

Aquatic Remedies: An Ethnopharmacological Study of Fish-Based Medicines in Assam's Tribal Villages

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Ethnopharmacological relevance: This study illuminates the ethnopharmacological significance of fish-based remedies in Assam's tribal medicine, spotlighting the use of local fish for treating various ailments. By documenting these traditional practices, it emphasizes the critical link between biodiversity and indigenous knowledge, urging conservation. The research offers a foundation for discovering new therapeutic agents, underscoring its importance in bridging traditional wisdom and modern pharmacology.

Aim of the study: The aim of this study is to document and analyze the traditional use of fish in tribal medicine across Assam, identifying specific species utilized and their application in treating health conditions. Through gathering this indigenous knowledge, the research seeks to contribute to the ethnopharmacological field, highlighting the potential of these practices in modern medicine. Additionally, it aims to underline the importance of conserving both the aquatic biodiversity and the cultural heritage of Assam's tribal communities, advocating for a balanced approach to preserving traditional wisdom alongside ecological sustainability.

Materials and methods: The study employed a qualitative research approach, focusing on Assam's tribal communities. Data were collected from the Bodo, Karbi, and Mishing tribes through semi-structured interviews, participant observations, and focus group discussions, targeting traditional healers, elders, and fishermen. Purposive sampling ensured a broad representation of medicinal practices. The areas chosen—Chariduar, Patgaon, and Pothailangso—were selected for their rich biodiversity and deep-rooted traditional medicine practices. Data analysis involved thematic categorization to identify recurring themes around fish species, their medicinal uses, and preparation techniques, aiming to consolidate indigenous knowledge on ichthyotherapy.

Results: The study identified numerous fish species across the Bodo, Karbi, and Mishing tribes, utilized for a variety of health conditions like anemia, asthma, and weakness. Key species include *Heteropneustes fossilis* and *Clarias magur*, known for their wide medicinal applications. Preparation methods varied from consumption of cooked fish to application of raw parts. The findings underscore a rich tradition of ichthyotherapy, with specific fish playing crucial roles in tribal healthcare. The data reveal a deep reliance on indigenous ichthyofauna, highlighting the significance of these practices in the cultural and medicinal landscape of Assam's tribal communities.

Conclusions: The study underscores the rich ethnopharmacological heritage of Assam's tribal communities, revealing a diverse array of fish-based remedies integral to their traditional medicine. It highlights the critical role of specific fish species in addressing a wide range of health issues, emphasizing the importance of preserving this indigenous knowledge alongside the aquatic biodiversity it depends on. The findings advocate for further research into the bioactive compounds of these fish species, potentially contributing to new pharmacological discoveries. Additionally, the study calls for a balanced approach to conserving both the natural and cultural heritage, ensuring the sustainability of these traditional practices for future generations.

Keywords: Ethnopharmacology, traditional medicine, ichthyotherapy, Assam, tribal villages, fish-based medicine.

Introduction

Traditional medicine, encompassing the knowledge, skills, and practices indigenous to different cultures, has been utilized for health maintenance and the treatment of physical and mental conditions for centuries (Sophia et al., 2023). Among the myriad forms of traditional medicine, the use of aquatic organisms, particularly fish, in ethnomedicine, or ichthyotherapy, stands out as a unique and less explored domain (Grassberger & Sherman, 2013). This practice, rooted in the profound understanding of local biodiversity and ecological systems, underscores the symbiotic relationship between human communities and their natural environments (Sophia et al., 2023).

Assam, a state in northeastern India, is renowned for its rich biodiversity and the vibrant cultural heritage of its tribal communities. These tribes have developed a deep connection with their surroundings, relying on the flora and fauna for sustenance, shelter, and medicine (Chakraborty, n.d.). Despite the growing body of research on ethnopharmacology in India, the medicinal use of fish by Assam's tribal villages remains under-documented, leaving a significant gap in the global compendium of traditional medicine (Teronpi et al., 2012).

The present study aims to bridge this gap by documenting the **Species** of fish used as medicine, the ailments they are purported to treat, and the methods of preparation and administration of these aquatic remedies. Through this investigation, we seek to contribute to the broader understanding of ethnopharmacological practices, highlight the ethnomedical significance of biodiversity, and underscore the importance of preserving traditional knowledge in the face of rapid modernization and environmental change.

This research not only enriches the ethnopharmacological literature but also opens avenues for the discovery of novel therapeutic agents, fostering a dialogue between traditional and modern medical practices. Moreover, by bringing to light the traditional uses of fish for medicinal purposes, this study advocates for the conservation of aquatic ecosystems, which are vital for the sustainability of these traditional practices.

