AMBIENT APPRAISAL

An Updated Diversity Pattern of Chalcididae (Hymenoptera: Chalcidoidea) between Disturbed and Undisturbed Forest of Meghalaya with Some New Records

Bankerdonbor Kharbisonop*, Sudhanya Ray Hajong

Department of Zoology, North Eastern Hill University, Mawlai
Umshing Mawkyntroh, Shillong 793022, Meghalaya, India

Study Area: Mawsynram, Uppershillong and
Nongpoh, Meghalaya, India

Coordinates: 25°17'55" N; 91°34'56" E; - 25°33'47"
N; 91°50'81"E; & 25°54'8" N; 91°52'37" E

Key words: Northeast India, New faunal records,
Forest types

Abstract

A survey on Chalcidoidea in Meghalaya was conducted. One genus *Kriechbaumerella* was recorded for the first time in the Mawsynram, Uppershillong and Nongpoh, Meghalaya for Meghalaya. Ten species (*Brachymeria aurea*, *Brachymeria coxadentata*, *Antrocephalus carnifrons*, *Antrocephalus subelongatus*, *Antrocephalus mitys*, *Antrocephalus validicornis*, *Hockeria bengalorica*, *Hockeria bifaciata*, *Kriechbaumerella destructor* and *Haltichella* sp.) were a new distributional records for the Northeastern region including the state of Meghalaya. The genera collected from the undisturbed and disturbed forest from three different selected sites under East Khasi Hills and Ribhoi Districts were analysed.

Introduction:

The members of Chalcididae are primary endoparasitoids of insects belonging to the order Lepidoptera, Diptera, Hymenoptera, Coleoptera and Neuroptera respectively (Iqbal & Inayatullah, 2015). About 1530 species under 90 genera were globally distributed and 645 species of chalcids was recorded from India (Noyes, 2015; www.nhm.ac.uk/entomology/chalcidoids/index.html). *Brachymeria* (Westwood) belongs to Brachymeriini under subfamily Chalcidinae and is highly diversified with 350 described species worldwide (Delvare, 2017). The genus *Brachymeria* (Westwood) is highly speciose among the members of Chalcididae and also has a wider host range, attacking various insect orders like Orthoptera, pupae of most Lepidoptera, Diptera and Coleoptera and rarely as hyperparasitoids of Hymenoptera (Bouèek, 1952; Joseph *et al.*, 1973). 76 species of *Brachymeria* (Westwood) were recorded from India and 22 species were documented among 8 Northeastern states of India (Noyes, 2019; www.nhm.ac.uk/entomology/chalcidoids/index.html). *Antrocephalus* Kirby, *Hockeria* Walker, *Kriechbaumerella* Dalla Torre and *Haltichella* Spinola belong to Halchillinae under *Haltichella* genus group which includes the genera *Euchalcis*, *Haltichella*, *Hockeria*, *Kriechbaumerella* and *Oxycoryphe*. *Antrocephalus* contributes a valid of 126 described species parasitized the host belonging to the families Tortricidae, Oecophoridae, Pyralidae and Crambidae under Lepidoptera. Some species use as parasitoids of phytophagous moths and bruchid beetles.

