ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 9, Issue, 04, pp.48625-48632, April, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

STUDIES ON INDIGENOUS ETHNO-ENTOMOLOGY OF ETHNIC MEITEI COMMUNITY OF BISHNUPUR DISTRICT, MANIPUR, NE INDIA

***,[1]Th. Ajita Chanu, [2]Robindra Teron and [3]O. Shashi Kumar Singh**

[1, 2]Department of Life Sciences and Bioinformatics, Assam University, Diphu Campus, Assam
[3]Department of Zoology, D. M. College of Science, Imphal, Manipur

ARTICLE INFO

Article History:
Received 19th January, 2017
Received in revised form
27th February, 2017
Accepted 22nd March, 2017
Published online 20th April, 2017

Key words:

Ethnoentomology, Insect as food , Medicine, Manipur, Northeast India.

ABSTRACT

Ethnozoology deals with the study of the relationships between human societies and animal resources around them and ethnoentomology deals with the study of the relationship between the human societies and insect resources around them. The present paper is an endeavour to study and document the relationships between the people and the different kinds of insects available around them vis-a-vis their use as food, medicine, bio-indicators, religious beliefs, etc. among the ethnic Meitei communities in Bishnupur District of Manipur, NE India. The present study reveals the use of 39 species of insects belonging to 39 genera and 28 families by the ethnic Meitei community of the District. The work was carried out during the period from May 2015 to August 2016. Information was collected from the ethnic local Meitei community, particularly the local elders and medicinal practitioners. Identification of insect specimen was done using collections from the markets. The high nutritive values and medicinal properties of insects are discussed.

Citation: Th. Ajita Chanu, Robindra Teron and O. Shashi Kumar Singh, 2017. "Studies on indigenous ethno-entomology of ethnic Meitei community of Bishnupur district, Manipur, ne India", *International Journal of Current Research*, 9, (04), 48625-48632.

INTRODUCTION

Ethnozoology is a branch of science dealing with the role of economically important animals in the life and socio-cultural aspects of traditional ethnic people, i.e direct relationship of animals to mankind. "Ethnoentomology" the word "ethno" generally indicates knowledge of "folk" societies and "ento" refers to insects, thus ethnoentomology is concerned with the knowledge and use of insects in different human societies. Bodenheimer (1951) for the first time brought to the world attention the importance of insects as a potential human food and an important source of protein. Wyman and Bailey (1952) use the term "Ethnoentomology" in print in their seminal work on the Navajo Indians. Some of the pioneers in ethnoentomology include viz. Clausen (1954), Hitchcock (1962), Conklin's (1973), Cloudsly-Thompson (1976), Hogue (1980), Kevan (1974; 1979; 1980), Posey (1976, 1986) and Ritchie (1979). India has a rich biodiversity enormous/various work has been done on utilization of plants as medicine. Similarly, insects also have a high medicinal and nutritional property for mankind. Documentation of traditional and indigenous knowledge on medicinal and food utility of insects is important for value addition and economic upliftment, poverty alleviation and also intellectual property protection by proper documentation. A number of workers in India also provided interesting information on Ethnoentomology. The Indian pioneers include Gope and Prasad (1983), Dhanapati, (1990, 1995); Bhattacharjee, (1990), Ranjit Singh *et al.* (2004), Jamir and Lal (2005), Chakravorty *et al.* (2011), Shantibala *et al* (2012) and Chattopadhyay (2015). The insects with therapeutic value being used by the Garo tribe of Goalpara district in Assam have been recorded by Ghosh and Deka (2015). Manipur is a small state located in north-eastern part of India, stretching from 23º 83'N to 25º 68'N latitude and 93º 03'E to 94º 78'E longitude. It has a geographically unique central valley extending about 1,843sq km only out of total area of 22,356 sq. km surrounded by nine hill ranges. Manipur, being a distinctive part of the Indo-Burma biodiversity hotspot region, enjoys a very rich and fascinating diversity of insect fauna.

Aims and objectives

The aim of the present work is to study on the traditional mode of uses of insects as food and for therapeutic purposes in treating various kinds of diseases and ailments by the ethnic Meitei community of Bishnupur district, Manipur in NE India.

Study area

Bishnupur district is one of the four valley districts of Manipur, which is located in the central valley of the State. Culturally and historically, Bishnupur district is an important

