

# Uchang-sa: A report on frog consumption around Dampa Tiger Reserve, Mizoram, northeast India

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**ABSTRACT.** The global amphibian population decline has been linked to various factors, among which overexploitation as a food source is one. Amphibians have been a part of the local delicacy in many parts of northeast India, including Mizoram. Using a questionnaire survey involving 260 households, we documented 11 species of anurans, belonging to four families, which were consumed locally at the periphery of Dampa Tiger Reserve. We also present our result in the context of seasonality of collection and livelihood among respondents, and discuss future conservation issues.

**KEYWORDS.** Amphibians, collection, food, Dampa Tiger Reserve, Mizoram

## Introduction

Various wild animals, both from terrestrial and aquatic systems, form the primary source of meat for hundreds of indigenous, rural and other marginalized communities across the globe (Asprilla-Perea & Díaz-Puente, 2019; Brashares et al. 2011). This consumption, valued at several billion dollars annually, forms a key component of local food security (Nielsen et al. 2018). Among the various wild taxa consumed, amphibians have been identified as a key source of protein (Valencia-Aguilar et al. 2013). The Global Amphibian Assessment (GAA) shows that about 220 species of amphibians are used as food across the globe (Stuart et al. 2008), with species assessed potential functional food sources for humans (Oliviera et al. 2017). Many species of amphibians are facing extinction today, and human exploitation, which includes harvesting frogs for food, has been identified as one of the critical reasons for the decline in frog populations worldwide (Whittaker et al. 2013; Grano 2020).

India is not only a biodiversity rich country with a rapidly developing economy, but it is also home to thousands of indigenous and tribal communities. Closeness to nature and lack of livelihood opportunities have resulted in a way of life that is heavily dependent on natural resources for many of these communities. Northeast India is rich in biodiversity and is home to around 145 tribal communities; most practise shifting cultivation and are dependent on natural resources for sustenance. Wild meat is considered a delicacy across the region and many taxa are also used in traditional medicines (Aiyadurai et al. 2010; Jugli et al. 2010; Verma et al. 2014; Borah & Prasad 2017; Chanu 2017; Dhakal et al. 2019; Talukdar et al. 2020). Due to the remoteness, rugged terrain, and lack of opportunities, many parts of the region are understudied when it comes to the socio-ecological nexus in the region.

Mizoram is the southernmost state of northeast India, and is part of the Indo-Burma biodiversity hotspot (Mittermeier et al. 2004);

however, its unique biodiversity is understudied (Pawar & Birand 2001). Though the consumption of frog meat is prevalent among the tribes of northeast India, little published literature is available in this regard (Talukdar & Sengupta 2020; Talukdar et al. 2020). Mizoram state has ca. 70 species of amphibians, with representatives from eight families under two orders (Chanda 2007; Lalremsanga et al. 2021 a,b; Sengupta et al. 2010; Lalronunga et al. 2020, 2021; Decemson et al. 2021; Lalmuansanga et al. 2020; Malsawmhriatzuali et al. 2020; Kundu et al. 2020). However, the faunal discovery is far from being exhausted for this area (Pawar & Birand 2001).

A preliminary market survey and anecdotal observations show that consumption of frogs is still rampant in the region, and forms a part of the local cuisine. Knowing which species are preferred and more prone to offtake will enable us to establish conservation priorities. Hence, this study is aimed at identifying the preferred species of frogs by the local communities within the study area.

## Methods

**Study area.** Dampa Tiger Reserve (DTR) is situated in the western part of Mizoram state, bordering Bangladesh in the west (Figure 1). With an area of 500 km<sup>2</sup>, it is the largest Protected Area of the state. The fringe villages of DTR are inhabited by the Mizo, Bru and Chakma tribes. The study was conducted in four fringe villages, viz. Teirei, Damparengpui, Rajivnagar and Lallen of DTR (Figure 1), from January 2021 to April 2021.

**Data collection and analysis.** A semi-structured questionnaire, informal interviews and interactions with local communities were used to gather information relating to the consumption of anurans (see Appendix 1). At least 10% of the population was surveyed randomly in each study village, with each respondent representing one household, and a proportionate representation of gender was attempted (Choudhury et al. 2019). The respondents were asked about the local names of harvested frogs, and time and places of collection. The identity of the frog species was also confirmed by showing the respondent photographs of species recorded in the area from published literature (Ahmed et al. 2009;

Lalronunga et al. 2020a; Decemson et al. 2021) and field surveys.

