NEW RECORDS OF CHALCID WASPS (HYMENOPTERA: CHALCIDOIDEA) FROM BANGLADESH

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Abstract

The study provides a list of 57 species belonging to 47 genera under 12 families of Chalcidoidea from Bangladesh. The recorded chalcidoid wasps are Aphelinidae (1 species/ 3 genera), Chalcididae (9 species/ 4 genera), Encyrtidae (6 species/ 5 genera), Eulophidae (23 species/ 13 genera), Eupelmidae (1 species/ 3 genera), Eurytomidae(1 species/ 2 genera), Mymaridae (9 species/ 9 genera), Ormyridae (species unidentified/ 1 genus), Perilampidae (species unidentified/ genus unidentified), Pteromalidae (4 species/ 4 genera), Torymidae (1 species/ 1 genera) and Trichogrammatidae (2 species/ 2 genera). Nine species and 18 genera were confirmed through DNA barcoding technique.

***Key words*:** Chalcidoidea; Hymenoptera; Malaise trap; Chittagong University Campus; Bangladesh.

INTRODUCTION

Hymenoptera parasitoids have been recognized as important agents in the field of biological control of insect pests in agriculture (Franck *et al*. 2017). Chalcid wasps (Chalcidoidea: Hymenoptera) constitute an important insect group (Yan *et al.* 2019) as their use as biological control agents against Lepidoptera, Coleoptera, Homoptera and Diptera (Sureshan 1999). Malaise traps are a common tool for monitoring ecosystem compositions, such as arthropod biodiversity (Moriniere *et al*. 2016). deWaard *et al.* (2017) assessed the Terrestrial Arthropod diversity by Coupling Malaise Traps with DNA Barcoding. Morphological characters has been a routine practice to identify global biodiversity but often it is very difficult to identify in closely related species morphologically (Siddiqui *et al*. 2019). Consequently, DNA barcoding has been shown to be a reliable technique for rapid and accurate species identification. A partial fragment of cytochrome c oxidase I gene (COI) of Mitochondrial DNA (mtDNA) has been extensively used in molecular studies (Hebert *et al*. 2003, Moriniere *et al*. 2016). Mazumdar *et al.* (2015) surveyed and collected parasitic wasps using Malaise Traps from different localities of Bangladesh. The present study reveals economically important more chalcid wasps collected from Chittagong University Campus. Recorded parasitic wasps from Bangladesh were identified by Morphological taxonomy and DNA barcoding technique. The result of the current study may assist in biological control in the field of crop protection.

METERIAL AND METHODS

The chalcid wasps were collected weekly during March 2014–February 2015 by using a Malaise trap installed at Chittagong University Campus (Latitude 22.46359°N; Longitude 91.7808°E). A total number of 1,116 specimens were studied. Mounted specimens were imaged with an Entovision Imaging Suite. Some unconfirmed specimens were sent to Department of Zoology, Malabar Christian College, Calicut 673001, Kerala, India for morphological taxonomic identification and confirmation. Molecular identification was supported by BIO (2017). Collection data, voucher information and taxonomy for each specimen are available in the Barcode of Life Data Systems (http://v3.boldsystems.org/index.php/Taxbrowser_Taxonpage?taxon). DNA barcoded specimens are deposited in the Biodiversity Institute of Ontario, University of Guelph, Guelph, Ontario, Canada. The rest specimens are housed at Insect Museum, Department of Zoology, Chittagong University.

RESULTS AND DISCUSSION

A total of 1,116 specimens were studied. Among them 57 species belonging to 47 genera from 11 subfamilies and 12 families for Chalcidoidea was examined and confirmed new form Bangladeshi fauna (Table 1). The families are: Aphelinidae (1 species/ 2 genera), Encyrtidae (1 species/ 1 genera), Eulophidae (2 species/ 4 genera), Eupelmidae (1 species/ 3 genera), Mymaridae (2 species/ 6 genera) and Trichogrammatidae (2 species/ 2 genera). Only the sequenced chalcid wasps of nine species and 18 genera were identified as *Centrodora* sp., *Encarsia sophia*, *Copidosoma floridanum*, *Asecodes* sp. *Ceranisus menes*, *Closterocerus* sp., *Aprostocetus purpureus*, *Anastatus* sp., *Eupelmus martellii*, *Zaischnopsis* sp., *Alaptus* sp., *Gonatocerus devikulamus*, *Lymaenon* sp., *Mymar atripennis*, *Neomymar* sp., *Omyomymar* sp., *Trichogramma achaeae*, *Trichogrammatoidea bactrae*. DNA barcoded specimens marked with a symble (♦).

Table 1. List of identified chalcid wasps.