Corresponding author:* **Th. Ajita Chanu,
Department of Life Sciences and Bioinformatics, Assam University, Diphu Campus, Assam

place in the state as the district with a number of traditional stories, historical events and monuments. Besides these, the district Bishnupur is unique in the state as the place is endowed with a number of natural beauties such as Bishnupur Ecological Park, Keibul Lamjao National Park (which is the only home of the Endangered deer, Brow antlered deer called "Sangai") and the largest fresh water lake i.e. Loktak lake. The Loktak Lake is the largest freshwater lake in eastern India. The floating marshes on the lake, locally called Phumdis makes the lake look green in colour. It is also the reason why most of the vegetation around the area is submerged in water. Most of the people residing in Bishnupur are Meities, the most prominent ethic group of Manipur. The district is located in the South Western part of the valley region of Manipur State (Fig. 1). Imphal East and West districts lie on the north, some areas of Churachandpur district on the south, some other areas of Churachandpur district and Senapati districts lie on the west of Bishnupur district. The district has a total area of 530 sq. km stretched from $93^0$43' E to 93.53^0 E longitudes and $24^0$18' N to 24.44^0 N latitudes. It is situated at an altitude of 800 metres amsl. It is bounded by Imphal West district on the North, on the South and the west by Churachandpur and Senapati districts. On the East, the district is bounded by Imphal West and Thoubal districts (Census population, 2001). The original name of Bishnupur District was *Lumlangdong*, now called *Lamangdong*. Ethnoentomological surveys were carried out in 11 villages in the District, viz., Nambol, Bishnupur, Phubala, Ningthoukhong, Keinou, Moirang, Kwakta, Sagang, Thanga, Karang, and Keibul Lamjao in the District.

places in the district. On the basis of the information, different species of insects were collected from the fields and wetlands and were identified with the help of available literatures and books. Edible aquatic insects were collected from various water bodies including the Loktak Lake, ponds, slow moving streams, swampy areas, etc. using various methods. Questionnaires and direct interactions with members of ethnic Meitei community, especially local medicine practitioners, Maibas (Male traditional healers) and Maibis (Female traditional healers) for information and collection of specimens after PIC. According to informants, their knowledge of medicinal animals was acquired mainly through parental heritage, or because they have experienced folk medicines to heal their kin or themselves. Special attention was paid to the modes of preparation of medicine, since this kind of information indicated how a folk medicine can be therapeutically efficient in terms of the right ingredients, the proper dose, and the right duration of preparation. Herbalists and healers only commercialize medicinal materials other than animal products and they are remunerated for their therapeutic services.

RESULTS

The present studies revealed the use of 39 species of insects belonging to 25 genera and 19 families as food by the indigenous Meitei communities in the study area. As many as

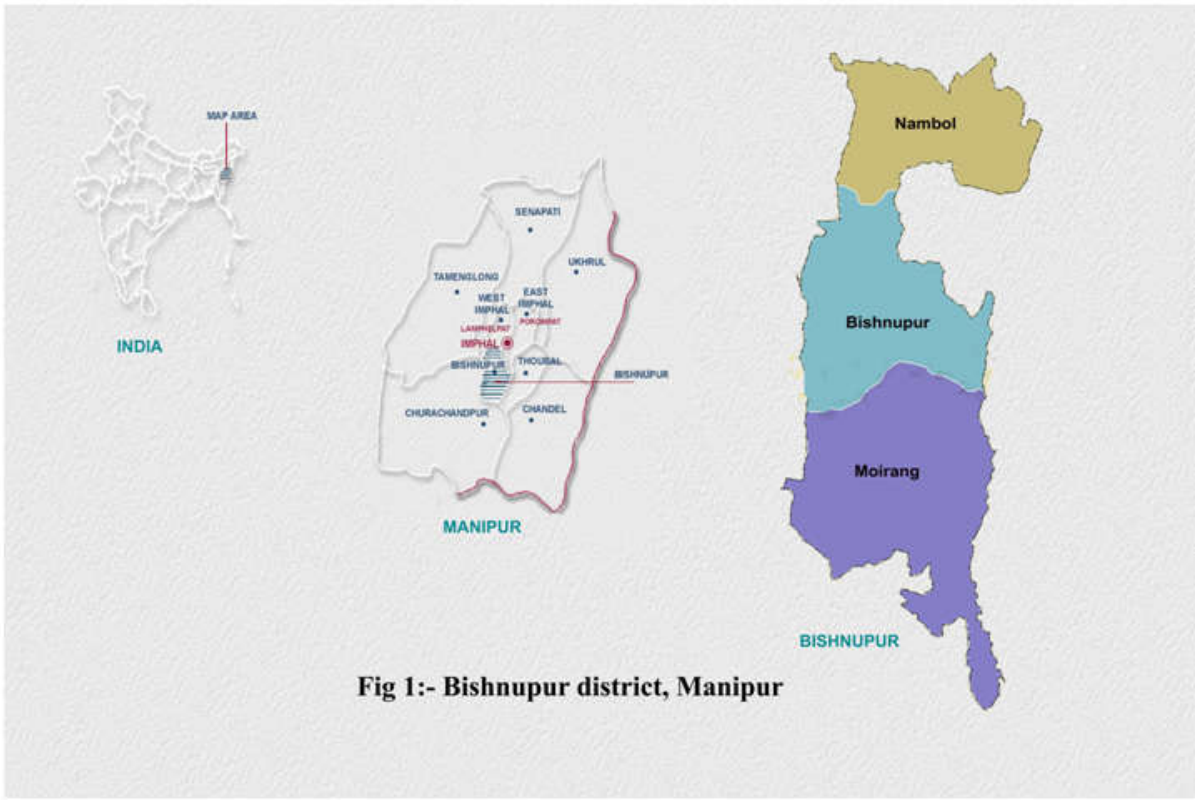

Fig 1:- Bishnupur district, Manipur

MATERIALS AND METHODS

The present studies were conducted during the period from May 2015 to August 2016 in different areas of the Bishnupur District, Manipur. Interviews were conducted with people of the Meitei communities to gather information regarding ethnozoology with reference to ethnoentomology. Specimens and related information were collected from different market

