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Insect-sourced sustenance practices among indigenous communities in Kamrup (Metro), Assam, India

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Abstract
This study investigates the entomophagy practices among indigenous communities (Bodo tribe) in the Kamrup (Metro) district of Assam, India, focusing on the insect species consumed. Through surveys conducted with various age groups within the tribe, 16 insect species were recorded, belonging to 14 families and 7 orders. Orthoptera accounted for the highest number of species, followed by Hymenoptera and Hemiptera. Insects such as grasshoppers, crickets, dragonflies, termites, beetles, honey bees, weaver ants, wasps and silkworms formed a significant part of the Bodo tribe's diet. The study documented the seasonal availability, consumable stages, and preparation methods of these insects, with oil frying and smoking being the most common cooking techniques. Insects, like *Oecophylla smaragdina*, are consumed at different life stages, including eggs, larvae, and adults, while others are primarily eaten in their adult stage. The results highlighted the importance of insects in the Bodo tribe's diet and culture, contributing to food security. The findings provide insights into the diversity of entomophagy practices and their potential for enhancing sustainable food systems in the region.

Keywords: Entomophagy, orthoptera, hymenoptera, hemiptera, tribe, diet, culture

Introduction

The practice of consuming insects as food is referred to as entomophagy (Gallo, 2019**)** [4]. Since ancient times, various indigenous communities have consumed insects to preserve their socio-cultural heritage (Imathiu, 2020; Wanjala *et al*., 2023) [6,12]. Insects offer numerous nutritional and environmental advantages and hold promise for addressing future food security, contributing to a sustainable circular economy. The nutritional benefits of these insects have garnered attention and could help meet the growing food demands of the exponentially increasing population in a sustainable manner (Abril *et al*., 2022) [1]. The global distribution of insect species consumed indicates that around 1,600 to 2,300 species from 25 orders are recognized as consumable (Tanga & Ekesi, 2024) [11]. Ethno-entomophagy refers to the use of insects in the diet based on indigenous knowledge and practices, often tied to cultural rituals, beliefs, and ecological sustainability. Among the Bodo tribe of Assam, India, insects play an important role in their traditional diet and culture. The selection of insect species consumed is influenced by seasonal availability, local knowledge of insect lifecycles, and the cultural practices passed down through generations. This traditional practice aligns with similar trends in Southeast Asia, where countries like Thailand, China, and India lead in entomophagy, consuming over 200 species of insects. The Asia-Pacific region's population is regarded as consuming the highest number of insect species in their diet (Omuse *et al*., 2024) [8].

Documentation on the insects consumed in the selected region is very rare. Therefore, the present study explores the ethno-entomophagy practices of the Bodo tribe through a survey of the insect species consumed in the Kamrup (Metro) region. The survey also aims to contribute to the knowledge on ethno-entomophagy and its relevance to both food security and cultural sustainability.

Materials and methods

The study was conducted in Kamrup (Metro) district of Assam, India. The district has many different tribes and amongst them, Bodo tribes have the highest population (according to the 2011 Census). The study was carried out in the form of a survey. The survey targeted individuals from different age groups (below 20 years, 20-40 years, 40-60 years and above 60 years) within the tribe to gather information on their insect consumption habits, preferences, and the cultural significance of insects in their diet. The survey aimed to determine whether the tribal community in the region consumed insects, and if so, to identify the insect species consumed, local names of the consumed insects, to document their seasonal availability, stage of the insect, cooking method. The collected insects were identified by taxonomic literatures and by Zoological Survey of India (ZSI), Kolkata, India.

Results and discussion

From the survey, a total of 16 different species of insects consumed by the Bodo tribe of Kamrup (Metro) were recorded belonging to 7 different orders and 14 different families (Table 1). Out of these 16 species of insects, highest species were recorded from the order Orthoptera with 4 species, followed by Hymenoptera and Hemiptera with 3 species each, Lepidoptera and Coleoptera with 2 species each, and 1 species each from the orders Odonata and Isoptera (Fig. 1). The collection included short-horned grasshoppers, pointed-nose grasshoppers, mole crickets, crickets, dragonflies, termites, water stick insects, water beetles, giant water bugs, Eri silkworms, Muga silkworms, honey bees, paper wasps, weaver ants, longhorn beetles, and diving beetles. The study by Ghosh *et al*., (2017) [5] reported only 8 insect species which is quite lower than what our study was observed, though, five of the eight species, including Giant water bugs, Eri silkworms, Muga silkworms, mole crickets, and weaver ants, aligned perfectly

