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### Fishing gears and crafts of Manasbal Lake: Insights from the Kashmir Himalayas

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#### Abstract

This study explores the diverse fishing crafts and gear utilized by the fishing community of Manasbal Lake. The tools and techniques employed by local fishers are relatively simple, reflecting traditional practices primarily aimed at small-scale commercial fish harvesting. Within this framework, the research sought to examine the fishing methods and gear used by the community to better understand their practices and challenges. Data for the study were gathered through semi-structured interviews with local fishermen and personal non-participant observation, ensuring a comprehensive understanding of the fishing activities. The findings revealed the use of one primary type of fishing craft and six distinct types of fishing gear. The craft consisted of a plank-built wooden boat, a traditional vessel well-suited to the lake's conditions. The fishing gear included longlines, cast nets, *Narcho* (a locally known gear), scoop nets, gillnets, and rod-and-line setups. The study also highlighted that the construction, fabrication, and maintenance of these crafts and gear rely heavily on traditional materials and indigenous knowledge passed down through generations. Despite their simplicity, these methods remain integral to the livelihoods of the fishing community. However, the continued reliance on traditional techniques raises questions about efficiency and sustainability, especially in the face of modern fishing challenges. This research underscores the need for targeted interventions to improve fishing efficiency while preserving the cultural heritage and ecological balance of Manasbal Lake.

**Keywords:** Manasbal Lake, fishing gear, fishing craft, fishing community

#### Introduction

Jammu and Kashmir is known as a tourist destination due to its munificence of blossoms and magnanimity of resorts, the state is holding huge water spread area (Qayoom *et al.*, 2014 & 2015) <sup>[12, 7, 11]</sup>. The valley has the distinction of having the different natural water resources which include Wular Lake, Dal Lake, Manasbal Lake, Anchar Lake and Nigeen Lake and River Jhelum, popularly known as lifeline of Kashmir. All these waterbodies hold a treasure of diverse fish species that contribute to confer the nutritional requirements of the people in the valley. However, these waterbodies have been witnessing increased levels of pollution (Akhtar *et al.*, 2015, Qayoom *et al.*, 2015 & Qayoom & Shah, 2017) <sup>[1, 7, 11, 8]</sup> making them vulnerable for fishes to survive. In this pretext, fishers have come up with efficient gears to cope up with the declining fish.

Fishing gears are essential tools in freshwater capture fisheries, enabling the efficient and selective harvesting of aquatic species while promoting sustainable practices and economic viability. Commonly used gears such as gillnets, cast nets, traps, and hook-and-line systems are designed to suit the unique conditions of rivers, lakes, reservoirs, and ponds. These gears allow fishers to target specific species, minimize bycatch, and reduce harm to non-target organisms and habitats, thereby supporting ecological balance. Proper gear design also plays a key role in conserving juvenile fish

by enabling the selective capture of mature specimens, which aids in the replenishment of fish stocks.

The evolution of fishing technology has significantly enhanced gear efficiency (Sreekrishna & Shenoy, 2001) <sup>[17]</sup>. For example, the replacement of natural fibers with synthetic materials, such as synthetic yarn, has greatly improved gear durability and effectiveness (Ramaroa *et al.*, 2002 & Thomas & Hridayanathan 2006) <sup>[15, 18]</sup>. Understanding fish behavior in relation to fishing gear is now a cornerstone of modern gear development, enabling the creation of tools that are not only more efficient but also more sustainable (Anon., 1999) <sup>[3]</sup>. Fishing technology, as an integral aspect of fishery science, underpins the proper exploitation and sustainable management of fisheries. Studies in fishing gears and methods provide crucial insights for balancing productivity with ecological preservation. By adhering to regulatory measures like mesh size restrictions, seasonal closures, and protected area guidelines, and through the adoption of innovative gear designs, freshwater fisheries can ensure long-term viability for both the ecosystems they depend on and the communities they support.