39 insect species belonging to 39 genera and 28 families were also found used in preparation of ethno -therapeutic medicines. Insects used for medicinal purposes are either consumed raw, roasted or cooked, or made into an ointment or paste form to be applied to the affected area. Insects used for edible purposes by the Meitei communities of Bishnupur district, N.E. India are listed in Table 1, while insects with therapeutic properties are listed in Table 2.

Table 1. Edible insects used by the ethnic Meitei community of Bishnupur district of Manipur, N.E. India

S.No.	*Scientific name*	Vernacular name	Family	Order	Edible Stage	Mode of preparation
1.	*Acisoma panorpoides*	*Charang, Maikhumbi*	Libellulidae	Odonata	Nymph, Adult	Fried
2.	*Anoplophora glabripennis*	*Yongchak tin*	Cerambycidae	Coleoptera	Adult	Fried
3.	*Antheraea proylei*	*Muga tin*	Saturniidae	Lepidoptera	Larvae and Pupae	Roasted, Fried
4.	*Apis cerana indica*	*Haying khoi*	Apidae	Hymenoptera	Larvae and Pupae	Fried
5.	*Apis dorsata*	*Khoiren*	Apidae	Hymenoptera	Larvae and Pupae	Fried
6.	*Apis mellifera*	*Haying khoi*	Apidae	Hymenoptera	Larvae and Pupae	Fried
7.	*Bombyx mori*	*Muga tin*	Bombycidae	Lepidoptera	Pupae	Fried
8.	*Callibaetis picta*	*Maikhumbi*	Baetidae	Ephemeroptera	Larvae	Fried
9.	*Crocothemis servilia*	*Charang, Maikhumbi*	Libellulidae	Odonata	Nymphs	Fried
10.	*Cybister cardoni*	*Tengbi*	Dytiscidae	Coleoptera	Adult	Fried
11.	*Cybister sigillatus*	*Tengbi*	Dytiscidae	Coleoptera	Adult	Fried
12.	*Cybister tripunctatus*	*Tengbi*	Dytiscidae	Coleoptera	Adult	Fried
13.	*Cybister ventralis*	*Tengbi*	Dytiscidae	Coleoptera	Adult	Fried
14.	*Diplacodes trivialis*	*Charang, Maikhumbi*	Libellulidae	Odonata	Nymphs	Fried
15.	*Diplonychus rusticus*	*Kongjeng kokphai*	Belostomatidae	Hemiptera	Adult	Roasted
16.	*Geris lacustris*	*Longkhajing*	Gerridae	Hemiptera	Adult	Roasted
17.	*Gryllotalpa orientalis*	*Waheibi*	Gryllotalpidae	Orthoptera	Nymph, Adult	Roasted, Fried
18.	*Gryllus sp.*	*Harou*	Gryllidae	Orthoptera	Nymph and Adult	Fried
19.	*Hydrometra greeni*	*Esing mi*	Hydrometridae	Hemiptera	Adult	Roasted
20.	*Hydrous olivaceus*	*Tharaokokpi*	Hydrophilidae	Coleoptera	Adult	Fried
21.	*Laccotrephes maculatus*	*Haonaosek*	Nepidae	Hemiptera	Adult	Roasted
22.	*Lethocerus inducus*	*Naosek*	Belostomatidae	Hemiptera	Adult	Roasted
23.	*Mecopoda elongata*	*Koujeng achouba*	Acrididae	Orthoptera	Adult	Fried
24.	*Notonecta sp.*	*Longkhajing*	Notonectidae	Hemiptera	Adult	Roasted
25.	*Odontotermes sp.*	*Leisou (maggot), Mukthrubi* (winged adult)	Termitidae	Isoptera	All the stages	Roasted, Fried
26.	*Omphisa fuscidentalis*	*Watin*	Pyralidae	Lepidoptera	Larvae	Fried
27.	*Orthetrum triangulare*	*Charang , Maikhumbi*	Libellulidae	Odonata	Nymph	Fried
28.	*Oryctes rhinoceros*	*Kangchet*	Dynastidae	Coleoptera	Adult ,Egg, Larva	Roasted, Fried
29.	*Oxya hyla hyla*	*Loubuk koujeng*	Acrididae	Orthoptera	Nymph, Adult	Fried
30.	*Pantala flavescens*	*Charang , Maikhumbi*	Libellulidae	Odonata	Nymph, Adult	Fried
31.	*Polistes olivaceus*	*Khoi*	Vespidae	Hymenoptera	Larvae and Pupae	Fried
32.	*Pomponia sp.*	*Harinongnang*	Cicadidae	Hemiptera	Adult	Roasted, Fried
33.	*Ranatra sp.*	*Chikribi*	Nepidae	Hemiptera	Adult	Roasted, Fried
34.	*Rhyothemis variegata*	*Charang,, Maikhumbi*	Libellulidae	Odonata	Nymph	Fried
35.	*Samia cynthia*	*Muga tin*	Saturniidae	Lepidoptera	Larvae and Pupae	Roasted, Fried
36.	*Solenopsis geminata*	*U kakcheng*	Formicidae	Hymenoptera	Adult	Fried
37.	*Valanga nigricornis*	*Koujeng*	Acrididae	Orthoptera	Nymph, Adult	Roasted
38.	*Vespa affinis*	*Khoibiningthou*	Vespidae	Hymenoptera	Larvae and pupae	Fried
39.	*Vespa basalis*	*Khoibiningthou*	Vespidae	Hymenoptera	Larvae and pupae	Fried

