as *Panzir*Phaji. Pole lengths at Anchar Lake and Wular Lake varied between 3.31 and 3.36 meters, whereas Dal Lake's lengths varied from 3.0 to 3.35 meters. A similar study was carried out by Dar *et al.* (2014) in Wular Lake, where various fishing equipment were employed for fish collection.

The pole's length in that study was determined to be 10–12 feet, which is consistent with the current investigation. The design and specifications are presented in Table 4.

Double pronged spear (*Narsoo*): The double-pronged spear, locally known as "Narsoo," is used in Wular Lake, Dal Lake, Manasbal Lake, and Anchar Lake. It consists of seven prongs arranged in a circular pattern around a central pole, with lengths varying from 2.51 to 3.59 meters across the different lakes. The prong lengths range from 0.10 to 0.19 meters. Syed and Mohite (2016) reported that a double-pronged spear had seven to nine prongs, with pole lengths ranging from 3 to 3.6 meters in both Dal Lake and Wular Lake, which differs slightly from our observations. The design and specifications of the double-pronged spear are provided in Table 5.

Scoop net : The scoop net, locally known as *Khashiv* and *Kranzzal*, is widely used in the Kashmir valley's Wular, Manasbal, Dal, and Anchar lakes. The net features a conical-shaped PE multifilament bag webbing that is attached to a circular or semicircular frame. A wooden pole is fastened to the frame for ease of use. The dimensions of the scoop net typically vary, but the net's diameter ranges from 1.2 to 2 meters, while the length of the wooden pole can vary from 3 to 4 meters. These dimensions make the scoop net effective for gathering fish that have been captured with other fishing gears, such as cast nets. The design allows for efficient retrieval of fish, particularly in shallow areas where the fish have been captured.

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CONCLUSION

The study provides a comprehensive overview of the traditional fishing gear practices employed in Kashmir's four major lakes, Wular, Dal, Manasbal and Anchar. These lakes support diverse fish populations, including both native and exotic species, which are crucial for local livelihoods and ecological balance. The research highlights the use of various fishing gears such as cast nets, longlines, lift nets, gill nets, spears, and scoop nets, each adapted to the unique ecological and socioeconomic conditions of the respective lakes. Findings reveal that fishing techniques vary significantly across lakes due to differences in water depth, fish species availability, and traditional knowledge. For instance, Wular Lake's vast expanse allows for larger cast nets and longer longlines, while Dal Lake's smaller, urbanized setting necessitates shorter immersion times for longlines. Additionally, the study notes the declining fish catch in some areas, leading to community-imposed restrictions on certain gear types, such as gill nets, to promote sustainable fishing. The study underscores the importance of preserving traditional fishing methods while advocating for sustainable practices to ensure the long-term health of these aquatic ecosystems. Balancing ecological conservation with the socioeconomic needs of local fishing communities remains critical. Future efforts should focus on implementing regulated fishing practices, habitat restoration, and community awareness programs to safeguard Kashmir's lake fisheries for future generations.

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