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Socio-Ecological Assessment of Capture Fisheries in District Chitral, Pakistan

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Abstract

Fishing is more than a livelihood, rather it is a way of life in the mountainous district of Chitral, Pakistan. This study explores the demography, practice, need and season of fishing in the area. Using a structured questionnaire and a snowball sampling approach, data were gathered from 90 local fishermen. Findings of the study show that most fishermen are young adults with basic to intermediate education, and they fish primarily for food or recreation. Gill nets are the most popular gear, used both alone and in combination with other methods. Seasonal preferences, gear choices, and bait use reflect a deep-rooted knowledge of local ecology. However, unsustainable practices like dynamite fishing, along with environmental threats such as pollution and habitat loss, are contributing to the decline of fish populations, especially the delicate trout. These findings emphasize the need for targeted conservation efforts and sustainable fishing policies in the region.

Keywords: Capture fisheries, Chitral, Fishing gear, Gill net, Sustainable fishing

Introduction

Capture fisheries, particularly in freshwater ecosystems, provide essential resources including food, income, and cultural identity for communities around the world (Noble et al., 2016). In Pakistan's northern highlands, rivers like those in District Chitral stream with life, offering

opportunities for both subsistence and recreational fishing (Jehan et al., 2024). Yet, these fragile ecosystems face mounting threats from human activities, climate change, and unsustainable fishing practices (Shahid Nadeem et al., 2009). As livelihoods evolve and environmental pressures grow, understanding the local dynamics of fishing becomes increasingly important (Nayak, 2017). In places like Chitral, fishing is more than just a way to gather food, it is a social activity, a cultural tradition, and, for some, a quiet connection with nature. However, without informed management and community involvement, fishing practices risk becoming unsustainable (Caddy & Seijo, 2005). By exploring background of fishermen and their method of fishing, we can better support both human wellbeing and freshwater biodiversity in these highland regions (Young et al., 2016).

Chitral, nestled in the heart of the Hindu Kush mountains, is one such region where fishing is deeply interwoven into the social fabric. Despite its importance, there's been limited scientific exploration of how people engage with this resource, what gear they use, what motivates them, what challenges they face, and how their practices align with or threaten ecological sustainability. This study aims to fill that gap. By looking closely at the people who fish in Chitral's rivers and streams, we hope to provide a clearer picture of how traditional practices, seasonal knowledge, and modern pressures intersect in this high-altitude region.

Methodology

Study Area

The research was conducted in District Chitral, located in northern Khyber Pakhtunkhwa, Pakistan (Ali et al., 2022). Known for its pristine rivers and cold-water habitats, the district supports a range of freshwater fish species, most notably trout (Javed & Abbas, 2018).

Sampling and Data Collection

Given the dispersed nature of the fishing population and the lack of official records, a snowball sampling technique was employed. The process began with a few known fishermen, who then referred the researchers to others in their community. In total, 90 fishermen participated in the study. Data were collected using a structured questionnaire, which

included questions about age, education, fishing experience, gear usage, fishing seasons and weather preferences, target species, bait selection, and perceptions of environmental change.

Data Analysis

Responses were organized and analysed using Microsoft Excel. Results were presented using simple descriptive statistics, frequencies and percentages to highlight trends and patterns in fishing behaviour and attitudes.

Results

1. **Demographic Analysis**

Fishing in Chitral is largely a young man's pursuit. Most of the respondents (44%, n= 40) were between 25 and 30 years old. Those aged 20–25 made up 27%, 24 while 21% 19 were between 15 and 20. Older fishermen were less common, with only 7.7 % (n=7) falling into the 30-Above age bracket. Education levels varied: 58 % (n=52) had completed matriculation, 39 % (n=35) had studied up to bachelor's degree, and only 3 % (n= 3) had postgraduate degrees.