Capture fishery in lentic environment constitutes the single largest resource in the country, both in terms of resource size and productivity potential (Sagunan, 1995) <sup>[16]</sup>. These resources are distributed under divergent geoclimatic,

morphometric and edaphic environment and fish production. The present low levels of production from Kashmir lake fishery is on account of many reasons such as low primary productivity of resources, slow growth rate of fish, inefficient fishing practices and inaccessibility of fishing sites, lack of fish seed stocking, poor landing and marketing channels, absence of closed season (Qureshi *et al.*, 2013)<sup>[13]</sup>. The information gathered in recent past indicated alarming downward swing in quality and average size of indigenous snow trouts, mahaseer and exotic trouts (Qureshi *et al.*, 2014)<sup>[14]</sup>.

In this pretext, the study was undertaken to assess the gear and craft technology used in the famous Manasbal Lake of Kashmir valley which has not been documented so far. This study will not only evaluate the types of fishing gears currently in use and analyze the efficiency and sustainability of these tools, but also identify gaps and propose strategies for technological upgrades. By addressing the challenges and leveraging advancements in fishing technology, the study aims to contribute to the preservation of Kashmir's aquatic biodiversity and the livelihoods of local communities dependent on these vital resources.

## Material and Methods

### Study Area

In Kashmir, Manasbal Lake is one of the important lentic water system which is not only is the centre of attraction for tourists, but also due to variety of fish species captured from the lake. The lake situated between districts of Ganderbal and Bandipora of Kashmir valley (Latitude 34°15' N and Longitude 74°40' 2014E). The lake is encircled by three village's *viz.* Jarokabal, Kondabal and Sumbal and is stated to be the deepest lake (13 m or 43 ft depth) of Kashmir. The drainage basin for the lake, covering an area of 33 km<sup>2</sup> has no major inlet channels and is thus fed mainly by precipitation (rain and snow fall) and springs (more than 1200 springs). The lake water outflows to the Jhelum River through a regulated outflow channel. It has good potential resources for capture fisheries, *Nelumbo* and extraction of grass and forms the life line for rural economy and environment of the area. Low-lying area is used for a variety of human activities including agriculture, horticulture, and irrigation. The lake harbours a variety of fish species especially *Cyprinus carpio* (*C. carpio* var. *communis* and *C. carpio* var. *specularis*), *Schizothorax niger*, *S. curvifrons*, *Carassius carassius*, *Pethia conchonius*, *Crossocheilus diplochilus* and *Gambusia holbrooki* (Andrabi *et al.*, 2022)<sup>[2]</sup>. However, these the endemic species, *Schizothorax* spp. are fast declining as these fishes cannot thrive well in polluted water and due to introduction exotic carps (Balkhi, 2007)<sup>[4]</sup>. However, the fishing methods operated in the Manasbal lake were not documented ever. The present report is an attempt to document the various fishing craft and gears of the Manasbal Lake.

### Collection of Data

Considering the documentary nature of the current study and the qualitative characteristics of the data involved, an exploratory survey research design was adopted. The data collection process was carried out directly in the field by the researchers and a field assistant. The researchers gathered data through a combination of methods, including direct

observation, measurement, and personal interviews with the fishermen. The respondents were approached at various locations, including the fisheries cooperative society, their homes, or at the fishing landing centers.

To facilitate the survey, a range of materials and tools were employed. These included measuring tapes and scales for accurate measurements, a still camera for visual documentation, a fish identification field guide to assist in recognizing different fish species, and drawing paper for sketches or additional illustrations required during the survey. These tools were essential in ensuring the accuracy and comprehensiveness of the data collected throughout the fieldwork process.

### Statistical Analysis

Descriptive statistics for calculation of frequency and percentage was employed using past statistical software ver. 4.17 for all calculations.

### Results and Discussion

The percentage cast net capture and percentage species composition in the Manasbal Lake is represented in Figure 9 & 10. Which describes that 46% of cast net capture is *Cyprinus carpio* spp. while as this fish comprises of 43% of the total catch (Figure 10 & 11).