Tin =insect in Manipuri; Charang=Adult; Maikhumbi = Nymph; watin=larva/maggot

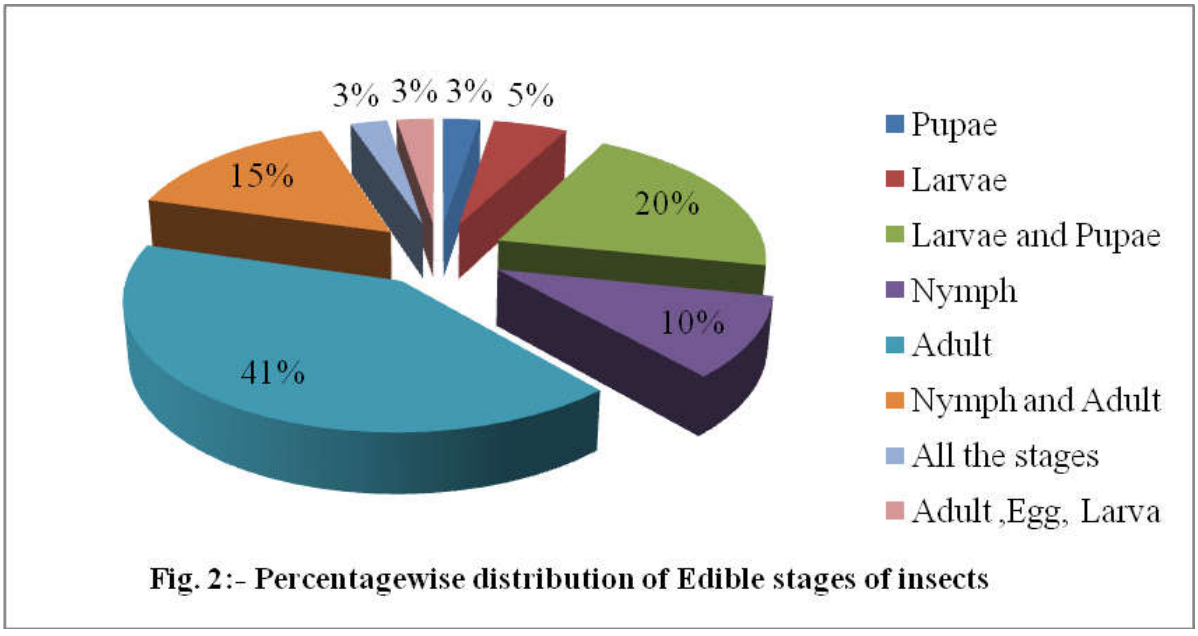

Fig. 2:- Percentagewise distribution of Edible stages of insects

Table 2. Therapeutic uses of insects by ethnic Meitei community of Bishnupur District of Manipur, N.E. India

