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Terrestrial edible insects and their therapeutic value in Moridhal Panchayat of Dhemaji district, Assam, Northeast- India

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Abstract
The Northeast India is one of the major biodiversity hotspots, where a large percentage of its flora and fauna remains unexplored. The Northeast India is home to many traditionally living indigenous tribes and communities who are in constant touch with nature. The Moridhal Panchayat in Dhemaji district of Assam, Northeast India, houses four main indigenous Assamese communities – Mising, Lalong, Koch and Ahom apart from others. These communities are reservoir of traditional ethno-zoological knowledge and ethno-zoological practices. During the survey it was found that these communities use 16 species of insects belonging to 6 orders of class insecta as food as well as for the treatment of over 6 kinds of diseases including whooping cough and asthma. These traditional practices needs to be further investigated which may eventually lead to the discovery of new and more effective drugs.

Keywords: Moridhal, entomophagy, therapeutic, entomofauna

1. Introduction
Insect as food is an idea that is not acceptable in practical terms among the modern societies across the world, although its beneficial effects are already being debated at the highest platform available. The consequence of the former being less attention is paid towards ethno-entomological studies. Traditional ethno- biological knowledge and habit of accepting insects as food and as an integral part of local therapies is nowadays confined to the traditionally living, largely indigenous societies of the region that until now have experienced little amount of "westernization" (Chakravorty *et al.*, 2011) [3].

In traditional indigenous societies, insect, forms a little part of the bulk of their diet but plays a significant role in compensating for the general deficiency in animal proteins, fats and calories (De Foliart, 1975) [7]. The therapeutic value of insects might have come to notice during its consumption as food by the people who were suffering from different ailments and thus the knowledge was passed down from one generation to the next being refined with every passing generation completing its transformation from insect with edible value to insect with therapeutic value.

A number of studies in recent years have drawn attention towards the therapeutic value of certain species of insects and their products (Antonio, 1994; Oudhia. 2002; Padamanbhan & Sujana, 2008) [1, 11, 12]. In Arunachal Pradesh, two tribes namely Galo and Nyishi which use several species of insect deemed medically important by them as home remedies for different ailments have been studied by Chakravorty *et al.*,(2011) [3]. The insects of therapeutic value being used by the Garo tribe of Goalpara district in Assam have been recorded by Ghosh & Deka (2015) [9]

Though the knowledge about edible insects is now being documented, the documentation of insects possessing therapeutic value is poor, fragmentary and unknown to most of the scientific community. Thus the present study aims to discover and preserve the traditional knowledge about terrestrial edible entomofauna and therapeutic value among the people falling under Moridhal Panchayat, in Dhemaji district of Assam.

2. Study area & Target group
The district Dhemaji is situated in northern bank of river Brahmaputra. Dhemaji district lies between 94°12'18"E and 95°41'32"E longitude and 27°05'27"N and 27°57'16" N latitudes. The district covers of 3237 sq. Km. The area receives an annual rainfall of about 2600mm to

3200mm. The maximum temperature during summer is around 39.9 ºC and the minimum temperature during the winter is around 5.9 ºC. The Moridhal Panchayat is located in the north-east direction, at a distance of about 10 Km from Dhemaji town. The name Moridhal denotes "dried up river". Ten villages falling under the Moridhal Panchayat and dominated by Mising, Lalong, Koch and Ahom community people were selected for the study.

3. Materials and Methodology

Edible entomofauna are the materials for present study. Extensive ethno-entomological field surveys were carried out in ten villages (namely Jamuguri, Borasira, Kathalguri, Moridhal Ghat, Barphukan, Maharani, Khajua, Mazgaon, and No.1 & No. 2 Nagaon) falling under the Moridhal Panchayat of Dhemaji district, Assam, to collect the knowledge on edible entomofauna by interview and questionnaire method. 20 households selected randomly from each village are visited to collect information on the practice of entomophagy. The interviewed people are shown museum specimens and photographs of the insects and are asked simple questions in order to obtain information on the vernacular names of the insects, their edible value and assumed therapeutic value, as described by Chakravorty *et al.,* (2011) [3].