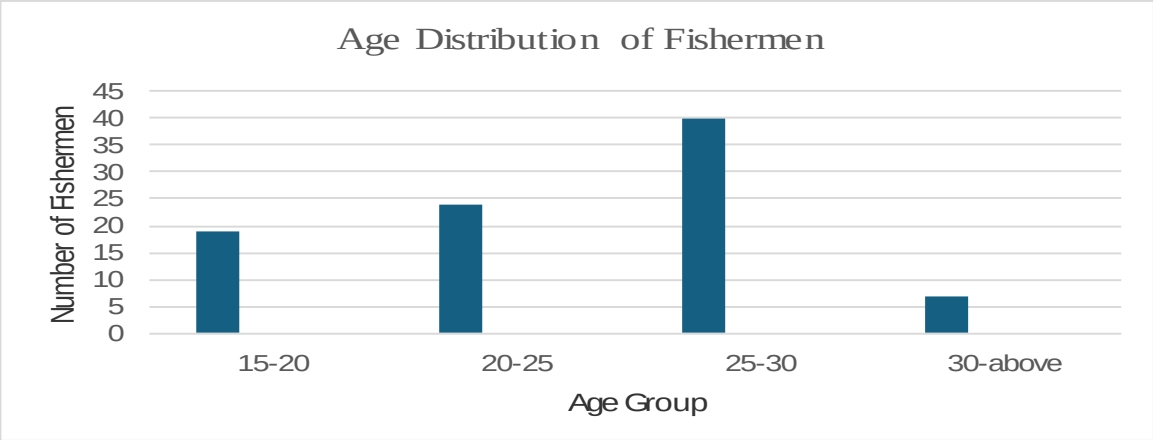

Figure 1. Age Distribution of Fishermen

2. Fishing Season

Spring stood out as the most popular fishing season (44%, n=40), followed by summer (29%, n=26). Autumn (18%, n=16) and winter (8%, n=7) were less favored, possibly due to harsh weather and lower fish activity. When it came to the best day for fishing, 40%, (n=36) preferred sunny days, 36% (n=32) liked cloudy conditions, 14% (n=13) fished during the rain, and 11 % (n=6) even ventured out in the snow.

Figure 2 (a) 2 (b)

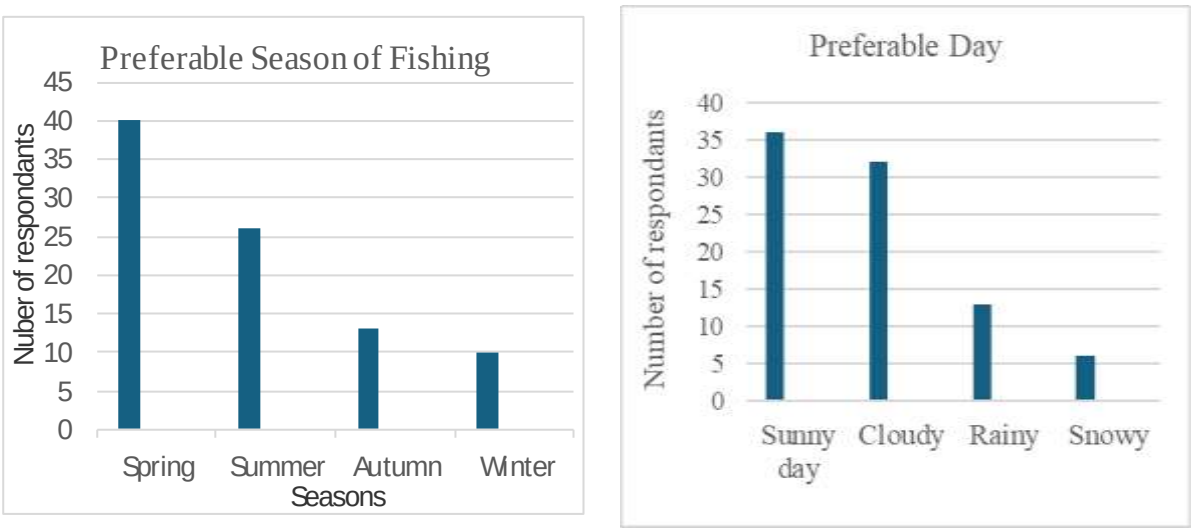

Figure 2. Preferable Seasons and Day for Fishing

3. Fishing Practices and Fishing Gears

Fishermen were classified as occasional, part-time, or (rarely) full-time. In terms of tools, gill nets were the most widely used (20%) , followed by hook lines (4.4%) and cast nets (8.89%). Notably, 50% of participants used more than one type of gear at a time, often combining gill nets with hook or cast nets. A few even reported using dynamite, a highly destructive and illegal method, which is a serious cause for concern.