Literature Review

The intersection of ethnopharmacology and traditional medicine offers a rich domain for exploring indigenous knowledge systems and their applications in healthcare. Ethnopharmacology, as a discipline, investigates the bioactive compounds present in natural resources traditionally used by ethnic groups, aiming to understand their medicinal properties and potential applications in modern medicine (Vontzalidou et al., n.d.). Within this framework, aquatic organisms, particularly fish, have been identified as valuable but underexplored sources of therapeutic agents (Grassberger & Sherman, 2013).

Globally, traditional medicine practices employing fish span various cultures and geographical regions, indicating a widespread recognition of their medicinal value. In Southeast Asia and parts of Africa, specific fish **Species** are utilized for their wound-healing properties, nutritional supplements during illness recovery, and treatments for a range of ailments including asthma, arthritis, and skin diseases (Garigliany et al., 2012). These practices underscore the diverse ethnomedical applications of fish, driven by local ecological knowledge and cultural traditions.

In India, the use of fish in traditional medicine is documented across several states, reflecting the country's vast biodiversity and cultural diversity. Studies by (A. Das et al., 2021) in the northeastern region highlight the significance of riverine ecosystems to tribal communities, not only for sustenance but also for medicinal purposes. However, Assam, despite its rich biodiversity and significant tribal population, has seen limited documentation of its traditional medicinal practices, particularly those involving fish (Nasreen & Borah, 2023) (Teronpi et al., 2012)(BASUMATARY et al., 2023).

The medicinal practices of Assam's tribal communities are deeply intertwined with their environment, with a reliance on natural resources for healthcare being a hallmark of their ethnomedicine (BORO et al., 2023). The state's diverse aquatic ecosystems provide a plethora of **Species** used in traditional remedies, yet the knowledge of these practices remains largely within the communities, at risk of being lost amidst rapid socio-environmental changes (Chetia et al., n.d.) (Verma et al., 2014).

This gap in documentation and understanding of Assam's traditional ichthyotherapy practices presents a critical area for research. By exploring the ethnomedicinal use of fish in Assam's tribal villages, this study aims to contribute to the conservation of indigenous knowledge, while offering insights into the potential for sustainable healthcare practices rooted in traditional wisdom. Moreover, it addresses the call by (M. Das et al., 2022) for interdisciplinary approaches to understanding the role of biodiversity in sustaining health and wellbeing in indigenous communities.

In summary, while the global context provides a backdrop of the diverse uses of fish in traditional medicine, the specific practices of Assam's tribal communities remain underexplored. This study seeks to fill this gap, contributing to the broader ethnopharmacological discourse and supporting the conservation of both biological and cultural diversity.

Methodology

The present study adopted a qualitative research approach to investigate the utilization of fish in ethnomedicine among tribal communities in Assam. The research was carried out in three distinct locations: the Chariduar area of Sonitpur district (inhabited by the Bodo tribal people), Patgaon village in Sonitpur district (home to the Mishing tribe), and Pothailangso village in Biswanath district (where the Karbi tribal people reside). The selection of these areas was based on their abundant biodiversity, substantial tribal population, and long-standing reliance on traditional medicinal practices.

Study Area and Population

The study area focused on three tribal communities in Assam, namely the Bodo, Mishing, and Karbi peoples. Each community possesses a unique cultural heritage and traditional knowledge system, which includes specific methods of employing fish for medicinal purposes. The diverse geographical and ecological characteristics of the selected areas contribute to a comprehensive understanding of the ethnomedicinal practices prevalent in the region.

Data Collection

Primary data were gathered by employing a synthesis of ethnographic techniques, encompassing semi-structured interviews, participant observation, and focus group deliberations. The individuals involved in this study comprised traditional healers, elder members of the community endowed with profound insight into traditional medicine, and native fishermen who possess extensive familiarity with the therapeutic applications of fish.

Semi-Structured Interviews: These interviews were conducted with traditional healers and knowledgeable elders in order to acquire comprehensive data regarding the various kinds of fish utilized, the ailments that are treated, as well as the methods of preparation and administration of fish-derived remedies.

Participant Observation: This research method involved actively participating in community activities and closely observing the processes of collecting, preparing, and utilizing fish in traditional medicine practices.

Focus Group Discussions: These discussions were facilitated among groups of community members with the purpose of validating and enhancing the information gathered through interviews and observations.