S.No.	Scientific name	Local name	Family	Parts used	Diseases/ Ailments	Mode of preparation and administration
1 .	*Acisoma panorpoides*	Charang/ Maikhumbi	Libellulidae	Whole body	Nail injury	Adult insects crushed and applied to the injured area.
2.	*Argiope pulchella*	Me	Araneidae	Whole body	Chicken pox/ Lichen planus	• Roasted insects made into an aqueous paste used for bathing. ii)Dried & finely powdered, mixed with mustard oil & *Nicotiana tabacum*. The mixture is used as ointment.
3.	*Apis sp.*	Haying Khoi	Apidae	Honey	Treating bodyache and gastric problems. Also used in treatment of mouth ulcer	Honey is taken orally; also applied to affected areas;
4.	*Batocera rubus*	Wateen	Cerambycidae	Whole body	Anaemia.	Roasted & orally taken once daily for 3 months.
5.	*Cimex rotundatus*	Maa	Cimicidae	Whole body	Alopecia/Malaria	Insect body put inside material like banana or bread & swallowed with water. Crushed with mineral oil (kerosene) & made into paste. Applied on the head for two or three times a day
6.	*Crocothemis servilia*	Charang/ Maikhumbi	Libellulidae	Whole body	Nail injury.	Adult insects are crushed and applied to the injured area.
7.	*Dermacutor pictus*	Ching-naachal	Carcidae	Whole body	Python bite.	Sundried animal is made into a paste with water; applied on the injured region.
8.	*Dincutus spinosus*	Ishing mapi chini champra nimbi	Gyrinidae	Whole body	As perfume.	Crushed insects made into paste. The paste is used as perfume.
9.	*Diplacodes trivialis*	Charang/ Maikhumbi	Libellulidae	Whole body	Nail injury.	Adult insects are crushed and applied to the injured area.
10.	*Diplonychus rusticus*	Kongjeng kokphai	Belostomatidae	Whole body	Morning sickness in pregnant women.	Insects are fried in oil and mixed with smoked, *Channa punctatus* along with *Allium tuberosum* and consumed.
11.	*Formica sp.*	Kakcheng	Formicidae	Whole body	To increase/ improve sweetness of voice (used mainly by singers).	Adult insects are crushed and orally taken as a tonic.
12.	*Gerris gibbifer*	Kangraibi	Gerridae	Flesh	injury of nail & for removing embeded thorn from the body.	Insect flesh is crushed & made into a paste; paste is applied to the injury part of nail.
13.	*Gryllotalpa orientalis*	Waheibi	Gryllotapidae	Whole body	Control of unwanted moles/warts.	Insect body crushed & made into a paste. The paste is applied on the moles/warts.
14.	*Hamoeacerus sp.*	Usingsha	Carcidae	Whole body/ Flesh	Alopecia/ baldness & to promote the hair growth.	Crushed with *Allium porrum* & made into a paste; applied once daily to the infected region for 6 days.
15.	*Helix sp.*	Nakal	Helicidae	Body slime	Boils.	Body slime is taken out and applied to the patient.
16.	*Hydrous olivaceus*	Tharaokokpi	Hydrophilidae	Whole body	Dog bite and tumor.	Fresh whole body crushed and applied to the affected area.
17.	*Lamprophorus sp.*	Tandal	Lampyridae	Whole body	Night blindness.	The flesh is put into the banana fruit then swallowed. Orally taken three times a week.
18.	*Lethocerus inducus*	Naosek	Belostomatidae		Skin tumor and antidote to snake bite.	Infliction with salivary fluid through biting is employed to cure external skin tumor and also as antidote to snake bite.
19.	*Macrobrachium malcolmsonii* H. Milne Edwards	Khajing	Palaemonidae	Flesh/ Whole body	Anaemia & to improve circulation of blood./ as remedy to wounds of the cattle (eradication of maggots)	Flesh is boiled with *Tectona grandis* (soup). Whole body is crushed by using mortar & made into a paste.
20.	*Mantis religiosa*	Timbong	Mentidae	Whole body	Sore throat.	Whole body boiled in water and made a decoction for sore throat.
21.	*Mecopoda elongata*	Koujeng achouba	Acrididae	Whole body	Malnutrition.	Whole body roasted and consumed.
22.	*Musca nebula*	Haying	Muscidae	Whole body	Nail injury.	Crushed with *Oxalis corniculata* to make a paste; applied on the injured region.

Continue……..

23.	*Mylabris sp.*	Kobitin	Teneloarianidae	Whole body	Piles / external tumor growth.	Heated to dryness & mixed with honey; used as ointment.
24.	*Nepa*	Hao naosek	Belostomatidae	Whole body	Removal of embedded thorn from the body.	Crushed to make a paste; applied on the injury.
25.	*Odonata sp.*	Charang	Agrioniade	Whole body	Convulsion.	Body is mixed with dried & finely powdered *Acorus calamus*. The mixture is made into tablet; one tablet once daily for two days.
26.	*Odontotermes sp.*	Leisou/ Mukthrubi	Termitidae		Skin rashes and cough.	Queen of colony crushed and applied on skin rash; roasted termite workers consumed to cure cough.
27.	*Orthetrum triangulare*	Charang	Libellulidae	Whole body	Nail injuries.	Adult insects crushed and made into a paste; applied to the affected areas.
28.	*Oryctes rhinoceros*	*Kangchet*	Dynastidae	Whole body	Clot and bruises.	Fresh larva crushed and applied on dissipating clot and bruises.
29.	*Pantala flavescens*	Charang	Libellulidae	Whole body	Nail injuries	Adult insects crushed into a paste and applied to the affected area.
30.	*Periplaneta Americana* Linn.	Kharmi	Blattidae	Whole body	Asthma/Antidiuretic & to stop bed wetting by children.	Roasted animal orally taken two times daily for seven days.
31.	*Haploa Clymene*	Tinkhak amubi	Picridae	Whole body	Used as a promoter of hair growth.	Whole body is dried & crushed into a powder; mixed with a vegetable hair oil to make a paste which is applied on the head of the patient.
32.	*Ranatra linearia*	Ishingkangraibi	Nepidae	Whole body	Chronic pain	Boiled with water & obtained a decoction.Orally given to the patient.
33.	*Rhyothemis variegata*	Charang	Libellulidae	Whole body	Nail injuries.	Adult insects are crushed to form a paste; applied to the affected area.
34.	*Saccharicocerus saccharicola*	Wahik	Coceidae	Whole body	Alopecia	Whole body is crushed into a paste; applied externally to the patient for 6 days.
35.	*Solenopsis geminata*	Oo- kakcheng	Formicidae	Whole body	Gastric problem.	The whole body is crushed and made into juice with water.
36.	*Stenobothrus lineatus*	Koujeng	Acrididae	Whole body	Boils on head.	The animal is fried in fat of cow/cow oil & made into an ointment.
37.	*Termes bellicosus*	Leishoumapi	Termitidae	Whole body	Colic pain, typhoid, fever	Animal body crushed to form a paste; orally given to the patient.
38.	*Tetrix sp.*	Khunu koujeng	Tetrigidae	Whole body	Colic pain.	Whole body is crushed into a paste and orally given to the patient.
39.	*Vespa cinictus*	Khoibiningthou	Apidae	Hive	Blisters, Boils	Deserted hive is taken & crushed into powder to form a paste with water. The paste is applied on the affected areas.