Gill nets were used by 50 % (n=45) of respondents. Cast nets were used by 35.5 % (n=32), while hook lines 9% (n=10) and mosquito nets 3.3 % (n=3) were used less frequently.

Figure 3

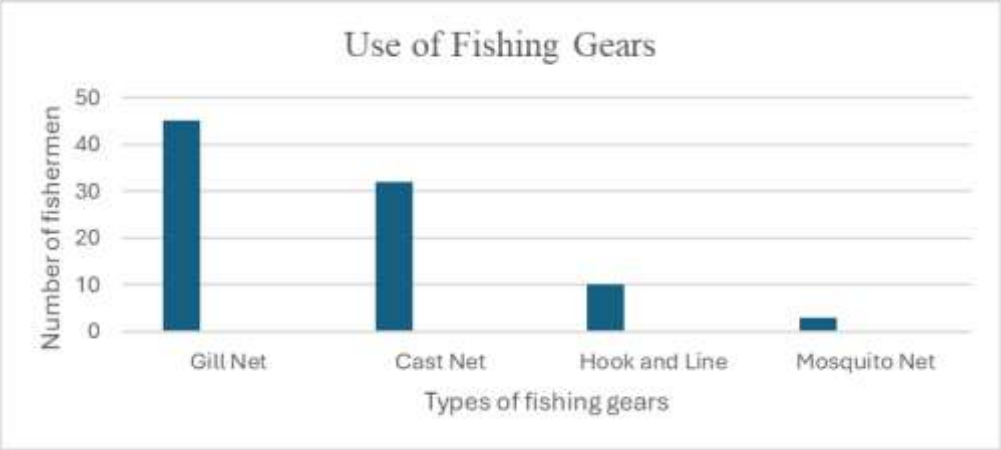

Figure 3. Use of Fishing Gears

4. Bait Used in Fishing

Bait selection shifted with the seasons. Insects were widely used (48.8%, n=44), while in winter, meat (33.3%, n=30) and grains (10%, n=9) were more common. Earthworms (7.7%, n=7) were used occasionally, especially in autumn.

Figure 4.

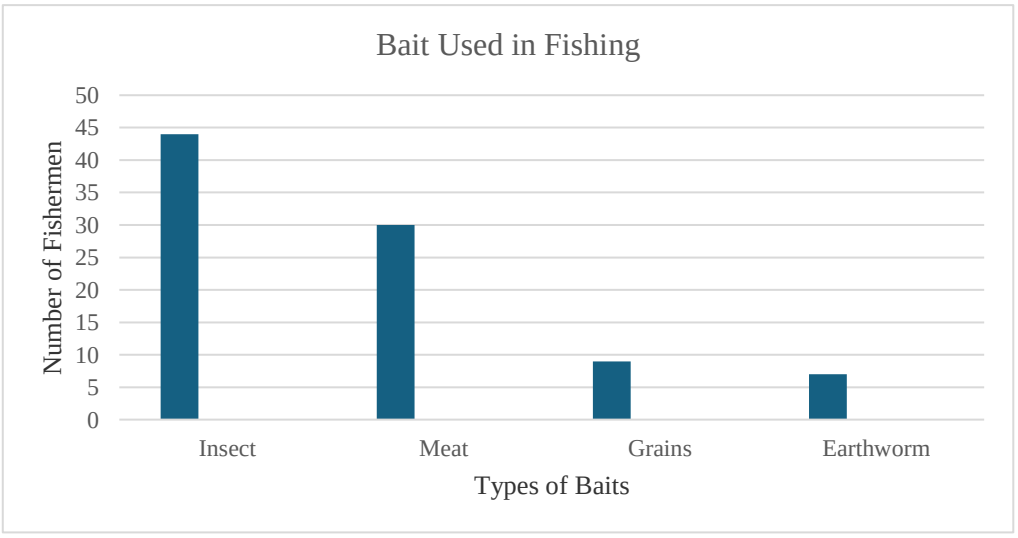

Figure 4. Bait Used in Fishing

5. Perceived Threats

Fishermen pointed to several reasons for declining fish populations: growing human population, environmental degradation from floods, pollution, and illegal fishing methods like dynamite. Many expressed concerns about the loss of aquatic habitats and called for stronger regulation.