### Fishing Craft

One of the most essential pieces of fishing equipment in Manasbal Lake is the plank-built boat, a traditional and indispensable fishing craft used exclusively in the region. These boats are a hallmark of local fishing practices, renowned for their durability and effectiveness. A plank-built boat is a type of wooden, non-motorized vessel that is manually operated, typically by oars or paddles. Locally, these boats are commonly referred to as "Naav", a term that has become synonymous with fishing in the area.

These boats are customarily handcrafted by local artisans, who have passed down their expertise in boat-building through generations. The construction process involves carefully selecting and joining planks of wood, which are secured using traditional methods, making the boat strong yet flexible enough to navigate the often challenging waters of the lake.

The dimensions of these boats vary, with the typical length ranging from 7 to 11 meters, and the width varying between 1 to 2 meters. This design allows the boat to remain stable while carrying the heavy loads of fish, fishing gear, and crew members. Despite their size, the boats are built to be lightweight enough to be manually maneuvered by fishermen across the lake.

To protect the boats from the harsh elements of the water and the environment, they are treated with care. The interior of the boat is typically painted with synthetic paints to provide some level of aesthetic appeal and water resistance. Meanwhile, the exterior is coated with dammar, a resinous substance derived from trees, which acts as a protective layer against water damage and deterioration. This coating is crucial for extending the boat's lifespan, especially since the boats are often exposed to constant immersion in water. On average, a plank-built boat has a lifespan of approximately 10 years, though this can vary depending on the frequency of use and maintenance. Regular upkeep,

including repainting and re-coating with dammar, is essential to prolong the boat’s service life. These boats represent not only a vital tool for the livelihood of local fishermen but also a deep-rooted cultural tradition, integral to the way of life at Manasbal Lake. It is pertinent to mention that no other gear is used for capture fishing in the lake that raises a concern for efficient fishing in the area. The boat has been shown in Figure 1.

**Fishing Gears**

In Manasbal Lake, six major types of gears are used by the fishers for capturing their stocks which include longline, rod and line, Narchoo, cast net, scoop net and gill net. It is important to mention that cast net contributes to 83% of capture fishing while as others in total contribute to 17% only. This is due to the fact that cast nets are easy to handle and give maximum catch to the fishers.

**1. Longline (Walraz)**

Longline fishing is a traditional and efficient technique used in Manasbal Lake for catching deep-water fish. It is locally called “walraz” and involves a long main line with multiple baited hooks spaced at regular intervals. It is made of nylon line with length ranging between 300-500 m to which hooks are attached at regular intervals. The main line is made from durable materials like nylon, and shorter branch lines, or snoods, trash fish, maize flour mixed with candy or small fish are grind and balls are prepared. These balls are used as bait. Long lines are set usually in the evening and the catches are collected in the morning next day. Floats keep the line suspended at the desired depth, while weights anchor parts of the line in deeper water. A buoy marks the line’s end for easy retrieval.

The line is left in the water for several hours or overnight, allowing fish to take the bait. Once retrieved, fishermen check each hook for fish, which are then sorted or released. Longlining is particularly effective for targeting specific species like carp or trout, covering a large area and causing less harm to the fish compared to other methods like nets.

Despite its advantages, longline fishing can result in bycatch. To mitigate this, techniques like circle hooks are used to reduce unintentional catches. When practiced sustainably, longline fishing remains an environmentally responsible and vital method in Manasbal Lake, supporting both the local fishing industry and ecological balance. Longline “Walraz” is shown in Figure 2.