The insects which were available were collected by hand picking with the help of local people of the study area. The collected insects are preserved using standard method of preservation (Ghosh and Sengupta, 1982) [8]. The insects are identified with the help of published taxonomic keys (Roonwal & Chhotani, 1989; Srinivasan and Prabhakar, 2013) [3, 15] and by comparing with the museum specimens of Entomology Division of Zoological Survey of India, Kolkata.

4. Results and Discussion

During the survey it was found that 16species of insect belonging to 6 orders of class insecta were consumed by the local people cutting across different communities. The results of the survey are listed in Table 1 and photo plate 1. The people consume these insects as a delicacy and also for the treatment of over 6 kinds of ailments including whooping cough and asthma.

The pupae and larvae of Mulberry silkworm (*Bombyx mori*) and Muga silkworm (*A. assama*) which is found mostly during the months of October and November, is used to treat constant itching and soreness of the throat. Though these two species of insects are used as delicacy among other tribes, its therapeutic use has been first recorded. Silkworm has been prescribed in Chinese medicine for detoxification and treating bacterial infections causing sore eyes, swollen throat and loss of speech (N. A. Ratcliffe *et al*. 2011) [14]

An interesting find of the study was the use of pupae and larvae of Eri silkworm (*Samia cynthia ricini*) for curing "dudmur" or infection of mouth and tongue in small children. Although the Garo tribe (a prominent community of Meghalaya and Assam) use honey for treating "dudmur" (Ghosh & Deka, 2015) [9]

During the survey it was found that 3 different species of grasshoppers were consumed by the local people for its food value. It included *Eupreponotus sp* (short horned grasshopper), *Choroedocus sp* (short horned grasshopper) and *Mecopoda elongate elongate* (long horned grasshopper). The consumption of grasshopper as it was recorded depends mainly on its availability.

The matured or adult cricket (*Tarbinskiellus sp*) and the mole cricket (*Gryllotalpa sp*) were consumed for its food value and as a delicacy.

A find of the survey was the use of weaver ant (*Oecophylla smaragdina*) for the treatment of nose infection, sinus and throat infection. The insect is sun dried, grinded and mixed with mustard seeds and is inhaled. It is also squashed and the liquid extract is inhaled.

The alate stage of termite (*Odontotermes* sp.) is consumed for its food value. It is considered to be highly nutritive among the local people. Although anti-microbial properties of termites are reported (Lamberty *et al.* 2001) [10], they are not used so by the local people.

An interesting find of the survey was the use of larvae and eggs of yellow jacket wasp (*Vespa orientalis*, *Vespa* (*magnifica*) and the "nest" of potter wasp (*Eumenus sp*.) is used to treat stomach problems. The local people believe that it contains alkaline substances which help in curing stomach problems.

Egg, larvae of honey bee (*Apis sp*) and its product honey is used to cure whooping cough by the local community. There has recently been a renewed interest in the healing properties of honey (N.A. Ratcliffe *et al*. 2011) [14]. Many trials were conducted and it was found that there was an increase in healing period of ailments (Tonks *et al*., 2007; Chernaik, 2010) [16, 4]

The use of cockroach (*Periplaneta americana*) for the treatment of asthma problems in both children and adults have been recorded in this survey. Interestingly, Costa-Neto and Oliveira (2000) [5] have also reported the use of cockroach for the treatment of asthma among the people of State of Bahia, Brazil.

During the survey it was also found that cicada (*Pomponia sp*) is used as a food delicacy among the local communities.

