

**TAXONOMIC STUDIES ON THE PTEROMALIDAE
(HYMENOPTERA: CHALCIDOIDEA) OF KERALA WITH
SPECIAL EMPHASIS ON AGROECOSYSTEMS**

Thesis
submitted to the University of Calicut in partial fulfillment of
the requirements for the award of the degree of

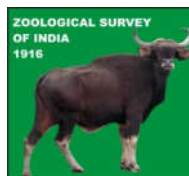
DOCTOR OF PHILOSOPHY IN ZOOLOGY
(Faculty of Science)

by

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DECLARATION

I do hereby declare that the thesis entitled "**TAXONOMIC STUDIES ON THE PTEROMALIDAE (HYMENOPTERA: CHALCIDOIDEA) OF KERALA WITH SPECIAL EMPHASIS ON AGROECOSYSTEMS**" submitted by me to the University of Calicut for the award of the **Degree of Doctor of Philosophy in Zoology** included the data generated by the original research made by me under the supervision and guidance of **Dr. P. M. Sureshan**, Scientist-D, **Zoological Survey of India, Western Ghat Regional Centre, Kozhikode**. The work has not been submitted to any university or institution for the award of any degree. I further declare that the findings of this research contribute in general to the advancement of knowledge in science and in particular to the parasitoid fauna of Kerala state, India.

Kozhikode

12.03.2018



Raseena Farsana V. K.

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*This thesis is dedicated to
the memory of my parents*

CONTENTS

Chapter	Title	Page No.
1.	INTRODUCTION	1-6
2.	REVIEW OF LITERATURE	7-32
	2.1. Previous work done on Taxonomy of Pteromalidae of Kerala	29
3.	MATERIALS AND METHODS	33-43
	3.1. Study area- Kerala	33
	3.2. Methods of Collection	35
	3.3. Processing	38
	3.4. Microphotography (digital imaging) and Measurements	39
	3.5. Mapping the distribution	40
	3.6. Identification	40
	3.7. Abbreviations and Terminology	40
4.	OBSERVATIONS AND RESULTS	45-252
	Family Pteromalidae	45
	4.1. Key to the genera of Pteromalidae of Kerala	46
	4.2. Systematic treatment of the taxa	61
	Subfamily: CEROCEPHLAINAE	61
	Genus <i>Cerocephala</i> Westwood	61
	<i>Cerocephala dinoderi</i> Gahan	
	Subfamily: DIPARINAE	63
	Genus <i>Dipara</i> Walker	63
	<i>Dipara bouceki</i> (Narendran)	
	<i>Dipara eukeralensis</i> Özdikmen	
	<i>Dipara gastra</i> (Sureshan & Narendran)	
	<i>Dipara hayati</i> Sureshan	
	<i>Dipara intermedia</i> Sureshan & Narendran	
	<i>Dipara kannurensis</i> Sureshan & Raseena	
	<i>Dipara keralensis</i> (Narendran)	
	<i>Dipara malabarensis</i> (Narendran & Mini)	
	<i>Dipara miniae</i> Narendran & Sureshan	

<i>Dipara nigra</i> Sureshan	
<i>Dipara yercaudensis</i> Sureshan	
Genus <i>Netomocera</i> Bouček	77
<i>Netomocera calicutensis</i> Sureshan & Raseena	
<i>Netomocera maculata</i> Raseena <i>et al.</i> ,	
<i>Netomocera minuta</i> Sureshan & Nikhil	
<i>Netomocera nigra</i> Sureshan & Narendran	
Subfamily: EROTOLEPSIINAE	84
Genus <i>Papuopsia</i> Bouček	84
<i>Papuopsia striata</i> Sureshan	
Subfamily: EUNOTINAE	85
Genus <i>Cephaleta</i> Motschulsky	85
<i>Cephaleta australiensis</i> (Howard)	
<i>Cephaleta brunniventris</i> Motschulsky	
Subfamily: HERBERTINAE	88
Genus <i>Herbertia</i> Howard	88
<i>Herbertia indica</i> Burks	
Subfamily: MISCOGASTERINAE	90
Genus <i>Halticoptera</i> Spinola	90
<i>Halticoptera agaliensis</i> Sureshan	
Genus <i>Stictomischus</i> Thomson	91
<i>Stictomischus malabarensis</i> sp. nov.	
<i>Stictomischus sahyadriensis</i> sp. nov.	
Subfamily: ORMOCERINAE	96
Genus <i>Systasis</i> Walker	96
<i>Systasis calicutensis</i> sp. nov.	
<i>Systasis convexa</i> sp. nov.	
<i>Systasis dalbergiae</i> Mani	
<i>Systasis dasyneurae</i> Mani	
<i>Systasis nigra</i> Sureshan	
<i>Systasis palakkadensis</i> sp. nov.	
Subfamily: Panstenoninae	106
Genus <i>Panstenon</i> Walker	106
<i>Panstenon collaris</i> Bouček	

<i>Panstenon flavogastrus</i> sp. nov.	
<i>Panstenon minutus</i> sp. nov.	
<i>Panstenon nigrogastrus</i> sp. nov.	
Subfamily: PTEROMALINAE	114
Genus <i>Acroclisoides</i> Girault and Dodd	114
<i>Acroclisoides maculatus</i> Sureshan & Narendran	
Genus <i>Anisopteromalus</i> Ruschka	115
<i>Anisopteromalus calandrae</i> (Howard)	
Genus <i>Callitula</i> Spinola	117
<i>Callitula anguloclypea</i> Sureshan	
<i>Callitula bambusae</i> Narendran & Jobiraj	
<i>Callitula keralensis</i> Sureshan	
<i>Callitula peethapada</i> Narendran & Mohana	
<i>Callitula rugosa</i> (Waterston)	
<i>Callitula travancorensis</i> Sureshan	
Genus <i>Chlorocytus</i> Graham	127
<i>Chlorocytus indicus</i> Sureshan	
Genus <i>Cryptoprymna</i> Förster	129
<i>Cryptoprymna elongata</i> Sureshan & Narendran	
<i>Cryptoprymna indiana</i> Sureshan & Narendran	
Genus <i>Cyrtogaster</i> Walker	131
<i>Cyrtogaster clavicornis</i> Walker	
Genus <i>Dinarmus</i> Thomson	132
<i>Dinarmus acutus</i> (Thomson)	
<i>Dinarmus basalis</i> (Rondani)	
<i>Dinarmus maculatus</i> (Masi)	
<i>Dinarmus vagabundus</i> (Timberlake)	
Genus <i>Halticopterella</i> Girault & Dodd	139
<i>Halticopterella burwelli</i> Sureshan	
<i>Halticopterella robusta</i> Sureshan	
Genus <i>Homoporus</i> Thomson	142
<i>Homoporus acuminatus</i> Sureshan & Narendran	
Genus <i>Kumarella</i> Sureshan	144
<i>Kumarella angulus</i> Sureshan	

Genus <i>Lyubana</i> Bouček	146
<i>Lyubana indica</i> sp. nov.	
Genus <i>Merismomorpha</i> Girault	148
<i>Merismomorpha microgastra</i> sp. nov.	
<i>Merismomorpha micropetiolata</i> sp. nov.	
<i>Merismomorpha minuta</i> Sureshan	
<i>Merismomorpha tamilnadensis</i> Sureshan <i>et al.</i> ,	
Genus <i>Mesopolobus</i> Westwood	157
<i>Mesopolobus keralensis</i> Sureshan & Narendran	
<i>Mesopolobus minutus</i> Sureshan & Narendran	
Genus <i>Metastenus</i> Walker	160
<i>Metastenus concinnus</i> Walker	
<i>Metastenus indicus</i> Sureshan & Narendran	
Genus <i>Miscogasteriella</i> Girault	163
<i>Miscogasteriella jayasreeae</i> Sureshan	
Genus <i>Mokrzekia</i> Mokrzecki	164
<i>Mokrzekia orientalis</i> Subba Rao	
Genus <i>Narendrella</i> Sureshan	166
<i>Narendrella nilamburensis</i> Sureshan	
Genus <i>Norbanus</i> Walker	167
<i>Norbanus acuminatus</i> Dutt & Ferrière	
<i>Norbanus equus</i> Sureshan	
Genus <i>Notoglyptus</i> Masi	170
<i>Notoglyptus scutellaris</i> (Dodd & Girault)	
Genus <i>Oxysychus</i> Delucchi	173
<i>Oxysychus coimbatorensis</i> (Ferrière)	
Genus <i>Pachycrepoideus</i> Ashmead	175
<i>Pachycrepoideus veerannai</i> Narendran & Anil	
Genus <i>Pachyneuron</i> Walker	176
<i>Pachyneuron groenlandicum</i> (Holmgren)	
<i>Pachyneuron leucopiscida</i> Mani	
Genus <i>Platecrizotes</i> Ferrière	179
<i>Platecrizotes keralensis</i> Sureshan & Raseena	
Genus <i>Propicroscytus</i> Szelényi	180

<i>Propicroscytus mirificus</i> (Girault)	
<i>Propicroscytus oryzae</i> (Subba Rao)	
Genus <i>Psilocera</i> Walker	185
<i>Psilocera heydoni</i> Sureshan	
<i>Psilocera vinayaki</i> Sureshan & Narendran	
Genus <i>Pteromalus</i> Swederus	188
<i>Pteromalus keralensis</i> Sureshan	
<i>Pteromalus metallicus</i> Sureshan	
<i>Pteromalus nigrus</i> Sureshan	
<i>Pteromalus puparum</i> (Linnaeus)	
<i>Pteromalus semotus</i> (Walker)	
Genus <i>Pycnetron</i> Gahan	196
<i>Pycnetron keralaensis</i> Raseena & Sureshan	
Genus <i>Sphegigaster</i> Spinola	198
<i>Sphegigaster anamudiensis</i> Sureshan & Narendran	
<i>Sphegigaster brunneicornis</i> (Ferrière)	
<i>Sphegigaster karnatakaensis</i> Sureshan	
<i>Sphegigaster reticulata</i> Sureshan & Narendran	
Genus <i>Syntomopus</i> Walker	203
<i>Syntomopus carinatus</i> Sureshan & Narendran	
<i>Syntomopus rajamalaiensis</i> Sureshan & Narendran	
Genus <i>Toxeumorpha</i> Girault	206
<i>Toxeumorpha minuta</i> Sureshan & Narendran	
Genus <i>Trichomalopsis</i> Crawford	208
<i>Trichomalopsis acarinata</i> Sureshan & Narendran	
<i>Trichomalopsis apanteloctena</i> (Crawford)	
<i>Trichomalopsis deplanata</i> Kamijo & Grissell	
<i>Trichomalopsis neelagastra</i> Sureshan & Narendran	
<i>Trichomalopsis nigra</i> Sureshan & Narendran	
<i>Trichomalopsis thekkadiensis</i> Sureshan & Narendran	
<i>Trichomalopsis travancorensis</i> Sureshan & Narendran	
Genus <i>Trichomalus</i> Thomson	219
<i>Trichomalus kannurensis</i> Sureshan & Narendran	
Genus <i>Trigonoderus</i> Westwood	220

	<i>Trigonoderus periyarensis</i> sp. nov.	
	Genus <i>Uniclypea</i> Bouček	223
	<i>Uniclypea kumarani</i> Sureshan & Narendran	
	<i>Uniclypea elongata</i> Sureshan & Narendran	
	Subfamily: SPALANGINAE	225
	Genus <i>Spalangia</i> Latreille	225
	<i>Spalangia impunctata</i> Howard	
	<i>Spalangia simplex</i> Perkins	
	<i>Spalangia parfuscipes</i> Ahmad	
	4.3. Pteromalidae in agroecosystems of Kerala	229
5.	CHECKLIST OF PTEROMALIDAE OF KERALA	253-271
6.	HOST PARASITE INDEX	272-298
7.	SUMMARY	299-301
	REFERENCES	302-339
	PLATES	
	APPENDIX: Geo-coordinates of collection localities	
	PUBLICATIOIS	

LIST OF MAPS

- PLATE 1 Study area (Kerala State with collection localities)
- PLATE 35 Species distribution map of genus *Dipara*
- PLATE 36 Species distribution map of genus *Netomocera*
- PLATE 37 Species distribution map of genera *Cerocephala*, *Papuopsia*, *Cephaleta* & *Herbertia*
- PLATE 38 Species distribution map of genus *Systasis*
- PLATE 39 Species distribution map of genus *Panstenon*
- PLATE 40 Species distribution map of genera *Halticoptera* & *Stictomischus*
- PLATE 41 Species distribution map of genera *Acroclisoides*, *Anisopteromalus*, *Chlorocytus*, *Cryptoprymna* & *Cyrtogaster*
- PLATE 42 Species distribution map of genus *Callitula*
- PLATE 43 Species distribution map of genus *Dinarmus*
- PLATE 44 Species distribution map of genera *Halticopterella*, *Homoporus*, *Kumarella*, *Lyubana* & *Merismomorpha*
- PLATE 45 Species distribution map of genera *Mesopolobus*, *Metastenus*, *Miscogasteriella*, *Mokrzekia* & *Narendrella*
- PLATE 46 Species distribution map of genera *Norbanus*, *Notoglyptus*, *Oxysychus*, *Pachycrepoideus* & *Pachyneuron*
- PLATE 47 Species distribution map of genera *Platecrizotes*, *Propicroscytus* & *Psilocera*
- PLATE 48 Species distribution map of genus *Pteromalus*
- PLATE 49 Species distribution map of genera *Pycnetron*, *Sphegigaster*, *Syntomopus* & *Toxeumorpha*
- PLATE 50 Species distribution map of genus *Trichomalopsis*
- PLATE 51 Species distribution map of genera *Trichomalus*, *Trigonoderus*, *Uniclypea* & *Spalangia*

LIST OF TABLES

Table No.	Title	Page No.
1	List of species of Pteromalidae associated with Agroecosystems of Kerala	232
2	Comparison of Pteromalidae species present in various Agroecosystems, stored products and forest	248

LIST OF PLATES

- PLATE-2 Fig. 1. Malaise trap, Fig.2. Sweepnet, Fig. 3. Yellow pan trap, Fig.4. Aspirator, Fig.5. Leica DFC500 digital camera, Fig.6. Leica MZ205C Microscope
- PLATE-3 Collection localities
- PLATE-4 Host rearing
- PLATE-5 Terminology
- PLATE-6 Terminology
- PLATE-7 Fig. 1. *Cerocephala dinoderi* Gahan, Fig.2. *Dipara bouceki* (Narendran), Fig.3. *Dipara eukeralensis* Özdikmen, Fig.4. *Dipara gastra* (Sureshan & Narendran), Fig.5. *Dipara hayati* Sureshan, Fig.6. *Dipara intermedia* Sureshan & Narendran
- PLATE-8 Fig. 1. *Dipara kannurensis* Sureshan & Raseena, Fig.2. *Dipara keralensis* (Narendran), Fig. 3. *Dipara malabarensis* (Narendran & Mini), Fig.4. *Dipara miniae* Narendran & Sureshan, Fig.5. *Dipara nigra* Sureshan, Fig.6. *Dipara yercaudensis* Sureshan
- PLATE-9 Fig. 1. *Netomocera calicutensis* Sureshan & Raseena, Fig.2. *Netomocera maculata* Raseena & Sureshan, Fig. 3. *Netomocera minuta* Sureshan & Nikhil, Fig.4. *Netomocera nigra* Sureshan & Narendran, Fig.5. *Papuopsia striata* Sureshan, Fig.6. *Cephaleta australiensis* (Howard)
- PLATE-10 Fig. 1. *Cephaleta brunniventris* Motschulsky, Fig.2. *Herbertia indica* Burks, Fig. 3. *Halticoptera agaliensis* Sureshan, Fig.4. *Systasis dalbergiae* Mani, Fig.5. *Systasis dasyneurae* Mani, Fig.6. *Systasis nigra* Sureshan
- PLATE-11 *Stictomischus malabarensis* sp. nov.
- PLATE-12 *Stictomischus sahyadriensis* sp. nov.
- PLATE-13 *Systasis calicutensis* sp. nov.
- PLATE-14 *Systasis convexa* sp. nov.

- PLATE-15 *Systasis palakkadensis* sp. nov.
- PLATE-16 *Panstenon flavogastrus* sp. nov.
- PLATE-17 *Panstenon minutus* sp. nov.
- PLATE-18 *Panstenon nigrogastrus* sp. nov.
- PLATE-19 Fig. 1. *Panstenon collaris* Bouček, Fig.2. *Acroclisoides maculatus* Sureshan & Narendran, Fig. 3. *Anisopteromalus calandrae* (Howard), Fig.4. *Callitula anguloclypea* Sureshan, Fig.5. *Callitula bambusae* Narendran & Jobiraj, Fig.6. *Callitula keralensis* Sureshan
- PLATE-20 Fig. 1. *Callitula peethapada* Narendran & Mohana, Fig.2. *Callitula rugosa* (Waterston), Fig. 3. *Callitula travancorensis* Sureshan, Fig.4. *Chlorocyclus indicus* Sureshan, Fig.5. *Cryptoprymna elongata* Sureshan & Narendran, Fig.6. *Cryptoprymna indiana* Sureshan & Narendran
- PLATE-21 Fig. 1 *Cyrtogaster clavicornis* Walker, Fig.2. *Dinarmus acutus* (Thomson), Fig. 3. *Dinarmus basalis* (Rondani), Fig.4. *Dinarmus maculatus* (Masi), Fig.5. *Dinarmus vagabundus* (Timberlake), Fig.6. *Halticopterella burwelli* Sureshan
- PLATE-22 Fig. 1. *Halticopterella robusta* Sureshan, Fig.2. *Homoporus acuminatus* Sureshan & Narendran, Fig. 3. *Kumarella angulus* Sureshan, Fig.4. *Merismomorpha minuta* Sureshan, Fig.5. *Merismomorpha tamilnadensis* Sureshan *et al.*, Fig.6. *Mesopolobus keralensis* Sureshan & Narendran
- PLATE-23 *Lyubana indica* sp. nov.
- PLATE-24 *Merismomorpha microgastra* sp. nov.
- PLATE-25 *Merismomorpha micropetiolata* sp. nov.
- PLATE-26 Fig. 1. *Mesopolobus minutus* Sureshan & Narendran, Fig.2. *Metastenus concinnus* Walker, Fig. 3. *Metastenus indicus* Sureshan & Narendran, Fig.4. *Miscogasteriella jayasreeae* Sureshan, Fig.5. *Mokrzekia orientalis* Subba Rao, Fig.6. *Narendrella nilamburensis* Sureshan

- PLATE-27 Fig. 1. *Norbanus acuminatus* Dutt & Ferrière, Fig.2. *Norbanus equus* Sureshan, Fig. 3. *Notoglyptus scutellaris* (Dodd & Girault), Fig.4. *Oxysychus coimbatorensis* (Ferrière), Fig.5. *Pachycrepoideus veerannai* Narendran & Anil, Fig.6. *Pachyneuron groenlandicum* (Holmgren)
- PLATE-28 Fig. 1. *Pachyneuron leucopiscida* Mani, Fig.2. *Platecrizotes keralensis* Sureshan & Raseena, Fig. 3. *Propicroscytus mirificus* (Girault), Fig.4. *Propicroscytus oryzae* (Subba Rao), Fig.5. *Psilocera heydoni* Sureshan, Fig.6. *Psilocera vinayaki* Sureshan & Narendran
- PLATE-29 Fig. 1. *Pteromalus keralensis* Sureshan, Fig.2. *Pteromalus metallicus* Sureshan, Fig. 3. *Pteromalus nigrus* Sureshan, Fig.4. *Pteromalus puparum* (Linnaeus), Fig.5. *Pteromalus semotus* (Walker), Fig.6. *Pycnetron keralaensis* Raseena & Sureshan
- PLATE-30 Fig. 1. *Sphegigaster anamudiensis* Sureshan & Narendran, Fig.2. *Sphegigaster brunneicornis* (Ferrière), Fig. 3. *Sphegigaster karnatakaensis* Sureshan, Fig.4. *Sphegigaster reticulata* Sureshan & Narendran, Fig.5. *Syntomopus carinatus* Sureshan & Narendran, Fig.6. *Syntomopus rajamalaiensis* Sureshan & Narendran
- PLATE-31 Fig. 1. *Toxeumorpha minuta* Sureshan & Narendran, Fig.2. *Trichomalopsis acarinata* Sureshan & Narendran, Fig. 3. *Trichomalopsis apanteloctena* (Crawford), Fig.4. *Trichomalopsis deplanata* Kamiyo & Grissell, Fig.5. *Trichomalopsis neelagastra* Sureshan & Narendran, Fig.6. *Trichomalopsis nigra* Sureshan & Narendran
- PLATE-32 Fig. 1. *Trichomalopsis thekkadiensis* Sureshan & Narendran, Fig.2. *Trichomalopsis travancorensis* Sureshan & Narendran, Fig. 3. *Trichomalus kannurensis* Sureshan & Narendran, Fig.4. *Uniclypea kumarani* Sureshan & Narendran
- PLATE-33 *Trigonoderus periyarensis* sp. nov.
- PLATE-34 Fig. 1. *Uniclypea elongata* Sureshan & Narendran, Fig.2. *Spalangia impunctata* Howard, Fig. 3. *Spalangia simplex* Perkins, Fig.4. *Spalangia parfuscipes* Ahmad

CHAPTER 1

INTRODUCTION

Taxonomy is the science of classifying organisms and provides discovery and identification of the basic units and their relationships. It unlocks the door to the vast store of published information pertaining to any particular species. Taxonomists identify both beneficial and injurious organisms to man. Information provided by them is used by a wide range of scientists from various fields including agriculturists to medical researchers. Taxonomy plays an important role in agriculture. It helps in the correct identification of both pest species and their natural enemies which has great significance in biocontrol programmes. The term alpha taxonomy is primarily used today to refer to the discipline of finding, describing, and naming taxa, particularly species. Before starting any kind of studies, one needs to know the correct scientific name of the organism on which the study is planned. This is important because the correct scientific name of the organism is a functional label, using which various pieces of information concerning that organism, including all the past work done on it, can be retrieved and stored ensuring easy reference (Narendran, 2006). Several years of expertise is needed to identify a species accurately and authentically. Taxonomic collections not only help to compare specimens for assessing the correct identity but also helps the pest management workers to know the details of vital information such as locality, distribution, hosts etc. In order to know which species are threatened or endangered we must know what they are and their ecological importance. Taxonomic data are also essential to conserve biodiversity.

Order: Hymenoptera

Hymenoptera is one of the most species-rich order of class insecta, comprising wasps, ants, bees and sawflies. Aguiar *et al.*, (2013) provided an updated classification of the Hymenoptera with the current numbers of genera and species described so far specified. A total of 153,088 extant species have been described, in addition to 2,429 extinct species. This order is composed of two suborders, 27 superfamilies, 132 families, 8,423 extant genera with an additional 685 extinct genera. The suborders are Symphyta (sawflies) and Apocrita (wasps, bees and ants). Parasitic hymenoptera play vital role in the terrestrial ecosystems in the control of insect pests attacking various crops. They are very important in maintaining the natural balance and also a good indicator of the ecosystem's state (Dorn *et al.*, 2002)

Superfamily: Chalcidoidea

Among various groups of parasitic Hymenoptera, the superfamily Chalcidoidea is the largest, taxonomically most difficult, ecologically perhaps most complex and economically important group (Mani, 1989). It comprises of 23 families, 2,045 genera and 22,784 species worldwide and commonly distributed in all the biogeographical areas (Aguiar *et al.*, 2013). The Chalcids can be distinguished from other parasitic microhymenoptera by the geniculate antennae with 13 or fewer segments, pronotum not curving back at the sides to touch the tegulae due to the presence of distinct prepectus, forewings with a single vein and that too confined only to the front margin, without closed cells, abdominal sternites sclerotized and lacking folds. Adults of Chalcids are free living insects that hardly feed, but larvae have diverse and often highly specialised feeding habits. All of them are not parasitic, even though they belong to Hymenoptera Parasitica. Some develop, partly or exclusively on a vegetarian diet (phytophagous), while others are entomophagous. In some cases, young host larva gets attacked by them and soon consumed, then the

entomophagous larva turns to surrounding plant tissue and completes its developments as the phytophagous one. Most Chalcids develop by feeding on other insects, rarely on some other arthropods like spiders and mites (Bouček, 1988). Entomophagous parasitoids are of two types, idiobionts and koinobionts. Idiobionts often immediately prevent the host from further growth and feeding. They particularly attack non-feeding stages of hosts, such as egg and pupae. The koinobionts coexists with the feeding host for a considerable time and they feed first slowly on the host allowing it to grow. Koinobionts are in particular larval and egg-larval parasites, its host may reach the stage of a mature larva or prepupa or even pupa, though often of reduced growth, before the parasite kills it. Primary parasitism is the most common, but hyperparasitism is also very frequent and even reaches even tertiary and quaternary levels. Multiparasitism and superparasitism are not infrequent. While many parasitic Chalcids are polyphagous (many host species), most others typically show a more or less pronounced tendency for oligophagy (several host species) and even monophagy (one host species), with strict host specificity.

Family Pteromalidae: Importance in biological control

The family Pteromalidae is one of the largest and taxonomically difficult families of Superfamily Chalcidoidea (Hymenoptera: Parasitica), members of which are distributed in all biogeographical regions of the world. Majority of Pteromalidae are primary or secondary parasitoids attacking a large range of insect orders in their various stages of development and also on some Arachnida. They are economically important, as they play a vital role in biocontrol of noxious insect pests (Sureshan, 2015). Pteromalidae comprised of 3,450 described species under 640 genera and 32 subfamilies worldwide and 279 species under 105 genera and 18 subfamilies from India (Noyes 2017).

Biological control is a natural ecological phenomenon which, when applied successfully to the pest control problem, can provide a relatively permanent, harmonious and economical result. Synthetic insecticides have many adverse effects to the nature. Target insects can develop resistance against insect pesticides and it forces to synthesize more powerful pesticides which has many side effects on consumers and environment. Therefore, more sustainable measures are required to reduce pest resurgence and to enhance the incidence of natural enemies in crop protection strategies. Many pteromalids are natural enemies of pests. Biocontrol includes release of natural enemies into the ecosystem to reduce pest population to below annoyance level (Apiwathnasorn, 2012). *Pteromalus puparum* was introduced to New Zealand in 1933 for the biological control of the cabbage white butterfly *Pieris rapae* (L.) (Barron, 2002).

Biological control by using natural enemies is one of the effective methods to control stored-product insect pests. For improvement in the use of these natural enemies, it is necessary to clarify the fauna of natural enemies of stored product insect pests. In 2004, Nakamura *et al.*, surveyed parasitoids and predators of stored rice pests all over Thailand and collected 29 species of hymenopterous parasitoids of seven families and 53 species of predators belonging to five orders from rice stores in Thailand. This included four Pteromalids, *Theocolax elegans*, *Cerocephala dinoderi*, *Anisopteromalus calandrae* and *Lariophagus distinguendus*.

Pupal parasitic wasps in the family Pteromalidae continue to receive considerable attention as biological control agents of house flies, *Musca domestica* L. and stable flies, *Stomoxys calcitrans* (L.) (Romero *et al.*, 2010). Romero collected house fly and stable fly pupae weekly from three fly habitats and evaluated for parasitism. They observed varying parasitism percentages throughout the study. Of the 6,222 house fly pupae and 1,660

stable fly pupae those produced either a host fly or a parasitoid; the genus *Spalangia* accounted for 85.7% of the total. The most common parasitoids attacking house fly and stable fly pupae were *Spalangia endius* Walker, *S. cameroni* Perkins and *S. nigroaenea* Curtis.

Flinn and Hagstrum (2001) have conducted studies to assess the effectiveness of the parasitoid wasp *Theocolax elegans* Westwood, for reducing insect fragments in flour by suppressing population of *Rhyzopertha dominica* in wheat. Their study showed that augmentative releases of parasitoid wasps into bins of stored wheat have reduced damage to wheat kernels and the number of insect fragments in flour.

Objectives of the study

1. Alpha taxonomy of Pteromalids of Kerala with special emphasis on agroecosystems.
2. Identification and description of new taxa and lesser known taxa of Pteromalidae.
3. Preparation of identification tool, dichotomous key for easy identification of various taxa.
4. Preparation of Checklist of Pteromalidae of Kerala.
5. Compilation of information on the distribution of genera and species in Kerala with special emphasis on agroecosystem.

Significance of the study

Prior to this study, 134 Pteromalids species under 58 genera were reported from Kerala (Noyes, 2017). However, the species were described and reported mainly based on collections from forest ecosystem. So, in the present studies on Pteromalids of Kerala, a special emphasis on the

agroecosystems has been given. This is for first time such a study is conducted in this region. After the study, a total of 166 Pteromalids species under 62 genera and 15 subfamilies have been reported from Kerala.

Parasitoids are important due to the emergence of pesticide resistance among pest population and to satisfy the growing demand by public for more environmental friendly methods to control pests. Use of natural enemies against harmful insects is getting great attention now. Many Pteromalids discovered during this study are collected from various agroecosystems. The results of this research could provide valuable information to economic entomologists and biological control specialists. The integration of these parasitoids into biocontrol programs require more information about their diversity, distribution, host ranges and extent in different habitats, which are yet to be determined. So far, no attempt has been made to use them for pest control in Kerala. Present contribution represents an attempt to understand the Pteromalids associated with agroecosystems.

CHAPTER 2

REVIEW OF LITERATURE

The family Pteromalidae is one of the largest families of Chalcidoidea. The study on Pteromalidae begun by Linnaeus (1758) with description of the species *Pteromalus puparum* and *Dinotiscus colon* under the names *Ichneumon puparum* and *Sphex colon* respectively from Sweden. He again described the species *Habrocytus capreae* under the name *Cynips capreae* in 1761. Fabricius, in 1787 described the species *Cheiropachus quadrum* under the name *Ichneumon quadrum* Fabricius. In 1795, Swederus erected the genus *Pteromalus* with *Ichneumon puparum* Linnaeus as type species and also described the species *Cheiropachus quadrum* under the name *Pteromalus bimaculatus* Swederus. One more species, *Cleonymus laticornis* under the name *Ichneumon depressus* Fabricius was added by Fabricius in 1798. Fabricius again in 1804 described another species *Diplolepis depressa* Fabricius. Latreille, in 1805 erected a new genus *Spalangia* with *Spalangia nigra* Latreille as type species. Latreille, in 1809 also described new genus *Cleonymus* with *Diplolepis depressa* Fabricius as type species.

Several new genera were added to the family Pteromalidae by the efforts of Spinola during the later years. He erected many genera like *Callitula*, *Chrysolampus*, *Halticoptera*, *Sphigigaster* etc in 1811. In 1820, Dalman first isolated the family Pteromalini which is the second earliest group name available in the superfamily Chalcidoidea. He also erected the genus *Cratomus* in the same paper. In 1827, Curtis described a new genus named *Colas* with *Colas dispar* Curtis as type species. Followed by this, Westwood described the genus *Cheiropachus* in 1829. He erected several genera like *Cerocephala*, *Macroglenus*, *Theocolax*, *Trignoderus* etc in 1832

(a and b). Westwood's contribution towards the taxonomy of Pteromalidae was undoubtedly noticeable.

In 1833, Walker described several new genera like *Dipara*, *Merismus*, *Miscogaster*, *Pachyneuron*, *Psilocera*, *Syntomopus* etc in his *Monographia Chalciditum* and also erected the family Miscogasteridae. Westwood, in 1833 erected a new genus, *Gastrancistrus* with *Gastrancistrus vagans* Westwood as the type species. In 1834, Walker again described a new genus *Systasis* with *Systasis encyrtoides* as type species. New species *Asaphes suspensus* and *Spalangia fuscipes* were described by Nees and Esenbeck in 1834. In 1837, Walker erected a new genus *Notanisus* with *Notanisus versicolor* Walker as the type species. This was followed by Haliday in 1844 established a group under Pteromalidae called tribus Pirenianii. Later Graham (1969) classified it as tribus Pirenini under subfamily Miscogastrinae. He also described a new genus *Agamerion* with *Miscogaster gelo* Walker as the type species in the same work.

Ratzeburg contributed significant works on Pteromalidae. In 1844, described a new genus *Roptrocerus* with *Pachyceras xylophagorum* Ratzeburg as the type species. In 1846, Walker added another new genus *Panstenon* with *Miscogaster oxylus* Walker as the type species. In 1848, he erected another genus *Macromesus* with *Macromesus amphiretus* Walker as type species. Ratzeburg, in 1852 further described a new species *Pteromalus seiboldi* Ratzeburg. In 1856, Förster made an assemblage of various genera under the family name Cleonymidae. He also placed genus *Asaphes* Walker under the name *Isocratus* in the family Miscogasteridae. Motschulsky, in 1859 erected two new genera, *Cephaleta* and *Scutellista* with *C. purpuriventris* Motschulsky and *S. cyanea* Motschulsky as type species respectively. Later in 1868, Westwood erected two new genera *Thaumasura* and *Solenura* with *T. terebrator* Westwood and *S. telescopica* Westwood as

type species respectively. Walsh and Riley, in 1869 described a new species *Chalcidiphagus* under the genus *Homoporus* Thomson. In 1872, Walker first mentioned Eunotinae under the family Pteromalidae, then Ashmead formally called subfamily Eunotinae in 1904. Westwood added two more genera *Amotura* and *Oodera* to the family Pteromalidae in 1874.

One of the significant contributions towards the study of Pteromalidae was given by Thomson during the later years. He described many genera and species in his standard work “Hymenoptera Scandinaviae” (1876, 1878). Following this, Riley in 1890 described a new genus *Ophelosia* with *O. crawfordi* Riley as the type species. Notable work was done by Howard during following years. In 1894, he described a new genus *Herbertia* with *H. lucens* Howard as the type species. In 1894, Ashmead also described a new genus *Paracarotomus* with *P. cephalotes* Ashmead as type species. This was followed by Howard who erected the genus *Aphobetus* in 1896 with *A. maskelli* Howard as the type species. Ashmead, in 1899 added one more new genus to the family, *Chalcidiscelis* with *C. koebeli* Ashmead as the type species. Ashmead’s monumental work on Chalcidoidea was published in 1904. In this work Ashmead keyed out the subfamilies, tribes and genera of Pteromalidae, Cleonymidae and Miscogasteridae; the two latter families are now included in family Pteromalidae. He first classified subfamily Eunotinae under family Pteromalidae. But Eunotinae was considered as a tribe under subfamily Pteromalinae by some worker’s like Schmiedeknecht (1909), Muesebeck *et al.*, (1951), Nikolskaya (1952) and Peck *et al.*, (1964). Later, the subfamily status of Eunotinae was retained by Graham (1969). Ashmead also added several new genera like *Acanthometopon*, *Nasonia*, *Pachycrepoideus* etc in the same monumental work on Chalcidoidea. Followed by Ashmead, Schmiedeknecht (1909) made valuable contributions to the family Pteromalidae.

In 1909, Crawford erected a new genus *Lariophagus* with *L. texanus* Crawford as the type species. Girault and Saunders, in 1910 described the genus *Muscidifurax*. Crawford's contributions to the family continued in the following year (1911a and b) also. He described a new genus *Agiommtus* with *A. sumatraensis* Crawford as the type species. In 1912, Ruschka erected a new genus *Anisopteromalus* with *A. mollis* Ruschka as the type species. During the later years (1913a,b,c,d and e) family Pteromalidae was enriched by efforts made by Girault and most of his publications were descriptions of Australian fauna. In 1913, Crawford contributed several new genera and species to the family, most of them were collected from the Indian region. The new genera erected by Crawford include *Zacalochlora*, *Trichomalopsis* and *Aplastomorpha* with *Z. milleri* Crawford, *T. shirakii* Crawford and *A. pratti* Crawford as the type species respectively. In the same paper, he also reported the species *Bruchobius laticeps* Ashmead and *Bruchobius colemani* Crawford from Bangalore and Mysore. In 1913, Kurdjumov described a new genus *Eupteromalus* with *Pteromalus nidulans* Thomson as the type species. In the same year (1913a), Girault also added several genera like *Amoturella*, *Isoplatoides*, *Coelocyboides*, *Parurios*, *Amerostenus*, *Pachyneuronella*, *Neapterolelapas*, *Sphegipterosema*, *Eurydinotomorpha*, *Sphegipterosemella* etc. In 1915, Waterston described three new species *Polycystus propinquus*, *Trigonogastra rugosa* and *Trigonogastra megacephala* from Sri Lanka. In the same year (1915a, b, c and d), Girault also contributed several genera to the family like *Miscogasteriella*, *Toxeumorpha*, *Acroclisoides*, *Trigonogastrella*, *Perilampella*, *Tomicobiella*, *Acroclisella*, *Neopolycystus* etc.

In the year 1917, Masi erected a new genus *Notoglyptus* with *N. virescens* Masi as the type species. Following this, Gahan (1919) published a report on collection of Indian parasitic hymenoptera belonging to the superfamily Chalcidoidea and Serphoidea. In the same paper he included three species of Pteromalidae, *Eupteromalus parnarae* Gahan, *Meraporus*

vandinei Tucker and *Bruchobius colemani* Crawford. Girault, in 1920 (a and b) again enriched the study of Pteromalidae by erecting genera like *Eupelmophotismus*, *Neochalcissia*, *Eurytomomma*, *Nerotolepsia* etc. In 1922, Waterston described a new genus named *Oedaule* with *O. stringifrons* Waterston as the type species. In the same year Girault further added three new genera *Westwoodiana*, *Eunotomyia* and *Australeunotus*. In 1923, Gahan and Fagan published a complete catalogue of all the known genera of Chalcidoidea in the Bulletin of United States National Museum. In this work they included all known Pteromalidae. In 1924, Ruschka described the genus *Perniphora* with *P. robusta* Ruschka as the type species. In the same year Masi described two new genera like *Conomorium* and *Dinarmoides*. A new species *Cerocephala dinoderi* Gahan was described by Gahan in 1925 from Philippines. Following this, Timberlake in 1926 described several new species of Pteromalidae, including good number collected from India. Masi also described a new genus *Glyptosticha* with two new species *G. flavipes* Masi as the type species and *G. nigricans* Masi in the same year.

Ferrière made remarkable contributions towards the study of Oriental Pteromalidae. In 1930, he described two new species under subfamily Sphegigasterinae from Sri Lanka and Malay Peninsula, viz. *Trigonogastra brunneicornis* Ferrière and *Agiommatus attaci* Ferrière. In the year 1931(a and b), he also described several new species of Pteromalidae like *Neocatolaccus sphenopterae* from Sudan, *Acroclisoides indicus* Ferrière and *Agiommatus acherontiae* from Dehra Dun. In 1933, Mokrzecki described a new genus *Mokrzeckia* with *Pteromalus pini* Hartig as the type species. In 1934, Kryger published keys to genera of certain Pteromalids. In the same year Ferrière again erected a few new genera and species under the subfamily Pireninae with a detailed key to the genera. They are *Platecrizotes* with *Platecrizotes sudanensis* Ferrière as type species and *Bairamlia nidicola* Ferrière.

In 1936, Girault erected a new genus to the family, named *Delislea* with *D. pattersoni* Girault as the type species. Gahan also described a new species of Pteromalidae named *Neocatolaccus moneicemae* Gahan in the same year from Texas. Girault (1938) again enriched the family by erecting a new genus *Austroterobia* with *A. partibrunnea* Girault as the type species. In 1939, Ferrière published a paper on Chalcid flies attacking noxious beetles in India and New Guinea. In this paper he reported two species from India, *Dinarmus coimbatorensis* Ferrière and *Aplastomorpha calandrae* Howard. In 1939, Girault's efforts also added a new genus named *Inkaka* with *I. quadridentata* Girault as type species. Mani also contributed remarkably towards the study of Indian Pteromalidae. In 1939, he reported several species of Pteromalidae under the family Miscogasteridae. In the same year, Ahmad and Mani described a new species of Pteromalidae parasitizing linseed midge *Dasyneura lini* Barnes, named *Systasis dasyneurae* Mani with detailed biology and morphology. *Dinarmus sauteri* Masi was first reported from India by Mani, in 1941 and he synonymized *D. coimbatorensis* Ferrière under *D. sauteri* Masi. In 1942, Mani again described a new species, *Systasis dalbergiae* Mani parasitic on larvae of Cecidomyiidae, *Contarinia dalbergiae* Mani from Dehra Dun. In 1946, Erdös erected a new genus *Bugacia* with *B. arenaria* Erdös as the type species.

Bhatnagar was one among the workers who contributed remarkably towards the systematics of Indian Pteromalidae. In 1951, he published an account on the family and reported several species of Pteromalidae from India. The published species include *Aplastomorpha calandrae* (Howard), *Bruchobius laticeps* Ashmead, *Pachyneuron ferrieri* Mani and *Pachycrepoides indicus* Bhatnagar under the family Miscogasteridae. In 1952, Ferrière erected a new genus *Xiphydriophagus* under the family Pteromalidae. Nikolskaya published a paper on Chalcid fauna of USSR in 1952. In this work, family Pteromalidae was treated under five separate families,

Cleonymidae (18 genera), Miscogasteridae (27 genera), Pteromalidae (62 genera), Spalangidae (four genera) and Tridymidae (24 genera). He provided diagnostic characters of each family and key to the genera in the same paper. In 1953, Mani and Kurian published a paper with information about species *Bruchobius laticeps* Ashmead and two new species *Pachycrepoideus coorgensis* Mani & Kurian and *Pachycrepoideus arcotensis* Mani & Kurian. Burks, in 1954 published a paper on list of parasitic wasps of genus *Catolaccus* and provided a detailed history of the genus and also added taxonomy and key to genera. In 1954 (a and b), Bouček contributed to the study of Pteromalidae fauna by erecting new genera like *Anisoptermalia*, *Dibrachella*, *Netomocera* and *Rohatina*. In 1955, he again described a new genus *Rakosina* with *R. deplanata* Bouček as the type species from Hungary and Czechoslovakia. Erdős also added a new genus to the family in the same year, *Neodipara* from Hungary with *N. perbella* Erdős as type species. Graham in 1956a erected a new genus *Thinodytes* with *Miscogaster cyzius* Walker as type species. He also described a new genus, *Chlorocytyus* Graham in 1956b. In the same year Delucchi added two new genera, *Cyrtoptyx* Delucchi and *Oxysychnus* Delucchi.

In 1957, Fernando contributed to the study of Oriental fauna by describing new species *Coelocyba musila* reared from the eggs of a Tettigonid from Sri Lanka. Following this, Sharma and Subba Rao described in 1958 a new species from India named *Asaphes swaraji* from Kalka (Haryana). Bouček also erected a new genus in the same year, *Austrogerrhus* with *A. gloriosus* Bouček as the type species. During following years, the family Pteromalidae was immensely enriched with several tribes, genera, species, subfamilies etc worldwide. Pteromalid fauna of India also enriched remarkably. Two new Indian species, *Neocatolaccus nupserhae* Dutt & Ferrière and *Norbanus acuminatus* Dutt & Ferrière parasitizing jute stem glider *Nupserha bicolor* Thomson and *Nupserha postbrunnea* Dutt were

described by Dutt and Ferrière in 1961 from West Bengal. In the same year Bouček also added a new species to the family, *Neodipara Masneri* Bouček from Czechoslovakia. In 1961, he also synonymised *Heterolaccus* Masi under *Pteromalus*. In 1962, Askew published a paper on collection of Chalcidoidea in the Manchester Museum in which he described eight species of Pteromalidae belonging to Cleonymidae.

In 1963, Peck published an elaborate catalogue of the Nearctic Chalcidoidea which included several genera and species of Pteromalidae. In the same year, Kamijo revised the genus *Glyptosticha* Masi and also transferred the species *Glyptosticha nigricans* Masi to another new genus *Trigonoderoides*. In the same paper, he also described a new species *G. sulcata* Kamijo. In the year 1963, Bouček published a paper on the systematics of Pteromalidae. In that paper, he reviewed the Holarctic, African, Oriental, Australian and Neotropical species of *Spalangia* Latrielle with keys and also reviewed species known from Pacific Islands. In the same paper, he redescribed the genus *Platecrizotes* Ferrière and dealt with the species misplaced under the genus *Spalangia* Latrielle. In the same year, Hedqvist also erected a new genus and two new species of Diparini from Angola. In 1964, Hedqvist published a note on tribe Diparini. According to him the tribe Diparini comprises 21 known genera and also added another genus *Diparisca* to this tribe. Bouček, in 1965a published notes on synonymy and new classification of certain Chalcids mostly from Palaeartic region and also included seven species. In 1967, Bouček again contributed a new genus *Tricolas* with *T. xylocleptis* Bouček as the type species.

In 1968, Hedqvist published notes on *Trigonoderus* with diagnostic characters of tribe Trigonoderini, key to the genera and species. His contribution to the family continued during 1969 also. He published (1969a) a paper on characters of the tribe Diparini with key to the genera of tribe, key to

the species of some genera and description of each genus. In the same year (1969b), he also published key for thirteen genera of tribe Cerocephalini and also provided biological, distributional and synonymical notes on each species. He described several new genera and species in the same paper. In 1969, Burks made a study of species of *Spalangia* Latrielle based on collections of United States National Museum. In the same work, he redescribed the types of nine species described by Ashmead, Girault, Howard and Richardson and designated lectotype for the specimens. One of the most outstanding works in the family was monograph on Pteromalidae of North Western Europe published by Graham in 1969. In this work, he dealt more than 800 species and described four new genera and 87 new species. He also provided keys up to species level, full synonymy at all levels, distribution and known biology for each species. Arora & Singh, in 1970 published a paper on biology of *Callosobruchus chinensis* in which they added notes on parasitization by *Dinarmus colemani*.

In 1971, Mani described a new species from India, *Acrodisis melanagromyzae* reared from Pupae of *Phytomyza syngenesiae* Hardy, complex leaf miner of *Helianthus* sp. In the same year, Hedqvist (1971a) described a new species *Neodipara hispanica* Hedqvist from Spain and also provided a key to the known species of *Neodipara* Erdős. In same year (1971b), in another paper he divided subfamily Diparinae into tribes Diparini, Lelapini and Netomocerini and also erected new genus *Diparomorpha* from Angola. In 1971c, he also described three new species of *Netomocera* Bouček (*N. alboscapus* Hedqvist, *N. africana* Hedqvist and *N. rufa* Hedqvist). Hedqvist continued his contribution during 1972 also. He revised the genus *Syntomopus* Walker, provided a key to European species and described a new species *S. agromyzae* Hedqvist. Bouček, in 1972a supplemented Graham's work of 1969 by the description of new taxa and revising the European species several genera of Pteromalidae. In the same year (1972b), he erected

new genus *Trichokaleva* with *T. microstigma* Bouček as type species which parasitize Sphecids in South America. A new species of *Systasis* named *S. cenchrivora* infesting on seeds of *Cenchrus* species was described by Farooqi and Ramdas Menon in 1972 from India. Roomi, *et al.*, also described a new species *Pteromalus schwenkei* from Pakistan in the same year.

In 1973a, Subba Rao erected new genus *Obtusiclava* with *O. oryzae* Subba Rao as type species, parasitizing *Pachydiplosis oryzae*, a serious pest of rice in India. Following this, in the same year, Farooqi and Ramdas Menon described two new genera *Pilkhanivora* (type species *P. nigra*) and *Parapilkhanivora* (type species *P. testacea*) from Delhi. Farooqi and Ramdas Menon also provided a key to separate three genera recorded from India under the tribe Brachyscelidiphagini. In 1973b, Subba Rao again described four new species *Norbanus africanus* Subba Rao, *Homoporus aegyptiaeus* (both from Africa), *Mokrzeckia orientalis* Subba Rao from Indonesia and India and *Mokrzeckia indica* from India with a key to *Mokrzeckia* species. In the same year, Mani *et al.*, also enriched Indian fauna of Pteromalidae by adding several species like *Chalcedectus indicus*, *Lycisia ahoma*, *Macromesus gardneri*, *Thaumasura indica* and *Zapachia beelsoni* under the family Cleonymidae. In the same paper, they also reported *Soleneura telescopica* Westwood from India.

In 1973, Bouček erected a new genus *Asoka* with evaniform gaster. In the same paper he described two new species *Asoka appendigaster* Bouček from Taiwan and *Asoka petiolatus* from Sri Lanka and Malaya. Hedqvist made a remarkable contribution to the world fauna of Pteromalidae in 1973. He erected two new genera, *Smeagolia* with type species *S. perplex* Hedqvist from South Sweden and *Nazgulia* with type species *Nazgulia petiolata* Hedqvist from Sweden. In the same year Kamijo and Takada studied Japanese Pteromalid fauna and their paper dealt with genera *Asaphes* Walker with two

species, *Coruna* Walker with two species, *Pachyneuron* Walker with five species and *Euneura* Walker with two species. They also studied the Pteromalid hyperparasitoids of Aphids. In 1974, Mani *et al.*, contributed remarkable work on Indian Pteromalidae in which they described seven new species of *Pachyneuron* with key to the species and also redescribed the species *Coruna clavata* Walker. In the same year (1974a), Bouček erected one new genus *Szelenyinus* with *S. brevicornis* as type species from Italy. In the same year (1974b), he published another paper with reclassification of Eutrichosomatinae as a subfamily of Pteromalidae and provided keys to the genera and species of the subfamily.

In 1975, Saraswat & Mukerjee reported four species under the family Pteromalidae and three species under Cleonymidae from India. Another remarkable work during the year 1975 was that of Burks. He reviewed 72 species of Chalcidoidea described by Walker from North America. This work included 24 species of Pteromalidae. In the same year (1975a), Hedqvist also published keys to the Swedish species of *Halticoptera* Spinola, *Halticopterina* Erdős, *Schimitschekia* Bouček and *Thinodytes* Graham. He also described *Halticoptera longipterolus* Burks in the same year (1975b). In 1976, Huggert erected a new genus *Zdenekia* with *Zdenekia plana* as type species and described *Spathopus monotanus*, *Spanopus hedqvisti* and males of *Stichomischus longiventris*. Kundra in the same year, published on some aspects on the biology of *Dinarmus vagabundus* Timberlake and listed its hosts *Callosobruchus chinensis* and *Callosobruchus maculatus*. Yoshimoto's contribution was also noteworthy during the year 1976a. He described a new genus *Playaspalangia* with *P. rothi* as type species from Mexico. Another excellent work on Pteromalidae was published in the same year by Bouček. In that work, he described seven new genera and eleven new species of Pteromalidae from Africa and synonymized six generic and two specific

names. In 1976, Gordh also described a new genus *Arachnopteromalus* from Missouri.

In 1977, Hedqvist contributed three new genera from South Sweden, *Brimeria*, *Brokkia* and *Elderia* with type species *Brimeria clavata* Hedqvist, *Brokkia paradoxa* Hedqvist and *Elderia suecica* respectively. In the same year, Bouček contributed a remarkable work in which he provided summary of work carried out by him over nineteen years on fauna of Yugoslavia. In that work he treated total 949 species of Chalcidoidea alphabetically which included 253 Pteromalid species. In the same year Kamijo also described a new genus *Spinancistrus* from Japan. Yoshimoto made remarkable contribution towards the family in 1977. He described (1977a) a new species *Spalangiopelta ciliata* from North America. In another paper (1977b) he made a revision of North American Diparinae.

Bouček *et al.*, in 1978 published the first authentic and comprehensive work on Pteromalidae from India. In that work they reviewed the family which included 82 genera in which 56 with 86 identified species and for another 26, species couldn't be identified. This taxonomic reclassification resulted in many changes including 21 generic transfer and 30 new specific synonymies. In the same year, Bouček erected two new Oriental genera *Manineura* and *Oricoruna*. In the same year, Hedqvist also contributed several new genera and species. He erected (1978a) a new subfamily Dvaliniinae under Pteromalidae and provided key to the known genera of this subfamily. In another paper (1978b), he described a new genus *Guancheria* Hedqvist. In 1979, Takada and Kamijo published a paper which deals with hymenopteran parasites of garden pea leaf miner *Phytomyza horticola* Gourea which included four species of Pteromalidae. In the same year, Graham listed 27 species of Pteromalidae based on study of Chalcidoidea from Madeiran Island and also included one new species *Miscogaster glabricula* Graham. In

the same year, Hedqvist also described two new species of Pteromalidae, *Pteromalus sylveni* and *Pteromalus osmiaae* from Sweden.

Prinsloo, in 1980 studied the African fauna of Pteromalidae. He transferred the species *Bruchobius magnus* Rohwer to *Dinarmus*. Eventhough *Dinarmus* Thomson was well known senior synonym of *Bruchobius* Ashmead, the species *B. magnus* was not transferred earlier. In the same paper, he also recorded *Oniticellobia reticulata* Bouček from the brood balls of *Oniticellus* sp. from South Africa. In 1980, Farooqi added a new species to Indian Pteromalid fauna named *Cephaleta hayati* Farooqi reared from *Cerococcus* sp. from Maharashtra, Madhya Pradesh and Tamil Nadu. In the same year, Wiebs described three new species of fig insects, *Odontofroggatia corneri*, *O. galili*, *O. ishi*, belonging to subfamily Epichrysomallinae of Pteromalidae from Perak, Malaya, Solomon Islands and Penang.

In 1981, Subba Rao contributed much to the family Pteromalidae, his efforts yielded five new species from Oriental region which include *Propicroscytus indicus*, *Colotrichnus agromyzae*, *Mokrzeckia menzeli*, *Gastrancistrus magniferae* and *Psilocera ghanii*. In the same paper, he also published key to the species of *Propicroscytus* and *Mokrzeckia* and recorded *Mokrzeckia orientalis* for the first time from Thailand. Grissel, in 1981 redescribed the species *Cerocephala eccoptogastris* Masi and *C. rufa* Walker and according to him the name *C. rufa* has been incorrectly applied to a Nearctic species, that is actually the Palaearctic species *C. eccoptogastris* Masi. In the same year, Graham also described a new European genus *Mauleus* from Madeira Island.

Japanese fauna of Pteromalidae was also remarkably enriched during 1981. In this year (1981a), Kamijo described three new species *Callitula fulvipes*, *C. nigricoxa* and *C. yasudai* from Japan. In another publication (1981b), he added four new species *Spaniopus japonicus*, *S. nigriceps*,

Lariophagus kuwayamai and *L. obtusus* to the family. In another paper (1981c), he studied Pteromalids reared from Cynipid galls from Japan and reported six species. In 1982, Kamijo and Grissel synonymised *Eupteromalus* Kurdjumov with *Trichomalopsis*. In the same paper, they also synonymised *T. parnarae* Gahan with *T. apanteloctena* Crawford and redescribed *T. shirakii* Crawford. Kamijo and Grissel in 1982, described new species *Trichomalopsis deplanata* reared from *Oulema oryzae*, puparia of *Agromyza yanosis* on wheat, tachinid puparia on cocoons of *Apanteles glomeratus*, *Ostrinia furnacalis*, larvae of *Parnara* sp on paddy. In the same paper, they provided host records of *Trichomalopsis apanteloctena* which include *Peropidas mathias*, *Cnaphalocrosis medinalis*, *Oulema oryzae*, *Agromyza oryzae* etc. Kamijo continued his contributions towards Japanese fauna in the following years also. He redefined the genus *Elatoides* Nikolskaya in 1983a and placed it in the tribe Sphegigasterini of Miscogasteridae. In the same year (1983b) he described a new genus *Usubaia* with *U. liparae* as type species.

Farooqi, in 1983 published an account on Indian Eunotinae and provided a key to the Indian genera. In the same paper, they also provided key to the Indian species of *Cephaleta* Motschulsky and described a new species *Ophelosia indica* Farooqi. Graham contributed much to the European fauna in the year 1984. He listed (1984a) 11 species of Pteromalidae from Madeira Island. In another paper (1984b) he provided an account on Pteromalid wasps associated with *Euphorbia* plants. In 1984, Prinsloo published an illustrated guide to the parasitic wasps associated with pests of citrus plants in South Africa, which included four Pteromalid species. In the same year, Narendran reviewed the Pteromalid species affecting plant galls in India.

In 1985, Grissel made a remarkable contribution by proposing new synonymies and nomenclatural changes in Pteromalidae. They were Dvaliniinae Hedqvist 1978 to Colotrechininae Thomson 1876, *Paradibrachys*

Girault 1917 to *Pseudocatolaccus* Masi 1908, *Systellogaster* Gahan 1917 to *Tritneptis* Girault 1908. Farooqi and Subba Rao in the same year published a key to the Indian genera of Pteromalidae in the review of Chalcidoidea of India and adjacent countries published by Subba Rao and Hayat. Bouček, in 1986 erected a new subgenus *Mangistrus* under the genus *Gastrancistrus* with description of a new species *Gastrancistrus (Mangistrus) cherryi*. Farooqi and Subba Rao contributed a catalogue of Pteromalidae to the catalogue of Chalcidoidea published by Subba Rao and Hayat in 1986. This catalogue included 78 genera and 90 species. In the same year, Farooqi & Subba Rao in their publication on Pteromalidae of India and adjacent countries listed *Hapalia machaeralis*, *Hybloea puera*, *Apanteles malevolus*, *Apanteles obliqua*, *Miocolus dubius* as hosts of *Mokrzekia menzeli*. Heydon made a remarkable contribution to the family. In 1988a he reviewed world species of *Notoglyptus* Masi. He added four *Notoglyptus* species, *N. bidentatus*, *N. luteicrus*, *N. nesiotus* and *N. tzeltales*. Another excellent work by him also came in the same year (1988b), in which he reviewed the Nearctic species of *Cryptoprymna* Förster. He also described a new genus *Polstonia* and modified the Graham's (1969) key to the genera of Sphegigasterini to include the genus *Polstonia*.

In 1988, Heydon and Grissel reported the genus *Toxeuma* Walker with four new species for first time from the Nearctic region. In the same paper, they also reported the Palearctic species of *Merismus*, *M. megapterus* Walker and *M. lasthenes* (Walker) from the Northern Nearctic region. Heydon and La Berge again in 1988 reviewed the North American species of *Sphegigaster* with a key to the species. Hidaka *et al.*, in 1988, published a paper on recent studies on natural enemies of gall midges *Orseolia oryzae*, in which several kinds of parasitoids like *Propicroscytus mirificus* and *P. oryzae* were identified and relationship between parasitic activities and developmental stages of the host insect were also clarified. African fauna of Pteromalidae

was also enriched during 1988. Rasplus described two new species of *Anisopteromalus*, *A. apiovorus* and *A. caryedophagus* from Ivory Coast. An excellent work of Bouček on Australasian Chalcidoidea came during 1988. In that work he made a biosystematic revision of 14 subfamilies of Australasian Chalcidoidea which included 28 subfamilies of Pteromalidae with 235 genera. He provided brief surveys on the biology, morphology, distribution of family and a good key to the genera. In 1989, Mani published an elaborate work on Chalcid fauna from India and adjacent countries in two parts and part one contains information about all the known genera and species of Pteromalidae. In 1990, Grissel and Schauff published a handbook of the families of the Nearctic Chalcidoidea with an account of family Pteromalidae also.

Bouček and Rasplus made a noteworthy contribution to the West Palaearctic fauna in 1991. They published a illustrated key which included 221 genera and ten subgenera with 491 elaborate drawings and 110 electroscan photographs. In the same year (1991a), Darling revised the world species of *Spalangiopelta* Masi. He recognized ten species including three new species under the genus. In the same year (1991b), he again erected a new genus *Bopha* from South Africa and this was the first record of subfamily Ceinae outside the Holarctic and Neotropical regions. In 1991, Nauman revised the Australian genus *Enoggera* Girault and redescribed five known species. In the same year, Askew also contributed a new European species *Cryptoprymna paludicola*. In 1992a Graham described a new species *Zdenekiana bisulcata*. He further added (1992b) to the family by revising Western European *Psilocera* Walker with description of three new species *P. seiugata*, *P. rufipes* and *P. confuse*. In the same year (1992c) he described one more species *Synedruss crassicornis*. Askew contributed much to the family during 1992. He reported seven species of Pteromalidae first time from Britain and mentioned uncommon species. In 1992, Narendran *et al.*, published a paper on some important and beneficial Chalcids associated with

sericulture, in which they provided systematic treatment of Pteromalid parasitoids *Pachycrepoideus veeranai* Narendran & Anil and *Spalangia endius* Walker attacking *Exorista sorbillans* Weid, uzifly, the notorious pest of silk worm from Karnataka, India.

Graham's contribution towards Pteromalidae continued during 1993 also. He revised the European species of genera *Trignoderus* Westwood and *Plutothrix* Förster. In the same year, Dawei and Huang described new species *Lamprotatus carinatus*. In 1993, DeSantis and Fidalgo added four new species of *Aditrochus* Ruebsaamen to the family. They are *A. bouceki*, *A. chilensis* from Chile and *A. gnirensis* and *A. coihuensis* from Argentina. *A. gnirensis* emerged from galls on *Nothofagus antartica* and *A. coihuensis* from galls on *N. dombeyi*. They also redescribed the species *A. fagicolus* Ruebsaamen emerged from galls on *N. pumilio*. In 1994, Delvare and Rasplus described a new genus *Spodophagus*, parasite of noctuid moth *Spodoptera littoralis* Bioisduval which is resistant to several classes of insecticides in Madagascar. This genus was described with a single species *S. lepidopterae* (Risbec, 1952) which was originally described from Madagascar by Risbec in the genus *Oxyglypta* Förster. A new species *Merismomorpha yousufi* was described by Agarwal from India in the same year.

In 1995, Darling described two new Palaearctic species *Spalangiopelta alboaculeate* from England and *S. shiko* from Japan. In the same year (1995a), Sureshan and Narendran erected a new genus *Neoepistenia* with *N. coorgensis* as type species from Karnataka, India. Ahmed & Khan in 1996 published a paper on some biological aspects of *Theocolax* Westwood parasitizing on *Sitophilus oryzae*. In the same year, Garrido and Nieves contributed much to the family. They revised six species of Pteromalidae described by Mercet, one from Fernando Poo and five from Spain. They synonymised *Mesopolobus blascoi* Askew with *Eutelus maculipennis* Mercet

and *Hispanolelaps coxalis* Mercet with *Dipara petiolata* Walker. In 1996 Kamijo made a valuable contribution to Japanese fauna. He described a new species of *Merismus* Walker, *M. bidentatus* Kamijo and also recorded *M. megapterous* Walker first time from Japan with host data (1996a). In the same year (1996b), he described four new species of *Cleonymus* Latreille with a key to the Japanese species. He synonymised *Paracleonymus* Masi with *Cleonymus* Latreille in the same paper. In 1996c, he recorded *Schimitschekia populi* Bouček for first time from Japan which reared from *Paraphytomyza populi* Kaltenbach. In the same paper, he described another species *Schimitschekia katoi* reared from *Chromatomyia sikazuræ* Sarakawa. In 1996, Sureshan and Narendran described new species of Pteromalid *Agiommatus geethæ* parasitizing the eggs of *Spodoptera litura* (Fabricius) on mulberry from Karnataka.

Bhuiya *et al.*, in 1997 reported *Cephaleta australiensis* attacking *Cerococcus* sp. on guava. In the same year, La Salle *et al.*, described a species *Idioporus affinis* parasitizing on white fly from Central America and created new tribe Idioporini for it. Narendran and Mini also described a new species *Cleonymus malaicus* from Malaysia in 1997. Xiao & Huang, in 1999a published a paper on preliminary study of pteromalid diversity in China. In the same year (1999b), they also recorded the genus *Stenomalina* for first time from China with description of a new species *S. pilosa*. In 2000a, Sureshan described a new species *Heydenia tuberculata* from Karnataka, India. In 2000, Xiao & Huang made a taxonomic study on *Asaphes* from China with description of four new species. They further contributed to Pteromalid fauna of China by describing two new species of *Cheiropachus* Westwood in 2001a. Xiao & Huang, in the same year (2001b) reviewed Eunotinae from China in which they provided hosts records for *Cephaleta* species. *Cephaleta australiensis* attacks *Coccus* sp., *Cerococcus* sp., *Coccus hesperidum*, *Coccus viridis*, *Ferrisia virgata*; and some coccids on *Hibiscus rosasinensis*,

Alternantia philoxeroides and cotton. Hosts of *Cephaleta brunniventris* include *Saissetia* sp., *Ceroplastes rubens*, *Coccus* sp., *Pseudococcus* sp. In the same paper, Xiao and Huang also listed hosts of *Moranila californica*. This species was mainly a parasitoid of scale insects, particularly Coccidae, and rarely as a hyperparasitoid through encyrtids and was reared from coccids on oak tree and *Rosanococcus* sp. Other hosts include *Asterolecanium pustulans* (Asterolecaniidae); *Ceroplastes ceriferus*, *C. Xoridensis*, *C. rubens*, *C. rusci*; *Coccus hesperidum*., *Parasaissetia nigra*, *Saissetia hemisphaerica*, *S. oleae* (Coccidae); *Antonina bambusae* (Pseudococcidae).