**2. Rod and Line**

The rod and line method is considered one of the oldest and most widely recognized techniques for fishing across the globe. This traditional approach involves attaching a metal

hook to one end of a nylon thread, while the other end of the thread is securely tied to a bamboo stick, which serves as the fishing rod. For bait, earthworms or small fish (known as fingerlings) are commonly used to lure the catch. The process begins by casting the nylon line, with the hook and bait, into a body of water, such as a lake, and allowing it to remain there for approximately one to two hours. This technique is typically practiced on a small scale, as it is not designed for commercial fishing purposes. Instead, it is primarily used by local fishers who catch fish for personal consumption. In Manasbal Lake, this method holds cultural significance and continues to be a simple yet effective way for individuals to engage in fishing. Rod and line gear is shown in Figure 3.

**3. Narchoo**

This traditional fishing gear is specifically designed for use in lakes and consists of a wooden pole with a double-headed spear or multi-headed spears affixed to one end. The equipment is skillfully used to target fish by thrusting or shooting the spear at the moment a fish is spotted. This method is particularly effective for capturing larger fish in shallow waters, where the clear visibility allows fishers to observe the movement of their targets.

The technique requires precision and quick reflexes, as it relies on the fisher’s ability to accurately strike the fish when it comes within range. This method is not only a practical approach for fishing in certain conditions but also a traditional practice that showcases the ingenuity of local fishing communities. It remains a significant part of subsistence fishing in areas where clear and shallow waters make this approach feasible and efficient. Narchoo gear is shown in figure 4.

**4. Cast net**

The cast net is the most widely used fishing gear throughout the valley and is considered the dominant tool for lacustrine fisheries. True to its name, the cast net is thrown or "cast" over the water surface from a fishing craft when fish are spotted. Its design is both simple and effective - a conical, small-meshed nylon net with a long line attached to the vertex. The circular open end of the net is weighted with lead or iron to ensure rapid sinking.

Using the cast net requires significant strength, balance, and skill. It must be cast in such a way that it spreads into a flat, circular shape as it reaches the water surface. The weights along the edges quickly pull the net down, enclosing any fish within its radius. As the net is hauled in using the line attached to the vertex, it closes in on the trapped fish. The fish become further ensnared as their gills get entangled in the mesh.

**Table 1:** Types of cast nets used in Manasbal Lake along with their practical utility

S. No.	Type of Cast Net	No of Meshes	Practical Utility
1	Guran Jal	1,200 meshes	Primarily used for catching small fish, locally known as <i>Guran</i>
2	Thapthal Jal	1,100 meshes	A medium-sized net suitable for varied fish sizes
3	Daljal	1,100 meshes	Similar to <i>Thapthal Jal</i> , often used interchangeably
4	Naushoth Jal	900 meshes	Named after the number of meshes, this net is versatile for medium-sized fish
5	Nuchkul Jal	800 meshes	Slightly smaller, suited for smaller fish species
6	Pouchkul Jal	500 meshes	A compact net for more specific fishing needs
7	Arajal	400 meshes	Designed for use in small streams, locally referred to as <i>Aras</i> . Its name reflects its specialized function

The cast net is categorized into different types based on the number of meshes, each with a specific name and purpose, discussed in Table 1.

The cast net’s efficiency and adaptability have made it a staple in traditional fishing practices across the valley. Its ability to target specific fish types and sizes, combined with the skill involved in its use, highlights its importance in sustaining local fisheries. The image of cast net is shown in Figure 5.

**5. Scoop Net**

The scoop net is an essential piece of fishing equipment commonly used in Manasbal Lake. It features a circular net attached to a long handle, making it highly effective for certain types of fishing. This tool is primarily utilized from a boat or the lake’s banks, particularly near the outgoing canals where fish tend to gather.

The scoop net is especially favored for catching carp, as its design allows fishers to easily maneuver it in the water to capture their target. This method is both practical and efficient, making it a popular choice among local fishers for harvesting fish in specific areas of the lake. The image of cast net is shown in Figure 6.

