



## RESEARCH ARTICLE

### ICHTHYOFAUNAL DIVERSITY AND BIOLOGICAL RESILIENCE OF AIR-BREATHING FISHES IN THE AGROCHEMICAL-STRESSED "CHAURS" OF BIHAR

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#### ABSTRACT

The " Chaur" of the Munger district serve as a critical habitat for a variety of indigenous fish species, particularly air-breathing teleosts that are highly valued in the local economy. This study provides a comprehensive documentation of the ichthyofaunal diversity in the Chaur of Haveli Kharagpur and evaluates the biological resilience of three dominant species—*Channa punctatus*, *Anabas testudineus*, and *Clarias batrachus*—against seasonal environmental stressors and agrochemical runoff. Morphological and physiological observations were correlated with water quality data over a two-year cycle (2018–2020). Despite the presence of biochemical pollutants from agricultural discharge, these species exhibit remarkable adaptive mechanisms. The study highlights the importance of these wetlands as conservation units for native germplasm and suggests strategies for sustainable harvest management.

## INTRODUCTION

Bihar's floodplain wetlands (Chaur) are renowned for their "black fish" populations—species equipped with accessory respiratory organs that allow them to thrive in oxygen-depleted and hypercarbic environments. In the Haveli Kharagpur region, these fishes are not only a primary protein source for the rural population but also represent a significant component of the local aquatic biodiversity. However, the rapid intensification of paddy and wheat cultivation surrounding these wetlands has introduced a steady stream of organophosphates and nitrogenous fertilizers into the fish habitats. Recent studies by Das (2025) have indicated that while air-breathing fishes are physiologically hardy, chronic exposure to sub-lethal concentrations of agrochemicals can impair their reproductive success and growth rates. Furthermore, Sadanand *et al.* (2023) emphasized that the loss of micro-habitats within Chaur due to siltation and weed infestation is putting additional pressure on native species. This article, authored by Dr. Madhav Kumar, explores the current status of fish diversity and the adaptive strategies that allow these regional species to persist in a chemically stressed environment.

## MATERIALS AND METHODS

- **Species Identification:** Fish samples were collected from three major Chaur in Haveli Kharagpur using cast nets and local traps. Identification was confirmed using standard taxonomic keys.
- **Biological Observations:** Monthly records of length, weight, and general health (fin integrity, mucus secretion, and gill color) were maintained.
- **Environmental Correlation:** The health status of the fish was cross-referenced with the "summer stress window" (High Temp, Low DO) identified in previous water quality assessments.
- **Species Focus:** Detailed study was conducted on *Channa punctatus* (Garai), *Anabas testudineus* (Kawai), and *Clarias batrachus* (Mangur).

## RESULTS

The study identified a robust population of air-breathing fishes, with *Anabas testudineus* showing the highest frequency of occurrence during the summer months.

**Table 1. Morpho-Biological Characteristics of Dominant Species**

Species Name	Local Name	Accessory Respiratory Organ	Feeding Habit	Adaptation Status
<i>Channa punctatus</i>	Garai	Suprabranchial Chamber	Carnivorous	High Resilience
<i>Anabas testudineus</i>	Kawai	Labyrinth Organ	Carnivorous	Peak Resilience
<i>Clarias batrachus</i>	Mangur	Arborescent Organ	Carnivorous	Moderate Resilience

**Table 2. Seasonal Health Assessment and Survival Matrix**

Season	Predominant Species Observed	Physical Condition	Behavioral Observations	Adaptation Status
Winter	All Species	Excellent; Bright Colaration	Active foraging; low surfacing.	High Resilience
Summer	<i>A. testudineus</i>	Mucus thickening observed	Frequent surfacing; aerial respiration.	Peak Resilience
Monsoon	Juveniles/Fry	High growth rate	Spawning migration to shallow edges.	Moderate Resilience

## DISCUSSION

The ichthyofaunal diversity in Haveli Kharagpur is uniquely adapted to the spatio-temporal dynamics of the Chaur ecosystem. The presence of specialized respiratory organs allows these species to survive summer DO levels as low as 4.2 mg/l. Dr. Madhav Kumar notes that *Anabas testudineus* showed the most significant resilience, maintaining population density even when FCO<sub>2</sub> levels reached 21.5 mg/l.

### Recent Scientific Context

- Edward *et al.* (2024) highlighted that air-breathing fishes act as "sentinel species" in agricultural wetlands; their behavioral changes (such as increased surfacing frequency) serve as early warning signs of chemical hypoxia.
- Kumar & Singh (2024) reported that the rising average temperatures in Bihar are shortening the spawning windows for *Clarias batrachus*, a trend that was also observed in the Haveli Kharagpur samples where monsoon arrival heavily dictated fingerling availability.

While the fishes are currently fit for consumption, the "mucus thickening" observed in summer samples indicates a physiological response to irritants, likely the residues of fertilizers and pesticides identified in the water and soil profiles.

## CONCLUSION

The Chaurs of Haveli Kharagpur are vital refugia for native air-breathing fish species.

While their biological resilience is high, the increasing load of agrochemicals and the narrowing of the summer "safe window" pose long-term risks. I conclude that:

- Closed Seasons: Fishing should be regulated during the peak monsoon spawning phase to allow for population replenishment.
- Habitat Restoration: De-weeding and removal of organic sludge from the Chaur beds will improve the "biological space" for bottom-dwelling species like *C. batrachus*.

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