Dorn *et al.*, in 2002 made an investigation on the potential of parasitoids for on-farm control of a coleopteran pest feeding within stored grains. *Dinarmus basalis* proved superior to *Anisopteromalus calandrae* to control *Acanthoscelides obtectus* and in a long term storage trail, it suppressed bruchid population considerably. Gibson, in 2003 published phylogenetics and classification of subfamily Cleonyminae. A survey conducted by Reji *et al.*, in the same year, revealed the occurrence of 7 hymenopterans parasitizing the maggots of *Liriomyza trifolii*, consisting one species of Pteromalidae, *Herbertia indica* Burks. In 2003, Sureshan and Narendran published a checklist of Pteromalidae from Indian Subcontinent, in which they listed 84 genera with 185 identified species and 12 genera with unidentified species. In 2004, Nakamura *et al.*, published a paper on natural enemies of stored rice insect pest in which they recorded 29 species of hymenopteran parasitoids collected from rice stores of Thailand. They estimated *Theocolax elegans*, *Cerocephala dinoderi*, *Anisopteromalus calandrae*, *Lariophagus distinguendus* as potential biological control agents for stored-rice insect pests. Heydon & Hanson, in 2005 reviewed the subfamily of the New world Pteromalidae for first time. In 2005a, Sureshan reported *Soleneura ania* emerged from decayed *Ficus* wood infested with Cerambycid beetle *Olenecamptus bilobus* Fabricius from Maharashtra. In the same year (2005b),

Sureshan recorded the genus *Papuopsia* Bouček for first time from Oriental region with a new species from Sri Lanka, *Papuopsia striata*. In 2005a, Sureshan and Narendran added new species *Dipara intermedia* to Pteromalid fauna of Sri Lanka. Sureshan & Narendran, in 2005b described a new species *Theocolax radhakrishnani* reared from pieces of dead wood of *Ficus* plant, which was heavily infested with wood boring beetles. In the same year (2005c), they again described a new species *Ophelosia maculata* reared from coccids on *Hibiscus rosasinensis* from Maharashtra, India.

In 2006, Mitroiu & Popescu, published first study of the pteromalid fauna in Piatra Craiului National Park, Romania in which twenty species of Pteromalids were reported belonging to the subfamilies Panstenoninae, Miscogasterinae and Pteromalinae. In 2006a, Sureshan recorded the genus *Coelopisthia* Förster for first time from Oriental region with a new species from Sri Lanka, *Coelopisthia lankana*. In 2006b, he further enriched the Pteromalid fauna of Sri Lanka by erecting a new genus *Neolyubana* Sureshan with *Neolyubana noyesi* as type species. In 2007, Baur *et al.*, reviewed the species of *Mesopolobus* reared as parasitoids of *Ceutorhynchus* (Coleoptera: Curculionidae) with description of new species *M. gemellus* Baur & Muller. In 2007, Hanson published a paper on some biological aspects of *Lariophagus distinguendus* against *Sitophilus granarius*. Narendran *et al.*, in 2007 reviewed *Pachyneuron* species of Middle East countries and described six new species from Yemen. Sureshan in 2007a, described a new species *Lyubana longigastra* from Sri Lanka which was the first record of genus from the country. Gibson, in 2009 revised *Spalangia* Latreille and *Playaspalangia* Yoshimoto, the only two genera classified in Spalangiinae for the New World. Thirty-one species of *Spalangia* and a single species of *Playaspalangia*, *P. rothi* Yoshimoto, were recognized from the New World.

In 2009, Sureshan added one more species *Heydenia gibsoni* to Pteromalid fauna of Srilanka. In the same year, Sureshan and Talukdar recorded the genus *Epipteromalus* Ashmead for first time from Old world with description of new species *Epipteromalus bengalensis* associated with spider egg sacs from India. Xiao *et al.*, in 2009 reported *Pachyneuron groenlandicum* reared from host *Pieris* sp. and *Dendrolimus* (Lepidoptera). Romero *et al.*, in 2010 published a paper on distribution and abundance of natural parasitoid populations of house flies and stable flies. From September 2001 through September 2002, house fly and stable fly pupae were collected weekly from three fly habitats at the University of Florida Research dairy in North Central Florida and evaluated for parasitism. The most common parasitoids attacking house fly and stable fly pupae were *Spalangia endius* Walker (33.9% and 27.3%), *S. cameroni* Perkins (27.9% and 40.6%), and *S. nigroaenea* Curtis (21.0% and 24.8%), respectively. In 2010a, Sureshan described a new species *Anisopteromalus ceylonensis* from Sri Lanka. In the same year (2010b), he described a new species *Netomocera ramakrishnai* from India and also provided a key to separate world species of *Netomocera*. In 2010c, Sureshan published a paper on taxonomic studies on collection of Pteromalidae from Patna and nearby districts of Bihar, in which he listed 34 species and described two new species *Ischyroptyx biharensis* and *Merismomorpha intermedia*.

In 2012, Narendran *et al.*, reviewed the oriental species of the genus *Syntomopus* Walker with description of new species *S. amaravathicus*. Apiwathnasorn in 2012, reviewed the literature for surveys of parasitoid of filth flies in Thailand. He described the ecological niches and biology of common species, including *Spalangia cameroni*, *S. endius*, *S. nigroaenea* and *Pachycrepoideus vindemmiae*. Ghahari & Huang 2012, reported *Agromyza schineri* Giraud (Diptera: Agromyzidae) as host of *Sphegigaster stepicola* Bouček in their work on study of the Pteromalidae (Hymenoptera:

Chalcidoidea) from Western and Northwestern Iran. Marchiori *et al.*, in 2012 reported the occurrence of *Pachycrepoideus vindemmiae* (Rondani) and *Spalangia cameroni* Perkins as parasitoids of *Ornidia obesa* Fabricius (Diptera: Syrphidae) in poultry farms in Morrinhos, Goicis, state Brazil. Samples of chicken feces were collected at two weeks intervals and taken to the laboratory. Each pupa was placed in capsules of gelatin until the emergence of dipterous or their parasitoids. In 2013, Sureshan *et al.*, revised Oriental species of *Merismomorpha* Girault with description of a new species *Merismomorpha tamilnadensis* parasitizing *Cerococcus* sp. on *Hibiscus* sp. In 2013a, Sureshan revised Oriental *Dipara* Walker with descriptions of six new species from India. In 2014, Heydon reviewed subfamily Coleocybinae of south temperate New World. In the same year, Sureshan revised the Oriental species of *Psilocera* Walker with description of three new species *P. keralensis*, *P. namdaphaensis* and *P. intermedia*.

In 2014, Raseena *et al.*, described a new species *Notanisus elongatus* from Southern Western Ghats. In 2014, Gupta and Sureshan described a new species *Anisopteromalus indicus* reared from the pupa of lymantriid on *Saccharum officinarum*. In 2014a, Sureshan *et al.*, described a new species *Trichomalopsis uziaie* hyperparasitizing the silk worm uzi fly *Exorista bombycis* (Louis) on *Bombyx mori* Linn. from Karnataka. In 2015, Hassan Ghahari published an annotated catalogue of the Iranian Pteromalidae, in which 227 species under 114 genera and 16 subfamilies were listed. In 2015, Sureshan & Nikhil added one new species *Netomocera minuta* which collected from Karnataka. In 2016, Askew & Mifsud published a preliminary check-list of the Chalcidoidea (Hymenoptera) of the Maltese Islands. They listed 147 species of Chalcidoidea including 33 Pteromalidae. Mitroiu, in 2016, reviewed world genera of Ceinae, with the description of two new Palearctic species of *Spalnsiopleta* Masi. In 2016, Sureshan *et al.*, described a new species *Halticoptera cavatura* from Tamil Nadu. In 2016 Raseena *et al.*,

described a new species *Netomocera maculata* from Eastern Ghats, Tamil Nadu. In 2017a, Sureshan *et al.*, described a new species *Psilocera manickai* from Tamil Nadu and provided key to the Oriental species of *Psilocera* Walker.

2.1. PREVIOUS WORK DONE ON TAXONOMY OF PTEROMALIDAE OF KERALA

Sureshan and Narendran made a valuable contribution towards the study of Pteromalid fauna of Kerala. In 1990, they described two new species, *Eurydinotomorpha malabarensis* Sureshan & Narendran and *Netomocera nigra* Sureshan and Narendran from Kerala with keys to the Oriental species of *Eurydinotomorpha* Girault and Afro-Oriental species of *Netomocera* Bouček. In that paper, they synonymised *Asoka* Bouček with *Eurydinotomorpha* Girault. In 1991, Narendran *et al.*, first reported the genus *Delislea* Girault from Oriental region with description of new species *D. rahimani* from Kerala. Sureshan and Narendran made a valuable contribution in 1994. They described new species under the little known genus of Pteromalidae, *Oniticellobia longigastra* Sureshan and Narendran from Kerala (1994a). In the same year (1994b), they recorded two genera *Trichomalus* Thomson and *Uniclypea* Bouček first time from India with new species *Trichomalus kannurensis* Sureshan and Narendran and *Uniclypea kumarani* Sureshan and Narendran from Kerala.

In 1995b, Sureshan and Narendran described two new species, *Psilocera vinayaki* Sureshan and Narendran and *P. clavata* Sureshan and Narendran. Since the name *Neoepistenia* is already occupied by *Neoepistenia* Hedqvist (1958), in 1997a Sureshan and Narendran proposed a new name *Grooca* for *Neoepistenia* Sureshan and Narendran (1995a). In 1997b, Sureshan and Narendran contributed two new species *Uniclypea elongata* and *Inkaka keralensis* from Kerala. In the same year (1997c), they described two

species of genera *Sphegigaster* Spinola namely *S. anamudiensis* and *S. reticulata*. In the same paper they also recorded the species *S. brunneicornis* Ferrière and *S. stepicola* Bouček for first time from Kerala. In 1998, Sureshan and Narendran erected a new genus *Paraiemea* with *Paraiemea vishnuae* as type species. He described one more new species *Paraiemea convexa* Sureshan and Narendran in the same paper.

Sureshan made a noteworthy contribution in 1999 also. In this year (1999a), he erected two new genera *Kumarella* with *Kumarella angulus* as type species and *Narendrella* with *Narendrella nilamburensis* as type species. In the same paper, he described another new species *Miscogasteriella jayasreeae* Sureshan. In the same year (1999b), he recorded a very rare subfamily Storeyinae for first time from India with description of a new species *Storeya minuta* Sureshan from Kerala. In 1999, Sureshan and Narendran described three species of *Syntomopus* Walker, *S. carinatus*, *S. rajamalaiensis* and *S. nigrus*. They also provided a key to the Indian species of *Syntomopus* Walker in the same paper. In 2000a, Sureshan and Narendran added three new species to the family Pteromalidae. They are *Cryptoprymna elongata* Sureshan & Narendran, *Cryptoprymna Indiana* Sureshan & Narendran and *Toxeumorpha minuta* Sureshan & Narendran. In the same year (2000b), they reported the genus *Homoporus* for first time from India with a new species *Homoporus gladius* and also recorded species *Pachyneuron solitarium* (Hartig) for first time from India.

In 2000b, Sureshan described a new species *Chloroscytus indicus* with key to species of Indian Subcontinent. In the same year (2000c), he again described three new species of genus *Merismomorpha*, *M. minuta*, *M. elongata* and *M. truncata* with key to the Indian species. In 2001a, Sureshan and Narendran described one new species of genus *Homoporus* Thomson, *H. acuminatus*. In the same year, Narendran and Sureshan contributed three new

species to Pteromalid fauna which include *Dipara keralensis*, *D. miniae* and *D. mohanae*. In 2001a, Sureshan further enriched the family by describing four new species of *Halticopterella* Girault and Dodd. This was the first record of Genus *Halticopterella* from India. In 2001, he again described three new species of *Pteromalus* Sewderus (2001b) and two new species of *Psilocera* Walker (2001c). In 2001b, Sureshan and Narendran published a paper on taxonomic studies on *Dinarmus* Thomson of India, in which they dealt six species and redescribed *Dinarmus maculatus* (Masi). In the same year (2001c), Sureshan and Narendran published a paper on Indian species of *Trichomalopsis* Crawford in which they described six new species.

In 2002a, Sureshan reported the genus *Cyclogastrella* Bukowski for first time from the Oriental region with description of a new species *C. nigra* from Kerala. In the same paper he also provided a key to the species of *Psilocera* Walker from Indian subcontinent. Sureshan in 2002b described three new species of Pteromalidae from Eravikulam National Park, *Stictomischus turneri*, *Systasis nigra* and *Trichomalus keralensis*. In the same year (2002c), he contributed four new species of *Callitula* Spinola to the Pteromalid fauna of Kerala. In 2002a, Sureshan and Narendran added new species *Sphegigaster indica* to the family. In the same year Sureshan and Narendran further enriched the family by describing several new species, *Metastenus indicus*, *Acroclisoides maculatus* (2002b), *Mesopolobus keralensis*, *Mesopolobus minutus* and *Mesopolobus harithus* (2002c). In 2003b, Sureshan described a new species *Halticoptera agaliensis*. In 2004, Narendran *et al.*, reported *Macroglenes* Westwood for first time from India with description of a new species from Kerala, *Macroglenes sivani*. In 2005, Narendran and Sudheer in their work on taxonomic review of Chalcidoids reported the association of *Acroclisoides indicus* with *Ficus benghalensis* Linnaeus and also mentioned its Pentatomid host. In 2011, Sureshan *et al.*, reviewed the Oriental Eunotinae with description of new

species *Cephaleta elongata* emerged from *Ceroplastes* sp. on a wild plant, from Kerala and recorded *Mesopeltita truncatipennis* (Waterston) for first time from Oriental region.

In 2013, Sureshan and Nikhil described a new species *Miscogasteriella bijoyi* from Southern Western Ghats, Kerala. In the same year, Sureshan *et al.*, identified a new host for *Solenura ania*, the beetle *Clytocera chinospila* Gahan (Cerambycidae) from a piece of decaying wood of an unidentified forest tree. In 2013, Sureshan & Balan described a new species of Pteromalidae parasitizing wood boring beetles *Cleonymus kamijoi* and two species *Trignoderus pulcher* walker and male *Heydenia tuberculata* Sureshan. Sureshan *et al.*, in 2014b published two new distributional and host records for *Spalangia simplex* and *S. impunctata*. They were emerged from the pupae of *Drosophila* sp. breeding in the decayed tender jack fruits (*Artocarpus heterophyllus*). In the same year (2014c), Sureshan *et al.*, described four new species of *Dipara* Walker, which are *D. andamanensis* Sureshan and Raseena, *D. angulata* Sureshan and Nikhil, *D. kannurensis* Sureshan and Raseena and *D. yercaudensis* Sureshan. In 2015, Sureshan and Raseena described two new species *Dipara ponmudiensis* and *Cleonymus indicus* from Southern Western Ghats of India. In 2015, Sureshan *et al.*, described a new species *Platecrizotes keralensis* reared from the host infested plant material, putrefied bitter gourd collected from mixed vegetable field. In 2017, Raseena *et al.*, reported the genus *Pycnetron* Gahan for first time from India with a new species *Pycnetron keralaensis*.

CHAPTER 3

MATERIALS AND METHODS

3.1. Study area- Kerala

For taxonomic studies of Pteromalidae, the specimens were collected from all fourteen districts of Kerala (Plate 1), including both agroecosystems, forests and other habitats. Kerala lies on the southern part of India, bordered by Karnataka state to north and northeast and Tamil Nadu to the east and south. It lies closer to the equator, yet is bestowed with a pleasant and equable climate throughout the year. This is because of the land's proximity to the Arabian sea and the presence of Western Ghats on the east. The area of the state is 38, 863 km² which forms 1.18% of total land area of India. It lies between latitude 8.32187 and 12.7549 N and longitude 74.89400 and 77.15012 E.

Geography

Geographically Kerala can be divided into three distinct regions:

- 1) Highlands are above 76metres altitude, which mainly include forest areas and plantations, which cover an area of 18653.5 km². The highlands slope down from Western Ghats, generally having an average altitude of about 900 metres with several peaks well over 1800 metres. Anamudi is the highest peak with 2695 metres of height. 41 of Kerala's west flowing rivers and three of its east flowing rivers originate at Highlands. Major crops cultivated in the high lands are coffee, cardamom, tea, rubber and other spices.
- 2) Midlands, the second region, is the area between 7.6 and 76 metres altitude which lie between the mountains and low lands or coastal area.

This geographic area is suitable for cultivation of many crops like coconut, cashew, arecanut, tapioca, banana, rice, ginger, pepper, sugarcane and different varieties of vegetables.

- 3) Lowlands are areas of below 7.6 metres altitude, which are formed by coastal regions, mainly formed by deposition of sediments brought down by rivers of Western Ghats and sand deposited by sea waves. Coconut and paddy are the main crops cultivated in lowlands.

Climate

Climate of Kerala is monsoonal and divided in to three: summer, monsoon and winter. Summer usually starts in the second half of February and ends by May. This is followed by the monsoon. South west monsoon period commences in June and lasts till September and North east monsoon period extends from October to November. This is followed by winter which extends till the beginning of February. Geographically shut off from the rest of India by the presence of Western Ghats, heavy rainfall and warm climate make Kerala to preserve flora and fauna of great diversity. This also provides an excellent habitat for insect fauna throughout year.

Agriculture

Kerala's most essential or the staple crop is the rice or paddy. About 600 varieties of rice are grown in different paddy fields of Kerala (Santha, 1993). Besides production of the main crop, Kerala is also a major producer of spices that form the cash crops of the state. The important spices cultivated are cardamom, cinnamon, clove, turmeric, nutmeg and vanilla. Cardamom is one among the highly exported spice which brings great revenues to the country. Other cash crops that constitute the agricultural sector include Tea, coffee, cashew, arecanut, ginger and coconut. Even though Kerala is a consumer state as far as vegetables are concerned; vegetable farming is

getting wide popularity at present. Mixed cropping is the type of cultivation generally followed in Kerala. Vegetable farm usually have different types of vegetables cultivated together.

Field Surveys conducted/ participated

Various localities of Western Ghats and agroecosystems in Kerala were surveyed for collecting Pteromalids (Plate 3). Most of the surveyed areas include National Parks, Wild Life Sanctuaries, mangroves, agroecosystems like paddy fields, vegetable farm, tea, coffee, rubber, cocoa and teak plantations. Nearly thousands of specimens were collected and studied. Apart from the specific collection efforts for this project during the study period (2013-2017), the specimens collected and preserved at Zoological Survey of India, Western Ghat Regional Centre (as part of institution's field surveys) and specimens preserved at Department of Zoology, Calicut University were also studied.

3.2. Methods of Collection

Active collecting

1. Sweep net (Plate 2, Fig.e)

Sweeping is found to be one of the best methods for the collection of Pteromalids in clear windless weather. Early morning hours and evening are ideal for sweep net collections. Compared with other techniques, the main advantage of sweep net collection is that it helps to get plenty of specimens with high diversity. The most suitable type of net for sweeping is of a triangular frame, because while sweeping, the shape of frame increases the surface area in contact with vegetations. The style of sweeping with triangular net improves catches of hymenopterans including Pteromalidae. However,

one of the disadvantages of net sweeping is that it is hard to get much information about the host.

In this study, the insect net used for collection had followed the design by Noyes, 1982. The frame is made of aluminum which measures 48cms x 46cms x 48cms on the sides. The handle measurement is 120 cms long. The long handle increases the reach to the bottom sides of long hanging bushes and extends the area of individual sweeps. The frame had been made in such a way that it can be removed from the end of the handle when not in use. The net bag is made up of long durable white cotton cloth and measures 60cms. Fine meshes of cloth allow easy passage of air and prevent escape of the smaller insects of less than 1mm in size. The rim of the bag is reinforced with thick canvas material by sewing it over frame, which helps to withstand the potential damage while sweeping.

After sweeping, Pteromalids were separated from the collected materials accumulated at the bottom of the net bag with the help of an aspirator (Plate 2, Fig.f). The aspirator consists of perspex vial container, with a lid and two flexible tubes. The end of one tube is covered by a small piece of gauze to prevent the specimen being drawn into the operator's mouth. Specimens were collected by sucking on the end of the gauze covered tube while holding the end of the other tube pointing towards the specimen. While using the aspirator, it is best to position the net bag towards light since the insects are attracted to light. Aspirated specimens were killed by placing saturated cotton of ethyl acetate in the aspirator.. The specimens were then transferred to vials containing 70% alcohol and labels with details of locality, name of collector, date of collection were placed on them.

2. Rearing (Plate 4)

Rearing is potentially the most rewarding method of insect parasitoid collection. Infested plant parts, egg, larvae, pupae, galls, seeds etc were collected from fields. They were kept in suitable type of clear container which helped to check emergence of parasitoid on a daily basis. Emerged parasitoids were collected with help of aspirator or by light trap method. This collection method has many advantages like getting information about host parasitoid associations, biology and male female associations etc. In this method, there is high possibility of collecting both sexes, which is very useful in studying the case of sexually dimorphic taxa.

Passive collecting

3. Malaise trapping (Plate 2, Fig.c)

Insects show positive phototaxis and negative geotrophic behaviors. Malaise trap works on the basis of this behavior of insects. This tent like device catches insects as they fly into the sides of the trap, crawl upwards on the cloth to the roof, where they enter the trap bottle containing 70% alcohol. The trap needs to be visited once in a week for emptying. Generally, the trap is dark in colour with a light coloured roof which reinforces any positive response to light in diurnal insects. Therefore, the malaise trap should be fixed in an area where sunlight reaches; especially with an alcohol carrying bottle is present. The flow of wind and presence of sunlight has significant roles in determining the efficiency of collection. Malaise trap was originally designed by R. Malaise in 1937 and later modified by many others. In this investigation malaise trap made by Rescholar Equipments was used.

4. Yellow pan trap (Plate 2, Fig.b)

Yellow pan trap or Moericke trap is a coloured bright yellow trap which works on the principle that wasps are attracted towards yellow coloured flowers. The yellow pans used for this are shallow trays measure about 60-75mm deep and 30 cm circle painted with bright yellow colour. The trays were filled with salted water and added a few drops of liquid soap to reduce the surface tension. Shadow areas were preferred to keep the trays, and they were kept for a minimum of 24 hours. A small hand sieve net was used to transfer specimens and did it carefully, not to lose any small specimens. The transferred specimens were washed with fresh water to remove all the soap content adhered to it, and then were transferred to 70% alcohol. Yellow pan traps helped to collect ground dwelling and low flying Pteromalids.

3.3. Processing

Processing the collected specimens involved sorting, relaxing, mounting, labeling, registering and preserving the mounted and un-mounted materials.

Un-mounted materials

The un-mounted specimens were kept in air tight vials containing 70% ethanol and vials stored in refrigerator. The alcohol is changed periodically to prevent any damage to stored specimens, especially due to fungal infection by evaporation of alcohol.

Relaxing

Relaxing was found to be very suitable for the specimens killed using ethyl acetate, to prevent breakage of specimens when they are being card mounted. For relaxing, specimens were kept in relaxing chamber with glacial

acetic acid for 6-8 hours. Then specimens then become soft and suitable for mounting and spreading.

Card mounting

The materials used for card mounting are absolute alcohol, cavity block, blotting paper, HMDS (Hexamethyl disilazane), fine zero point brush, table lamp with 60W bulb, mounting cards (made with ivory paper), entomological pins, water soluble gum and stereo zoom microscope. Before mounting, specimens were transferred from 70% to 100% alcohol and kept in it for 30 minutes. The specimens were then transferred to HMDS. The time for specimens to be kept in HMDS varies for different genera. HMDS were not used for Pteromalids with hard body. Using an entomological pin, a very small drop of water soluble glue was placed on the tip of triangular card, and specimens were glued to card point on the mesosoma. Specimens were placed on a card in a way that all taxonomically significant characters are visible. Then the card was pinned using an entomological pin on a pinning block. This was followed by labeling. Rectangular labels were made, containing essential information such as; name of the country in capital letters, name of the state, name of locality from which specimens were collected, name of collector and date of collection. If any host data is available it was added on a second label. Then the specimens were placed under table lamp for few hours to make it completely dry. After registering with all necessary data, the mounted specimens were kept in insect boxes and stored inside insect cabinets. 1, 4-Dichlorobenzene and naphthalene balls were used to avoid damage caused by fungi and other small insects.

3.4. Microphotography (digital imaging) and Measurements

Photographs of different parts of the specimens were taken under high resolution stereozoom microscopes Leica MZ205 (Plate 2, Fig.d) equipped

with a Leica DFC500 digital camera that fed image data to a desktop computer where the software LAS 3.4.4 was used to merge image series representing different focal planes into single in-focus composite image. The editing of the images in a permissive level was done by Adobe Photoshop CS2. Measurements were taken by using Leica MZ205 C (camera Leica MC170 HD- Plate 2, Fig.a) microscope and software Leica LAS 4.7.

3.5. Mapping the distribution

Distribution maps of genera and species in collection localities of study area were generated using DIVA- GIS 7.5. Geographical co-ordinates of the collection localities have been given in appendix.

3.6. Identification

The generic level identification was made by running the keys of Sureshan & Narendran (2004), Bouček (1988) and Bouček and Rasplus (1991). Species level identification were done by using keys of Sureshan (2003), literatures available in Universal Chalcidoidea Database, Natural History Museum, London and literatures obtained from collections of Dr. P.M. Sureshan. Specimens were also compared with type materials deposited in Zoological Survey of India, Calicut. New species encountered have been described in detail. A short diagnosis with major characters was given for known and previously described species.

3.7. Abbreviations and Terminology (Plate 5 & Plate 6)

Morphological terms and abbreviations followed here are those used by Boucek (1988) except thorax and abdomen. The term 'mesosoma' includes propodeum and is equivalent to thorax. The petiole plus the gaster together called metasoma and is equivalent to abdomen. The morphological terms mesosoma and metasoma are used by Gibson (Gibson *et al.*, 1991).

Abbreviations: BMNH- The Natural History Museum, London, United Kingdom; F1–F7-Funicular segments 1 to 7; MV-Marginal vein; OOL- Ocellocular distance; PMV- Postmarginal vein; POL- Post-ocellar distance; SMV-Submarginal vein; STV-Stigmal vein; T1 to T7- gastral tergites 1-7; ZSIK- Zoological Survey of India, Western Ghat Regional Centre, Kozhikode.

Head

Clypeus: The medial sclerite of the head just above the labrum.

Antennae: Paired sensory appendages present between compound eyes.

Toruli: The paired socket in front of head which accommodated the radicle of antenna.

Scape: First segment of antenna.

Pedicel: Second segment of antenna.

Anelli: Small ring segments after pedicel.

Clava: Last three segments of antenna together called clava.

Scrobe: The groove on head to accommodate the scape.

Frons: The area of head between toruli and front ocellus.

Malar space: The shortest lateral distance between compound eye and base of mandible.

Gena: The lateral part of head after compound eye.

Malar sulcus: The vertical groove present in malar space.

Carina: Ridge or raised area.

Mandible: Highly sclerotized paired chewing lateral appendage of mouth parts with teeth.

Ocelli: It is the simple eyes present on dorsal part of head, with a triangle shaped arrangement.

Vertex: The area between anterior ocellus to occiput.

Occiput: Area behind the vertex.

Mesosoma

Pronotum: First segment of mesosoma dorsally.

Mesoscutum: Pronotum followed by mesoscutum, it has three lobes.

Notauli: Two longitudinal grooves on mesoscutum.

Mesopleuron: Lateral part of mesothorax.

Metapleuron: Lateral part of metathorax.

Mesepisternum & Mesepimeron: The mesopleural suture sub divides mesopleuron into Mesepisternum and mesepimeron. The mesepimeron is divided into upper mesepimeron and lower mesepimeron.

Prepectus: The triangle shaped structure or sclerite present between lateral sides of pronotum and mesepisternum.

Tegula: Small, almost rounded sclerite which cover the base of forewing.

Scutellum: The region between mesoscutum and propodeum. Posteriorly the scutellum sometimes has a subapical region, the frenum, differentiated by frenal groove.

Propodeum: Scutellum follows propodeum, propodeum can be slightly to conspicuously prolonged into a neck like nucha.

Metasoma

Petiole: The stalk like structure to connect the propodeum to gaster.

Gaster: 7-8 post-petiole segments together comprise the gaster.

Tergites: Dorsal segments of gaster.

Sternites: The ventral segments of gaster.

CHAPTER 4

OBSERVATIONS AND RESULTS

During the present study, nearly thousand specimens belonging to the family Pteromalidae were collected from all fourteen districts of Kerala including both forest and agroecosystems. One hundred and four species belonging to 45 genera and 10 subfamilies were identified and included in the thesis, among which 12 species are new to science. All these new taxa with morphologically distinct characters have been described in detail and for others diagnostic characters are given. A dichotomous key to the Kerala genera of Pteromalidae, key to the species under each genus, a check list of Pteromalidae of Kerala and host-parasitoid index for the Kerala species are provided.

Family Pteromalidae

Diagnosis

Pteromalidae represents most difficult families of Superfamily Chalcidoidea (Hymenoptera Parasitica). No single character or set of characters separate all species of Pteromalidae from other families. Most of the Pteromalidae can be segregated from closely related families and other related groups by 8-13 antennal segments and five tarsal segments. They are small to large chalcids of size 1-48mm, usually metallic, forewing with postmarginal and stigma veins well developed and mostly with distinct speculum.

Biology

Pteromalidae shows great morphological diversity. Their morphological diversity also reflects the wide variety of biological aspects. This family includes egg, larval and pupal parasitoids of many orders of insects. A few species even oviposit into body of adult beetles (Bouček, 1988). They are

ectoparasitoids or endoparasitoids, primary or secondary parasitoids, koinobionts or idiobionts, phytophagous, predators and even some are known to be gall makers. Since a variety of potential hosts emerge, it is difficult to determine their exact trophic relationships. Out of 166 species known from Kerala, host records are available for only 46 species.

Distribution: Cosmopolitan

Classification

The Pteromalidae is very large family comprising 3450 described species under 640 genera and 32 subfamilies worldwide (Noyes 2017).

Status in India and Kerala

279 species under 105 genera and 18 subfamilies and 166 species under 62 genera and 15 subfamilies are so far reported from India and Kerala respectively. Prior to this study 134 species under 58 genera were reported from Kerala (Noyes, 2017). The present work reports 12 new species, three new genus records from India and 17 new species records from Kerala.

4.1 KEY TO THE GENERA OF PTEROMALIDAE OF KERALA

1. Antennal toruli situated at extreme lower margin of head, overhanging the mouth, antenna 1171, anellus absent, clava undivided; head prognathous or subprognathous; gaster petiolate, MV very long, PMV and STV short.....2
- Antennal toruli situated at least slightly above mouth margin, antennal formula and wing venation usually different..... 3
2. (1) Body always black sometimes with slight metallic reflection; occipital carina present and well developed, head and thorax usually with deep setiferous punctures, the surface between them shiny;

- forewing disc flat, pubescent, without a tuft of scales at parastigma, frons with punctured median groove (Plate 34, Fig.d).....
.....*Spalangia* Latreille
- Body mainly yellowish; head and thorax almost smooth; scutellum with fine out-curving sublateral lines, forewing disc convex and almost bare, parastigma with tuft of black scales; frons without median groove.....*Storeya* Bouček
3. (1) Head subprognathous or globose with conspicuous, protruding vertical ridge or tooth between toruli, occipital carina strong, body shiny, yellowish to black, rarely yellow with metallic gloss, wings if not reduced, without conspicuous setae on disc, long marginal fringe, parastigma with or without tuft of bristles..... 4
- Head mostly orthognathous, antennae and wings different from above..... 5
4. (3) Head dorsally depressed, head viewed anteriorly as long as broad or longer with sides parallel; antennae inserted below level of ocular line, funicular segments five or six, brachypterous forms common.....*Theocolax* Westwood
- Head stout, dorsally rather convex, antennae inserted at the level of ocular line, funicle always six segmented, always macropterous (Plate 7, Fig.a)..... *Cerocephala* Westwood
5. (3) First tergite of gaster with characteristic longitudinal striae; head and thorax dorsally often with strong paired bristles, gaster on quadrangular transverse petiole (Plate 9, Fig.e).....
.....*Papuopsia* Bouček

- First tergite without characteristic striae, other characters different from above... 6
- 6. (5) Antenna 13-segmented, formula 11173, hind coxa inserted unusually high; outer face often with transverse sculpture; brachypterous and macropterous are common, vertex and thorax with paired strong bristles... 7
- Antennal formula variable, head and thorax with or without paired strong bristles, hind coxa not inserted high as above, rest of the characters also varying... 8
- 7. (6) Gaster always with short petiole, broader than long, without lateral setae, antenna strongly clavate; colour often brownish black to jet black with various parts of body testaceous or even yellowish, brachypterous and apterous females are not common but rarely with wing polymorphism (Plate 9, Fig.b)... ***Netomocera* Bouček**
- Gaster with distinct long petiole with at least one pair of setae on the lateral margins; antennae not strongly clavate as above, body usually black or honey brown, brachypterous and apterous females are common (Plate 8, Fig.b)... ***Dipara* Walker**
- 8. (6) Propodeum with transverse crust interrupted in the middle and a T shaped median carina; forewing with two dark completely separated fasciae, antenna with one short anellus and seven funicular segments... ***Erotolepsiella* Girault**
- Propodeum not as above, antenna with one or more anelli, forewing with or without fasciae ... 9
- 9. (8) Pronotum campanulate with convex collar not delimited by an edge, moderate to very long, mesosoma densely punctured and pilose,

- both fore femur and hind femur usually swollen to varying degrees.....10
- Pronotum not so elongated, mesosoma with different sculpture; fore and hind femora not thickened.....13
10. (9) Pronotum very long and narrow with lower edges of panels widening forwards, forewing with three dark bands, the basal band extending from enlarged base of parastigma usually enlarged having tuft of black bristles.....***Heydenia Förster***
- Pronotum moderate or short, broadly adhering to mesoscutum, forewing with or without bands, base of parastigma not greatly enlarged, without distinct tuft of bristles.....11
11. (10) Gaster punctured, strongly sclerotised and apically produced into a narrow tail with median keel, T5 and T6 are lengthened; notaular groove distinct and complete.....***Solenura Westwood***
- Gaster with T5 and T6 not elongated as above, if gaster has tail that is formed by epipygium and ovipositor sheaths; sculpture of gaster much finer.....12
12. (11) Eye densely setose; gaster sessile; forewing without speculum; hind femur often serrate or with a sub apical tooth on ventral margin.....***Cleonymus Latreille***
- Eye bare; gaster distinctly petiolate; basal third of forewing bare; hind femur with smooth ventral margin.....***Notanisis Walker***
13. (9) Body short and broad, vertex often separated from broadly concave occiput by sharp ridge touching eyes and posterior ocelli; flagellum with four or five funicular segments, first funicular segment is often

- anelli form; T1 very large and usually covering remaining tergites.....14
- Body mostly elongated, vertex not separated from occiput by sharp ridge, other characters different from alternate.....15
14. (13) Propodeum with distinct median carina; gena strongly shiny between hairs, posteriorly delimited by a distinct carina; wings almost entirely pilose (Plate 9, Fig.f)..... ***Cephaleta* Motschulsky**
- Propodeum without median carina; gena weakly carinate posteriorly; wings with non-pilose area extending along MV to STV revealing a weak row of seven weak setae behind MV on underside of wing ***Calyconotiscus* Narendran**
15. (13) Pronotum large, transverse, anteriorly rounded, antennae attached near mouth margin; gena posteriorly usually carinate, which extends along temple up to some distance.....16
- Pronotum generally small, if large then either body flattened or MV abruptly thickened.....17
16. (15) Eyes densely hairy, antennae with one anellus and six funicular segments; gaster sessile, T1 of gaster covering half of it (Plate 10, Fig.b)..... ***Herbertia* Howard**
- Eyes not hairy; antennae with two anelli and six funicular segments; gaster petiolate, petiole longer with longitudinal carina ***Asaphes* Walker**
17. (15) Antennae with 12 or fewer than 12 segments, very rarely 13 segmented.....18
- Antennae with 13 segments..... 19

18. (17) Antennae inserted higher up on face, with two distinct anelli and five funicular segments; MV of forewing with a row of conspicuous long hairs on underside, both mandibles with three teeth, clypeus not produced (Plate 10, Fig.d)..... ***Systasis* Walker**
- Antennae inserted in lower third of face, antennae with only five segments between pedicel and clava, of these two at least short, anelliform, sometimes basal ones fused; mandibles four toothed, clypeus produced..... ***Macroglenes* Westwood**
19. (17) Wings unusually narrow, forewing at least 3.3 times as long as broad and hairy, MV fully three times as long as the stigma, pronotum long subconical, antennae inserted above centre of the very convex face; petiole widening caudad, rugose, transverse to subquadrate; flagellum 263 (Plate 19, Fig.a) ***Panstenon* walker**
- Wings always broader than in alternate; pronotum shorter and other characters not in the above combination.....20
20. (19) Clypeal margin with deep median incision and asymmetric teeth, antenna inserted below ocular line21
- Clypeal margin symmetric with or without teeth, antenna rarely inserted below ocular line22
21. (20) Forewing with stigma conspicuously enlarged and PMV longer than the MV (Plate 11, Fig.f)..... ***Stictomischus* Walker**
- Forewing with stigma very small and PMV shorter than MV (Plate 10, Fig.c) ***Halticoptera* Spinola**
22. (20) Gaster distinctly petiolate.....23
- Gaster sessile or subsessile.....40

23. (22) Forewing with MV thickened, sometimes slightly and uniformly, and stigma large or moderate.....24
- Forewing with MV not thickened.....27
24. (23) Head unusually transverse with conspicuous occipital carina, anterior margin of clypeus rather straight, not produced, antennae inserted high above centre of face; face extensively striated; notaular grooves complete (Plate 19, Fig.b).....***Acroclisoides Girault***
- Head not unusually transverse, notaular grooves incomplete, posteriorly indistinct, other characters different.....25
25. (24) Gaster with T2 large and parallel sided, forewing with MV almost parallel sided (Plate 27, Fig.e).....***Pachycrepoideus Ashmead***
- Gaster with T2 not as above, Forewing with MV more or less broadening apically.....26
26. (25) Antennae inserted slightly below middle of face; antennae with two anelli (three anelli in *P. aphidis* and MV strongly wedge shaped) (Plate 28, Fig.a).....***Pachyneuron Walker***
- Antennae inserted near to mouth, antennae with three anelli (Plate 28, Fig.b).....***Platecrizotes Ferrière***
27. (23) Antenna with both anelli or at least second, subquadrate; head very stout; gena very broad and especially in male almost flat, posteriorly ending by acute-angular edge; face protuberant at antennal insertion; gaster round.....***Coelopisthia Förster***
- Anelli obviously transverse, head less stout; other characters different.....28

28. (27) Female gaster subcircular, shorter than mesosoma, body broad, eyes rather large, antennae short, inserted low on face, flagellum with two or three anelli, clava subacuminate, forewing with PMV hardly longer than STV, marginal fringe extensively short..... ..
.....*Cyclogastrella Bukowski*
- Gaster ovate to elongate, not as above, body not broad as above, other characters partly to completely different.....29
29. (28) Antennae inserted very high on face, clypeus with a median notch anteriorly, face covered with moderately dense long white hairs, antennae in female with three and in male two anelli (Plate 26, Fig.f).....*Narendrella Sureshan*
- Antennae inserted not very high on face as above; other characters partly or completely different..... 30
30. (29) Notaular grooves complete, fine or deeply impressed.....31
- Notaular grooves incomplete.....32
31. (30) Scutellum with an elongate median fovea before frenal groove (Plate 27, Fig.c)*Notoglyptus Masi*
- Scutellum without an elongate median fovea (Plate 21, Fig.a).....
.....*Cyrtogaster Walker*
32. (30) Propodeum strongly ascending, the attachment of petiole on propodeum is peculiar.....*Eurydinotomorpha Girault*
- Propodeum not as above and, attachment of petiole different... ..33
33. (32) Propodeum with three longitudinal depressions or shallow grooves, median the longest and often subdivided by transverse

carinulate with median carina (Plate 26, Fig.d).....*Miscogasteriella*
Girault

- Propodeum not as above.....34
- 34. (33) Mesosoma usually flattened; pronotum large, quadrangular, gaster with T1 largest, its hind margin incised in the middle (Plate 30, Fig.f).....*Syntomopus* Walker
- Mesosoma not unusually flattened as above; pronotum not quadrangular, other characters varying.....35
- 35. (34) Gaster petiole distinctly sinuate in profile, posteriorly on ventral side embraced by a narrow extension of first gastral sternite, clypeal margin rounded, subconical or truncate (Plate 22, Fig.e)..... *Merismomorpha* Girault
- Gastral petiole not as above (in some cases sinuate in male and embraced by a narrow extension of first gastral sternite, then clypeus and forewing venation different, petiole shorter, clypeus not as above)36
- 36. (35) T1 of gaster covering most of it, other tergites almost completely hidden; flagellum in female strongly clavate (Plate 20, Fig.e)... ..*Cryptoprymna* Förster
- T1 of gaster not covering most of it, other tergites not hidden as above, flagellum different.....37
- 37. (36) Axillae in outer corner with a small deep pit; stigma of forewing moderately capitate, propodeum moderately long, without carina, with a pair of shallow submedian longitudinal grooves posteriorly which converge to merge with saddle like constriction before nucha, this

- constriction connects laterally with deep supra coxal pit; gaster dorsally collapsing..... ***Paraiemna Sureshan & Narendran***
- Axillae without pit; propodeum not as above; gaster dorsally not collapsing..... 38
38. (37) Propodeum with distinct short subglobose nucha, plicae strongly curving towards median carina line, but disappearing before reaching middle; gaster dorsally rather convex, not collapsing.....
..... ***Delislea Girault***
- Propodeum with or without nucha, not subglobose, plicae different, gaster different..... 39
39. (38) Gastral petiole anteriorly on either side with a sharp triangular tooth, seems to be composed of three parts, the median stalk is the true petiole, whilst the side parts are connected ventrally and form a stiffened ventral projection of first gastral sternite; T2 not the largest (Plate 31, Fig.a)..... ***Toxeumorpha Girault***
- Petiole not as above, ventrally without projection of first gastral sternite as above; gaster with T2 largest, covering most of it, anterior margin of clypeus with sharp teeth (Plate 30, Fig.a).....
..... ***Sphegigaster Spinola***
40. (22) Forewing with MV thickened either uniformly or at base or distally.....41
- Forewing with MV not thickened42
41. (40) Clypeal margin broad with a deep median incision, female antenna with two anelli, inserted lower on face; pronotum barely visible dorsally and has no collar, gaster sessile.... ***Inkaka Girault***

- Clypeal margin different; female antenna with very short anelli, inserted above the level of lower orbital borders; pronotum with collar visible dorsally (Plate 26, Fig.b).**Metastenus Walker**

- 42. (40) Gaster with characteristic distinct tail formed by prolonged epipygium and protruding ovipositor sheaths (Plate 29, Fig.f).....**Pycnetron Gahan**

- Gaster without tail as above, epipygium not prolonged as above43

- 43. (42) Pronotum with collar appears in the form of two blunt lateral teeth due to, a median notch, clypeus with a broad median tooth (Plate 22, Fig.c).....**Kumarella Sureshan**

- Pronotum without lateral teeth as above; clypeus different.....44

- 44. (43) Clypeus with a sharp median tooth; gaster dorsally convex; cylindrical or subconical with either T1 or both T1 and T2 medially incised.....45

- Clypeus with or without tooth, but not shaped as above; other characters partly or completely varying.....46

- 45. (44) Gaster with T1 incised medially; forewing with extensive pilosity, basal cell pilose, speculum absent, or small, then not reaching cubital line; prepectus mostly pilose, reticulate; PMV longer than MV (Plate 33, Fig.a,f)..... **Trigonoderus Westwood**

- Gaster with T1 and T2 incised medially; forewing with basal part bare, discal pubescence not dense, speculum open below; prepectus not pilose, finely reticulate; PMV shorter than MV (Plate 34, Fig.a)..... **Unicypea Bouček**

46. (44) Reticulate propodeum with nucha separated by arcuate costula connected with plicae; dorsum of mesosoma uniformly pilose (Plate 23, Fig.e).....***Lyubana* Bouček**
- Propodeum without costula connected plicae; other characters varying.....47
47. (46) Propodeum with a short, distinct neck and conspicuous plicae which define a broadly cordiform median carina, plicae high, converging, connected posteriorly by a weak or distinct costula; notaular grooves deep but hardly traceable middle of mesoscutum; scutellum with extensive pilosity, except for a narrow median strip (Plate 21, Fig.f).....***Halticopterella* Girault & Dodd**
- Propodeum with or without nucha but not as above, other characters varying.....48
48. (47) Hind tibia with two spurs; body mostly robust, reticulate punctuate with white pubescence on head and mesosoma; pronotum as broad as mesoscutum.....49
- Hind tibia with one spur, head and mesosoma without distinct pubescence as above, pronotum narrower than mesoscutum.....56
49. (48) Antennae slender, in female segment of clava spine like at apex, in male funicular segments petiolate with whorls of long erect hairs; pronotum very broad, hence mesosoma very compact, dorsum of head and mesosoma including most of scutellum with abundant curved hairs (Plate 27, Fig.a).....***Norbanus* Walker**
- Antennae without terminal spine in female, male funicular segments not petiolate with or without erect hairs; other characters varying.....50

50. (49) Propodeum with hind margin deeply and arcuately excised; pronotum dorsally very short, but sharply carinate; clypeus large, well delimited, lower margin produced, bilobed with sharp median incision; mesoscutum densely pubescent, antennae and legs including coxae yellow (Plate 26, Fig.e)..... ***Mokrzeckia Mokrzecki***
- Propodeum different, its adpetiolar margin not unusually emarginated, pronotum bluntly ridged or rounded, not sharply carinate, other characters varying.....51
51. (50) Propodeum with a short or well developed nucha.....52
- Propodeum not produced to form a nucha.....55
52. (51) Propodeum with a conspicuous subglobose nucha; gaster short and coediform, mesosoma short and very compact; female antennae with three and male with two anelli; costal cell of forewing bulged in some species (Plate 21, Fig.d)..... ***Dinarmus Thomson***
- Propodeum with nucha not subglobose; gaster not cordiform, rather elongated, other characters partly or completely varying.....53
53. (52) Antenna with two anelli in both sexes; gaster mostly yellow with one median and two lateral longitudinal brownish lines, which are sometimes incomplete or absent; hind margin of T1 truncate; propodeum uniformly convex and finely reticulate punctuate; male antenna with funicular segments long and with erect hairs (Plate 28, Fig.d)..... ***Propicroscytus Szelenyi***
- Female antenna with three anelli, gaster different, T1 medially produced mostly smooth with a cross carina or at least medially raised, male antenna different.....54

54. (53) Notauli groove like, almost complete; clypeus with two distinct teeth, propodeum with a cross carina; T1-T3 covering half or less than half of gaster.....***Oniticellobia* Bouček**
- Notauli finer, indicated only anteriorly; clypeus only shallowly emarginated; propodeum medially raised without cross carina, T1-T3 covering more than half of gaster (Plate 19, Fig.c).....
.....***Anisopteromalus* Ruschka**
55. (51) Pronotal collar with complete fine carina; clava with a line of pilosity extending all along its lengths; propodeum between spiracles almost flat or weakly convex (Plate 27, Fig.d)....***Oxysychus* Delucchi**
- Pronotal collar weakly carinate in the middle; clava with the pilosity limited to its apical segment; propodeum not so flat.....
.....***Cyrtoptyx* Delucchi**
56. (48) Terminal segment of clava in female narrowly pointed.....57
- Terminal segment of clava in female not narrowly pointed.....58
57. (56) Female antenna with three anelli and five funicular segments, propodeum produced into a distinct reticulate and subglobose nucha; T1 or sometimes T2 also evidently enlarged (Plate 19, Fig.f).....
.....***Callitula* Spinola**
- Female antenna with two anelli and six funicular segments, propodeum with nucha short, not subglobose; gastral tergites different (Plate 22, Fig.b).....***Homoporus* Thomson**
58. (56) Occiput with transverse ridge placed near foramen, far behind and below lateral ocelli; propodeum with distinct plicae and mostly with

- distinct median carina, all converging to globose reticulate nucha
(Plate 32, Fig.a).....***Trichomalopsis Crawford***
- Occiput without transverse ridge; other characters partly or completely
different.....59
59. (58) Toruli situated completely below centre of face with three anelli,
pronotal collar with abrupt ridge but not carinate; propodeum smooth;
plicae complete without nucha (Plate 22, Fig.f).....
.....***Mesopolobus Westwood***
- Toruli situated in about the middle of face; antennae mostly with two
anelli; pronotal collar rounded or ridged; propodeum different.....60
60. (59) Sides of propodeum and T1 thickly set with white hairs, pronotal
collar with smooth sharp margin (Plate 32, Fig.c).....
.....***Trichomalus Thomson***
- Sides of propodeum and T1 without dense patches of hairs, pronotal
collar mostly rounded61
61. (60) Female antennae strongly clavate, of male with pedunculate
segments, with whorls of erect bristles, head much broader than
mesoscutum, gaster with posterior margins of several terga usually
with median indentation; in some species scutellum raised into a
triangular horn with finger nail like tip (Plate 28, Fig.e).....
.....***Psilocera Walker***
- Female antenna different, not strongly clavate as above; male antenna
different; other characters varying.....62
62. (61) Hind corners of propodeum in dorsal view appearing right angled
or even slightly acute; hind margin of T1 slightly produced medially,

- lower face swollen, clypeal margin emarginated.....
.....*Lariophagus Crawford*
- Hind corners of propodeum rather rounded, not as above; T1 of gaster not produced; other characters partly or completely different.....63
63. (62) Pronotal neck appears longer than collar in dorsal view; prepectus relatively large, its upper margin at least as long as tegula, its surface nearly regularly reticulate, rather slender; propodeum without nucha, forewing with MV more than 1.5× as long as STV (Plate 20, Fig.d).....*Chloroscytus Graham*
- Pronotal neck hardly visible; prepectus small; horizontally shorter than tegula; its surface smooth or hardly sculptured and mesosoma not slender propodeum with a narrow distinct nucha, forewing with MV usually 1.5× as long as STV. (Plate 29, Fig.b).....
.....*Pteromalus Swederus*

4.2 SYSTEMATIC TREATMENT OF THE TAXA

Subfamily: CEROCEPHLAINAE

Cerocephala Westwood

1832a. *Cerocephala* Westwood, *Mag. Zool. Vol.2*, 'Classe'. IX, pl. 4. Type species: *Cerocephala cornigera* Westwood by monotypy

1920a. *Proamotura* Girault, *Insecutor Inscitiae Menstruus*, vol.8, p. 143. Type species: *Proamotura aquila* Girault by monotypy.

Diagnosis: Short convex head with short normal mandibles; forewing with presence of a distinct tuft of black bristles on an expansion of the parastigma; horizontal propodeum with relatively fine irregular rugulose sculpture, without coarse carinae or areolae, although the median carina is sometimes slightly indicated.

Distribution: Africa, Indo-Australian region

1. *Cerocephala dinoderi* Gahan

(Plate 7, Fig.a)

1925. *Cerocephala donoderi* Gahan, 100-102. *The Philippine Journal of Science*.
Type species *Cerocephala dinoderi* Gahan

Diagnosis: Head as long as broad in front view; gena rounded and the vertex convex; face below antennae striate, the striae converging at the clypeus; occiput delicately margined; six funicles gradually thickening towards the apex; F1 smallest; F2 to F6 subequal in length but successively increasing in thickness; pronotum slightly longer than the mesoscutum; rounded in front and perfectly smooth, except the neck which is finely rugulose; scutellum and axillae smooth and polished; petiole as long as hind coxae.

Materials examined: 2 females & 1 male, INDIA, Kerala, Calicut, Ashokapuram, 14.ix.2016, ZSIK.reg.no.IR/INV/7637, coll. Raseena Farsana; 3 females, INDIA, Calicut, Mahe, 20.iv.2015, ZSIK.reg.no.IR/INV/7332, Coll. Raseena Farsana.

Distribution: India: Kerala (**New Record**), Arunachal Pradesh, Karnataka, West Bengal; Australia; Hawaii; Indonesia; Peru; Philippines; Sri Lanka; Thailand; USA.

Remarks: Emerged from stored product green gram (*Vigna radiata*) along with the pest *Dinoderus* sp. It also emerged from stored rice infected with *Sitophilus* sp.

Subfamily: DIPARINAE

***Dipara* Walker**

1833. *Dipara* Walker, *Ent. Mon.Mag.*1: 371-373. Type species *D. petiolata* Walker by monotypy.

Diagnosis: Gastral petiole distinct, with at least one pair of setae or bristles on the lateral margins; mesoscutum with two pairs of long bristles; scutellum with at most two pairs of bristles; frenum distinctly separated; propodeum with distinct nucha; antennae with anellus broader than long; clypeus without tooth.

Biology: Not known, usually species are collected from litter under trees.

Key to the species of *Dipara* Walker (females)

- 1. Wings reduced (brachypterous) (Plate 7, Fig.c,d &f).....2
- Wings fully developed (macropterous) (Plate , Fig.b & e)..... .11
- 2. (1) Median area of propodeum with uniform longitudinal rugae, arranged in a sub-circular form; frenum represented by a very narrow area with small rugae; mesoscutum almost completely black with a characteristic ‘W’ shaped yellowish brown area (Plate 8, Fig.f).....*D. yercaudensis* Sureshan
- Propodeum without uniform longitudinal rugae, partly, irregularly carinated or with irregular areolae; scutellum always with frenum broader than above; mesoscutum not coloured as above, sometimes body completely brownish black... .. 3
- 3. (2) Mesoscutum with notauli not meeting in posterior end..... 4
- Mesoscutum with notauli meeting in posterior end9

4. (3) Mesoscutum blackish brown in distal two-thirds; carina of pronotal collar characteristically angulate and slightly broken in middle; forewing stump long and narrow reaching beyond tip of petiole.....*D. angulata* Sureshan & Nikhil
- Mesoscutum without blackish brown colour as above, sometimes body uniformly brownish black, then forewing stump long and broad, reaching beyond tip of petiole; otherwise forewing stump very short and not reaching petiole 5
5. (4) Forewing stump 4.3× as long as broad, reaching beyond tip of petiole; petiole stout, finely reticulate, 1.6× as long as broad; propodeum with characteristic median carina, plicae and costulae *D. venkati* Sureshan
- Forewing stump very short and narrow, not reaching or just touching base of petiole; petiole slender, longitudinally carinate, more than 1.6× as long as broad; propodeum with or without median carina; plicae and costulae not as above. 6
6. (5) Propodeum with baso-medial area between plicae conically elevated up to middle, surface not shiny, with longitudinal and transverse carinae and striae; wing stump extending well beyond hind margin of scutellum, touching base of petiole and with 5 or 6 bristles..... 8
- Propodeum with baso-medial area between plicae not conically elevated up to middle, surface almost shiny, sometimes with very weak striations; wing stump very short not extending much beyond hind margin of scutellum or sometimes hardly reaching hind margin of nucha then with only three bristles 7

7. (6) Forewing stump very short, only a little longer than tegula, not extending much beyond hind margin of scutellum; forewing with two bristles; OOL almost as long as POL; antenna with scape as long as eye, pedicel slightly longer than F1; general body colour yellowish brown (Plate 7, Fig.f).....*D. intermedia* Sureshan & Narendran
- Forewing stump 5.2× as long as tegula,, hardly reaching tip of nucha ; forewing with three long bristles; OOL 1.2× POL; antenna with scape 0.8× as long as eye, pedicel distinctly longer than F1 (1.8×); general body colour dark honey brown.....*D. tamila* Sureshan *et al.*,
8. (6) Body length, 2.6 mm; upper face and vertex distinctly reticulate; POL equal to OOL; antenna with F6 and F7 whitish yellow as clava; F2–F5 dark brown; wing stump with five bristles; hind coxae reticulate (Plate 7, Fig.c).....*D. eukeralensis* Özdikmen
- Body length, 1.5 mm; upper face and vertex almost shiny, only weakly reticulate; POL slightly shorter than OOL; only F7 whitish yellow as clava; F3–F6 brown; wing stump with six bristles; hind coxae striate reticulate.....*D. mohanae* Narendran & Sureshan
9. (3) Mesoscutum with distinct black patch covering almost posterior two-thirds; pronotum with a distinct transverse carina; forewing stump with one short and one long bristle... ..*D. thirumalaii* Sureshan
- Mesoscutum with black patch on posterior half of scapulae only; pronotum with or without transverse carina; forewing stump with three or four bristles 10
10. (9) Propodeum without a median carina; antenna with F6 partly whitish yellow as clava; forewing stump with four setae; gaster swollen with T1–T2 not very short, and yellowish brown with a

- distinct yellow band overlapping T1 and T2 (Plate 7, Fig.d).....*D. gastra* (Sureshan & Narendran)
- Propodeum with a weak median carina in posterior third; antenna with F6 completely brown; forewing stump with three setae; gaster narrow and compressed with T1–T6 short, and almost brown with epipygium and ventral part paler (Plate 8, Fig.c).....
..... *D. malabarensis* (Narendran & Mini)
11. (1) Pronotal collar with separate long and stout bristles near posterior margin in addition to pubescence15
- Pronotal collar without separate long and stout bristles near posterior margin in addition to pubescence 12
12. (11) Mesoscutum posteriorly with a black or bluish black patch in lower half of scapulae; petiole long, 2-2.6× as long as broad in dorsal view13
- Mesoscutum posteriorly without black or bluish black patch in lower half of scapulae, sometimes black patch covering all three lobes in posterior third; petiole short, 1.63× as long as broad in dorsal view 14
13. (12) Scapulae with bluish black patch distinct and covering almost half length in lower half; petiole 2× as long as broad in dorsal view; pronotal collar carinate anteriorly.....*D. debanensis* Sureshan
- Scapulae with black patch small, and not sharp, and covering only posterior third; petiole 2.6× as long as broad in dorsal view; pronotal collar not carinate anteriorly.....*D. andamanensis* Sureshan & Farsana

14. (12) Mesoscutum without any black patch or band, bristles a little above centre; reticulation of body fine; antenna with F4–F6 brown (F4 partly) (Plate 8, Fig.d)*D. miniae* Narendran & Sureshan
- Mesoscutum with a broad black patch covering all three lobes in posterior third, bristles in centre; reticulation of body coarse; antenna with F4–F7 brown*D. nigriscuta* Sureshan
15. (11) Scrobe long, separated from front ocellus by a distance as long as diameter of front ocellus, exceeding well over middle length of eye from toruli 16
- Scrobe shorter, at most reaching mid-level of eyes from toruli.....20
16. (15) Petiole smooth and shiny without longitudinal carina, with maximum posterior width $1.13 \times$ dorsal length; frenal area of scutellum shorter than scutellar area in front; body large, length 4.5 mm..... *D. sringericus* (Narendran)
- Petiole with distinct longitudinal carina or reticulation, with maximum posterior width $0.7-1.0 \times$ dorsal length; frenal area almost as long as scutellar area in front; body small, length 1.5–2.7 mm17
17. (16) Antenna with anellus wide, distinct; fu_1 anelliform, without sensilla; petiole as long as broad in dorsal view; general pubescence on head and mesosoma long in the form of thin bristles.....
.....*D. ponmudiensis* Sureshan & Farsana
- Antenna with anellus not wide as above, less distinct; F1 not anelliform, with sensillae; petiole distinctly longer than broad; general pubescence of body short, not in the form of bristles as above18

18. (17) Petiole long, 1.7× as long as broad in dorsal view, dorsally mostly reticulate and with carinae only in hind part; face without metallic blue reflection(Plate 8, Fig.e)..... *D. nigra* Sureshan
- Petiole short, 1.2–1.4× as long as broad in dorsal view, without reticulation, only longitudinally carinate, carinae sometimes weak medially; face with distinct metallic blue reflection.....19
19. (18) Petiole short, 1.2× as long as broad in dorsal view, and with a pair of setae very close to anterior margin; pronotal collar with a row of four strong setae near posterior margin; bristles on mid lobe of mesoscutum little below middle; forewing almost hyaline (Plate 7, Fig.e)...
.....*D. hayati* Sureshan
- Petiole long, 1.4× as long as broad in dorsal view, and with a pair of setae almost in middle; pronotal collar with a row of two strong setae near posterior margin; bristles on mid lobe of mesoscutum little above middle; forewing smoky (Plate 8, Fig.a).....
.....*D. kannurensis* Sureshan & Farsana
20. (15) Forewing with three infumate patches; petiole a little longer than half length of hind coxa; axillae and pronotum pink; head mostly brownish pink with vertex and occiput darker (Plate 7, Fig.b)
.....*D. bouceki* (Narendran)
- Forewing without infumations, hyaline; petiole one-third as long as hind coxa; axillae, pronotum and head black (Plate 8, Fig.b).....
.....*D. keralensis* (Narendran)

2. *Dipara bouceki* (Narendran)

(Plate 7, Fig.b)

2006. *Parurios bouceki* Narendran, Narendran *et al.*, *J. Biol. sci.*, 20, (ZSIK).

2013a. *Dipara bouceki* (Narendran): Sureshan, *Rec. Zool. Surv. India*, 113 (1): 86.

Diagnosis: Head pale brownish pink; antennae blackish brown except scape, pedicel and clava pale brownish yellow; POL 1.83× OOL; pronotum with a row of six stout setae near posterior margin and with several short pubescence; wings with three infusate patches; notauli arched and approaching each other on posterior part; frenal area of scutellum little shorter than anterior part; propodeum with an anterior median areola followed by a median longitudinal carina; petiole with several longitudinal carinae; gaster with T1 having longer striae.

Materials examined: 1 female, INDIA, Kerala: Calicut, Kakkadamboyil, 30.xii.2016, ZSIK.reg.no.IR/INV/8207 coll. Sureshan & Raseena Farsana

Distribution: India: Kerala (**New Record**), Karnataka

Remarks: Collected from agroecosystem (Mixed crops) close to forest.

3. *Dipara eukeralensis* Özdikmen

(Plate 7, Fig.c)

2001. *Dipara keralensis* Narendran & Sureshan, *Zoos'print journal*, 16 (4):452, (ZSIK). Junior sec. homonym of *D. keralensis* (Narendran).

2011. *Dipara eukeralensis* Özdikmen, 843. Replacement name. *Munis. Ent. & Zool*, 6 (2): 843.

Diagnosis: Head blackish brown, mesosoma honey brown, gaster brownish black with epipygium mostly pale yellow; antenna with scape yellowish brown, pedicel, anellus and F1 pale brownish yellow, F2–F5 blackish brown, F6, F7 and clava whitish yellow; wings reduced, forewing stump reaching base of

petiole with five bristles; POL equal to OOL; gastral petiole 1.2× as long as broad in dorsal view; gaster 1.9× as long as mesosoma.

Materials examined: 1 female, INDIA, Kerala, Calicut, Medical College Campus, 18.iv.2013, ZSIK.reg.no.IR/INV/3626, coll. Shweta; 1 female, INDIA, Kerala, Calicut, Medical College Campus, 18.ix.2013, ZSIK.reg.no.IR/INV/3998, coll. Shweta; 1 female, INDIA, Kerala: Calicut, Easthill, 10.vi.2015, ZSIK.reg.no.IR/INV/4659, coll. P.M.Sureshan; 2 female, INDIA, Kerala, Trivandrum, Ponmudi, 12.ii.2015, ZSIK.reg.no.IR/INV/7640, coll.Rajmohana;

Distribution: India: Kerala, Tamil Nadu

Remarks: Collected from forest and homestead vegetation.

4. *Dipara gastra* (Sureshan & Narendran)

(Plate 7, Fig.d)

2004b. *Grahamsia gastra* Sureshan & Narendran, *Zoo's print journal*, 19(9):1616.
2007. *Dipara gastra* (Sureshan & Narendran), transferred by Desjardins, 2007. *Zootaxa*, 1647:52.

Diagnosis: Antennal scape, upper half of F6, F7 and clava whitish yellow, pedicel and F1-F5 and base of F6 pale brown, gaster yellowish brown with an yellow transverse band covering hind part of T1 and base of T2; notauli meet in the middle; scapula with a black punctured patch; propodeum without median carina; plicae on either side unite above base of nucha to form a 'V' shaped structure; brachypterous, forewing stump just short of reaching base of petiole with four strong brown setae; gaster 2.1× as long as wide and 1.5× as long head plus mesosoma combined, petiole with a pair of backwardly directed white setae.

Materials Examined: 5 females, INDIA, Kerala, Calicut, Nechooli, 9.iii.2016, ZSIK.reg.no.IR/INV/5525, coll. Raseena Farsana; 2 females & 1 male, INDIA, Kerala, Calicut, Medical College Campus, 18.iv.2013, ZSIK.reg.no.IR/INV/3625, coll. Shweta M; 3 females, INDIA, Kerala, Calicut, Mayanad, 7.i.2014, ZSIK.reg.no.IR/INV/3996, coll. Shweta M; 2 females & 1 male, Kerala, Calicut, Medical College, 18.ix.2013, ZSIK.reg.no.IR/INV/3997, coll. Shweta M; 1female, INDIA, Kerala, Calicut, Kakkayam, 1.iv.2014 ZSIK.reg.no.IR/INV/3999, coll. Shweta; 2 females, INDIA, Kerala, Calicut, Chelavur, 24.viii.2014, ZSIK.reg.no.IR/INV/6789, coll. Anjana G; 1 female, INDIA, Kerala, Calicut, Kakkayam, 8.ii.2015, ZSIK.reg.no.IR/INV/ 8921, coll. P.M.Girish Kumar.

Distribution: India: Kerala (**New record**), Tamil Nadu, Manipur, Maharashtra; Sri Lanka

Remarks: Collected from agroecosystem (Cocoa), homestead vegetation and forest.

5. *Dipara hayati* Sureshan

(Plate 7, Fig.e)

2013a. *Dipara hayati* Sureshan, *Rec.Zoo.Surv.India*: 113 (Part-1): 75-93.