Fig.3. Ethnic Meitei old women selling *Lethocerus inducus* in the market

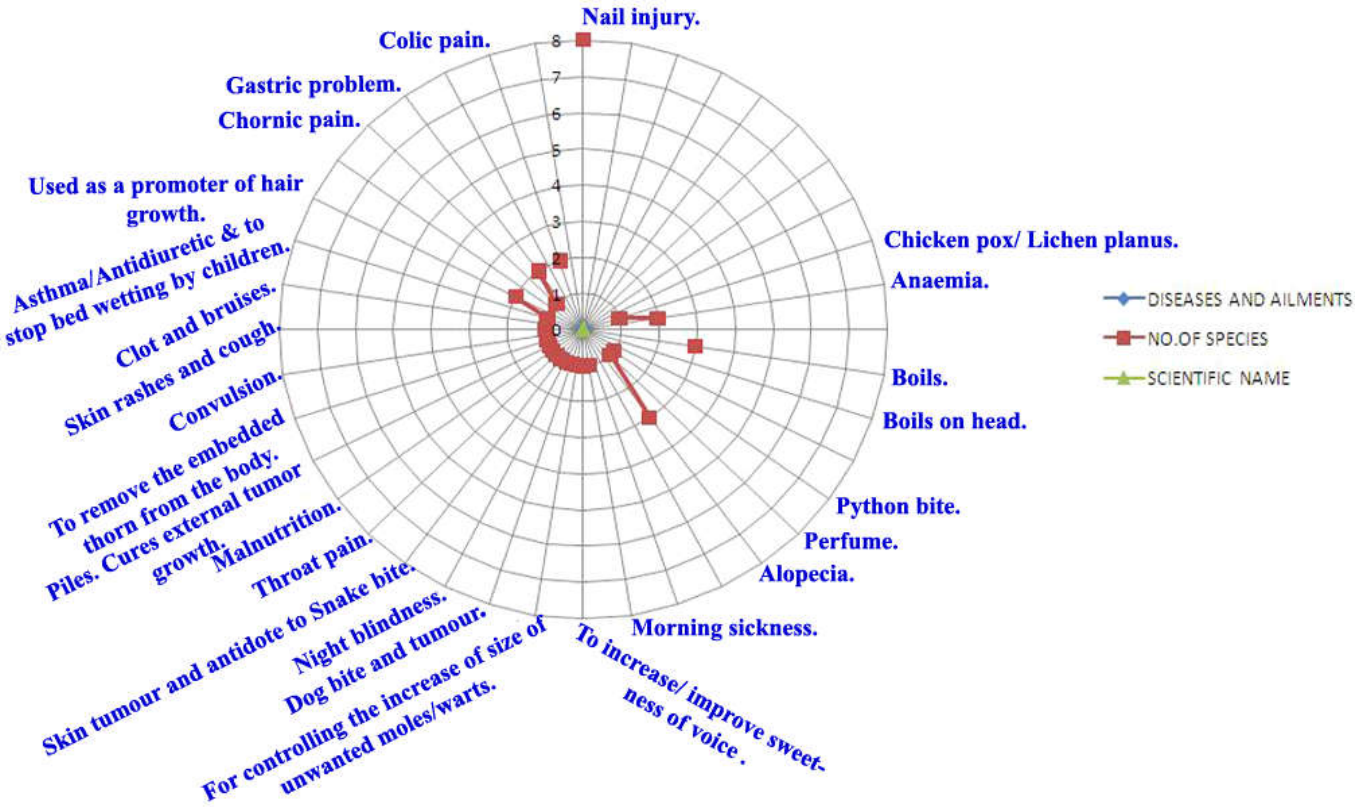

Fig. 4:- Radar with markers in chart type showing no. of species used for diseases and ailments as therapeutic by the ethnic Meitei comunity.