Family	Subfamily	Scientific name	Material Examined
Aphelinidae	Coccophaginae	*Centrodora* sp. ♦	6♀, CUC, 07.viii.09, 06.xi, 01.i.2015
		Coccobius sp.	3♀, CUC, 07.vii, 06.xi, 01.i.2015
		Encarsia sophia Girault & Dodd♦	3♀, CUC, 07.iii, 08.v. 2014
Chalcididae	Chalcidinae	*Brachymeria bengalensis* (Cameron)	3 ♀, CUC, 30.i.2015
		B.lasus (Walker)	2 ♀, CUC, 15.viii.2014
		B.nigrifemorata Joseph, Narendran and Joy	1 ♀, CUC, 15.iv.2015
	Haltichellinae	*Hockeria amamioshimensis* Habu	1 ♀, CUC, 22.ii.2015
		H. gibsoni Narendran	2♀, CUC, 30.iv.2015
		H. grisselli Narendran	1♀, CUC, 30.vii.2014
		Kriechbaumerella cordigaster Roy and Farooqi	1 ♀, CUC, 15.x.2014
		K. rufimanus (Walker)	1 ♀, CUC, 07.iii.20015
		Rhynchochalcis thresiae Narendran	1 ♀, CUC, 15.i.2015
Encyrtidae	Encyrtinae	*Copidosoma floridanum* Ashmead♦	26, CUC, 07.iii, 8.iv, 07.vii, 06.xi, 04.xii. 2014, 01.i, 26.ii.2015
		C. thebe (Walker)	2, CUC, 06.xi, 2014
		Encyrtus aurantii Geoffroy	1 ♀, CUC, 30.ix.2014
		E. lecaniorum (Mayr)	1 ♀, CUC, 15.ii.2015
		Neastymachus delhiensis (Subba Rao)	1 ♀, CUC, 23.i.2015
		Prochiloneurus latiscapus Compere 1938	1 ♀, CUC, 07.viii.2014
		Syrphophagus sp.	3, CUC, 26.ii. 2015
Eulophidae	Entedontinae	*Asecodes* sp. ♦	3, CUC, 07.ix,x, 04.xii.2014
		Ceranisus menes (Walker)♦	2, CUC, 07.iii.2014
		Closterocerus sp. ♦	1, CUC, 08. iv. 2014
	Eulophinae	*Elasmus brevicornis* Gahan	1 ♀, CUC, 22.iii.2014
		E. caligneus Narndran	1 ♀, CUC, 30.iii.2014
		E. flavescence Verma and Hayat	1 ♀, CUC, 22.iv.2014
		E. homonae Ferriere	1 ♀, CUC, 15.iiv.2014
		E. johnstoni Ferriere	1 ♀, CUC, 07.viii.2014
		E. zehntneri Ferriere	1 ♀, CUC, 21.v.2014
		Euplectromorpha flava Girault	1 ♀, CUC, 21.i.2015
		Euplectrus litoralis Wijesekara	1 ♀, CUC, 21.ix.2014
		Hemiptarsenus varicornis (Girault)	1, CUC, 08.v.2014
		Pnigalio bengali Narendran	1 ♀, CUC, 21.iii.2014
		P. cadoti Narendran	1 ♀, CUC, 21.viii.2014
		Sympiesis bardisis Narendran	1 ♀, CUC, 30.vi.2015
		S. hyblaeae Surekha	1 ♀, CUC, 22.ii.2014