Diagnosis: Head bluish black anteriorly, rest brownish black except pronotum and gaster laterally, scape testaceous; wings hyaline with slight pale brown infumation uniformly; POL 1.2× OOL; occipital carina far below posterior ocelli; clypeus delimited, convex, anterior margin arcuate; clypeus and paraclypeal area shiny; mesoscutum moderately reticulate with dense brown pubescence, with a pair of stout setae located below middle; notauli meeting together subapically, joined by transverse groove; scutellum medially little shorter than mesoscutum; propodeum with distinct median carina, connected to

an anterior 'V' shaped carina; petiole posteriorly little wider, distinctly carinate with a pair of white setae very near to base directed backwards.

Materials Examined: 1female, INDIA, Kerala, Idukki, Mannavanshola, Munnar 17.ix.2014, ZSIK.reg.no.IR/INV/4073, coll. P.M.Sureshan; 1 female, INDIA, Kerala, Calicut, Mayanad, 24.iv.2015, ZSIK.reg.no.IR/INV/7000, coll. Shweta

Distribution: India: Kerala, Tamil Nadu, Bihar

Remarks: Collected from forest and homestead vegetation.

6. *Dipara intermedia* Sureshan & Narendran

(Plate 7, Fig.f)

2005a. *Dipara intermedia* Sureshan & Narendran, *Rec.Zool.Surv.India*: 105(1-2): 105-109.

Diagnosis: Body yellowish brown, antennae brownish yellow, F5 brown, clava whitish yellow; propodeum with baso-medial area between plicae not elevated, surface almost shiny, plicae reaching only one third length, median carina weakly indicated half of length; bracypterous, forewing stump very short with two long setae; gaster elongate 2× as long as mesosoma; petiole basally with two fine backwardly directed hairs on each side, length 1.2× width dorsally; longitudinally striate and minutely reticulate.

Materials Examined: 1 female, INDIA, Kerala, Wayanad, Kalladi, 13.x.2016, ZSIK.reg.no.IR/INV/9313, coll. Raseena Farsana.

Distribution: India: Kerala; Sri Lanka

Remarks: Collected from agroecosystem (Cardamom).

7. *Dipara kannurensis* Sureshan & Raseena

(Plate 8, Fig.a)

2014b. *Dipara kannurensis* Sureshan & Raseena. Sureshan *et al.*, *Entomon* 39(1): 43-62.

Diagnosis: Body black, face and vertex with metallic bluish green with golden reflection, POL 1.37× OOL, pronotal collar narrow, anteriorly not carinate, almost shiny; scutellum distinctly shorter than mesoscutum (0.64×) with a pair of stout setae near transcutellar suture and another on frenal line, frenal area longitudinally carinate; propodeum with distinct median area bifurcate in the form of 'V' anteriorly, rest of the median area with large areolae formed by thick irregular carinae; gaster including petiole 1.05× as long as head plus mesosoma combined.

Materials Examined: 1 female, INDIA, Kerala, Calicut, Easthill, 21.xi.2015, ZSIK.reg.no.IR/INV/4765, coll. Raseena Farsana; 1 female & 2 males, INDIA, Kerala, Trissur, Velupadam, 12.v.2015, ZSIK.reg.no.IR/INV/7641, coll. Ranjith; 1 female, INDIA, Kerala, Kozhikode, Janakikkadu, 23.ii.2015, ZSIK.reg.no.IR/INV/8881, Ranjith.

Distribution: India: Kerala, Karnataka, Tamil Nadu

Remarks: Collected from agroecosystem (Nutmeg) and forest.

8. *Dipara keralensis* (Narendran)

(Plate 8, Fig.b)

2000. *Parurios keralensis* Narendran. Narendran *et al.*, *Bull. Pure and Appl. Sci.* 19A (2):137.

2011. *Dipara keralensis* (Narendran): Özdikmen, *Mun. Ent. Zool.* 6 (2): 843. Senior homonym

Diagnosis: Body black; antenna dark brown with clava pale brownish yellow and scape brown; wings hyaline with brown tinge; scrobe reaching mid level of

eye; POL 1.5× OOL; mesoscutum with notauli approaching each other on posterior part; scutellum distinctly shorter than mesoscutum; frenum with strong longitudinal carinae; propodeum with an anterior median areola followed by a median longitudinal carina, costula weak; gastral petiole a little shorter than one third length of T1 in dorsal view.

Materials examined: 1 female, INDIA, Kerala, Wayanad, Kalladi, 20.v.2015, ZSIK.reg.no.IR/INV/5240, coll. Raseena Farsana

Distribution: India: Kerala, Uttar Pradesh.

Remarks: Collected from agroecosystem (Cardamom).

9. *Dipara malabarensis* (Narendran & Mini)

(Plate 8, Fig.c)

2000. *Grahamisia malabarensis* Narendran & Mini, *Zoos's print journal* XV (12) 371. (ZSIK)

2007. *Dipara malabarensis* (Narendran & Mini), transferred by Desjardins, *Zootaxa*, 1647:53.

Diagnosis: Head brownish yellow with dark brown bands on lower face, mesosoma pale brownish yellow with two large black spots on scapulae, gaster dark brown with middle part of T1 and ventrally pale; antenna blackish brown with middle part of scape, ring segment, F7 and clava pale white or pale yellow; propodeum with median carina not quite reaching basal margin, median area conically little elevated; forewing reduced, hardly reaching base of petiole; gaster length including petiole 2× that of mesosoma.

Materials Examined: 1 female, INDIA, Kerala, Trivandrum, Chatharangal, 17.xii.2015, ZSIK.reg.no.IR/INV/7013, coll. Rajmohana; 1 female, Kerala, Wayanad, Kalladi, 12.x.2016, ZSIK.reg.no.IR/INV/9294, coll. Raseena Farsana;

Distribution: India: Kerala, Tamil Nadu, Manipur, Chhattisgarh

Remarks: Collected from forest and agroecosystem (Cardamom).

10. *Dipara miniae* Narendran & Sureshan

(Plate 8, Fig.d)

2001. *Dipara miniae* Narendran & Sureshan, *Zoos'print journal*. 16 (4): 453. (ZSIK)

Diagnosis: Head and mesosoma honey brown; antennae pale yellow with apex of F4, F5 and F6 darker; wings with three dark infumations; POL 2× OOL; scutellum with area behind frenum mostly smooth and with faint longitudinal striae; propodeum without median carina and with a polished elevated median triangular area, costula distinct; gastral petiole a little more than 1.5× as long as broad, longitudinally carinate and reticulate.

Materials Examined: 2 females, INDIA, Kerala, Calicut, Nechooli, 9.iii.2016, ZSIK.reg.no.IR/INV/5526, coll. Raseena Farsana; 2 females, INDIA, Kerala, Calicut, Kakkadampoyil, 30.xii.2016, ZSIK.reg.no.IR/INV/8208 coll. Sureshan & Raseena Farsana; 3 Females, INDIA: Kerala, Wayanad, Kalladi, 8.iii.2016, ZSI/WGRC/IR.INV.9292, coll. Raseena Farsana

Distribution: India: Kerala, Bihar, Tamil Nadu

Remarks: Collected from agroecosystems (Cocoa, cardamom and mixed crops)

11. *Dipara nigra* Sureshan

(Plate 8, Fig.e)

2013a. *Dipara nigra* Sureshan, *Rec.Zoo.Surv.India*: 113(Part-1): 75-93.

Diagnosis: Body brownish black except pronotum uniformly, mesoscutum with anterior part of mid lobe, axillae and axillulae pinkish brown; antennae with scape except tips and clava whitish yellow, remainder brown, wings hyaline; POL 1.5× OOL, occipital carina far below posterior ocelli; vertex with three pairs of strong setae directed forwards; notauli meeting subapically, joined by a transverse groove; metasoma including petiole 1.3× as long as head plus mesosoma combined; hypopygium reaching hind margin of T3; ovipositor distinctly produced, T1 largest.

Materials Examined: 1 female, INDIA, Kerala, Kottayam, Kuruvalangad, 22.iv.2016, ZSIK.reg.no.IR/ INV/7642, coll.Raseena Farsana; 1 female, INDIA, Kerala: Calicut, Nechooli, 9.iii.2016, ZSIK.reg.no.IR/INV/9311, coll. Raseena Farsana;

Distribution: India: Kerala (**New Record**), Arunachal Pradesh

Remarks: Collected from agroecosystem (Cocoa and Nutmeg)

12. *Dipara yercaudensis* Sureshan

(Plate 8, Fig.f)

2014b. *Dipara yercaudensis* Sureshan. Sureshan *et al.*, *Entomon* 39(1): 43-62.

Diagnosis: Body honey brown except mesoscutum (almost completely), and scutellum (completely) black; clypeus smooth, anterior margin sub truncate; clava as long as three preceding segments combined; notauli not meeting

posteriorly; scutellum medially $0.43\times$ length of mesoscutum; frenum very narrow; propodeum with distinct median carina, connected to small 'V' shaped carina anteriorly, remaining areas uniformly with strong longitudinal rugae, in a sub circular form; hind coxa with strong transverse rugae; hind tibia with two unequal spurs.

Materials Examined: 1 female, INDIA, Kerala, Calicut, Eashill, 13.iv.2015, ZSIK.reg.no.IR/INV/4427, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Easthill, 17.iv.2015, ZSIK.reg.no.IR/INV/4706, coll. P.M.Sureshan; 1 female, INDIA, Kerala, Calicut, Easthill, 5.xii.2014, ZSIK.reg.no.IR/INV/4833, coll. G.Kumar; 2 females, INDIA, Kerala, Calicut, Nechooli, 9.iii.2016, ZSIK.reg.no.IR/INV/5524, coll. Raseena Farsana; 2 females, INDIA, Kerala, Ernakulam, Urulanthanni, 17.vi.2016, ZSIK.reg.no.IR/INV/6873, coll. Nikhil; 1 female, INDIA, Kerala, Malappuram, Nilambur, 18.v.2015, ZSIK.reg.no.IR/INV/6993, coll. Ranjith; 1 female, INDIA, Kerala, Calicut, Annasserri, 17.vii.2016, ZSIK.reg.no.IR/INV/7172, coll. Sheeja;

Distribution: India: Kerala, Andra Pradesh, Karnataka, Tamil Nadu

Remarks: Collected from homestead vegetation, forest and agroecosystems (Mixed vegetables).

Netomocera Bouček

1954a. *Netomocera* Bouček, *Acta Ent.Mus.Natl.Pragae*, 29:49. Type species *Netomocera setifera* Bouček, by monotypy and original designation.

Diagnosis: Colour often brownish black to jet black with various parts dark testaceous or even yellowish; body rather robust in females but males are smaller in size; gaster with short petiole (broader than long or quadrate) in both sexes; antennae strongly clavate, clava strongly asymmetrical in females and always long in males; mandibles strongly sickle shaped and three toothed;

clypeus almost truncate or slightly produced, very finely reticulate to almost shiny; vertex and thoracic dorsum with strong bristles.

Hosts: Not yet known. Species are often found in relatively open spaces, not in deep forests (Bouček, 1988). Host insects are probably found under leaf litter evidenced by the collection of parasitoids from such habitats.

Distribution: Known from all continents (mostly undescribed) except Antarctica.

Key to the species of *Netomocera* Bouček

1. Wings reduced..... 2
- Wings fully developed.....4
2. (1) Gaster short, 1.4× as long as broad, T1 covering slightly over half of gaster, apical margin of tergites straight *N. nearctica* Yoshimoto
- Gaster long, 1.5-1.8× as long as broad, T1 covering distinctly more than half of gaster; apical margin of tergites slightly angulate..... 3
3. (2) T1 slightly broader than long, clava as long as three preceding segments combined.*N. sedlaceki* Bouček
- T1 1.0-1.3× as long as broad, clava as long as about five preceding segments combined.....
.....*N. ramakrishani* Sureshan (Brachypterous form)
4. (1) Forewing with two fuscous spots, one below MV and the other at apex..... *N. setifera* Bouček
- Forewing without fuscous spots, but sometimes with uniform brown infumation..... 5

5. (4) Antenna inserted distinctly above lower ocular line; eyes large ($2\times$ as long as wide); malar space very short, less than $0.2\times$ as long as eye.....*N.alboscapus* Hedqvist
- Antenna inserted just at lower ocular line; eyes not large (less than $2\times$ as long as wide); malar space not very short, more than $0.2\times$ as long as eye (in profile).....6
6. (5) Gaster (excluding petiole) long, $2.65\times$ as long as its maximum width; T1 not reaching middle of gaster*N. africana* Hedqvist
- Gaster (excluding petiole) oval or elongate oval, less than $2\times$ as long as its maximum width; T1 reaching middle of gaster.....7
7. (6) Gaster with hind margin of T1 distinctly emarginate, petiole as long as broad; forewing with uniform brown infumation (Plate 9, Fig. d)..... *N. nigra* Sureshan & Narendran
- Gaster with hind margin of T1 slightly angulate, petiole transverse, $2.3-4.3\times$ as broad as long; forewing sometimes smoky.....8
8. (7) Body mostly reddish brown especially on mesosoma, legs uniformly brownish yellow; gaster as long as head plus mesosoma combined and $1.8\times$ as long as broad in dorsal view; frenum clearly marked, wings hyaline..... *N.ramakrishnai* Sureshan, (winged form)
- Body mostly black or partially yellowish brown on lateral part of pronotum and gaster ventrally; legs not uniformly brownish yellow, gaster short, $0.8\times$ as long as head plus mesosoma combined and $1.4-1.6\times$ as long as broad in dorsal view; frenum vaguely separated, wings with uniform brown infumation9

9. (8) Body generally brownish black, lateral part of pronotum yellowish brown; antennae testaceous except F7 and clava blackish brown; pronotum with seven black bristles frenum centrally with reticulations and laterally with rugae; gastral petiole transverse, 4.3× as broad as long with longitudinal rugae only on hind part; PMV 2× and MV 4.3× as long as STV; (Plate 9, Fig. c).....*N. minuta* Sureshan & Nikhil
- Body uniformly black, antennae mainly blackish brown; pronotum with 10 black bristles frenum uniformly with longitudinal rugae ; gastral petiole long, 2.67× as broad as long with distinct longitudinal ridges; PMV 1.5× and MV 3.3× as long as STV; (Plate 9, Fig. a).....*N. calicutensis* Sureshan et al

13. *Netomocera calicutensis* Sureshan & Raseena

(Plate 9, Fig. a)

2017b. *Netomocera calicutensis* Sureshan & Raseena. Sureshan *et al.*, Insect Diversity and Taxonomy, *T.C.N. Com. Vol.* 131-152.

Diagnosis: Body black with slight brownish tinge on posterior and ventral part of gaster, antennae testaceous except F7 and clava brownish black; clypeus convex, projecting from general surface, almost completely shiny, anterior margin sub truncate; malar grooves distinct; POL 4× OOL; funicular segments becoming wider towards the tip; clava as long as about four preceding segments combined; notauli complete but not distinct; frenum vaguely separated, frenal area with longitudinal rugae; propodeum 3.1× as broad as median length with irregular strong carinae enclosing broad areas, the interior of which shiny; median carina not indicated; petiole transverse, 2.67× as broad as long, with longitudinal ridges; T1 covering most of the gaster, posterior margin slightly angulate.

Materials Examined: 1 female, INDIA, Kerala, Calicut, Easthill, 8.iv.2015, ZSIK.reg.no.IR/INV/4705, coll. Raseena Farsana; 1 male, INDIA, Kerala, Calicut, Easthill, 31.viii.2015, ZSIK.reg.no.IR/INV/6790, coll. Raseena Farsana;

Distribution: India: Kerala

Remarks: Collected from homestead vegetation.

14. *Netomocera maculata* Raseena *et al.*,

(Plate 9, Fig. b)

2016. *Netomocera maculata* Raseena *et al.*, *J. Ent. Res.* 40 (3): 297-301, (ZSIK)

Diagnosis: Body black except scape, half of first funicular segment, terminal segment of clava, micropilosity and tarsi testaceous; femora and tibia brownish black; forewing with two large brown infumations, one below MV and other below PMV; dorsal head width $1.66\times$ as broad as long; pedicel $0.7\times$ as long as F1, frenal area medially $0.53\times$ length of the area above scutellar line, frenal groove present and distinct; propodeum with large smooth area on both sides, median carina complete; T1 $0.5\times$ total length of gaster; MV $1.8\times$ PMV.

Materials Examined: 1 female, Kerala: Calicut, Kakkadampoyil, 30.xii.2016, ZSIK.reg. no.IR/INV/ 8206, coll. Sureshan & Raseena Farsana.

Distribution: India: Kerala, Tamil Nadu.

Remarks: Collected from agroecosystem (mixed crops) close to forest.

15. *Netomocera minuta* Sureshan & Nikhil

(Plate 9, Fig. c)

2015. *Netomocera minuta* Sureshan & Nikhil, *Journal of Threatened Taxa* 7(2): 6904-6906, (ZSIK).

Diagnosis: Head and mesosoma black except lateral part mainly, dorsal part slightly and upper mesepimeron brown; antennae testaceous except clava brown; anterior margin of clypeus angularly produced; POL 4.2× OOL; antennae inserted at level with lower margin of eyes; clava as long as about five preceding segments combined; scutellum with frenum vaguely indicated, distinctly reticulate in the centre and longitudinally ridged laterally; gastral petiole 4.3× as broad as long, smooth basally and with small carinae in the hind part; gaster 1.4× as long as broad in dorsal view.

Materials Examined: 1 female, INDIA, Kerala, Kozhikode, Easthill, 21.v.2015, Coll.P.M.Sureshan, ZSIK Reg. No. IR/ INV/ 4525; 5 males, INDIA, Kerala, Calicut, Easthill, 25.iii.2015, ZSIK.reg.no.IR/INV/4497, coll. Ranjith A.P; 1 female, INDIA, Kerala, Calicut, Easthill, 22.iv.2015, ZSIK.reg.no.IR/INV/4498, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Easthill, 20.iv.2015, ZSIK.reg.no.IR/INV/4500, coll. Ranjith A.P; 2 females & 2 Males, INDIA, Kerala, Trissur, Velupadam 12.v.2015, ZSIK.reg.no.IR/INV/7015, coll. Ranjith A P.

Distribution: India: Kerala, Karnataka, Tamil Nadu

Remarks: Collected from homestead vegetation and agroecosystem (Nutmeg).

16. *Netomocera nigra* Sureshan & Narendran

(Plate 9, Fig. d)

1990. *Netomocera nigra* Sureshan & Narendran, *Oriental Insects* 24: 223-224, (ZSIK)

Diagnosis: Body black, gaster slightly brownish ventrally; antenna except scape, pedicel annelli and F1 black; clava as long as four preceding segments combined; scutellar frenum distinctly separated with longitudinal rugae; gastral petiole longitudinally ridged, T1 covering more than half of gaster, hind margin deeply emarginate.

Materials Examined: 1 female, INDIA, Kerala, Thrissur, Vazhachal, 27.ii.2013, ZSIK.reg.no.IR/INV/3000, coll. P.M.Sureshan; 1 female, INDIA, Kerala, Kozhikode, Easthill, 25.v.2015, Coll. P.M.Sureshan; 4 males, INDIA, Kerala, Ernakulam, Thattekkad, Koottikal, 24.iv.2015, Coll. P. M. Sureshan, ZSIK Reg.No.IR/INV/4494; 1male, INDIA, Kerala, Kozhikode, Easthill, 24.x.2014, ZSIK.reg.no.IR/INV/4218, coll. Raseena Farsana; 4 males, INDIA, Kerala, Ernakulam, Thattekkad, Koottikkal 24.iv.2015, ZSIK.reg.no.IR/INV/4494, coll. Sureshan; 2 males, INDIA, Kerala, Ernakulam, Thattekkad, Thoppimudi, 23.iv.2015, ZSIK.reg.no.IR/INV/4495, coll. P.M.Sureshan; 1 female, INDIA, Kerala, Calicut, Easthill, 8.v.2015, ZSIK.reg.no.IR/INV/4700, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Easthill, 21.v.2015, ZSIK.reg.no.IR/INV/4701, coll. P.M.Sureshan; 1 female, INDIA, Kerala, Ernakulam, Thattekkad, Kolumba, 20.ix.2016, ZSIK.reg.no.IR/INV/7639, coll.P.M.Sureshan.

Distribution: India: Kerala. Orissa; People's Republic of China

Remarks: Collected from forest and homestead vegetation.

Subfamily: EROTOLEPSIINAE

Papuopsia Bouček

1988. *Papuopsia* Bouček, 349. Type species *Papuopsia setosa* Bouček by monotypy and original designation.

Diagnosis: Head and mesosoma dorsally with extremely shallow ground reticulation and sparse bristles, body black with faint metallic gloss; head with large bare eyes with orbits converging forward; no temples; clypeus extremely reduced, anterior margin emarginated; antenna slender, scape long, anellus very small, six transverse funicular segments; scrobe deep; scutellum without frenal groove but frenal area smooth and bare; petiole conspicuous, transversely quadrangular, dorsally almost flat but with several longitudinal carinae, T1 covering fully 2/3 of gaster, anteriorly narrow, dorsally at base depressed with radiating striae.

Distribution: New Guinea, Sri Lanka, India.

Biology: Not known.

17. *Papuopsia striata* Sureshan

(Plate 9, Fig. e)

2005b. *Papuopsia striata* Sureshan, *Rec. Zool. Surv. India*. 105 (3-4):82.

Diagnosis: Black with faint metallic gloss; clypeus reduced with anterior margin round; malar space 0.3× as long as eye; mandibles two toothed; POL slightly greater than 2× OOL; pedicel as long as F1 and F2 combined; pronotum short, broad and crescentic; propodeum with distinct median carina, plicae and weak costula; petiole 2× as broad as long; T1 covering 0.6× total length of gaster, dorsally with radiating striae, longer on sides reaching upto middle of T1.

Materials examined: 1 female & 1 male, INDIA, Kerala, Kozhikode, Easthill, 23.x.2014, ZSIK.reg.no.IR/INV/4221, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Easthill, 21.ix.2015, ZSIK.reg.no.IR/INV/4764, coll. Sheeja; 1 female, INDIA, Kerala, Kakkayam, 29.xii.2015, ZSIK.reg.no.IR/INV/6679, coll. Rajmohana

Distribution: India: Kerala; Papua New Guinea; Sri Lanka

Remarks: Collected from homestead vegetation and forest.

Subfamily: EUNOTINAE

***Cephaleta* Motschulsky**

1859. *Cephaleta* Motshulsky: *Etudes entomologiques.Helsing.* 173. Type species. *Cepahleta purpureiventris* Motschulsky designated by Ashmead, 1904.

Diagnosis: Gena strongly shiny between hairs, posteriorly delimited by a distinct carina; antennal insertion above clypeal margin; antennae with ten segments (nine segmented in males); thorax shiny between hairs which are placed on papillae; scutellum moderately produced over propodeum; propodeum with distinct median carina plicae absent, hind corner of propodeum forming a sharp straight vertical edge with an angular tooth distally; wings almost entirely pilose; T1 largest.

Distribution: Florida, South America, South Asia to Australia.

Biology: Parasitoides of coccids especially of genera *Cerococcus*, *Ceroplastes*, *Asterolecanium*, *Ferrisia* etc.

Key to the Kerala species of *Cephaleta* Mostschulsky

1. Female antenna stout, distinctly clavate, gaster yellowish brown and mostly short and cordiform; pedicel longer than F1; male antenna with F1 distinctly curved and longer than scape (Plate 10, Fig.

- a).....*C. brunniventris* Motschulsky
- Female antenna slender not strongly clavate, pedicel shorter than or as long as F1; gaster short, cordiform colour black with metallic blue reflections, sometimes distinctly elongate, then colour mostly yellowish brown; male antenna with F1 very slightly or distinctly curved and shorter than scape in the latter.....2
2. (1) Gaster mostly yellowish brown, blackish at tip, distinctly elongated, dorsally 1.9× as long as broad and laterally 1.4× as long as head plus thorax; male antenna with F1 distinctly curved and little longer than scape*C. elongata* Sureshan
- Gaster black with metallic bluish green reflection, short and cordiform, dorsally 1.4× as long as broad and laterally little shorter than head plus thorax; male antenna with F1 hardly curved and shorter than scape (Plate 9, Fig. f)..*C. australiensis* (Howard)

18. *Cephaleta australiensis* (Howard)

(Plate 9, Fig. f)

1896. *Anysis australiensis* Howard *Canad. Ent.*28 : 167.

1978. *Cephaleta australiensis* (Howard). Synonymized by Bouček *et al.*, 438.

Diagnosis: Body including gaster black with metallic bluish green reflection; head in dorsal view about 2× as broad as long; gena smooth and posteriorly carinate; antennae inserted below lower margin of eyes; pedicel shorter than F1 and F2 combined; mesoscutum moderately reticulate with dense white pubescence; scutellum with raised reticulation; T1 largest and remaining tergites gradually decreasing in length.

Materials examined: 1 female, INDIA, Kerala, Calicut, Vengeri, 7.xi.2014,

ZSIK.reg. no.IR/INV/9311, coll. Raseena Farsana

Distribution: India: Kerala, Andaman, Andra Pradesh, Assam, Bihar, Delhi, Maharashtra; Karnataka, Orissa, Uttar Pradesh, West Bengal, Tamil Nadu, Australia, Bangladesh, India, Indonesia, New Zealand, Pakistan, China and Sri Lanka.

Remarks: Collected from agroecosystem (Mixed vegetables).

19. *Cephaleta brunniventris* Motschulsky

(Plate 10, Fig. a)

1859. *Cephaleta brunniventris* Motschulsky, *Etudes Ent.* 8: 174.

2011. *Cephaleta brunneiventris* Motschulsky, Sureshan *et al.*, *Hexapoda*, 18 (2): 97.

Diagnosis: Head and mesosoma shiny black, gaster yellowish brown; head in dorsal view 3× broader than length; malar groove indistinct; POL 4× OOL; antenna stout, distinctly clavate; antenna with pedicel longer than F1, scape not reaching median ocellus; propodeum subquadrate; gaster as long as mesosoma, T1 as long as T2, T3 and T4 combined.

Materials examined: 11 females & 9 males, INDIA, Kerala, Palakkad, Thathamangalam, 19.xii.2013, ZSIK.reg.no.IR/INV/3417, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Eashill, 13.iv.2015, ZSIK.reg.no.IR/INV/4426, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Easthill, 29.iv.2015, ZSIK.reg.no.IR/INV/4603, coll. P.M.Sureshan; 1 female, INDIA, Kerala, Calicut, Easthill, 25.v.2015, ZSIK.reg.no.IR/INV/4658, coll. Gnana Kumar; 2 females & 1 male, INDIA: Kerala, Calicut, Vengeri, 13.ii.2014, ZSIK.reg.no.IR/INV/9250, coll. Raseena Farsana.

Distribution: India: Kerala, Assam, Manipur, Bihar, Uttar Pradesh, West Bengal, Karnataka, Tamil Nadu, Telungana; Bangladesh; Malaysia; Pakistan; China; Philippines; Sri Lanka; Taiwan; USA.

Remarks: Collected from agroecosystem. In the present study this species emerged from Pigeon pea infested with Coccidae (Homoptera). It also emerged from mango leaf gall.

Subfamily: HERBERTINAE

***Herbertia* Howard**

1894. *Herbertia* Howard, Type species *Herbertia lucens* Howard, by monotypy, 98.

Diagnosis: Body small, hairy with extensively pilose wings; MV very long and STV very short; mandibles narrow, two toothed, labrum exposed, clypeus subdivided by a cross carina; eyes densely hairy; shiny pleural sides bear a small dense patch of hairs between the bases of the mid and hind coxae; gaster convex, with large bell shaped T1 which has a deep short basal fovea with conspicuous hairs sublaterally and medially.

Distribution: Circumtropical but reaching into warmer parts of temperate zones, America, Africa, with South Europe, Southeast Asia, to the East reaching New Guinea and Queensland (Boucek, 1988).

Biology: Parasites of leaf mining Diptera, Agromyzidae.

20. *Herbertia indica* Burks

(Plate 10, Fig. b)

1959. *Herbertia indica* Burks, *Proc. Ent. Soc. Wash.*, 61 (6): 252.

Diagnosis: Black metallic violaceous reflection on face and gaster dorsally; head and mesosoma granulate reticulate; antennae inserted on lower face, scape not reaching middle of face; F1 shorter than pedicel; clava as long as three

preceding segments combined; forewing with MV slightly greater than $2\times$ as long as PMV; gaster broad and short, T1 covering most of the length.

Materials examined: 4 females & 1 male, INDIA, Kerala, Palakkad, Chittur, 2.i.2016, ZSIK.reg.no .IR/INV/5527, coll. Raseena Farsana; 1 female, INDIA, Kerala, Palakkad, Silent valley N.P., Sairandri, 20.ii.2013, coll.P.M.Sureshan, ZSIK.reg.no.IR/INV/2958; 1 female, INDIA, Kerala, Calicut, Easthill, 21.ix.2015, ZSIK.reg.no.IR/INV/4762, coll. Sheeja; 2 females & 1 male, INDIA, Kerala, Palakkad, Chittur, 20.i.2015, ZSIK.reg.no.IR/INV/7023, coll. Raseena Farsana; 1 female & 2 males, INDIA, Kerala, Calicut, Easthill, 20.iii.2015, ZSIK.reg.no.IR/INV/7064, coll. Sheeja; 1 female & 1 male, INDIA, Kerala, Kannur, Muzhuppilangad, 15.xii.2014, ZSIK.reg.no.IR/INV/8774, coll. Nikhil & Gnana Kumar; 3 females, Kerala, Kozhikode, Olavanna, 2.i.2015, ZSIK.reg.no.IR/INV/8776, coll. Sheeja & Raseena Farsana; 1 female, Kerala, Kozhikode, Muthukkad, 28.xii.2014, ZSIK.reg.no.IR/INV/8777, coll. Sheeja; 2 females, Kerala, Kozhikode, Kuttyadi, 5.iii.2015, ZSIK.reg.no. IR/INV/8779, coll. Sheeja; 1 female, Kerala, Kozhikode, Kottoli, 12.xi.2014, ZSIK.reg.no.IR/ INV/8780, coll. Sheeja; 1 female, Kerala, Kozhikode, Narenkulam, 24.xii.2014, ZSIK.reg.no.IR/INV/8781, coll.G.Kumar;

Distribution: India: Kerala, Bihar, Madhyapradesh, Karnataka; Malaysia; People's Republic of China; Sri Lanka.

Remarks: Collected from agroecosystem (paddy, mixed vegetables and rubber) and forest.

Subfamily: MISCOGASTERINAE

***Halticoptera* Spinola**

1811. *Halticoptera* Spinola, 148. Type species *Diplolepis flavicornis* Spinola, designated by Ashmead, 1904: 376.

1946. *Halticopterina* Erdős, 160; type-species: *H. triannulata* Erdős, by original designation, Synonymized by Bouček

1834. *Phacostomus* Nees & Esenbeck, 121; type-species: *Diplolepis patellana* Dalman, 1818, by monotypy. Synonymized by Graham, 1969: 155.

Diagnosis: Clypeal margin asymmetric but with deep median incision and prominent teeth; antenna with two anelli and six funicular segments; pronotum dorsally very short; mesoscutum with notauli posteriorly becoming very shallow and indistinct; propodeum medially elevated and frequently shiny, always with median carina; gaster mostly distinctly petiolate; maxillary palpi of male mostly inflated.

Distribution: Widely distributed in the Palearctic, Nearctic and Oriental regions. Also known from Africa and Australia (probably introduced) (Bouček, 1988).

Biology: Parasites of Diptera mining leaves or burrowing in other tissues of herbaceous plants especially of umbellifers and ferns. The dipterous hosts are mainly Agromyzidae, less frequently Tephritidae and Drosophilidae.

21. *Halticoptera agaliensis* Sureshan

(Plate 10, Fig. c)

2003b. *Halticoptera agaliensis* Sureshan, *Rec. Zool. Sur. of India*. 232, (ZSIK).

Diagnosis: Body dark metallic blue with more metallic reflection on gaster. Antenna with basal half of scape testaceous, remainder dark brown; coxae concolorous with mesosoma, femora dark brown, remainder of legs honey yellow; POL subequal to OOL; frenal area of scutellum moderately reticulate;

median area of propodeum finely but distinctly reticulate; plicae distinct as far forwards as spiracles; forewing with MV $3.5\times$ STV; gaster cordiform, length $1.4\times$ width; petiole finely reticulate with distinct median and lateral ridges, a little wider than long; posterior margin of T1 deeply incised in the middle, little wider than long.

Materials Examined: 4 females, INDIA, Kerala, Kozhikode, Malabar Wildlife Sanctuary, Kakkayam, 30.xii.2014, coll. P. M. Sureshan, ZSIK.reg.no.IR/INV/7255; 3 females & 1 male, INDIA, Kerala, Kakkayam, 30.xii.2014, ZSIK.reg. no.IR/INV/7095, coll. Rajmohana; 3 females, INDIA, Kerala, Kozhikode, Kakkayam, 8.ii.2015, ZSIK.reg.no.IR/INV/8920, coll. Girish Kumar.

Distribution: India: Kerala, Tamil Nadu

Remarks: Collected from forest.

Stictomischus Thomson

1876. *Stictomischus* Thomson, 220,234. Type species *Stictomischus scaposus* Thomson: designated by Ashmead, 1904.

Diagnosis: Forewing with stigma conspicuously enlarged and PMV longer than MV; speculum absent or strongly reduced, either indicated by narrow strip; noatuli rather deep; mesoscutum with numerous dark hairs; prepectus with vertical carina, if rarely this indistinct then forewing with isolated bare area below parastigma; frenal groove distinct; gaster on conspicuous petiole from hardly shorter than to about twice as long as broad, dorsally with distinct reticulation.

Distribution: Europe to Japan, New Guinea, Asia.

Biology: Parasitoids of Agromyzidae, Anthomyiidae and Scatophagidae boring in stems and thicker parts of certain herbaceous plants.

22. *Stictomischus malabarensis* sp. nov.

(Plate 11, Fig. a-g)

Female: Length 2.1mm. Body bright metallic blue with face and vertex greenish blue; scape testaceous, remaining antennal segments blackish brown; coxae concolorous with body, remainder of legs testaceous with tips of tarsi and upper dorsal half of tibia brown; tegulae brown; wing membrane hyaline; veins and pubescence brown.

Head: Moderately reticulate with sparse pubescence; clypeus smooth with two sharp teeth. In front view head width $1.21\times$ height; malar groove distinct, gena engraved reticulate; malar space $0.3\times$ eye length; eye height $1.5\times$ width in profile. Scrobal area deep and not reaching median ocellus; in dorsal view head width $2.72\times$ as broad as long; POL $1.18\times$ OOL, temple $0.2\times$ eye length. Antennae inserted middle of face, inter-antennal space raised; scape $0.61\times$ eye length and not reaching median ocellus, pedicel plus flagellum $0.77\times$ as long as head width, pedicel $1.5\times$ as long as wide and $0.72\times$ as long as F1, anelli transverse. Relative length, scape 1.16, pedicel 0.07, F1 0.094, F2 0.094, F3 0.093, F4 0.06, F5 0.04, F6 0.04, clava 0.168; clava longer than three preceding segments combined.

Mesosoma: Pronotum moderately reticulate with long brown setae. Mesoscutum $1.7\times$ as broad as long, mid lobe moderately reticulate and side lobes engraved reticulate with brown sparse pubescence, notauli complete; axillae engraved reticulate. Scutellum $0.76\times$ as broad as long and engraved reticulate; frenum present, frenal groove distinct; dorsellum broad and shiny. Propodeum medially convex with engraved reticulation, $2.92\times$ as wide as long, median carina distinct, spiracle long, oval close to metanotum, post-spiracular groove reaching posterior margin; callus with long white hairs. Prepectus as long as tegula and engraved reticulate with sharp anterior carina. Upper mesepimeron shiny; lower mesepimeron, mesepisternum and metapleuron

reticulate punctate. Forewing $2.22\times$ as long as broad, discal pubescence dense, speculum almost absent, basal cell bare, basal hairline with a few hairs, marginal fringe moderately long, relative lengths SMV 0.75, MV 0.35, PMV 0.47, STV 0.22; STV strongly capitate. Hind coxae moderately reticulate with long white hairs laterally; tibia widened medially.

Metasoma: Gaster petiolate; $0.71\times$ head plus mesosoma combined (excluding petiole) and $1.49\times$ as long as propodeum; petiole rugulose punctate, anteriorly converging, dorsally not depressed, $0.3\times$ length of gaster; $2.13\times$ longer than broad; T1 and T2 cover most of length of gaster; T1 $0.64\times$ length of gaster; T1 $1.75\times$ as long as T2 and $6.87\times$ as long as T3; T1, T2 and T3 visible dorsally, remaining tergites strongly retracted.

Male: unknown

Materials Examined: Holotype: Female, INDIA, Kerala, Calicut, Kakkadampoyil, 13.i.2017, Coll. Raseena Farsana, ZSIK.reg.no.IR/INV/9599; Paratype: 1 Female, INDIA, Kerala, Calicut, Kakkadampoyil, 30.xii.2016, Coll. P.M. Sureshan & Raseena Farsana, ZSIK.reg.no.IR/INV/9600.

Host: Unknown.

Remarks: Both holotype and paratype were collected from agroecosystem (Mixed crops) close to forest. This species closely resembles *S. turneri* Sureshan, but differs from it in having body bright metallic blue without golden reflection on face vertex and mesosoma, upper dorsal half of tibia brown; clava longer than three preceding segments combined; temple length $0.2\times$ eye length; pronotum moderately reticulate; mesoscutum with side lobes engraved reticulation; lower mesepimeron and metapleuron moderately reticulate; petiole rugulose punctate, dorsally not depressed; T1 and T2 cover most of the length of gaster, only T1, T2 and T3 dorsally visible, other tergites strongly retracted (In *S. turneri* Sureshan body bright metallic blue with golden reflection on face

vertex and mesosoma, tibia uniformly testaceous; clava little longer than two preceding segments combined; temple length $0.4\times$ eye length; pronotum with dorsal part of collar transversely striated; mesoscutum with side lobes transversely striated; lower mesepimeron and metapleuron almost shiny; petiole rugulose reticulate dorsally somewhat depressed; T1 covers more than half of tergites and all tergites are dorsally visible).

Etymology: The species name derives from the type locality, Malabar area of Kerala.

23. *Stictomischus sahyadriensis* sp. nov.

(Plate 12, Fig. a-f)

Female: Length 1.93mm. Head and mesosoma bright metallic green; gaster brown with bluish green reflection; antennae brown except scape testaceous; mesepisternum black; coxae concolorous with body, remainder of legs testaceous with tips of tarsi brown; tegulae brown; petiole bluish black; wing membrane hyaline; veins and pubescence brown.

Head: Moderately reticulate; clypeus smooth with two sharp teeth, left mandible with three teeth and right with four teeth. In front view head width $1.3\times$ height; malar groove distinct, gena engraved reticulate; malar space $0.26\times$ eye length; eye height $1.5\times$ width in profile. Scrobal area deep and not reaching median ocellus; in dorsal view head width $3.5\times$ as broad as long; POL $1.25\times$ OOL, temple $0.35\times$ eye length. Antennae inserted middle of face; scape $0.65\times$ eye length and not reaching median ocellus, pedicel plus flagellum $1.1\times$ as long as head width, pedicel $1.37\times$ as long as wide and $0.72\times$ as long as F1, anelli transverse. Relative length, scape 0.214, pedicel 0.07, F1 0.097, F2 0.097, F3 0.097, F4 0.097, F5 0.078, F6 0.066, clava 0.172; clava little longer than two preceding segments combined.

Mesosoma: Pronotum moderately reticulate with backwardly directed long brown pubescence. Mesoscutum 1.74× as broad as long, mid lobe moderately reticulate and side lobes engraved reticulate with brown sparse pubescence, notauli complete; axillae engraved reticulate. Scutellum 0.89× as broad as long and engraved reticulate; frenum present, frenal groove distinct; frenal area 0.35× as long as area anterior to it; dorsellum broad and shiny. Propodeum medially convex with engraved reticulation, 2.95× as wide as long, median carina distinct, spiracles oval close to metanotum, post-spiracular groove reaching posterior margin; callus with long white hairs, nucha short. Prepectus horizontally little shorter than tegula, engraved reticulate with sharp anterior carina. Upper mesepimeron and lower mesepimeron shiny except a narrow reticulate punctate area separating them, mesepisternum reticulate punctate, metapleuron engraved reticulate. Forewing 2.38× as long as broad, discal pubescence dense, speculum very narrow, almost absent, basal cell bare, basal hairline with a few hairs, marginal fringe moderately long, relative lengths SMV 0.77, MV 0.35, PMV 0.53, STV 0.26; STV strongly capitate. Hind coxae moderately reticulate.

Metasoma: Gaster petiolate; 0.82× head plus mesosoma combined (excluding petiole); petiole reticulate punctate, anteriorly converging, 3.25× length of gaster, 1.89× longer than broad; T1 and T2 cover most of length of gaster; T1 0.52× length of gaster; T1 1.9× as long as T2 and 4.75× as long as T3; remaining gastral tergites highly retracted.

Male: unknown

Materials Examined: Holotype: Female, INDIA, Kerala, Pathanamthitta, Gavi, 10.iv.2013, Coll: P.M.Sureshan, ZSIK.reg.no.IR/INV/9061; Paratype: Female, INDIA, Kerala, Idukki, Periyar Tiger Reserve, 8.iv.2013, Coll. Abhilash, ZSIK.reg.no.IR/ INV/9062.

Host: Unknown.

Remarks: Both holotype and paratype were collected from forest area. This species closely resembles *S. lamprosomus* Graham but differs in having body length 1.93-1.95mm; POL 1.25× OOL; dorsal head width 3.5× as broad as long; temple 0.35× eye length; pedicel plus flagellum 1.1× as long as head width; pedicel 0.7× length of F1; mesoscutum with mid lobe moderately reticulate and side lobes engraved reticulate, hind margin of mesoscutum not sinuate; upper and lower mesepimeron shiny with a narrow reticulate punctate area separating them, metapleuron engraved reticulate; MV 1.34× as long as STV (in *S. lamprosomus* Graham body length 3-3.2mm; POL approximately equal to OOL; dorsal head width 2.25× as broad as long; temple 0.2-0.25× eye length; pedicel plus flagellum about 1.5× as long as head width; mesoscutum with very fine slightly raised scaly reticulation, hind margin of mesoscutum sinuate; mesepimeron and metapleuron with fine slightly raised reticulation; MV 1.7× as long as STV).

Etymology: The species name derives from the type locality, Western Ghats (in Malayalam Sahyadri) of Kerala.

Subfamily: ORMOCERINAE

***Systasis* Walker**

1834. *Systasis* Walker, 288, 296. Type species *Systasis encyrtoides* Walker, designated by Westwood, 1839.

1913c. *Paruriella* Girault, 308, Type species *Paruriella australiensis* Girault, by original designation. Synonymized by Bouček 1988, 310.

Diagnosis: Body robust; antenna 12 segmented; antennal formula 11253; notauli complete, sharply cut; face with scattered umbilicate punctures; wings hyaline with speculum extending to STV; under surface of forewing bearing a row of long erect hairs behind the MV; gaster sessile.

Distribution: North America, Europe, Africa, Asia, Australia.

Biology: Reared from seeds of grass, galls of plants, feed on plant tissue, reported parasitism on cecidomyiid larva in its gall.

Key to the Kerala species of *Systasis* Walker

1. Mesosoma strongly convex (Plate 14, Fig. a-g).....
..... *Systasis convexa* sp.nov.
- Mesosoma moderately convex.....2
2. (1) Body blackish brown with golden yellow reflection (Plate 10, Fig. f)*Systasis nigra* Sureshan
- Body bright metallic green or blue.....3
3. (2) Forewing with disc densely setose.....4
- Forewing with disc moderately setose.....5
4. (3) Body bright metallic green; scape reaching median ocellus; clava as long as three preceding segments combined; MV 1.8× PMV (Plate 10, Fig. d)..... *Systasis dalbergiae* Mani
- Body bright metallic blue; scape not reaching median ocellus; clava shorter than three preceding segments combined, MV 2.3× PMV (Plate 15, Fig. a-g).....*Systasis palakkadensis* sp. nov.
5. (3) Anterior margin of clypeus truncate; POL 3.5× OOL; scape reaching median ocellus; propodeum with median carina distinct; MV 2.3× PMV (Plate 10, Fig. e).....*Systasis dasyneurae* Mani
- Anterior margin of clypeus arched; POL 4.8× OOL; scape not reaching median ocellus; propodeum with median carina less distinct; MV 1.85× PMV (Plate 13, Fig. a-e)*Systasis calicutensis* sp.nov.

24. *Systasis calicutensis* sp. nov.

(Plate 13, Fig. a-e)

Female: Length 2.mm. Body bright metallic blue with greenish tinge; antennae black except pedicel and scape brown; coxae and hind femur concolourous with body; basal three fourths of fore and mid femur and tibiae brown; tarsal segments testaceous with tips black; wings hyaline with veins pale brown.

Head: Densely rugulose punctate with long white pubescence; clypeus engraved reticulate with anterior margin arched. In front view head width $1.4\times$ height; malar groove distinct, gena moderately reticulate; malar space $0.43\times$ eye length; eye height $1.23\times$ width in profile; in dorsal view head width $2.6\times$ as broad as long; POL $4.8\times$ OOL, temple $0.23\times$ eye length. Antennae inserted middle of face; scape $0.89\times$ eye length and not reaching median ocellus, pedicel plus flagellum $0.98\times$ as long as head width, pedicel, anelli two, transverse. Relative length, scape 0.27, pedicel 0.09, F1 0.06, F2 0.06, F3 0.07, F4 0.07, F5 0.07, clava 0.15; clava a little longer than three preceding segments combined, each funicle with single row of sensilla.

Mesosoma: Pronotum very narrow in middle. Mesoscutum strongly convex, $1.6\times$ as broad as long, raised reticulate, notauli distinct and complete; axillae raised reticulate. Scutellum $1.08\times$ as broad as long and raised reticulate. Propodeum very short and almost hidden by scutellum medially, median carina less distinct, plicae present; spiracle large, round close to metanotum; callus with less pubescence. Prepectus raised reticulate. Upper mesepimeron and lower mesepimeron engraved reticulate, mesepisternum moderately reticulate and metapleuron engraved reticulate. Forewing $2.1\times$ as long as broad, a row of erect hairs below MV, discal pubescence moderately dense,

basal half bare, marginal fringe small, relative lengths SMV 0.62, MV 0.37, PMV 0.2, STV 0.16; Hind coxae engraved reticulate.

Metasoma: Gaster as long as head plus mesosoma combined; tergites engraved reticulate; relative lengths of tergites T1 0.26, T2 0.13, T3 0.09, T4 0.11, T5 0.11.

Male: unknown

Materials Examined: Holotype: Female, INDIA, Kerala, Calicut, Kakkadampoyil, 13.i.2017, Coll. Raseena Farsana, ZSIK.reg.no.IR/INV/9607; Paratype: 1 Female, INDIA, Kerala, Calicut, Kakkadampoyil, 30.xii.2016, Coll. Raseena Farsana, ZSIK.reg.no.IR/INV/9608; 1 Female, INDIA, Kerala, Calicut, Kakkadampoyil, 19.i.2017, Coll. Raseena Farsana, ZSIK.reg.no.IR/INV/9609.

Host: Unknown.

Remarks: Both holotype and paratype were collected from agroecosystem close to forest area. This species closely resembles *Systasis dasyneurae* Mani but differs in having body bright metallic blue; anterior margin of clypeus arched; POL 4.8× OOL; scape not reaching median ocellus; propodeum with median carina less distinct; MV 1.85× PMV (in *Systasis dasyneurae* Mani body bright metallic green; anterior margin of clypeus truncate; POL 3.5× OOL; scape reaching median ocellus; propodeum with median carina distinct; MV 2.3× PMV).

Etymology: The species name derives from its collection locality.

25. *Systasis convexa* sp. nov.

(Plate 15, Fig. a-g)

Female: Length 2.4mm. Head and mesosoma metallic green; gaster black with greenish refrigence; antennae black, scape with greenish tinge; coxae and hind femora concolourous with body; tibiae medially brown; tarsal segments testaceous; eyes and ocelli silvery white.

Head: Umbilicately punctate with long white pubescence; clypeus engraved reticulate with anterior margin straight. In front view head width $1.35\times$ height; malar groove distinct, gena moderately reticulate; malar space $0.37\times$ eye length; eye height $1.27\times$ width in profile; in dorsal view head width $2.23\times$ as broad as long; POL $3.43\times$ OOL, temple $0.21\times$ eye length. Antennae inserted middle of face; scape $0.63\times$ eye length and not reaching median ocellus, pedicel plus flagellum almost as long as head width, pedicel, anelli two, transverse. Relative length, scape 0.2, pedicel 0.1, F1 0.08, F2 0.08, F3 0.07, F4 0.07, F5 0.07, clava 0.21; clava as long as three preceding segments combined, each funicle with single row of sensilla.

Mesosoma: Pronotum very narrow in middle. Mesoscutum strongly convex, $1.37\times$ as broad as long, raised reticulate with scattered deep punctures and sparse pubescence, notauli distinct and complete; axillae raised reticulate. Scutellum $0.92\times$ as broad as long and raised reticulate. Propodeum $6.07\times$ as wide as long medially, median carina distinct, plicae present; spiracle large, round close to metanotum; callus with pubescence less distinct. Prepectus raised reticulate. Upper mesepimeron and lower mesepimeron engraved reticulate, mesepisternum moderately reticulate and metapleuron engraved reticulate. Forewing $2.86\times$ as long as broad, a row of erect hairs below MV, discal pubescence dense, basal half bare, marginal fringe small, relative lengths SMV 0.76, MV 0.49, PMV 0.29, STV 0.19, costal cell bare. Hind coxae engraved reticulate.

Metasoma: Gaster $1.27\times$ head plus mesosoma combined; tergites engraved reticulate; relative lengths of tergites T1 0.32, T2 0.13, T3 0.16, T4 0.16, T5 0.16.

Male: unknown

Materials Examined: Holotype: Female, INDIA, Kerala, Idukki, Mannavanshola, Manthop, 24.v.2014, Coll. P.M.Sureshan, ZSIK.reg.no.IR/INV/9603; Paratype: 1 Female, INDIA, Kerala, Idukki, Mannavanshola, Manthop, 24.v.2014, Coll. P.M.Sureshan, ZSIK.reg.no.IR/INV/9604.

Host: Unknown.

Remarks: Both holotype and paratype were collected from forest. This species closely resembles *Systasis cenchrivora* Farooqi but differs in having scape $2\times$ pedicel; scutellum $0.92\times$ as broad as long; propodeum with median carina distinct; spiracles large; forewing with discal pubescence dense (in *Systasis cenchrivora* Farooqi scape as long as pedicel; scutellum $0.71\times$ as broad as long; propodeum with median carina slightly indicated; spiracles small; forewing with discal pubescence sparse).

Etymology: The species name derives from its character, strongly convex mesosoma.

26. *Systasis dalbergiae* Mani

(Plate 10, Fig. d)

1942. *Systasis dalbergiae* Mani. *Indian. J. Ent.*, 4: 157-158.

Diagnosis: Body bright metallic green; antennae dark brown; head in front view round; POL $3.5\times$ OOL; face rugosely punctuate between scape and inner

orbital border, just below antenna transversly reticulate; both mandibles tridentate; antennae with pedicel much longer than F1, all funicular segments quadrate, subequal; scutellum 3× as long as propodeum; propodeum with distinct median carina; forewing 2× as long as broad.

Materials Examined: 6 females & 2 Males, INDIA, Kerala, Trivandrum, Vellayini, 16.xii.2014, ZSIK.reg.no.IR/INV/9517, coll. Raseena Farsana; 2 females & 1 Male, INDIA, Kerala, Kozhikode, Nechooli, 2.iii.2016, ZSIK.reg.no.IR/INV/9518, coll. Raseena Farsana; 2 females, INDIA, Kerala, Palakkad, Pattancheri, 11.x.2014, ZSIK.reg.no.IR/INV/9519, coll. Raseena Farsana; 4 females, INDIA, Kerala, Palakkad, Koduvayoor, 8.x.2014, ZSIK.reg.no.IR/INV/9520, coll. Raseena Farsana; 2 females & 2 males, INDIA, Kerala, Kozhikode, Chathamangalam, 8.iii.2016, ZSIK.reg.no.IR/INV/9521, coll. Raseena Farsana; 3 females & 4 males, INDIA, Kerala, Kottayam, Kozha Seed Farm, 27.iv.2016, ZSIK.reg.no.IR/INV/9522, coll. Raseena Farsana; 3 females, INDIA, Kerala, Kozhikode, Vengeri, 27.vi.2014, ZSIK.reg.no.IR/INV/9523, coll. Raseena Farsana; 1 female, INDIA, Kerala, Ernakulam, Kolancheri, 21.ii.2014, ZSIK.reg.no.IR/INV/9524, coll. Raseena Farsana; 1 female, INDIA, Kerala, Kannur, Madayippara, 20.x.2015, ZSIK.reg.no.IR/INV/9525, coll. Raseena Farsana; 1 female, INDIA, Kerala, Kasarkode, Periya, 26.x.2015, ZSIK.reg.no.IR/INV/9526, coll. Raseena Farsana; 5 females & 1 Male, INDIA, Kerala, Trissur, Kannara, 7.v.2015, ZSIK.reg.no.IR/INV/9527, coll. Ranjith; 3 females, INDIA, Kerala, Alappuzha, Marari Resort, 29.iii.2014, ZSIK.reg.no.IR/INV/9528, coll. Raseena Farsana; 4 females & 1 Male, INDIA, Kerala, Kozhikode, Annasserri, 14.v.2015, ZSIK.reg.no.IR/INV/9529, coll. Raseena Farsana

Distribution: India: Kerala (**New Record**), Delhi, Uttar Pradesh, Uttarakhand.

Remarks: Collected from agroecosystem (Paddy and mixed vegetables).

27. *Systasis dasyneurae* Mani

(Plate 10, Fig. e)

1939. *Systasis dasyneurae* Mani, *Indian. J. Agricultural Scie.*, 535-537.

Diagnosis: Body bright metallic green; antennae dark brown with basal part of scape paler; POL 3.5× OOL; mandibles heterodont, left with three and right with four teeth; antenna with second anellus thick; scape reaching median ocellus; pedicel slightly longer than F1, funicular segments subequal; propodeum very short.

Materials Examined: 2 females, INDIA, Kerala, Kakkayam, 29.xii.2015, ZSIK.reg. no.IR/INV/6683, coll. Rajmohana; 7 females & 2 males, INDIA, Kerala, Trivandrum, Vellayini, 16.xii.2014, ZSIK.reg.no.IR/INV/9477, coll. Raseena Farsana; 2 females & 1 male, INDIA, Kerala, Trivandrum, Vellayini, 29.v.2014, ZSIK.reg.no.IR/INV/9478, coll. Raseena Farsana; 2 females, INDIA, Kerala, Kozhikode, Payyoli, 21.vii.2015, ZSIK.reg.no.IR/INV/9479, coll. Raseena Farsana; 2 females, INDIA, Kerala, Kozhikode, Easthill, 23.x.2014, ZSIK.reg.no.IR/INV/9480, coll. Raseena Farsana; 1 female, INDIA, Kerala, Palakkad, Sidarkundu, 10.x.2014, ZSIK.reg.no.IR/INV/9481, coll. Raseena Farsana; 2 females, INDIA, Kerala, Palakkad, Pattancheri, 11.x.2014, ZSIK.reg.no.IR/INV/9482, coll. Raseena Farsana; 1 female, INDIA, Kerala, Kannur, Madayippara, 20.x.2015, ZSIK.reg.no.IR/INV/9483, coll. Raseena Farsana; 1 female, INDIA, Kerala, Palakkad, Chittur, 20.1.2015, ZSIK.reg.no.IR/INV/9484, coll. Raseena Farsana; 1 female & 1 male, INDIA, Kerala, Calicut, Vengeri, 27.vi.2014, ZSIK.reg.no.IR/INV/9485, coll. Raseena Farsana; 1 female & 1 male, INDIA, Kerala, Calicut, Vengeri, 12.xi.2015, ZSIK.reg.no.IR/INV/9486, coll. Raseena Farsana; 1 female, INDIA, Kerala, Kollam, Pandimotta, 17.xii.2015, ZSIK.reg.no.IR/INV/9487, coll. Rajmohana; 1 female, INDIA, Kerala, Trivandrum, Ponmudi, 12.ii.2015,

ZSIK.reg.no.IR/INV/9488, coll. Rajmohana; 1 female, INDIA, Kerala, Kozhikode, Annassery, 14.v.2015, ZSIK.reg.no.IR/INV/9489, coll. Raseena Farsana.

Distribution: India: Kerala (**New Record**), Bihar, Haryana, Karnataka, Maharashtra, Madhya Pradesh, Uttar Pradesh.

Remarks: Collected from homestead vegetation, forest and agroecosystems (Paddy and mixed vegetables).

28. *Systasis nigra* Sureshan

(Plate 10, Fig. f)

2002b. *Systasis nigra* Sureshan, *Fauna of Eravikulam NP. Zool. Surv. India*.13: 30.

Diagnosis: Blackish brown with golden yellow reflection on face mesosoma and gaster dorsally; head distinctly and umbilicately punctate; POL 3.8× OOL; anterior margin of clypeus straight; pronotal collar narrow in the middle and deeply emarginated posteriorly; propodeum with strong median and lateral carinae, gaster elongatedly ovate, length 2× width.

Materials Examined: 1 female, INDIA, Kerala, Idukki, Puthukkudi, 3.iv.2016, ZSIK.reg.no.IR/INV/9515, coll. Rajmohana; 1 female, India, Kerala, Trissur, Choorakaattukara, 8.i.2016, ZSIK.reg.no.IR/INV/9516, coll. Raseena Farsana.

Distribution: India: Kerala

Remarks: Collected from agroecosystem (Mixed vegetables).

29. *Systasis palakkadensis* sp. nov.

(Plate 15, Fig. a-g)

Female: Length 1.51mm. Body bright metallic greenish blue; antennae brown except scape lower half testaceous; eyes and ocelli silvery white; coxae and hind femur concolorous with body, tibiae brown with tips testaceous; tarsal segments testaceous.

Head: Umbilicately punctate with long white pubescence; clypeus engraved reticulate with anterior margin straight. In front view head width $1.34\times$ height; malar groove distinct, gena engraved reticulate; malar space $0.31\times$ eye length; eye height $1.2\times$ width in profile; in dorsal view head width $2.2\times$ as broad as long; POL $3.2\times$ OOL, temple $0.24\times$ eye length. Antennae inserted middle of face; scape $0.58\times$ eye length and not reaching median ocellus, pedicel plus flagellum almost as long as head width, pedicel, anelli two, transverse. Relative length, scape 0.16, pedicel 0.08, F1 0.06, F2 0.06, F3 0.06, F4 0.07, F5 0.07, clava 0.16; clava shorter than three preceding segments combined, funicles anelliform, each funicle with single row of sensilla.

Mesosoma: Pronotum very narrow in middle. Mesoscutum moderately convex, $1.61\times$ as broad as long, raised reticulate with scattered deep punctures and sparse pubescence, notauli distinct and complete; axillae raised reticulate. Scutellum $0.92\times$ as broad as long and raised reticulate. Propodeum $6.8\times$ as wide as long medially, median carina distinct, plicae complete; spiracle large, round close to metanotum; callus with pubescence less distinct. Prepectus engraved reticulate. Upper mesepimeron and lower mesepimeron engraved reticulate, mesepisternum moderately reticulate and metapleuron raised reticulate. Forewing $2.3\times$ as long as broad, a row of erect hairs below MV, discal pubescence dense, basal half bare, marginal fringe small, relative

lengths SMV 0.44, MV 0.38, PMV 0.17, STV 0.14, costal cell bare; Hind coxae engraved reticulate.

Metasoma: Gaster 0.8× head plus mesosoma combined; tergites engraved reticulate; relative lengths of tergites T1 1.71, T2 0.06, T3 0.69, T4 0.93, T5 0.1.

Male: Length 1.37mm, Resembles female but differs from it in having flagellum with dense long pubescence; gaster short and hairy.

Materials Examined: Holotype: Female, INDIA, Kerala, Palakkad, Koduvayoor, 8.x.2014, Coll. Raseena Farsana, ZSIK.reg.no.IR/INV/9605; Paratype: 1 Male, India: Kerala, Palakkad, Koduvayoor, 8.x.2014, Coll. Raseena Farsana, ZSIK.reg.no.IR/INV/ 9606.

Host: Unknown.

Remarks: Both holotype and paratype were collected from paddy field. This species closely resembles *Systasis dalbergiae* Mani but differs in having body bright metallic blue; scape not reaching median ocellus; clava shorter than three preceding segments combined, MV 2.3× PMV (in *Systasis dalbergiae* Mani body bright metallic green; scape reaching median ocellus; clava as long as three preceding segments combined, MV 1.8× PMV) .

Etymology: The species name derives from its collection locality.

Subfamily: Panstenoninae

***Panstenon* Walker**

1846. *Panstenon* Walker. *List. Hym. British Mus. Part.I.* 29. Type species *Miscogaster oxylus* Walker by monotypy.

1850. *Caudonia* Walker, 125-126. Type species *Caudonia agylla* Walker, by monotypy. Synonymized by Kerrich & Graham, 1957: 276.

Diagnosis: Forewing unusually long and narrow, about 3× as long as broad with MV at least 3× as long as STV; petiole subquadrate, broadening posteriorly with irregular longitudinal rugosity; toruli very high on strongly convex shiny face, the sculpture below toruli very weak; clypeus as high as broad; legs slender and mostly yellow.

Distribution: North America, Europe, South Asia, Australia.

Biology: Associated with grasses (Gramineae) and their hosts seem to be insect eggs and larvae developing in the internodes of the grass stems.

Key to the Kerala species of *Panstenon* Walker

1. Mesosoma brown (Plate 17, Fig. a-f)..... *P. minutus* sp.nov
- Mesosoma metallic green except pronotum testaceous.....2
2. (1) Pronotal collar not margined; antennal scape exceeding vertex by almost than half of its length (Plate 19, Fig. a)..... *P. collaris* Bouček
- Pronotal collar margined; antennal scape exceeding vertex by less than half of its length3
3. (2) Petiole conical, gaster black, MV and PMV equal in length (Plate 18, Fig. a-g) *P. nigrogastrus* sp.nov
- Petiole strongly tranverse, gaster yellow, MV shorter than PMV (Plate 16, Fig. a-g)..... *P. flavogastrus* sp.nov

30. *Panstenon collaris* Bouček

(Plate 19, Fig. a)

1976. *Panstenon collaris* Bouček. *J. Ent. Soc. Sth. Afr.* 39(1): 17-18.

Diagnosis: Body metallic green except scape, legs with coxae, pronotum testaceous; antennal scape exceeding vertex by almost half of its length; pedicel equal in length to F1; clava equal to preceding two segments combined. POL $1.6\times$ OOL; pronotal collar not margined; base of forewing densely hairy; gaster about $2\times$ as long as broad.

Materials examined: 1 female, INDIA, Kerala, Ernakulam, Thattekkad, 6.i.2015, ZSIK.reg.no.IR/INV/9530, coll. PM. Sureshan.

Distribution: India: Kerala (**New record**), Karnataka; Peoples' Republic of China, South Africa, Sri Lanka, Zimbabwe.

Remarks: Collected from forest.

31. *Panstenon flavogastrus* sp. nov.

(Plate 16, Fig. a-g)

Female: Length 2.53mm. Head black with violaceous refrigence; eyes and ocelli silvery white; antennae brown with scape testaceous, pedicel pale brown; pronotum testaceous; mesosoma metallic green; gaster yellow with brown laterally; petiole brown; legs including coxae yellow with tarsal tips brown; tegulae pale yellow; wings hyaline, veins pale yellow.

Head: Engraved reticulate with sparse white pubescence; clypeus smooth and shiny, anterior margin slightly produced. In front view head width $1.38\times$ height; malar groove present, gena smooth and raised; malar space $0.61\times$ eye length; eye height $1.42\times$ width in profile; mandibles testaceous with tips

brown; in dorsal view head width $2\times$ as broad as long; POL $1.81\times$ OOL, temple $0.28\times$ eye length. Antennae inserted middle of face; scape almost as long as eye length and exceeds median ocellus, pedicel plus flagellum as long as head width, pedicel $1.53\times$ as long as wide and $0.88\times$ as long as F1, anelli two, equal in length. Relative length, scape 0.33, pedicel 0.08, F1 0.09, F2 0.09, F3 0.09, F4 0.09, F5 0.08, F6 0.06, clava 0.14; clava as long as two preceding segments combined.

Mesosoma: Pronotum engraved reticulate, collar margined. Mesoscutum convex, $1.57\times$ as broad as long, punctate reticulate, notauli deep groove like, incomplete; transcutal groove broad; axillae moderately reticulate. Scutellum almost as broad as long and punctate reticulate; metanotum broad and shiny. Propodeum $2.6\times$ as wide as long medially, median carina absent, irregularly rugulose-alveolate, plicae complete; spiracle oval; callus with dense long setae. Prepectus broad and engraved reticulate. Upper mesepimeron engraved reticulate, lower mesepimeron moderately reticulate, mesepisternum and metapleuron moderately reticulate. Forewing $3.28\times$ as long as broad, discal pubescence dense, speculum absent, marginal fringe long, relative lengths SMV 0.79, MV 0.52, PMV 0.63, STV 0.19. Hind coxae smooth.

Metasoma: Gaster $0.7\times$ head plus mesosoma combined; petiole strongly transverse; relative lengths of tergites T1 0.4, T2 0.1, T3 0.12, T4 0.07, T5 0.09.