Discussion

The capture fisheries in District Chitral is a deep-rooted tradition, changing motivations, and a delicate ecological balance. As our findings show, fishing here is not merely a source of income, but it is a multifaceted activity shaped by culture, necessity, recreation, and seasonal rhythms. The demographic of Chitral's fishermen aligns with trends observed in other parts of northern Pakistan, where young adults make up the core of the fishing population (Khan & Khan, 2011; Nafees et al., 2012). It also presents an opportunity, with the younger generation more adaptable, better connected, and potentially more responsive to conservation education and sustainable practices, if engaged appropriately.

One striking aspect of the Chitral fishery is the motivational diversity behind fishing. While 43% of respondents fish for food and 38% for recreation, only 7% depend on it for income. This is a sharp contrast to lowland riverine fisheries in provinces like Sindh or Punjab, where fishing is often a full-time profession and a primary livelihood (Ali, 2018). In Chitral, fishing plays a more hybrid role, part sustenance, part sport, and part tradition, which may reduce pressure on fish stocks compared to regions with high commercial exploitation (Khan et al, 2025) Yet, it also complicates conservation policy, as regulatory measures must cater to diverse motivations, not just economic ones.

Gill nets are clearly the most favored, often used in tandem with cast nets or hook lines. This mirrors findings in studies by (He, 2006), who documented similar gear use across Malaysian inland fisheries. However, Chitral presents a more troubling dimension: the use of dynamite and mosquito nets. While these methods are rarely acknowledged openly and used secretly their mention by participants underscores a need for urgent attention. Dynamite fishing, in particular, is catastrophic not only to fish populations but to aquatic habitats, damaging

breeding grounds and non-target species. This illegal practice suggests a broader enforcement and awareness gap across Pakistan's remote fisheries.

Seasonal patterns and bait preferences also reveal a fascinating intersection of traditional knowledge and ecological insight. Fishermen's timing aligns closely with fish life cycles, spring is favored due to increased fish activity, insect hatches, and milder river conditions. The use of specific baits like insects in spring and grains or meat in colder seasons reflects a keen observation of local ecological rhythms. Similar seasonal adaptations have been documented in indigenous fisheries in the Himalayas and Central Asia (Petr, 1999), where fishing communities have learned to synchronize their practices with natural cues. Such knowledge, often passed down orally, could be invaluable in designing conservation strategies that resonate with local customs rather than clash with them.

Even without formal scientific training, fishermen cited habitat loss, pollution, floods, and overfishing as key drivers behind declining fish populations. This reflects a growing ecological consciousness and could form the foundation for community-based conservation initiatives. Chitral could benefit from such participatory models, especially since enforcement in remote mountain valleys is logistically difficult.

In terms of socioeconomic dynamics, Chitral's fishing scene is still relatively low-pressure compared to Pakistan's densely populated southern fisheries. Yet, the emerging challenges, especially dynamite use, population growth, and habitat encroachment, suggest that the window for preventative action is narrowing. Policies that worked in high-pressure fisheries, such as license systems, seasonal bans, and gear restrictions, can be adapted for Chitral, but only if they're coupled with education and community awareness.

Conclusion

Capture fisheries in Chitral are a cornerstone of life for many communities, feeding families, providing recreation, and preserving local traditions. But they are not without their challenges. From illegal practices to habitat loss, the threats are real and growing. This study offers a snapshot of current practices and perspectives, serving as a baseline for future policy,

education, and conservation efforts. With the right support and regulation, Chitral's rivers can continue to sustain both people and fish for generations to come.

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