Haltichella Spinola recorded 36 species globally and are parasitoids to the families of Lepidoptera (Bucculatricidae; Gelechiidae; Momphidae; Notodontidae; Oecophoridae; Pyralidae; Tortricidae) and Hymenoptera (Braconidae; Ichneumonidae) (Noyes, 2011; www.nhm.ac.uk/entomology/chalcidoids/index.html). The genus *Hockeria* Walker was recorded a total of 106 described species globally. They are the parasitoids on pupae of various families belonging to Lepidoptera, Strepsiptera (Boucek, 1988) Neuroptera and Hymenoptera (Diprionidae) (Boucek and Delvare, 1992). *Kriechbaumerella* includes 25 valid species worldwide and the known hosts belong to families Limacodidae, Lasiocampidae and Saturniidae mostly large moths (Delvare, 2017). India recorded 21 described species of *Antrocephalus*, 7 species in *Haltichella*, *Hockeria* with 24 described species and 11 species for *Kriechbaumerella*. From the North-Eastern region of India, 5 described species of *Antrocephalus* were reported, *Hockeria* and *Kriechbaumerella* listed 2 described species each and *Haltichella* with a single undescribed species (Sheela *et al.*, 2003; Noyes, 2019). The Chalcids fauna in Meghalaya is very low. 8 described species of *Brachymeria* were recorded so far. *Brachymeria shillongensis* was the first *Brachymeria* species documented in the state (Narendran, 1986). Thakur (1990) recorded *Brachymeria lasus*. Twenty years later another species *Brachymeria jambolana* was reported from Meghalaya (Gupta, 2010). Gowriprakash (2019) in her thesis reports 7 species under *Brachymeria*. There has no

*Corresponding Author: bkbisnop@gmail.com

record so far for the genus *Kreichbaumerella* from Meghalaya. This paper highlights a new distributional record of a single genus and ten species from Meghalaya. Data were analysed based on the specimens collected from undisturbed and disturbed forests of three selected study sites with a comparison of both the forest types.

Methodology:

Sampling was conducted for a period of two years (February 2017 to March 2019). Three study sites viz., Mawsynram, Upper Shillong and Nongpoh were selected for the sample collection. The selected area shows the different ranges of temperatures with different vegetation types. Mawsynram located at 25°17'55" N and 91°34'56" E with an altitude of about 1,532 metres in East Khasi Hills District, holds a record for receiving the most rainfall in the world. The forest in this study site is temperate type. Upper-Shillong with a Latitude 25°33'47" N and Longitude 91°50'81" E and an elevation of 1652 m above sea level are a Subtropical and broadleaf forest with *Pinus kesiya* as the dominant tree species. Nongpoh with latitude 25°54'8" N and longitude 91°52'37" E and an elevation of 508 metres above mean sea level is mostly covered by dense forests of tropical and deciduous types. The area is the hot and humid border to the neighbouring state of Assam. The method of collection was followed by Noyes (1982). Yellow Pan Trap and sweep net were used during the survey. For YPT, a soap solution and a pinch of salt were added displayed in study sites for 22 to 24 hours. A distance of 5 meters in vegetative areas was selected for sweeping. The samples were then brought to the laboratory, separated into different families, genera and species and kept in a refrigerator. The samples were then identified using available literature by Mani (1989), Narendran *et al.* (2016) and Delvare (2017). All specimens were deposited in the Entomology Laboratory, Department of Zoology, North-Eastern Hill University. Abbreviations were used for UD=Undisturbed, D=Disturbed, YPT=Yellow Pan Trap, SN=Sweep Net.

Our observations:

During our survey on Chalcidoidea of Meghalaya in the year, 2017 to 2019 very few samples on the Chalcididae family were collected. From our experiment, we found out that more members of Chalcididae were collected from the undisturbed forest as compared to disturbed forest. A total of 122 samples were collected from three different collecting sites. 63 samples in 2017-18 and 59 samples in 2018-19 were collected from undisturbed and disturbed forests of the selected study site. Five genera (Table: 1) were found to be the most dominant in the state. *Antrocephalus* with a record of four species *A.subelongatus* Kohl (Plate-1a), *A.mitys* Walker (Plate-1b), *A.carnifrons* Cameron (Plate-1c), *A.validicornis* Holmgren (Plate-1d), *Brachymeria* were represented by *B.minuta* Linnaeus (Plate-1e), *B.jambolana* Gahan (Plate-1f), *B.euploeae* Westwood (Plate-1g), *B.aurea* Girault (Plate-1h), *B.coxodentata* Joseph *et al.* (Plate-1i), *Kriechbaumerella* by a described species of *K.dustructor* Waterston (Plate-1j), *Hockeria* by *H.bengalorica*

Narendran (Plate-1k), *H.bifaciata* Walker (Plate-1l) and unidentified species of *Haltichella* (Plate-1m). Ten species *Antrocephalus carnifrons* Cameron, *A.mitys* Walker, *A.subelongatus* Kohl, *A.validicornis* Holmgren, *Brachymeria aurea* Girault, *B.coxodentata* Joseph *et al.*, *H.bengalorica* Narendran, *H.bifaciata* Walker, *Kriechbaumerella dustructor* Waterston and an undescribed species of the genus *Haltichella* Spinola were reported for the first time in Northeast India and in Meghalaya.