DISCUSSION

The present investigations revealed the use of 39 species of insects belonging to 8 orders 26 families and 23 genera under Class Insecta being consumed by the ethnic meitei communities of Bishnupur District in Manipur. Likewise, 38 species under 38 genera and 26 families were used in treatment of 27 different ailments (Table 1 & Table 2). 14 species were used both for edible as well as for therapeutic purposes. Ratcliffe *et al* (2011) reported use of silkworm in Chinese medicine for detoxification and treatment of bacterial infections causing sore eyes, swollen throat and loss of speech. The study reveals that *Formica* sp. (Local name-*Kakcheng*) is taken orally as a tonic to increase and improve sweetness of voice of singers. Honey taken from hive of *Apis* sp. belonging to the family Apidae is generally used for treating body ache and gastric problems, in addition to other universally accepted health benefits. It is also used for the treatment of mouth ulcer. There has recently been a renewed interest in the healing properties of honey. Ghosh & Deka (2015) reported the use of honey for treating "dudmur". Many trials were conducted and it was found that there was an increase in healing period of ailments (Tonks et al., 2007; Chernaik, 2010). An interesting find of the survey was the use of the nest of *Vespa cinictus* after the bees have deserted their hive. The hive is crushed into powder to form a paste with water in the treatment of blisters, boils, etc. Costa-Neto and Oliveira (2000) have also reported the use of cockroach for the treatment of asthma among the people of State of Bahia, Brazil. The use of cockroach (*Periplaneta americana,* local name- *Kharmi*) as an Asthma and anti-diuretic substitute to stop bed-wetting by children is considered as a reliable alternative to allopathic medicines. The study reveals that therapeutic uses of insects in different diseases and ailments were followed by the indeginous meitei community of the study area. It has been recorded that for the treatment of nail injuries, 8 species of insects are used but the mode of preparation and administering are different. For the treatment of Alopecia, 3 species has been used, viz. *Cimex rotundatus*, *Hamoeacerus sp. and Saccharicocerus saccharicola*). Lamberty *et al*. (2001) reported that, although termites have anti-microbial properties, they are not used so by the local people. A late stage of termite (*Odontotermes* sp.) is consumed by the local people for its highly nutritive food value. *Odontotermes sp.* (L.N. *Laisou/ Mukthrubi*) is used traditionally in the treatment of skin rashes and cough by the ethnic meiteis.

Conclusion

The present studies revealed the used of several species of insects being used by humans as food or for medicinal purposes since time immemorial. It further reveals a facet of human/insect interactions that, most of the time, is little known, and in a way, is masked by the negative perception that most people have of these insects. It has been ascertained that the value of insects as a source of food or popular remedies is widespread in many countries of the world, showing that these animals have been historically exploited by humans from a utilitarian perspective, an aspect that, combined with their

ecological importance, may contribute to demystifying the negative view associated with these insects (Raubenheimer, 2012). 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 and Deka 2015). 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. The ethnic Meitei community has comprehensive indigenous knowledge of nutritional value and medical importance of insects. Ayeiko *et al.* (2010) has reported that processing edible insects into conventional consumer products encourages entomophagy and has potential for income generation. Shantibala *et al*. (2012) has reported that documenting the significance of edible insects becomes the foremost requirement in bringing linkage between people's livelihood and their sustainable use. Thus, further studies on insects as food should include key factors like ecology, management and conservation implications, industrialization and marketing of edible insects in order to promote their sustainable development.

Acknowledgement

The authors express gratitude and thankfulness to the Department of Biotechnology, Ministry of Science and Technology, Government of India, New Delhi for providing the necessary financial support in carrying out field works for collection of materials and information required for the present investigations, and also for providing laboratory and computer facilities in the Bioinformatics Infrastructure Facility Centre in D. M. College of Science, Imphal, which was necessary for carrying out the present work. Authors are further thankful to the ethnic people residing in different parts of Bishnupur District who shared their traditional knowledge with the authors and provided the useful information necessary for this article. Authors are thankful also to the local guides for their assistance, co-operation and hospitality during the field studies.

REFERENCES

Ayeiko, M, Oriaro, V, Nyambuga, I.A. 2010. Processed products of termites and lake flies; improving entomophagy for food security within the lake Victoria region. *African Journal of Food, Agriculture, Nutrition and Development,* 10(2); 2010.

Bodenheimer, F.S. 1951. Insects as human food: A chapter in the Ecology of Man. Junk, The Hague. 352 pp.

Census population, Census of India, (Ministry of Finance India), 2011.

Chakravorty J, Ghosh S, Meyer-Rochow VB. Practices of entomophagy and entomotherapy by members of Nyishi and Galo tribes, two ethnic groups of the state of Arunachal Pradesh (North-East India). Journal of Ethnobiology and Ethnomedicine. 2011; 7:5

Chattopadhyay. 2015. Conservation of ethno-entomological resources for human health care, an urgent need.pp 31-30. *Souvenir & Book Abstract*, National Entomologists' Meet, 5-7 Feb 2015, ICAR- IINRG, Mankum, Ranch (Jharkhand). 165p.