Sample Selection

To ensure a broad representation of knowledge on fish-based medicinal practices, participants were chosen using purposive sampling. The selection criteria included age (with a preference for elders possessing extensive knowledge of traditional practices), role in the community (such as traditional healers or fishermen), and willingness to share information.

Data Analysis

Data obtained from interviews, observations, and focus group discussions were meticulously transcribed and subjected to a comprehensive thematic analysis. This process entailed the meticulous categorization of the data into distinct groups that were centered around recurring themes pertaining to fish Species, medicinal applications, techniques of preparation, and cultural relevance. The primary objective of this analysis was to discern patterns and establish correlations amongst the ethnomedicinal wisdom encompassing the three indigenous communities under study.

Results

This ethnopharmacological survey documented a variety of fish **Species** used as medicinal remedies by three tribal communities in Assam: the Kachari, Karbi, and Mishing tribes. The fish **Species** were identified, along with their respective family and class, diseases they are used to treat, mode of preparation, and the tribe utilizing them for medicinal purposes. The survey yielded a significant inventory of ichthyotherapeutic practices as detailed below:



Species: *Amblypharyngodon mola* (Family: Cyprinidae)
 - Disease: Asthma (Tribe: Karbi)
 Way to use: Cooked fish is prescribed for consumption.

Species: *Amphipnous cuchia* (Family: Synbranchidae)
 - Disease: Anemia (Tribe: Bodo)
 Way to use: Blood is consumed orally.
 - Disease: Piles (Tribe: Bodo)
 Way to use: Flesh is cooked with *Lasia spinosa* tuber and consumed.
 - Disease: Asthma, jaundice, weakness (Tribe: Mishing)
 Way to use: Raw blood is consumed.

Species: *Anabas testudineus* (Family: Anabantidae)
 - Disease: Cold and fever, Jaundice, General weakness (Tribe: Bodo)
 Way to use: Meat is consumed.

Species: *Anguilla bengalensis* (Family: Anguillidae)
 - Disease: Piles (Tribe: Bodo)
 Way to use: The head is utilized.
 - Disease: Rheumatoid arthritis (Tribe: Karbi)
 Way to use: Fat is applied and massaged to relieve pain.

Species: *Anguilla sp* (Family: Anguillidae)
 - Disease: Weakness (Tribe: Mishing)
 Way to use: Eel blood mixed with turmeric is taken orally when hot and dry.

Species: *Badis badis* (Family: Badidae)
 - Disease: Postpartum respiratory issues (Puwati) (Tribe: Bodo)
 Way to use: Flesh and head are used.

Species: *Botia dario* (Family: Cobitidae)
 - Disease: Mild cold, Fever, Anemia (Tribe: Bodo)
 Way to use: Flesh and head are used.

Species: *Chaca chaca* (Family: Chacidae)
 - Disease: Asthma (Tribe: Karbi)
 Way to use: Dry fish is ground and prescribed to be drunk with water.

Species: *Channa gachua* (Family: Channidae)
 - Disease: Lactation issues, Bone health, Joint pain, Arthritis, Delayed onset of walking in children (Tribe: Bodo)
 Way to use: Whole fish meat, head, and live fish are used.
 - Disease: Gall bladder stone (Tribe: Bodo)

Way to use: Flesh is cooked and consumed.
 - Disease: When pricked by a thorn (Tribe: Karbi)
 Way to use: Bile of the fish is applied to remove the thorn.

- Disease: Dysentery (Tribe: Karbi)
 Way to use: The fish is mixed with salt, wrapped in a banana leaf, boiled, and taken.

Species: *Channa marulius* (Family: Channidae)
 - Disease: Cold and fever, Blood purification, Increase in hemoglobin (Tribe: Bodo)
 Way to use: Meat and head are used.

Species: *Channa punctata* (Family: Channidae)
 - Disease: Body weakness, Mild cold and fever, Blood purification, Renal stones (Tribe: Bodo)
 Way to use: Head and whole fish are used.
 - Disease: Corn or clavus (Tribe: Mishing)
 Way to use: Eyes mixed with salt are applied to the affected area.

Species: *Channa punctatus* (Family: Channidae)
 - Disease: Diarrhea (Tribe: Mishing)
 Way to use: Boiled fish is consumed.
 - Disease: Swelling of the testicle (Tribe: Mishing)
 Way to use: Heads are tapped on the affected testicle.

Species: *Channa striata* (Family: Channidae)
 - Disease: Wound healing, Blood purification, Cold and fever (Tribe: Bodo)
 Way to use: Meat, head, and caudal fin are used.