Male: unknown

Materials Examined: Holotype: Female, INDIA, Kerala, Palakkad, Pattancheri, 11.x.2014, Coll. Raseena Farsana, ZSIK.reg.no.IR/INV/9589; Paratype: 1 Female, INDIA, Kerala, Palakkad, Pattancheri, 11.x.2014, Coll. Raseena Farsana, ZSIK.reg.no.IR/INV/9590; 1 Female, INDIA, Kerala,

Trivandrum, Vellayini, 30.v.2014, Coll. Raseena Farsana, ZSIK.reg.no.IR/INV/9591.

Host: Unknown.

Remarks: Both holotype and paratype were collected from agroecosystems (paddy fields). This species closely resembles *Panstenon collaris* Bouček but differs in having pronotal collar margined; antennae inserted middle of face; petiole brown; gaster yellow; MV shorter than PMV; gastral petiole strongly transverse, not tapering forwards; sides without erect hairs (in *Panstenon collaris* Bouček pronotal collar not margined; antennae inserted very high; MV longer than PMV; gaster petiole as long as broad, tapering forwards, sides with erect hairs).

Etymology: The species name derives from its character, yellow gaster

32. *Panstenon minutus* sp. nov.

(Plate 17, Fig. a-f)

Female: Length 1.37mm. Body brown except eyes and ocelli reddish brown, scape testaceous, petiole testaceous, legs including coxae yellow with tarsal tips brown .

Head: Almost smooth; clypeus smooth and shiny, anterior margin slightly produced. In front view head width $1.19\times$ height; malar groove present, gena smooth and raised; malar space $0.51\times$ eye length; eye height $1.4\times$ width in profile; in dorsal view head width $1.5\times$ as broad as long; POL $3.6\times$ OOL, temple $0.25\times$ eye length. Antennae inserted above middle of face; scape $0.88\times$ eye length and exceeds median ocellus, pedicel plus flagellum $1.11\times$ as long as head width, pedicel $1.43\times$ as long as wide and $1.42\times$ as long as F1, anelli two, unequal in length, second anellus longer than first. Relative length, scape

0.22, pedicel 0.05, F1 0.03, F2 0.04, F3 0.05, F4 0.05, F5 0.05, F6 0.05, clava 0.11; clava just short of two preceding segments combined.

Mesosoma: Pronotum smooth, collar not margined. Mesoscutum 1.51× as broad as long, engraved reticulate, notauli groove like, incomplete; transcutal groove broad; axillae engraved reticulate. Scutellum as broad as long and engraved reticulate; dorsellum narrow; metanotum broad and shiny. Propodeum 2.76× as wide as long medially, median carina absent, irregularly rugulose-alveolate, plicae complete; spiracle round; callus with dense long pubescence. Prepectus broad, depressed and engraved reticulate. Mesopleuron and metapleuron engraved reticulate. Forewing 2.2× as long as broad, discal pubescence dense, speculum absent, marginal fringe long, relative lengths SMV 0.77, MV 0.5, PMV 0.56, STV 0.17. Hind coxae smooth.

Metasoma: Gaster lanceolate, as long as head plus mesosoma combined; petiole as long as broad; relative lengths of tergites T1 0.2, T2 0.09, T3 0.09, T4 0.1, T5 0.07.

Male: Unknown

Materials Examined: Holotype: Female, INDIA, Kerala, Calicut, Nechooli, 2.iii.2016, Coll. Raseena Farsana, ZSIK.reg.no.IR/INV/9592; Paratype: 1 Female, INDIA, Kerala, Calicut, Nechooli, 2.iii.2016, Coll. Raseena Farsana, ZSIK.reg.no.IR/INV/9593; 1 Female, INDIA, Kerala, Wayanad, Panamaram, 25.ix.2014., Coll. Ranjith. ZSIK.reg.no.IR/INV/9594.

Host: Unknown.

Remarks: Both holotype and paratype were collected from agroecosystems (paddy field). This species closely resembles Chinese species *Panstenon annuliforme* Xui Xiao & Da-Wei Huang but differs in having mesosoma brown; pedicel 1.43× as long as wide, F1 0.75× F2; POL 3.6× OOL; plicae

present; forewing $2.2\times$ as long as broad; MV almost equal to PMV (*Panstenon annuliforme* Xui Xiao & Da-Wei Huang mesosoma except pronotum and propodeum green; pedicel $2\times$ as long as wide; F1 quadrate about half of the F2; POL $2\times$ OOL; plicae absent; forewing $3.2\times$ as long as broad; MV $1.78\times$ PMV) .

Etymology: The species name derives from its small size.

33. *Panstenon nigrogastrus* sp. nov.

(Plate 18, Fig. a-g)

Female: Length 2mm. Head black with violaceous refrigence; antennae black except pedicel brown and scape testaceous with base brown; eyes and ocelli silvery white; pronotum testaceous; mesosoma metallic green, gaster black; petiole brown; legs including coxae yellow with tarsal tips brown.

Head: smooth, engraved reticulate; clypeus smooth and shiny, anterior margin slightly produced. In front view head width $1.26\times$ height In front view head width $1.19\times$ height; malar groove present, gena smooth and raised; malar space $0.36\times$ eye length; eye height $1.31\times$ width in profile; scrobal area depressed; in dorsal view head width $2.3\times$ as broad as long; POL $2.1\times$ OOL, temple $0.5\times$ eye length. Antennae inserted at the middle of face; scape $0.86\times$ eye length, pedicel plus flagellum $1.2\times$ as long as head width, pedicel $2.2\times$ as long as wide and $1.36\times$ as long as F1, anelli two, equal in length. Relative length, scape 0.2, pedicel 0.11, F1 0.08, F2 0.08, F3 0.08, F4 0.08, F5 0.08, F6 0.08, clava 0.3; clava shorter than three preceding segments combined.

Mesosoma: Pronotum engraved reticulate, collar margined. Mesoscutum $1.6\times$ as broad as long, punctate reticulate, notauli deep groove like, incomplete; transcutal groove broad; axillae moderately reticulate. Scutellum almost as

broad as long and punctate reticulate; dorsellum narrow; metanotum broad and shiny. Propodeum $2.73\times$ as wide as long medially, median carina absent, irregularly rugulose-alveolate, plicae complete; spiracle oval; callus with dense long setae. Prepectus broad and engraved reticulate. Mesopleuron and metapleuron engraved reticulate. Forewing $3.4\times$ as long as broad, discal pubescence dense, speculum absent, marginal fringe long, relative lengths SMV 0.71, MV 0.49, PMV 0.49, STV 0.16. Hind coxae smooth.

Metasoma: Gaster $0.7\times$ head plus mesosoma combined; petiole conical; relative lengths of tergites T1 0.8, T2 0.14, T3 0.07, T4 0.08.

Male: Unknown

Materials Examined: Holotype: Female, INDIA, Kerala, Idukki, Puthukkudi, 3.iv.2016, Coll. Rajmohana, ZSIK.reg.no.IR/INV/9595; Paratype: 1 Female, INDIA, Kerala, Idukki, Puthukkudi, 3.iv.2016, Coll. Rajmohana, ZSIK.reg.no.IR/INV/9596.

Host: Unknown.

Remarks: Both holotype and paratype were collected from agroecosystem (Mixed vegetables). This species closely resembles Chinese species *Panstenon impube* Xui Xiao & Da-Wei Huang but differs in having gaster black without two dark bands; antennae inserted middle of face; anelli quadrate; pedicel $2.2\times$ as long as wide; PMV as long as MV (in *Panstenon impube* Xui Xiao & Da-Wei Huang gaster brown with two dark brown bands on dorsal side; antennae inserted very high on face; anelli transverse; pedicel about $1.6\times$ as long as broad; PMV shorter than MV).

Etymology: The species name derives from its character black gaster.

Subfamily: PTEROMALINAE

***Acroclisoides* Girault and Dodd**

1915a. *Acroclisoides* Girault and Dodd, in Girault, *Mem. Qd. Mus.* (232): 334. Type species: *Acroclisoides megacephalus* Girault and Dodd by original designation.

Diagnosis: Head unusually broad; occipital carina conspicuous, situated very high; clypeal margin not produced, almost straight; antennae inserted high above centre of face; anelli two; mesoscutum with notauli complete; gastral petiole subquadrate, smooth and dorsally flat; T1 often narrowed basally so that gaster is prolonged behind the petiole; MV of forewing more or less widened.

Distribution: Africa, Australia, New Guinea, South Asia

Biology: Parasites of eggs of Pentatomid Heteroptera.

Key to the Kerala species of *Acroclisoides*

1. Forewing with a broad brown spot beneath STV; gaster long, 0.8× as long as head plus mesosoma combined; in dorsal view head width 2.2× length; antenal flagellum dark brown (Plate 19, Fig. b).....
.....*A. maculatus* Sureshan & Narendran
- Forewing hyaline, without brown spot; gaster short, length 0.6× as long as head plus mesosoma combined; in dorsal view head width 1.9× length; flagellum pale brown.....*A. indicus* Ferrière

34. *Acroclisoides maculatus* Sureshan & Narendran

(Plate 19, Fig. b)

2002b. *Acroclisoides maculatus* Sureshan and Narendran, *Rec. Zool. Surv. India*, 100 (3-4):128. ZSIK.

Diagnosis: Head and mesosoma dark metallic blue; lower face with golden

reflection; gaster brown with metallic blue reflection beyond middle; petiole brown; POL $0.7\times$ OOL; lower posterior corner of gena with a sharp tooth; scape little shorter than eye; pedicel wider than long; pronotal collar dorsally shiny behind anterior carina; mesoscutum width $2.4\times$ length; forewing length $2.3\times$ width with a broad brown spot beneath STV; basal cell and speculum closed below; gaster $0.8\times$ as long as head plus mesosoma combined .

Materials examined: 2 males, INDIA, Kerala, Palakkad, Varadimala, 22.ii.2013, ZSIK.reg.no.IR/INV/3164; 1 female, INDIA, Kerala, Palakkad, Silent valley, Sairandri, 20.ii.2013, ZSIK.reg.no.IR/INV/3165, coll. P.M. Sureshan; 1 female, INDIA, Kerala, Idukki, Puthukkudi, 3.iv.2016, ZSIK.reg.no.IR/INV/9287, coll. Ranjith A P.

Distribution: India: Kerala, Karnataka, Tamil Nadu.

Remarks: Collected from both forest and agroecosystem.

Anisopteromalus Ruschka

1912. *Anisopteromalus* Ruschka. *Verh. Zool. Bot. Ges. Wien.* 62: 243-245. Type species: *Anisotrromalus mollis* Ruschka by monotypy.

1913. *Aplastomorpha* Crawford, *Proc. U.S. Natn. Mus.* 45: 252. Type species: *Aplastomorpha pratti* Crawford, by original designation. (Peck synonymised *Aplastomorpha* Crawford under *Anisopteromalus* Ruschka in 1951)

Diagnosis: Body usually with bronze, bluish black or dark greenish with metallic reflections; vertex slightly raised; anterior margin of clypeus shallowly emarginate; antenna with three anelli, third anellus largest, flagellum distinctly clavate or filiform; notaular grooves incomplete; propodeum with median carina either developed only anteriorly or complete, plicae indicated as anterior plical foveae; nucha short, distinct, finely reticulate or smooth; gaster with hind margin of T1 curving backwards and medially produced or not produced; first three gastral tergites cover more than half of gaster.

Distribution: Cosmopolitan

Biology: Well known parasites of beetles associated with stored grains (cereals, especially wheat and rice). Most commonly reported hosts are *Stegobium*, *Sitophilus* species. It also reported from outdoors.

35. *Anisopteromalus calandrae* (Howard)

(Plate 19, Fig. c)

1881. *Pteromalus calandrae* Howard, *Ann. Report. U.S. Dept. Agr.* for 1880: 273. (Synonymised by Graham 1969)

1891. *Pteromalus oryzae* Cameron, *Mem. Proc. Lit. Phil. Soc. Manchester*, 4:184. (Synonymised by Bouček *et al.*, 1978. 435).

Diagnosis: Female: Head and mesosoma greenish black, gaster black, legs testaceous except femora, brown and coxae concolrous with mesosoma, antenna brown, scape not reaching median ocellus, F1 as long as pedicel, POL 1.42× OOL, pronotum not carinate anteriorly, incomplete notauli, propodeum with median carina indicated anteriorly, forewing with MV 1.32× STV, MV little shorter than PMV, speculum bare, hind margin of T1 produced.

Materials examined: 2 females, INDIA, Kerala, Palakkad, Varadimalai, 22.ii.2013, coll.P.M.Sureshan, ZSIK.reg.no.IR/INV/3166; 1 female, INDIA, Kerala, Calicut, Vengeri, 11.viii.2015, ZSIK.reg.no.IR/INV/4709, coll. Sheeja; 1 female, INDIA, Kerala, Calicut, Vengeri, 3.ii.2015, ZSIK.reg.no.IR/INV/5327, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Ashokapuram, 14.ix.2016, ZSIK.reg.no.IR/INV/7636, coll.Raseena Farsana; 98 females& 66males, INDIA, Kerala, Calicut, Ashokapuram, 18.ix.2016, ZSIK.reg.no.IR/INV/7638, coll.Raseena Farsana; 5 females, INDIA, Kerala, Calicut, Vengeri, 22.x.2016, ZSIK.reg.no.IR/INV/7791, coll.Sheeja; 2 females & 1 male, Kerala, Calicut, Kinasseri, 28.x.2016, ZSIK.reg.no.IR/INV/7919,

coll.Raseena Farsana; 2 Females & 2 Males, INDIA, Kerala, Idukki, Kolukkumala, 7.iv.2016, ZSIK.reg.no.IR/ INV/9265, coll. Ranjith A P; 2 Females, INDIA, Kerala, Kozhikode, Nechooli, 2.iii.2016, ZSIK.reg.no.IR/INV9277, coll. Raseena Farsana; 2 Females& 1 Male, INDIA, Kerala, Trissur, Kannara, 7.iv.2015, ZSIK.reg.no.IR/INV/9278, coll. Ranjit A P.

Distribution: India: Kerala, Himachal Pradesh, Karnataka, Rajasthan, Tamil Nadu & West Bengal; Argentina; Australia; Austria; Bangladesh; Brazil; Columbia; Czechoslovakia; Egypt; France; Germany; Greece; Hawali; Iran; Iraq; Italy; Japan; Korea; New Zealand; Nigeria; Pakistan; Russia, Sweden; Russia; Tailand, Turkey; U.K; U.S.A; West Africa.

Remarks: Cosmopolitan parasitoid of stored product pests. In present study *A.calandrae* emerged from stored products Bengal gram (*Cicer arietinum*) infested by *Callosobruchus analis* and green gram (*Vigna radiata*) infested by *Callosobruchus maculatus*. It also collected from agroecosystem (Vegetable field, Paddy field, Tea and Nutmeg).

Callitula Spinola

1811. *Callitula* Spinola. *Ann. Mus. Hist. Nat. Paris*, 17: 151. Type species: *Callitula bicolor* Spinola, by monotypy.

1833. *Micromelus* Walker. *Ent. Mag.* 1(4): 371, Type species: *Micromelus rufomaculatus* Walker, by designation of Westwood, 1839.

Diagnosis: Body mostly metallic; head wider than mesosoma, antennae with three anelli and five funicular segments; clava acuminate or with a narrow spicule; pronotal collar with sharp margin; propodeum usually with long convex, reticulate nucha; gaster often with T1 or both T1 & T2 evidently enlarged; petiole if visible bordered ventrally by flange visible on either side and formed from extension of first gastral sternite.

Distribution: All countries from the northern temperate zone to the tropics to southern temperate zone.

Biology: Parasites of small Diptera, especially Agromyzidae and Cecidomyiidae. They attack larvae which burrow in grass stems or other plant parts. Main hosts include leaf-mining or stem-mining species on herbaceous plants.

Key to the Kerala species of *Callitula* Spinola

1. Anterior margin of clypeus roundly produced.....2
 - Anterior margin of clypeus slightly or moderately emarginate..... 3
2. Gaster distinctly longer than mesosoma; in dorsal view length 2.7× width; forewing with broad speculum and basal cell open below; antenna with pedicel shorter than F1; pronotal collar not margined anteriorly, only little raised in the middle; POL subequal to OOL; gaster with metallic blue reflection on TI dorsally (Plate 19, Fig. f).....*C. keralensis* Sureshan
 - Gaster as long as mesosoma; in dorsal view length 1.8× width; forewing with narrow speculum and basal cell closed below, pedicel little longer than F1; pronotal collar distinctly margined at least medially; POL 1.6× OOL; gaster without metallic blue reflection dorsally on TI (Plate 19, Fig. d)..... *C. anguloclypea* Sureshan
3. Forewing with PMV almost half of MV; antennal flagellum distinctly widened towards the tip; terminal stylus of clava prominent (Plate 19, Fig. e).....*C. bambusae* Narendran and Jobiraj
 - PMV longer than half of MV; antennal flagellum not widened as

- above; terminal stylus of clava less prominent..... 4
4. Body robust, length 3.7mm; gaster 1.1× as long as head plus mesosoma; antenna with scape not exceeding level of vertex.....*C. robusta* Sureshan
- Body not robust, size small; gaster shorter than head plus mesosoma combined; scape exceeding level of vertex..... 5
5. Gaster with T2 large, occupying 0.2× total length of gaster; head and mesosoma dark metallic blue; legs with coxae brown (Plate 20, Fig. b).....*C. rugosa* (Waterston)
- Gaster with T2 not as above; head and mesosoma metallic green or black; legs including coxae testaceous..... 6
6. Antennal scape exceeding well above level of vertex; pedicel plus flagellum length equal to head width; clava with distinct terminal stylus; forewing with basal cell bare; head and mesosoma metallic green (Plate 20, Fig. a)..... *C. peethapada* Narendran and Mohana
- Antennal scape exceeding only little above level of vertex; pedicel plus flagellum length little more than head width; terminal stylus of clava less distinct; forewing with basal cell closed below and hairy towards the distal half; head and mesosoma black (Plate 20, Fig. c)..... *C. travancorensis* Sureshan

36. *Callitula anguloclypea* Sureshan

(Plate 19, Fig. d)

2002c. *Callitula anguloclypea* Sureshan, *Rec. Zool. Surv. India*, 100 (1-2): 25, ZSIK.

Diagnosis: Head and mesosoma black; gaster brown with an yellow spot at base dorsally; antennae brown except scape, pedicel and anelli testaceous; head uniformly engraved reticulate; POL 1.6× OOL; anterior margin of clypeus roundly produced; antennae with scape reaching very little above the level of vertex and F1 little shorter than pedicel; clava as long as two preceding segments combined; pronotal collar distinctly margined at least medially, propodeum strongly produced, nucha occupying one third length; forewing with basal cell closed below, marginal fringe long; gaster as long as mesosoma; T1 occupying one third length and hind margin curved medially.

Materials examined: 1 female & 1 male, INDIA, Kerala, Idukki, Pampadum Shola, 26.v.2014, ZSIK.reg.no.IR/INV/3411, coll.P.M.Sureshan; 2 females, INDIA, Kerala, Calicut, Chelannur, 21.iii.2014, ZSIK.reg.no.IR/INV/3421, coll. Raseena Farsana; 1 female, INDIA, Kerala, Vellayini, Trivandrum; 30.v.2014, ZSIK.reg.no.IR/INV/3422, coll. Raseena Farsana; 1 female, INDIA, Kerala, Kozhikode, Mavoor, 13.ii.2014, ZSIK.reg.no.IR/INV/3961, coll. Swetha. M; 1 female, INDIA, Kerala, Kozhikode, Easthill, 23.x.2014, ZSIK.reg.no.IR/INV/4217, coll. Gnana Kumar; 2 females, INDIA, Kerala, Calicut, Vengeri, 6.iii.2015, ZSIK.reg.no.IR/INV/4386, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Vengeri, 7.i.2015, ZSIK.reg.no.IR/INV/4387, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Easthill, 21.ix.2015, ZSIK.reg.no.IR/INV/4763, coll. Sheeja; 1 female, INDIA, Kerala, Calicut, Vengeri, 3.ii.2015, ZSIK.reg.no.IR/INV/5238, coll. Raseena Farsana; 3 females, INDIA, Kerala, Calicut, Kakkayam, 30.xii.2015, ZSIK.reg.no.IR/INV/6674, coll. Rajmohana; 1 male, INDIA, Kerala, Ernakulam, Kolancheri, 21.xi.2014, ZSIK.reg.no.IR/INV/6757, coll. Raseena

Farsana; 1 female, INDIA, Kerala, Calicut, Chelannur, 21.iii.2014, ZSIK.reg.no.IR/INV/6785, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Chathamangalam, 8.iii.2016, ZSIK.reg.no.IR/INV/6834, coll. Raseena Farsana; 1 female, INDIA, Kerala, Kottayam, Kozha Seed Farm, 27..iv.2016, ZSIK.reg.no.IR/INV/6838, coll. Raseena Farsana; 1female &1male, INDIA, Kerala, Kannur, Madaayippara, 20.x.2015, ZSIK.reg.no.IR/INV/6991, coll. Raseena Farsana; 3 females, INDIA, Kerala, Kasargod, Periya, 26.x.2015, ZSIK.reg.no.IR/INV/6997, coll. Raseena Farsana; 1female, INDIA, Kerala, Calicut, Mayanad, 2.iii.2015, ZSIK.reg.no.IR/INV/6999, coll. Shwetha M; 3 females, INDIA, Kerala, Ernakulam, Thattekkad, Kallippara, Sathrapadi, 6.i.2015, ZSIK.reg.no.IR/INV/7053, coll. Sureshan; 2 females, INDIA, Kerala, Ernakulam, Thattekkad, Urulamthanni, 6.i.2015, ZSIK.reg.no.IR/INV/7055, coll. Sureshan; 3 females, INDIA, Kerala, Calicut, Kakkadampoyil, 13.i.2017, ZSIK.reg.no.IR/INV/8667, coll. Raseena Farsana; 2 females, INDIA, Kerala, Calicut, Kakkadampoyil, 19.i.2017, ZSIK.reg.no.IR/INV/8672, coll. Raseena Farsana; 1 female, INDIA, Kerala, Palakad, Varadimala, 22.ii.2012, ZSIK.reg.no.IR/INV/8877, P.M. Sureshan; 1female, INDIA, Kerala, Idukki, Pambadum Shola, 26.v.2014, ZSIK.reg.no.IR/INV/8918, coll. P.M.Sureshan; 1 female, INDIA, Kerala, Palakkad, Mannarkkad, 24.ii.2013, ZSIK.reg.no.IR/INV/ 8919, coll. P.M.Sureshan; 1 female, INDIA, Kerala, Idukki, Puthukkudi, 3.iv.2016, ZSIK.reg.no.IR/INV/9295, coll. Ranjit A P; 1 Male, INDIA, Kerala, Kozhikode, Chelannur, 17.v.2014, ZSIK.reg.no.IR/INV/9298, coll. Raseena Farsana; 1 Male, INDIA, Kerala, Trivandrum, Vellayini, 17.xii.2016, ZSIK.reg.no.IR/INV/9299, coll. Raseena Farsana.

Distribution: India: Kerala, Tamil Nadu; Sri Lanka.

Remarks: Collected from agroecosystem (paddy and mixed vegetables) and forest.

37. *Callitula bambusae* Narendran & Jobiraj

(Plate 19, Fig. e)

2001. *Callitula bambusae* Narendran & Jobiraj. Narendran *et al.*, *Uttarpradesh J. Zool.* 21 (1): 29. (ZSIK).

Diagnosis: Head and mesosoma metallic bluish green; gaster brown with T1 having bluish tinge dorsally; antennae testaceous; head 1.2× as wide as mesosoma, moderately reticulate; POL 1.3× OOL; clypeus with anterior margin weakly emarginate; scape slightly reaching above level of vertex; F1 shorter than pedicel; clava shorter than three preceding segments combined; terminal stylus prominent and long; pronotal collar carinate, almost smooth; propodeum with median area little raised on median line; forewing with pubescence very sparse; gaster short, 0.7× as long as head plus mesosoma combined; hind margin of T1 produced medially.

Materials Examined: 1 female, INDIA, Kerala, Ernakulam, Karumaloor, 15.v.2015, ZSIK.reg.no.IR/INV/7034, coll. Raseena Farsana; 1 female, INDIA, Kerala, Kannur University, 15.xii.2014, ZSIK.reg.no.IR/INV/7045, coll. Nikhil& Kumar; 1 female, INDIA, Kerala, Kannur, 15.xii.2014, ZSIK.reg.no.IR/INV/7320, coll. P.M.Sureshan.

Distribution: India: Kerala, Tamil Nadu

Remarks: Collected from agroecosystem (mixed vegetables).

38. *Callitula keralensis* Sureshan

(Plate 19, Fig. f)

2002c. *Callitula keralensis* Sureshan, *Rec. Zool. Surv. India* 100 (1-2): 23 (ZSIK).

Diagnosis: Head and mesosoma metallic blue, gaster almost black with metallic blue reflection on T1; antennae brown except scape and pedicel testaceous; POL $1.08\times$ OOL; clypeus anteriorly roundly produced; scape exceeding level of vertex; pedicel shorter than F1; pronotal collar not margined; scutellum little longer than mesoscutum; propodeum with basal fovea deep, forewing with stigma slightly capitates; gaster distinctly longer than mesosoma, length $2.7\times$ width in dorsal view.

Materials Examined: 1 female, INDIA, Kerala, Calicut, Vengeri, 27.vi.2014, ZSIK.reg.no.IR/INV/3420, Coll. Raseena Farsana; 4 females & 1 male, INDIA, Kerala, Calicut, Kakkadampoyil, 19.i.2017, ZSIK.reg.no.IR/INV/8673, Coll. Raseena Farsana; 1 female, INDIA, Kerala, Trichur, Vazhachal, 27.ii.2013, ZSIK.reg.no.IR/INV/2526, Coll. P.M.Sureshan; 1 female, INDIA, Kerala, Palakkad, Silentvalley, 20.ii.2013, ZSIK.reg. no.IR/INV/2990, Coll. P.M.Sureshan, 1 female, INDIA, Kerala, Palghat, Mannarkad, Pattiyar, 24.ii.2013, ZSIK.reg.no.IR/INV/3157. Coll. P.M.Sureshan, 2 females, INDIA, Kerala, Calicut, Kakkayam, Malabar WS, 16.i.2013, ZSIK.reg.no.IR/INV/3301, Coll. P.M.Sureshan; 1 female & 1 male, Kerala: Calicut, Kakkadampoyil, 30.xii.2016, ZSIK.reg.no.IR/INV/ 8205 Coll. Sureshan & Raseena Farsana; 1 female, INDIA, Kerala, Trissur, Vazhachal, Malakkappara, 27.ii.2013, ZSIK.reg.no.IR/INV/2526, coll. P.M.Sureshan.

Distribution: India: Kerala, Karnataka, Tamil Nadu

Remarks: Collected from agroecosystem (mixed vegetables) and forest.

39. *Callitula peethapada* Narendran & Mohana

(Plate 20, Fig. a)

2001. *Callitula peethapada* Narendran and Mohana. Narendran *et al.*, *Uttarpradesh J. Zool.* 21 (1): 31. (ZSIK).

Diagnosis: Head and mesosoma metallic green with bronzy reflection dorsally; gaster brown with a broad yellowish spot dorsally at base; antennae brown except scape and pedicel testaceous; all legs including coxae brownish yellow; POL 1.6× OOL; anterior margin of clypeus shallowly emarginate; antennal scape reaching well beyond level of vertex; pedicel as long as F1; clava as long as two preceding segments combined; terminal stylus long; Pronotal collar anteriorly margined; propodeum with nucha well constricted, almost half of median length; gaster elongate, ovate, 0.8× as long as head plus mesosoma combined, petiole short, finely reticulate.

Materials Examined: 8 females, INDIA, Kerala, Palakkad, Pattambi, 22.v.2014, ZSIK.reg.no.IR/INV/3415, coll. Raseena Farsana; 1 female, INDIA, Kerala, Trivandrum, Vellayini, 30.v.2014, ZSIK.reg.no.IR/INV/3416, coll. Raseena Farsana; 3 females, INDIA, Kerala, Calicut, Chelannur, 17.iii.2014, ZSIK.reg.no.IR/INV/3418, coll. Raseena Farsana; 3 females, INDIA, Kerala, Calicut, Vengeri, 17.vi.2014, ZSIK.reg.no.IR/ INV/3419, coll. Raseena Farsana, 1 female, INDIA, Kerala, Palakkad, Thathamangalam, 19.xii.2014, ZSIK.reg.no.IR/INV/3423, coll. Raseena Farsana; 1 female, INDIA, Kerala, Kozhikode, Mavoor, 16.i.2014, ZSIK.reg.no.IR/INV/3962, coll. Swetha. M.; 1 female, INDIA, Kerala, Kozhikode, Vengeri 7.ix.2014, ZSIK.reg.no.IR/INV/4216, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Easthill, 17.iv.2015, ZSIK.reg.no. IR/INV/4706, coll. P.M.Sureshan; 1 female, INDIA, Kerala, Ernakulam, Kolencheri, 21.xi.2014, ZSIK.reg.no.IR/INV/4757, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Vengeri, 3.ii.2015, ZSIK.reg.no.IR/INV/5237, coll. Raseena Farsana; 2 females, INDIA, Kerala, Calicut, Vengeri, 6.iii.2015, ZSIK.reg.no.IR/INV/5528, coll. Raseena Farsana; 1 female, INDIA, Kerala,

Calicut, Vengeri, 3.ii.2015, ZSIK.reg.no.IR/INV/6780, coll. Raseena Farsana; 1 female & 1 male, INDIA, Kerala, Calicut, Chathamangalam, 8.iii.2016, ZSIK.reg.no.IR/INV/6832, coll. Raseena Farsana; 1 female & 1 male, INDIA, Kerala, Kottayam, Kuruvilangad, 28.iv.2016, ZSIK.reg.no.IR/INV/6839, coll. Raseena Farsana; 1 female, INDIA, Kerala, Kottayam, Kozha Seed Farm, 27.iv.2016, ZSIK.reg.no.IR/INV/6840, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Nechooli, 2.iii.2016, ZSIK.reg.no.IR/INV/6927, coll. Raseena Farsana; 2 females & 1 male, INDIA, Kerala, Trissur, Kannara, 7.v.2015, ZSIK.reg.no.IR/INV/7019, coll. Ranjith P; 1 female, INDIA, Kerala, Ernakulam, Thattekkad, Kallippara, 6.i.2015, ZSIK.reg.no.IR/INV/7054, coll. Sureshan; 1 female, INDIA, Kerala, Kottayam, Kozha Seed Farm, 27.iv.2016, ZSIK.reg.no.IR/INV/9296, coll. Raseena Farsana; 1 female, INDIA, Kerala, Kozhikode, Chelannur, 17.v.2014, ZSIK.reg.no.IR/INV/9297, coll. Raseena Farsana; 1 Male, INDIA, Kerala, Kozhikode, Chathamangalam, 8.iii.2016, ZSIK.reg.no.IR/INV/9300, coll. Raseena Farsana; 1 Male, INDIA, Kerala, Ernakulam, Kuttippuzha, 15.v.2015, ZSIK.reg.no.IR/INV/9301, coll. Raseena Farsana.

Distribution: India: Kerala, Bihar, Gujarat, Tamil Nadu, Telungana; Sri Lanka.

Remarks: Collected from agroecosystem (Paddy and mixed vegetables).

40. *Callitula rugosa* (Waterston)

(Plate 20, Fig. b)

1915. *Trigonogastra rugosa* Waterston, *Bull. Ent. Res.* 5: 326.

1978. *Callitula rugosa* (Waterston), Bouček *et al.*, *Oriental Insects*, 12 (4): 437-438.

Diagnosis: Head and mesosoma dark green, almost black; gaster brownish black with slight bluish tinge dorsally; antennae brown except scape yellowish brown; vertex abruptly curving to occiput; POL 1.5× OOL; anterior margin of clypeus slightly emarginate; scape reaching above level of vertex; pedicel 2× as

long as wide; F1 little shorter than pedicel; pronotal collar sharply margined; forewing with basal cell closed with few scattered hairs, MV $2\times$ STV; gaster as long as mesosoma with T1 occupying more than one third length of gaster.

Materials Examined: 1 female, INDIA, Kerala, Trivandrum, Kumbu, 11.x.2012, ZSIK.reg.no.IR/INV/8855, P.M. Sureshan; 1 female, INDIA, Kerala, Kannur, Madayippara, 15.xii.2014, ZSIK.reg.no.IR/INV/9475, coll. Raseena Farsana

Distribution: India: Kerala, Panjab, Tamil Nadu; Sri Lanka.

Remarks: Collected from forest and agroecosystem (mixed vegetables).

41. *Callitula travancorensis* Sureshan

(Plate 20, Fig. c)

2002c. *Callitula travancorensis* Sureshan, *Rec. Zool. Surv. India.*, 100 (1-2): 26, ZSIK.

Diagnosis: Body black with gaster mostly yellowish brown; antennae dark brown except scape and pedicel testaceous; anterior margin of clypeus weakly emarginate; POL $1.7\times$ OOL; scape reaching above level of vertex; pronotal collar finely but sharply carinate; propodeum with plicae less sharp, reaching up to base of nucha; basal cell of forewing closed below; speculum very narrow; gaster short, ovate, length $0.72\times$ as long as head plus mesosoma combined.

Materials Examined: 1 female, INDIA, Kerala, Calicut, Chelannur, 21.iii.2014, ZSIK.reg.no.IR/INV/3424, coll. Raseena Farsana, 1 female, INDIA, Kerala, Calicut, Vengeri, 27.vi.2014, ZSIK.reg.no.IR/INV/ 3425, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Vengeri, 7.i.2015, ZSIK.reg.no.IR/INV/5151, coll. Raseena Farsana; 1 female, INDIA, Kerala,

Calicut, Vengeri, 3.ii.2015, ZSIK.reg.no.IR/INV/5239, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Vengeri, 6.iii.2015, ZSIK.reg.no.IR/INV/6756, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Nechooli, 2.iii.2016, ZSIK.reg.no.IR/INV/6833, coll. Raseena Farsana; 1 female, INDIA, Kerala, Kozhikode Westhill Beach, 19.xii.2014, ZSIK.reg.no.IR/INV/7046, coll. Sheeja & Kumar; 1 male, INDIA, Kerala, Calicut, Vengeri, 12.i.2015, ZSIK.reg.no.IR/INV/7059, coll. Sheeja; 1 female, INDIA, Kerala, Calicut, Easthill, 19.iii.2015, ZSIK.reg.no.IR/INV/7061, coll. Nikhil & Sureshan; 2 females, INDIA, Kerala, Kasarkode, Periya, 26.x.2015, ZSIK.reg.no.IR/INV/9302, coll. Raseena Farsana.

Distribution: India: Kerala, Arunachal Pradesh, Gujarat, Tamil Nadu, Uttar Pradesh

Remarks: Collected from agroecosystem (Mixed vegetables and paddy)

Chlorocytus Graham

1956a. *Chlorocytus* Graham, *Ent. Mon. Mag.* 92. Type species: *Pteromalus pulchripes* Walker, by original designation.

Diagnosis: Body mostly metallic; antennae with 13 segments mostly with two anelli; anterior margin of clypeus mostly truncate to slightly emarginate; mesosoma rather slender; prepectus relatively large and as long as tegula; pronotal neck appears longer than collar in dorsal view; mesoscutum with notauli incomplete; propodeum without nucha, nuchal part reduced to a narrow adpetiolar strip, gaster sessile or subsessile, elongate.

Distribution: From Europe to East Africa and throughout Asia to Australia.

Biology: Reported as parasites of insect larvae boring in stems of Gramineae, mainly Diptera, Hymenoptera and Coleoptera.

42. *Chlorocytus indicus* Sureshan

(Plate 20, Fig. d)

2000b. *Chlorocytus indicus* Sureshan, *Rec. Zool. Sur. India*, 98 (2): 143, ZSIK.

Diagnosis: Body bright metallic blue with golden reflection, antennae with scape and pedicel testaceous, remainder brown; head closely and distinctly punctate; scape 0.82× as long as eye height, pedicel plus flagellum length 1.2× head width, pronotal collar sharply carinate anteriorly; mesosoma closely reticulate punctate; propodeum with complete fine median carina; forewing with basal vein setate; gaster longer than head plus mesosoma combined.

Materials Examined: 1 female, INDIA, Kerala, Kasargod, Ranipuram, 10.v.2013, ZSIK.reg.no.IR/INV/2669, coll. Bijoy; 1 female, INDIA, Kerala, Palakkad, Silentvalley, 22.iii.2013, ZSIK.reg.no.IR/INV/2672, coll. P.M.Sureshan; 1 female, INDIA, Kerala, Calicut, Kakkayam, 30.xii.2014, ZSIK.reg.no.IR/INV/7051, coll. Sureshan; 1 female, INDIA, Kerala, Palakkad, Puthunagaram, 1.i.2015, ZSIK.reg.no.IR/INV/9279, coll. Raseena Farsana; 2 females, INDIA, Kerala, Idukki, Puthukkudi, 3.iv.2016, ZSIK.reg.no.IR/INV/9280, coll. Ranjit A P; 1 female, INDIA, Kerala, Kannur, Madayippara, 20.x.2015, ZSIK.reg.no.IR/INV/9281, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Chelannur, 19.iii.2014, ZSIK.reg.no.IR/INV/9310, coll. Raseena Farsana;

Distribution: India: Kerala, Arunachal Pradesh, Jammu, Karnataka, Tamil Nadu

Remarks: Collected from both forest and agroecosystem (Mixed vegetables & paddy).

Cryptoprymna Förster

1833. *Prosodes* Walker, *Ent. Mag.* 1: 371,374, Type species: *Prosodes ater* Walker, by monotypy.

1856. *Cryptoprymna* Förster, *Hym.stud.* 2: 52-59. Replacement name for *Prosodes* Walker.

1915a. *Polycystelomorpha* Girault, *Mem. Qd. Mus.* 3: 340. Type species: *Polycystelomorpha flavifemur* Girault, by original designation, synonymized by Bouček, 1988: 467.

Diagnosis: Head, mesosoma, coxae and petiole black; gaster dark brown; head transversely oval in front view; clypeus with anterior margin truncate; genae with broad concavity extending from mouth margin to orbit; antennal formula 11263; antennae inserted below middle of face; clava distinctly wider than F6; pronotal collar with sharp transverse carina anteriorly; propodeum as long as scutellum, strongly arched; median carina and plicae sharp; gaster ovate, petiole elongate; and sculptured; T1 enlarged, hypopygium extending to the tip of gaster.

Distribution: Europe, Africa, South Asia to New Guinea and Australia.

Biology: Little is known about the biology of the species under this genus. One species was reared from a flat larva of an unknown genus of Syrphidae.

Key to the Kerala species of *Cryptoprymna*

1. Antenna slender with F1 as long as F2, scape little longer than eye; clava 2× as long as wide; MV length 1.3× PMV; gastral petiole slender, length 2.9× width (Plate 20, Fig. e).....
..... *C. elongata* Sureshan & Narendran
- Antenna stout with F1 shorter than F2, scape little shorter than eye, clava 1.6× as long as wide; MV as long as PMV; petiole short, length 2.3× width (Plate 20, Fig.f) *C. indiana* Sureshan & Narendran

43. *Cryptoprymna elongata* Sureshan & Narendran

(Plate 20, Fig. e)

2000a. *Cryptoprymna elongata* Sureshan & Narendran, *J. Bombay Nat. Hist. Soc.* 79 (3) : 403. (ZSIK).

Diagnosis: Body black; antennae testaceous with clava darker; head finely reticulate; anterior margin of clypeus slightly emarginate, antennal scape reaching median ocellus, clava little longer than three preceding segments combined; mesoscutum finely reticulate; gaster length $1.5\times$ width; petiole length $2.9\times$ width.

Materials Examined:, 2 females, INDIA, Kerala, Kasargod, Kottamcheri, 6.i.2013, ZSIK.reg.no.IR/INV/2668, coll.Rajmohana; 1 male, INDIA, Kerala, Trivandrum, Ponmudi, 15.x.2012, ZSIK.reg.no.IR/INV/2803, coll.P.M.Sureshan; 7 females, INDIA, Kerala, Wayanad, Tholpetti, 8.x.2013, ZSIK.reg. no.IR/INV/9082, coll.Abhilash; 1 female, INDIA, Kerala, Idukki, Munnar, Mathikettanshola, 19.ix.2014, ZSIK.reg.no.IR/INV/8890, P.M. Sureshan; 1 female, INDIA, Kerala, Kannur, Kodachal, 6.i.2013, ZSIK.reg.no.IR/INV/8809, coll. Rajmohana.

Distribution: India: Kerala, Karnataka.

Remarks: Collected from forest.

44. *Cryptoprymna indiana* Sureshan & Narendran

(Plate 20, Fig. f)

2000a. *Cryptoprymna indiana* Sureshan & Narendran, *J. Bombay Nat. Hist. Soc.* 79 (3): 405. (ZSIK).

Diagnosis: Body black; gaster brownish ventrally; head finely reticulate; in dorsal view width $2\times$ length; POL $1.4\times$ OOL; clypeus with anterior margin

almost straight; antennae stout with F1 shorter than F2; antennal scape not reaching median ocellus; scape little shorter than eye; clava 1.6× as long as wide; clava longer than three preceding segments combined; mesoscutum moderately reticulate; gaster with petiole short, length 2.3× width.

Materials Examined: 1 female, INDIA, Kerala, Kassargod, Kottancheri, 6.i.2013, ZSIK.reg.no.IR/INV/2671, coll.Rajmohana; 1 female, INDIA, Kerala, Trivandrm, Ponmudi, 15.x.2012, ZSIK.reg.no.IR/INV/ 8914, coll. P.M.Sureshan.;

Distribution: India: Kerala

Remarks: Collected from forest.

Cyrtogaster Walker

1833. *Cyrtogaster* Walker, *Ent. Mag.* 1: 377, 381, Type species: *Cyrtogaster rufipes* Walker, by designation of Westwood, 1839: 68.

Diagnosis: Head and mesosoma blue green to dark green; gaster dark metallic green to black; head transversely oval; clypeus with three symmetrically arranged teeth; antennal formula 11263; flagellum strongly clavate; notauli complete or incomplete; frenal grooves of scutellum distinct; propodeum rugulose; callus with dense setae; forewing with basal cell completely hairy or bare; gastral petiole transverse or longer than wide; T1 and T2 covering nearly its entire dorsal surface; hind margin of T1 broadly concave, remainder with hind margin straight; maxillary palpi enlarged in males.

Distribution: Europe, South Asia, America.

Biology: Pupal parasites of different leaf, stem or seed mining Diptera.

45. *Cyrtogaster clavicornis* Walker

(Plate 21, Fig. a)

1833. *Cyrtogaster clavicornis* Walker, *Entomol. Mag.* 1: 383.

Diagnosis: Body dark bluish green; antennae brown; coxae brown, remainder of legs testaceous; head finely reticulate 1.3× as wide as mesosoma; antennae with pedicel plus flagellum slightly longer than head width; pedicel longer than F1; POL 1.28× OOL; anterior margin of pronotal collar carinate; notauli complete, groove like; propodeum with coarse irregular areolation; forewing completely hairy; marginal fringe long; gaster length 1.9× width; petiole transverse; maxillary palpi of male enlarged.

Materials examined: 1 Female, INDIA, Kerala, Idukki, Kolukkumala, 7.iv.2016, ZSI/WGRC/IR.INV.9271, coll. Ranjit A P

Distribution: India: Kerala; Belgium; Denmark; Europe; Germany; Kazakhstan; Netherlands; People's Republic of China; Spain; Sweden; U.K.

Remarks: Collected from agroecosystem (Tea).

Dinarmus Thomson

1878. *Dinarmus* Thomson, *Hym. Scand.* 5: 50, 56. Type species: *Dinarmus acutus* Thomson. Designated by Ashmead, 1904.

1904. *Bruchobius* Ashmead, *Mem. Carnegie. Mus.* 1 (4): 314. Type species: *Bruchobius laticeps* Ashmead by original designation.

1915a. *Metastenoides* Girault, *Mem. Qd. Mus.* 4: 190. Type species: *Metastenoides simus* Girault. By original designation (Synonymised by Boucek, 1988: 413).

1922. *Oedaule* Waterston, *Ind. Forest Rec.* 9: 31. Type species: *Oedaule stringifrons* Waterston by monotypy (Synonymised by Boucek, 1988: 413).

Diagnosis: Head large, not prominent behind eyes; anterior margin of clypeus shallowly emarginate or toothed; female antennae with three anelli and male with two anelli; third anellus sometimes quadrate; mesosoma stout, convex;

pronotum as broad as mesoscutum; collar broad; bluntly ridged or rounded, not sharply carinate; neck hardly visible from above; prepectus small, subquadrate; propodeum short, reticulate, constricted into subglobose nucha; enlarged sometimes; forewing with stigma more or less capitate; costal cell enlarged sometimes; gaster short; legs stout; hind tibia with two spurs.

Distribution: All temperate, subtropical and tropical zones reaching Australia.

Biology: Probably all species of *Dinarmus* attack Bruchid beetles in pods of leguminous plants. Some species are cosmopolitan together with their Bruchid hosts which spread to stored beans and grains.

Key to Kerala species of *Dinarmus* Thomson

1. Fore wing with PMV shorter than MV (0.6×) and only as long as STV; discal pubescence very short, less distinct; POL only slightly longer than OOL (Plate 21, Fig. e)*D. vagabundus* (Timberlake)
 - PMV as long as , little longer or shorter than MV but distinctly longer than STV; discal pubescence distinct; POL distinctly longer than OOL.....2
2. (1) Anelli transverse, third anellus not longer than second..... 3
 - Third anellus distinctly longer than second and as long as first and second combined.....4
3. (2) Anterior margin of clypeus weakly bidentate; antennae with pedicel as long as F1; forewing with PMV as long as MV; gaster short, not collapsing , 0.7× as long as head plus mesosoma combined (Plate 21, Fig. b).....*D. acutus* (Thomson)
 - Anterior margin of clypeus slightly projecting, not bidentate; pedicel

little shorter than F1; PMV 0.8× as long as MV; gaster long, dorsally slightly collapsing, subequal to head and mesosoma combined
.....*D. colemani* (Crawford)

4. (2) Anterior margin of clypeus almost straight, not projecting; PMV as long as or slightly longer than MV; antennae slender, yellowish brown except anelli and clava brown; similar brown bands on funicular segments distally, scape reaching middle of median ocellus; POL subequal to OOL; gaster highly cordiform (Plate 21, Fig. d)...
.....*D. maculatus* (Masi)

- Anterior margin of clypeus shallowly emarginate, slightly projecting; PMV 1.3× OOL; antennae not slender, uniformly yellowish brown or brown without brown rings on funicular segments, scape hardly reaching median ocellus; POL 1.3× OOL; gaster not cordiform (Plate 21, Fig. c).....*D. basalis* (Rondani)

46. *Dinarmus acutus* (Thomson)

(Plate 21, Fig. b)

1878. *Dimacus (Dinarmus) acutus* Thomson, *Hym. Scand.*, 5: 56.

Diagnosis: Body dark metallic blue with gaster darker; antennae brown except scape testaceous; anterior margin of clypeus with two small teeth; antennae with third anellus not longer than second; pronotum as broad as mesoscutum; propodeum with nucha elongate; forewing with PMV as long as MV; gaster short and cordiform, 0.7× as long as head plus mesosoma combined.

Materials Examined: 1 female, INDIA, Kerala, Calicut, Chelannur, 21.iii.2014, ZSIK.reg.no.IR/INV/3974, coll. Raseena Farsana. 1 female, INDIA, Kerala, Calicut, Easthill, 17.iv.2015, ZSIK.reg.no.IR/INV/4605, coll.

P.M.Sureshan; 1 female, INDIA, Kerala, Calicut, Vengeri, 6.iii.2015, ZSIK.reg.no.IR/INV/5241, coll. Raseena Farsana; 3 females & 1 male, INDIA, Kerala, Kasarkode, Periya, 26.x.2015, ZSIK.reg.no.IR/ INV/6995, coll. Raseena Farsana; 1 female, INDIA, Kerala, Palakkad, Pattambi, RARS, 9.vii.2016, ZSIK.reg.no.IR/INV/7030, coll. Ranjith; 1 female, INDIA, Kerala, Kozhikode, Easthill, 19.iii.2015, ZSIK.reg.no.IR/INV/7063, coll. Nikhil; 1 female, INDIA, Kerala, Idukki, Kolukkumala, 7.iv.2016, ZSIK.reg.no.IR/INV/9262, coll. Ranjit A P, 1 male, INDIA, Kerala, Calicut, Chathamangalam, 8.iii.2016, ZSIK.reg.no.IR/INV/9291, coll. Raseena Farsana.

Distribution: India: Kerala, Arunachal Pradesh, Andra Pradesh; Bihar, Karnataka, Gujarat, Rajasthan, Uthar Pradesh, Tamil Nadu; Afrotropical; Austria; Belgium; Canada; Czechoslovakia; Europe; France; Germany; Hungary; Iran; Iraq; Italy; Kazakhtan, Morocco; Netherlands; North America; Romania; Russia, Spain, Sri Lanka, Sweden; Switzerland; Turkey; U.K.; U.S.A.

Remarks: Collected from agroecosystems (Mixed vegetables, paddy and tea).

47. *Dinarmus basalis* (Rondani)

(Plate 21, Fig. c)

1877. *Entedon basalis* Rondani, *Bull. Soc. Ent. Ital.* 9: 174.

1974c. *Dinarmus basalis* (Rondani), in Bouček, *Redia*, 55pp: 241-285.

Diagnosis: Body dark green with brassy reflection; antennae brown or yellowish brown; head moderately reticulate; anterior margin of clypeus slightly produced, shallowly emarginate; POL 1.3× OOL; antennae with scape hardly reaching median ocellus, pedicel shorter than F1 (0.6×); third anellus longest; mesosoma reticulate punctuate; propodeum with nucha long; forwing PMV longer than MV (1.3×); gaster ovate, dorsally flat, less collapsing, 0.85× as

long as head plus mesosoma combined.

Materials Examined: 1 female, INDIA, Kerala, Calicut, Easthill, 30.iii.2015, ZSIK.reg.no.IR/INV/4606, coll. P.M.Sureshan; 22 females & 25 males, Kerala, Calicut, Kinasseri, 28.x.2016, ZSIK.reg.no.IR /INV/7917, coll.Raseena Farsana.

Distribution: India: Kerala, Andra Pradesh, Bihar, Delhi, Haryana, Karnataka, Madhya Pradesh, Rajasthan; Bangladesh; Brazil; Columbia; Egypt; France; Iran; Israel; Italy; Kazhakstan; Madagascar; Nigeria; Peru; Pakistan; South Africa; Sri Lanka; Sudan; Thailand; USA; USSR.

Remarks: Emerged from stored product (Bengal gram), also collected from homestead vegetation.

48. *Dinarmus maculatus* (Masi)

(Plate 21, Fig. d)

1924. *Sphaerakis maculatus* Masi, *Ann. Mus. Civ. Stor. Nat. Giacomo Doria* 51: 157.
1978. *Dinarmus maculatus* (Masi): Bouček *et al.*, *Oriental Ins.* 12 (4): 442.

Diagnosis: Body metallic blue with bronzy patch on vertex and mesosoma; gaster darker; antennae testaceous except anelli and clava brown; antennae slender with brown band on funicular segments distally; wings slightly smoky; anterior margin of clypeus almost straight not projecting; POL subequal to OOL (1.11×); scape reaching median ocellus; pedicel plus flagellum 0.8× head width; third anellus as long as combined length of first and second; propodeum with nucha moderate in length; basal part of propodeum with short vertical rugae; PMV little longer than MV; gaster cordiform.

Materials Examined: 1 female & 1 male, INDIA, Kerala, Kannur, Aaralam,

10.i.2013, ZSIK.reg.no.IR/INV/2807, coll.P.M.Sureshan; 4 females & 2 males, INDIA, Kerala, Calicut, Kakkayam, 16.i.2013, ZSIK.reg.no.IR/INV/3300, coll.P.M.Sureshan; 1 female, INDIA, Kerala, Calicut, Vengeri, 27.vi.2014, ZSIK.reg.no.IR/INV/3412, coll. Raseena Farsana; 4 females, INDIA, Kerala, Idukki, Pambadumshola, 24.v.2014, ZSIK.reg.no.IR/INV/3505, coll. P.M.Sureshan; 2 males, INDIA, Kerala, Kozhikode, Easthill, 5.iii.2015, ZSIK.reg. no.IR/INV/4364, coll. P.M.Sureshan; 1 female & 3 males, INDIA, Kerala, Malappuram, Nilambur, 5.iii.2015, ZSIK.reg.no.IR/INV/4385, coll. Raseena Farsana; 1 male, INDIA, Kerala, Calicut, Easthill, 25.iii.2015, ZSIK.reg.no.IR/INV/4604, coll. P.M.Sureshan; 1 female, INDIA, Calicut, Vengeri 6.iii.2015, ZSIK.reg.no. IR/INV/5153, coll. Raseena Farsana; 2 females, INDIA Kerala, Calicut, Annasserri, 14.v.2015, ZSIK.reg.no.IR/INV/5242, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Kakkavayal, 25.ix.2015, ZSIK.reg.no.IR/INV/6835, coll. Sureshan; 2 females, INDIA, Kerala, Calicut, Mavoor, 19.ii.2015, ZSIK.reg.no.IR/INV/6931, coll. Swetha M; 2 females, INDIA, Kerala, Kannur, Madaayippara, 20.x.2015, ZSIK.reg.no.IR/INV/6992, coll. Raseena Farsana; 3 females, INDIA, Kerala, Kasargad, Mavumkal, 27.x.2015, ZSIK.reg.no.IR/INV/6994, coll. Raseena Farsana; 2 females, INDIA, Kerala, Kozhikode, Chelannur, 17.v.2014, ZSIK.reg.no.IR/INV/7008, coll. Raseena Farsana, 2 females & 1 male, INDIA, Kerala, Kannur, Madaayippara, 21.iii.2014, ZSIK.reg.no.IR/INV/7009, coll. Raseena Farsana; 2 females, INDIA, Kerala, Trivandrum, Aripa, 16.xii.2015, ZSIK.reg.no.IR/INV/7014, coll. Rajmohana; 1 female, INDIA, Kerala, Trissur, Choorakkattukara, 8.i.2016, ZSIK.reg.no.IR/INV/7021, coll. Raseena Farsana; 1 male, INDIA, Kerala, Palakkad, Chittur, 20.i.2015, ZSIK.reg.no.IR/INV/7024, coll. Raseena Farsana; 1 female & 1 male, INDIA, Kerala, Palakkad, Pattambi, RARS, 9.iii.2015, ZSIK.reg.no.IR/INV/7029, coll. Ranjith; 1 female, INDIA, Kerala, Wayanad, Thirunelli, 16.ii.2016, ZSIK.reg.no.IR/INV/7170, coll. Sureshan; 3 females,

INDIA, Kerala, Idukki, Puthukkudi, 3.iv.2016, ZSIK.reg.no.IR/INV/8580, coll. Rajmohana; 1 female, INDIA, Kerala, Kottayam, Ramapuram, 20.ii.2013, ZSIK.reg.no.IR/INV/9081, coll. Minu.

Distribution: India: Kerala, Maharashtra, Karnataka, West Bengal; Myanmar.

Remarks: Collected from both agroecosystems (Cashew, paddy, mixed vegetables and teak) and forest.

49. *Dinarmus vagabundus* (Timberlake)

(Plate 21, Fig. e)

1926. *Bruchobius vagabundus* Timberlake, *Proc. Hawaii Ent. Soc.* 6: 305.

1978. *Dinarmus vagabundus* (Timberlake); Bouček *et al*, *Oriental Ins.* 12 (4): 1978: 442.

Diagnosis: Body black without metallic reflection with gaster brownish black with brassy lusture; head closely and finely reticulate; anterior margin of clypeus slightly emarginate, vertex narrow; antennae inserted little above lower margin of eyes; scape reaching median ocellus; antennae with pedicel as long as F1; third anellus quadrate and largest; mesosoma reticulate punctate; propodeum with nucha short; forewing with discal pubescence very short and indistinct; PMV as long as STV; gaster broadly ovate, shorter than head plus mesosoma combined.

Materials Examined:, 1 female, INDIA, Kerala, Calicut, Chalappuram, 20.ix.2014, ZSIK.reg.no.IR/INV/3821, coll. Shweta; 102 females & 23 males, INDIA, Kerala, Calicut, Mahe, 12.iii.2016, ZSIK.reg.no.IR /INV/6777, coll. Raseena Farsana; 8 females & 3 males, INDIA, Kerala, Calicut, Kinasseri, 28.x.2016, ZSIK.reg.no.IR/INV/7918, coll.Raseena Farsana.

Distribution: India: Kerala, Karnataka, Panjab, Tamil Nadu; France; Hawaii;

Madagascar; Pakistan, Sri Lanka; Vietnam.

Remarks: Emerged from stored product (Green gram), also collected from forest.

***Halticopterella* Girault & Dodd**

1915c. *Halticopterella* Girault and Dodd, in Girault, *Mem. Qd. Mus.* 4: 198. Type species: *Halticopterella nigriflagellum* Girault, by original designation.

Diagnosis: Head and mesosoma reticulate and extensively pilose except for a median longitudinal band on scutellum; scrobes not deep; occiput immargined; anterior margin of clypeus with two triangular teeth; antennae inserted at centre of face antenna three anelli and five funicular segments; pronotal collar anteriorly with sharp carina; notauli anteriorly deep, incomplete; propodeum with distinct nucha and conspicuous plicae which define a broadly cordiform median area; plicae connected posteriorly by a weak or distinct costula, median carina hardly indicated anteriorly; forewing with PMV shorter than MV; gaster sessile, lanceolate and dorsally collapsing; T1 occupying 0.2× length of gaster.

Distribution: India, Australia, New Guinea, China

Biology: Not known.

Key to the Kerala species of *Halticopterella* Girault & Dodd

1. Antennae with flagellum slender, funicular segments elongate; clava distinctly shorter than two preceding segments combined (0.75×); propodeum with costula reaching anterior margin of nucha
.....*H. longiflagellum* Sureshan
- Antenna with flagellum stouter; clava longer than or as long as two

- preceding segments combined; costula reaching half or little above hind margin of nucha..... 2
2. (1) Antennae with F1 as long as pedicel; clava 1.4× as long as two preceding segments combined; propodeum with fine and sharp costula reaching almost up to hind margin of nucha; callus convex, without spine; POL 1.3× OOL; hind margin of T1 straight.....
..... *H. rampurensis* Sureshan
- Antennae with F1 longer than pedicel; clava as long as two preceding segments combined; propodeum with costula not sharp as above and not reaching up to hind margin of nucha; callus ending in a blunt or sharp spine; POL subequal to OOL; hind margin of T1 produced and with weak median incision.....3
3. (2) Propodeum with median area within the plicae 2.3× as wide as long ; nucha short, medially propodeum 0.5× as long as scutellum; adpetiolar margin finely reticulate; forewing with MV 1.4× PMV and 3.3× STV; gaster dorsally collapsing, length 2.6× width; head and mesosoma dark metallic blue (Plate 22, Fig. a).....
..... *H. robusta* Sureshan
- Propodeum with median area within the plicae 1.7× as wide as long; nucha long, medially propodeum 0.61× as long as scutellum; adpetiolar margin moderatly reticulate; forewing with MV 1.2× PMV and 2.5× STV; gaster strongly sclerotise, hardly collapsing, in dorsal view length 3.4× width; head and mesosoma black (Plate 21, Fig. f).....*H. burwelli* Sureshan

50. *Halticopterella burwelli* Sureshan

(Plate 21, Fig. f)

2001a. *Halticopterella burwelli* Sureshan, *Oriental insects*, 35: 33, (ZSIK).

Diagnosis: Length 3.1–3.4mm. Head and mesosoma black, gaster brown with metallic blue reflection; antennal scape touching median ocellus; clava almost equal to two preceding segments combined; POL as long as OOL; propodeum with median area including coxae coarsely reticulate; nucha long, medially propodeum $0.61\times$ as long as scutellum; forewing with MV $1.2\times$ PMV and $2.5\times$ STV; gaster $1.3\times$ as long as head plus mesosoma combined; hind margin of T1 produced.

Materials Examined: 1 female, INDIA, Kerala, Kannur, Kottiyoor, Reserve Forest; 9.i.2013, coll. Bijoy, ZSIK.reg.no.IR/INV/2797; 1 female, INDIA, Kerala, Palakkad, Silent valley, Poochippara, 21.ii.2013, coll.P.M.Sureshan, ZSIK.reg.no.IR/INV/3042; 1 female, INDIA, Kerala, Calicut, Vengeri, 6.iii.2014, ZSIK.reg.no.IR/INV/4424, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Easthill, 13.iv.2015, ZSIK.reg.no.IR/INV/4425, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Easthill, 25.v.2015, ZSIK.reg.no.IR/INV/4608, coll. P.M.Sureshan; 1 female, INDIA, Kerala, Calicut, Easthill, 12.v.2015, ZSIK.reg.no.IR/INV/7066, coll. Sheeja &Nikhil; 1 female, INDIA, Kerala, Calicut, Kakkadampoyil, 13.i.2017, ZSIK.reg.no.IR/INV/8670, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Kakkadampoyil, 19.i.2017, ZSIK.reg.no.IR/INV/8676, coll. Raseena Farsana

Distribution: India: Kerala, Karnataka

Remarks: Collected from agroecosystem (mixed crops and mixed vegetables), homestead vegetation and forest.

51. *Halticopterella robusta* Sureshan

(Plate 22, Fig. a)

2001a. *Halticopterella robusta* Sureshan, *Oriental insects*, 35: 32, (ZSIK)

Diagnosis: Length.2.9–3.3mm. Body dark metallic blue with gaster brownish black; antennae with flagellum thick; clava little longer than two preceding segments combined; mesosoma robust; propodeum with nucha short, medially propodeum 0.5× as long as scutellum, adpetiolar margin finely reticulate; forewing with MV 1.4× PMV and 3.3× STV; gaster dorsally collapsing, 1.2× as long as head plus mesosoma combined.

Materials Examined: 1 female, INDIA, Kerala, Idukki, Mathikettanshola, 10.v.2012, coll.P.M.Sureshan, ZSIK.reg.no.IR/INV/2749; 1 female, INDIA, Kerala, Trivandrum, Ananirathi, 11.xi.2012, ZSIK.reg.no.IR/INV/2800, coll.P.M.Sureshan; 1 female, INDIA, Kerala, Calicut, Vengeri, 3.ii.2014, ZSIK.reg.no.IR/INV/4423, coll. Raseena Farsana; 1 female, Kerala, Ernakulam, Thattekkad, Kollippara, 3.i.2015, ZSIK.reg.no.IR/INV/8782, coll. Nihkil &G.Kumar.

Distribution: India: Kerala

Remarks: Collected from both forest and agroecosystem (mixed vegetables).

Homoporus Thomson

1878. *Homoporus* Thomson, *Hym. Scand.* 5: 60, 64 (as subgenus of *Merisus* Walker).

Type species: *Pteromalus fulvicornis* Walker, designated by Ashmead 1904.

1878. *Phaenacra* Förster, *Verh. Naturh. Ver. Preuss. Rheinl.* 35:51. Type species: *Phaenacra nubigera* Förster by monotypy.

1904. *Parapteromalus* Ashmead, *Mem. Carnegie. Mus.* 1(4): 320, 384. Type species: *Parapteromalus isosomatis* Ashmead, by monotypy and original designation.

1924. *Merisoporus* Masi, *Ann. Mus. Civ. Stor. Nat. Giacomo Doria* 50: 226. Type species: *Pteromalus luniger* Nees, by original designation.

1953. *Pseudomerisus* Erdös & Novitzsky, in Erdös, *Acta Biol. Acad. Scient. Hung.* 4:236. Type species: *Pseudomerisus stipae* Erdös & Novitzsky, by original designation. (As subgenus)

Diagnosis: Antennae with two or three anelli each funicular segment usually having one, but sometimes two rows of long, often sparse longitudinal sensillae; clava with apex pointed or acuminate and claval sutures often become indistinct; antennae inserted about middle of face; pronotum narrower, mesosoma not compact, dorsal side of mesosoma especially scutellum with pilosity strongly reduced; gaster dorsally collapsing, flat concave, sometimes more or less yellow.

Distribution: Europe, North America, Africa, Australia, South and East Asia

Biology: Parasites of hosts in stems of grasses and other herbaceous plants, the host larvae are either Diptera or Hymenoptera and some of their primary parasites.

Key to the Indian species of *Homoporus*

1. Antennae inserted distinctly above lower margin of eyes; clava with apex acute, terminal stylus not prominent; gaster with hind margin of T1 straight; fifth tarsal segment of mid and hind legs swollen.....
.....*H. gladius* sureshan and Narendran
- Antennae inserted almost level with lower margin of eyes; clava acuminate with terminal stylus prominent; gaster with hind margin of T1 medially produced and slightly incised; tarsal segments not swollen (Plate 22, Fig. b)..... *H. acuminatus* sureshan and Narendran

52. *Homoporus acuminatus* Sureshan & Narendran

(Plate 22, Fig. b)

2001a. *Homoporus acuminatus* Sureshan & Narendran, *Zoos'print journal*, 16 (1): 391. (ZSIK)

Diagnosis: Length 1.3–2.4mm. Body black with gaster yellowish brown; head finely engraved reticulate; anterior margin of clypeus weakly emarginate; antennae inserted below middle of face; POL 1.2× OOL; clava acuminate with sharp terminal stylus; pronotal collar anteriorly finely ridged mainly on sides; forewing with PMV slightly shorter than MV; gaster with T1 medially produced in the hind margin and slightly incised; gaster ovate and dorsally collapsing, 1.1× head plus mesosoma combined.