with the insect list found in the study by them. The three species that did not match were silkworms (*Bombyx mori*), termites (*Odontotermes*), and the Great diving beetle (*Dytiscus marginalis*). In Sharma (2018) [10], only seven out of the 18 insect species used as food by the tribes from a specific developmental block in Kamrup matched the insect species identified in the current study. In addition to silkworms, grasshoppers, beetles, termites, weaver ants, honey bees, dragonflies, and crickets, which were common in both observations, the study from Kamrup district (Das *et al*., 2024) [2] also reported the presence of shrimps, water scorpions, crabs, prawns, ants, and stem borers, which were not found in the current study. Moreover, the study of Langthasa and Sarma (2022) [7], recorded a total of 15 species of insects by the Boros of Murara, Kamrup district, in which, 8 insect species corroborated with the present study. In Dhemaji district of Assam, India, 14 insect species from 12 families consumed by ethnic tribes in the district were identified. Hymenopterans were most common, followed by Lepidopterans and Orthopterans. Insects were collected seasonally, consumed in various forms, and sold in village markets for income (Doley and Kalita, 2011) [3]. In Morigaon district of Assam, 15 different species of insects were consumed by Tiwa tribes belonging to 6 and 14 orders and families respectively (Rahman *et al*., 2018) [9].

Many of the listed insect species are available throughout the year, indicating that this consistent availability makes them a reliable food source in different seasons. While some species, are only available seasonally. Adult stages were the most commonly consumed, some of them are such as *Oxya fuscovittata*, *Gryllotalpa africana*, *Tarbinskiellus portentosus*, *Ranatra longipes thai*, *Cybister ventralis*. Several species, such as *Samia ricini*, *Antheraea assamensis* and *Apis cerana indica* are consumed at their both larval and pupal stages, offering diverse eating options. *Oecophylla smaragdina* is notable for its wide range of consumable stages, including eggs, larvae, and adults. The most common preparation methods for consumption are oil frying and smoking, *Diplonychus annulatus* is prepared into chutney. *Ranatra longipes thai* is primarily smoked while *Batocera sp.* are also prepared by smoking, along with oil frying, indicating regional variations in culinary practices (Table 2). The diversity of insects consumed reflects the rich entomophagic heritage of the Bodo tribe, showcasing their ability to harness the nutritional potential of local insect fauna.

Table 1: List of insects consumed by Bodo tribe of Kamrup (Metro), Assam

Sl. No.	Scientific name	Order	Family	Common name
1.	*Oxya fuscovittata* (Marschall, 1836)	Orthoptera	Acrididae	Short-horned grasshopper
2.	*Atractomorpha ps. psittacina* (De Haan, 1842)		Pyrgomorphidae	Pointed-nose Grasshopper
3.	*Gryllotalpa africana* (Beauvois, 1805)		Gryllotalpidae	Mole cricket
4.	*Tarbinskiellus portentosus* (Lichtenstein, 1796)		Gryllidae	Cricket
5.	*Ictinogomphus rapax* (Rambur, 1842)	Odonata	Gomphidae	Dragonfly
6.	*Microtermes obesi* (Holmgren, 1912)	Isoptera	Termitidae	Termite
7.	*Ranatra longipes thai* (Lansbury, 1972)	Hemiptera	Nepidae	Water stick-insect
8.	*Diplonychus annulatus* (Fabricius, 1781)		Belostomatidae	Water beetle
9.	*Lethocerus indicus* (Lepeletier & Serville, 1825)		Belostomatidae	Giant water bug
10.	*Samia ricini* (Donovan)	Lepidoptera	Saturniidae	Eri silkworm
11.	*Antheraea assamensis* (Helfer, 1837)		Saturniidae	Muga silkworm
12.	*Apis cerana indica* (Fabricius, 1798)	Hymenoptera	Apidae	Honeybee
13.	*Polistes olivaceus* (De Geer, 1773)		Vespidae	Paper wasp
14.	*Oecophylla smaragdina* (Fabricius, 1775)		Formicidae	Weaver ant
15.	*Batocera sp.*	Coleoptera	Cerambycidae	Long horn beetle
16.	*Cybister ventralis* (Sharp, 1882)		Dytiscidae	Diving beetle