Species: *Chitala chitala* (Family: Notopteridae)
 - Disease: Dandruff in babies (Tribe: Bodo)
 Way to use: Scales are utilized.

Species: *Clarias batrachus* (Family: Clariidae)

Disease: Small pox (Tribe: Karbi)
 Way to use: Cooked fish is eaten to cure small pox.
 Disease: Weakness after delivery (Tribe: Karbi)
 Way to use: Boiled fish is taken regularly.

Species: *Clarias magur* (Family: Clariidae)

Disease: Anemia (Tribe: Bodo)
 Way to use: Meat is consumed.
 Disease: Asthma (Tribe: Karbi)
 Way to use: The animal is cooked and consumed.
 Disease: Small pox (Tribe: Kachari)
 Way to use: Fish is cooked.

Disease: Weakness after delivery (Tribe: Kachari)

Way to use: Fish is boiled.

Disease: Weakness (Tribe: Kachari)

Way to use: Fish is prepared as soup with Piper nigrum and Spinacia oleracea.

Disease: Chicken pox, Measles (Tribe: Kachari)

Way to use: Fried fishes with processed bamboo shoot (Kharisha) are consumed.

Disease: Malaria (Tribe: Kachari)

Way to use: Fresh fishes are cooked with a local vegetable leaf, called jwglaoi.

Disease: Body ache (Tribe: Kachari)

Way to use: Cooked with spices like black pepper.

Disease: Chicken pox (Tribe: Kachari)

Way to use: Magur is cooked with fermented bamboo shoot following a specific recipe (hukoni).

Species: Danio aequipinnatus (Family: Cyprinidae)

Disease: Constant spitting (Tribe: Karbi)

Way to use: The boiled fish is consumed regularly.

Species: Danio rerio (Family: Cyprinidae)

Disease: Anemia (Tribe: Bodo)

Way to use: The whole fish is consumed.

Species: Glossogobius giuris (Family: Gobiidae)

Disease: Night bed-wetting in children (Tribe: Bodo)

Way to use: Flesh and head are used.

Species: Glossogobius gutum (Family: Gobiidae)

Disease: Disease of passing urine while asleep (Tribe: Mishing)

Way to use: Flesh is cooked and eaten.

Species: Heteropneustes fossilis (Family: Clariidae)

Disease: Anaemia (Tribe: Kachari)

Way to use: Boiled fish is prepared as a tonic.

Disease: Wound healing (Tribe: Kachari)

Way to use: The fish is cooked with black pepper.

Disease: Physical weakness (Tribe: Kachari)

Way to use: Fresh fishes are cooked with local vegetables.

Disease: Sting by the fish (Tribe: Kachari)

Way to use: Brain of the fish is removed.

Disease: Use of Clarius magur in Assamese medicine (Tribe: Kachari)

Way to use: Not specified.

Disease: Digestive issues, Immune system support, General strength (Tribe: Bodo)

Way to use: Meat is consumed.

Disease: Sting by the fish itself (Tribe: Karbi)

Way to use: Brain is consumed raw as an analgesic when stung by the fish.

Disease: Weakness after delivery (Tribe: Karbi)

Way to use: Boiled fish is taken to regain strength.

Species: Labeo gonius (Family: Cyprinidae)

Disease: Allergies (Tribe: Bodo)

Way to use: Meat and head are used.

Disease: Allergy (Tribe: Mishing)

Way to use: Whole body is used by cooking with herb.

Species: Labeo pangusia (Family: Cyprinidae)

Disease: Weakness after delivery (Tribe: Mishing)

Way to use: Boiled fish is taken regularly to regain strength.

Disease: Stomach ache (Tribe: Mishing)

Way to use: Bile is taken orally to relieve stomach pain.

Species: Labeo rohita (Family: Cyprinidae)

Disease: Cardiovascular health, Brain development, Pain relief (Tribe: Bodo)

Way to use: Head, flesh, viscera, and bile are used.

Species: Leiodon cutcutia (Family: Synbranchidae)

Disease: Skin wounds, Gastric or stomach issues, Night bed-wetting (Tribe: Bodo)

Way to use: Whole body is used.

Species: Lepidocephalichthys guntea

AD

Start from the Lepidocephalichthys guntea
ChatGPT

Continuing from where we left off:

Species: Lepidocephalichthys guntea (Family: Cobitidae)

Disease: Tongue and mouth ulcers (Tribe: Bodo)

Way to use: The whole fish is consumed.