Analysis of the distribution of chalcids was done for the genus only. On analysing the data from the undisturbed and disturbed forest, in February 2017- January 2018 a total of 49 and 14 individuals from undisturbed and disturbed were collected respectively. Out of these *Antrocephalus* were recorded 12 (UD=10, D=2), *Brachymeria* with a total of 26 (UD=18, D=8) individuals, *Hockeria* with 17 (UD=13, D=4), *Haltichella* recorded 7 individuals and a single individual of *Kriechbaumerella* both were collected from the undisturbed forest. In February 2018- January 2019, a total of 53 individuals were collected from undisturbed and 6 from disturbed forests respectively. From these collections, *Antrocephalus* was recorded 7 (all collected from the undisturbed forest), *Brachymeria* with a total of 15 (specimens collected from the undisturbed forest only) individuals, *Hockeria* with 23 (UD=17, D=6) individuals, *Haltichella* with 14 individuals collected from undisturbed areas and with no collection of *Kriechbaumerella*. The specimens were also analysed based on the type of method involved in the collection (Table-2), though two methods

Table-1: Species list under five genera (Family: Chalcididae)

# Genera	Species
1 <i>Antrocephalus</i> Kirby	<i>Antrocephalus carnifrons</i> Cameron <i>Antrocephalus mitys</i> Walker <i>Antrocephalus subelongatus</i> Kohl <i>Antrocephalus validicornis</i> Holmgren
2 <i>Brachymeria</i> Westwood	<i>Brachymeria euploeae</i> Westwood <i>Brachymeria jambolana</i> Gahan <i>Brachymeria aurea</i> Girault <i>Brachymeria minuta</i> Linnaeus <i>Brachymeria coxodentata</i> Joseph <i>et al.</i>
3 <i>Hockeria</i> Walker	<i>Hockeria bengalorica</i> Narendran <i>Hockeria bifaciata</i> Walker
4 <i>Haltichella</i> Spinola	Unidentified sp.
5 <i>Kriechbaumerella</i> Dalla Torre	<i>Kriechbaumerella dustructor</i> Waterston

Table 2: Showing the data collected from different collecting methods (YPT and SN), (Family: Chalcididae).

# Genera	Feb '17-Jan '18			Feb '18-Jan '19		
	YPT	SN	Total	YPT	SN	Total
1 <i>Antrocephalus</i> Kirby	12	0	12	7	0	7
2 <i>Brachymeria</i> Westwood	26	0	26	15	0	15
3 <i>Hockeria</i> Walker	17	0	17	23	0	23
4 <i>Haltichella</i> Spinola	7	0	7	14	0	14
5 <i>Kriechbaumerella</i> Dalla Torre	1	0	1	0	0	0
	63	0	63	59	0	59

Figure-1: Bar representing the Chalcids from the disturbed and undisturbed forest of different collecting sites

Figure-2: Bar representing the Chalcids from the period of Feb 2017-Jan 2018 and Feb 2018-Jan 2019

Figure-3: Bar representing the Chalcids from three different collecting sites

were used i.e. yellow pan trap and sweep net, 122 samples were only collected from yellow pan trap. In comparison to the data collected from three collecting sites, Mawsynram shows a high number of Chalcids with a total collection of 58 individuals, followed by Uppershillong with 42 chalcids and Nongpoh with a total of 22 chalcids. *Brachymeria* is widely distributed in all the three collecting sites, followed by *Hockeria* and *Kriechbaumerella* shows the least among the chalcids. This paper reveals that chalcids fauna is more in the undisturbed forests with plenty of vegetation unlike in disturbed forests which is the main cause for the decline of biodiversity (Brockerhoff *et al.*, 2017) and a threat to the fauna due to habitat destruction and fragmentation. Hence further study could be conducted in the future for other Chalcidoids to be discovered and described before they become extinct.