**6. Gillnet**

The gillnet, locally known as *Thani*, is a widely used fishing tool in Manasbal Lake, measuring between 15 and 35 meters in length and 2 to 3 meters in width. Fishermen

utilize gillnets with varying mesh sizes, carefully selected based on the specific fish species they aim to target. This versatility makes the gillnet an adaptable and effective choice for different fishing needs.

Gillnets are primarily deployed during flood seasons, particularly at the lake's outflow channels, where fish movement is more concentrated. The design of a typical gillnet is straightforward yet efficient, with floats attached along the head rope to keep the net buoyant and lead sinkers along the bottom rope to ensure it remains upright and properly positioned in the water.

While the catch obtained using gillnets typically includes less economically valuable indigenous fish species and is relatively low in volume, this method is particularly well-suited for carp fisheries. Its simplicity and adaptability make the gillnet a reliable tool for local fishers, contributing to their livelihoods and sustaining traditional fishing practices in the region. The image of cast net is shown in Figure 7.

**Technological Constraints Using Traditional Fishing Gears and Crafts in Manasbal Lake**

The use of fishing gears plays a pivotal role in the socioeconomic upliftment of fishers by enhancing their productivity, income, and overall livelihood sustainability (Qayoom *et al.*, 2016 & 2019, Bhat *et al.*, 2024, Dar *et al.*, 2024) [10, 9, 5, 6]. Modern and efficient fishing gear improves the catch quality and quantity, enabling fishers to meet both subsistence needs and market demands (Figure 8).

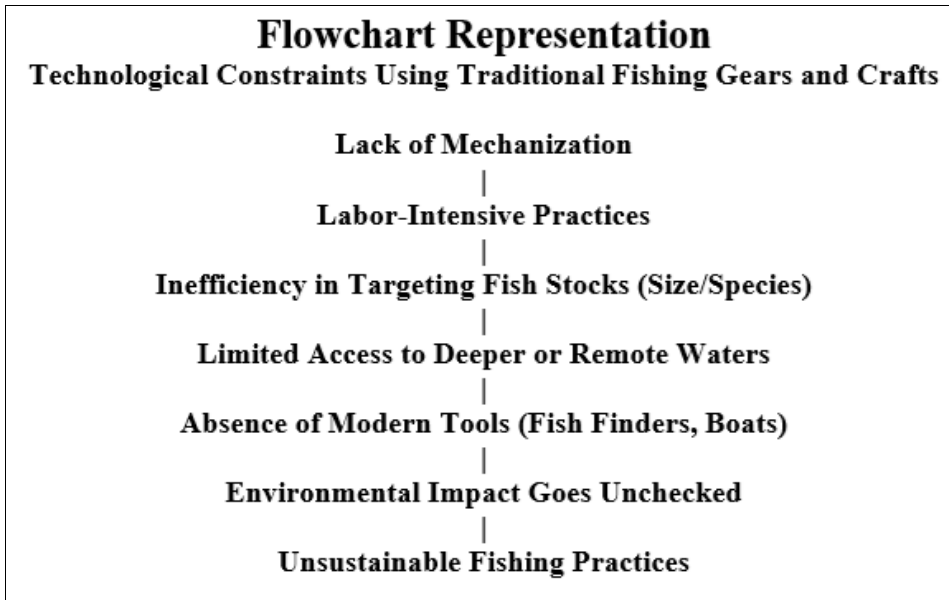


**Fig 8:** Pathways for socio-economic upliftment of fisher communities

The use of traditional fishing gears and crafts in Manasbal Lake is limited by several technological constraints. The lack of mechanized equipment makes fishing labor-intensive, requiring significant physical effort and skill. Traditional nets, such as gillnets and cast nets, are often inefficient for large-scale operations, as they target only specific fish sizes and species. Additionally, these methods are less effective in deeper waters or during unfavorable weather conditions. The absence of modern fish-finding

technology and motorized boats restricts the ability of fishers to locate and access abundant fish stocks, particularly in less accessible areas of the lake. Furthermore, traditional practices may result in overfishing of certain species, while their environmental impact, such as damage to non-target species or aquatic vegetation, goes unchecked due to a lack of monitoring tools as described in the flowchart below:





These measures aim to strike a balance between enhancing fishing efficiency and preserving the delicate ecosystem of Manasbal Lake, fostering long-term economic and ecological sustainability.