Species: Macrognathus aral (Family: Mastacembelidae)

Disease: Cold, Fever (Tribe: Bodo)

Way to use: Meat and the whole fish are consumed.

Species: Macrognathus pancalus (Family: Mastacembelidae)

Disease: Ingrowing nail, Cellulitis (Tribe: Bodo)

Way to use: The head is used.

Species: Monopterus cuchia (Family: Synbranchidae)

Disease: Asthma (Tribe: Karbi)

Way to use: Taken in combination with other treatments.

Disease: Anemia, Skin scars (Tribe: Bodo)

Way to use: Meat and blood are used.

Disease: Stomach ache (Tribe: Bodo)

Way to use: The head is used.

Disease: Anemia (Tribe: Karbi)

Way to use: Raw blood is taken orally.

Disease: Kala-azar (Tribe: Karbi)

Way to use: Raw fish or fresh blood of the fish is consumed.

Disease: Entry of leech into the anus (Tribe: Karbi)

Way to use: Fresh raw blood is consumed to remove leeches from the rectum/anus.

Species: *Mystus carcio* (Family: Bagridae)

Disease: General weakness post-illness (Tribe: Bodo)

Way to use: Meat is consumed.

Species: *Mystus sp* (Family: Bagridae)

Disease: Small pox (Tribe: Karbi)

Way to use: Cooked fish is eaten.

Species: *Mystus tengara* (Family: Bagridae)

Disease: General weakness post-illness (Tribe: Bodo)

Way to use: Meat is consumed.

Species: *Nandus nandus* (Family: Nandidae)

Disease: Mild colds and fevers, Eyesight improvement, Strength recovery (Tribe: Bodo)

Way to use: Flesh and head are used.

Species: *Puntius sarana* (Family: Cyprinidae)

Disease: Eye health (Tribe: Bodo)

Way to use: Meat is consumed.

Species: *Puntius sophore* (Family: Cyprinidae)

Disease: Pain from *H. fossilis* sting (Tribe: Bodo)

Way to use: Whole fish along with the alimentary canal and bile are used.

Species: *Puntius sp* (Family: Cyprinidae)

Disease: Eye problem (Tribe: Bodo)

Way to use: Fish is cooked and consumed.

Disease: Weakness after delivery, Night blindness, Memory (Tribe: Karbi)

Way to use: Boiled fish is taken to regain health. Cooked head is consumed regularly for memory enhancement.

Species: *Rasbora sp* (Family: Cyprinidae)

Disease: Eye health, Brain development (Tribe: Bodo)

Way to use: Whole fish including flesh and head are used.

Species: *Trichogaster fasciata* (Family: Osphronemidae)

Disease: Cold and fever, Jaundice (Tribe: Bodo)

Way to use: Flesh, head, meat, and the whole fish are used.

Species: *Trichogaster lalius* (Family: Osphronemidae)

Disease: General illness, Typhoid (Tribe: Bodo)

Way to use: The whole fish is consumed.

Species: *Wallago attu* (Family: Siluridae)

Disease: Dry skin, Skin scars (Tribe: Bodo)

Way to use: Skin, muscles, bladder, and the whole fish are used.

Disease: Liver tonic (Tribe: Karbi)

Way to use: Boiled head of the fish is taken regularly to improve liver function.

Species: *Wallago auto* (Family: Siluridae)

Disease: Asthma (Tribe: Karbi)

Way to use: It is advised to include in the diet for asthma relief.

Disease: Asthma trouble (Tribe: Mishing)

Way to use: Airbladder is utilized in the diet for asthma relief.

Species: *Xenentodon cancila* (Family: Belonidae)

Disease: Bruises, Hematoma (Tribe: Bodo)

Way to use: Head, snout, and the whole fish are used.

Analysis:

The analysis of the revealed a notable certain fish species for purposes among the communities of Assam. catfish, *Heteropneustes* most frequently cited, mentions across various species, renowned for its in low-oxygen revered for its wide array applications, ranging from wound healing. Its occurrence suggests a trust in its healing among the tribes, particularly the Kachari (Figure 1).