## Results

During the study period, we sampled 40 households in Lallen Village inhabited by the Mizo tribe, 40 households in Teirei village inhabited by the Mizo and Bru tribes, 80 households in Damparengpui village inhabited by the Bru and Mizo tribes, and 100 households in Rajivnagar village inhabited by the Chakma tribe. Our study showed that 72.7% of total respondents consumed frogs. About 55% of respondents from Teirei, 81.3% from Damparengpui, 76.0% from Rajivnagar and 65% from Lallen consumed frogs. The occupation-wise frog consumption among the respondents (or sampled household) is shown in figure 2. A chi-squared test indicated that frog consumption was significantly higher among daily-wage labourers compared to other occupations ( $p = 0.0015$ ).

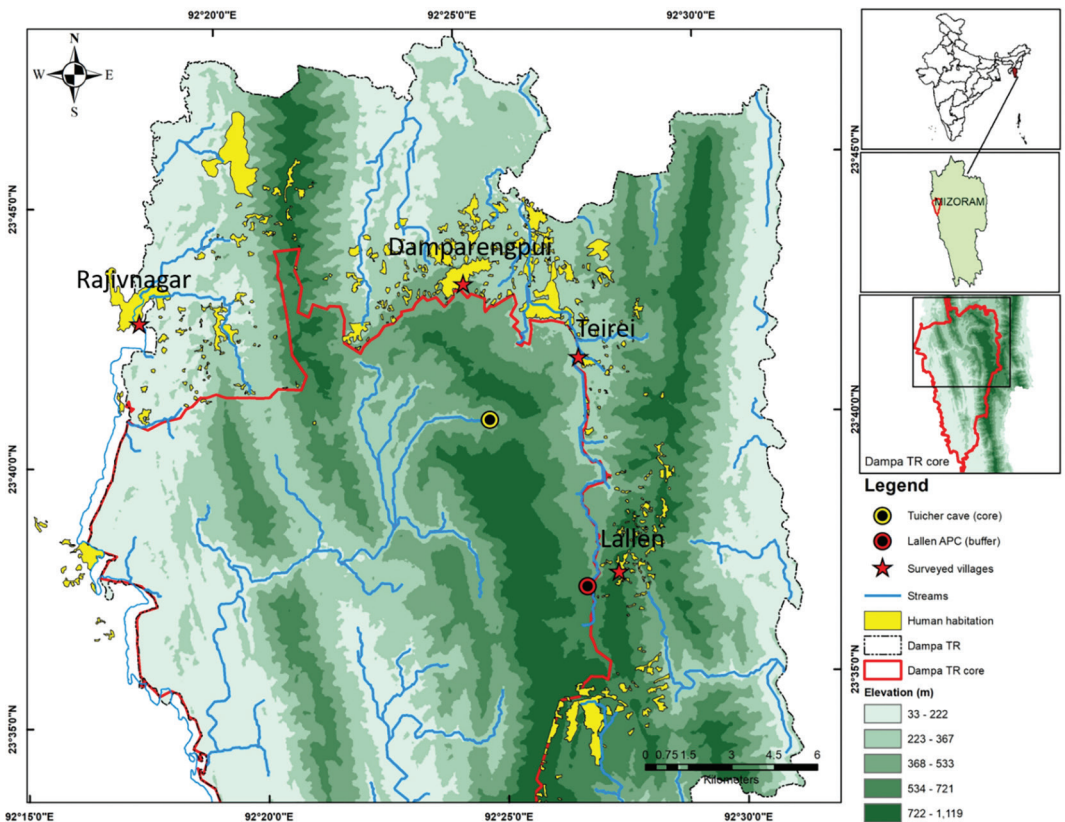
A total of 11 species belonging to four families were consumed in the study area, as shown in table 2 and figure 4. Frog harvesting was done primarily during the rainy season. This is also the time frogs are most vocal and can be located easily because of their activities.