Materials Examined: 1 female, INDIA, Kerala, Calicut, Easthill, 10.iv.2015, ZSIK.reg.no.IR/INV/4602, coll. P.M.Sureshan

Distribution: India: Kerala

Remarks: Collected from homestead vegetation.

Genus *Kumarella* Sureshan

1999a. *Kumarella* Sureshan, *Oriental Ins.* 32: 99-100. Type species: *Kumarella angulus* Sureshan by original designation.

Diagnosis: Body with metallic reflection; head wider than mesosoma; clypeus broad clearly demarcated anteriorly with a broad median tooth; scrobe deep; antennae with three anelli and five funicular segments in female and two anelli and six funicular segments in male; pronotum anteriorly weakly carinate; collar laterally appears in the form of two blunt teeth due to a median notch; scutellum with frenum separated; propodeum with median carina and costula; forewing with MV longer than PMV; hind tibia with one spur; gaster sessile,

lanceolate, longer than head plus mesosoma combined.

Distribution: India, Malaysia, Taiwan, Thailand, Vietnam.

Biology: Unknown

Key to the Kerala species of *Kumarella* Sureshan

1. Gaster long, $2.5\times$ as long as mesosoma; frenal area of scutellum with a distinct median ridge; propodeum with median carina not extending beyond costula; pedicel distinctly shorter than F2; body black with metallic green refringence.....*K. sandroi* Narendran & Mohana
- Gaster short ; length $1.78\times$ as long as mesosoma, frenal area without median ridge; propodeum with median carina extending beyond costula up to nucha; pedicel as long as F2 ; head and mesosoma metallic blue (Plate 22, Fig. c)*K. angulus* Sureshan

53. *Kumarella angulus* Sureshan

(Plate 22, Fig. c)

1999a. *Kumarella angulus* Sureshan. *Oriental Ins.*, 32: 100-101. (ZSIK)

Diagnosis: Length 3.8–4.1mm. Body dark metallic blue with gaster brown; antennal toruli above lower margin of eyes; POL $0.72\times$ OOL; antennal scape reaching median ocellus; pedicel as long as F2; third anellus little longer than first and second; clava shorter than two preceding segments combined; propodeum medially with four depressed areas, forewing with MV $1.4\times$ PMV; gaster $1.3\times$ as long as head plus mesosoma combined.

Materials Examined: 1 female & 1 male, INDIA, Kerala, Palakkad, Varadimala, 22.ii.2013, ZSIK.reg.no.IR/INV/2930, coll. P.M. Sureshan; 1

male, INDIA, Kerala, Idukki, Mannavanshola, 27.v.2014, ZSIK.reg.no.IR/INV/3365, coll.P.M.Sureshan; 1 female, INDIA, Kerala, Calicut, Easthill, 29.iv.2015, ZSIK.reg.no.IR/INV/4667, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Feroke, 24.i.2016, ZSIK.reg.no.IR/INV/5235, coll. Vishnu K; 1 male, INDIA, Kerala, Idukki, Mathikettanshola, 17.ix.2014, ZSIK.reg.no.IR/INV/ 8912, coll. P.M.Sureshan.

Distribution: India: Kerala, Karnataka, Maharashtra; Malaysia, Taiwan, Thailand, Vietnam.

Remarks: Collected from forest and homestead vegetation.

***Lyubana* Bouček**

1991. *Lyubana* Bouček, *Inst. Nat. Derech. Agro. 129*, Type specie: *Lyubana slavica* Bouček, by Original designation (Bouček & Rasplus, 1991).

Diagnosis: Propodeum with plicae turning in the middle as arcuate costula, before reaching nucha; a smooth elongate fovea anteriorly inside of each plica, median carina hardly indicated anteriorly, gaster sessile, lanceolate, hind margin of T1 arcuately produced; antennal formula 11353, flagellum hardly clavate with micropilosity strip down to base of third claval segment.

Distribution: Palearctic and Oriental Region.

Biology: Not Known.

Remarks: New **genus record** from India.

54. *Lyubana indica* sp. nov.

(Plate 23, Fig. a-g)

Female: Length 1.88mm. Body black; gaster black with blue reflection on T1; eyes and ocelli reddish brown; antennae testaceous with funicular joints brown; coxae concolorous with body, femur brown, tibiae and tarsus except tip testaceous; wings hyaline, veins pale brown.

Head: Moderately reticulate with sparse long white pubescence; clypeus striated, anteriorly with two sharp teeth. In front view head width $1.34\times$ height; malar groove distinct; malar space and gena engraved reticulate; malar space $0.45\times$ eye length; eye height $1.3\times$ width in profile. Scrobal area depressed and not reaching median ocellus; in dorsal view head width $2.16\times$ as broad as long; POL $2.1\times$ OOL, temple $0.21\times$ eye length. Antennae inserted middle of face; scape $0.75\times$ eye length and not reaching lower margin of median ocellus, pedicel plus flagellum $0.86\times$ as long as head width, anelli three and third anellus little wider than first and second. Relative length, scape 0.27, pedicel 0.08, F1 0.07, F2 0.06, F3 0.06, F4 0.05, F5 0.04, clava 0.15; clava as long as three preceding segments combined, all funicular segments longer than wide except F5 quadrate.

Mesosoma: Pronotum moderately reticulate and less wider than mesoscutum. Mesoscutum $1.63\times$ as broad as long, moderately reticulate with sparse long white pubescence, notauli incomplete; axillae moderately reticulate. Scutellum $1.13\times$ as broad as long and moderately reticulate; dorsellum narrow. Propodeum $3\times$ as wide as long, medial area distinctly reticulate; median carina absent; plicae on both sides converged to form transverse carina above nucha which enclose two depressions on either side; spiracle long and reaching metanotum; nucha finely reticulate. Prepectus triangular, shiny and shorter than tegula; Upper mesepimeron shiny and smooth; lower mesepimeron, mesepisternum and metapleuron engraved reticulate. Forewing

2.04× as long as broad, discal pubescence not densely pilose, speculum broad and open below, basal hairline indicated by a few hairs, marginal fringe small, relative lengths of tergites SMV 0.49, MV 0.28, PMV 0.21, STV 0.13. Hind coxae engraved reticulate with white long hairs laterally.

Metasoma: Gaster as long as head plus mesosoma combined; relative lengths of tergites T1 0.21, T2 0.08, T3 0.11, T4 0.1, T5 0.1.

Male: unknown

Materials Examined: Holotype: Female, India, Kerala, Kottayam, Kozha Seed Farm; 27.iv.2016, Coll. Raseena Farsana. ZSIK.reg.no.IR/INV/9585.

Host: Unknown.

Remarks: Holotype collected from agroecosystem (Mixed vegetables). This species resembles Chinese species *Lyubana prolongata* Xui Xiao & Da-Wei Huang but varies in having body black; gaster black with blue reflection on T1 dorsally; F1 1.7× as long as broad; POL 2.1× OOL; malar space 0.45× eye length; basal cell bare (in *Lyubana prolongata* Xui Xiao & Da-Wei Huang body blackish green; gaster pale brown without blue reflection on T1 dorsally; F1 3× as long as broad; POL 1.2× OOL; malar space 0.38× eye length; basal cell with a few hairs and closed posteriorly).

Etymology: The species name derives from name of country from where collection made.

***Merismomorpha* Girault**

1913c. *Merismomorpha* Girault, *Trans R. Soc. Aust.* 37: 82-83. Type species: *Merismomorpha acutiventris* Girault, by original description, repeated by Girault, 1913b: *Mem. Qd. Mus.* 2: 321

1915a. *Neopolycystella* Girault, *Mem. Qd. Mus.* 3: 336. Type species: *Neopolycystella sicarius* Girault, by original designation. Synonymised by Bouček, 1988: 461.

1915a. *Epipolycystus* Girault, *Mem. Qd. Mus.* 3: 335. Type species *Epipolycystus* Girault, by original designation. Synonymised by Bouček, 1988: 461.

Diagnosis: Head little wider than mesosoma; lower face often convex along the median line, the convexity continuing down to apex of the produced clypeus; lower margin of clypeus often rounded, sub-conical, in some species apex angulate, blunt, truncate, or even slightly emarginate; antennal formula 11353 or 11263; mesosoma arched in profile; notauli complete or incomplete; propodeum with distinct nucha and with converging submedian channels; forewing with MV longer than PMV; hind tibia with one spur, Gaster ovate, lanceolate; petiole dorsally almost smooth and distinctly sinuate in profile, at apex embraced from below by the thin and narrow extension of first gastral sternite.

Distribution: India; Australia.

Biology: Not known.

Key to the Kerala species of *Mersimomorpha*

1. Lower margin of clypeus truncate..... *M.truncata* Sureshan
- Lower margin of clypeus sub-conical or angulate..... 2
2. (1) Antenna with two anelli; T1 and T2 not incised in the middle..... 3
- Antenna with three anelli; hind margin of T1 and T2 incised in the middle or sometimes only T2 incised..... 4
3. (2) Gaster 1.13× head plus mesosoma combined; petiole short, 0.37× length of coxa; forewing without transparent break between SMV and MV (Plate 25, Fig.a-g)..... *M. micropetiolata* sp.nov.
- Gaster 0.55× head plus mesosoma combined; petiole long, 2.21×

- length of coxa; forewing with a transparent break between SMV and MV (Plate 24, Fig. a-g)..... *M. microgastra* sp.nov.
- 4.(2) Propodeum with median carina indicated.....5
- Propodeum with median carina not indicated.....6
5. (4) POL little shorter than OOL; scape reaching upper margin of median ocellus; pedicel as long as F1; forewing with basal hairline indicated by three rows of hairs; PMV $0.9\times$ MV; petiole as long as hind coxa.....*M. elongata* Sureshan
- POL slightly longer than OOL; scape just short of reaching median ocellus; pedicel little longer than F1; forewing with basal hairline not indicated; PMV $0.5\times$ MV; petiole shorter than hind coxa.....*M. intermedia* Sureshan
6. (4) Gastral petiole shorter than hind coxa, embraced by a long extension of first gastral sternite; hind margin of T1 and T2 incised in the middle; forewing with PMV $0.65\times$ MV (Plate 22, Fig. d).....
.....*M. minuta* Sureshan
- Gastral petiole as long as hind coxa, embraced by a short extension of first gastral sternite; hind margin of T1 not incised in the middle; forewing with PMV $0.8\times$ MV (Plate 22, Fig. e).....
..... *M. tamilnadensis* Sureshan

55. *Merismomorpha microgastra* sp. nov.

(Plate 24, Fig. a-g)

Female: Length 1.96mm. Body black; gaster brownish black; antennae brown except scape testaceous; eye chocolate brown, ocelli silvery white; coxae concolorous with body; remaining segments testaceous; wings hyaline; veins testaceous.

Head: Moderately reticulate with long white pubescence; clypeus angulate. In front view head width $1.37\times$ height; malar groove distinct; malar space $0.56\times$ eye length; eye height $1.5\times$ width in profile. Scrobal area depressed and not reaching median ocellus; in dorsal view head width $2.2\times$ as broad as long; POL $1.13\times$ OOL, temple $0.3\times$ eye length. Antennae inserted middle of face; scape $0.73\times$ eye length and hardly reaching lower margin of median ocellus, pedicel plus flagellum $0.96\times$ as long as head width, pedicel $1.81\times$ as long as wide and $1.16\times$ as long as F1, anelli two and transverse. Relative length, scape 0.24, pedicel 0.08, F1 0.07, F2 0.07, F3 0.07, F4 0.07, F5 0.07, F6 0.06, clava 0.12; clava little longer than two preceding segments combined.

Mesosoma: Pronotum moderately reticulate and anteriorly carinate. Mesoscutum $2.3\times$ as broad as long, moderately reticulate with long white pubescence, notauli incomplete & indistinct; axillae engraved reticulate. Scutellum $1.09\times$ as broad as long and punctate reticulate, frenal line not indicated; frenal area engraved reticulate; dorsellum narrow with fine reticulation. Propodeum moderately reticulate, $2.07\times$ as wide as long, median carina absent, median area raised; plicae complete, depressed, area behind plicae raised; spiracle long, oval and reaching metanotum; nucha produced and large, $0.4\times$ length of propodeum medially; callus without distinct pubescence. Prepectus broad with fine reticulation. Mesepisternum finely reticulate; mesepimeron and metapleuron engraved reticulate. Forewing $2.23\times$ as long as broad with a transparent break between SMV and MV, discal

pubescence moderately dense, speculum broad and closed below, basal cell closed and bare, marginal fringe small, relative lengths SMV 0.66, MV 0.29, PMV 0.27, STV 0.15. Hind coxae engraved reticulate.

Metasoma: Gaster lanceolate; $0.55\times$ head plus mesosoma combined (excluding petiole); petiole moderately reticulate, $0.54\times$ length of gaster, $1.4\times$ length of propodeum medially, $2.21\times$ length of coxa; relative lengths of gastral tergites T1 0.18, T2 0.4, T3 0.05, other tergites retracted; T2 covering most of the length of gaster;

Male: unknown

Materials Examined: Holotype: Female, India: Kerala, Trivandrum, Ponmudi; 15.x.2012, Coll. P.M. Sureshan. ZSIK.reg.no.IR/INV/9588.

Host: Unknown.

Remarks: Holotype collected from forest. This species resembles *Merismomorpha minuta* Sureshan but varies in having long white pubescence on head and mesosoma; body black; only two anelli present; notauli incomplete and indistinct; forewing with a transparent break between SMV and MV; gaster (excluding petiole) distinctly shorter than head plus mesosoma combined; hind margin of T1 and T2 not incised in the middle; petiole long $2.21\times$ length of coxa (in *Merismomorpha minuta* Sureshan head and mesosome with very short pubescence; body bluish black; three anelli present; notauli almost complete; forewing without transparent break between SMV and MV; gaster (excluding petiole) slightly longer than head plus mesosoma combined; hind margin of T1 and T2 incised in the middle; petiole short $0.5\times$ length of coxa).

Etymology: The species name derives from the distinct character of short gaster.

56. *Merismomorpha micropetiolata* sp. nov.

(Plate 25, Fig. a-g)

Female: Length 2.7mm. Body bluish black; gaster brownish black with bluish green tinge on T1; antennae brownish black except scape; pedicel and anelli testaceous; eyes and ocelli chocolate brown; coxae concolorous with body, remaining segments testaceous except femur and tips of tarsi brown; wings hyaline and veins brown.

Head: Moderately reticulate with white pubescence; clypeus striated, anterior margin produced and angulate; face convex along a median line. In front view head width $1.2\times$ height; malar groove distinct, gena engraved reticulate; malar space $0.31\times$ eye length; eye height $1.62\times$ width in profile. Scrobal area depressed and not reaching median ocellus; in dorsal view head width $2.3\times$ as broad as long; POL equal to OOL, temple $0.21\times$ eye length. Antennae inserted above lower margin of eye, inter-antennal space raised; scape $0.63\times$ eye length and not reaching median ocellus, pedicel plus flagellum $0.75\times$ as long as head width, pedicel $1.5\times$ as long as wide and $1.36\times$ as long as F1, anelli two, transverse. Relative length, scape 0.28, pedicel 0.07, F1 0.05, F2 0.05, F3 0.07, F4 0.07, F5 0.07, F6 0.07, clava 0.17; F1 width $0.9\times$ length, F6 width $1.29\times$ length; clava shorter than three preceding segments combined.

Mesosoma: Pronotum moderately reticulate, anteriorly not carinate. Mesoscutum $2.25\times$ as broad as long, punctate reticulate with sparse white pubescence, notauli complete; axillae punctate reticulate. Scutellum almost as broad as long and punctate reticulate; frenum present, frenal line not indicated, frenal area raised and moderately reticulate, posterior margin subtriangular; dorsellum narrow and finely reticulate; metanotum broad and shiny. Propodeum $2.4\times$ as wide as long medially, median area depressed and moderately reticulate, median carina absent, plicae complete, area behind plicae raised and engraved reticulate, spiracles long, oval, close to

metanotum, post-spiracular area deep; callus with less pubescence. Prepectus broad and moderately reticulate. Mesopleuron and metapleuron engraved reticulate. Forewing 2.16× as long as broad, discal pubescence moderately dense, speculum broad and open below, basal cell bare, marginal fringe small, relative lengths SMV 0.53, MV 0.33, PMV 0.29, STV 0.16. Hind coxae engraved reticulate, hind tibial spur one.

Metasoma: Gaster 1.13× head plus mesosoma combined (excluding petiole); petiole smooth, widening towards base, embraced by a short extension of first gastral sternite, 0.06× length of gaster; 0.29× as long as propodeum medially, 0.37× as long as coxa; T1 medially produced; relative lengths of tergites T1 0.34, T2 0.21, T3 0.13, T4 0.08, T5 0.08, T6 0.19.

Male: Length 1.6-1.9mm. Resembles female but differs from it in having flagellum with dense long pubescence; gaster short and compressed.

Materials Examined: Holotype: Female, India: Kerala, Calicut, Easthill, 23.x.2014, Coll. Raseena Farsana. ZSIK.reg.no.IR/INV/9586; Paratype: 1 female & 21 males, India: Kerala, Calicut, Easthill, 23.x.2014, Coll. Raseena Farsana. ZSIK.reg.no.IR/INV/9587.

Host: Unknown.

Remarks: Both holotype and paratype were collected from agroecosystem (mixed crops). This species closely resembles *Merismomorpha tamilnadensis* Sureshan but differs from it in having POL equal to OOL; malar space 0.31× eye length; anelli two; clava shorter than three preceding segments combined; propodeum with median area depressed; plicae distinct, area behind plicae raised; petiole short, 0.37× as long as coxa; hind margin of T2 and T3 not medially incised (in *M. tamilnadensis* Sureshan POL 1.5× OOL; malar space 0.82× eye length; anelli three, third one thicker than others; clava as long as three preceding segments combined; propodeum with median area raised and

converging; plicae indistinct; petiole as long as hind coxa; hind margin of T2 & T3 medially incised.

Etymology: The species name derives from its distinct character short petiole which makes them easily distinguishable from other species.

57. *Merismomorpha minuta* Sureshan

(Plate 22, Fig. d)

2000c. *Mersimomorpha minuta* Sureshan, *Rec. Zool. Surv. India*, 98 (3):105. (ZSIK).

Diagnosis: Length 1.5–2.2mm. Body bluish black with gaster metallic bluish black except T1 and ventral part dark brown; POL 1.3× OOL; lower margin of clypeus angulate, antennae with pedicel as long as F1, antennae inserted little above middle of face; propodeum without median carina; forewing with PMV 0.64× MV; gaster short, ovate, little longer than head plus mesosoma combined, petiole short, embraced by a long extension of first gastral sternite.

Materials Examined: 1 female, INDIA, Kerala, Kannur, Muzhippalangad, 15.xii.2014, ZSIK.reg.no.IR/INV/7042, coll. Nikhil & Kumar; 1 female, INDIA, Kerala, Palakad, Silent valley, Sairendry, 20.ii.2013, ZSIK.reg.no.IR/INV/8853, P.M. Sureshan; 1 female, INDIA, Kerala, Kasaragod, Rannipuram, 05.i.2013, ZSIK.reg.no.IR/INV/8854, Rajmohana; 1 female, INDIA, Kerala, Idukki, Kolukkumala, 7.iv.2016, ZSIK.reg.no. IR/INV/9264, coll. Ranjit A P.

Distribution: India: Kerala, Tamil Nadu, Manipur, Maharashtra

Remarks: Collected from forest and agroecosystem (Tea).

58. *Merismomorpha tamilnadensis* Sureshan *et al.*,

(Plate 22, Fig. e)

2013. *Merismomorpha tamilnadensis* Sureshan *et al.*, *Hexapoda (Insecta indica)*, vol: 19(1): 15-17, (ZSIK)

Diagnosis: Head and mesosoma black with metallic reflection; gaster brownish black with metallic blue reflection; antennae not exceeding beyond median ocellus; POL 1.5× OOL, clypeus slightly striated, anterior margin produced, sub-angulate, F1 distinctly longer than wide and longer than F2; pronotum not carinate anteriorly; mesoscutum with notauli complete; forewing with PMV 0.85× MV and 2.13× STV, gaster lanceolate, including petiole distinctly longer than head plus mesosoma combined; petiole as long as hind coxa, expanded in the middle, embraced by short extension of first gastral sternite at tip, hind margin of T1 not medially incised, T2 and T3 medially incised.

Materials Examined: 1 female, INDIA, Kerala, Palakkad, Pattancheri, 11.x.2014, ZSIK.reg.no.IR/INV/4215, coll.Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Easthill, 5.v.2015, ZSIK.reg.no.IR/INV/4710, coll. Sheeja; 1 female, INDIA, Kerala, Kozhikode, Easthill, 13.iii.2015, ZSIK.reg.no.IR/INV/7035, coll. Raseena Farsana; 1 Female, INDIA, Kerala, Kozhikode, Mahe, 12.iii.2016, ZSIK.reg.no.IR/INV/9285, coll. Raseena Farsana.

Distribution: India: Kerala (**New Record**), Tamil Nadu

Remarks: Collected from homestead vegetation and agroecosystem (paddy).

Mesopolobus Westwood

1833. *Mesopolobus* Westwood, *Lond. Edinb. Dubl. Phil. Mag.* 2: 443. Type species: *Mesopolobus fasciventris* Westwood by monotypy.

1913c. *Urielloides* Girault, *Trans. R. Soc. Aust.* 37: 109-107. Type species: *Urielloides fulvipes* Girault, by original designation. Synonymised by Bouček, 1988: 432.

1915a. *Paranogmus* Girault & Dodd, in Girault, *Mem. Qd. Mus.* 3: 318; Type species: *Paranogmus pallidicornis* Girault & Dodd by original designation. Synonymised by Bouček, 1988:432.

1924. *Anogmoidea* Girault, *Insec. Ins. Menst.* 12: 174. Type species: *Anogmoides joulei* Girault by monotypy. Synonymised by Bouček, 1988: 432.

Diagnosis: Antennal toruli distinctly below middle of face; antennae with three anelli and five funicular segments, third anellus often only slightly transverse or quadrate or even oblong; anterior margin of clypeus truncate or shallowly emarginated. Pronotal collar short or long; mesoscutum with notauli incomplete; scutellum without frenum; median area of propodeum usually more shiny and relatively weakly sculptured; plicae usually sharp throughout or distinct at base of propodeum; spiracles large, oval close to hind margin of metanotum; gaster ovate, lanceolate.

Distribution: Worldwide, best known in Europe, North America and other parts of North temperate zone and also described from Africa, South Asia, New Zealand and Australia.

Biology: Parasites of various Dipterous (mainly Cecidomyiid), Hymenopterous and Coleopterous gall makers and larvae developing in seeds of plants and stems of grasses. Their morphological variety included in the genus reflects in their variety too.

Key to the Kerala species of *Mesopolobus*

1. Antennae rather long, combined length of pedicel plus flagellum as long as head width; F1-F3 longer than wide; propodeum long, medially 0.6× as long as scutellum; plicae sharp and complete; gaster little shorter than head plus mesosoma combined (Plate 22, Fig. f).....
*M. keralensis* Sureshan & Narendran
- Antennae short, combined length of pedicel plus flagellum 0.8-0.9× head width; F1-F3 strongly transverse or quadrate; propodeum short, medially 0.4-0.5× as long as scutellum; plicae not very sharp as above, complete or incomplete; gaster 1.1-1.2× as long as head plus mesosoma combined.....2
2. (1) Temple broad, length 0.6× eye length; antennae with basal funicular segments strongly transverse; reticulation on head coarse; pronotal collar anteriorly carinate; mesoscutum width 1.6× length; propodeum medially 0.5× as long as scutellum; plicae not distinct beyond middle; forewing with PMV 0.7× MV; body bright green with golden reflection.....*M. harithus* Sureshan & Narendran
- Temple narrow, length 0.3× eye length; basal funicular segments of antenna not much transverse; reticulation on head finer; pronotal collar finely carinate anteriorly; mesoscutum width 2× length; propodeum medially 0.4× as long as scutellum; plicae fine but complete; PMV short, only 0.5× MV ; body bluish black with slight metallic reflection (Plate 26, Fig. a).....*M. minutus* Sureshan & Narendran

59. *Mesopolobus keralensis* Sureshan & Narendran

(Plate 22, Fig. f)

2002c. *Mesopolobus keralensis* Sureshan & Narendran, *Entomon* 27 (1):81 (ZSIK).

Diagnosis: Length 1.4–2.2mm. Body bluish green with brassy reflection; anterior margin of clypeus shallowly emarginate; head width $2\times$ length in dorsal view; antennae with pedicel plus flagellum as long as head width; antennae inserted little above lower margin of eyes; pronotal collar finely carinate; propodeum long, medially $0.6\times$ as long as scutellum, plicae sharp and complete; gaster little shorter than head plus mesosoma combined.

Materials Examined: 1 female, INDIA, Kerala, Calicut, Vengeri 3.ii.2015, ZSIK.reg.no.IR/INV/5078, coll. Raseena Farsana; 2 females, INDIA, Kerala, Kasargode, Periya, 26.x.2015, ZSIK.reg.no.IR/INV/9316, coll. Raseena Farsana.

Distribution: India: Kerala, Karnataka, Tamil Nadu; People's Republic of China.

Remarks: Collected from agroecosystem (mixed vegetables).

60. *Mesopolobus minutus* Sureshan & Narendran

(Plate 26, Fig. a)

2002c. *Mesopolobus minutus* Sureshan & Narendran, *Entomon*, 27 (1): 88, (ZSIK).

Diagnosis: Length 1.1–1.6mm. Body bluish black, gaster brownish black with bluish reflection on T1 dorsally; temple narrow, length $0.3\times$ eye length; head width $1.9\times$ length in dorsal view; anterior margin of clypeus shallowly emarginate; POL $2\times$ OOL; antennae with scape not reaching median ocellus; pronotal collar finely carinate anteriorly; propodeum medially $0.4\times$ as long as

scutellum; plicae fine and complete; forewing with PMV short only $0.5\times$ MV; gaster $1.2\times$ as long as head plus mesosoma combined.

Materials Examined: 1 female, INDIA, Kerala, Calicut, Easthill, 2.vii.2015, ZSIK.reg.no.IR/INV/6778, coll. Raseena Farsana; 2 females, INDIA, Kerala, Kannur University Campus, 15.xii.2014, ZSIK.reg.no.IR/INV/7044, coll. Nikhil & Kumar; 1 female, INDIA, Kerala, Calicut, Vengeri, 21.i.2015, ZSIK.reg.no.IR/INV/7058, coll. Sheeja.

Distribution: India: Kerala

Remarks: Collected from agroecosystem (mixed vegetables) and homestead vegetation.

Metastenus Walker

1834. *Metastenus* Walker, *Ent. Mag.* 2: 301. Type species: *Metastenus concinnus* Walker, by monotypy.

1915a. *Tripolycystus* Dodd, in Girault, *Mem. Qd. Mus.* 3: 337. Type species: *Tripolycystus sulcatus* Dodd by original designation. Synonymised by Bouček, 1988: 440.

Diagnosis: Gena with a hollow above the base of mandible, extending fully one third up the malar space; female flagellum with three very short anelli and five funicular segments with dense longitudinal sensillae; propodeum tapering to nucha; MV parallel sided, thickened; gaster sessile.

Distribution: Africa, Australia, China Europe and India.

Biology: Parasites of coccidophagous and aphidophagous Coccinellid beetles.

Key to the Kerala species of *Metastenus* Walker

1. Propodeum with nucha coarse and moderately reticulate; antennae inserted at centre of face; plicae raised and distinct; scutellum with frenum clearly marked (Plate 26, Fig. b)..... *M. concinnus* Walker
- Propodeum with nucha short, finely reticulate; antennae inserted below middle of face; plicae very fine, almost indistinct; scutellum without frenum (Plate 26, Fig.c) *M. indicus* Sureshan & Narendran

61. *Metastenus concinnus* Walker

(Plate 26, Fig. b)

1834. *Metastenus concinnus* Walker, *Ent. Mag.* 2: 302.

Diagnosis: Length 1.4mm. Body black; antennae dark brown; head uniformly and moderately reticulate; clypeus finely striate, anterior margin shallowly emarginate; malar space length $0.6\times$ eye height; posterior margin of gena sharp; POL $1.25\times$ OOL; pedicel longer than F1; antennal scape $0.7\times$ as long as the eye; pronotal collar almost shiny, anteriorly carinate; frenum clearly separated; propodeum with median area coarsely reticulate; plicae sharp and complete; forewing with PMV $1.4\times$ MV; gaster $2\times$ as long as wide and as long as head plus mesosoma combined.

Materials Examined: 1 female, INDIA, Kerala, Malappuram, Ponnani, 25.viii.2015, ZSIK.reg.no.IR/INV /5531, coll. Raseena Farsana.

Distribution: India: Kerala; Argentina; Bulgaria; Czechoslovakia; Europe; France; Germany; Iran; Kazakhstan; Spain; Switzerland; UK.

Remarks: Collected from agroecosystem (mixed vegetables).

62. *Metastenus indicus* Sureshan & Narendran

(Plate 26, Fig. c)

2002b. *Metastenus indicus* Sureshan & Narendran, *Rec. Zool. Surv. India* 100 (3-4). 125, (ZSIK).

Diagnosis: Length 1.5–1.8mm. Body black; gaster with brownish tinge; head uniformly finely reticulate; clypeus similarly sculptured as on rest of face except anteriorly shiny; POL 1.12× OOL; both mandibles with four teeth; clava 1.2× as long as two preceding segments combined; scutellum without frenum; propodeum with nucha short, finely reticulate, median carina vaguely indicated in some specimens; plicae very fine, almost indistinct; forewing length 2× width; gaster little longer than head plus mesosoma combined.

Materials Examined: 1 female, INDIA, Kerala, Calicut, Easthill, 8.iv.2015, ZSIK.reg. no.IR/INV/4698, coll. P.M.Sureshan; 2 females, INDIA, Kerala, Kakkayam, 29.xii.2015, ZSIK.reg.no.IR/INV/6677, coll. Rajmohana; 1 female, INDIA, Kerala, Ernakulam, Thattekkad, Kallippara, Sathrapadi, 6.i.2015, ZSIK.reg.no.IR/INV/7052, coll. Sureshan; 1 female, INDIA, Kerala, Trivandrum, Ponmudi, 15.x.2012, ZSIK.reg.no.IR/INV/8917, coll. P.M.Sureshan.; 1 female, INDIA, Kerala, Idukki, Puthukkudi, 3.iv.2016, ZSI/WGRC/IR.INV.9288, coll. Ranjit A P

Distribution: India: Kerala

Remarks: Collected from both forest and agroecosystem (mixed vegetables).

Miscogasteriella Girault

1915c. *Miscogasteriella* Girault, *Mem. Qd. Mus.* 4: 196-197. Type species: *Miscogasteriella longiventris* Girault, by original designation.

1926. *Glyptosticha* Masi, *Konowia*, 5: 348-349. Type species: *Glyptosticha flavipes* Masi by original designation. Synonymised By Bouček, 1988: 402.

Diagnosis: Clypeal margin broadly truncate, subemarginate between the slight and blunt sublateral teeth; clypeus smooth, neighboring lower face with raised reticulation and conspicuous pilosity; tentorial pits not distinct; scutellum with frenal groove removed from apex thus delimiting a distinct frenal area; propodeum with median and sub median longitudinal furrows subdivided by cross-rugae but no clear-cut median carina.

Distribution: India, Japan; China; Papua New Guinea; Queensland

Biology: Forest dwellers; develop as parasites of wood-boring beetle.

Key to the Kerala species of *Miscogasteriella* Girault

1. Gaster short, 1.1× as long as head plus mesosoma combined; forewing basal cell with a few hairs in the distal end; propodeum with median carina not extended beyond middle and median groove formed of small fovea in the basal half, lateral groove formed of four foveae; POL 0.8× OOL.....*M. bijoyi* Sureshan & Nikhil
- Gaster long, 1.7× as long as head plus mesosoma combined; forewing with basal cell completely hairy; propodeum with median carina extend beyond middle though interrupted by costae; median groove with deep and large foveae; lateral groove formed of six foveae; POL as long as OOL (Plate 26, Fig. d).....*M. jayasreeae* Sureshan

63. *Miscogasteriella jayasreeae* Sureshan

(Plate 26, Fig. b)

1999a. *Miscogasteriella jayasreeae* Sureshan, *Oriental Ins.*, 33: 104-105. (ZSIK).

Diagnosis: Length, 7.3–7.5mm. Body dark metallic blue; gaster almost black towards tip; head finely reticulate, almost shiny on vertex with long white pubescence; head in dorsal view width 2× length; POL little longer than OOL; antennae inserted below centre of face; scrobes moderately deep; mesoscutum with median segment moderately reticulate and lateral lobes transversely rugose; notaular grooves deep and complete; propodeum deeply emarginate at apex; gaster longer than head plus mesosoma combined; T1 with hind margin deeply incised in the middle.

Materials Examined: 1 female, INDIA, Kerala, Trivandrum, Pandimotta, 17.xii.2016, ZSIK.reg.no.IR/INV/9293, coll. Rajmohana;

Distribution: India: Kerala

Remarks: Collected from forest

Genus *Mokrzenia* Mokrzecki

1933. *Mokrzenia* Mokrzecki, *Polskie. Pismo. Ent.* 12: 143. Type species: *Pteromalus pini* Hartig by monotypy.

1958. *Beierina* Delucchi, *Entomophaga*. 3: 271. Type species *Pteromalus pini* Hartig, by original designation.

Diagnosis: Antennae with two anelli and six funicular segments; each flagellar segment generally with two rows of sensilla; clypeus large well delimited, its lower margin produced, bilobed with sharp median incision; mesoscutum densely pubescent; pronotum dorsally very short but sharply carinate; propodeum with adpetiolar margin raised and deeply emarginated medially;

gaster ovate, about as long as mesosoma.

Distribution: Oriental region as far as Java and Japan, Europe.

Biology: Hyperparasites of Lepidoptera through Braconidae.

64. *Mokrzezia orientalis* Subba Rao

(Plate 26, Fig. b)

1973a. *Mokrzezia orientalis* Subba Rao, *Oriental Ins.* 7: 358-360.

Diagnosis: Length 2.3-2.6mm, Head and mesosoma bright metallic bluish green; gaster dorsally brown with metallic tinge on sides and ventrally yellowish; antennae dark brown; antennae inserted in the middle of face; all funicular segments longer than broad and subequal; head very much wider than mesosoma; pronotal collar evenly and strongly carinate, forewing with PMV $0.8 \times$ MV, with irregular setae below SMV, stigmal knob large and quadrate; gaster ovate or lanceo-ovate, as long as mesosoma, collapsing.

Materials Examined: 1 female, INDIA, Kerala, Calicut, Kakkayam 15.ix.2015, ZSIK.reg.no.IR/INV/7089, coll. Nikhil& Kumar; 1 female, INDIA, Kerala, Idukki, Puthukkudi, 3.iv.2016, ZSIK.reg.no.IR/INV/9314, coll. Ranjit A P

Distribution: India: Kerala (**New Record**), Karnataka, Maharashtra, Uttar Pradesh, Tamil Nadu; Indonesia, Malaysia; Sri Lanka; Thailand.

Remarks: Collected from both forest and agroecosystem (mixed vegetables).

Genus *Narendrella* Sureshan

1999a. *Narendrella* Sureshan, *Oriental Ins*: 33: 101-102. Type species: *Narendrella nilaburensis* Sureshan by original designation.

Diagnosis: Body metallic, head and mesosoma raised reticulate with distinct white pubescence; head wider than mesosoma; clypeus radially striated; anterior margin of clypeus with a deep notch in the middle and two blunt teeth; antennae inserted well above middle of face; anelli three in female and two in male; pronotal collar anteriorly margined; notauli incomplete; propodeum finely reticulate; submedian area depressed; plicae distinct anteriorly; forewing with MV longer than PMV; gaster petiolate; petiole smooth, embraced by the projecting first sternite up to middle ventrally; gaster shorter than head plus mesosoma combined; hind margin of T1 deeply incised in the middle.

Distribution: India: Kerala

Biology: Not known

65. *Narendrella nilamburensis* Sureshan

(Plate 26, Fig. e)

1999a. *Narendrella nilamburensis* Sureshan, *Oriental Ins.*, 33: 102-103. (ZSIK).

Diagnosis: Length 1.5–2.8mm. Body dark metallic blue; gaster dark brown with metallic blue reflection dorsally; head in dorsal view width 2× length; POL 1.4× OOL; malar groove distinct; clava 1.4× as long as two preceding segments combined; mesosoma raised reticulate; pubescence sparse; propodeum with median carina indicated in the anterior part, nucha distinct; gaster ovate; dorsally collapsing, petiole smooth length 1.4× width; T1 deeply incised in the middle; T2-T4 slightly incised in the middle.

Materials examined: 3 females, INDIA, Kerala, Kozhikode, Easthill,

15.iii.2015, ZSIK.reg.no.IR/INV/4360, coll. P.M.Sureshan; 2 females & 1 male, INDIA, Kerala, Kozhikode, Easthill, 19.iii.2015, ZSIK.reg.no.IR/INV/4361, coll. P.M.Sureshan; 1 female, INDIA, Kerala, Calicut, Easthill 2.vii.2015, ZSIK.reg.no.IR/INV/5074, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Easthill 13.iv.2015, ZSIK.reg.no.IR/INV/5079, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Easthill, 13.iv.2015, ZSIK.reg.no.IR/INV/5330, coll. Raseena Farsana; 1female, INDIA, Kerala, Calicut, Easthill, 10.iv.2015, ZSIK.reg.no.IR/INV/5530, coll. Raseena Farsana; 1female, INDIA, Kerala, Trissur, Velupadam, 12.v.2015, ZSIK.reg.no.IR/INV/7016, coll. Ranjith;

Distribution: India: Kerala, Tamil Nadu

Remarks: Collected from homestead vegetation and agroecosystem (Nutmeg).

Genus *Norbanus* Walker

1843. *Norbanus* Walker, *Annl. Soc. Ent. France*, (2)1: 159. Type species: *Norbanus dysaulus* Walker by designation of Ashmead, 1904.

1878. *Picroscytus* Thomson, *Hym. Scand.* 5: 50, 58. Type species: *Pteromalus scabriculus* Nees by monotypy.

1904. *Stylophorella* Ashmead, *Mem. Carnegie. Mus.* 1(4): 389. Type species: *Stylophorella perplexa* Ashmead by monotypy and original designation.

1913d. *Amicromelus* Girault, *Arch. Naturgesch* (159): 91, Type species: *Amicromelus cyaneus* Girault by original designation. Synonymised by Bouček 1988: 408.

Diagnosis: Female antenna with two anelli and six funicular segments; terminal segment of clava with a spine like process at apex, in male, flagellum with whirls of erect setae at each node; pronotum very broad, hence mesosoma very compact; prepectus smaller than tegula; propodeum rather small, flat and featureless, with regular raised reticulate sculpture and without distinct nucha; gaster sessile or subsessile.

Distribution: All continents

Biology: Parasitic on larvae of Diptera and Hymenoptera, less often of other insects developing in grass stems.

Key to the Kerala species of *Norbanus*

1. Gaster not much pointed towards the tip, uniformly golden yellow; mesosoma narrow; posterior margin of pronotal collar deeply emarginated..... *N. thekkadiensis* Sureshan
 - Gaster pointed towards the tip, brown or black, not golden yellow; mesosoma wider, posterior margin of pronotal collar not as above; if deeply emarginated then antennae thicker and body robust.....2
2. (1) Anelli transverse, equal in length; pedicel plus flagellum little shorter than head width (0.96×); forewing with discal pubescence very small, almost indistinct; antennae uniformly testaceous (Plate 27, Fig. b).....*N. equus* Sureshan
 - Antennae with second anellus twice as long as first; pedicel plus flagellum as long as or little longer than head width; discal pubescence of forewing moderately dense; antennae blackish brown.....3
3. (2) Forewing with MV 3.5× STV short; PMV short, only 0.54× MV.....*N. scrobatus* Sureshan
 - Forewing with MV 2.4-2.5× STV; PMV only little shorter than MV.....4
4. (3) Hind femora thick, length 2.5× width; gaster thick, length 2.1× width; head in side view thick (Plate 27, Fig. a).....
.....*N. acuminatus* Dutt & Ferrière
 - Hind femora slender, length 3.4× width; gaster slender, length 2.5× width in dorsal view; head in side view thin.....
.....*N. malabarensis* Sureshan

66. *Norbanus acuminatus* Dutt & Ferrière

(Plate 27, Fig. a)

1961. *Norbanus acuminatus* Dutt & Ferrière, *Ind. Jr. Agric. Sci.*, 31:141.

Diagnosis: Length 2.5–5.1mm. Body bluish black; gaster brown with greenish coppery tinge; antennae brownish black; head 1.2× as wide as mesosoma and engraved reticulate; anterior margin of clypeus weakly emarginated; POL almost as long as OOL; antenna with second anellus twice as long as first; antennae inserted at the same level or little below lower margin of eyes; clava almost as long as two preceding segments combined; mesosoma moderately reticulate punctate; hind femora thick, length 2.5× width; forewing with discal pubescence small; gaster ovate length 1.2× as long as head plus mesosoma combined.

Materials examined: 1 female, INDIA, Kerala, Calicut, Vengeri, 17.vi.2014, ZSIK.reg. no.IR/INV/5079, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Annasseri, 14.v.2015, ZSIK.reg.no.IR/INV/5243, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Vengeri, 13.v.2014, ZSIK.reg.no.IR/INV/6540, coll. Raseena Farsana; 1 female, INDIA, Kerala, Kozhikode, Kottoli, 12.ii.2016, ZSIK.reg.no.IR/INV/6998, coll. Raseena Farsana; 1 female, Kerala, Calicut, Vengeri, 30.v.2016, ZSIK.reg.no.IR/INV/7173, coll. Sheeja; 1 female, INDIA, Kerala, Idukki, Chinnar, 12.ix.2014, ZSIK.reg.no. IR/INV/8128, coll. Sureshan; 1 female, INDIA, Kerala, Idukki, Kolukkumala, 7.iv.2016, ZSIK.reg.no.IR/INV/8577, coll. Ranjith P; 1 female & 1 male, INDIA, Kerala, Calicut, Kakkayam, 23.ii.2016, ZSIK.reg.no.IR/INV/8679, coll. Girish Kumar.

Distribution: India: Kerala, Karnataka and West Bengal

Remarks: Collected from both agroecosystem (mixed vegetables and tea) and forest.

67. *Norbanus equus* Sureshan

(Plate 27, Fig. b)

2003a. *Norbanus equus* Sureshan, *Rec. Zool. Surv. India., Occ. Paper No.*, 205: 61-62 (ZSIK).

Diagnosis: Length 1.8–3.1mm. Body dark metallic blue; gaster blackish brown with metallic blue reflection dorso-laterally and ventrally; head moderately reticulate, 1.3× as wide as mesosoma; antennae transverse, equal in length, pedicellus plus flagellum little shorter than head width; POL 1.3× OOL; anterior margin of clypeus weakly emarginate; pronotal collar finely margined on the sides; forewing with discal pubescence less distinct, basal part almost bare; gaster elongate ovate, 1.1× as long as head plus mesosoma combined.

Materials Examined: 1 female, INDIA, Kerala, Kannur, Kottiyoor Reserve Forest, 8.i.2013. coll. Rajmohana. ZSIK.reg.no.IR/INV/2464, 1 female, INDIA, Kerala, Kakkayam, 29.xii.2015, ZSIK.reg.no.IR/INV/6681, coll. Rajmohana; 1 female, INDIA, Kerala, Calicut, Olavanna, 08.i.2015, ZSIK.reg.no.IR/INV/7138, coll. Raseena & Sheeja;

Distribution: India: Kerala, Tamil Nadu

Remarks: Collected from both forest and agroecosystem (paddy).

Genus *Notoglyptus* Masi

1917. *Notoglyptus* Masi, *Novit. Zool.* 24: 181. Type species: *Notoglyptus niger* Masi, by original designation.

Diagnosis: Colour black to metallic green; clypeus with anterior margin straight or produced, sometimes bidentate; antennae with two anelli and six funicular segments, pronotum reduced, much narrower and depressed; collar bordered anteriorly by weak to strong carina; notauli complete; deep fovea on the side of scutellum in front of the frenal cross-groove; frenal groove distinct;

propodeum with plicae and median carina; forewing with MV longer than PMV; gaster petiolate, ovate, petiole quadrate to elongate; T1 nearly concealing succeeding tergites.

Distribution: From Central Europe to South Africa, throughout Southern Asia to Japan and Queensland, in Australia.

Biology: Parasites of small Diptera associated with herbaceous vegetation.

68. *Notoglyptus scutellaris* (Dodd & Girault)

(Plate 27, Fig. c)

1915a. *Merismus scutellaris* Dodd & Girault, in Girault. *Mem. Qd. Mus.* 3: 328. Queensland: Gordonvale.

1915a. *Merismus squamosus* Girault, *Mem. Qd. Mus.* 3: 328, Queensland: Gordonvale. Synonymised by Bouček, 1988: 466.

1917. *Notoglyptus niger* Masi, *Novit. Zool.* 24:181. Italy. Synonymised by Bouček, 1976: 15.

1917. *Notoglyptus virescens* Masi, *Novit. Zool.* 24:181-183. Synonymised by Bouček, 1988: 466-467.

Diagnosis: Length 1.2-1.5mm. Head, mesosoma and petiole dark green; gaster brown; antennae with scape yellow, remainder brown; clypeus smooth; anterior margin of clypeus nearly straight; head delicately alveolate; POL: 1.33× OOL; antennae with combined length of pedicel plus flagellum 1.1× head width; mesoscutum roughly alveolate medially; scutellum coriaceous with distinct discal fovae; gaster petiole alveolate, length 1.2× width with weak median carina; gaster smooth.

Materials Examined: 2 females, INDIA, Kerala, Calicut, Kakkayam, 13.ii.2014, ZSIK.reg.no.IR/INV/3238, coll. Raseena Farsana, 1 female, INDIA, Kerala, Kozhikode, Mavoor, 13.ii.2014, ZSIK.reg.no.IR/INV/3959, coll. Swetha. M; 2 females & 2 males, INDIA, Kerala, Calicut, Chelannur, 21.iii.2014, ZSIK.reg.no.IR/INV/5236, coll. Raseena Farsana; 2 females,

INDIA, Kerala, Calicut, Areekkad, 4.ii.2015, ZSIK.reg.no.IR /INV/6541, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Vengeri, 26.vi.2014, ZSIK.reg.no.IR/INV/6782, coll. Raseena Farsana; 2 female, INDIA, Kerala, Palakkad, Pattambi, 22.v.2014, ZSIK.reg.no.IR/INV/6783, coll. Raseena Farsana; 2 females, INDIA, Kerala, Trivandrum, Vellayini, 29.v.2014, ZSIK.reg.no.IR/INV/6784, coll. Raseena Farsana; 10 females & 3 Males, INDIA, Kerala, Kottayam, Kozha seed Farm, 27.iv.2016, ZSIK.reg.no.IR/INV/6869, coll. Raseena Farsana; 3 females, INDIA, Kerala, Kottayam, Kuruvalangad, 28.iv.2016, ZSIK.reg.no.IR/INV/6870, coll. Raseena Farsana; 4 females, INDIA, Kerala, Calicut, Nechooli, 2.iii.2016, ZSIK.reg.no.IR/INV/6871, coll. Raseena Farsana; 1female, INDIA, Kerala, Calicut, Chathamangalam, 8.iii.2016, ZSIK.reg.no.IR/INV/6872, coll. Raseena Farsana; 3 females & 1 Male, INDIA, Kerala, Kozhokode, Annasserri, 14.v.2015, ZSIK.reg.no.IR/INV/7006, coll. Raseena Farsana; 1female, INDIA, Kerala, Kozhikode Chelannur, 17.v.2014, ZSIK.reg.no.IR/INV/7011, coll. Raseena Farsana; 1 male, INDIA, Kerala, Trissur, Kannara, 7.v.2015, ZSIK.reg.no.IR/INV/7018, coll. Ranjith A P; 5 females, INDIA, Kerala, Ernakulam, Kuttippuzha 15.v.2015, ZSIK.reg.no.IR/INV/7032, coll. Raseena Farsana; 1 female, INDIA, Kerala, Idukki, Kolukkumala, 7.iv.2016, ZSIK.reg.no. IR/INV/9261, coll. Ranjit A P; 1 Female, INDIA, Kerala, Trissur, Adatt, 7.i.2016, ZSIK. reg.no.IR/INV/9282, coll. Raseena Farsana

Distribution: India: Kerala, Delhi, Uttar Pradesh; Afrotropical; Australia; Canada; Czechoslovakia; Europe; Hungary; Italy; Japan; Kasakhstan; Malaysia; Morocco; New Zealand; North Africa; People's Republic of China; Romania; Seychelles island; South Africa, Spain; Sweden; Zimbabwe

Remarks: Collected from both agroecosystem (paddy, mixed vegetables, nutmeg and tea) and forest.

Oxysychus Delucchi

1956. *Oxysychus* Delucchi, *Z. Angew. Ent.* 39: 240. Type species: *Dinarmus silvestrii* Masi, by original designation.

Diagnosis: Body mostly robust; anterior margin of clypeus often deeply excised medially, bidentate; female antenna with three anelli and five funicular segments; pronotal collar carinate; dorsal part of mesosoma with extensive pilosity; propodeum medially rather flat, without convex nucha, with or without median carina, but strongly reticulate between plical foveae; gaster sessile; hind tibia with two spurs.

Distribution: Central and South Africa, Southern Europe, China, India, New Guinea and Australia.

Biology: Parasites of beetle larvae (Curculionidae and Buprestidae) burrowing in tough stems of some herbaceous plants and in twigs of some woody plants.

Key to the Kerala species of *Oxysychus* Delucchi

1. Gaster with hind margin of T1-T3 medially produced and distinctly notched in the middle; antennae not much slender ; forewing with PMV 2× STV; all femora testaceous
.....*O. macregaster* Sureshan & Narendran
- Gaster with hind margin of T1-T3 not produced or notched as above; antennae not much slender, PMV shorter, less than 2× STV; femora brown (prominent on hind femora)..... 2
2. (1) Gaster elongate and pointed at the tip; distinctly narrower than mesosoma; scutellum highly convex, almost as long as broad; antennae with clava shorter than two preceding segments combined; STV shorter, only one third of MV (Plate 27, Fig. d).....
.....*O. coimbatorensis* (Ferrière)

- Gaster oval, not narrower than mesosoma; scutellum less convex, shorter than broad; clava little longer than two preceding segments combined; STV longer, almost half of MV.....
.....*O. nupserphae* (Dutt & Ferrière)

69. *Oxysychus coimbatorensis* (Ferrière)

(Plate 27, Fig. d)

1939. *Dinarmus coimbatorensis* Ferrière, *Bull. Ent. Res.*, 33: 164.

1978. *Oxysychus coimbatorensis* (Ferrière). Bouček *et al.*, *Oriental Ins.*, 12(4): 449-450.

Diagnosis: Length 2.6–5.1mm. Head and mesosoma dark bluish green, body stout, covered with distinct white pubescence; antennae with F1 2× as long as pedicel, clava shorter than two preceding segments combined; mesosoma convex; propodeum without median carina; STV shorter, only one third of MV; PMV almost 2× STV; gaster elongate and pointed at tip; longer than head plus mesosoma combined.

Materials Examined: 2 females, INDIA, Kerala, Kannur, Kottiyoor Reserve Forest, 08.i.2013, Rajmohana, ZSIK.reg.no.IR/INV/2463; 1 female, INDIA, Kerala Calicut, Chelannur, 21.iii.2014, ZSIK.reg.no.IR/INV/3413, coll. Raseena Farsana; 4 females, INDIA, Kerala, Calicut, Vengeri, 27.vi.2014, ZSIK.reg.no.IR/INV/3414, coll. Raseena Farsana.

Distribution: India: Kerala, Andra Pradesh, Bihar, Delhi, Tamil Nadu; Indonesia; Pakistan

Remarks: Collected from both agroecosystem (mixed vegetables) and forest.

Genus *Pachycrepoideus* Ashmead

1904. *Pachycrepoideus* Ashmead, *Mem. Carnegie. Mus.* 1 (4): 329. Type species: *Pachycrepoideus dubius* Ashmead, by monotypy.

1915c. *Toxeumopsis* Girault, *Mem. Qd. Mus.* 4: 196. Type species: *Toxeumopsis nigra* Girault, by original designation.

1954a. *Anisopteromalia* Bouček. *Acta Ent. Mus. Ntl. Pragae* 29: 57. Type species: *Anisopteromalia crassinervis* Bouček, by original designation.

Diagnosis: Antennae inserted at level with ventral edge of eyes; antenna with three anelli and five funicular segments; Pronotum dorsally round; mesopleuron entirely reticulate; forewing with MV about equally widened throughout, distinctly longer than STV, gaster petiole if exposed reticulate and bordered on either side by flange formed by extension of first gastral sternite; T1 and T2 together covering most of the gaster approximately equal in length.

Distribution: Cosmopolitan.

Biology: Parasites of small dipteran families Drosophilidae, Tephritidae, Muscidae etc.

70. *Pachycrepoideus veerannai* Narendran & Anil

(Plate 27, Fig. e)

1992. *Pachycrepoideus veerannai* Narendran & Anil, Narendran *et al.*, *Bioved* 3(1): 1-6, (ZSIK).

Diagnosis: Length: 1.8- 2.01 mm. Body black; antenna dark brown except scape and pedicel brownish yellow; head transverse, slightly wider than mesosoma, closely reticulate punctate with short sparse pubescence; clypeal margin arcuate; malar groove distinct; antenna filiform; inserted at level of lower margin of eye, scape subequal to scrobal length, reaching about one ocellar diameter before median ocellus, pedicel longer than F1; third anellus as long as first two combined; propodeum with weak median carina and plicae; forewing with MV thickened, STV shorter than MV; gaster slightly

longer than mesosoma, petiole nearly as long as wide, T1 large and hind margin medially produced.

Materials Examined: 1 female & 1 male, INDIA, Kerala, Calicut, Vengeri, 29.i.2014, ZSIK.reg.no.IR/INV/3972, coll. Raseena Farsana; 5 females & 2 males, INDIA, Kerala, Calicut, Vengeri, 6.iii.2014, ZSIK.reg.no.IR/INV/3973, coll. Raseena Farsana; 1 female, INDIA, Kerala Calicut, Easthill, 13.iv.2015, ZSIK.reg.no.IR/INV/6537, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Chelannur, 6.iii.2014, ZSIK.reg.no.IR/ INV/6781, coll. Raseena Farsana; 2 females & 4 males, Kerala, Calicut, Vengeri, 3.iii.2014, ZSIK.reg.no.IR/INV/7867, coll.Raseena Farsana.

Distribution: India: Kerala (**New record**), Karnataka, Tamil Nadu

Host: Collected from agroecosystem (emerged from pest infested bitter gourd)

Pachyneuron Walker

1833. *Pachyneuron* Walker, *Ent. Mag.* 1: 371: Type species: *Pachyneuron formosum* Walker by monotypy.

1913. *Serimus* Brèthes, *Ann. Mus. Nat. Hist. Buenos Aires*, 24: 90. Type species: *Serimus argentines* Brèthes, by monotypy.

1955. *Atrichoptilus* Delucchi, *Zangew. Ent.* 38: 141: Type species; *Pachyneuron aneum* Masi, by original designation.

Diagnosis: Antennae inserted at lower ocular line with two or rarely with three anelli; flagellum hardly clavate; gena with a shallow depression at mouth corner, behind the depression the edge ending more or less sharply; clypeus produced, anterior margin more or less truncate or even shallowly emarginate; propodeum without median carina, narrowing into a short nucha; forewing with MV distinctly widening distally, wedge like; gaster dorsally flat, more or less petiolate, petiole sometimes transverse and short.

Distribution: Cosmopolitan.

Biology: Mostly associated with coccids, aphids etc.

Key to the Kerala species *Pachyneuron*

1. Forewing with speculum closed below; propodeum narrow posteriorly and remarkably produced beyond bases of hind coxae; median area of propodeum longitudinally and broadly elevated and plicae indicated by an elevation between basal fovea and spiracular sulcus so that a 'V' shaped depression is formed between the median and lateral elevations; petiole slender...*P. solitarium* (Hartig)
- Forewing without speculum, if speculum closed then MV little longer than STV and petiole not slender; propodeum not much produced beyond bases of hind coxae, median area without any depression as above.....2
2. (1) Forewing with MV shorter than STV (Plate 28, Fig.a).....
.....*P. leucopscida* Mani
- Forewing with MV longer than STV (Plate 27, Fig. f).....*P. groenlandicum* (Holmgren)

71. *Pachyneuron groenlandicum* (Holmgren)

(Plate 27, Fig. f)

1872. *Pteromalus groenlandicus* Holmgren, *Ofvers. Kongi Vet. Akad. Förh.*, 29: 100.

1939. *Pachyneuron karnalensis* Mani, *Ind. Jour. Ent.* 1: 85 (IARI)

1955. *Pachyneuron umbratum* Delucchi, *Z. Angew. Ent.* 38: 132-133.

Diagnosis: Body bluish black with metallic reflection; antennae dark brown with scape paler, clypeus slightly emarginate or truncate anteriorly; antennal

scape reaching front ocellus; scutellum with a faint frenum; propodeum with nucha polished, median carina absent; forewing without speculum, few hairs on the basal hairline; gastral petiole widened towards tip, gaster fusiform, short.

Materials examined: 1 female, INDIA, Kerala, Idukki, Kolukkumala, 7.iv.2016, ZSIK.reg.no.IR/INV/9266, coll. Ranjit A P

Distribution: India: Kerala, Delhi, Haryana, Himachal Pradesh, Jammu& Kashmir, Orissa, Tamil Nadu, Karnataka; Belgium; Czechoslovakia; Europe; France; Germany; Iran; Italy; Japan; Kazakhstan; Korea; Netherlands; People's Republic of China; Poland; Romania; Sweden; Switzerland; Turkey; UK; USSR

Remarks: Collected from agroecosystem (tea)

72. *Pachyneuron leucopiscida* Mani

(Plate 27, Fig. a)

1939. *Pachyneuron leucopiscida* Mani, *Ind. J. Ent.* 1: 86, (IARI).

1953. *Pachyneuron cremifaniae* Delucchi, *Bull. Inst. R. Sci. Nat. Belge.*, 29: 8-12.

Diagnosis: Head and mesosoma dark metallic blue; gaster brownish black; anterior margin of clypeus weakly emarginate, scape reaching front ocellus; POL 2× OOL; pronotal collar finely carinate; mesoscutum with notauli deep and incomplete; propodeum with nucha almost smooth and marked off by a distinct constriction; gaster fusiform; T1 occupying nearly half length of gaster; petiole reticulate, longer than hind coxa.

Materials Examined: 1 female, India, Kerala, Kozhikode, Kakkadampoyil, 30.xii.2016, ZSIK.reg.no.IR/INV/9474, coll. Raseena Farsana

Distribution: India: Kerala, Bihar, Delhi, Karnataka, Tamil Nadu; Czechoslovakia; Europe; Germany; Iran; Israel; Kazakhstan; Sweden; Switzerland; Turkey; UK; Yemen

Remarks: Collected from agroecosystem (mixed crops) close to forest.

Platecrizotes Ferrière

1934. *Platecrizotes* Ferrière, *Mitt. Schweiz. Ent. Ges.*16: 90. Type species: *Platecrizotes sudanesis* Ferrière, by monotypy.

Diagnosis: Body dorsally depressed; head subprognathous; antennae short, inserted evidently below ocular line with three anelli and five funicular segments; funicular segments transeverse; forewing with MV strongly widened at proximal end, its lower edge sinuate; gaster petiolate, petiole sharp, angulate, punctuate; gaster ovate, flat, T1 occupying about one third of it.

Distribution: India, Africa, Europe

Host: Parasites of Dipterous puparia (Drosophilidae, Cecidomyidae).

73. *Platecrizotes keralensis* Sureshan & Raseena

(Plate 28, Fig. b)

2015. *Platecrizotes keralensis* Sureshan & Raseena, *J. Threatened taxa*, 7(15): 2-4. (ZSIK).

Diagnosis: Length 1.5mm. Body black; antenna brownish black except scape pedicel and anelli testaceous; head sub prognathous, POL 1.3× OOL; clypeus angularly produced; medially raised; malar sulcus less distinct; antennal clava as long as 2.5× preceding segments combined; propodeum with plicae not distinct reaching up to base of nucha; T1 of gaster not reaching up to middle.

Materials Examined: Holotype: 1 female, INDIA, Kerala, Calicut, Vengeri, 6.iii.2014, ZSIK.reg.no.IR /INV/3426, coll. Raseena Farsana, Paratype: 2 females & 1 male, INDIA, Kerala, Calicut, Vengeri, 6.iii.2014, ZSIK.reg.no.IR/INV/3427, coll. Raseena Farsana; 1 female, INDIA, Kerala,

Calicut, Vengeri, 21.ii.2014, ZSIK.reg.no.IR/INV/3428, coll. Raseena Farsana;
1 female, INDIA, Kerala, Calicut, Vengeri, 10.iii.2014,
ZSIK.reg.no.IR/INV/3429, coll. Raseena Farsana.

Distribution: India: Kerala

Remarks: Reared from Dipterous pupa (near *Drosophila* sp.) breeding on putrefied bitter gourd, probably parasitizing in the pupae.

Propicroscytus Szelényi

1941. *Propicroscytus* Szelényi, *Annl. Hist. Natn. Hung.* 34: 123. Type species: *Arthrolysis trilongifasciatus* Girault by original designation.

1973b. *Obtusiclava* Subba Rao, *Bull. Ent. Res.* 62: 627. Type species: *Obtusiclava oryzae* Subba Rao by monotypy and original designation.

Diagnosis: Head wider than mesosoma; occiput not margined; scrobes virtually absent; represented only by shallow depression just above insertion of antennae; lower margin of clypeus emarginated; antennae inserted distinctly above lower margin of eyes, filiform with two anelli and six funicular segments; in male funicular segments long and with long whorls of erect hairs; pronotum short, collar carinate; notauli incomplete, indicated only anteriorly; propodeum with short nucha and without median carina; plicae indicated only anteriorly by small depression; forewing with MV and PMV very long; hind tibia with one spur; gaster longer than head and mesosoma combined, mostly yellow with dark markings.

Distribution: Africa, Southeast Asia to Australia, Zimbabwe.

Biology: Primary or secondary parasites of certain larger Cecidomyiidae in grass stems, including the rice pest *Orseolia oryzae* and also attacks hosts in grasses other than rice.

Key to the Kerala species of *Propicroscytus*

1. Head and mesosoma black or bluish black; POL almost equal to OOL; forewing with basal vein bare (Plate 28, Fig. c).....
.....*P. mirificus* (Girault)
- Head and mesosoma dark green; POL 0.85× OOL; basal vein with irregular hairs (Plate 28, Fig. d)..... *P. oryzae* (Subba Rao)

74. *Propicroscytus mirificus* (Girault)

(Plate 28, Fig. c)

1915c. *Arthrolysis mirificus* Girault, *Mem. Qd. Mus.* 4: 191.

1915c. *Arthrolysis flaviventris* Girault & Dodd in Girault, *Mem. Qd. Mus.* 4: 190, 191. Synonymized by Szelényi 1941: 123, 125-126.

1981. *Propicroscytus indicus* Subba Rao, *Proc. Ind. Acad. Sci., (B)* 90: 474-475. Synonymized by Bouček, 1988: 410.

Diagnosis: Length 2.5–4mm. Black or bluish black, gaster pale to dark yellow, sides and middle with brown bands longitudinally; antennae dark brown except scape, pedicel and anelli testaceous; scape almost as long as eye; clava 1.6× as long as preceding segment; pedicel plus flagellum 1.4× head width; clypeus slightly emarginate anteriorly; POL almost equal to OOL; pronotum distinctly at a lower level; notauli incomplete only indicated anteriorly; propodeum medially 0.63× as long as scutellum; gaster lanceolate, 1.2× as long as head plus mesosoma combined.