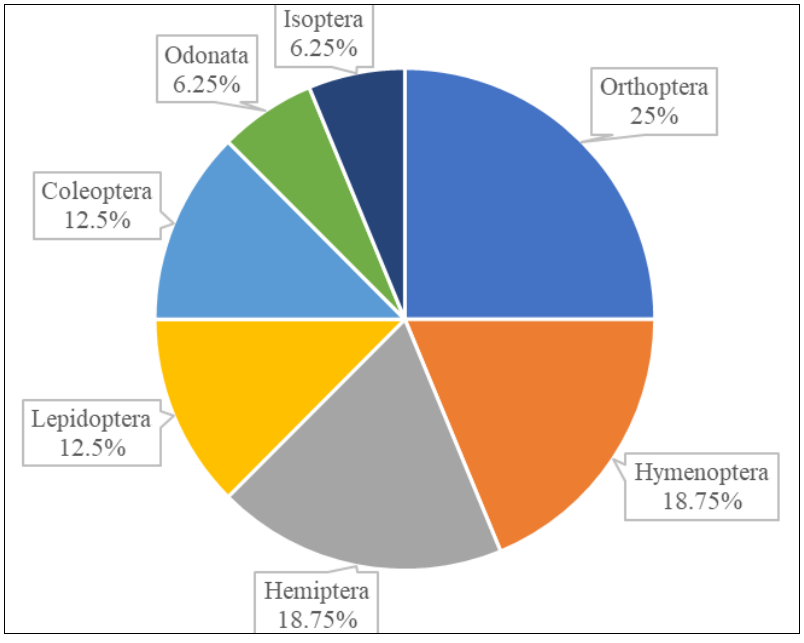

Fig 1: Distribution of various insect orders consumed by the studied tribe in Kamrup (Metro)

Table 2: Insects - Seasonal availability and consumable stages

Sl. No.	Scientific name	Seasonal availability	Consumable stage
1.	*Oxya fuscovittata* (Marschall, 1836)	Throughout the year	Adult
2.	*Atractomorpha ps. psittacina* (De Haan, 1842)	May - Dec.	Adult
3.	*Gryllotalpa Africana* (Beauvois, 1805)	Throughout the year	Adult
4.	*Tarbinskiellus portentosus* (Lichtenstein, 1796)	Throughout the year	Adult
5.	*Ictinogomphus rapax* (Rambur, 1842)	March-September	Nymph
6.	*Microtermes obesi* (Holmgren, 1912)	March-September	Larva, Adult
7.	*Ranatra longipes thai* (Lansbury, 1972)	Throughout the year	Adult
8.	*Diplonychus annulatus* (Fabricius, 1781)	May-October	Adult
9.	*Lethocerus indicus* (Lepeletier & Serville, 1825)	Throughout the year	Nymph, Adult
10.	*Samia ricini* (Donovan)	Throughout the year	Larva & Pupa
11.	*Antheraea assamensis* (Helfer, 1837)	Throughout the year	Larva & Pupa
12.	*Apis cerana indica* (Fabricius, 1798)	Throughout the year	Eggs, Larva
13.	*Polistes olivaceus* (De Geer, 1773)	March-Oct	Eggs, Larva
14.	*Oecophylla smaragdina* (Fabricius, 1775)	March-May	Eggs, Larva, Adult
15.	*Batocera sp.*	Jan-June	Larva
16.	*Cybister ventralis* (Sharp, 1882)	Throughout the year	Adult

Conclusion

Insects have been integral part to many communities for centuries, and their growing acceptance in modern food markets further emphasizes their potential. The study among the studied tribe in Kamrup (Metro) emphasizes the importance of these insects from both a nutritional and ecological standpoint. As research and interest in alternative protein sources continue to expand, these insects could play a crucial role in addressing global food security challenges, particularly in the face of population growth and environmental constraints.

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