## Discussion

Out of the 11 reported species of frogs, nine species are found to be consumed by all three tribes; however, *Duttaphrynus melanostictus* was consumed only by the Bru and Chakma tribes, after removing the skin. The harvesting season also coincides with the breeding season of the species in Mizoram, indicating that there is a dedicated effort towards collection during the peak activity period by following their acoustic trail. In our subsequent surveys in the study area, we noted that locally abundant species such as *Ingerana borealis*, *Raorchestes* sp., etc., are not eaten. Few species such as *Leptobrachium* sp and *Theloderma* sp. Are not consumed, even though they are present in the region, due to their apparent rarity. The frog species harvested for food were comparatively large-sized species, attaining a size class > 50 mm SVL. Such size preference could be due to the ease in locating and catching these species. The habitat of preferred species varies from streams to pools and trees, so the observation indicates that the

**Table 1.** Anuran species harvested in the study area, with their local name and seasonality of collection.

Species	Local Name	Time of collection	Previous records	IUCN status
<i>Duttaphrynus melanostictus</i>	Utawak	March to November	Decemson et al., 2021	Least concern
<i>Hoplobatrachus tigerinus</i>	Usai/Ukei/Usial	March to September	Decemson et al., 2021	Least concern
<i>Hoplobatrachus litoralis</i>	Usai/Ukei/Usial	March to september	Decemson et al., 2021; Kundu et al., 2021	Data deficient
<i>Euphlyctis kalasgramensis</i>	Chungu	March to August	Decemson et al., 2021	Least concern
<i>Amolops indoburmanensis</i>	Usial/Lengkir uchang	February to August	Decemson et al., 2021; Lalronunga et al., 2020a	Not Assessed
<i>Pterorana khare</i>	Usial thla nei/Uthlawk/ Uhlap	September to December	Decemson et al., 2021	Vulnerable
<i>Odorrana chloronota</i>	Uhring	February to August	Decemson et al., 2021	Least concern
<i>Hydrophylax leptoglossa</i>	Changtuk	March to August	Decemson et al., 2021	Least concern
<i>Sylvirana lacrima</i>	Utereng	September to January	Decemson et al., 2021; Lalronunga et al., 2021 a.	Least concern
<i>Polypedates teraiensis</i>	Changban	March to August	Decemson et al, 2021	Not assessed
<i>Zhangixalus smaragdinus</i>	Uchhawhring	March to August	Decemson et al, 2021	Not assessed

**Figure 1.** Study area showing the location of the study sites with respect to Dampa Tiger reserve.

collection of frogs for consumption may not be habitat specific.

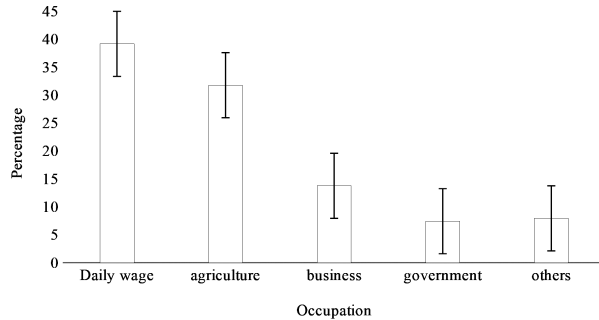
Our results also indicated that the majority of households that collected frogs fell in either

of the two livelihood categories *viz.*, daily-wage workers or individuals working in the agriculture sector. Both these occupations are primarily season dependent and could entail more free

days, compared to those working in government (regular) jobs or those involved in businesses. These livelihood strategies also give irregular income, and villagers engaged in these might look for free sources of food. Among the Chakma tribes in Rajivnagar village, a small portion of the sampled population (3%) stated that *Duttaphrynus melanostictus* is also used for the treatment of cold and cough. They further added that eating frog meat reduces chances of getting diseases.

The study flags an important conservation issue that frog consumption not only threatens the local anuran bio-

diversity, but could also pose zoonotic risks for local communities (Funk et al. 2021; Grano 2020). Persistent collection of larger body sized breeding populations might be detrimental for the local populations of various frog species. A detailed study needs to be conducted to understand the population level impacts of such harvesting practices. Except for *Pterorana khare*, the species consumed as a delicacy by the local communities are either Data Deficient or Least Concern as per the IUCN status. Thus, the amount of impact caused in the ecosystem due to the off-take of frogs is yet to be assessed. This would provide a way forward to developing sustainable alternatives for select aquatic fauna that are a crucial part of local culinary practices.