Materials Examined: 1 female, INDIA, Kerala, Calicut, Vengeri, 29.i.2014, ZSIK.reg.no.IR/INV/3239, coll. Raseena Farsana; 1 female & 1 male, INDIA, Kerala, Idukki, Mannavanshola, 27.v.2014, ZSIK.reg.no.IR/INV/3365, coll.P.M.Sureshan; 3 males, INDIA; Kerala, Calicut, Mayanad, 12.xii.2013, ZSIK.reg.no.IR/INV/3822, coll. Shweta; 1 female & 1 male, INDIA, Kerala, Palakkad, Sidarkund, 10.x.2014, ZSIK.reg.no.IR/INV/3964, coll. Raseena

Farsana; 1 female, Kerala, Kozhikode, Kakkayam, 30.xii.2014, ZSIK.reg.no.IR/INV/4384, coll. Shwetha M; 1 female, INDIA, Kerala, Calicut, Vengeri, 8.ii.2015, ZSIK.reg.no.IR/INV/5152, coll. Raseena Farsana; 2 females, INDIA, Kerala, Kakkayam, 29.xii.2015, ZSIK.reg.no.IR/INV/6678, coll. Rajmohana; 1 female and 1 male, INDIA, Kerala, Calicut, Kakkavayal, 25.ix.2015, ZSIK.reg.no.IR/INV/6788, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Mavoor, 11.iv.2014, ZSIK.reg.no.IR/INV/6932, coll. Swetha, 1 female & 1 male, INDIA, Kerala, Calicut, Kakkayam, 30.i.2015, ZSIK.reg.no.IR/INV/6933, coll. Swetha, 1 male, INDIA, Kerala, Calicut, Mayanad, 24.iv.2015, ZSIK.reg.no.IR/INV/6934, coll. Swetha, 1 female, INDIA, Kerala Calicut, Kakkayam, 29.iv.2014, ZSIK.reg.no.IR/INV/6935, coll. Swetha, 2 females, INDIA, Kerala, Trissur, Adatt, 17.v.2014, ZSIK.reg.no.IR/INV/7022, coll. Raseena Farsana, 1 female, INDIA, Kerala, Ernakulam, Thattekkad, Urulanthanni,, 6.i.2015, ZSIK.reg.no.IR/INV/7056, coll. Sureshan; 1 female, INDIA, Kerala, Kannur, Vellikkeel, 13.vii.2015, ZSIK.reg.no.IR/INV/7270, coll. Rajesh; 1 Female, INDIA, Kerala, Idukki, Pambadum Shola, 8.iv.2016, ZSIK.reg.no.IR/INV/8578, coll. Ranjith P; 1 male, INDIA: Kerala, Calicut, Kakkadampoyil, 13.i.2017, ZSIK.reg.no.IR/INV/8669, coll. Raseena Farsana; 4 females, INDIA, Kerala, Idukki, Puthukkudi, 3.iv.2016, ZSIK.reg.no.IR/INV/9286, coll. Ranjit A P.

Distribution: India: Kerala, Andra Pradesh, Maharashtra, Orissa, Karnataka, Tamil Nadu, Uttar Pradesh; Australia; Indonesia; Malaysia; People's Republic of China; Sri Lanka.

Remarks: Collected from both agroecosystem (paddy and mixed vegetables) and forest.

74. *Propicroscytus oryzae* (Subba Rao)

(Plate 28, Fig. d)

1973b. *Obtusiclava oryzae* Subba Rao, *Bull. Ent. Res.* 62: 627.

Diagnosis: Head and mesosoma dark green; gaster yellow with longitudinal brown bands dorsally; clypeus with distinct striation, clypeal margin slightly emarginate; antennae inserted middle of face; flagellum plus pedicel longer than head width; POL $0.85\times$ OOL; pronotal collar short and margined; forewing densely hairy outside speculum; basal vein irregularly setose; gaster sessile $3\times$ as long as broad.

Materials Examined: 1 male, INDIA, Kerala, Idukki, Mangaladevi, 4.ix.2015, ZSIK.reg.no.IR/INV/4835, coll. P.M. Sureshan; 1 female, INDIA, Kerala, Palakkad, Puthunagaram, 1.i.2015, ZSIK.reg.no.IR/INV/6787, coll. Raseena Farsana; 4 females, INDIA, Kerala, Calicut, Chathamangalam, 8.iii.2016, ZSIK.reg.no.IR/INV/6831, coll. Raseena Farsana, 15 females & 5 males, INDIA, Kerala, Calicut, Nechooli, 2.iii.2016, ZSIK.reg.no.IR/INV/6837, coll. Raseena Farsana; 3 females & 1 male, INDIA, Kerala, Calicut, Mavoor, 3.xii.2014, ZSIK.reg.no.IR/INV/7003, coll. Swetha, 4 females, INDIA, Kerala, Calicut, Mavoor, 2.iv.2014, ZSIK.reg.no.IR/INV/7004, coll. Swetha, 2 females, INDIA, Kerala, Calicut, Chelannur, 17.v.2014, ZSIK.reg.no.IR/INV/7007, coll. Raseena Farsana, 1 female, INDIA, Kerala, Calicut, Chelannur, 21.iii.2014, ZSIK.reg.no. IR/INV/7010, coll. Raseena Farsana, 2 females, INDIA, Kerala, Calicut, Payyoli, 31.vii.2015, ZSIK.reg.no.IR/INV/7012, coll. Raseena Farsana; 1 female, INDIA, Kerala, Trissur, Kannara 7.v.2015, ZSIK.reg.no.IR/INV/7017, coll. Ranjith A P; 2 females, INDIA, Kerala, Trissur, Choorakkattukara, 8.1.2016, ZSIK.reg.no.IR/INV/7020, coll. Raseena Farsana; 3 females, INDIA, Kerala, Palakkad, Pattambi, RARS, 9.iii.2015, ZSIK.reg.no.IR/INV/7025, coll. Ranjith; 3 females & 2 males, INDIA, Kerala, Malappuram, Thalappara, 30.x.2014, ZSIK.reg.no.IR/INV/7040, coll. Sheeja &

Raseena; 1 male, INDIA, Kerala, Kannur, Muzhippalangad, 15.xii.2014, ZSIK.reg.no.IR/INV/ 7041, coll. Nikhil & Kumar; 1 female, INDIA, Kerala, Kannur, Keezhara, 30.vi.2015, ZSIK.reg.no.IR/INV/7267, coll.Rajesh; 1 female, INDIA, Kerala, Kannur, Kaitheel, 4.vii.2015, ZSIK.reg.no.IR/INV/7268, coll.Rajesh; 1 female, INDIA, Kerala, Trissure, Mangalassery, 14.vi.2015, ZSIK.reg.no.IR/INV/7269, coll.Rajesh; 2 females, INDIA, Kerala, Kannur, Munderikkadavu, 6.vii.2015, ZSIK.reg.no.IR/INV/7563, coll.Rajesh; 1 female, Kerala, Kannur, Mullul, 29.vi.2015, ZSIK.reg.no.IR/INV/7564, coll.Rajesh; 4 females, INDIA, Kerala, Idukki, Kolukkumala, 6.iv.2016, ZSIK.reg.no.IR/INV/8579, coll. Rajmohana; 1 female, INDIA, Kerala, Idukki, Pambadum Shola, 8.iv.2016, ZSIK.reg.no.IR/INV/8581, coll. Ranjith P; 1 female, INDIA, Kerala, Idukki, Kolukkumala, 7.iv.2016, ZSIK.reg.no.IR/INV/9270, coll. Ranjit A P; 16 females, INDIA, Kerala, Ernakulam, Mulamthuruthy, 26.i.2013, ZSIK.reg.no.IR/INV/9129, coll. Rajesh; 17 females, INDIA, Kerala, Trivandrum, Kadakkavoor, 23.i.2013, ZSIK.reg.no.IR/INV/9130, coll. Rajesh; 4 females, INDIA, Kerala, Malappuram, Kalachal, 12.iv.2013, ZSIK.reg.no.IR/INV/9131, coll. Rajesh; 5 females, INDIA, Kerala, Kollam, Thuruthikkara, 7.iii.2014, ZSIK.reg.no.IR/INV/9132, coll. Ranjith; 2 females, INDIA, Kerala, Kollam, Kundara, 23.i.2013, ZSIK.reg.no.IR/INV/9133, coll. Ranjith; 2 females, INDIA, Kerala, Wayanad, Panamaram, 25.ix.2014, ZSIK.reg.no.IR/INV/9134, coll. Ranjith; 1 female, INDIA, Kerala, Kottayam, Changanassery, 25.i.2013, ZSIK.reg.no.IR/INV/9135, coll. Rajesh; 1 female, INDIA, Kerala, Kasarkod, Beminja, 16.i.2013, ZSIK.reg.no.IR/INV/9136, coll. Ranjith; 1 female, INDIA, Kerala, Pathanamthitta, Perumthuruthy, 6.ii.2013, ZSIK.reg.no.IR/INV/9137, coll. Ranjith.

Distribution: India: Kerala, Arunachal Pradesh, Andra Pradesh, Maharashtra, Orissa; Imdonesia; People's Republic of China; Sri Lanka; Tailand.

Remarks: Collected from various agroecosystems (tea, mixed vegetables and paddy) and forest.

Psilocera Walker

1833. *Psilocera* Walker, *Ent. Mag.* 1: 373. Type species: *Psilocera obscura* Walker by monotypy.

1904. *Acanthometopon* Ashmead, *Mem. Carneige. Mus.* 1 (4): 314, 315, 498. Type species *Acanthometopon clavicorne* Ashmead, by monotypy and original designation. Synonymised by Sureshan, 2001c: 83-90.

1913e. *Polycystoides* Girault, *Ent. News.* 24: 459. Type species: *Polycystoides kennysoni* Girault by original designation.

1915a. *Parapolycystus* Girault & Dodd, in Girault, *Mem. Qd. Mus.* 3: 339. Type species: *Parapolycystus pulchricornis* Girault by original designation.

Diagnosis: Head distinctly wider than mesosoma; vertex narrow; occiput abruptly sloping, immargined; lower margin of clypeus with two triangular teeth, wide apart; antennae strongly clavate, with two or three anelli; male flagellum filiform with 6-8 peduncles between segments bearing whorls of setae; mesosoma strongly arched in profile; pronotal collar carinate; scutellum highly convex, sometimes with a conical hump bearing a finger nail like tip; propodeum constricted into nucha with median carina and costula; gaster short, petiole smooth, hind margins of basal tergites incised in the middle.

Distribution: Asia, Australia, Africa, America, Europe, New Guinea.

Biology: Host not known.

Key to the Kerala species of *Psilocera*

1. Scutellum with a conical hump bearing a fingernail-like tip.....2
- Scutellum normal, without a conical hump3
2. (1) Hump of scutellum short median length of scutellum up to tip of

- hump 0.73× median length of mesoscutum; hind tibial spur long, almost half as long as basitarsus; forewing with PMV 0.72× as long as MV; eyes shorter, height 1.6× width; gaster dorsally with metallic blue reflection; antenna with scape, pedicel and anelli brown; legs with femora brown (Plate 28, Fig. e).....*P. heydoni* Sureshan
- Hump of scutellum long, median length of scutellum up to tip of hump 0.82× median length of mesoscutum; hind tibial spur short, 0.3× as long as basitarsus; PMV 0.9× as long as MV; eyes longer, height 1.9× width; gaster without metallic blue reflection; scape pedicel and anelli testaceous; femora testaceous*P. scutellata* Sureshan
 - 3. (1) Antennal flagellum strongly clavate, F1 short, anelliform, scape reaching far below median ocellus; antennae except clava testaceous.....*P. clavata* Sureshan & Narendran
 - Antennal flagellum less clavate F1 not anelliform, scape either touching or just short of reaching median ocellus; antennae except scape, pedicel, anelli and F1 blackish brown (Plate 28, Fig. f)..... *P. vinayaki* Sureshan & Narendran
 -

75. *Psilocera heydoni* Sureshan

(Plate 28, Fig. e)

2001c. *Psilocera heydoni* Sureshan, *Oriental Ins.* 35: 87. (ZSIK).

Diagnosis: Length 2.7–2.9mm. Body black, gaster blackish brown dorsally with metallic blue reflection; antennae with scape, pedicel and anelli brown, remainder black; dorsal view head width 2.2× length; POL 1.4× OOL; malar sulcus finely indicated; antennal scape reaching median ocellus; hump of scutellum shorter, median length of scutellum up to tip of hump 0.73× median

length of mesoscutum; hind tibial spur long, almost as long as basitarsus; forewing with PMV $0.72 \times$ MV; gaster collapsing, $0.8 \times$ length of head and mesosoma combined.

Materials Examined: 1 female, INDIA: Kerala, Wayanad, Kalladi 22.v.2015, ZSIK.reg. no.IR/INV/7005, coll. Raseena Farsana.

Distribution: India: Kerala (**New record**), Karnataka

Remarks: Collected from agroecosystem (Cardamom).

76. *Psilocera vinayaki* Sureshan & Narendran

(Plate 28, Fig. f)

1995b. *Psilocera vinayaki* Sureshan & Narendran. *J. Ecobiol.* 7 (3): 209 (ZSIK).

Diagnosis: Length 1.6–2.4mm. Head and mesosoma black, gaster metallic green with brownish reflection ventrally; head uniformly finely reticulate with sparse pubescence; POL almost as long as OOL; malar groove distinct; antennal scape hardly reaching lower margin of median ocellus, flagellum less clavate; scutellum convex with broader and finer reticulation; frenum vaguely indicated; propodeum shorter than scutellum with median carina distinct; gaster length $3 \times$ that of scutellum; T1-T3 covering major part of gaster.

Materials Examined: 1 female, INDIA, Kerala, Idukki, Mannavanshola, Idalimotta, 25.v.2014, ZSIK.reg.no.IR/INV/3407, coll.P.M.Sureshan, 1 female, INDIA, Kerala, Calicut, Chelannur, 31.iii.2014, ZSIK.reg.no.IR/INV/4761, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Vengeri, 14.iii.2014, ZSIK.reg.no.IR/INV/5077, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Chelannur, 21.iii.2014, ZSIK.reg.no.IR/INV/5329, coll. Raseena Farsana, 1 female, Kerala: Calicut, Chelannur, 19.iii.2014,

ZSIK.reg.no.IR/INV/6755, coll. Raseena Farsana; 1female, INDIA, Kerala, Palakkad, Pattambi, RARS, 9.iii.2015, ZSIK.reg.no.IR/INV/7026, coll. Ranjith; 1 Male, INDIA: Kerala, Kannur, Chovva, 8.iii.2016, ZSI/WGRC/IR.INV.9290, coll. Raseena Farsana;

Distribution: India: Kerala, Bihar, Tamil Nadu

Remarks: Collected from agroecosystem (mixed vegetables and paddy) and forest.

Pteromalus Swederus

1795. *Pteromalus* Swederus, *Kung. Svenska Vetensk. Akad. Handl.* 16: 201. Type species: *Ichneumon puparum* Linnaeus designated by Westwood, 1839.

1878. *Habrocytus* Thomson, *Hym. Scand.* 5: 88-109. (as subgenus of *Etroxys* Förster) Type species: *Pteromalus albipennis* Walker designated by Ashmead 1904.

1937. *Heterolaccus* Masi, *Geburstage E. Strand.* 3: 371. Type species: *Heterolaccus mauritanicus* Masi, by original designation.

Diagnosis: Head and mesosoma reticulate punctate; occipital foramen not margined; prepectus small, usually shorter than tegula, its surface smooth or hardly sculptured; anterior margin of clypeus mostly shallowly emarginate, rarely deeply emarginate or truncate to slightly produced, pronotal neck hardly visible; notaular grooves incomplete; propodeum often much shorter than half of scutellum, produced into a short subglobose nucha; forewing with PMV always longer than STV; gaster sessile.

Distribution: Cosmopolitan.

Biology: Mainly parasites of pupae of Lepidoptera, gall making Tephritidae (Diptera) etc.

Key to the *Pteromalus* Kerala species

1. Propodeum with costula indicated, plica not complete, not reaching hind margin of nucha..... 2
 - Propodeum with costula not indicated, plica complete, reaching hind margin of nucha..... 3

2. (1) Gaster elongate, 1.2× as long as head plus mesosoma combined, length 2.6× width in dorsal view; antennal scape reaching to upper margin of median ocellus; F1 longer than pedicel (1.2×); clava as long as two preceding segments combined; body dark metallic blue (Plate 29, Fig. b)*P. Metallicus* Sureshan
 - Gaster a little shorter than head plus mesosoma combined, length 1.6× width in dorsal view; scape hardly reaching median ocellus; F1 a little shorter than pedicel (0.8-0.9×); clava a little shorter than two preceding segments combined; body black (Plate 29, Fig. a)*P. keralensis* Sureshan

3. (1) Propodeum with nucha long, medially propodeum 0.7× as long as scutellum; POL as long as OOL; gaster shorter than head plus mesosoma combined; temple wide, length 0.6× eye length (Plate 29, Fig. d).....*P. puparum* (Linnaeus)
 - Propodeum with nucha short, medially propodeum 0.7× as long as scutellum; POL 1.8× to 2× OOL; gaster longer than head plus mesosoma combined; temple narrow, length 0.3-0.4× eye length.....4

4. (3) Antennae with F1 longer than pedicel; propodeum medially 0.4× as long as scutellum; gaster 1.3× as long as head plus mesosoma combined and 2.5× as long as wide in dorsal view; MV 2× as long as

- STV; POL 2× OOL (Plate 29, Fig. c).....*P. nigrus* Sureshan
- F1 little shorter than pedicel; propodeum medially 0.5× as long as scutellum; gaster 1.1× as long as head plus mesosoma combined and 2.1× as long as wide ; MV short, 1.1-1.6× as long as STV; POL 1.8× OOL (Plate 29, Fig. e).....*P. semotus* (Walker)

77. *Pteromalus keralensis* Sureshan

(Plate 29, Fig. a)

2001b. *Pteromalus keralensis* Sureshan, *Rec. Zool. Surv. India*, 99(1-4): 12-13: (ZSIK).

Diagnosis: Length 1.3–2.4mm. Body black with metallic blue reflection on gaster dorsally; antennae pale brown with scape and pedicel testaceous; POL 1.8× OOL; head moderately and closely reticulate; antennal scape hardly reaching median ocellus; F1 almost as long as pedicel; anterior margin of pronotal collar round; scutellum medially as long as mesoscutum; propodeum with median carina vaguely indicated; plicae distinct; gaster short, ovate, length 1.6× width, little shorter than head plus mesosoma combined.

Materials Examined: 1 female, INDIA, Kerala, Ernakulam, Kolencheri, 21.xi.2014, ZSIK.reg.no.IR/INV/6758, coll. Raseena Farsana; 3 females, INDIA, Kerala, Calicut, Kakkadampoyil, 19.i.2017, ZSIK.reg.no.IR/INV/8677, coll. Raseena Farsana; 3 females, INDIA, Kerala, Trissur, Adatt, 7.i.2016, coll. Raseena Farsana, ZSIK.reg.no. IR/INV/9351; 2 females, INDIA, Kerala, Calicut, Chathamangalam, 8.iii.2016, coll. Raseena Farsana, ZSIK.reg.no.IR/INV/9352; 1 female, INDIA, Kerala, Trivandrum, Vellayini, 30.v.2014, coll. Raseena Farsana, ZSIK.reg.no.IR/INV/9353; 1 female, INDIA, Kerala, Palakkad, Puthunagaram, 19.i.2015, coll. Raseena Farsana, ZSIK.reg.no.IR/INV/9354.

Distribution: India: Karnataka, Kerala, Tamil Nadu

Remarks: Collected from both agroecosystem (mixed vegetables, paddy and mixed crops).

78. *Pteromalus metallicus* Sureshan

(Plate 29, Fig. b)

2001b. *Pteromalus metallicus* Sureshan, *Rec. Zool. Surv. India* 99 (1-4): 9, (ZSIK).

Diagnosis: Length 2.6–3.6mm. Head and mesosoma dark metallic blue with bronzy reflection; gaster blackish blue, T1 with strong metallic blue reflection; head moderately reticulate; head width $2.3\times$ length in dorsal view; anterior margin of clypeus emarginate; POL $1.5\times$ OOL; pedicel plus flagellum $0.9\times$ head width, pedicel little shorter than F1; propodeum with a weak costula; median carina indicated only anteriorly; plicae not indicated beyond costula; gaster $1.2\times$ as long as head plus mesosoma combined, in dorsal view length $2.6\times$ width.

Materials Examined: 1 female, INDIA, Kerala, Calicut, Vengeri, 21.iii.2014, ZSIK.reg.no.IR/INV/4758, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Areekkad, 4.ii.2015, ZSIK.reg.no.IR/INV/5076, coll. Raseena Farsana; 1 female, INDIA, Kerala, Idukki, Iravikulam National Park, 11.iv.2014, ZSIK.reg.no.IR/INV/8883, P.M. Sureshan.; 1 female, INDIA, Kerala, Idukki, Eravikulam National Park, Rajamalai, 09.iv.2012, ZSIK.reg.no.IR/INV/8884, P.M. Sureshan; 1 female, INDIA, Kerala, Palakad, Silentvalley, Havlock, 23.ii.2013, ZSIK.reg.no.IR/INV/8885, P.M. Sureshan.; 1 female, INDIA, Kerala, Kasaragod, Kotanchovi, 06.i.2013, ZSIK.reg.no.IR/INV/8886, Rajmohana.; 1 female, INDIA, Kerala, Idukki, Kolukkumala, 7.iv.2016, coll. Ranjith, ZSIK.reg.no.IR/INV/9350;

Distribution: India: Kerala, Karnataka

Remarks: Collected from agroecosystem (mixed vegetable and tea) and forest.

79. *Pteromalus nigrus* Sureshan

(Plate 29, Fig. c)

2001b. *Pteromalus nigrus* Sureshan, *Rec. Zool. Surv. India*, 99 (1-4): 12, (ZSIK).

Diagnosis: Length 1.7–3.8mm. Head and mesosoma bluish black; gaster brownish black, antennae dark brown except scape and pedicel testaceous; head uniformly and finely reticulate; in dorsal view width $2.2\times$ length; POL $2\times$ OOL; anterior margin of clypeus emarginate; antennae inserted below centre of face; F1 $1.5\times$ pedicel; propodeum with two transverse depressions connecting basal and apical foveae of both sides; plicae less sharp; median carina vaguely indicated at the base; gaster $1.3\times$ as long as head plus mesosoma combined.

Materials Examined: 1 female, INDIA, Kerala, Malappuram, Nilambur, 5.iii.2015, ZSIK.reg.no.IR/INV/6536, coll. Raseena Farsana; 1 female, INDIA, Kerala, Kakkayam, 29.xii.2015, ZSIK.reg.no.IR/INV/6676, coll. Rajmohana; 1 female, INDIA, Kerala, Trissur, Vazhachal, 22.ii.2013, ZSIK.reg.no.IR/INV/8874, P.M. Sureshan.; 1 female, Kerala, Kannur, Paithalmala, 08.i.2013, ZSIK.reg.no.IR/INV/8876, Rajmohana; 1 female, INDIA, Kerala, Idukki, Kolukkumala, 7.iv.2016, coll. Ranjith, ZSIK.reg.no.IR/INV/9347; 1 female, INDIA, Kerala, Palakkad, Puthunagaram, 19.i.2015, coll. Raseena Farsana, ZSIK.reg.no.IR/INV/9348; 1 female, INDIA, Kerala, Malappuram, Ponnani, 25.ii.2015, coll. Raseena Farsana, ZSIK.reg.no.IR/INV/9349;

Distribution: India: Kerala

Remarks: Collected from agroecosystem (paddy, mixed vegetables, tea and teak) and forest.

80. *Pteromalus puparum* (Linnaeus)

(Plate 29, Fig. d)

1758. *Ichneumon puparum* Linnaeus, *Syst. nat.* 10th Edit. 567.

1978. *Pteromalus puparum* (Linnaeus). Bouček *et al.*, *Oriental Ins.* 12 (4): 454.

Diagnosis: Length 2.4–3mm. Body dark metallic blue; antennae brown with scape testaceous; head moderately and closely reticulate; POL as long as OOL; malar grooves weakly indicated; anterior margin of clypeus shallowly emarginate; temple length 0.6× eye length; antennae with F1 longer than pedicel; clava almost equal to two preceding segments combined; pronotal collar distinctly narrower than head; frenal line vaguely indicated; propodeum with median area moderately reticulate, lateral area finely reticulate; gaster shorter than head plus mesosoma combined.

Materials Examined: 3 females, INDIA, Kerala, Palakkad, Silent valley, Sairandri, 20.ii.2013, coll. P.M. Sureshan, ZSIK.reg.no. IR/INV/3135; 1 female, INDIA, Kerala, Calicut, Areekkad, 4.ii.2015, ZSIK.reg.no. IR/INV/5075, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Chelannur, 19.iii.2014, ZSIK.reg.no. IR/INV/5328, coll. Raseena Farsana; 1 male, INDIA, Kerala, Wayanad, Thirunelli, 16.ii.2016, ZSIK.reg.no. IR/INV/7169, coll. Sureshan;

Distribution: India: Kerala, Assam, Bihar, Himachal Pradesh, Meghalaya, Panjab, Tamil Nadu, Uttar Pradesh, Utharakhand; Algeria; Australia; Austria; Belgium; Bolivia; Bulgaria; Canada; Chile; Czechoslovakia; Egypt; Finland; France; Germany; Greece; Hawaii; Hungary; Iran; Iraq; Israel; Italy; Japan; Kazakhstan; Korea; Malaysia; Nepal; Netherlands; New Zealand; Pakistan;

People's Republic of China; Poland; Portugal; Romania; Russia; Spain; Sweden; Switzerland; Taiwan; Ukraine; UK; USA; Yugoslavia.

Remarks: Collected from agroecosystem (mixed vegetables) and forest.

81. *Pteromalus semotus* (Walker)

(Plate 29, Fig. e)

1834. *Eutelus semotus* Walker, *Ent. Mag.* 2: 367.

1906. *Etroxys marginicolis* Cameron, *J. Bombay Nat. Hist. Soc.* 17: 97. (Synonymized by Bouček *et al.*, 1978: 454)

1953. *Habrocytus milleri* Delucchi, *Bull. Inst. R. Sci Nat. Belg.* 29 (3): 1-14. (Synonymized by Graham, 1969: 529)

Diagnosis: Length 1.8-2.8mm. Body dark metallic green with golden reflection; antennae testaceous; head closely and moderately reticulate; dorsal view head width $2.2\times$ length; POL $1.8\times$ OOL; temple length $0.4\times$ eye length; anterior margin of clypeus weakly emarginate; malar grooves weakly indicated; antenna with pedicel little longer than F1; anterior margin of pronotum sharp, not margined; scutellum slightly longer than broad; propodeum $0.5\times$ as long as scutellum; forewing with MV short, $1.1\times$ to $1.6\times$ STV; gaster $1.1\times$ as long as head plus mesosoma combined.

Materials Examined: 3 females, INDIA, Kerala, Kannur, Kottiyoor Reserve Forest, 8.i.2013, ZSIK.reg.no.IR/INV/2465, coll. Rajmohana.; 1 female, INDIA, Kerala, Kannur, Paithalmala, 8.i.2013, coll. Bijoy, ZSIK.reg.no.IR/INV/3137; 2 females, INDIA, Kerala, Kasargod, Kottenchery, 10.xi.2013, ZSIK.reg.no .IR/INV/3123, coll.P.M. Sureshan; 2 females & 1 male, INDIA, Kerala, Idukki, Pambadumshola, 26.v.2014, ZSIK.reg.no. IR/INV/3426, coll. P.M.Sureshan; 1 female, INDIA, Kerala, Calicut, Vengeri, 21.iii.2014, ZSIK.reg.no.IR/INV/4759, coll. Raseena Farsana; 1 female, INDIA, Kerala, Kakkayam, 29.xii.2015, ZSIK.reg.no.IR/INV/6680, coll.

Rajmohana, 1 female, INDIA, Kerala, Kannur, Paithalmala, 08.i.2015, ZSIK.reg.no.IR/INV/8859, Rajmohana.; 1 female, Kerala, Idukki, Iravikulam National Park, 09.iv.2012, ZSIK.reg.no.IR/INV/8860, Rajmohana.; 2 females, INDIA, Kerala, Idukki, Mannavanshola, 07.iv.2012, ZSIK.reg.no.IR/INV/8861, P.M.Sureshan.; 1 female, INDIA, Kerala, Kasaragod, Rannipuram, 05.i.2013, ZSIK.reg.no.IR/INV/8862, P.M. Sureshan.; 1 female, INDIA, Kerala, Trissur, Vazhachal, 27.ii.2013, ZSIK.reg.no.IR/INV/8863, P.M. Sureshan.; 1 female, INDIA, Kerala, Kasarkode, Mavumgal, 27.x.2015, coll. Raseena Farsana, ZSIK.reg.no.IR/INV/9338; 1 female, INDIA, Kerala, Wayanad, Kalladi, 22.v.2015, coll. Raseena Farsana, ZSIK.reg.no.IR/INV//9339; 1 female, INDIA, Kerala, Palakkad, Puthunagaram, 1.i.2015, coll. Raseena Farsana, ZSIK.reg.no.IR/INV/9340; 2 females, INDIA: Kerala: Palakkad, Puthunagaram, 19.i.2015, coll. Raseena Farsana, ZSIK.reg.no.IR/INV/9341; 2 females & 1 male, INDIA, Kerala, Palakkad, Chittur, 20.i.2015, coll. Raseena Farsana, ZSIK.reg.no.IR/INV//9342; 2 females, INDIA, Kerala, Idukki, Puthukkudi, 3.iv.2016, coll. Ranjith, ZSIK.reg.no.IR/INV/9343; 19 females, INDIA: Kerala: Idukki, Kolukkumala, 7.iv.2016, coll. Ranjith, ZSIK.reg.no.IR/INV/9344; 3 females, INDIA, Kerala, Idukki, Vaguvarai, 9.iv.2016, coll. Bijoy, ZSIK.reg.no.IR/INV/9345; **Distribution:** India: Kerala, Arunachal Pradesh, Karnataka, Jarkhand, Telungana, Tamil Nadu, Uttar Pradesh; Austria; Belgium; Bulgaria; Canary Islands; Czechoslovakia; Denmark; Egypt; Europe; France; Germany; Hungary; Italy; Japan; Kasakhstan; Mexico; Netherlands; New Zealand; Norway; Pakistan; People's Republic of China; Poland; Romania; Russia; Serbia; Sweden; Switzerland; Syria; Turkey; Ukraine; UK.

Remarks: Collected from both agroecosystem (paddy, mixed vegetables, cashew, tea and cardamom) and forest.

Genus *Pycnetron* Gahan

1925. *Pycnetron* Gahan, Type species: *Pycnetron curculionidis* Gahan, by monotypy. 91-93.

Diagnosis: Female gaster with long tail formed by the laterally compressed posterior part and narrow extended epipygium; head and mesosoma robust; pronotum very broad without carina but with an abrupt angle to the slightly concave vertical front slop; scrobes deep and reaching the ocellus; antenna with three anelli in female and two in male; notauli not quite complete in some species; axillar grooves always very deep; apex of scutellum projecting, vertical, but frenal groove weak; mesopleuron anteriorly carinate, the carina starting at the lower third of prepectus as “epicnemial” carina and crosses to the other side near to the middle coxae, thus delimiting a short “mesosternal shelf”.

Hosts: *P.curculionidis* was reared from the weevil *Acicnemis filicornis* Husbenthal. Hosts of *P.pix* include *Pissodes nemorensis* and *Antliarhinus peglerae* (Prinsloo, 2005).

Distribution: Queensland, Papua New Guinea, People’s republic of China, Philippines, Taiwan, Madagascar, South Africa, India (**New record**).

Key to the species of *Pycnetron* Gahan (Females)

1. Forewing with dark spot; propodeum with median carina, notauli incomplete..... 2
- Forewing without dark spot; propodeum without median carina, notauli complete but weak towards posterior end 3
2. Forewing disc palely infuscated with a bold, broad, dark brown patch extending from STV across wing disc to near posterior wing margin, antenna dark brown except base of scape, F2, F3 and basal half of F4

- paler, basal claval segment black, apical two segments testaceous, F1 2.8-3.3× as long as wide *P. longicauda* (Risbec)
- Forewing hyaline with a small roundish patch below STV not extending down as above; antenna with funicle and basal half of clava uniformly black, apical half of clava pale testaceous in contrast, F1 2.5× as long as broad..... *P. pix* Prinsloo
3. Scape reddish testaceous, three anelli subequal in length, F1 twice as long as broad, T2-T6 successively increasing slightly in length *P. curculionidis* Gahan
- Scape brownish black except base testaceous, first anellus smallest, 0.77× length of second anellus and 0.58× length of third anellus, F1 1.5× as long as broad; T2 short, 0.44× as long as T1 and 0.43× as long as T3 (Plate 29, Fig. f)..... *P. keralaensis* Raseena & Sureshan

82. *Pycnetron keralaensis* Raseena & Sureshan

(Plate 29, Fig. f)

2017. *Pycnetron keralaensis* Raseena *et al.*, *Halteres*, Vol. 8: 103-108. (ZSIK).

Female: Length 4.5mm. Body black with slight metallic reflection on face, vertex, mesoscutum, axilla, metanotum, upper mesepisternum, metapleuron and nucha; antennae brownish black except half of first, second and third segments of clava and base of scape testaceous. Head strongly reticulate, clypeal and paraclypeal area radiately striated, striae just reaching lower margin of eyes; clypeal margin weakly emarginated, malar space and gena elongate reticulate, posterior margin of gena sharp and raised. Scrobal area very deep and reach median ocellus, scrob moderately reticulate. POL 1.25× OOL, first anellus small, F1 and F2 almost equal and remaining segments gradually decreasing in

length. Mesoscutum 1.64× as broad as long, strongly reticulate with white pubescence, notauli almost complete but fading towards posterior part. Scutellum distinctly and strongly reticulate, frenum absent. Propodeum with median carina absent, plicae complete and touch transverse edge, behind which deep transverse groove separating nucha; Gaster sessile, 1.44× as long as head plus mesosoma combined, T1-T4 incised in the middle.

Materials Examined: Holotype: Female, India: Kerala, Calicut, Kakkadampoyil (11.33618°N & 76.11025°E, elevation 674.6m), 13.i.2017, Coll. P.M.Sureshan. Reg.No. ZSI/WGRC/IR/INV/8603.

Sphegigaster Spinola

1811. *Sphegigaster* Spinola *Anns. Mus. Hist. Nat.* 17: 147. Type species: *Diplolepis pallicornis* Spinola designated by Ashmead. 1904.

1904. *Trigonogastra* Ashmead, *Mem. Carnegie. Mus.* 1(4): 330 Type species: *Trigonogastra aurata* Ashmead, by original designation.

1915a. *Paratrigonogastra* Girault, *Mem. Qd. Mus.* 3: 343. Type species: *Paratrigonogastra voltairei* Girault, by monotypy. (Synonymised by Bouček, 1988: 465).

1957. *Basileweskyella* Risbec, *Bull. Inst. Fr. Afr. Noire* (4) 19 (1): 194-195, Type species: *Basileweskyella* Risbec, by original designation. (Synonymised by Bouček, 1988: 465).

Diagnosis: Body slender; clypeal margin with two sharp teeth; antennae always with two anelli; gena with a large fovea above base of mandible; notauli incomplete; pronotum rather long behind anterior subrectangular edge which sometimes bears several blunt teeth; propodeum without longitudinal carinae, about as strongly reticulate as scutellum, gastral petiole longer than propodeum, dorsally with dense reticulation; T2 very large.

Distribution: South Asia, Africa, Europe, America, Australia.

Biology: Parasites of Diptera especially Agromyzidae mining in the leaves or other soft parts of plants.

Key to the Kerala species of *Sphегigaster*

1. Antennae short all funicular segments transeverse, scape metallic brownish black or black.....*S. stepicola* Bouček
- Antennae long slender, funicular segments longer than broad, scape yellow or testaceous2
2. (1) Gaster with posterior margin of T1 medially produced.....3
- Posterior margin of T1 not produced, straight.....4
3. (2) Antennae with pedicel length 2× width; F1 distinctly longer than pedicel, not narrowed basally; forewing with basal hairline indicated; gaster (without petiole) distinctly longer than mesosoma (Plate 30, Fig. a).....*S. anamudiensis* Sureshan & Narendran
- Pedicel length 1.5× width; F1 little longer than pedicel (1.33×), narrowed basally; forewing with basal hairline not indicated; gaster not longer than mesosoma (Plate 30, Fig. b)*S. brunneicornis* (Ferriere)
4. (2) Gaster slender, elongate; petiole short and stout (length 2× width); T2 small, only 0.3× as long as body of gaster; scutellum with frenum clearly marked off; propodeum medially raised, median carina indicated anteriorly.....*S. indica* Sureshan & Narendran
- Gaster not slender and elongate as above; petiole long and slender (length 3-3.8× width); T2 large, 0.6× as long as body of gaster; scutellum with frenum marked only on sides; propodeum medially not raised, median carina not indicated (Plate 30, Fig. d).....
..... *S. reticulata* Sureshan & Narendran

83. *Sphegigaster anamudiensis* Sureshan & Narendran

(Plate 30, Fig. a)

1997c. *Sphegigaster anamudiensis* Sureshan & Narendran, *Entomon*, 22 (3&4): 194-195. (ZSIK).

Diagnosis: Length 3-3.2mm. Body bluish green with slight golden reflection on head and thorax; antennae dark brown except scape testaceous; head in dorsal view width $1.2\times$ length; POL almost equal to OOL; antennae inserted below middle of face; antennal scape reaching median ocellus; pronotal collar sharply margined anteriorly; propodeum with median carina not indicated; gaster $1.2\times$ as long as mesoscutum in profile, petiole length $0.3\times$ gaster length in profile.

Materials Examined: 1 female & 1 male, INDIA, Kerala, Idukki, Pampadum Shola, 26.v.2014, ZSIK.reg.no.IR/INV/3406, coll.P.M.Sureshan.; 1 female, Kerala, Idukki, Munnar, 19.ix.2014, ZSIK.reg.no.IR/INV/8889, P.M. Sureshan.

Distribution: India: Kerala

Remarks: Collected from forest.

84. *Sphegigaster brunneicornis* (Ferrière)

(Plate 30, Fig. b)

1930. *Trigonogastra brunneicornis* Ferrière, *Bull. Ent. Res.* 21: 356-357.

1978. *Sphegigaster brunneicornis* (Ferrière): Bouček *et al.*, *Oriental Ins.* 12 (4): 458.

Diagnosis: Length 2–2.5mm. Body dark green, almost black, especially on head; gaster dark green; antennae with scape, pedicel and anelli clear yellow; flagellum reddish brown; F1 longer than pedicel, narrowed basally; all funicular segments longer than wide except F6 subquadrate; clava almost as long as two preceding segments combined; pronotum distinctly carinate; gaster excluding petiole not longer than mesosoma.

Materials Examined: 2 females, INDIA, Kerala, Calicut, Chelannur, 19.iii.2014, ZSIK.reg.no.IR/INV/6786, coll. Raseena Farsana; 1 female, INDIA, Kerala, Palakkad, Puthunagaram, 9.ii.2015, ZSIK.reg.no.IR/INV/7031, coll. Raseena Farsana; 1 Female, INDIA, Kerala, Calicut, Kakkadam-poyil, 19.i.2017, ZSIK.reg.no.IR/INV/8674, coll. Raseena Farsana; 2 females, INDIA, Kerala, Idukki, Periyar Tiger Reserve, 7.vi.2013, ZSIK.reg.no.IR/INV/9073, coll. Abhilash, 1 female, INDIA, Kerala, Palakkad, Silent Valley, 15.i.2013, ZSIK.reg.no.IR/INV/9074, coll. Nikhil; 1 female, INDIA, Kerala, Kannur, Paithalmala, 8.i.2013, ZSIK.reg.no.IR/INV/2809, coll. Rajmohana.; 1 female, INDIA; Kerala, Kasargod, Periya, 26.x.2015, ZSIK.reg.no.IR/INV/7696, coll. Raseena Farsana; 1 Female, INDIA: Kerala, Calicut, Chathamangalam, 8.iii.2016, ZSIK.reg.no.IR/INV/9269, coll. Raseena Farsana

Distribution: India: Kerala, Tamil Nadu; Ethiopia; Sri Lanka; Thailand

Remarks: Collected from agroecosystem (mixed vegetables, paddy and mixed crops) and forest.

85. *Sphegigaster karnatakaensis* Sureshan

(Plate 30, Fig. c)

2007b. *Sphegigaster karnatakaensis* Sureshan, *Rec. Zool. Surv. India. Occ. Paper No.* 268: 36-37.

Diagnosis: Length 1.7- 1.8mm. Head, mesosoma and petiole dark metallic blue, head more blackish, gaster brown; head finely reticulate with small pubescence; head in dorsal view $2.1\times$ as broad as long; POL as long as OOL; clypeus with two sharp teeth, radiately striated; antennae inserted little below middle of face; anelli two, transverse, pedicel $2\times$ as long as broad; pedicel plus flagellum as long as head width; mesoscutum with notuali incomplete, $2.1\times$ as broad as long, scutellum medially slightly longer than mesoscutum; petiole

finely reticulate; gaster fusiform, in dorsal view $2.2\times$ as long as broad, posterior margin of T1 slightly produced, T2 largest.

Materials Examined: 1 female, INDIA, Kerala, Palakkad, Thathamangalam, 12.vii.2014, ZSIK.reg.no.IR/INV/6753, coll. Raseena Farsana.

Distribution: India: Kerala (**New record**), Karnataka

Remarks: Collected from agroecosystem.

86. *Sphegigaster reticulata* Sureshan & Narendran

(Plate 30, Fig. d)

1997c. *Sphegigaster reticulata* Sureshan & Narendran. *Entomon*, 2 (3 & 4). 195. (ZSIK).

Diagnosis: Length 2.5-2.7mm. Head, mesosoma and petiole bluish black; gaster black, antennae yellow; head in dorsal view width $2\times$ length; POL $1.6\times$ OOL; antennal scape hardly reaching median ocellus, F1 slightly shorter than pedicel; funicular segments longer than wide except last two almost as long as wide; pronotal collar nearly rectangular, uniformly reticulate except a narrow smooth strip posteriorly; forewing with basal vein setate; gaster elongate ovate; petiole length $3.6\times$ width; T2 occupying more than half of gaster.

Materials examined: 1female, INDIA, Kerala, Kozhikode, Kakkayam, 30.xii.2014, ZSIK.reg.no.IR/INV/7049, coll. Sureshan; 1 female, INDIA, Kerala, Calicut, Kakkadampoyil, 13.i.2017, ZSIK.reg.no.IR/INV/8671, coll. Raseena Farsana; 1 female, INDIA, Kerala, Idukki, Kolukkumala, 7.iv.2016, ZSIK.reg.no.IR/INV/9267, coll. Ranjit A P; 1 female, INDIA, Kerala, Kozhikode, Areekkad, 4.ii.2015, ZSIK.reg.no.IR/INV/ 9268, coll. Raseena Farsana.

Distribution: India: Kerala, Tamil Nadu

Remarks: Collected from forest and agroecosystem (mixed crops and tea).

Syntomopus Walker

1833. *Syntomopus* Walker, *Ent. Mag.*1: 371-372. Type species *Syntomopus thoracicus* Walker by designation of Westwood, 1839.

1927. *Merismorella* Girault, 405-1, Type species: *Merismorella shakespearei* Girault, by monotypy. (Synonymised by Bouček, 1988:466).

Diagnosis: Clypeus with three broad symmetrically arranged teeth, middle tooth longer than other two; antennae with flagellum compact; lateral part of mouth margin with short genal concavity; mesosoma dorsally flattened; pronotum quadrangular; propodeum width about 1.5× length; median carina and plicae well developed and connected posteriorly by ‘W’ shaped carina; gastral petiole longer than wide, cylindrical with complete basal flange continuous laterally and ventrally without median carina, lateral setae present; gaster ovate, acuminate, hind margin of T1 sinuate laterally, typically emarginate medially.

Distribution: Australia, Europe, North and South America, Africa, South Asia, New Guinea

Biology: Parasites of small Diptera, especially Agromyzidae mining stiff stems of some herbaceous plants.

Key to the Kerala species of *Syntomopus* Walker

1. Propodeum with median carina effaced in the middle, indicated on anterior and posterior ends, width 1.5× maximum length; T1 of gaster deeply incised in the middle; POL 1.4× OOL; temple length 0.3× eye length; body dark green with golden reflection on head and dorsal part of mesosoma (Plate 30, Fig. f).....

-*S. rajamalaiensis* Sureshan & Narendran
- Propodeum with median carina either complete or indicated on anteriorly (slightly), width 1.7-2× maximum length; T1 not as above; POL 1.9× OOL); temple length greater than 0.6× eye length; body bright green or bluish black without golden reflection..... 2
2. (1) Propodeum with median carina indicated only anteriorly; POL 1.9× OOL; scape length 0.8× eye length; mesoscutum width 1.8× length; forewing with MV 1.7× STV; PMV 1.3× STV; body bluish black; antenna with scape and pedicel bluish black with metallic reflection, remainder dark brown; legs except coxae not testaceous.....
-*S. nigrus* Sureshan & Narendran
- Propodeum with median carina complete; POL 1.6× OOL; scape length 0.6× eye length; mesoscutum width 2.2× length; forewing with MV 2.9× STV; PMV 2× STV; body bright metallic green; antenna with scape and pedicel testaceous, remainder pale brown; legs except coxae testaceous (Plate 30, Fig. e).....
-*S. carinatus* Sureshan & Narendran

87. *Syntomopus carinatus* Sureshan & Narendran

(Plate 30, Fig. e)

1999. *Syntomopus carinatus* Sureshan & Narendran, *Rec. Zool. Surv. India.*, 97 (4): 84-86. (ZSIK).

Diagnosis: Length 2.1-2.2mm. Head, mesosoma, petiole and coxae metallic green, gaster brown with greenish tinge; antennae brown with scape and pedicel testaceous; head uniformly and finely reticulate; POL 1.6× OOL; antennal scape not reaching median ocellus; funicle segments mostly transverse; clava as

long as 2.5 preceding segments combined; propodeum with median area finely reticulate, median carina complete; forewing with basal vein bare; gaster length $1.8\times$ width in dorsal view; petiole length $2\times$ width.

Materials Examined: 1 female, INDIA, Kerala, Trichur, Vazhachal, Malakkappara, 27.ii.2012, ZSIK.reg.no.IR/INV/3146; 1 female, INDIA, Kerala, Palakkad, Mannarkad, Pattiyar, 24.ii.2013, ZSIK.reg.no.IR/INV/3162, coll.P.M.Sureshan; 1 female & 1 male, Kerala, Idukki, Mannavanshola, 27.v.2014, ZSIK.reg.no.IR/INV/3364, coll.P.M.Sureshan, 1 female, India, Kerala, Wayanad, Kalladi, 22.x.2015, ZSIK.reg.no.IR/INV/9473, coll. Raseena Farsana

Distribution: India: Kerala, Manipur, Tamil Nadu, Utharakhand; Malaysia, Thailand.

Remarks: Collected from forest and agroecosystem (cardamom).

88. *Syntomopus rajamalaiensis* Sureshan & Narendran

(Plate 30, Fig. f)

1999. *Syntomopus rajamalaiensis* Sureshan & Narendran, *Rec. Zool Surv. India*, 97 (4): 86-89. (ZSIK).

Diagnosis: Length 2.8-3mm. Head and mesosoma dark green with golden reflection, gaster including petiole dark bluish green with metallic blue reflection on T1 dorsally; antennae dark brown except scape dark blue; head uniformly and finely reticulate with meshes very small; POL $1.4\times$ OOL; scape not reaching median ocellus; scrobe moderately deep and broad; pronotum raised reticulate; notauli complete; propodeum with median carina effaced in the middle; plicae sharp; forewing with few setae on basal vein; gaster with hind margin of T1 deeply incised.

Materials Examined: 2 females, INDIA, Kerala, Idukki, Pallarodushola, 27.v.2014, ZSIK.reg.no.IR/INV/3409, coll.P.M.Sureshan; 1 female, INDIA, Kerala, Idukki, Mannavanshola, Idalimotta, 25.v.2014, ZSIK.reg.no.IR/INV/3410, coll.P.M.Sureshan, 1 Female, INDIA, Kerala, Calicut, Vengeri, 2.iv.2014, ZSI/WGRC/IR.INV.9272, coll. Raseena Farsana; 1 female, INDIA, Kerala, Idukki, Puthukkudi, 3.iv.2016, ZSIK.reg.no. IR/INV/9315, coll. Ranjith A P

Distribution: India: Kerala

Remarks: Collected from both forest and agroecosystem (mixed vegetables).

Toxeomorpha Girault

1915c. *Toxeomorpha* Girault *Mem. Qd. Mus.* 4:195. Type species: *Troxeomorpha nigra* Girault by original designation.

1976. *Nigricolana* Bouček, *J. Ent. Soc. S. Africa.* 39: 16-17. Type species: *Trigonogastra nigricola* Ferrière by original designation. (Synonymised by Bouček 1988: 443).

Diagnosis: Head and mesosoma including propodeum reticulate, occiput immargined; clypeus with anterior margin produced, shallowly emarginate in the middle; antennae with three anelli and five funicular segments; pronotal collar rounded anteriorly; propodeum without median carina; forewing with MV distinctly longer than STV. Gastral petiole elongate, reticulate with fine median carina, composed of three parts, the median stalk (true petiole) and the side parts connected ventrally and actually form a stiffened ventral projection of the first gastral sternite.

Distribution: Africa, South Asia, Australia

Biology: Parasites of puparia of small Diptera.

89. *Toxeumorpha minuta* Sureshan & Narendran

(Plate 31, Fig. a)

2000a. *Toxeumorpha minuta* Sureshan & Narendran, *J. Bombay. Nat. Hist. Soc.* 97 (3): 406-407, (ZSIK).

Diagnosis: Length 1.2-1.5mm. Body black; antennae brown with scape paler; head uniformly and moderately reticulate; POL 1.4× OOL; clypeus with a median angulate tooth; antennae inserted along the lower margin of eyes; pedicel longer than F1; third anellus as long as first and second combined; funicular segments quadrate; scutellum convex without frenum; propodeum with plicae complete; forewing with basal vein setate, speculum open below; gaster with T1 and T2 covering most of the length.

Materials Examined: 2 females & 1 male, INDIA, Kerala, Calicut, Vengeri, 3.iii.2014, ZSIK.reg.no.IR/INV/3242, coll. Raseena Farsana; 1 female & 1 male, INDIA, Kerala, Calicut, Vengeri, 13.ii.2014, ZSIK.reg.no.IR/INV/3238, coll. Raseena Farsana; 1 female, INDIA, Kerala, Kozhikode, Easthill, 25.iii.2015, ZSIK.reg.no.IR/INV/4365, coll. P.M.Sureshan; 1 female, INDIA, Kerala, Kozhikode, Mahe, 8.iii.2014, ZSIK.reg.no.IR/INV/5150, coll. Raseena Farsana; 2 females, INDIA, Kerala, Calicut, Vengeri, 10.iii.2014, ZSIK.reg.no.IR/INV/5326, coll. Raseena Farsana; 2 females, INDIA, Kerala, Calicut, Vengeri, 6.iii.2014, ZSIK.reg.no.IR/INV/6754, coll. Raseena Farsana.

Distribution: India: Kerala

Remarks: Emerged from infested bitter gourd, also collected from homestead vegetation.

***Trichomalopsis* Crawford**

1913. *Trichomalopsis* Crawford, *Proc. U.S. Natn. Mus.* 45:251, Type species: *Trichomalopsis shirakii* Crawford, by original designation.

1926. *Metadicylus* Girault, *Insec. Inscit. Menstr.* 14:17. Type species: *Metadicylus australiensis* Girault, by monotypy. (Synonymised by Bouček, 1988: 438).

Diagnosis: Occiput with strong ‘∩’ shaped carina placed about half way down to foramen; eye superficially bare; antenna 13-segmented with two anelli and six funicular segments in both sexes; flagellum rather slender; flagellum clavate in female; usually less conspicuously clavate in male; pronotal collar weakly and irregularly margined or immargined; notauli incomplete posteriorly; metacoxa bare dorso-basally; propodeum with subglobose reticulate nucha; median area delimited by sinuate plicae, mostly with distinct median carina; petiole highly transverse and supported ventrally by flange like extension of anterior margin of first gastral sternum; basal cell usually bare, marginal vein uniformly slender and marginal fringe present.

Distribution: Known from all continents.

Biology: Gregarious parasites in cocoons and pupae of various moths, in puparia of some Diptera, less frequently in eggs sacs of spiders, cells of some Pompilidae. Sometimes hyperparasites emerging from tachnid puparia or from cocoons of hymenopterous primary parasites.

Key to the Kerala species *Trichomalopsis* Crawford

1. Lower margin of clypeus incised medially; head in dorsal view thick; occipital carina strongly curved medially (Plate 31, Fig. c).....
.....*T. apanteloctena* (Crawford)

- Lower margin of clypeus only weakly emarginated; head not much thick in dorsal view; occipital carina not strongly curved medially as above..... 2
- 2. (1) Lower margin of face on either side of clypeus curved and projected below level of lower margin of clypeus; head 1.9-2× as broad as long; flagellum in female stout (Plate 31, Fig. d).....
..... *T. deplanata* Kamijo & Grissell
- Lower margin of face not projecting below level of lower margin of clypeus; head 2-2.1× as broad as long; flagellum not stout as above.....3
- 3. (2) Gastral petiole almost as long as nucha, weakly sculptured; propodeum with post spiracular sulcus without transverse ridge; legs with coxae not concolorous with mesosoma, yellowish brown or brownish yellow.....4
- Gastral petiole strongly transverse and sculptured; post spiracular sulcus with a distinct transverse ridge; legs with coxae mostly concolorous with mesosoma.....5
- 4. (3) Pronotal collar weakly and irregularly margined or immargined; scape 0.9× eye length; pedicel plus flagellum almost about as long as head width; T1 of gaster reaching only little more than one third length; temple length 0.5× eye length; head and mesosoma greenish black with metallic reflection; antennae paler (Plate 31, Fig. b).....
.....*T. acarinata* Sureshsn & Narendran
- Pronotal collar weakly but sharply margined except at sides; scape as long as eye; pedicel plus flagellum 0.84× as long as head width; T1 reaching almost half length of gaster; temple length 0.4× eye length,

- length; head and mesosoma black with little reflection; antennae darker (Plate 31, Fig. f).....*T. nigra* Sureshan & Narendran
5. (3) Gaster oval; ovipositor sheaths strongly protruded out; head in dorsal view with temples rounded; median area of propodeum broad 1.3× as broad as long; plicae not very sharp.....
.....*T. ovigastra* Sureshan & Narendran
- Gaster more elongated; ovipositor sheaths not strongly protruded out as above; head in dorsal view with temples not much rounded; median area of propodeum less broad, 1.1×-1.2× as broad as long; plicae more sharp.....6
6. (5) Propodeum with plicae very sharp reaching up to tip of nucha; nucha more constricted; median carina strong; T1 of gaster reaching only upto one third length; head in dorsal view with temples short length 0.5× eye length; pronotal collar irregularly margined (Plate 32, Fig. a).....*T. thekkadiensis* Sureshan & Narendran
- Propodeum with plicae not sharp as above, at least slightly incomplete towards the end of nucha; median carina not very strong; T1 occupying little beyond or before half length of gaster; temples longer, 0.7× as long as eye; pronotal collar weakly but more regularly margined.....7
7. (6) Gaster 1.8× as long as broad and longer than mesosoma; T1 occupying little less than half length with only slight metallic blue reflection dorsally; nucha less convex in profile; scape little shorter than eye (0.9×) (Plate 32, Fig. b).....
.....*T. travencorensis* Sureshan & Narendran

- Gaster 1.6× as long as broad and as long as mesosoma; T1 occupying little beyond with bright metallic blue reflection dorsally; nucha more convex in profile; scape as long as eye (Plate 31, Fig. e)..... *T. neelagastra* Sureshan & Narendran

90. *Trichomalopsis acarinata* Sureshan & Narendran

(Plate 31, Fig. b)

2001c. *Trichomalopsis acarinata* Sureshan & Narendran, *J. Bombay Nat. Hist. Soc.* 98 (3): 401-402 (ZSIK).

Diagnosis: Length 1.3–2.1 mm. Head and mesosoma dark green; gaster dark brown; antennae dark brown with scape yellowish brown; POL 1.3× OOL; temple length half of eye length; clypeus striated, anterior margin of weakly emarginate; pedicel plus flagellum almost equal to head width; pronotal collar weakly margined or immargined; propodeum with median carina weak, plicae not sharp; petiole almost as long as nucha; T1 of gaster occupying little more than one third length.

Materials Examined: 1 female, INDIA, Kerala, Calicut, Areekkad, 4.ii.2015, ZSIK.reg.no.IR/INV/6538, coll. Raseena Farsana; 5 females, INDIA, Kerala, Calicut, Westhill Beach, 19.xii.2014, ZSIK.reg.no.IR/INV/7047, coll. Sheeja & Kumar; 3 females, INDIA, Kerala, Kottayam, Kozha Seed Farm, 27.iv.2016, ZSIK.reg.no.IR/INV/9303, coll. Raseena Farsana; 1 female, INDIA, Kerala, Kottayam, Changanassery, 25.i.2013, ZSIK.reg.no.IR/INV/9109, coll. Rajesh

Distribution: India: Kerala

Remarks: Collected from agroecosystem (paddy and mixed vegetables).

91. *Trichomalopsis apanteloctena* (Crawford)

(Plate 31, Fig. c)

1911a. *Trichomalopsis apanteloctena* Crawford, *Proc. U.S.Natn. Mus.* 39: 618.

1919. *Eupteromalus parnarae* Gahan, *Proc. U. S. Natn. Mus.* 56: 522. Synonymised by Kamio & Grissell, 1982.

Diagnosis: Length 1.6–2.5mm. Lower margin of clypeus rather deeply incised medially; striation of clypeus extending to lower margin of eyes and to malar sulcus; head thick, occipital carina sharp in postero-dorsal view, strongly curved medially; pronotal collar indistinctly margined; scutellum with frenal furrow usually distinct; forewing with MV 1.55- 2.1× as long as STV; gaster 1.7–2× as long as broad.

Materials Examined: 1 female, INDIA, Kerala, Kasragod, Beminja, 11.i.2013, ZSIK.reg.no.IR/INV/4581, coll. Ranjith A P, 11 females, INDIA, Kerala, Calicut, Nechooli, 8.iii.2016, ZSIK.reg.no.IR/INV/6836, coll. Raseena Farsana; 1 female, INDIA, Kerala, Kannur, Kaitheel, 11.viii.2015, ZSIK.reg.no.IR/INV/7273, coll. Rajesh; 5 Females, INDIA: Kerala, Idukki, Kolukkumala, 7.iv.2016, ZSI/WGRC/IR.INV.9273, coll. Ranjit A P; 8 females, INDIA, Kerala, Kasragod, Beminja, 16.i.2013, ZSIK.reg.no.IR/INV/9093, coll. Ranjith A P; 7 females, INDIA, Kerala, Kannur, Kaiveli, 29.xi.2013, ZSIK.reg.no.IR/INV/9094, coll. Rajesh; 1 female, INDIA, Kerala, Malappuram, Kalachal, 12.iv.2013, ZSIK.reg.no.IR/INV/9095, coll. Rajesh; 7 females & 5 males, INDIA, Kerala, Trivandrum, Kadakkavoor, 23.i.2013, ZSIK.reg.no.IR/INV /9096, coll. Rajesh; 1 female, INDIA, Kerala, Alappuzha, Kainakari, 5.ii.2013, ZSIK.reg.no.IR/INV/9097, coll. Ranjith A P; 9 females, INDIA, Kerala, Kottayam, Chnganassery, 25.i.2013, ZSIK.reg.no.IR/INV/9115, coll. Rajesh; 2 females, INDIA, Kerala, Trivandrum, Amaravila, 23.i.2013, ZSIK.reg.no.IR/INV/9116, coll. Ranjith; 1 female, INDIA, Kerala, Kollam, Kundara, 23.i.2013, ZSIK.reg.no.IR/INV/9118, coll. Ranjith; 2 females, INDIA, Kerala, Kollam,

Thuruthikkara, 7.iii.2014, ZSIK.reg.no.IR/INV/9115, coll. Ranjith; 1 female, INDIA, Kerala, Pathanamthitta, Thiruvalla, 6.ii.2013, ZSIK.reg.no.IR/INV/9119, coll. Rajesh; 1 female, INDIA, Kerala, Pathanamthitta, Perumthuruthy, 6.ii.2013, ZSIK.reg.no.IR/INV/9120, coll. Ranjith; 6 females, INDIA, Kerala, Ernakulam, Mulamthuruthy, 26.i.2013, ZSIK.reg.no.IR/INV/9121, coll. Rajesh

Distribution: India: Kerala, Andra Pradesh, Bihar, Karnataka, Meghalaya, Orissa, Tamil Nadu, West Bengal; Bangladesh, Japan; Korea; Malaysia; People's Republic of China; Philippines; Russia; Taiwan; Vietnam.

Remarks: Collected from agroecosystem (paddy and tea).

92. *Trichomalopsis deplanata* Kamijo & Grissell

(Plate 31, Fig. d)

1982. *Trichomalopsis deplanata* Kamijo & Grissell, *Kontyu*, 50 (1): 84-86.

Diagnosis: Length 1.5–2.4mm. Body bluish green; antennae brown with scape and pedicel yellowish brown; lower margin of face on either side of clypeus curved or projecting below lower margin of clypeus; anterior margin of clypeus weakly emarginate; antennal flagellum stout; POL 1.1-1.2× OOL; pronotal collar not margined anteriorly; propodeum with median carina not so strong, plicae sharp throughout; callus moderately hairy; gaster ovate, about as long as mesosoma, 1.3–1.4× as long as broad; petiole strongly transverse.

Materials Examined: 1 female, INDIA, Kerala, Kasragod, Beminja 11.i.2013, ZSIK.reg.no.IR/INV/4582, coll. Ranjith A P, 1female, INDIA, Kerala, Ernakulam, Thattekkad, Urulanthanni, 6.i.2015, ZSIK.reg.no.IR/INV/7057, coll. Sureshan;

Distribution: India: Kerala, Tamil Nadu, West Bengal; Japan; Korea; People's Republic of China; Russia.

Remarks: Collected from agroecosystem (paddy) and forest.

93. *Trichomalopsis neelagastra* Sureshan & Narendran

(Plate 31, Fig. e)

2001c. *Trichomalopsis neelagastra* Sureshan & Narendran, *J. Bombay Nat. Hist. Soc.* 98 (3): 404. (ZSIK).

Diagnosis: Length 2-2.4mm. Head and mesosoma dark bluish green with bronzy tinge; gaster dark bluish green; T1 with strong metallic blue reflection; head moderately reticulate, in dorsal view width $2\times$ length; temple length $0.7\times$ eye length; POL $1.5\times$ OOL; antennal scape as long as eye, reaching level of vertex; propodeum with median carina weak; nucha convex, forewing with MV $1.8\times$ STV and $1.5\times$ PMV; gaster ovate, as long as mesosoma, $1.7\times$ as long as broad; T1 Occupying $0.54\times$ length of gaster.

Materials Examined: 5 females, INDIA, Kerala, Calicut, Nechooli, 2.iii.2016, ZSIK.reg.no.IR/INV/6928, coll. Raseena Farsana; 1 female, INDIA, Kerala, Palakkad, Pattambi, RARS, 9.iii.2015, ZSIK.reg.no.IR/INV/6836, coll. Ranjith A.P, 1 female, INDIA, Kerala, Ernakulam, Kuttippuzha, 15.v.2015, ZSIK.reg.no.IR/INV/7032, coll. Raseena Farsana; 1 female, INDIA, Kerala, Kannur, Kaiveli, 30.vi.2015, ZSIK.reg.no.IR/INV/7274, coll. Rajesh; 2 females, INDIA, Kerala, Idukki, Kolukkumala, 7.iv.2016, ZSIK.reg.no.IR/INV/9276, coll. Ranjit A P; 1 female, INDIA, Kerala, Kottayam, Changanassery, 25.i.2013, ZSIK.reg.no.IR/INV/9110, coll. Rajesh; 1 female, INDIA, Kerala, Trivandrm, Kadakkavoor, 23.i.2013, ZSIK.reg.no.IR/INV/9112, coll. Rajesh

Distribution: India: Kerala, Karnataka

Remarks: Collected from agroecosystem (paddy and tea).

94. *Trichomalopsis nigra* Sureshan & Narendran

(Plate 31, Fig. f)

2001c. *Trichomalopsis nigra* Sureshan & Narendran, *J. Bombay Nat. Hist. Soc.* 98 (3): 400-401 (ZSIK).

Diagnosis: Length 1.5–2mm. Black to bluish black with slight metallic reflection; antennae dark brown with scape paler; clypeus anteriorly weakly emarginated; striate; combined length of pedicel plus flagellum $0.84\times$ head width; clava a little shorter than three preceding segments combined; temple length $0.4\times$ eye length; POL $1.3\times$ OOL; pronotal collar weakly but sharply margined except on sides; scutellum convex, longer than mesosoma; propodeum with median carina weak, plicae not sharp; petiole as long as nucha, gaster shorter than mesosoma; T1 occupying almost half length.

Materials Examined: 1 female, INDIA, Kerala, Kozhikode, Nechooli, 2.iii.2016, ZSIK.reg.no.IR/INV/9304, coll. Raseena Farsana; 1 male, INDIA, Kerala, Trivandrm, Amaravila, 23.i.2013, ZSIK.reg.no.IR/INV/9106, coll. Ranjith; 1 females, INDIA, Kerala, Kollam, Thuruthikkara, 7.iii.2014, ZSIK.reg.no.IR/INV/9107, coll. Ranjith; 2 females, INDIA, Kerala, Kottayam, Changanassery, 25.i.2013, ZSIK.reg.no.IR/INV/9108, coll. Rajesh; 3 females, INDIA, Kerala, Trivandrm, Kadakkavoor, 23.i.2013, ZSIK.reg.no.IR/INV/9111, coll. Rajesh; 1 female, INDIA, Kerala, Pathanamthitta, Thiruvalla, 6.ii.2013, ZSIK.reg.no.IR/INV/9112, coll. Rajesh

Distribution: India: Kerala

Remarks: Collected from agroecosystem (paddy).

95. *Trichomalopsis thekkadiensis* Sureshan & Narendran

(Plate 32, Fig. a)

2001c. *Trichomalopsis thekkadiensis* Sureshan & Narendran, *J. Bombay Nat. Hst. Soc.* 98 (3): 398-399 (ZSIK).

