

# ASSESSMENT OF HUMAN-INDUCED IMPACTS ON AQUATIC ECOSYSTEMS AND INDIGENOUS FISHING PRACTICES IN THE TRIBAL BELT OF UDAIPUR, RAJASTHAN

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**Abstract:** Fish serve as crucial bio-indicators of aquatic health and play a foundational role in sustaining ecological balance. This study explores the extent of anthropogenic impacts on fish populations and aquatic ecosystems within the tribal belts of Udaipur district, Rajasthan. Field surveys, community interviews, and direct observations identified pressing environmental threats such as eutrophication, household pollution, and unsustainable fishing practices. Traditional fishing methods like the Thali method, fish poisoning, and dynamite fishing are also assessed. The findings emphasize the urgent need for awareness, regulatory frameworks, and sustainable practices to conserve biodiversity and support local communities.

**Index Terms** - Aquatic ecosystem, Eutrophication, Tribal fishing, Pollution, Biodiversity, Fish conservation, Udaipur

## INTRODUCTION

Fish are entirely dependent on aquatic ecosystems for their survival, serving as significant indicators of environmental quality. Their presence or absence can reflect the health of a water body. In Udaipur's tribal regions, such as Gogunda, Kotra, Jhadol, Kherwara, and Salumber, human activities like domestic waste discharge, traditional fishing, and unsupervised tourism have begun to threaten aquatic biodiversity [8]. This study aims to understand these dynamics and identify actionable strategies for conservation and policy-level interventions. The region's ecological fragility, compounded by socio-economic dependency on fishing, highlights the critical need to explore and document both harmful practices and potential solutions.

## REVIEW OF LITERATURE

The relationship between aquatic biodiversity and anthropogenic stress has been extensively studied worldwide. According to Allan et al. (2005), land use changes and pollution contribute significantly to the degradation of freshwater ecosystems [1]. Similarly, Karr (1991) emphasized the role of fish as bio-indicators due to their sensitivity to water quality changes [2]. In the Indian context, Sharma and Singh (2013) reported that tribal communities often rely on traditional fishing techniques, some of which can be unsustainable if not regulated [3].

Eutrophication, a condition driven by excess nutrients, has been linked to human agricultural runoff and waste discharge (Smith et al., 1999) [4]. This condition not only leads to algal blooms but also causes a steep decline in dissolved oxygen, endangering aquatic fauna. In Rajasthan, Patel et al. (2016) highlighted similar findings where local rivers showed reduced fish biodiversity due to eutrophication and pollution [5].

Traditional knowledge systems, while rich and sustainable in some contexts, need evaluation against modern ecological standards. For instance, the use of plant-based fish poisons has been deemed relatively harmless, yet others like *Euphorbia royleana* (Thoor) pose significant health risks (Meena & Rathore, 2017) [6]. The prevalence of dynamite fishing, although banned under multiple environmental laws, continues to be practiced due to lack of enforcement and awareness (Deshmukh, 2019) [7].

Overall, literature underscores the importance of integrating indigenous practices with scientific management for successful conservation outcomes.

## MATERIAL AND METHODOLOGY

A qualitative research approach was adopted for this study. Data collection involved field surveys, direct observations, and semi-structured interviews conducted in tribal belts including Gogunda, Kotra, Jhadol, Kherwara, and Salumber. Surveys were conducted over two periods: pre-monsoon and post-monsoon seasons in 2020. Stakeholders interviewed included local residents, panchayat leaders, environmental activists, and journalists [9]. Observations were recorded using field notes and photographic evidence. The survey data included documentation of visible pollution, fishing techniques, and community interactions with the aquatic environment.

To ensure data reliability, triangulation was employed by cross-verifying interview responses with observational findings. This method helped in building a comprehensive understanding of the ecological and sociocultural dynamics at play.

## RESULT AND DISCUSSION

### Eutrophication

Eutrophication was most prominently observed in the Gogunda River. Field researchers recorded approximately 5–7 kg of fallen flowers and leaves in the water during each visit [8]. This organic matter, combined with agricultural runoff and domestic effluents, triggered extensive algal blooms. The subsequent decline in dissolved oxygen rendered the habitat unsuitable for fish survival, leading to a noticeable decrease in fish populations. Stationary water flow in the region exacerbates the condition by limiting oxygenation and water exchange.

### Bathing and Washing Practices

Tribal communities in Udaipur heavily rely on natural water bodies for daily activities. Surveys revealed that 3–8 women and 5–7 men use these water sources for bathing and washing clothes daily. The detergents and soaps used in these practices contain non-biodegradable compounds that increase nitrate concentration and reduce water quality [8]. Over time, these activities contribute to nutrient pollution and alter the chemical composition of aquatic ecosystems.

Fig: 1 Eutrofication in Gogunda



Fig: 2 Washing of Cloth in Gogunda pond



Fig:3 Washing of cloth in Salumber Anicut



## Water Pollution

The Kotra River, situated along a busy tourist route, has become a dumping ground for plastic waste. Fieldwork documented over 7 kg of garbage—including plastic bottles, food wrappers, and polybags—during each observation session [8]. Such pollution not only degrades aesthetic value but also endangers aquatic life through ingestion or entanglement. The absence of proper waste disposal systems further aggravates the situation.

## Traditional Fishing Practices and Their Impacts

**Thali Method:** This method employs a flat dish (thali) to collect fish, including juveniles. Its indiscriminate nature prevents younger fish from maturing and reproducing, thereby disrupting the natural regeneration cycle. Over time, this can lead to a collapse in fish population structure.

**Use of Fish Poisons:** Local tribes use plant-derived fish poisons such as *Butea monosperma*, *Millettia pinnata* (Karanja), and *Euphorbia royleana* (Thoor). While most are eco-friendly, Thoor is known to be hazardous and can cause permanent blindness upon contact with the eyes [6]. The lack of awareness about safe handling practices calls for urgent educational interventions.

**Use of Dynamite (Toto):** Some tribal groups resort to homemade dynamite for fishing. This practice is extremely dangerous and ecologically devastating [7]. It results in the indiscriminate killing of all aquatic organisms within the blast radius and has led to severe injuries among community members, especially children. Despite being banned, its continued usage points to gaps in enforcement and awareness.

## CONCLUSION

Fish play an indispensable role in maintaining the ecological health of aquatic systems, especially in the tribal regions of Udaipur. While certain traditional methods of fishing are benign or even beneficial, others are causing irreversible harm to both biodiversity and human health. A combination of scientific insight, community participation, and policy reform is essential to mitigate these challenges. Strengthening education, improving infrastructure, and enforcing laws can restore ecological balance and ensure the sustainability of both aquatic life and tribal livelihoods.

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