	Tetrastichinae	*Aprostocetus purpureus* (Cameron)♦	1 ♀, CUC, 22.i.2015
		Neotrichoporoides budaensis (Narendran)	1 ♀, CUC, 15.ii.2015
		N. viridimaculatus Fullaway	1 ♀, CUC, 30.iv.2014
		Tetrastichusdasi Narendran	1 ♀, CUC, 07.iii.2014
		*T. inferens*Yoshimoto	1 ♀, CUC, 15.xi.2015
		*T. krishnaiahi*Saraswat	1 ♀, CUC, 07.viii.2015
		T. mangifera Khan and Sushil	1 ♀, CUC, 15.iii.2014
		T. pantnagorensis Khan	1 ♀, CUC, 22.viii.2015
		T. tunicus Narendran	1 ♀, CUC, 22.xii.2014
		Quadrastichus sp.	1 ♀, CUC, 26.viii.2015
Eupelmidae	Eupelminae	*Anastatus* sp.♦	13, CUC, 07.iii, viii,x, 06.xi, 04.xii, 2014, 01.i, 26.ii.2015
		Eupelmus martellii Masi♦	2, CUC, 07.iii, 08.iv.2014
		Zaischnopsis sp. ♦	1, CUC, 08.iv.2014
Eurytomidae♦	Eurytominae	*Eurytoma*sp.	1 ♀, CUC, 30.ii.2014
		Plutarchia indefensa (Walker)	1 ♀, CUC, 15.iv.2014
Mymaridae	--	*Acmotemnus luteiclava* Noyes and Valentine	1 ♂, CUC, 21.iii.2014
		*Alaptus*sp. ♦	1, CUC, 26.II.2015
		Gonatocerus devikulamus Mani & Saraswat♦	1 ♀, CUC, 07.iv.2014
		G. narayani Subba Rao & Kaur	1 ♀, CUC, 15.v.2014
		G. triguttatus Girault	1 ♀, CUC, 22.v.2014
		*Lymaenon*sp.♦	54, CUC, 07.iii, 08.iv, 08.v, 06.vi.,07.vii,viii,ix,x,06. xi, 04.xii, 01, 26.ii. 2015
		Mymar atripennis Curtis ♦	1 ♀, CUC, 14.iv.2014
		M. indica Mani	1 ♀, CUC, 22.ii.2015
		M. pulchellum Curtis	1 ♀, CUC, 15.vi.2014
		Neomymar sp. ♦	4, CUC, 04.xii.2014, 01.i.2015
		Omyomymar sp. ♦	4, CUC, 06.xi, 04.xii.2014, 01.i.2015
		Polynemacrassa Mani and Saraswat	2♀, CUC, 15.vii.2014
		P.orientale Girault	2♀, CUC, 22.iii.2014
		Stethynium sp.	1♀, CUC, 15.vii.2014
Ormyridae♦	--	*Ormyrus* sp.	1♀, CUC, 15.v.2014
Perilampidae♦	--	unidentified	1, CUC, 26. 02. 2015
Pteromalidae♦	Pteromalinae	*Oxysychus nupserhae* Dutt and Ferriere	1♀, CUC, 21.iii.2014
		Paraiemea vishnuae Sureshan and Narendran	1♂, CUC, 07.iv.2014
		Psilocera clavata Sureshan and Narendran	1♀, CUC, 15.ii.2015
		Syntomopus rajamalaiensis Sureshan and Narendran	1♀, CUC, 21.xi.2014.
Torymidae♦	*Toryminae*	*Glyphomerus montanus* Zerova and Seryogina	2♀, CUC, 15.ix.2014
Trichogrammatidae	--	*Trichogramma achaeae* Nagarajaand Nagarkatti♦	4♀, CUC, 07.iii.2014
		Trichogrammatoidea bactrae Nagaraja♦	2♀, CUC, 04.xii.2014

CUC = Chittagong University Campus

A total of 5169 hymenopteran species out of 150000 have been barcoded globally. In India, only 167 species of Hymenoptera have been subjected to barcoding where 58 belong to superfamily Chalcidoidea including 44 Trichogrammatidae, 5 Eulophidae, 2 Torymidae and 7 Encyrtidae species (Rasool *et al*. 2018). The previous studies of the chalcid wasps of Bangladesh have been described and illustrated mostly at morphological level. For instance, Bhuiya (1998) published only taxonomic descriptions of two new species *Aschitus zakeri* and *Paraphaenodiscus monawari* from Bangladesh. Bhuiya (2000) listed 20 genera and 33 species of Chalcidoidea from Bangladesh. Bhuiya and Miah (2007) listed 65 species under two subfamilies and 33 genera belonging to Encyrtidae from Bangladesh. Bhuiya *et al.* (2014) provided a list of 28 aphelinid parasitic wasps (Aphelinidae) belonging to eight genera under five subfamilies.

Mazumdar and Bhuiya (2016) reared four parasitoid species, viz. *Chrysocharis pentheus*, Neochrysocharis *formosa* and *Cirrospilus* sp. belonging to family Eulophidae from agromyzid leafminers. Tax summary of the DNA barcoding library of Chalcidoidea in the BOLD system is presented in Table 2.

Table 2. Tax summary of DNA barcoding library of Chalcidoidea in the BOLD system.

Family	Specimens	Sequences	Records with BINs	BINs
Aphelinidae	158	158	74	15
Chalcididae	20	20	6	4
Encyrtidae	59	59	29	7
Eulophidae	287	287	153	73
Eupelmidae	20	20	5	3
Eurytomidae	14	14	8	2
Mymaridae	368	368	141	29
Ormyridae	1	1	1	1
Perilampidae	1	1	1	1
Pteromalidae	41	41	21	12
Torymidae	7	7	7	1
Trichogrammatidae	140	140	70	16
Total	**1,116**	**1,116**	**516**	**164**

DNA barcoding based a list of 15 genera of *Mymaridae* was found in Bangladesh. The present study additionally presents 57 species belonging to 47 genera under 12 families of Chalcidoidea to Bangladeshi fauna where nine species and 18 genera were DNA barcoded. It is expected that some of the *still* unknown *species* may add as new species to the field.

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