



Diversity of edible insects in Tuensang District, Nagaland, India

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ABSTRACT: This study provides important information on the population diversity of edible insects in Tuensang district, Nagaland, India. The region is known for its diverse group of entomofauna, which are used as a healthy food source by the local people. In the study to evaluate the edible insects of Tuensang district, Nagaland, 23 different varieties of insects were identified. The study highlights the importance of these insects as a food source for the local people, which could have implications for food security and sustainability in the region. © 2023 Association for Advancement of Entomology

KEYWORDS: Entomofauna, diversity, entomophagy, food source

Eating insects is a need in many underdeveloped countries. The edible insects have a healthy quantity of fats, proteins, carbohydrates, lipids, minerals and vitamins (Costa-Neto and Dunkel, 2016; Bernard and Womeni, 2017; Mozhui *et al.*, 2017). In addition to serving as a supplemental meal or food additive in industrialised nations, edible insects may be utilised as a food source to enhance the nutritional condition of individuals living in poor countries (Van Huis *et al.*, 2013, 2015). In Nagaland, insects are an important part of the human diet historically and still insects are consumed. They include termites, cicadas, ant, wasp nests, grasshoppers, locusts, caterpillars, beetle larvae, and many aquatic insect species. Nagaland has a variety of animals, including a large diversity of insects connected to its native plants, and an abundance of natural resources. The rural populations are not always access to affordable, lengthy-to-prepare traditional

sources of animal based protein. Insects are frequently eaten as a meat alternative. The ingestion of a number of edible insect species was passed down through the generations in Nagaland (Shantibal *et al.*, 2012; Pongener *et al.*, 2019).

The Tuensang district's edible insect population was not previously assessed. The current study allows us to recognize the diversity of edible entomofauna present in this area. The residents of Tuensang usually consume large amounts of edible insects that are gathered seasonally from a variety of habitats and used as a delicious meal. Despite the tribe's ignorance about the nutritional benefits of insects, the majority of people who live in villages consumed them as a nutritious seasonal meal.

The international boundary runs along Tuensang's eastern border, one of Nagaland's districts that is situated on the country's eastern side. Its neighbours

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Table 1. Edible insects of Tuensang district, Nagaland, India

No.	Common/ localname	ScientificName/ Order	Availability	Edible stage	*IUCN3.1
1	Honey bee/ Nau	<i>Apis cerana</i> (F)/ Hymenoptera	Through out the year	Eggs, Larva, pupa	LC
2	Honey bee/ Nau	<i>Apis florea</i> (F)/ Hymenoptera	Sept -Feb	Eggs, larva, pupa	LC
3.	Asian giant hornet/ Nau	<i>Vespa mandarinia</i> (Smith)/ Hymenoptera	Oct –feb	Eggs, Larva, pupa	LC
4.	Honey bee/ Nau	<i>Apis dorsata</i> (F)/ Hymenoptera	Sept –may	Eggs, larva, pupa	LC
5	Termites/ Lango	<i>Odontotermes obesus</i> (Rambur)/ Isoptera	Oct -Nov	Adult	LC
6	Cicada/ Onyung	<i>Cryptotympana facialis</i> (Walker)/ Hemiptera	June –August	Adult	LC
7	Giant cicada/ Onyung	<i>Quesada gigas</i> (Olivier)/ Hemiptera	June -August	Adult	LC
8	Dinorid bug/ Aubi labie	<i>Coridius singhalanus</i> (Distant)/ Hemiptera	Jan -march	Adult	LC
9	Katydids/ koksung	<i>Mecopoda nipponensis</i> (Walker)/ Orthoptera	Aug -Nov	Adult	LC
10	Gray bird grasshopper/ koksung	<i>Schistocerca nitens</i> (Thunberg, 1815)/ Orthoptera	June –oct	Adult	LC
11	Two –striped grasshopper/ koksung	<i>Melanoplus bivittatus</i> (Say)/ Orthoptera	June –oct	Adult	LC
12	Rice -field grasshopper/ koksung	<i>Oxya yezoensis</i> (Shiraki)/ Orthoptera	June –oct	Adult	LC
13	Red –legged grasshopper/ koksung	<i>Melanoplus femurrubrum</i> (De Geer)/ Orthoptera	June –oct	Adult	LC
14	Sulphur-winged grasshopper/ koksung	<i>Arphia sulphurea</i> (F))/ Orthoptera	June -oct	Adult	LC
15	Grasshopper/ koksung	<i>Oxya fuscovittata</i> (Marschall)/ Orthoptera	Aug- NoV	Adult	LC
16	Field cricket/ Kotshou moun shou	<i>Gryllus</i> sp./ Orthoptera	Aug –Nov	Adult	LC
17	Bush cricket/ koksung	<i>Mecopoda elongata</i> (L))/ Orthoptera	Aug – nov	Adult	LC
18	Grasshopper/ koksung	<i>Oxya hyla</i> (Servile)/ Orthoptera	June –oct	Adult	LC
19	Dragonfly/ Deipin	<i>Pantala flavescens</i> (F)/ Odonata	July –Nov	Nymph	LC
20	Dragonfly/ Deipin	<i>Orthetrum Sabina</i> (Drury)/ Odonata	July –Nov	Nymph	LC
21	Eri silkworm/ Eri yang	<i>Samia ricini</i> (Drury, 1773)/ Lepidoptera	Through out the year	Larva, pupa	LC
22	Carpenter worm/ Akyang	<i>Cossus</i> sp / Lepidoptera	July -Feb	larva	LC
23	Preying mantids/ Keipong	<i>Hierodula coarctata</i> / Mantodae	July -sept	Adult	LC
*Conservation status					