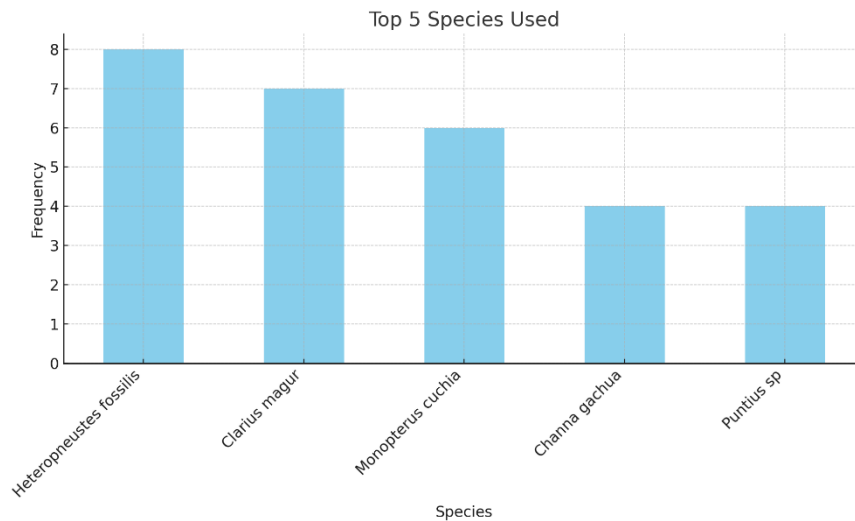


Figure 1: Most used fished for medicine in the survey

collected data reliance on medicinal tribal The stinging *fossilis*, was the with eight ailments. This ability to survive environments, is of medicinal anemia to repeated deep-seated properties

The magur catfish, often referred to in the dataset as *Clarius magur*, which is likely a variant of *Clarias magur*, appears seven times. This species is well-known for its nutritional value and is commonly utilized in aquaculture. Its prominence in the dataset underscores its dual importance as a dietary staple and a medicinal resource, indicating its integral role in the tribal communities' health practices.

The cuchia, *Monopterus cuchia*, an eel-like fish, is mentioned six times and is particularly notable for its use in treating anemia and conditions related to childbirth. This might be attributed to its high content of iron and other micronutrients, which are crucial for recovery and strength post-delivery.

The dwarf snakehead, *Channa gachua*, appears four times, signifying its importance in treating ailments like swelling and dysentery. Its therapeutic use might be associated with its perceived potency and the active compounds found within its tissues.

Lastly, the unspecified species of the genus *Puntius* (*Puntius sp.*) is mentioned four times and is used for a spectrum of conditions, including eye health and as a blood purifier. The recurrent mention of *Puntius spp.* reflects the tribes' broad-spectrum use of barbs for their perceived medicinal properties.

The recurring reference to these species underscores their medicinal significance and the reliance on indigenous ichthyofauna for healthcare among the tribal communities of Assam. This highlights the intricate link between the cultural heritage of these tribes and the biodiversity they have historically accessed for their health and wellbeing.

Conclusion

The ethnopharmacological survey conducted in the tribal villages of Assam has culminated in a substantial inventory of fish species used as medicinal remedies. Key findings reveal a rich tradition of ichthyotherapy among the Bodo, Karbi, and Mishing tribes, with species such as *Heteropneustes fossilis*, *Clarias magur*, *Monopterus cuchia*, *Channa gachua*, and various species of the genus *Puntius* playing a significant role in the traditional healthcare practices of these communities. The study underscores the vast, yet largely undocumented, repository of traditional knowledge concerning the medicinal use of fish and highlights the critical role of ethnopharmacology in understanding and preserving these practices.

Our findings reinforce the importance of ethnopharmacological studies in contributing to the body of traditional medicine, potentially providing insights for modern therapeutic approaches. The documentation of specific fish species

and their applications in treating a wide array of ailments not only preserves traditional knowledge but also serves as a foundation for future pharmacological research.

Further research is recommended to isolate and characterize the bioactive compounds in these fish species, which may contribute to the discovery of new drugs and therapeutic treatments. Additionally, it is imperative to continue documenting traditional knowledge systems, which are at risk of erosion due to rapid cultural and environmental changes.

Preservation of this traditional knowledge is not without its challenges. The increasing exploitation of aquatic resources and environmental degradation poses a threat to the survival of these fish species and, consequently, the medicinal practices that depend on them. Conservation efforts must be integrated with cultural preservation, ensuring sustainable practices that allow for the continuation of traditional medicine while maintaining ecological balance.

In conclusion, this study not only provides a valuable ethnopharmacological record but also calls for a thoughtful reflection on the sustainable use of natural resources. It emphasizes the need for a synergetic approach that encompasses health benefits, conservation, and the safeguarding of traditional wisdom, ensuring that these ancient practices continue to benefit future generations.

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