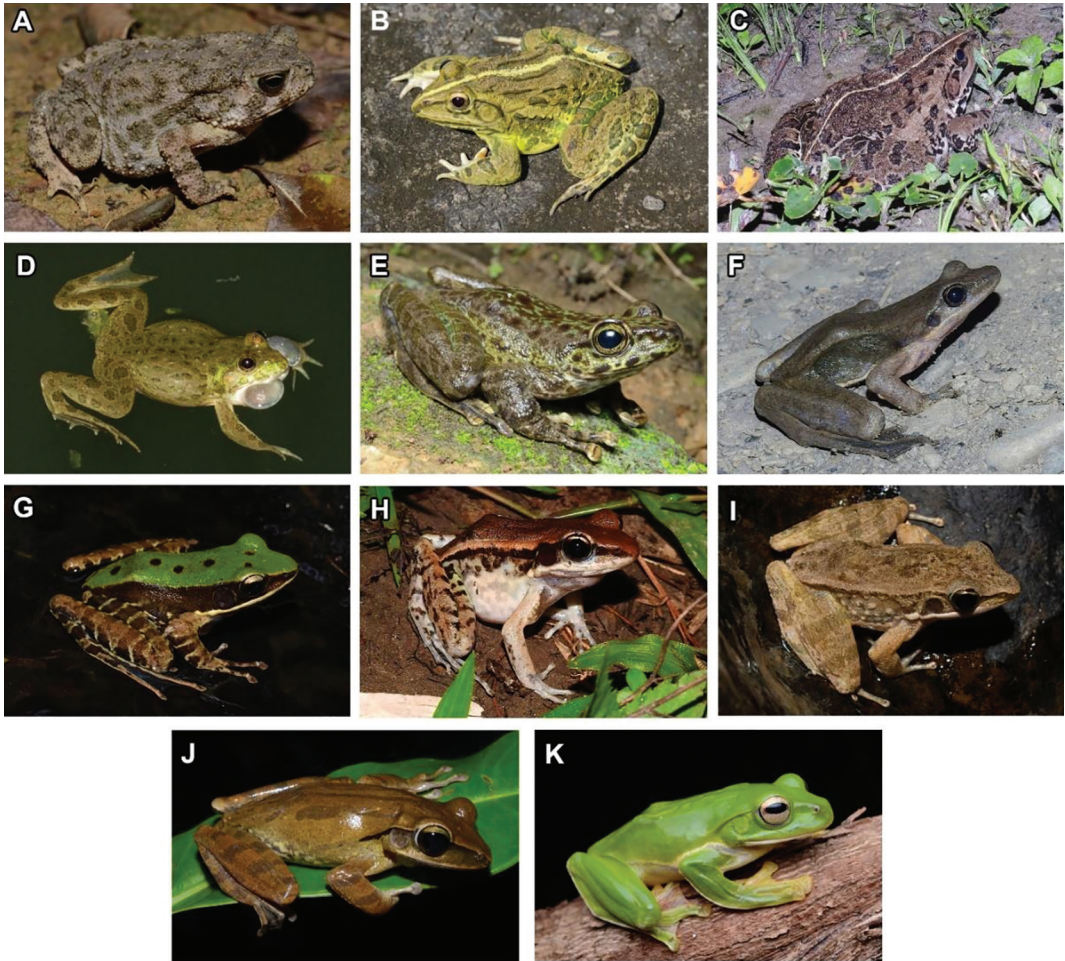
**Figure 2.** Occupation of respondents who harvest frogs for consumption in the study area.

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**Figure 3.** Frogs and snails collected by hunters.



**Figure 4.** Frog species harvested for consumption in the study area. A) *Duttaphrynus melanocstictus* B) *Hoplobatrachus litoralis* C) *Hoplobatrachus litoralis* D) *Euphlyctis kalasgramensis* E) *Amolops indoburmanensis* F) *Pterorana khare* G) *Odorrana chloronota* H) *Hydrophylax leptoglossa* I) *Sylvirana lacrima* J) *Polypedates teraiensis* K) *Zhangixalus smaragdinus*

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#### Appendix 1. Sample of questions asked during interviews.

Basic demography of respondents	Age
	Gender
	Educational qualification
	Family members
Frog collection	Yes or No?
	Time of collection?
	Species (in local names, confirmed with photographs from published literatures)
	Need for conservation?
	Medicinal values?