1. To cause modernization or introduction of appropriate technologies through modification of existing gears/crafts or introduction of new ones under scientific guidance.
2. To save ecology and environment in the state by avoiding use of any chemical for capture fishery.
3. Training of fishermen for overall economic development in sustainable manner.



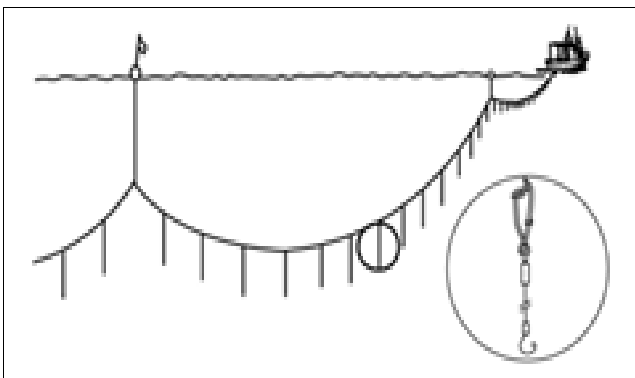
**Fig 3: Rod and Line**



**Fig 1: Fishing Craft (Naav)**



**Fig 4: Narchoo**



**Fig 2: Structure of Longline**



**Fig 5: Cast Net**



**Fig 6:** Scoop Net



**Fig 7:** Gill Net



**Fig 8:** Dip Net



**Fig 9:** Ways to enhance sustainable fishing practice

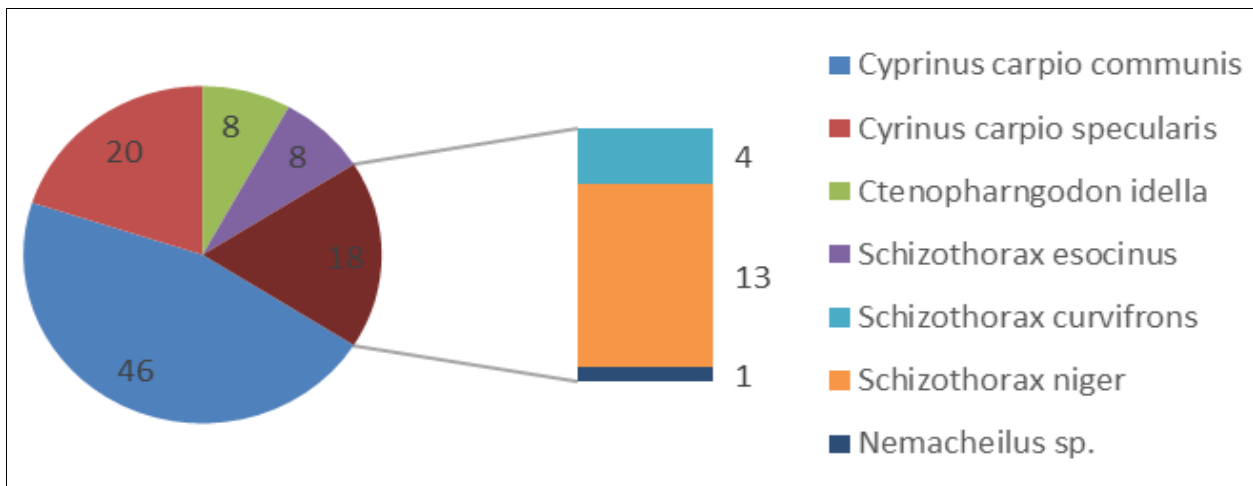


Fig 10: Percentage Cast Net Capture from Manasbal Lake

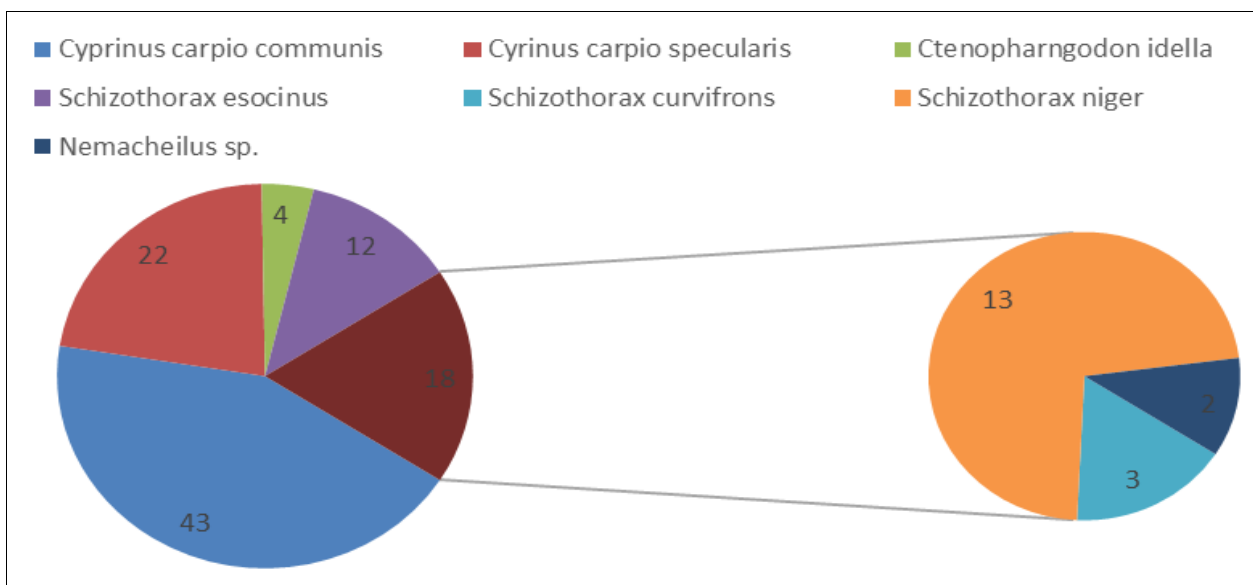


Fig 11: Percentage species composition Manasbal Lake

**Recommendations**

To enhance fishing efficiency in reservoirs and lakes, it is crucial to replace outdated fishing crafts and gears with modern, motorized equipment. However, the adoption of fully mechanized fishing methods has not been recommended due to specific scientific concerns, such as their potential ecological impacts and the unique characteristics of certain water bodies. Despite advancements in fishing technologies, most fishers in Manasbal Lake continue to rely on traditional crafts and gears that are now considered inefficient and obsolete. This reliance hampers their fishing productivity and economic viability.

Given these challenges, it is essential to propose targeted measures to address the inefficiencies of traditional practices while ensuring the sustainable management of the lake’s ecosystem. Below are several suggestive recommendations aimed at improving the fishery sector and promoting the ecological balance of Manasbal Lake that are described in Figure 9.

**Conclusion**

This study highlights the traditional fishing practices of the

Manasbal Lake community, revealing a reliance on simple yet effective crafts and gear. The plank-built wooden boats and various fishing methods, including longlines, cast nets, and gillnets, reflect the community's deep-rooted cultural heritage and indigenous knowledge. While these methods are integral to local livelihoods, they face challenges related to efficiency and sustainability, particularly in the context of modern fishing pressures and environmental changes. The findings underscore the need for targeted interventions to modernize fishing practices while preserving cultural traditions and ensuring ecological balance. By enhancing fishing efficiency and promoting sustainable practices, the fishing community can secure their livelihoods and protect the vital resources of Manasbal Lake.

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