Plate-1: Images of the Chalcids identified during study from different collecting sites

References:

- Bouček, Z. (1952): The first revision of the European species of the family Chalcididae (Hymenoptera). *Acta Entomol Mus Natl Pragae*, 27(1):1-108.
- Bouček, Z. (1988): **Australasian Chalcidoidea (Hymenoptera). A Biosystematic Revision of Genera of Fourteen Families, with a Reclassification of Species**. Pub. by: CAB International Wallingford, Oxon UK. 832pp.
- Bouček, Z. & Delvare, G. (1992): The new world genera of Chalcididae. *Mem. Am. Entomol. Ins.*, 53:1-466.
- Brockerhoff, E.G., Barbaro, L., Castagneyrol, B., Forrester, D.I., Gardiner, B., González-Olabarria, J. R., Lyver, P. O.B., Meurisse, N., Oxbrough, A., Taki, H., Thompson, I.D., Plas, F. & Jactel, H. (2017): Forest biodiversity, ecosystem functioning and the provision of ecosystem services. *Biodivers. Conserv.*, 26:3005-3035.
- Delvare, G. (2017): Order Hymenoptera, family Chalcididae. *Ar. Fau. UAE*, 6:225-274.
- Gowri, P.J. (2019): **Morphology versus Molecular Phylogeny in Diagnosing Indian Chalcididae (Hymenoptera: Chalcidoidea)**. Thesis Submitted to the Annamalai University, India.
- Gupta, A. (2010): First record of *Brachymeria jambolana* Gahan (Hymenoptera: Chalcididae) as a pupal parasitoid of *Graphium doson* (C. & R. Felder) (Lepidoptera: Papilionidae). *J. Biol. Count.*, 24(4):363-364.
- Iqbal, T. & Inayatullah, M. (2015): Two species of genus *Antrocephalus* Kirby (Chalcididae: Chalcidoidea: Hymenoptera): New Records for Province Khyber Pakhtunkhwa, Pakistan. *J. Entomol. Zool. Stud.*, 3(1):295-301.
- Joseph, K.J., Narendran, T.C. & Joy, P.J. (1973): **Oriental Brachymeria. A monograph on the Oriental species of Brachymeria (Hymenoptera: Chalcididae)**. Pub. by: University of Calicut, Zoology Monograph No 1 pp. vii+215pp.
- Mani, M.S. (1989): **The Fauna of India and the adjacent countries Chalcidoidea (Hymenoptera) Part 1**. Pub. by: Zoological Survey of India, Govt. of India.
- Narendran, T.C. (1986): Family Chalcididae. In: Subba Rao, B.R. & Hayat, M. (Eds) - The Chalcidoidea (Insecta: Hymenoptera) of India and the adjacent countries. *Orient. Insects*, 20:18.
- Narendran, T.C. & Achterberg, C.V. (2016): Revision of the family Chalcididae (Hymenoptera, Chalcidoidea) from Vietnam, with the description of 13 new species. *Zool. Keys*, 576:1-202.
- Noyes, J.S. (1982): Collecting and preserving chalcid wasps (Hymenoptera: Chalcidoidea). *J. Nat. Hist.*, 16:315-334.
- Sheela, S., Narendran, T.C. & Tiwari, R.N. (2003): Contribution to the knowledge of Chalcididae of India. *Rec. Zool. Surv. India*, 101(3-4): 247-266.
- Thakur, N.S.A. (1990). Additional record of parasitoids (*Brachymeria lasus*, *Ascogaster* sp.) on soyabean leaf folders, *Nacoleia* spp. in Khasi Hills of Meghalaya (India). *India. J. Hill Farm.*, 3(2):83-84.