Diagnosis: Length 1.6–2.7mm. Body bluish green with metallic reflection; antennae pale brown with scape and pedicel testaceous; POL 1.3× OOL; temple length 0.5× eye length; anterior margin of clypeus weakly emarginated, striated, striae extending near lower margin of eyes; pronotal collar irregularly margined; mesosoma raised reticulate; propodeum with median carina distinct, nucha highly constricted, gaster length 1.6× width, slightly longer than mesosoma.

Materials Examined: 2 females, INDIA, Kerala, Alappuzha, Kainakari, 5.ii.2013, ZSIK.reg.no.IR/INV/4496, coll. Ranjith A P; 24 females, INDIA, Kerala, Kasragod, Beminja, 11.i.2013, ZSIK.reg.no.IR/INV/4583, coll. Ranjith A P; 5 females & 2males, INDIA, Kerala, Calicut, Nechooli, 2.iii.2016, ZSIK.reg.no.IR/INV/6929, coll. Raseena Farsana; 2 females, INDIA, Kerala, Palakkad, Pattambi, RARS, 9.iii.2015, ZSIK.reg.no.IR/INV/6836, coll. Ranjith A.P; 3 females, INDIA, Kerala, Westhill Beach, 19.xii.2014, ZSIK.reg.no.IR/INV/7048, coll. Sheeja&Kumar; 2 females, INDIA, Kerala, Kannur, Keezhara, 30.vi.2015, ZSIK.reg.no.IR/INV/7271, coll.Rajesh; 3 females, INDIA, Kerala, Kannur, Munderikkadav, 6.vi.2015, ZSIK.reg.no.IR/INV/7276, coll.Rajesh; 1 female, INDIA, Kerala, Kannur, Kaiveli, 3.ix.2015, ZSIK.reg.no.IR/INV/7277, coll.Rajesh; 2 females, INDIA, Kerala, Kannur, Keezhara, 30.vi.2015, ZSIK.reg.no.IR/INV/7567, coll.Rajesh; 2 females, INDIA, Kerala, Kannur, Munderikkadavu, 6.vi.2015, ZSIK.reg.no.IR/INV/7568, coll.Rajesh; 2 females, INDIA, Kerala, Kannur, Periyadu, 23.vii.2015, ZSIK.reg.no.IR/INV/7569, coll.Rajesh; 9 Females & 2 Males, INDIA: Kerala, Idukki, Kolukkumala, 7.iv.2016,

ZSIK.reg.no.IR/INV/9275, coll. Ranjit A P; 8 females & 6 males, INDIA, Kerala, Kottayam, Changanassery, 25.i.2013, ZSIK.reg.no.IR/INV/9089, coll. Rajesh; 9 females, INDIA, Kerala, Trivandrum, Amaravila, 23.i.2013, ZSIK.reg.no.IR/INV/9090, coll. Rajesh; 6 females, INDIA, Kerala, Pathanamthitta, Perumthuruthi, 6.ii.2013, ZSIK.reg.no.IR/INV/9091, coll. Ranjith A P; 15 females & 4 males, INDIA, Kerala, Trivandrum, Kadakkavoor, 23.i.2013, ZSIK.reg.no.IR/INV/9098, coll. Rajesh; 6 females, INDIA, Kerala, Kollam, Kundara, 23.i.2013, ZSIK.reg.no.IR/INV/9099, coll. Ranjith A P; 5 females, INDIA, Kerala, Kollam, Thuruthikkara, 7.iii.2014, ZSIK.reg.no.IR/INV/9100, coll. Ranjith A P; 1 female, INDIA, Kerala, Kottayam, Perunna, 8.xi.2012, ZSIK.reg.no.IR/INV/9101, coll. Rajesh; 1 female, INDIA, Kerala, Palakkad, Pattambi, 8.i.2014, ZSIK.reg.no.IR/INV/9102, coll. Ranjith; 1 female, INDIA, Kerala, Malappuram, Valancheri, 27.iii.2013, ZSIK.reg.no.IR/INV/9103, coll. Rajesh; 3 females, INDIA, Kerala, Ernakulam, Mulamthurythy, 26.i.2013, ZSIK.reg.no.IR/INV/9104, coll. Rajesh; 3 females, INDIA, Kerala, Pathanamthitta, Thiruvalla, 6.ii.2013, ZSIK.reg.no.IR/INV/9105, coll. Rajesh.

Distribution: India: Kerala, Tamil Nadu

Remarks: Collected from agroecosystem (paddy and tea)

96. *Trichomalopsis travancorensis* Sureshan & Narendran

(Plate 32, Fig. b)

2001c. *Trichomalopsis travancorensis* Sureshan & Narendran, *J. Bomb. Nat. Soc.* 98 (3): 404 (ZSIK).

Diagnosis: Length 1.6- 2.3mm. Head and mesosoma dark green with bronzy reflection; gaster brown with bluish reflection dorsally; antennae brown with scape testaceous basally; POL 1.4× OOL; temple length 0.7× eye length;

antennal scape length $0.9\times$ eye length; pronotal collar sharply margined; scutellum with frenal area distinct; propodeum with median carina weak; nucha moderately convex; forewing with basal cell and basal vein bare; MV $1.9\times$ STV; gaster ovate, elongate, length $1.8\times$ width, longer than mesosoma; petiole strongly transverse.

Materials Examined: 1 female, INDIA, Kerala, Trissur, Ottapilav 16.x.2013, ZSIK.reg. no.IR/INV/4584, coll. Ranjith A P, 1 female, INDIA, Kerala, Kannur, Keezhara, 11.viii.2015, ZSIK.reg.no.IR/INV/7272, coll.Rajesh; 1 female, INDIA, Kerala, Kannur, Kaiveli, 3.ix.2015, ZSIK.reg.no.IR/INV/7275, coll.Rajesh; 1 female, INDIA, Kerala, Trissur, Mangalassery, 16.vi.2015, ZSIK.reg.no.IR/INV/7565, coll.Rajesh; 4 females, INDIA: Kerala, Idukki, Kolukkumala, 7.iv.2016, ZSIK.reg.no.IR/INV/9274, coll. Ranjit A P; 6 females, INDIA, Kerala, Trivandrum, Amaravila, 23.i.2013, ZSIK.reg.no.IR/INV/9122, coll. Ranjith; 1 female, INDIA, Kerala, Ernakulam, Mulamthuruthy, 26.i.2013, ZSIK.reg.no.IR/INV/9123, coll. Rajesh; 5 females, INDIA, Kerala, Kottayam, Changanassery, 25.i.2013, ZSIK.reg.no.IR/INV/9124, coll. Rajesh; 1 female, INDIA, Kerala, Kollam, Kundara, 23.i.2013, ZSIK.reg.no.IR/INV/9125, coll. Ranjith; 1 female, INDIA, Kerala, Pathanamthitta, Thiruvalla, 6.ii.2013, ZSIK.reg.no.IR/INV/9126, coll. Rajesh; 4 females, INDIA, Kerala, Kollam, Thuruthikkara, 7.iii.2013, ZSIK.reg.no.IR/INV/9127, coll. Ranjith; 5 females, INDIA, Kerala, Trivandrum, Kadakkavoor, 23.i.2013, ZSIK.reg.no.IR/INV/9128, coll. Rajesh

Distribution: India: Kerala

Remarks: Collected from agroecosystem (paddy).

***Trichomalus* Thomson**

1878. *Trichomalus* Thomson, *Hym. Scand.* 5: 134, Type species: *Trichomalus punctinucha* Thomson by designation of Ashmead. 1904. (As subgenus of *Isocyrtus*).
1953. *Lanceosoma* Erdös. *Acta. Biol. Hung.* 4: 234-235. Type species: *Lanceosoma athaceae* Erdös by monotypy and original designation.

Diagnosis: Flagellum with two anelli and six funicular segments; pronotal collar margined with sharp carina; propodeum with complete plicae and with panels of the median area very shiny, smooth or having only traces of weak sculpture; spiracular sulci distinctly impressed; sides of propodeum and T1 of gaster with tuft of white hairs.

Distribution: India, Pakistan, Myanmar; Europe, America.

Biology: Parasites of Diptera, eg: Chloropidae in stems of Graminaea and small Curculionidae (Coleoptera) in herbaceous plants.

97. *Trichomalus kannurensis* Sureshan & Narendran

(Plate 32, Fig. c)

1994b. *Trichomalus kannurensis* Sureshan & Narendran, *Hexapoda*, 6 (2): 60-61. (ZSIK).

Diagnosis: Length 1.7–2.1mm. Body dark green with slight bronzy tinge; gaster brown with greenish tinge. POL 1.2× OOL; temple length 0.53× eye length; anterior margin of clypeus almost straight; antennal scape reaching level of vertex; propodeum with median carina not reaching beyond costula; forewing length 2.6× width; gaster longer than head plus mesosoma combined.

Materials Examined: 1 female, INDIA, Kerala, Ernakulam, Kolencheri, 21.xi.2014, ZSIK.reg.no.IR/INV/4760, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Kakkayam, 30.xii.2014, ZSIK.reg.no.IR/INV/7050, coll. Sureshan; 2 females, INDIA, Kerala, Calicut, Chathmangalam, 8.iii.2016,

ZSIK.reg.no.IR/INV/9317, coll. Raseena Farsana; 1 female, INDIA, Kerala, Palakkad, Pattambi, RARS, 8.iii.2015, ZSIK.reg.no.IR /INV/9318, coll. Ranjith A P.

Distribution: India: Kerala

Remarks: Collected from agroecosystem and forest (paddy and mixed vegetables).

***Trigonoderus* Westwood**

1832b. *Trigonoderus* Westwood, *Lond. Edinb. Dubl. Phil. Mag.* (3):1; 127. Type species: *Trigonoderus princeps* Westwood, by monotypy

Diagnosis: Head quadrate or ovate in anterior view; clypeus with a median round tooth anteriorly; anterior tenetorial pits distinct; genal region coriaceous, smooth or faintly reticulate; vertex with raised reticulation or alveolate; antenna with two anelli and six funicular segments; pronotal collar with an anterior cross carina; prepectus with posterior margin set off by carina; propodeum with median carina; forewing without speculum..

Distribution: Palearctic and Oriental regions.

Biology: Parasitic on larvae of wood boring coleopteran families Anobiidae, Cerambycidae, Scolytidae

Key to the Kerala species of *Trigonoderus* Westwood

1. Forewing with two brown macula; hind margin of T1, T2 & T3 incised in the middle (Plate 33, Fig. a-g).....*T. periyarensis* sp. nov
- Forewing without brown macula; hind margin of T1 incised in the middle, T2 & T3 straight.....*T. pulcher* Walker

99. *Trigonoderus periyarensis* sp. nov.

(Plate 33, Fig. a-g)

Female: Length 5.85mm. Head and mesosoma greenish black, gaster blackish brown with bluish tinge on sides of T1-T4 and greenish tinge on T5; antenna black except pedicel brown, scape and apical half of clava testaceous, apical part of scape with metallic blue refringence; coxae concolourous with body, tibia brown with apex and basal tips pale yellow, femur brown except basal tip, first tarsal segment white, remaining brown; forewing hyaline with two brown macula, one dark brown below STV and a pale brown at the discal end.

Head: Punctate reticulate with long white pubescence; clypeus smooth and shiny with a broad, round tooth apically. In front view head width $1.36\times$ height; malar groove distinct, gena smooth and raised; malar space $0.34\times$ eye length; eye height $1.37\times$ width in profile; scrob like shallow pit; in dorsal view head width $2.27\times$ as broad as long; POL $1.2\times$ OOL, temple $0.23\times$ eye length. Antennae inserted above lower margin of eyes, scape $0.69\times$ eye length and not reaching median ocellus, pedicel plus flagellum $1.31\times$ as long as head width, pedicel $1.63\times$ as long as wide and $0.44\times$ as long as F1, anelli two, second anellus longer than first. Relative length, scape 0.5, pedicel 0.15, F1 0.34, F2 0.27, F3 0.25, F4 0.25, F5 0.22, F6 0.2, clava 0.41; clava as long as two preceding segments combined; three rows of sensillae on each segment.

Mesosoma: Pronotum moderately reticulate without a cross carina. Mesoscutum $1.62\times$ as broad as long, raised reticulate with white pubescence, notauli deep and complete; axillae moderately reticulate with long white setae on lower margin. Scutellum almost as broad as long and moderately reticulate; frenal groove distinct; dorsellum broad and shiny; metanotum broad and shiny. Propodeum $3.4\times$ as wide as long medially, median area raised and smooth, median carina present, plicae indicated in the posterior

half which joins with a diverging submedian carina, spiracles bean shaped separated from posterior margin of metanotum by a distance as long as diameter of spiracle; callus with dense white pubescence. Prepectus broad and moderately reticulate with white hairs. Upper mesepimeron smooth, lower mesepimeron engraved reticulate, mesepisternum moderately reticulate with long white hair, metapleuron engraved reticulate. Forewing $2.7\times$ as long as broad, discal pubescence dense, speculum very narrow, basal cell hairy, basal hair line curving towards apical side; marginal fringe very small, relative lengths SMV 1.84, MV 0.8, PMV 1.34, STV 0.3. Hind coxae engraved reticulate with long white setae, hind tibia with two equal spurs.

Metasoma: Gaster sessile, $1.19\times$ head plus mesosoma combined; T1 deeply incised in the middle, T2 and T3 slightly incised in the middle; relative lengths of tergites T1 0.32, T2 0.29, T3 0.32, T4 0.46, T5 0.54, T6 0.68.

Materials Examined: Holotype: Female, India: Kerala, Idukki, Periyar Tiger Reserve, Manalar, 7.iv.2012, Rajmohana, Reg.No. ZSIK.reg.no.IR/INV/9598; Paratype: 1 Female, India: Kerala, Idukki, Kambiliparashola, 23.v.2014, P.M. Sureshan, Reg.No. ZSIK.reg.no.IR/INV/9597.

Host: Unknown.

Remarks: Both holotype and paratype were collected from forest. This species closely resembles *Trigonoderus keesi* Narendran (described from North Vietnam) but differs in having head and mesosoma greenish black; forewing with two macula; head in front view width $1.36\times$ height; POL $1.2\times$ OOL; scape not reaching anterior ocellus; sensillae in three rows on each funicular segment; pronotal collar without cross carina; hind tibia with two equal apical spurs; T1 deeply incised in the middle, T2 and T3 slightly incised in the middle (in *T. keesi* Narendran head and mesosoma metallic blue; forewing with one macula; head in front view width $1.8\times$ height; POL equal

to OOL; scape reaching anterior ocellus; sensillae in four rows on each funicular segment; pronotal collar with cross carina; hind tibia with two unequal apical spurs; T1 incised in the middle, T2 & T3 not incised in the middle)

Etymology: The species name derives from collection locality.

Genus *Uniclypea* Bouček

1976. *Uniclypea* Bouček, *J. Ent. Soc. S. Africa* 39: 27-28, Type species: *Uniclypea conica* Bouček, by original designation.

Diagnosis: Gaster conical; clypeus with one strong median tooth anteriorly; antennae in female with two anelli. Pronotal collar not carinate; notaular grooves complete, shallow posteriorly; scutellum with distinct frenal groove; propodeum with costula indicated, not well developed. Gaster with T1 small and thin, hind margin produced, but with median excision; similar excision on T2.

Distribution: India; Vietnam, Sumatra, Borneo, South Africa.

Biology: Parasites of beetles.

Key to the Kerala species of *Uniclypea* Bouček

1. Gaster slender, elongate, length 4.5× width and 1.2× as long as head plus mesosoma combined (Plate 32, Fig. d).....
.....*U. elongata* Sureshan & Narendran
- Gaster not slender, elongatedly ovate, length 2.8× width and as long as head plus mesosoma combined (Plate 34, Fig. a).....
.....*U. kumarani* Sureshan & Narendran

100. *Uniclypea kumarani* Sureshan & Narendran

(Plate 32, Fig. d)

1994b. *Uniclypea kumarani* Sureshan & Narendran, *Hexapoda* 6(2): 62-63. ZSIK.

Diagnosis: Length 2.9–3.7mm. Head and mesosoma black, gaster dark metallic blue almost black towards the tip; antennae testaceous with clava brown; head finely reticulate with small sparse pubescence; POL 1.5× OOL; clypeus longitudinally striated; antennae with pedicel little longer than F1; propodeum finely reticulate, median carina weak but distinct, forewing length 2.1× width with basal part bare; gaster as long as head plus mesosoma combined.

Materials Examined: 3 females, INDIA, Kerala, Palakkad, Silent valley, Sairandri, 20.ii.2013 .coll.P.M.Sureshan, ZSIK.reg.noIR/INV//2924. 1 female, INDIA, Kerala, Calicut, Kakkadampoyil, 19.i.2017, ZSIK.reg.no.IR/INV/8675, coll. Raseena Farsana.

Distribution: India: Kerala

Remarks: Collected from forest and agroecosystem (mixed crops) close to forest.

101. *Uniclypea elongata* Sureshan & Narendran

(Plate 34, Fig. a)

1997b. *Uniclypea elongata* Sureshan & Narendran, *Hexapoda*, 9 (1 & 2): 27-29 (ZSIK)

Diagnosis: Length 3.3-3.5mm. Head and mesosoma black; gaster dark metallic greenish blue, antenna testaceous with tip of clava dark; POL 1.2× OOL; notauli complete; frenum clearly marked off; propodeum with median area depressed, callus with a few long hairs; forewing with basal part bare, costal cell hairy on upper half; gaster 1.2× as long as head plus mesosoma combined.

Materials Examined: 1 female, INDIA, Kerala, Palakkad, Varadimala, 22.ii.2013, coll.P.M.Sureshan, ZSIK.reg.no.IR/INV//2925; 1 female, INDIA, Kerala, Calicut, Elathur, 19.vi.2014, coll. Athira, ZSIK.reg.no.IR/INV//9337;

Distribution: India: Kerala

Remarks: Collected from forest also emerged from mango leaf gall.

Subfamily: **SPALANGINAE**

Genus *Spalangia* Latreille

1805. *Spalangia* Latreille, *Hist. Nat. Crust. Ins.* 13: 227-228. Type species: *Spalangia nigra* Latreille, (by monotypy).

Diagnosis: Body black including antennae, coxae, femora and tibiae, often with metallic tinge; head almost subprognathous; tourli at extreme lower margin of head and lateral to clypeus on lobes, overhanging mouth,; occipital carina present and well developed; in female pedicellus longer than F1; upper face with median line of punctures in front of ocellus; scutellum flat or nearly so; frenum mostly well delimited by a cross- row of coarse punctures; head and mesosoma usually with deep piliferous punctures; forewing with costal cell very narrow, MV very long, PMV and STV very short; petiole usually long with longitudinal carinae.

Distribution: Cosmopolitan.

Biology: Primary parasitoids of Diptera.

Key to the Kerala species of *Spalangia* Latreille

1. Pronotum without an isolated cross-line in front of the hind margin (Plate 34, Fig. d)*S. parfuscipes* Ahmad
- Pronotum with an isolated cross-line in front of the hind margin.....

-2
2. Mesoscutum with distinct cross-line and a round fovea below it on disc (Plate 34, Fig. c)*S. simplex* Perkins
- Mesoscutum without a cross-line and fovea.....3
3. Pronotum including antero-lateral parts moderately punctate, without any triangular bare area; cross-line at the hind margin of pronotum slightly angulate medially (Plate 34, Fig. b).....
-*S. impunctata* Howard
- Pronotum including antero-lateral parts rugulosely punctate except a triangular bare area medially, cross-line at the hind margin of pronotum straight.....*S. gemina* Bouček

102. *Spalangia impunctata* Howard

(Plate 34, Fig. b)

1897. *Spalangia impunctata* Howard, *Journal of the Linnean Society (Zool.)* 26:140-141.

Diagnosis: Length 1.6mm. Body black; head smooth scattered fine piliferous punctures; POL 1.9× OOL; antennal scape reticulately granulated; F1 almost as long as wide; clava slightly longer than three preceding segments combined; scutellum flat, almost completely smooth, sublaterally with traces of effaced frenal cross line; propodeum almost completely smooth, no median carina; plicae indistinct; STV slightly longer than PMV, SMV 1.5× MV; gastral petiole 1.5× as long as broad, distinctly punctate reticulate.

Materials Examined: 1female &1male, INDIA, Kerala, Malappuram, Feroke, 11.xii.2013, ZSIK. reg.no.IR/ INV/3224, coll. Raseena Farsana.

Distribution: India (**New Record**): Kerala; Antilles; Grenada; Hawaii; Philippines

Biology: Emerged from *Drosophila* puparia infested on putrified jack fruit.

103. *Spalangia simplex* Perkins

(Plate 34, Fig. c)

1910. *Spalangia simplex* Perkins, *Fauna Hawaiiensis*, 2: 657.

Diagnosis: Female: Length 1.4-2mm. Body black, Antennae with pedicel about 2.1-2.3× as long as apical width, F1 slightly longer than wide and subsequent segments quadrate or slightly transverse basally and increasingly and distinctly transverse apically, clava about 2.1-2.5× as long as wide; pronotum with distinct crenulated corss-line posteriorly, otherwise smooth and shiny; mesoscutal median lobe with a single median puncture posterior to transverse row of setiferous punctures; propodeum with distinct post-spiracular sulcus; gaster with petiole 1.8-2× as long as median width, distinctly microreticulate between longitudinal carinae.

Materials Examined: 6 females & 3 males, INDIA, Kerala, Malappuram, Feroke, 11.xii.2013, ZSIK.reg.no.IR/INV/3224, coll. Raseena Farsana; 1 female, INDIA, Kerala, Kozhikode, Mavoor, 13.ii.2014, ZSIK.reg.no.IR/INV/3960, coll. Swetha. M; 1 female, INDIA, Kerala, Kozhikode, Easthill, 23.x.2014, ZSIK.reg.no.IR/INV/4218, coll. G.Kumar; 1 female & 1 Male, Kerala, Kozhikode, Easthill, 20.iii.2015, ZSIK.reg.no.IR/INV/4363, coll. P.M.Sureshan; 1 female, INDIA, Kerala, Malappuram, Ponnani, 25.viii.2015, ZSIK.reg.no.IR/INV/5529, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Narayankulam, 13.i.2015, ZSIK.reg.no.IR/INV/6539, coll. Raseena Farsana; 1 female, INDIA, Kerala, Kakkayam, Ambhalappara, 30.xii.2015, ZSIK.reg.no. IR/INV/6675, coll. Rajmohana; 1 female, INDIA, Kerala, Calicut, Easthill, 31.viii.2014, ZSIK.reg.no.IR/INV/6791, coll. Raseena Farsana; 1 female, INDIA, Kerala, Kozhikode, Mayanad, 7.i.2014, ZSIK.reg.no.IR/INV/7001, coll. Swetha; 1

female, INDIA, Kerala, Calicut, Kakkadampoyil, 19.i.2017, ZSIK.reg.no.IR/INV/8678, coll. Raseena Farsana; 1 female, INDIA, Kerala, Calicut, Chalappuram, 29.xi.2013, ZSIK.reg.no.IR/INV/9283, coll. Shwetha M; 1 female, INDIA, Kerala, Idukki, Puthukkudi, 3.iv.2016, ZSIK.reg.no.IR/INV/9284, coll. Ranjit A P.

Distribution: India: Kerala (**New Record**), Tamil Nadu, Uttar Pradesh; Australia; Congo; Hawaii; Malaysia; People's Republic of China; South Africa; Uganda

Biology: Reported as emerged from *Drosophila* puparia infested on putrified jack fruit. They also collected from agroecosystem (Mixed vegetables, paddy, mixed crops and rubber) and forest by sweep net.

104. *Spalangia parfuscipes* Ahmad

(Plate 34, Fig. d)

1998. *Spalangia parfuscipes* Ahmad, *Shashpa*, 5(1): 10-11.

Diagnosis: Length 1.8-1.10mm. Body black with metallic gloss; head slightly longer than wide in facial view with fine piliferous punctures, widely spaced; gena smooth; malar groove indistinct; anterior margin of clypeus truncated; pronotum rounded off anteriorly; scutellum shiny, impunctate with frenal groove deep and complete; forewing basally setose; petiole slightly more than 1.5× as long as wide with seven longitudinal carinae.

Materials Examined: 1female, India, Kerala, Kannur, Madayippara, 20.x.2016, ZSIK.reg.no.IR/INV/9476, coll. Raseena Farsana

Distribution: India: Kerala (**New record**), Uttar Pradesh

Remarks: Collected from agroecosystem.

4.3 PTEROMALIDAE IN AGROECOSYSTEMS OF KERALA

A total of 693 specimens were collected from 68 different agroecosystems belonging to all 14 districts of Kerala (Table 1 & Table 2). Agroecosystems explored for collection include paddy fields, vegetable gardens, mixed crops, tea, cardamom, teak, nutmeg, cashew, cocoa and rubber. 83 species belonging to 38 genera and nine subfamilies were collected from these localities, of which eight species are new to science and have described in this work under taxonomy section. New species described are *Stictomischus malabarensis* sp. nov., *Systasis calicutensis* sp. nov., *Merismomorpha micropetiolata* sp. nov. collected from mixed crops, *Panstenon minutus* sp. nov., *Systasis palakkadensis* sp. nov., *Panstenon flavogastrus* sp. nov. collected from paddy fields and *Panstenon nigrogastrus* sp. nov., *Lyubana indica* sp. nov. collected from mixed vegetables.

A total of 32 species under 16 genera were collected from paddy fields. Among them, the most predominant genera are *Trichomalopsis* Crawford and *Propicroscytus* Szelenyi. This is followed by *Callitula* Spinola, *Notoglyptus* Masi, *Systasis* Walker, *Panstenon* Walker, *Dinarmus* Thomson, *Pteromalus* Swederus, *Trichomalus* Thomson and *Herbertia* Howard. The genera which are found rare in paddy fields include *Sphegigaster* Spinola, *Chloroscytus* Graham, *Psilocera* Walker, *Merismomorpha* Girault and *Spalangia* Latrielle. 60 species under 33 genera were collected from mixed crops and mixed vegetable fields. Probably the variety in crops and associated pest species are the reasons for more diversity in parasitoids in agroecosystems with mixed crops (Table 2). The genera *Dipara* Walker and *Netomocera* Bouček were comparatively more collected from the crop fields with more leaf litter like Nutmeg, Cocoa, Cardomom and Teak. They are probably parasites of hosts associated with leaf litter. The study shows much variation in number and diversity of Pteromalid

species collected from organic and inorganic agroecosystems. Use of pesticides and lack of hosts may be the reasons for less number of Pteromalid parasitoids and even a single specimen was not collected from some agricultural fields like Coffee and Tea.

Some species of Pteromalidae were reared and collected from stored products infested with various insect pests. Biological control by using natural enemies is one of the effective methods to control stored product insect pests. In the present work *Cerocephala dinoderi* Gahan has been reported for first time from Kerala. The specimens were emerged from stored products such as rice and green gram along with pest species *Sitophilus* sp. (Order: Coleoptera) and *Dinoderus* sp. (Order: Coleoptera) respectively. *Anisopteromalus calandrae* (Howard) is one of useful Pteromalid parasitoid and in the present work the specimens of which were emerged from Bengal gram (*Cicer arietinum*) along with their host *Callosobruchus* sp. The host material was collected from a super market in Calicut and 98 females and 66 males were emerged. *Dinarmus basalis* (Rondani) (22♀ & 25♂), *Dinarmus vagabundus* (Timberlake) (8♀ & 3♂) and *Anisopteromalus calandrae* (Howard) (2♀ & 1♂) were together emerged from Bengal gram collected from another locality. It was heavily infested with *Sitophilus* sp. and *Callosobruchus* sp.

Attempts were also made to collect specimens by host rearing method. *Spalangia simplex* Perkins and *S. impunctata* Howard were emerged from the pupae of *Drosophila* sp. breeding in the decayed tender jack fruits (*Artocarpus heterophyllus*). It was a new distributional and host records for these species (Sureshan and Raseena, 2014). The genus *Platecrizotes* Ferrière were first time recorded from India with a new species *Platecrizotes keralensis* Sureshan and Raseena. This species was reared from the host infested plant material, putrefied bitter gourd, collected from mixed vegetable field (Sureshan & Raseena, 2015). Five other species such as *Toxeumorpha*

minuta Sureshan & Narendran, *Propicroscytus mirificus* (Girault)
Pachycrepoideus veeranai Narendran & Anil, *Halticopterella burwelli*
Sureshan and *Halticopterella robusta* Sureshan were also emerged along with
Platecrizotes keralensis from same host plant. *Pachycrepoideus veeranai*
Narendran was recorded for first time from Kerala. It was reported as a
hyperparasitoid of *Exorista sorbillans* Weid, uzifly, the notorious pest of silk
worm (Narendran & Anil, 1992). *Cephaleta brunniventris* Motschulsky was
reared from Pigeon pea plant infested with Coccidae (Homoptera). It also
emerged from mango leaf gall. The species *Uniclypea elongata* Sureshan &
Narendran was also emerged from mango leaf gall.

Table 1. LIST OF SPECIES OF PTEROMALIDAE ASSOCIATED WITH AGROECOSYSTEMS OF KERALA

Districts	Localities	Type of agroecosystem	Species collected
Kasargode	Periya	Mixed vegetables	<i>Systasis dalbergiae</i> Mani <i>Callitula anguloclypea</i> Sureshan <i>Callitula travancorensis</i> Sureshan <i>Dinarmus acutus</i> (Thomson) <i>Mesopolobus keralensis</i> Sureshan & Narendran <i>Sphегigaster brunneicornis</i> (Ferrière)
	Mavumgal	Cashew	<i>Dinarmus maculatus</i> (Masi) <i>Pteromalus semotus</i> (Walker)
	Beminja	Paddy	<i>Propicroscytus oryzae</i> (Subba Rao) <i>Trichomalopsis apanteloctena</i> (Crawford) <i>Trichomalopsis deplanata</i> Kamijo & Grissell <i>Trichomalopsis thekkadiensis</i> Sureshan & Narendran
Kannur	Madaayippara	Mixed vegetables	<i>Systasis dalbergiae</i> Mani <i>Systasis dasyneurae</i> Mani <i>Callitula anguloclypea</i> Sureshan <i>Callitula rugosa</i> (Waterston)

			<i>Chlorocytus indicus</i> Sureshan <i>Dinarmus maculatus</i> (Masi) <i>Spalangia parfuscipes</i> Ahmad
	Vellikeel	Paddy	<i>Propicroscytus mirificus</i> (Girault)
	Keezhara	Paddy	<i>Propicroscytus oryzae</i> (Subba Rao) <i>Trichomalopsis thekkadiensis</i> Sureshan & Narendran <i>Trichomalopsis travancorensis</i> Sureshan & Narendran
	Munderikkadavu	Paddy	<i>Propicroscytus oryzae</i> (Subba Rao) <i>Trichomalopsis thekkadiensis</i> Sureshan & Narendran
	Mullul	Paddy	<i>Propicroscytus oryzae</i> (Subba Rao)
	Chovva	Mixed vegetables	<i>Psilocera vinayaki</i> Sureshan & Narendran
	Kaitheel	Paddy	<i>Trichomalopsis apanteloctena</i> (Crawford)
	Kaiveli	Paddy	<i>Trichomalopsis apanteloctena</i> (Crawford) <i>Trichomalopsis neelagastra</i> Sureshan & Narendran <i>Trichomalopsis thekkadiensis</i> Sureshan & Narendran <i>Trichomalopsis travancorensis</i> Sureshan & Narendran
Wayanad	Kalladi	Cardamom	<i>Dipara intermedia</i> Sureshan &

Kozhikode			<p>Narendran <i>Dipara keralensis</i> Narendran <i>Dipara malabarensis</i> (Narendran & Mini) <i>Dipara miniae</i> Narendran & Sureshan <i>Psilocera heydoni</i> Sureshan <i>Pteromalus semotus</i> (Walker) <i>Syntomopus carinatus</i> Sureshan & Narendran</p>
	Panamaram	Paddy	<i>Propicroscytus oryzae</i> (Subba Rao)
	Kakkadampoyil	Mixed crops	<p><i>Dipara bouceki</i> (Narendran) <i>Dipara miniae</i> Narendran & Sureshan <i>Netomocera maculata</i> Raseena & Sureshan <i>Callitula anguloclypea</i> Sureshan <i>Callitula keralensis</i> Sureshan <i>Halticopterella burwelli</i> Sureshan <i>Stictomischus malabarensis</i> sp. nov. <i>Systasis calicutensis</i> sp. nov. <i>Pachyneuron leucopiscida</i> Mani <i>Propicroscytus mirificus</i> (Girault) <i>Pteromalus keralensis</i> Sureshan <i>Pycnetron keralaensis</i> sp.nov. <i>Sphegigaster reticulata</i> Sureshan & Narendran <i>Uniclypea kumarani</i> Sureshan &</p>

			Narendran <i>Spalangia simplex</i> Perkins
	Nechooli	Cocoa	<i>Dipara gastris</i> (Sureshan & Narendran) <i>Dipara miniae</i> Narendran & Sureshan <i>Dipara nigra</i> Sureshan
	Nechooli	Paddy	<i>Systasis dalbergiae</i> Mani <i>Callitula peethapada</i> Narendran and Mohana <i>Callitula travancorensis</i> Sureshan <i>Panstenon minutus</i> sp. nov. <i>Notoglyptus scutellaris</i> (Dodd & Girault) <i>Propicroscytus oryzae</i> (Subba Rao) <i>Trichomalopsis apanteloctena</i> (Crawford) <i>Trichomalopsis neelagastra</i> Sureshan & Narendran <i>Trichomalopsis nigra</i> Sureshan & Narendran <i>Trichomalopsis thekkadiensis</i> Sureshan & Narendran
	Chathamangalam	Mixed crops	<i>Dipara yercaudensis</i> Sureshan <i>Systasis dalbergiae</i> Mani <i>Callitula anguloclypea</i> Sureshan <i>Callitula peethapada</i> Narendran and

		<p>Mohana <i>Dinarmus acutus</i> (Thomson) <i>Notoglyptus scutellaris</i> (Dodd & Girault) <i>Propicroscytus oryzae</i> (Subba Rao) <i>Pteromalus keralensis</i> Sureshan <i>Sphigigaster brunneicornis</i> (Ferrière) <i>Trichomalus kannurensis</i> Sureshan & Narendran</p>
Annassery	Mixed vegetables	<p><i>Dipara yercaudensis</i> Sureshan <i>Systasis dalbergiae</i> Mani <i>Systasis dasyneurae</i> Mani <i>Dinarmus maculatus</i> (Masi) <i>Norbanus acuminatus</i> Dutt & Ferrière <i>Notoglyptus scutellaris</i> (Dodd & Girault)</p>
Vengeri	Mixed vegetables	<p><i>Cephaleta australiensis</i> (Howard) <i>Cephaleta brunniventris</i> Motschulsky <i>Systasis dalbergiae</i> Mani <i>Systasis dasyneurae</i> Mani <i>Anisopteromalus calandrae</i> (Howard) <i>Callitula anguloclypea</i> Sureshan <i>Callitula keralensis</i> Sureshan <i>Callitula peethapada</i> Narendran and Mohana <i>Callitula travancorensis</i> Sureshan <i>Dinarmus acutus</i> (Thomson)</p>

			<i>Dinarmus maculatus</i> (Masi) <i>Halticopterella burwelli</i> Sureshan <i>Halticopterella robusta</i> Sureshan <i>Mesopolobus keralensis</i> Sureshan & Narendran <i>Norbanus acuminatus</i> Dutt & Ferrière <i>Notoglyptus scutellaris</i> (Dodd & Girault) <i>Oxysychus coimbatorensis</i> (Ferrière) <i>Pachycrepoideus verannai</i> Narendran & Anil <i>Platecrizotes keralensis</i> Sureshan & Raseena <i>Propicroscytus mirificus</i> (Girault) <i>Psilocera vinayaki</i> Sureshan & Narendran <i>Pteromalus metallicus</i> Sureshan <i>Pteromalus semotus</i> (Walker) <i>Syntomopus rajamalaiensis</i> Sureshan & Narendran <i>Toxeumorpha minuta</i> Sureshan & Narendran
	Olavanna	Paddy	<i>Herbertia indica</i> Burks <i>Norbanus equus</i> Sureshan
	Narenkulam	Rubber	<i>Herbertia indica</i> Burks

			<i>Spalangia simplex</i> Perkins
	Payyoli	Mixed crops	<i>Systasis dasyneurae</i> Mani
	Chelannur	Mixed vegetables	<i>Callitula anguloclypea</i> Sureshan <i>Callitula peethapada</i> Narendran and Mohana <i>Callitula travancorensis</i> Sureshan <i>Chlorocytus indicus</i> Sureshan <i>Dinarmus acutus</i> (Thomson) <i>Dinarmus maculatus</i> (Masi) <i>Notoglyptus scutellaris</i> (Dodd & Girault) <i>Oxysychus coimbatorensis</i> (Ferrière) <i>Pachycrepoideus verannai</i> Narendran & Anil <i>Propicroscytus oryzae</i> (Subba Rao) <i>Psilocera vinayaki</i> Sureshan & Narendran <i>Pteromalus puparum</i> (Linnaeus) <i>Sphegigaster brunneicornis</i> (Ferrière)
	Mavoor	Paddy	<i>Callitula anguloclypea</i> Sureshan <i>Callitula peethapada</i> Narendran and Mohana <i>Dinarmus maculatus</i> (Masi) <i>Notoglyptus scutellaris</i> (Dodd & Girault) <i>Propicroscytus mirificus</i> (Girault) <i>Propicroscytus oryzae</i> (Subba Rao)

			<i>Spalangia simplex</i> Perkins
	Easthill	Mixed crops	<i>Merismomorpha micropetiolata</i> sp. nov.
	Feroke	Mixed vegetables	<i>Spalangia impunctata</i> Howard <i>Spalangia simplex</i> Perkins
Malappuram	Nilambur	Teak	<i>Dipara yercaudensis</i> Sureshan <i>Dinarmus maculatus</i> (Masi) <i>Pteromalus nigrus</i> Sureshan
	Ponnani	Mixed vegetables	<i>Metastenus concinnus</i> Walker <i>Pteromalus nigrus</i> Sureshan <i>Spalangia simplex</i> Perkins
	Thalappara	Mixed vegetables	<i>Propicroscytus oryzae</i> (Subba Rao)
	Kalachal	Paddy	<i>Propicroscytus oryzae</i> (Subba Rao) <i>Trichomalopsis apanteloctena</i> (Crawford)
	Valancheri	Paddy	<i>Trichomalopsis thekkadiensis</i> Sureshan & Narendran
Palakkad	Thathamangalam	Paddy	<i>Cephaleta brunniventris</i> Motschulsky <i>Callitula peethapada</i> Narendran and Mohana <i>Sphegigaster karnatakaensis</i> Sureshan
	Chittur	Paddy	<i>Herbertia indica</i> Burks <i>Systasis dasyneurae</i> Mani <i>Dinarmus maculatus</i> (Masi)

			<i>Pteromalus semotus</i> (Walker)
	Pattancheri	Paddy	<i>Systasis dalbergiae</i> Mani <i>Systasis dasyneurae</i> Mani <i>Panstenon flavogastrus</i> sp. nov. <i>Merismomorpha tamilnadensis</i> Sureshan et al
	Koduvayoor	Paddy	<i>Systasis dalbergiae</i> Mani <i>Systasis palakkadensis</i> sp. nov.
	Sidarkundu	Mango	<i>Systasis dasyneurae</i> Mani <i>Propicroscytus mirificus</i> (Girault)
	Pattambi	Paddy	<i>Callitula peethapada</i> Narendran and Mohana <i>Notoglyptus scutellaris</i> (Dodd & Girault) <i>Trichomalopsis thekkadiensis</i> Sureshan & Narendran
	Puthunagaram	Paddy	<i>Chlorocytus indicus</i> Sureshan <i>Propicroscytus oryzae</i> (Subba Rao) <i>Pteromalus keralensis</i> Sureshan <i>Pteromalus nigrus</i> Sureshan <i>Pteromalus semotus</i> (Walker) <i>Sphegigaster brunneicornis</i> (Ferrière)
	Pattambi-RARS	Paddy	<i>Dinarmus acutus</i> (Thomson) <i>Dinarmus maculatus</i> (Masi) <i>Propicroscytus oryzae</i> (Subba Rao) <i>Psilocera vinayaki</i> Sureshan & Narendran

			<i>Trichomalopsis neelagastra</i> Sureshan & Narendran <i>Trichomalopsis thekkadiensis</i> Sureshan & Narendran <i>Trichomalus kannurensis</i> Sureshan & Narendran
Trissur	Velupadam	Nutmeg	<i>Dipara kannurensis</i> Sureshan & Raseena <i>Netomocera minuta</i> Sureshan & Nikhil <i>Narendrella nilamburensis</i> Sureshan
	Choorakkattukara	Mixed vegetables	<i>Systasis nigra</i> Sureshan <i>Dinarmus maculatus</i> (Masi) <i>Propicroscytus oryzae</i> (Subba Rao)
	Kannara	Mixed vegetables	<i>Anisopteromalus calandrae</i> (Howard) <i>Callitula peethapada</i> Narendran and Mohana <i>Propicroscytus oryzae</i> (Subba Rao)
	Adatt	Paddy	<i>Notoglyptus scutellaris</i> (Dodd & Girault) <i>Propicroscytus mirificus</i> (Girault) <i>Pteromalus keralensis</i> Sureshan
	Mangalassery	Paddy	<i>Propicroscytus oryzae</i> (Subba Rao) <i>Trichomalopsis travancorensis</i> Sureshan & Narendran
	Ottapilav	Paddy	<i>Trichomalopsis travancorensis</i>

			Sureshan & Narendran
Ernakulam	Kolancheri	Paddy	<i>Systasis dalbergiae</i> Mani <i>Callitula anguloclypea</i> Sureshan <i>Callitula peethapada</i> Narendran and Mohana <i>Pteromalus keralensis</i> Sureshan <i>Trichomalus kannurensis</i> Sureshan & Narendran
	Karumaloor	Mixed vegetables	<i>Callitula bambusae</i> Narendran & Jobiraj
	Kuttipuzha	Paddy	<i>Callitula peethapada</i> Narendran and Mohana <i>Notoglyptus scutellaris</i> (Dodd & Girault) <i>Trichomalopsis neelagastra</i> Sureshan & Narendran
	Mulamthuruthy	Paddy	<i>Propicroscytus oryzae</i> (Subba Rao) <i>Trichomalopsis apanteloctena</i> (Crawford) <i>Trichomalopsis thekkadiensis</i> Sureshan & Narendran <i>Trichomalopsis travancorensis</i> Sureshan & Narendran
Idukki	Puthukkudi	Mixed vegetables	<i>Systasis nigra</i> Sureshan <i>Acroclisoides maculatus</i> Sureshan and Narendran <i>Callitula anguloclypea</i> Sureshan

		<p><i>Chlorocyclus indicus</i> Sureshan <i>Dinarmus maculatus</i> (Masi) <i>Panstenon nigrogastrus</i> sp. nov. <i>Metastenus indicus</i> Sureshan & Narendran <i>Mokrzekia orientalis</i> Subba Rao <i>Propicroscytus mirificus</i> (Girault) <i>Pteromalus semotus</i> (Walker) <i>Syntomopus rajamalaiensis</i> Sureshan & Narendran <i>Spalangia simplex</i> Perkins</p>
	Kolukkumala	Tea <p><i>Anisopteromalus calandrae</i> (Howard) <i>Cyrtogaster clavicornis</i> Walker <i>Dinarmus acutus</i> (Thomson) <i>Mersimomorpha minuta</i> Sureshan <i>Norbanus acuminatus</i> Dutt & Ferrière <i>Notoglyptus scutellaris</i> (Dodd & Girault) <i>Pachyneuron groenlandicum</i> (Holmgren) <i>Propicroscytus oryzae</i> (Subba Rao) <i>Pteromalus metallicus</i> Sureshan <i>Pteromalus nigrus</i> Sureshan <i>Sphegigaster reticulata</i> Sureshan & Narendran <i>Trichomalopsis apanteloctena</i> (Crawford)</p>

			<i>Trichomalopsis neelagastra</i> Sureshan & Narendran <i>Trichomalopsis thekkadiensis</i> Sureshan & Narendran <i>Trichomalopsis travancorensis</i> Sureshan & Narendran
	Vaguvarai	Tea	<i>Pteromalus semotus</i> (Walker)
Kottayam	Kuruvalangad	Nutmeg	<i>Dipara nigra</i> Sureshan <i>Callitula peethapada</i> Narendran and Mohana <i>Notoglyptus scutellaris</i> (Dodd & Girault)
	Kozha Seed Farm	Mixed vegetables	<i>Systasis dalbergiae</i> Mani <i>Callitula anguloclypea</i> Sureshan <i>Callitula peethapada</i> Narendran and Mohana <i>Lyubana indica</i> sp. nov. <i>Notoglyptus scutellaris</i> (Dodd & Girault) <i>Trichomalopsis acarinata</i> Sureshan & Narendran

	Changanassery	Paddy	<i>Propicroscytus oryzae</i> (Subba Rao) <i>Trichomalopsis acarinata</i> Sureshan & Narendran <i>Trichomalopsis apanteloctena</i> (Crawford) <i>Trichomalopsis neelagastra</i> Sureshan & Narendran <i>Trichomalopsis nigra</i> Sureshan & Narendran <i>Trichomalopsis thekkadiensis</i> Sureshan & Narendran <i>Trichomalopsis travancorensis</i> Sureshan & Narendran
	Perunna	Paddy	<i>Trichomalopsis thekkadiensis</i> Sureshan & Narendran
Alappuzha	Marari Resort	Mixed vegetables	<i>Systasis dalbergiae</i> Mani
	Kainakari	Paddy	<i>Trichomalopsis apanteloctena</i> (Crawford) <i>Trichomalopsis thekkadiensis</i> Sureshan & Narendran
Pathanamthitta	Perumthuruthy	Paddy	<i>Propicroscytus oryzae</i> (Subba Rao) <i>Trichomalopsis apanteloctena</i> (Crawford) <i>Trichomalopsis thekkadiensis</i> Sureshan & Narendran
	Thiruvalla	Paddy	<i>Trichomalopsis apanteloctena</i>

			(Crawford) <i>Trichomalopsis nigra</i> Sureshan & Narendran <i>Trichomalopsis thekkadiensis</i> Sureshan & Narendran <i>Trichomalopsis travancorensis</i> Sureshan & Narendran
Kollam	Thuruthikkara	Paddy	<i>Propicroscytus oryzae</i> (Subba Rao) <i>Trichomalopsis nigra</i> Sureshan & Narendran <i>Trichomalopsis thekkadiensis</i> Sureshan & Narendran <i>Trichomalopsis travancorensis</i> Sureshan & Narendran
	Kundara	Paddy	<i>Propicroscytus oryzae</i> (Subba Rao) <i>Trichomalopsis apanteloctena</i> (Crawford) <i>Trichomalopsis thekkadiensis</i> Sureshan & Narendran <i>Trichomalopsis travancorensis</i> Sureshan & Narendran
Thiruvananthapuram	Vellayini	Mixed vegetables	<i>Systasis dalbergiae</i> Mani <i>Systasis dasyneurae</i> Mani <i>Callitula anguloclypea</i> Sureshan <i>Callitula peethapada</i> Narendran and Mohana <i>Notoglyptus scutellaris</i> (Dodd &

			Girault) <i>Pteromalus keralensis</i> Sureshan
	Kadakkavoor	Paddy	<i>Propicroscytus oryzae</i> (Subba Rao) <i>Trichomalopsis apanteloctena</i> (Crawford) <i>Trichomalopsis neelagastra</i> Sureshan & Narendran <i>Trichomalopsis nigra</i> Sureshan & Narendran <i>Trichomalopsis thekkadiensis</i> Sureshan & Narendran <i>Trichomalopsis travancorensis</i> Sureshan & Narendran
	Amaravila	Paddy	<i>Trichomalopsis apanteloctena</i> (Crawford) <i>Trichomalopsis nigra</i> Sureshan & Narendran <i>Trichomalopsis thekkadiensis</i> Sureshan & Narendran <i>Trichomalopsis travancorensis</i> Sureshan & Narendran

Table 2. COMPARISON OF PTEROMALIDAE SPECIES PRESENT IN VARIOUS AGROECOSYSTEMS, STORED PRODUCTS AND FOREST

Type of locality: Paddy (Pd), Mixed crops (MC), Mixed vegetables (MV), Tea (T), Cardamom (Cd), Rubber (Rb), Teak (Tk), Cashew (Cw), Nutmeg (Ng), Stored products (SP), Cocoa (Cc), Homestead vegetation (HV), Forest (F).

Sl. No	Species	Pd	MC/MV	T	Cd	Rb	Tk	Cw	Ng	SP	Cc	HV	F
1	<i>Cerocephala dinoderi</i> Gahan	-	-	-	-	-	-	-	-	✓	-	-	-
2	<i>Dipara bouceki</i> (Narendran)	-	✓	-	-	-	-	-	-	-	-	-	-
3	<i>Dipara eukeralensis</i> Özdikmen	-	-	-	-	-	-	-	-	-	-	✓	✓
4	<i>Dipara gastr</i> a (Sureshan & Narendran)	-	-	-	-	-	-	-	-	-	✓	✓	✓
5	<i>Dipara hayati</i> Sureshan	-	-	-	-	-	-	-	-	-	-	✓	✓
6	<i>Dipara intermedia</i> Sureshan & Narendran	-	-	-	✓	-	-	-	-	-	-	-	-
7	<i>Dipara kannurensis</i> Sureshan & Raseena	-	-	-	-	-	-	-	✓	-	-	✓	✓
8	<i>Dipara keralensis</i> (Narendran)	-	-	-	✓	-	-	-	-	-	-	-	-
9	<i>Dipara malabarensis</i> (Narendran & Mini)	-	-	-	✓	-	-	-	-	-	-	-	✓
10	<i>Dipara miniae</i> Narendaran & Sureshan	-	✓	-	✓	-	-	-	-	-	✓	-	-
11	<i>Dipara nigra</i> Sureshan	-	-	-	-	-	-	-	✓	-	✓	-	-
12	<i>Dipara yercaudensis</i> Sureshan	-	✓	-	-	-	✓	-	-	-	✓	✓	✓
13	<i>Netomocera calicutensis</i> Sureshan et al	-	-	-	-	-	-	-	-	-	-	✓	-
14	<i>Netomocera maculata</i> Raseena & Sureshan	-	✓	-	-	-	-	-	-	-	-	-	-
15	<i>Netomocera minuta</i>	-	-	-	-	-	-	-	✓	-	-	✓	-

	Sureshan & Nikhil												
16	<i>Netomocera nigra</i> Sureshan & Narendran	-	-	-	-	-	-	-	-	-	-	✓	✓
17	<i>Papuopsia striata</i> Sureshan	-	-	-	-	-	-	-	-	-	-	✓	✓
18	<i>Cephaleta australiensis</i> (Howard)	-	✓	-	-	-	-	-	-	-	-	-	-
19	<i>Cephaleta brunniventris</i> Motschulsky	-	✓	-	-	-	-	-	-	-	-	✓	-
20	<i>Herbertia indica</i> Burks	✓	-	-	-	✓	-	-	-	-	-	✓	✓
21	<i>Halticoptera agaliensis</i> Sureshan	-	-	-	-	-	-	-	-	-	-	-	✓
22	<i>Stictomischus malabarensis</i> sp. nov.	-	✓	-	-	-	-	-	-	-	-	-	-
23	<i>Stictomischus sahyadriensis</i> sp. nov.	-	-	-	-	-	-	-	-	-	-	-	✓
24	<i>Systasis calicutensis</i> sp. nov.	-	✓	-	-	-	-	-	-	-	-	-	-
25	<i>Systasis convexa</i> sp. nov.	-	-	-	-	-	-	-	-	-	-	-	✓
26	<i>Systasis dalbergiae</i> Mani	✓	✓	-	-	-	-	-	-	-	-	-	-
27	<i>Systasis dasyneurae</i> Mani	✓	✓	-	-	-	-	-	-	-	-	✓	✓
28	<i>Systasis nigra</i> Sureshan	-	✓	-	-	-	-	-	-	-	-	-	-
29	<i>Systasis palakkadensis</i> sp. nov.	✓	-	-	-	-	-	-	-	-	-	-	-
30	<i>Panstenon collaris</i> Bouček	-	-	-	-	-	-	-	-	-	-	-	✓
31	<i>Panstenon flavogastrus</i> sp. nov.	✓	✓	-	-	-	-	-	-	-	-	-	-
32	<i>Panstenon minutus</i> sp. nov.	✓	-	-	-	-	-	-	-	-	-	-	-
33	<i>Panstenon nigrogastrus</i> sp. nov.	-	✓	-	-	-	-	-	-	-	-	-	-
34	<i>Acroclisoides maculatus</i> Sureshan & Narendran	-	✓	-	-	-	-	-	-	-	-	-	✓
35	<i>Anisopteromalus calandrae</i> (Howard)	✓	✓	✓	-	-	-	-	✓	-	-	✓	✓
36	<i>Callitula anguloclypea</i> Sureshan	✓	✓	-	-	-	-	-	-	-	-	-	✓
37	<i>Callitula bambusae</i> Narendran & Jobiraj	-	✓	-	-	-	-	-	-	-	-	✓	-
38	<i>Callitula keralensis</i> Sureshan	-	✓	-	-	-	-	-	-	-	-	-	✓

39	<i>Callitula peethapada</i> Narendran & Mohana	✓	✓	-	-	-	-	-	-	-	-	✓	✓
40	<i>Callitula rugosa</i> (Waterston)	-	✓	-	-	-	-	-	-	-	-	-	✓
41	<i>Callitula travancorensis</i> Sureshan	-	✓	-	-	-	-	-	-	-	-	✓	-
42	<i>Chlorocyttus indicus</i> Sureshan	✓	✓	-	-	-	-	-	-	-	-	-	✓
43	<i>Cryptoprymna elongata</i> Sureshan & Narendran	-	-	-	-	-	-	-	-	-	-	-	✓
44	<i>Cryptoprymna indiana</i> Sureshan & Narendran	-	-	-	-	-	-	-	-	-	-	-	✓
45	<i>Cyrtogaster clavicornis</i> Walker	-	-	✓	-	-	-	-	-	-	-	-	-
46	<i>Dinarmus acutus</i> (Thomson)	✓	✓	✓	-	-	-	-	-	-	-	✓	-
47	<i>Dinarmus basalis</i> (Rondani)	-	-	-	-	-	-	-	-	✓	-	✓	-
48	<i>Dinarmus maculatus</i> (Masi)	✓	✓	-	-	-	✓	✓	-	-	-	-	✓
49	<i>Dinarmus vagabundus</i> (Timberlake)	-	-	-	-	-	-	-	-	✓	-	✓	-
50	<i>Halticopterella burwelli</i> Sureshan	-	✓	-	-	-	-	-	-	-	-	✓	✓
51	<i>Halticopterella robusta</i> Sureshan	-	✓	-	-	-	-	-	-	-	-	-	✓
52	<i>Homoporus acuminatus</i> Sureshan & Narendran	-	-	-	-	-	-	-	-	-	-	✓	-
53	<i>Kumarella angulus</i> Sureshan	-	-	-	-	-	-	-	-	-	-	✓	✓
54	<i>Lyubana indica</i> sp. nov.	-	✓	-	-	-	-	-	-	-	-	-	-
55	<i>Merismomorpha microgastra</i> sp. nov.	-	-	-	-	-	-	-	-	-	-	-	✓
56	<i>Merismomorpha micropetiolata</i> sp. nov.	-	✓	-	-	-	-	-	-	-	-	-	-
57	<i>Merismomorpha minuta</i> Sureshan	-	-	✓	-	-	-	-	-	-	-	-	✓
58	<i>Merismomorpha tamilnadensis</i> Sureshan et al	✓	-	-	-	-	-	-	-	-	-	✓	-
59	<i>Mesopolobus keralensis</i> Sureshan & Narendran	-	✓	-	-	-	-	-	-	-	-	-	-
60	<i>Mesopolobus minutus</i> Sureshan & Narendran	-	✓	-	-	-	-	-	-	-	-	✓	-
61	<i>Metastenus concinnus</i> Walker	-	✓	-	-	-	-	-	-	-	-	-	-

62	<i>Metastenus indicus</i> Sureshan & Narendran	-	✓	-	-	-	-	-	-	-	-	✓	✓
63	<i>Miscogasteriella jayasreeae</i> Sureshan	-	-	-	-	-	-	-	-	-	-	-	✓
64	<i>Mokrzekia orientalis</i> Subba Rao	-	✓	-	-	-	-	-	-	-	-	-	✓
65	<i>Narendrella nilamburensis</i> Sureshan	-	-	-	-	-	-	-	✓	-	-	✓	-
66	<i>Norbanus acuminatus</i> Dutt & Ferrière	-	✓	✓	-	-	-	-	-	-	-	-	✓
67	<i>Norbanus equus</i> Sureshan	-	-	-	-	-	-	-	-	-	-	-	✓
68	<i>Notoglyptus scutellaris</i> (Dodd & Girault)	✓	✓	✓	-	-	-	-	✓	-	-	-	-
69	<i>Oxysychus coimbatorensis</i> (Ferrière)	-	✓	-	-	-	-	-	-	-	-	-	✓
70	<i>Pachycrepoideus veerannai</i> Narendran & Anil	-	✓	-	-	-	-	-	-	-	-	✓	-
71	<i>Pachyneuron groenlandicum</i> (Holmgren)	-	-	✓	-	-	-	-	-	-	-	-	-
72	<i>Pachyneuron leucopiscida</i> Mani	-	✓	-	-	-	-	-	-	-	-	-	-
73	<i>Platecrizotes keralensis</i> Sureshan & Raseena	-	✓	-	-	-	-	-	-	-	-	-	-
74	<i>Propicroscytus mirificus</i> (Girault)	✓	✓	-	-	-	-	-	-	-	-	-	✓
75	<i>Propicroscytus oryzae</i> (Subba Rao)	✓	✓	✓	-	-	-	-	-	-	-	-	✓
76	<i>Psilocera heydoni</i> Sureshan	-	-	-	✓	-	-	-	-	-	-	-	-
77	<i>Psilocera vinayaki</i> Sureshan & Narendran	✓	✓	-	-	-	-	-	-	-	-	-	✓
78	<i>Pteromalus keralensis</i> Sureshan	✓	✓	-	-	-	-	-	-	-	-	-	-
79	<i>Pteromalus metallicus</i> Sureshan	-	✓	✓	-	-	-	-	-	-	-	-	✓
80	<i>Pteromalus nigrus</i> Sureshan	✓	✓	✓	-	-	✓	-	-	-	-	-	✓
81	<i>Pteromalus puparum</i> (Linnaeus)	-	✓	-	-	-	-	-	-	-	-	-	✓
82	<i>Pteromalus semotus</i> (Walker)	✓	✓	✓	✓	-	-	✓	-	-	-	-	✓
83	<i>Pycnetron keralaensis</i> sp.nov.	-	✓	-	-	-	-	-	-	-	-	-	-

84	<i>Sphegigaster anamudiensis</i> Sureshan & Narendran	-	-	-	-	-	-	-	-	-	-	-	✓
85	<i>Sphegigaster brunneicornis</i> (Ferrière)	✓	✓	-	-	-	-	-	-	-	-	-	✓
86	<i>Sphegigaster karnatakaensis</i> Sureshan	✓	-	-	-	-	-	-	-	-	-	-	-
87	<i>Sphegigaster reticulata</i> Sureshan & Narendran	-	✓	✓	-	-	-	-	-	-	-	-	-
88	<i>Syntomopus carinatus</i> Sureshan & Narendran	-	-	-	✓	-	-	-	-	-	-	-	✓
89	<i>Syntomopus rajamalaiensis</i> Sureshan & Narendran	-	✓	-	-	-	-	-	-	-	-	-	✓
90	<i>Toxeumorpha minuta</i> Sureshan & Narendran	-	✓	-	-	-	-	-	-	-	-	✓	-
91	<i>Trichomalopsis acarinata</i> Sureshan & Narendran	✓	✓	-	-	-	-	-	-	-	-	-	-
92	<i>Trichomalopsis apanteloctena</i> (Crawford)	✓	-	✓	-	-	-	-	-	-	-	-	-
93	<i>Trichomalopsis deplanata</i> Kamijo & Grissell	✓	-	-	-	-	-	-	-	-	-	-	✓
94	<i>Trichomalopsis neelagastra</i> Sureshan & Narendran	✓	-	✓	-	-	-	-	-	-	-	-	-
95	<i>Trichomalopsis nigra</i> Sureshan & Narendran	✓	-	-	-	-	-	-	-	-	-	-	-
96	<i>Trichomalopsis thekkadiensis</i> Sureshan & Narendran	✓	-	✓	-	-	-	-	-	-	-	-	-
97	<i>Trichomalopsis travancorensis</i> Sureshan & Narendran	✓	-	-	-	-	-	-	-	-	-	-	-
98	<i>Trichomalus kannurensis</i> Sureshan & Narendran	✓	✓	-	-	-	-	-	-	-	-	-	-
99	<i>Trigonoderus periyarensis</i> sp. nov.	-	-	-	-	-	-	-	-	-	-	-	✓
100	<i>Unicypea kumarani</i> Sureshan & Narendran	-	✓	-	-	-	-	-	-	-	-	-	✓
101	<i>Unicypea elongata</i> Sureshan & Narendran	-	-	-	-	-	-	-	-	-	-	✓	✓
102	<i>Spalangia impunctata</i> Howard	-	✓	-	-	-	-	-	-	-	-	-	-
103	<i>Spalangia simplex</i> Perkins	✓	✓	-	-	✓	-	-	-	-	-	-	✓
104	<i>Spalangia parfuscipes</i> Ahmad	-	✓	-	-	-	-	-	-	-	-	-	-
	Total number of species collected	32	60	15	7	2	3	2	4	3	4	28	51

CHAPTER 5
**CHECKLIST OF PTEROMALIDAE
(INSECTA: HYMENOPTERA:
CHALCIDOIDEA) OF KERALA**

Pteromalidae is one of the largest families of superfamily Chalcidoidea (Hymenoptera). The family comprises 3450 described species under 640 genera and 32 subfamilies worldwide (Noyes, 2017), out of which 279 species under 105 genera and 18 subfamilies are reported from the India. The current check list includes 166 species under 62 genera and 15 subfamilies reported so far from Kerala.

CHECKLIST

(Classification as per Bouček, 1988)

Class: Insecta

Order: Hymenoptera

Sub order: Apocrita (Parasitica)

Super family: Chalcidoidea

Family: Pteromalidae

Subfamily Asaphinae

Genus *Asaphes* Walker, 1834

1. *Asaphes vulgaris* Walker, 1834 (India: Kerala, Karnataka, Meghalaya & Uttar Pradesh; Europe, America, Australia, New Zealand)

Subfamily Cerocephalinae

Genus *Theocolax* Westwood, 1832

2. ***Theocolax elegans* (Westwood, 1874)** (India: Kerala , Andhra Pradesh, Arunachal Pradesh, Delhi, Karnataka, Tamil Nadu; Argentina; Australia; Belgium; Brazil; Canad; Congo; Germany; Hawaii, Madagasker; Malasia; Pakistan; Sweden; Thailand; Thurkey)

Genus *Cerocephala* Westwood, 1832

3. ***Cerocephala dinoderi* Gahan, 1925** (India: Kerala, Arunachal Pradesh, Karnataka, West Bengal; Australia; Hawaii; Indonesia; Peru; Philipines; Sri Lanka; Tailand; USA.)