to the north and east are Mon and Longleng District, respectively, as well as Mokokchung in the northwest, Zunheboto in the southwest, Kiphire in the south, and Myanmar in the east. This district's geography is made up of the Helipong Range, Yakur Range, Longtokur Range, Mangko Range, and Takhaya Range, which is distinguished by its high hills, deep gorges, and small valleys. The district Tuensang covers 4,228 square kilometres and can be found at latitudes of 26° 14' 8.67"N and longitude of 94° 48' 47.47"E, with elevations ranging from 800 to 3500m above mean sea level. The native inhabitants of this region are comparable to other Nagas in terms of their mongoloid characteristics. Changs, Khamniungans, Sangtams, and Yimkhiung are the main tribes to call Tuensang district home. Although each tribe has its own native dialect, Nagamese serves as the "language" of communication in this territory. The district has three types of soil: alluvial soil, non-laterite red soil, and forest soil. Tuensang has an evergreen subtropical and temperate coniferous forest, which supports a diverse flora and fauna.

The largest and eastern most district of Nagaland is Tuensang, which is also blessed with a diverse entomofauna. Assessment of the edible insects in Tuensang District has not previously been conducted or examined, however the current research contributes to learning about the variety of edible entomofauna. By direct field investigation, interviews with locals, including employees, neighbours, villages, and hunters, as well as references from books, a total of 23 edible insect species from 7 Orders and 17 Genera were evaluated and identified from this study region (Table 1). The edible insects were gathered from different locations in this region based on their physical and systematic differences when they were in season and samples were kept in alcohol (70%) for subsequent characteristics reference. The images were taken using cameras. The mode of consumption is very well practised by them such as cooking or frying with local ingredients. The ingredients used were fermented bamboo shoot, dried bamboo shoot, local garlic and ginger.

The Order Hymenoptera members *Apis cerana*,

A. florea, *A. dorsata*, and *Vespa mandarina* are available periodically in the Tuensang region. *A. cerana* species are abundantly available throughout the year and easily domesticated. The largest hornet, *V. mandarina*, is a wholesome diet by the locals of this area. *A. florea* is very tiny when compared to other honeybee varieties, it is known as the dwarf honey bee. Immature stages of *A. dorsata*, such as the eggs and larvae, are typically prepared with fermented bamboo shoot and local spices. They are the good source of honey and bee wax. Under order Othoptera, *O. yezoensis*, *S. nitens*, *M. bivittatus*, *M. femurrubrum*, *A. sulphurea*, *O. hyla*, *M. nipponensis* and *Mecopoda elongata* are found seasonally available. They are harvested in large quantities and commonly consumed in cooked or fried form with using local ingredients. Species of dragonfly *P. flavescens* and *Orthetrum sabina* Drury, 1770 are seasonally available and people prefer to collect only their nymph stage for consumption (Table 1).

Eri silkworm (*Samia cynthia ricini*) available throughout the year, as they are reared commonly in every tribal houses and is considered as their most delicious and nutritious food. It is an edible worm that is most commonly preferred by many people as they are considered as an environmentally friendly diet as they do not require a large amount of resources when they are raised. The carpenter worm (*Cossus sp*) is an edible insect; most commonly prefer their larva stage for consumption.

The termite species known as *O. obesus* (Isoptera) is most frequently consumed in fried form and makes for a nutritious meal. *C. singhalanus* (Hemiptera) known as stinkbugs is edible insect which is best consumed in chutney or cooked form and they are harvested during the month of January - March. *C. facialis* and *Q. gigas* (Hemiptera), commonly known as Cicada insect, harvested are in large quantities when available periodically by the farmers for consumption. The wings, digestive tract, and heads of the Mantodea species, *H. coarctata* are removed before the insect is ready for food. They are consumed in cooked or fried form with local ingredients.

The current study adds to the awareness of edible insect variety of Tuensang District, Nagaland, and aids in the nutritional worth. The Tuensang tribes collected the edible insects in larger quantities seasonally when they are available and consumed it as their primary source of sustenance..

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