Chernaik EP. 2010. Bugs as drugs, part 1; insects, the new alternative medicine for 21st century? Alternate Medical Review 15:124-135.

Clausen, L. W. 1954. Insect Fact and Folklore. Macmillan, New York.194 pp.

Cloudsly-Thompson, J. L. 1976. Insects and history. St. Martins, New York. 242 pp.

Conklin, H. C. 1973. Folk Classification: A topically arranged bibliography of contemporary and background references through 1971.Yales Univ. Press, New Haven.

Costa Neto EM, Oliveira MVM. 2000. Cockroach is good for asthma: zootherapeutic practices in northeastern Brazil. Human Ecology Review 7:241-51.

Costa-Neto EM. 2005. Entomotherapy, or the Medicinal Use of Insects. J Ethnobiol. 25:93– 114.

Devi, Dhanapati, L. 1990. Folk lore medicines of Ethnobiological importance in Manipur Vol. 1. 142 pp.

Devi, Dhanapati. L. 1995. Folklore on the use of indigenous Plants and Animals in Manipur Vol. 1. 198.

Doley, A.K. and Jatin Kalita 2011.An investigation on edible insects and their role in socio-economic development of rural communities: a case study on edible insects of Dhemaji district of Assam (India), Social Science Researcher, 1(1): 1-11.

Dossey AT. 2010. Insects and their chemical weaponry: New potential for drug discovery. Nat Prod Rep. 27:1737–1757.

Ghosh Sasanka S, Deka K. 2015.Therapeutic use of insects by the Garo tribe of Goalpara district, Assam. Zoon, Annual Journal 13:59-64.

Hitchcock, S. W. 1962. Insects and Indians of the Americas. Bull. Entomol. Soc. Am. 8:181-187.

Hogue, C.L. 1980. Commentaries in cultural entomology – definition of cultural entomology. Entomol.News 91(2):33-36.

Jamir N. S. & P. Lal 2005. Ethnozoological practices among Naga tribes, Indian Journal of Traditional Knowledge Vol.4 (1):100-104.

Kevan, D. K. 1974. The Land of Grasshoppers.Lyman Entomol. Mus.Ste-Anne-de-Bellevue, Quebec.328 pp.

Kevan, D. K. 1980. Grigs, graces, graphics and graffiti. Metaleptea 2(2): 55-72.

Kevan, K. M. 1979. The place of grasshoppers and crickets in Amerindian cultures. Proc. of the 2nd Triennial Meet. Pan-Arne Acridol. Soc. 74 pp.

Lamberty M, Zachary D, Lanot R, Bordereau C, Robert A, Hoffmann J et al. 2001. Insect immunity, Constitutive expression of a cystine-rich antifungal and a linear antibacterial peptide in a termite insect, J Biol. Chem,; 276:4085-4092.

Posey 1977. An ethnoentomological perspective of the southeastern Indian belief system. Hum. Mosaic 11(1):1-9.

Posey 1978. Ethnoentomological survey of Amerind groups of lowland South America. Florida Entomolo. 61:225-229.

Posey, D.A. 1976. Entomological considerations in southeastern aboriginal demography. J. Ethnohist. 23(2):147-160.

Ramos-Elorduy J: Anthropo-entomophagy: Cultures, evolution and sustainability. Entomological Research 2009, 39: 271–288.

Ranjit Singh, A.J.A and Padmalatha, C. 2004. Ethno-entomological practices in Tirunelveli district, Tamil Nadu, Indian Journal of Traditional Knowledge, 3(4): 442-446.

Ratcliffe NA, Me.llo CB, Garcia ES, Butt TM, Azambuja P. Insect natural products and processes: New treatments for

human disease. Insect Biochemistry and Molecular Biology 2011; 41:747-769.

Raubenheimer D, Rothman J. 2012 Nutritional Ecology of Entomophagy in Humans and Other Primates. Annu Rev Entomol.;58:141–160. doi: 10.1146/annurev-ento-120710-100713.

Ritchie, C.1979. Insects, the creeping conquerors and human history. Soc. Sci. 54(2):122-132.

Sachan JN, Das BB, Gangwar SK, Pathak KA, Katiyar JN : Insects as human food in North Eastern Hill Region of India. Bull Ent 1987, 28: 67-68.

Shantibala, T., R.K. Lokeshwari, H. Debaraj Sharma Entomophagy practices among the Ethnic communities of Manipur, North-East India. Int. J. Int sci. Inn. Tech. Sec. A, Dec. 2012, Vol. 1, Iss 5, pg 13-20

Tonks AJ, Dudley E, Porter NG. A 58-KDa component of Manuka Honey stimulates immune cells via TLR4. J Leukoc. Biol. 2007; 82:1147-1155.

Wilsanand V, Prema V, Ranjitha P. Therapeutic use of insects and insect products in South Indian traditional medicine. Indian Journal of Traditional Knowledge.2007; 6(4):563-568.

****