5. Conclusion

The use of insects for their therapeutic value cannot be at once denied as just plain belief or myth only, as these communities are using these home remedies for time immemorial and the knowledge is being passed down from one generation to the next (Ghosh & Deka 2015) [9]. As it was observed during the survey, the use of silkworm for treatment of bacterial infections and the use of cockroach for treatment of asthma is prescribed for the treatment of same disease and ailments in Chinese traditional medicine and in Brazilian folk medicine both of which are thousands of miles away from the study area. Thus these folk medicines must possess some scientific basis for which they are used in different parts of the world. Also a pattern emerged during the survey that the younger generation are reluctant to learn these traditional healing practices as they are being touched by winds of modernization. So, it is of outmost importance that we must record and preserve this knowledge before they become extinct and also for the scientific community that it may find it easier for directly testing the bioactive compounds present in the insect body before putting in millions of dollars in research in just finding the candidates for treating new and established diseases.

Table 1

Scientific name	Order	Common name	Vernacular name	Body parts/products used/stage used	Disease/ailment for which insect is used/food value	Formulation & application
Bombyx mori	Lepidoptera	Mulberry silkworm	Pat	Larvae, pupae & adult	Constant itching & soreness of throat	Consumed by frying and boiling
Antherea assamensis	Lepidoptera	Muga silkworm	Muga	Larvae, pupae & adult	Constant itching & soreness of throat	Consumed by frying and boiling
Samia cynthia ricini	Lepidoptera	Eri silkworm	Eri	Larvae, pupae & adult	Infection of tongue & mouth	Consumed by frying and boiling
Eupreponotus sp	Orthoptera	Short horned grasshopper	Phoring	Adult	Food value	Wings & intestine removed then fried in oil
Choroedocus sp	Orthoptera	Short horned grasshopper	Phoring	Adult	Food value	Wings & intestine removed then fried in oil
Mecopoda elongate elongate	Orthoptera	Long horned grasshopper	Phoring	Adult	Food value	Wings & intestine removed then fried in oil
Tarbinskiellus sp	Orthoptera	Cricket	wishinga	Adult	Food value	Wings & intestine removed then fried in oil
Gryllotalpa sp	Orthoptera	Mole cricket	Kumoti	Adult	Food value	Wings & intestine removed then fried in oil
Oecophylla smoragdina	Hymenoptera	Weaver ant	Amlori porua	Adult	Nose infection, sinus & throat infection	Insect dried, grinded and mixed with mustard seeds & inhaled.
Odontotermes sp	Isoptera	Termite	wipok	Alate stage	Food value	Wings & intestine removed then fried in oil
Vespa orientalis	Hymenoptera	Yellow jacket wasp	Borol	Eggs & larvae	Stomach problems	Larvae and eggs are crushed & boiled and consumed
Vespa magnifica	Hymenoptera	Yellow jacket wasp	Borol	Eggs & larvae	Stomach problems	Larvae and eggs are crushed & boiled and consumed
Eumenus sp	Hymenoptera	Potter wasp	Kumaroni	Nest	Stomach problems	Nest is mixed with local herbs and consumed
Apis indica	Hymenoptera	Honey bee	Mou makhi	Egg, larvae & honey	Whooping cough	The eggs, larvae are crushed and mixed with honey and consumed
Periplaneta americana	Blattodea	Cockroach	Poitasura	Adult	Asthma	Insect is boiled/burned & consumed
Pomponia sp	Hemiptera	Cicada	Jilli	Adult	Food value	Wings & intestine removed then fried in oil

Photo Plate 1 (Some of the recorded insect species used by the local people)

Fig 1: *Oecophylla smaragdina*

Fig 2: Hive of *Apis indica*

Fig 3: Larvae of *Samia cynthia ricini*

Fig 4: Larvae of *Bombyx mori* being cooked

Fig 5: Pomponia *sp.*

Fig 6: *Mecopoda elongate elongate*

Fig 7: *Eupreponotus sp*

Fig 8: *Gryllotalpa sp*

Fig 9: *Tarbinskiellus Sp*

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