Subfamily Cleonyminae

Genus *Cleonymus* Latreille, 1809

4. ***Cleonymus indicus* Sureshan, 2015** (India: Kerala)
5. ***Cleonymus kamijoi* Sureshan & Balan, 2013** (India: Kerala)
6. ***Cleonymus keralicus* Narendran & Rajmohana, 2008** (India: Kerala)

Genus *Heydenia* Forster, 1856

7. ***Heydenia tuberculata* Sureshan, 1990** (India: Karnataka, Kerala)

Genus *Notanisis* Walker, 1837

8. ***Notanisis indicus* Sureshan, 2015** (India: Kerala)

Genus *Solenura* Westwood, 1868

9. ***Solenura ania* (Walker, 1846)** (India: Kerala, Assam, Maharashtra, Uttar Pradesh & Uttarakhand; China; Indonesi; Malaysia; Philippines; Singapore; Taiwan; Thailand; Japan)
10. ***Solenura keralensis* (Narendran, 1992)** (India: Kerala; Sri Lanka)

Subfamily Coelocybinae

Genus *Erotolepsiella* Girault, 1915

11. *Erotolepsiella indica* Narendran, 2001 (India: Kerala)

Subfamily Diparinae

Genus *Dipara* Walker, 1833

12. *Dipara angulata* Sureshan & Nikhil, 2015 (India: Kerala)
13. *Dipara bouceki* (Narendran, 2006) (India: Kerala, Karnataka)
14. *Dipara eukeralensis* özdikmen, 2011 (India: Kerala, Tamil Nadu)
15. *Dipara gastra* (Sureshan & Narendran, 2004) (India: Kerala, Tamil Nadu, Manipur, Maharashtra; Sri Lanka)
16. *Dipara hayati* Sureshan, 2013 (India: Kerala, Tamil Nadu, Bihar)
17. *Dipara intermedia* Sureshan & Narendran, 2005 (India:Kerala; Sri Lanka)
18. *Dipara kannurensis* Sureshan & Raseena, 2015 (India: Kerala, Karnataka, Tamil Nadu)
19. *Dipara keralensis* (Narendran, 2000) (India: Kerala, Uttar Pradesh)
20. *Dipara malabarensis* (Narendran & Mini, 2000) (India: Kerala, Tamil Nadu, Manipur, Chhattisgarh)
21. *Dipara miniae* Narendran & Sureshan, 2001 (India: Kerala, Bihar, Tamil Nadu)
22. *Dipara nigra* Sureshan, 2013 (India: Kerala, Arunachal Pradesh)
23. *Dipara nigriscuta* Sureshan 2013 (India: Kerala, Arunachal Pradesh)

24. *Dipara mohanae* Narendran & Sureshan, 2001 (India: Kerala)
25. *Dipara ponmudiensis* Sureshan & Farsana, 2015 (India: Kerala)
26. *Dipara yercaudensis* Sureshan, 2014 (India: Kerala, Andra Pradesh, Karnataka, Tamil Nadu)

Genus *Netomocera* Bouček, 1954

27. *Netomocera calicutensis* Sureshan & Raseena, 2017 (India: Kerala)
28. *Netomocera maculata* Raseena & Sureshan, 1990 (India: Kerala, Tamil Nadu)
29. *Netomocera minuta* Sureshan & Nikhil, 2015 (India: Kerala, Karnataka, Tamil Nadu)
30. *Netomocera nigra* Sureshan & Narendran, 1990 ((India: Kerala, Orissa; People's Republic of China)

Subfamily Erotolepsiinae

Genus *Papuopsia* Bouček, 1988

31. *Papuopsia striata* Sureshan, 2005 (India: Kerala; Papua New Guinea; Sri Lanka)

Subfamily Eunotinae

Genus *Calyconotiscus* Narendran & Saleem, 2012

32. *Calyconotiscus frontofasciatus* Narendran & Saleem, 2012 (India: Kerala)

Genus *Cephaleta* Motschulsky, 1859

33. *Cephaleta australiensis* (Howard, 1896) (India : Kerala, Andaman, Andhra Pradesh, Assam, Bihar, Delhi, Maharashtra; Karnataka, Orissa, Uttar Pradesh, West Bengal, Tamil Nadu, Australia, Bangladesh, India, Indonesia, New Zealand, Pakistan, China and Sri Lanka.)
34. *Cephaleta brunniventris* Motschulsky, 1859 (India: Kerala, Assam, Manipur, Bihar, Uttar Pradesh, West Bengal, Karnataka, Tamil Nadu, Telungana; Bangladesh; Malaysia; Pakistan; China; Philippines; Sri Lanka; Taiwan; USA)
35. *Cephaleta elongata* Sureshan, Dhanya, Bijoy and Ramesh Kumar, 2011 (India: Kerala)

Genus *Moranila* Cameron

36. *Moranila californica* (Howard, 1881) (India: Karnataka; Afrotropical; Australia; Europe; Iran; Italy; Mexico; Netherlands; New Zealand; Papua New Guinea; People's Republic of China; USA)

Subfamily Herbertinae

Genus *Herbertia* Howard, 1894

37. *Herbertia indica* Burks, 1959 (India: Kerala, Bihar, Madhyapradesh, Karnataka; Malaysia; People's Republic of China; Sri Lanka)
38. *Herbertia malabarica* Narendran, 2006 (India: Kerala)

Subfamily Miscogastrinae

Genus *Halticoptera* Spinola, 1811

39. *Halticoptera agaliensis* Sureshan, 2003 (India: Kerala, Tamil Nadu)
40. *Halticoptera propinqua* (Waterston, 1915) (India: Kerala, Andhra Pradesh, Delhi; Pakistan; Sri Lanka)

Genus *Stictomischus* Walker, 1834

- 41. *Stictomischus malabarensis* sp. nov. (India: Kerala)
- 42. *Stictomischus sahyadriensis* sp. nov. (India: Kerala)
- 43. *Stictomischus turneri* Sureshan, 2002 (India: Kerala)

Subfamily Ormocerinae

Genus *Systasis* Walker, 1834

- 44. *Systasis calicutensis* sp. nov. (India: Kerala)
- 45. *Systasis convexa* sp. nov. (India: Kerala)
- 46. *Systasis dalbergiae* Mani (India: Kerala, Delhi, Uttar Pradesh, Uttarakhand)
- 47. *Systasis dasyneurae* Mani (India: Kerala, Bihar, Haryana, Karnataka, Maharashtra, Madhya Pradesh, Uttar Pradesh)
- 48. *Systasis nigra* Sureshan (India: Kerala)
- 49. *Systasis palakkadensis* sp. nov. (India: Kerala)

Subfamily Panstenoninae

Genus *Panstenon* Walker, 1846

- 50. *Panstenon collaris* Bouček (India: Kerala, Karnataka; Peoples' Republic of China, South Africa, Sri Lanka, Zimbabwe)
- 51. *Panstenon flavogastrus* sp. nov. (India: Kerala)
- 52. *Panstenon minutus* sp. nov. (India: Kerala)
- 53. *Panstenon nigrogastrus* sp. nov. (India: Kerala)

Subfamily Pireninae

Genus *Macroglenes* Westwood, 1832

54. *Macroglenes sivani* Narendran & Sureshan, 2004 (India: Kerala)

Subfamily Pteromalinae

Genus *Acroclisoides* Girault & Dodd, 1915

55. *Acroclisoides indicus* Ferrière, 1931 (India: Kerala, Tamil Nadu, Uttar Pradesh, Uttarakhand; Myanmar; People's Republic of China; Sri Lanka)
56. *Acroclisoides maculatus* Sureshan & Narendran, 2002 (India: Kerala, Karnataka, Tamil Nadu)

Genus *Anisopteromalus* Ruschka, 1912

57. *Anisopteromalus calandrae* (Howard, 1881) (India: Kerala, Himachal Pradesh, Karnataka, Rajasthan, Tamil Nadu & West Bengal; Argentina; Australia; Austria; Bangladesh; Brazil; Columbia; Czechoslovakia; Egypt; France; Germany; Greece; Hawali; Iran; Iraq; Italy; Japan; Korea; New Zealand; Nigeria; Pakistan; Russia, Sweden; Russia; Tailand, Turkey; U.K; U.S.A; West Africa)

Genus *Callitula* Spinola, 1811

58. *Callitula anguloclypea* Sureshan, 2002 (India: Kerala, Tamil Nadu; Sri Lanka)
59. *Callitula bambusae* Narendran & Jobiraj, 2001 (India: Kerala, Tamil Nadu)
60. *Callitula keralensis* Sureshan, 2002 (India: Kerala, Karnataka, Tamil Nadu)

61. *Callitula peethapada* Narendran & Mohana, 2001 (India: Kerala, Bihar, Gujarat, Tamil Nadu, Telungana; Sri Lanka)
62. *Callitula robusta* Sureshan, 2002 (India: Kerala)
63. *Callitula rugosa* (Waterston, 1915) (India: Kerala, Panjab, Tamil Nadu; Sri Lanka)
64. *Callitula travancorensis* Sureshan, 2002 (India: Kerala, Arunachal Pradesh, Gujarat, Tamil Nadu, Uttar Pradesh)

Genus *Chlorocytus* Graham, 1956

65. *Chlorocytus indicus* Sureshan, 2000 (India: Kerala, Arunachal Pradesh, Jammu, Karnataka, Tamil Nadu)

Genus *Coelopisthia* Förster, 1856

66. *Coelopisthia indica* Sureshan, 2015 (India: Kerala)

Genus *Cryptoprymna* Förster

67. *Cryptoprymna elongata* Sureshan & Narendran, 2000 (India: Kerala, Karnataka)
68. *Cryptoprymna indiana* Sureshan & Narendran, 2000 (India: Kerala)

Genus *Cyclogastrella* Bukowski, 1938

69. *Cyclogastrella nigra* Sureshan, 2000 (India: Kerala)

Genus *Cyrtogaster* Walker, 1833

70. *Cyrtogaster clavicornis* Walker, 1833 (India: Kerala; Belgium; Denmark; Europe; Germany; Kazakhsthan; Netherlands; People's Republic of China; Spain; Sweden; U.K)

Genus *Cyrtoptyx* Delucchi, 1956

71. *Cyrtoptyx wayanadensis* Sureshan, 2012 (India: Kerala)

Genus *Delislea* Girault, 1936

72. *Delislea rahimani* Narendran & Anil, 1992 (India: Kerala)

Genus *Dinarmus* Thomson, 1878

73. *Dinarmus acutus* (Thomson, 1878) (India: Kerala, Arunachal Pradesh, Andra Pradesh; Bihar, Karnataka, Gujarat, Rajasthan, Uthar Pradesh, Tamil Nadu; Afrotropical; Austria; Belgium; Canada; Czechoslovakia; Europe; France; Germany; Hungary; Iran; Iraq; Italy; Kazakhtan, Moroco; Netherlands; North America; Romania; Russia, Spain, Sri Lanka, Sweden; Switzerland; Turkey; U.K.; U.S.A.)
74. *Dinarmus basalis* (Rondani, 1877) (India: Kerala, Andra Pradesh, Bihar, Delhi, Haryana, Karnataka, Madhya Pradesh, Rajastan; Bangladesh; Brazil; Columbia; Egypt; France; Iran; Israel; Italy; Kazhakstan; Madagascar; Nigeria; Peru; Pakistan; South Africa; Sri Lanka; Sudan; Thailand; USA; USSR.)
75. *Dinarmus colemani* (Crawford, 1913) (India: Kerala, Bihar, Delhi, Karnataka, Tamil Nadu; Bangladesh)
76. *Dinarmus maculatus* (Masi, 1924) (India: Kerala, Maharashtra, Karnataka, West Bengal; Myanmar)
77. *Dinarmus vagabundus* (Timberlake, 1926) (India: Kerala, Karnataka, Panjab, Tamil Nadu; France; Hawaii; Madagascar; Pakistan, Sri Lanka; Vietnam)

Genus *Eurydinotomorpha* Girault, 1913

78. *Eurydinotomorpha malabarensis* Sureshan & Narendran, 1990
(India: Kerala)

79. *Eurydinotomorpha indica* Sureshan, 2016 (India: Kerala)

Genus *Halticopterella* Girault & Dodd, 1915

80. *Halticopterella burwelli* Sureshan, 2001 (India: Kerala, Karnataka)

81. *Halticopterella longiflagellum* Sureshan, 2001 (India: Kerala)

82. *Halticopterella rampurensis* Sureshan, 2001 (India: Kerala)

83. *Halticopterella robusta* Sureshan, 2001 (India: Kerala)

Genus *Homoporus* Thomson, 1878

84. *Homoporus acuminatus* Sureshan & Narendran, 2000 (India: Kerala)

85. *Homoporus gladius* Sureshan & Narendran, 2000 (India: Kerala)

Genus *Inkaka* Girault, 1939

86. *Inkaka keralensis* Sureshan & Narendran, 1997 (India: Kerala, Maharashtra)

Genus *Kumarella* Sureshan, 1999

87. *Kumarella angulus* Sureshan, 1999 (India: Kerala, Karnataka, Maharashtra; Malaysia, Taiwan, Thailand, Vietnam)

88. *Kumarella sandroi* Narendran & Mohana, 2001 (India: Kerala)

Genus *Lariophagus* Crawford, 1909

89. *Lariophagus distinguendus* (Förster, 1841) (India: Kerala, Tamil Nadu; Argentina; Australia; Belgium; Brazil; Canada; Chile; Czechoslovakia; Egypt; Germany; Israel, Italy; Japan; Kazaksthan; Mexocco; Morocco; Nepal; Netherlands; New Zealand; People's Republic of China; Sri Lanka; Sweden; Tailand; Turkey, UK, USA)

Genus *Lyubana* Bouček, 1991

90. *Lyubana indica* sp.nov. (India: Kerala)

Genus *Merismomorpha* Girault, 1913

91. *Merismomorpha elongata* Sureshan, 2000 (India: Kerala)
92. *Merismomorpha microgastra* sp. nov. (India: Kerala)
93. *Merismomorpha micropetiolata* sp. nov. (India: Kerala)
94. *Merosmomorpha minuta* Sureshan, 2000 (India: Kerala, Tamil Nadu, Manipur, Maharashtra)
95. *Merismomorpha tamilnadensis* Sureshan et al, 2012 (India: Kerala, Tamil Nadu)
96. *Merismomorpha truncata* Sureshan, 2000 (India: Kerala)

Genus *Mesopolobus* Westwood, 1833

97. *Mesopolobus harithus* Sureshan & Narendran, 2002 (India: Kerala)
98. *Mesopolobus keralensis* Sureshan & Narendran, 2002 (India: Kerala, Karnataka, Tamil Nadu; People's Republic of China)
99. *Mesopolobus minutus* Sureshan & Narendran, 2002 (India: Kerala)

Genus *Metastenus* Walker, 1834

100. *Metastenus concinnus* Walker, 1834 (India: Kerala; Argentina; Bulgaria; Czechoslovakia; Europe; France; Germany; Iran; Kazakhstan; Spain; Switzerland; UK)
101. *Metastenus indicus* Sureshan & Narendran, 2002 (India: Kerala)

Genus *Miscogasteriella* Girault, 1915

102. *Miscogasteriella bijoyi* Sureshan & Nikhil, 2013 (India: Kerala)
103. *Miscogasteriella jayasreeae* Sureshan, 1999 (India: Kerala)

Genus *Mokrzeckia* Mokrzecki, 1934

104. *Mokrzeckia menzeli* Subba Rao, 1981 (Karnataka, Kerala, Uttar Pradesh, Uttarakhand)
105. *Mokrzeckia orientalis* Subba Rao, 1973 (India: Kerala, Karnataka, Maharashtra, Uttar Pradesh, Tamil Nadu; Indonesia, Malaysia; Sri Lanka; Thailand)

Genus *Narendrella* Sureshan, 1999

106. *Narendrella nilamburensis* Sureshan, 1999 (India: Kerala, Tamil Nadu)

Genus *Norbanus* Walker, 1843

107. *Norbanus acuminatus* Dutt & Ferrière, 1961 (India: Kerala, Karnataka, West Bengal)
108. *Norbanus equus* Sureshan, 2003 (India: Kerala, Tamil Nadu)
109. *Norbanus malabarensis* Sureshan, 2003 (India: Kerala)

110. *Norbanus scrobatus* Sureshan, 2003 (India: Kerala)

111. *Norbanus thekkadiensis* Sureshan, 2003 (India: Kerala, Karnataka)

Genus *Notoglyptus* Masi, 1917

112. *Notoglyptus scutellaris* (Dodd & Girault, 1915) (India: Kerala, Delhi, Uttar Pradesh; Afrotropical; Australia; Canada; Czechoslovakia; Europe; Hungary; Italy; Japan; Kasakhstan; Malaysia; Morocco; New Zealand; North Africa; People's Republic of China; Romania; Seychelles island; South Africa, Spain; Sweden; Zimbabwe)

Genus *Oniticellobia* Bouček, 1976

113. *Oniticellobia longigastra* Sureshan & Narendran, 1994 (India: Kerala, Karnataka, West Bengal; Sri Lanka)

Genus *Oxysychus* Delucchi, 1956

114. *Oxysychus coimbatorensis* (Ferrière, 1939) (India: Kerala, Andhra Pradesh, Bihar, Delhi, Tamil Nadu; Indonesia; Pakistan)

115. *Oxysychus macregaster* Sureshan & Narendran 2002 (India: Kerala,)

116. *Oxysychus nupserhae* (Dutt & Ferrière, 1961) (India: Kerala, Delhi, West Bengal; People's Republic of China)

Genus *Pachycrepoideus* Ashmead, 1904

117. *Pachycrepoideus veerannai* Narendran & Anil, 1992 (India: Kerala, Karnataka, Tamil Nadu)

118. *Pachycrepoideus vindemmiae* (Rondani, 1875) (India: Kerala, Haryana, Maharashtra, Punjab, Tamil Nadu, Uttar Pradesh; Argentina; Australia; Belgium, Bolivia; Brazil; Canada; Colombia;

Czechoslovakia; Denmark; Europe; Fiji; Germany, Hawaii; Indonesia;
Iran, Italy; Japan, Malaysia; Mexico; Netherlands; New Zealand;
Spain; Sweden; Switzerland; Taiwan; Thailand; Turkey; UK; USA)

Genus *Pachyneuron* Walker, 1833

119. *Pachyneuron groenlandicum* (Holmgren, 1872) (India: Kerala, Delhi, Haryana, Himachal Pradesh, Jammu & Kashmir, Orissa, Tamil Nadu, Karnataka; Belgium; Czechoslovakia; Europe; France; Germany; Iran; Italy; Japan; Kazakhstan; Korea; Netherlands; People's Republic of China; Poland; Romania; Sweden; Switzerland; Turkey; UK; USSR)
120. *Pachyneuron leucopiscida* Mani, 1939 (India: Kerala, Bihar, Delhi, Karnataka, Tamil Nadu; Czechoslovakia; Europe; Germany; Iran; Israel; Kazakhstan; Sweden; Switzerland; Turkey; UK; Yemen)
121. *Pachyneuron solitarium* (Hartig, 1838) (India: Kerala, Maharashtra; Belgium; Bulgaria; Czechoslovakia; Europe; Georgia; Germany; Japan; Kazakhstan; Korea; Netherlands; People's Republic of China; Romania; Russia, Sweden; USSR)

Genus *Paraiemea* Sureshan & Narendran, 1998

122. *Paraiemea convexa* Sureshan & Narendran, 1998 (India: Kerala)
123. *Paraiemea vishnuae* Sureshan & Narendran, 1998 (India: Kerala)

Genus *Platecrizotes* Ferrière, 1934

124. *Platecrizotes keralensis* Sureshan & Raseena 2015 (India: Kerala)

Genus *Propicroscytus* Szélnyi, 1941

125. *Propicroscytus mirificus* (Girault, 1915) India: Kerala, Andhra

Pradesh, Maharashtra, Orissa, Karnataka, Tamil Nadu, Uttar Pradesh;
Australia; Indonesia; Malaysia; People's Republic of China; Sri Lanka

126. *Propicroscytus oryzae* (Subba Rao, 1973) (India: Kerala, Arunachal Pradesh, Andhra Pradesh, Maharashtra, Orissa; Indonesia; People's Republic of China; Sri Lanka; Thailand)

Genus *Psilocera* Walker, 1833

127. *Psilocera clavata* Sureshan & Narendran, 1995 (India: Kerala)
128. *Psilocera heydoni* Sureshan, 2001 (India: Kerala, Karnataka)
129. *Psilocera keralensis* Sureshan, 2014 (India: Kerala)
130. *Psilocera scutellata* Sureshan, 2001 (India: Kerala)
131. *Psilocera vinayaki* Sureshan & Narendran, 1995 (India: Kerala, Bihar, Tamil Nadu)

Genus *Pteromalus* Swederus, 1795

132. *Pteromalus keralensis* Sureshan, 2001 (India: Karnataka, Kerala, Tamil Nadu)
133. *Pteromalus metallicus* Sureshan, 2001 (India: Kerala, Karnataka)
134. *Pteromalus nigrus* Sureshan, 2001 (India: Kerala)
135. *Pteromalus puparum* (Linnaeus, 1758) (India: Kerala, Assam, Bihar, Himachal Pradesh, Meghalaya, Punjab, Tamil Nadu, Uttar Pradesh, Utharakhand; Algeria; Australia; Austria; Belgium; Bolivia; Bulgaria; Canada; Chile; Czechoslovakia; Egypt; Finland; France; Germany; Greece; Hawaii; Hungary; Iran; Iraq; Israel; Italy; Japan; Kazakhstan; Korea; Malaysia; Nepal; Netherlands; New Zealand; Pakistan; People's Republic of China; Poland; Portugal; Romania; Russia;

Spain; Sweden; Switzerland; Taiwan; Ukrain; UK; USA; Yugoslavia)

136. *Pteromalus semotus* (Walker, 1834) (India: Kerala, Arunachal Pradesh, Karnataka, Jarkhand, Telungana, Tamil Nadu, Uttar Pradesh; Austria; Belgium; Bulgaria; Canary Islands; Czechoslovakia; Denmark; Egypt; Europe; France; Germany; Hungary; Italy; Japan; Kasakhstan; Mexico; Netherlands; New Zealand; Norway; Pakistan; People's Republic of China; Poland; Romania; Russia; Serbia; Sweden; Switzerland; Syria; Turkey; Ukraine; UK)

Genus *Pycnetron* Gahan

137. *Pycnetron keralaensis* Raseena & Sureshan (India: Kerala)

Genus *Sphegigaster* Spinola, 1811

138. *Sphegigaster anamudiensis* Sureshan & Narendran, 1997 (India: Kerala)
139. *Sphegigaster brunneicornis* (Ferrière, 1930) (India: Kerala, Tamil Nadu; Ethiopia; Sri Lanka; Thailand)
140. *Sphegigaster indica* Sureshan & Narendran, 2001 (India: Kerala)
141. *Sphegigaster karnatakaensis* Sureshan, 2007 (India: Kerala, Karnataka)
142. *Sphegigaster reticulata* Sureshan & Narendran, 1997 (India: Kerala, Tamil Nadu)
143. *Sphegigaster stepicola* Bouček, 1965 (India: Kerala, Bihar, Delhi, Karnataka, Tamil Nadu, Uttar Pradesh; Algeria; Austria; Bulgaria; Czechoslovakia; Ethiopia; Europe; Hungary; Iran; Italy; Kazakhstan; Morocco; People's Republic of China; Romania; Thailand)

Genus *Syntomopus* Walker, 1833

144. *Syntomopus carinatus* Sureshan & Narendran, 1999 (India: Kerala, Manipur, Tamil Nadu, Utharakhand; Malaysia, Thailand)
145. *Syntomopus nigrus* Sureshan & Narendran, 1999 (India: Kerala)
146. *Syntomopus rajamalaiensis* Sureshan & Narendran, 1999 (India: Kerala)

Genus *Toxeumorpha* Girault, 1915

147. *Toxeumorpha minuta* Sureshan & Narendran, 2000 (India: Kerala)

Genus *Trichomalopsis* Crawford, 1913

148. *Trichomalopsis acarinata* Sureshan & Narendran, 2001 (India: Kerala)
149. *Trichomalopsis apanteloctena* (Crawford, 1911) (India: Kerala, Andra Pradesh, Bihar, Karnataka, Meghalaya, Orissa, Tamil Nadu, West Bengal; Bangladesh, Japan; Korea; Malaysia; People's Republic of China; Philippines; Russia; Taiwan; Vietnam)
150. *Trichomalopsis deplanata* Kamijo & Grissell, 1982 (India: Kerala, Tamil Nadu, West Bengal; Japan; Korea; People's Republic of China; Russia)
151. *Trichomalopsis neelagastra* Sureshan & Narendran, 2001 (India: Kerala, Karnataka)
152. *Trichomalopsis nigra* Sureshan & Narendran, 2001 (India: Kerala)
153. *Trichomalopsis ovigastra* Sureshan & Narendran, 2001 (India: Kerala)

154. *Trichomalopsis thekkadiensis* Sureshan & Narendran, 2001 (India: Kerala, Tamil Nadu)

155. *Trichomalopsis travancorensis* Sureshan & Narendran, 2001 (India: Kerala)

Genus *Trichomalus* Thomson, 1878

156. *Trichomalus kannurensis* Sureshan & Narendran, 1994 (India: Kerala)

157. *Trichomalus keralensis* Sureshan 2002 (India: Kerala)

Genus *Trigonoderus* Westwood, 1832

158. *Trigonoderus pulcher* Walker, 1836 (India: Kerala; Belgium; Croatia; Czechoslovakia; Europe; Germany; Iran; Ireland; Japan; Romania; Russia; Serbia; Sweden; UK; Yugoslavia.

159. *Trigonoderus periyarensis* sp. nov. (India: Kerala)

Genus *Uniclypea* Bouček, 1976

160. *Uniclypea elongata* Sureshan & Narendran, 1997 (India: Kerala)

161. *Uniclypea kumarani* Sureshan & Narendran, 1994 (India: Kerala)

Subfamily Spalanginae

Genus *Spalangia* Latreille, 1805

162. *Spalangia gemina* Bouček, 1963 (India: Kerala, Karnataka, Tamil Nadu, West Bengal; Brazil; Fiji; Malaysia; Mauritius; People's Republic of China; Thailand; Venezuela)

163. *Spalangia impunctata* Howard, 1897 (India: Kerala; Antilles; Grenada; Hawaii; Philippines)

164. *Spalangia parfuscipes* Ahmad, 1998 (India: Kerala, Uttar Pradesh)
165. *Spalangia simplex* Perkins, 1910 (India: Kerala, Tamil Nadu, Uttar Pradesh; Australia; Congo; Hawaii; Malaysia; People's Republic of China; South Africa; Uganda)

Subfamily Storeyinae

Genus *Storeya* Bouček, 1988

166. *Storeya minuta* Sureshan, 1999 (India: Kerala)

CHAPTER 6
HOST PARASITE INDEX

	Host	Distribution in India
<p>Subfamily Asaphinae</p> <p>Genus <i>Asaphes</i> Walker, 1834</p> <p>1. <i>Asaphes vulgaris</i> Walker, 1834</p>	<p>Order: Coleoptera Family: Curculionidae <i>Anthonomus pomorum</i> <i>Tychius medicaginis</i></p> <p>Order Diptera Family: Agromyzidae <i>Lyriomyza lutea</i></p> <p>Family: Cecidomyiidae <i>Aphidoletes cucumeris</i> <i>Dasineura ignorata</i></p> <p>Family: Syrphidae <i>Syrphus ribesii</i></p> <p>Order: Hemiptera Family: Aphididae <i>Acyrtosiphon caraganae</i> <i>Acyrtosiphon pisum</i> <i>Amphorophora ampullata</i> <i>Amphorophora rubi</i> <i>Anuraphis persicaeniger</i> <i>Anuraphis schwartzi</i> <i>Aphis armata</i> <i>Aphis maidis</i> <i>Aphis pomi</i> <i>Brachycaudus helichrysi</i></p>	<p>Kerala, Karnataka Meghalaya UttarPradesh</p>

	<p> <i>Brachycolus korotnewi</i> <i>Brachycolus noxius</i> <i>Capitophorus ribis</i> <i>Caveriella aegopodii</i> <i>Cinara piceae</i> <i>Cinara pinea</i> <i>Corylobium avellanae</i> <i>Dactynotus</i> <i>solydaginis</i> <i>Dysaphis plantaginea</i> <i>Elatobium abietinum</i> <i>Eriosoma lanigerum</i> <i>Eucallipterus tiliae</i> <i>Hyalopterus pruni</i> <i>Hyperomyzus lactucae</i> <i>Macrosiphum avenae</i> <i>Macrosiphum</i> <i>euphorbiae</i> <i>Macrosiphum</i> <i>granarium</i> <i>Macrosiphum rosae</i> <i>Myzus cerasi</i> <i>Myzus persicae</i> <i>Nasonovia ribisnigri</i> <i>Nectarosiphon</i> <i>persicae</i> <i>Phorodon pruni</i> <i>Rhopalosiphum</i> <i>insertum</i> <i>Rhopalosiphum padi</i> <i>Schizaphis graminum</i> <i>Schizolacunus pineti</i> <i>Sitobion avenae</i> <i>Therioaphis trifolii</i> <i>Toxoptera aurantii</i> <i>Tuberculoides</i> <i>annulatus</i> <i>Uroleucon cersii</i> </p> <p> Family: Coccidae <i>Eulecanium fletcheri</i> </p> <p> Family: Diaspididae </p>	
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	<p><i>Aulacaspis rosae</i></p> <p>Family: Pseudococcidae <i>Phenacoccus aceris</i> <i>Pseudococcus adonidum</i></p> <p>Family:Psyllidae <i>Psylla mali</i> <i>Psylla pyricola</i></p> <p>Order: Hymenoptera Family: Cynipidae <i>Phaenoglyphis villosa</i></p>	
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<p>Subfamily Cerocephalinae</p> <p>Genus <i>Cerocephala</i> Westwood, 1832 2. <i>Cerocephala dinoderi</i> Gahan, 1925</p>	<p>Order : Coleoptera Family: Bostrychidae <i>Dinoderus minutus</i></p> <p>Family: Dryophthoridae <i>Sitophilus oryzae</i></p>	<p>Kerala Arunachal Pradesh Karnataka West Bengal</p>
<p>Genus <i>Theocolax</i> Westwood, 1832 3. <i>Theocolax elegans</i> (Westwood, 1874)</p>	<p>Order: Coleoptera Family: Anobiidae <i>Lasioderma serricorne</i> <i>Stegobium paniceum</i></p> <p>Family: Bostrychidae <i>Prostephanus truncates</i> <i>Rhizopertha dominica</i></p> <p>Family: Bruchidae <i>Acanthoscelides obtectus</i> <i>Bruchus quadrimaculatus</i> <i>Callosobruchus analis</i></p>	<p>Kerala Andhra Pradesh Arunachal Pradesh Delhi Karnataka Tamil Nadu</p>

	<p><i>Callosobruchus chinensis</i> <i>Callosobruchus maculatus</i> <i>Zaobrotes subfasciatus</i></p> <p>Family: Cucujidae <i>Cryptolestes ferrugineus</i></p> <p>Family: Curculionidae <i>Caulophilus latinasus</i> <i>Caulophilus oryzae</i></p> <p>Family: Dryophthoridae <i>Calandra granaria</i> <i>Calandra oryzae</i> <i>Sitophilus granarius</i> <i>Sitophilus linearis</i> <i>Sitophilus oryzae</i> <i>Sitophilus Zeamais</i></p> <p>Order Lepidoptera Family: Gelechiidae <i>Sitotroga cerealella</i></p>	
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<p>Subfamily Cleonyminae</p> <p>Genus <i>Solenura</i> Westwood, 1868</p> <p>4. <i>Solenura ania</i> Westwood, 1868</p>	<p>Order: Coleoptera Family: Buprestidae <i>Chrysobothris succedanea</i></p> <p>Family: Cerambycidae <i>Clytocera chinospila</i> <i>Trichoferus campestris</i></p>	<p>Kerala Assam Maharashtra Uttar Pradesh Uttarakhand</p>
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<p>Subfamily Eunotinae Genus <i>Cephaleta</i> Motschulsky, 1859 5. <i>Cephaleta</i> <i>australiensis</i> (Howard, 1896)</p>	<p>Order: Hemiptera Family: Cerococcidae <i>Cerococcus indicus</i></p> <p>Family: Coccidae <i>Ceroplastes</i> sp <i>Coccus hesperidum</i> <i>Coccus viridis</i> <i>Drepanococcus chiton</i> <i>Lecanium viridae</i> <i>Pulvinaria psidii</i> <i>Saissetia</i> sp.</p> <p>Family: Eriococcidae <i>Eriococcus</i> sp.</p> <p>Family: Pseudococcidae <i>Ferrisia virgata</i> <i>Nipaecoccus viridis</i></p>	<p>Kerala Andhra Pradesh Assam Karnataka Maharashtra Orissa Tamil Nadu Uttar Pradesh</p>
<p>6. <i>Cephaleta</i> <i>brunniventris</i> Motschulsky, 1859</p>	<p>Order: Hemiptera Family: Asterolecaniidae <i>Asterolecanium</i> sp.</p> <p>Family: Cerococcidae <i>Cerococcus hibisci</i> <i>Cerococcus indicus</i> <i>Cerococcus ornatus</i></p> <p>Family: Coccidae <i>Ceroplastes actiniformis</i> <i>Ceroplastes floridensis</i> <i>Ceroplastes rubens</i> <i>Chloropulvinaria psidii</i> <i>Coccus viridis</i> <i>Drepanococcus chiton</i> <i>Pulvinaria psidii</i> <i>Saissetia coffeae</i> <i>Saissetia hemisphaerica</i> <i>Saissetia nigra</i></p>	<p>Kerala Andhra Pradesh Assam Bihar Delhi Goa Karnataka Manipur Uttar Pradesh Tamil Nadu West Bengal</p>

	<p><i>Saissetia oleae</i></p> <p>Family: Pseudococcidae <i>Ferrisia virgata</i> <i>Pseudococcus</i> sp.</p> <p>Order: Lepidoptera Family: Gracillaridae <i>Acrocercops caerulea</i></p>	
<p>7. <i>Cephaleta elongata</i> Sureshan, Dhanya, Bijoy and Ramesh Kumar, 2011</p>	<p>Order: Hemiptera Family: Coccidae <i>Ceroplastes</i> sp.</p>	Kerala
<p>Genus <i>Moranila</i> Cameron, 1881</p> <p>8. <i>Moranila californica</i> (Howard, 1881)</p>	<p>Order: Hemiptera Family: Asterolecaniidae <i>Asterolecanium pustulans</i></p> <p>Family: Coccidae <i>Ceroplastes ceriferus</i> <i>Ceroplastes floridensis</i> <i>Ceroplastes rubens</i> <i>Ceroplastes rusci</i> <i>Coccus hesperidum</i> <i>Lichtensia viburni</i> <i>Pulvinaria vitis</i> <i>Saissetia coffeae</i> <i>Saissetia hemisphaerica</i> <i>Saissetia nigra</i> <i>Saissetia oleae</i></p> <p>Family: Eriococcidae <i>Eriococcus</i> sp.</p> <p>Family: Pseudococcidae <i>Antonina bambusae</i></p> <p>Order: Neuroptera Family: Sympherobidae <i>Sympherobius californicus</i></p>	Kerala Karnataka

<p>Subfamily Herbertinae</p> <p>Genus <i>Herbertia</i> Howard, 1894</p> <p>9. <i>Herbertia indica</i> Burks, 1959</p>	<p>Order: Diptera Family: Agromyzidae <i>Liriomyza</i> sp. <i>Liriomyza trifolii</i> <i>Melanagromyza</i> sp. <i>Tropicomyia coffeae</i></p>	<p>Kerala Bihar Karnataka Madhya Pradesh Maharashtra</p>
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<p>Subfamily Miscogastrinae</p> <p>Genus <i>Halticoptera</i> Spinola, 1811</p> <p>10. <i>Halticoptera propinqua</i> (Waterston, 1915)</p>	<p>Order: Diptera Family: Agromyzidae <i>Agromyza phaseoli</i> <i>Ophiomyia phaseoli</i></p>	<p>Kerala Andhra Pradesh Delhi</p>
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<p>Subfamily Ormocerinae</p> <p>Genus <i>Systasis</i> Walker, 1834</p> <p>11. <i>Systasis dalbergiae</i> Mani, 1942</p>	<p>Order: Diptera Family: Cecidomyiidae <i>Contarinia dalbergiae</i></p>	<p>Kerala Delhi Uttar Pradesh Uttarakhand</p>
<p>12. <i>Systasis dasyneurae</i> Mani, 1939</p>	<p>Order: Diptera Family: Cecidomyiidae <i>Dasineura lini</i> <i>Erosomyia indica</i></p>	<p>Kerala Delhi Uttar Pradesh Uttarakhand</p>

<p>Subfamily Pteromalinae</p> <p>Genus <i>Acroclisoides</i> Girault & Dodd, 1915</p> <p>13. <i>Acroclisoides indicus</i> Ferriere, 1931</p>	<p>Order: Hemiptera Family: Pentatomidae <i>Erthesina</i> sp. <i>Placosternum dama</i></p>	<p>Kerala Uttarakhand Uttar Pradesh Tamil Nadu</p>
<p>Genus <i>Anisopteromalus</i> Ruschka, 1912</p> <p>14. <i>Anisopteromalus</i></p>	<p>Order: Coleoptera</p>	<p>Kerala</p>

<p><i>calandrae</i> (Howard, 1881)</p>	<p>Family: Anobiidae <i>Catorama herbarium</i> <i>Lasioderma serricorne</i> <i>Stegobium paniceum</i></p> <p>Family: Anthribidae <i>Araecerus fasciculatus</i></p> <p>Family: Apionidae <i>Piezotrachelus varium</i></p> <p>Family: Bostrychidae <i>Rhizopertha dominica</i></p> <p>Family: Bruchidae <i>Acanthoscelides obtectus</i> <i>Bruchus chinensis</i> <i>Bruchus obscurus</i> <i>Bruchus quadrimaculatus</i> <i>Callosobruchus chinensis</i> <i>Callosobruchus maculatus</i> <i>Callosobruchus analis</i> <i>Pachymerus sp.</i> <i>Zabrotes subfasciatus</i></p> <p>Family: Curculionidae <i>Athesapeuta cyperi</i> <i>Caulophilus latinasus</i> <i>Pempherus affinis</i></p> <p>Family: Dermestidae <i>Trogoderma granarium</i></p> <p>Family: Dryophthoridae <i>Calandra granaria</i> <i>Calandra oryzae</i> <i>Sitophilus granarius</i> <i>Sitophilus oryzae</i></p> <p>Family: Nitidulidae <i>Carpophilus obsoletus</i></p> <p>Family: Silvanidae</p>	<p>Himachal Pradesh Karnataka Rajasthan Tamil Nadu West Bengal</p>
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	<p><i>Oryzaephilus surinamensis</i></p> <p>Order: Hymenoptera Family: Pteromalidae <i>Anisopteromalus calandrae</i></p> <p>Order: Lepidoptera Family: Gelechiidae <i>Sititroga cerealella</i></p> <p>Family: Pyralidae <i>Cadra cautella</i> <i>Ephestia elutella</i> <i>Ephestia kuehniella</i></p>	
<p>Genus <i>Cyrtogaster</i> Walker, 1833</p> <p>15. <i>Cyrtogaster clavicornis</i> Walker, 1833</p>	<p>Order: Diptera Family: agromyzidae <i>Agromyza</i> sp.</p> <p>Family: Anthomyiidae <i>Phorbia</i> sp. <i>Pegomya hyoscyami</i></p> <p>Family: Ephydriidae <i>Hydrellia nasturtii</i> <i>Hydrellia griseola</i> <i>Hydropota nasturtii</i> <i>Hydropota griseola</i></p> <p>Family: Lonchopteridae <i>Lonchoptera</i> sp.</p>	Kerala
<p>Genus <i>Dinarmus</i></p> <p>16. <i>Dinarmus acutus</i> (Thomson, 1878)</p>	<p>Order: Coleoptera Family: Bruchidae <i>Acanthoscelides perforatus</i> <i>Bruchidius ater</i> <i>Bruchidius marginalis</i> <i>Bruchidius unicolor</i> <i>Bruchus affinis</i></p>	Kerala Rajasthan

	<p><i>Bruchus emarginatus</i> <i>Bruchus tristiculus</i> <i>Callosobruchus maculatus</i></p> <p>Order: Hemiptera Family: Coccidae <i>Ceroplastes rusci</i></p> <p>Order: Hymenoptera Family: Pteromalidae <i>Dinarmus rufimanus</i></p>	
<p>17. <i>Dinarmus basalis</i> (Rondani, 1877)</p>	<p>Order: Coleoptera Family: Apionidae <i>Piezotrachelus varium</i></p> <p>Family: Brentidae <i>Cylas puncticollis</i></p> <p>Family: Bruchidae <i>Acanthoscelides obtectus</i> <i>Bruchidius atrolineatus</i> <i>Bruchus analis</i> <i>Bruchus quadrimaculatus</i> <i>Callosobruchus analis</i> <i>Callosobruchus chinensis</i> <i>Callosobruchus maculatus</i> <i>Pachymerus cassia</i></p> <p>Family: Dermestidae <i>Trogoderma granarium</i></p>	<p>Kerala Andhra Pradesh Bihar Delhi Haryana Karnataka Madhya Pradesh Rajasthan</p>
<p>18. <i>Dinarmus colemani</i> (Crawford, 1913)</p>	<p>Order: Coleoptera Family: Bruchidae <i>Bruchus chinensis</i> <i>Callosobruchus chinensis</i></p>	<p>Kerala Bihar Delhi Jharkhand Karnataka Tamil Nadu</p>
<p>19. <i>Dinarmus maculatus</i> (Masi, 1924)</p>	<p>Order: Coleoptera Family: Bruchidae</p>	<p>Kerala Karnataka, Maharashtra</p>

	<i>Callosobruchus chinensis</i>	Tamil Nadu West Bengal
20. <i>Dinarmus vagabundus</i> (Timberlake, 1926)	Order: Coleoptera Family: Bruchidae <i>Bruchus chinensis</i> <i>Bruchus quadrimaculatus</i> <i>Callosobruchus analis</i> <i>Callosobruchus chinensis</i> <i>Callosobruchus maculatus</i>	Kerala Karnataka, Punjab Tamil Nadu
Genus <i>Merismomorpha</i> Girault, 1913 21. <i>Merismomorpha tamilnadensis</i> Sureshan, Manickavasagam & Dhanya, 2012	Order: Hemiptera Family: Cerococcidae <i>Cerococcus</i> sp.	Kerala Tamil Nadu
Genus <i>Metastenus</i> Walker, 1834 22. <i>Metastenus concinnus</i> Walker, 1834	Order: Coleoptera Family: Coccinellidae <i>Cryptolaemus montouzieri</i> <i>Cryptognatha signata</i> <i>Pullus impexus</i> <i>Scymnus apetzi</i> <i>Scymnus impexus</i>	Kerala Karnataka
Genus <i>Mokrzeckia</i> Mokrzecki, 1933 23. <i>Mokrzeckia menzeli</i> Subba Rao, 1973	Order: Lepidoptera Family: Hyblaeidae <i>Hyblaea puer</i> Family: Pyralidae <i>Hapalia machaeralis</i>	Kerala Karnataka Uttar Pradesh Uttarakhand
Genus <i>Norbanus</i> Walker, 1843 24. <i>Norbanus acuminatus</i> Dutt & Ferrière, 1961	Order: Coleoptera Family: Cerambycidae <i>Nupserha bicolor</i>	Kerala Karnataka West Bengal
Genus <i>Oxysychus</i> Delucchi, 1956 25. <i>Oxysychus</i>	Order: Coleoptera Family: Curculionidae	Kerala Andhra Pradesh

<i>coimbatorensis</i> (Ferrière, 1939)	<i>Hypolixus truncatulus</i> <i>Lixus truncatulus</i> <i>Lophobaris piperis</i> <i>Pempherus affinis</i> <i>Pempherulus affinis</i>	Bihar Delhi Tamil Nadu
26. <i>Oxysychus nupserhae</i> (Dutt & Ferrière, 1961)	Order: Coleoptera Family: cerambycidae <i>Nupserha bicolor</i>	Kerala Delhi West Bengal
Genus <i>Pachycrepoideus</i> Ashmead, 1904 27. <i>Pachycrepoideus</i> <i>veerannai</i> Narendran & Anil, 1992	Order: Lepidoptera Family: Bombycidae <i>Bombyx mori</i> Parasitoid hosts Order: Diptera Family: Techinidae <i>Exorista bombycis</i> <i>Exorista sorbillans</i>	Kerala Karnataka
28. <i>Pachycrepoideus</i> <i>vindemmiae</i> (Rondani, 1875)	Order: Diptera Family: Anthomyiidae <i>Delia antiqua</i> <i>Hylemya antiqua</i> <i>Phorbia brassicae</i> Family: Calliphoridae <i>Chrysomya megacephala</i> <i>Lucilia illustris</i> <i>Phormia regina</i> Family: Cecidomiidae <i>Orseolia oryzae</i> Family: Drosophilidae <i>Drosophila melanogaster</i> <i>Drosophila uvarum</i> Family: Lonchaeidae <i>Lonchaea aristella</i>	Kerala Haryana Chandigarh, Karnataka Maharashtra Puducherry Punjab Tamil Nadu Uttar Pradesh

	<p>Family: Muscidae <i>Fannia scalaris</i> <i>Lyperosia irritans</i> <i>Musca domestica</i> <i>Muscina stabulans</i> <i>Ophyra leucostoma</i> <i>Stomoxys niger</i></p> <p>Family: Phoridae <i>Megaselia scalaris</i></p> <p>Family: Piophilidae <i>Piophila casei</i></p> <p>Family: Sarcophagidae <i>Oxysarcodexia thornax</i> <i>Peckia chrysostoma</i> <i>Sarcodexia lambens</i></p> <p>Family: Sphaeroceridae <i>Poecilosomella angulata</i></p> <p>Family: Stratiomyiidae <i>Hermetia illucens</i></p> <p>Family: Tephritidae <i>Anastrepha obliqua</i> <i>Anastrepha suspense</i> <i>Ceratitis capitata</i> <i>Ceratitis rosa</i> <i>Dacus ciliatus</i> <i>Dacus dorsalis</i> <i>Dacus oleae</i> <i>Myiopardalis pardalina</i> <i>Rhagoletis cingulata</i> <i>Terellia fuscicornis</i></p> <p>Order: Hemiptera Family: Coreidae <i>Anasa tristis</i></p> <p>Order: Hymenoptera Family: Apidae</p>	
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	<p><i>Bombus</i> sp</p> <p>Order: Lepidoptera Family: Bombycidae <i>Bombyx mori</i></p> <p>Family: Pyralidae <i>Cadra cautella</i> <i>Plodia interpunctella</i></p>	
<p>Genus <i>Pachyneuron</i> Walker, 1833 29. <i>Pachyneuron</i> <i>groenlandicum</i> (Holmgren, 1872)</p>	<p>Order: Diptera Family: Chloropidae <i>Oscinella frit</i></p> <p>Family: Psilidae <i>Psila rosae</i></p> <p>Family: Syrphidae <i>Epistrophe cinctipes</i> <i>Epistrophe balteatus</i> <i>Macrosyrphus confrator</i> <i>Sphaerophoria scripta</i> <i>Syrphus balteatus</i></p> <p>Order: Hemiptera Family: Aphididae <i>Callipterinella calliptera</i> <i>Forda marginata</i></p> <p>Family: Coccidae <i>Physokermes jezoensis</i></p> <p>Order: Lepidoptera Family: Lasiocampidae <i>Dendrolimus</i> sp.</p> <p>Family: Noctuidae <i>Autographa gamma</i></p> <p>Family: Pieridae <i>Pieris</i> sp.</p>	<p>Kerala Delhi Haryana Himachal Pradesh Jammu & Kashmir Karnataka Orissa Tamil Nadu</p>

<p>30. <i>Pachyneuron leucopiscida</i> Mani, 1939</p>	<p>Order: Diptera Family: Chamaemyiidae <i>Cremifanila nigrocellulata</i> <i>Leucopis nigricornis</i></p> <p>Family: Drosophilidae <i>Acletoxenus indicus</i></p> <p>Order: Hemiptera Family: Aphididae <i>Aphis cracivora</i> <i>Aphis gossypii</i> <i>Cryptomyzus ribis</i> <i>Dysaphis reaumuri</i> <i>Smynthuodes betae</i></p> <p>Family: Pseudococcidae <i>Dactylopius</i> sp.</p>	<p>Kerala Bihar Delhi Karnataka Tamil Nadu</p>
<p>31. <i>Pachyneuron solitarium</i> (Hartig, 1838)</p>	<p>Order: Coleoptera Family: Coccinellidae <i>Coccinella septempunctata</i></p> <p>Order: Diptera Family: Asilidae <i>Eutolmus</i> sp.</p> <p>Order: Hemiptera Family: Aphididae <i>Aphis craccivora</i> <i>Cinara laricis</i> <i>Cinara pineti</i> <i>Eriosoma lanigerum</i> <i>Lipaphis erysimi</i> <i>Schizolachnus orientalis</i></p> <p>Family: Coccidae <i>Ceroplastes rubens</i> <i>Eriopeltis araxis</i> <i>Pulvinaria populi</i></p>	<p>Kerala Karnataka Maharashtra</p>

	<p>Family: Pseudococcidae <i>Phenacoccus aceris</i> <i>Pseudococcus comstoki</i></p> <p>Family: Psyllidae <i>Psylla pyri</i></p> <p>Order: Lepidoptera Family: Lasiocampidae <i>Dendrolimus pini</i> <i>Dendrolimus superans</i> <i>Selenephra lunigera</i></p> <p>Family: Lymantriidae <i>Dasychira axutha</i> <i>Lymantria monacha</i></p>	
<p>Genus <i>Platecrizotes</i> Ferriere, 1934 32. <i>Platecrizotes</i> <i>keralensis</i> Sureshan & Raseena</p>	<p>Order: Diptera Family: Drosophilidae <i>Drosophila</i> sp.</p>	Kerala
<p>Genus <i>Propicroscytus</i> Szelényi, 1941 33. <i>Propicroscytus</i> <i>mirificus</i> (Girault, 1915)</p>	<p>Order: Diptera Family: Cecidomyiidae <i>Orseolia oryzae</i> <i>Orseolia mnesitheae</i> <i>Orseoliella javanica</i> <i>Pachydiplosis oryzae</i></p> <p>Order: Lepidoptera Family: Pyralidae <i>Scirpophaga incertulas</i></p>	Kerala Andhra Pradesh Karnataka Maharashtra Orissa Uttar Pradesh
<p>34. <i>Propicroscytus</i> <i>oryzae</i> (Subba Rao, 1973)</p>	<p>Order: Diptera Family: Cecidomyiidae <i>Orseolia oryzae</i> <i>Pachydiplosis oryzae</i></p> <p>Order: Lepidoptera Family: Pyralidae</p>	Kerala Andhra Pradesh, Arunachal Pradesh Maharashtra Orissa

	<i>Scirpophaga incertulas</i>	
Genus <i>Pteromalus</i> Swederus, 1795 35. <i>Pteromalus puparum</i> (Linnaeus, 1758)	Order: Coleoptera Family: Bruchidae <i>Bruchidius unicolor</i> Family: Curculionidae <i>Ceutorhynchus obstrictus</i> Family: Scolytidae <i>Pityocteines curvidens</i> Order: Diptera Family: Chloropidae <i>Oscinella frit</i> Order: Hemiptera Family: Diaspididae <i>Lepidosaphes malicola</i> Order: Hymenoptera Family: Braconidae <i>Apanteles</i> sp. Family: Sphecidae <i>Sceliphron</i> sp. Family: Vespidae <i>Polistes fuscatus</i> Order: Lepidoptera Family: Arctiidae <i>Phragmatobia fuliginosa</i> Family: Coleophoridae <i>Coleophora fuscedinella</i> Family: Geometridae <i>Lambdina fiscellaria</i> Family: Hesperidae <i>Epargyreus tityrus</i>	Kerala Assam Bihar Himachal Pradesh Meghalaya Punjab Tamil Nadu Uttar Pradesh Uttarakhand

	<p><i>Thymelicus lineola</i></p> <p>Family: Lasiocampidae <i>Malacosoma disstria</i> <i>Malacosoma neustria</i></p> <p>Family: Lycaenidae <i>Cosmolyce baeticus</i></p> <p>Family: Lymantriidae <i>Cynthia carye</i> <i>Euproctis chrysorrhoea</i> <i>Lymantria monacha</i></p> <p>Family: Noctuidae <i>Autographa gamma</i> <i>Mamestra brassicae</i></p> <p>Family: Notodontidae <i>Thaumetopoea</i> <i>processionea</i></p> <p>Family: Nymphalidae <i>Agraulis vanillae</i> <i>Argynnis cydippe</i> <i>Bassaris gonerilla</i> <i>Ladoga camilla</i> <i>Limenitis camilla</i> <i>Nymphalis antiopa</i> <i>Pandoriana pandora</i> <i>Polygonia comma</i> <i>Polygonia satyrus</i> <i>Vanessa antiopa</i> <i>Vanessa atlanta</i></p> <p>Family: Papilionidae <i>Papilio demodocus</i> <i>Papilio memnon</i> <i>Papilio polytes</i></p> <p>Family: Pieridae <i>Aporia crataegi</i> <i>Ascia monuste</i> <i>Colias electo</i></p>	
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	<p><i>Pieris brassicae</i></p> <p>Family: Saturniidae <i>Philosamia Cynthia</i></p> <p>Family: Tortricidae <i>Archips rosanus</i> <i>Lobesia botrana</i></p> <p>Family: Yponomeutidae <i>Plutella xylostella</i></p> <p>Family: Zygaenidae <i>Zygaena meliloti</i></p>	
<p>36. <i>Pteromalus semotus</i> (Walker, 1834)</p>	<p>Order: Coleoptera Family: Anobiidae <i>Ernobius abietis</i></p> <p>Family: Apionidae <i>Apion pomonae</i></p> <p>Family: Chrysomelidae <i>Oulema gallaeciana</i></p> <p>Family: Curculionidae <i>Brachonyx pineti</i> <i>Hypera contaminate</i> <i>Microlarinus lypriformis</i></p> <p>Order: Hymenoptera Family: Diprionidae <i>Neodiprion sertifer</i></p> <p>Order: Lepidoptera Family: Coleophoridae <i>Coleophora congeriella</i> <i>Coleophora hemerobiella</i> <i>Coleophora montegella</i></p> <p>Family: Gelechiidae <i>Coleotechnites piceaella</i></p>	<p>Kerala</p>

	<p><i>Mesophleps oxycedrella</i></p> <p>Family: Geometridae <i>Ectropis bistortata</i> <i>Eupithecia innotata</i></p> <p>Family: Gracillariidae <i>Caloptilia stigmatella</i> <i>Cameraria ophridella</i> <i>Gracillaria syringella</i> <i>Phyllonoycter stettinensis</i></p> <p>Family: Lymantriidae <i>Leucoma salicis</i> <i>Lymantria dispar</i></p> <p>Family: Lyonetiidae <i>Leucoptera malifoliella</i></p> <p>Family: Noctuidae <i>Spodoptera littoralis</i></p> <p>Family: Notodontidae <i>Cerura vinula</i></p> <p>Family: Pieridae <i>Pieris brassicae</i> <i>Pieris rapae</i></p> <p>Family: Tischeriidae <i>Tischeria heinemanni</i></p> <p>Family: Tortricidae <i>Archippus similis</i> <i>Archippus pulchra</i> <i>Cydia pomonella</i> <i>Cymolomia hartigiana</i> <i>Epiphyas postvittana</i> <i>Rhyacionia simulata</i> <i>Tortrix viridana</i></p> <p>Family: Zygaenidae <i>Zygaena filipendulae</i></p>	
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<p>Genus <i>Sphegigaster</i> Spinola, 1811 37. <i>Sphegigaster</i> <i>brunneicornis</i> (Ferrière, 1930)</p>	<p>Order: Diptera Family: Agromyzidae <i>Agromyza</i> sp. <i>Ophiomyia phaseoli</i></p>	<p>Kerala Tamil Nadu</p>
<p>38. <i>Sphegigaster</i> <i>stepicola</i> Bouček, 1965</p>	<p>Order: Diptera Family: Agromyzidae <i>Agromyza schineri</i> <i>Melanagromyza</i> sp. <i>Melanagromyza soyae</i> <i>Ophiomyia cunctata</i> <i>Phytomyza albiceps</i> <i>Phytomyza syngenesiae</i></p>	<p>Kerala Bihar Delhi Karnataka Uttar Pradesh</p>
<p>Genus <i>Trichomalopsis</i> Crawford, 1913 39. <i>Trichomalopsis</i> <i>apanteloctena</i> (Crawford, 1911)</p>	<p>Order: Coleoptera Family: Chrysomelidae <i>Dicladispa armigera</i> <i>Oulema oryzae</i></p> <p>Order: Diptera Family: Agromyzidae <i>Agromyza oryzae</i></p> <p>Family: Cecidomyiidae <i>Pachydiplosis oryzae</i></p> <p>Family: Ephydrinae <i>Hydrellia griseola</i></p> <p>Order: Lepidoptera Family: Hesperidae <i>Parnara guttata</i> <i>Pelopidas mathias</i></p> <p>Family: Limacodidae <i>Latoia bicolor</i></p> <p>Family: Noctuidae <i>Leucania separata</i> <i>Pseudaletia separata</i> <i>Naranga aenescens</i> <i>Spodoptera litura</i></p>	<p>Kerala Andhra Pradesh Bihar Karnataka Meghalaya Orissa Tamil Nadu Uttar Pradesh</p>

	<p><i>Sesamia inferens</i></p> <p>Family: Pieridae <i>Pieris rapae</i></p> <p>Family: Pyralidae <i>Chilo suppressalis</i> <i>Cnaphalocrocis medinalis</i> <i>Nacoleia vulgaris</i> <i>Tryporyza incertulas</i> <i>Scirpophaga incertulas</i></p> <p>Family: Saturniidae <i>Antheraea mylitta</i></p> <p>Family: Tortricidae <i>Grapholita molesta</i></p> <p>Family: Yponomeutidae <i>Plutella xylostella</i></p> <p>Order: Orthoptera Family: Acrididae <i>Oxya intricata</i></p>	
<p>40. <i>Trichomalopsis deplanata</i> Kamijo & Grissell, 1982</p>	<p>Order: Coleoptera Family: Chrysomelidae <i>Oulema oryzae</i></p> <p>Order: Diptera Family: Agromyzidae <i>Agromyza yanonensis</i></p> <p>Order: Lepidoptera Family: Hesperidae <i>Parnara guttata</i></p> <p>Family: Pyralidae <i>Ostrinia furnacalis</i></p>	<p>Kerala West Bengal</p>

<p>Subfamily Spalanginae Genus <i>Spalangia</i> Latreille, 1805 41. <i>Spalangia cameroni</i> Perkins, 1910</p>	<p>Order: Diptera Family: Anthomyiidae <i>Atherigona soccata</i> <i>Hydrotaea dentipes</i> <i>Hylemya antique</i> <i>Paregle cineralla</i></p> <p>Family: Calliphoridae <i>Chrysomya putoria</i></p> <p>Family: Chloropidae <i>Hippelates collusor</i></p> <p>Family: Muscidae <i>Dendrophaonia querceti</i> <i>Fannia cannicularis</i> <i>Fannia scalaris</i> <i>Gymnodia cilifera</i> <i>Lyperosia irritans</i> <i>Musca domestica</i> <i>Muscina stabulans</i> <i>Neomyia cornicina</i> <i>Stomoxys niger</i></p> <p>Family: Otitidae <i>Physiphora aenea</i> <i>Physiphora demandata</i></p> <p>Family: Sarcophagidae <i>Coprosarcophaga</i> sp. <i>Ravinia striata</i></p> <p>Family: Syrphidae <i>Ornidia obesa</i> <i>Syritta pipiens</i></p> <p>Family: Tephritidae <i>Anastrepha suspensa</i> <i>Dacus cucurbitae</i> <i>Dacus passiflorae</i></p>	<p>Kerala Delhi, Karnataka</p>
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	Order: Lepidoptera Family: Bombycidae <i>Bombyx mori</i>	
42. <i>Spalangia endius</i> Walker, 1839	Order: Diptera Family: Anthomyiidae <i>Delia antiqua</i> <i>Atherigona soccata</i> Family: Calliphoridae <i>Chysomya albiceps</i> <i>Chysomya megacephala</i> <i>Hemilucilia favifacies</i> <i>Lucilia sericata</i> <i>Pycnosoma rufifacies</i> Family: Drosophilidae <i>Zaprionus indianus</i> Family: Muscidae <i>Fannia femoralis</i> <i>Fannia scalaris</i> <i>Haematobia irritans</i> <i>Musca domestica</i> <i>Musca sorbens</i> <i>Muscina stabulans</i> <i>Ophyra anthrax</i> <i>Ophyra leucostoma</i> <i>Stomoxys calcitrans</i> Family: Otitidae <i>Physiphora aenea</i> Family: Sarcophagidae <i>Ravinia striata</i> <i>Sarcophaga effrenata</i> Family: Tachinidae <i>Paratheresia</i> sp. Family: Tephritidae	Kerala Chandigarh Delhi Maharashtra

	<p><i>Anastrpha ludens</i> <i>Anastrepha suspensa</i> <i>Ceratitis capitata</i> <i>Dacus cucurbitae</i> <i>Dacus dorsalis</i></p> <p>Order: Lepidoptera Family: Bombycidae Bombyx mori</p> <p>Family: Pyralidae <i>Diatraea</i> sp.</p>	
43. <i>Spalangia fuscipes</i> Nees, 1834	<p>Order: Diptera Family: Cecidomyiidae <i>Thomasiella eryngi</i> <i>Lasioptera eryngi</i></p> <p>Family: Chloropidae <i>Oscinella frit</i> <i>Oscinella pusilla</i></p>	Kerala Andhra Pradesh Karnataka
44. <i>Spalangia impunctata</i> Howard, 1897	<p>Order: Diptera Family: Drosophilidae <i>Drosophila</i> sp.</p>	Kerala
45. <i>Spalangia nigroaenea</i> Curtis, 1839	<p>Order: Diptera Family: Anthomyiidae <i>Phaonia corbetti</i> <i>Phaonia querceti</i></p> <p>Family: Calliphoridae <i>Chrysomya aenea</i> <i>Chrysomya megacephala</i> <i>Lucilia sericata</i> <i>Neopollenia stygia</i></p> <p>Family: Muscidae <i>Fannia canicularis</i> <i>Gymnodia cilifera</i> <i>Haematobia irritans</i> <i>Lyperosia irritans</i> <i>Musca domestica</i></p>	Kerala Delhi Karnataka, Maharashtra

	<p><i>Musca hilli</i> <i>Musca stabulans</i> <i>Stomoxys niger</i></p> <p>Family: Otitidae <i>Physiphora aenea</i></p> <p>Family: Phoridae <i>Megaselia iroquoiana</i></p> <p>Family: Sarcophagidae Ravinia striata Sarcophaga frontalis Sarcophaga impatiens</p> <p>Family: Sepsidae <i>Saltella</i> sp.</p> <p>Family: Syrphidae Syritta sp.</p> <p>Family: Techinidae <i>Paratheresia claripalpis</i></p> <p>Order: Lepidoptera Family: Pyralidae <i>Diatraea sacharalis</i></p>	
<p>46. <i>Spalangia simplex</i> Perkins, 1910</p>	<p>Order: Diptera Family: Drosophilidae <i>Drosophila</i> sp.</p>	<p>Kerala Tamil Nadu Uttar Pradesh</p>

CHAPTER 7

SUMMARY

A total of 104 species under 45 genera and 10 subfamilies of Pteromalidae collected from Kerala are treated in this study. Among them 12 species are new to science. In the present work special emphasis is given on the Pteromalid fauna of agroecosystem. 83 species belonging to 38 genera and nine subfamilies were collected from various agroecosystems of Kerala, of which eight species are new to science. Detailed descriptions of new species, diagnosis of known species, key to the species of Kerala, Checklist of Pteromalidae of Kerala and host- parasitoid index are provided

Significant findings

New Species

12 new species have been identified and described from Kerala, out of which eight are from agroecosystem.

Table 1. List of new Species

SI No	New species	Type of vegetation
1	<i>Stictomischus malabarensis</i> sp. nov.	Agroecosystem
2	<i>Stictomischus sahyadriensis</i> sp. nov.	Forest ecosystem
3	<i>Systasis calicutensis</i> sp. nov.	Agroecosystem
4	<i>Systasis convexa</i> sp. nov.	Forest ecosystem
5	<i>Systasis palakkadensis</i> sp. nov.	Agroecosystem
6	<i>Panstenon flavogastrus</i> sp. nov.	Agroecosystem
7	<i>Panstenon minutus</i> sp. nov.	Agroecosystem
8	<i>Panstenon nigrogastrus</i> sp. nov.	Agroecosystem
9	<i>Lyubana indica</i> sp. nov.	Agroecosystem
10	<i>Merismomorpha microgastra</i> sp. nov.	Forest ecosystem
11	<i>Merismomorpha micropetiolata</i> sp. nov.	Agroecosystem
12	<i>Trigonoderus periyarensis</i> sp. nov.	Forest ecosystem

Table 2. List of new species published during work period

SI No.	New species published	Type of vegetation
1	<i>Notanisus elongatus</i> Raseena & Sureshan	Forest ecosystem
2	<i>Netomocera maculata</i> Raseena & Sureshan	Forest ecosystem
3	<i>Dipara ponmudiensis</i> Sureshan & Raseena	Forest ecosystem
4	<i>Dipara andamanensis</i> Sureshan & Raseena	Forest ecosystem
5	<i>Dipara kannurensis</i> Sureshan & Raseena	Homestead vegetation
6	<i>Platecrizotes keralensis</i> Sureshan & Raseena	Agroecosystem
7	<i>Psilocera manickai</i> Sureshan & Raseena	Forest ecosystem
8	<i>Pycnetron keralensis</i> Raseena & Sureshan	Agroecosystem

New generic reports: Three genera are recorded for first time from India

1. *Platecrizotes* Ferrière
2. *Pycnetron* Gahan
3. *Lyubana* Bouček

New Species reports: 17 species are recorded for first time from Kerala and *Spalangia impunctata* Howard recorded for first time from India.

1. *Cerocephala dinoderi* Gahan
2. *Dipara bouceki* (Narendran)
3. *Dipara gastris* (Sureshan & Narendran)
4. *Dipara intermedia* Sureshan & Narendran
5. *Dipara nigra* Sureshan
6. *Dipara yercaudensis* Sureshan
7. *Systasis dalbergiae* Mani
8. *Systasis dasyneurae* Mani
9. *Panstenon collaris* Bouček
10. *Merismomorpha tamilnadensis* Sureshan *et. al.*,
11. *Mokrzekia orientalis* Subba Rao
12. *Pachycrepoides veerannai* Narendran & Anil

13. *Psilocera heydoni* Sureshan
14. *Sphegigaster karnatakaensis* Sureshan
15. *Spalangia simplex* Perkins
16. *Spalangia parfuscipes* Ahmad
17. *Spalangia impunctata* Howard (New record from India)

Pteromalidae plays a significant role in controlling other insects. Present study indicates presence of diverse fauna of Pteromalidae in agroecosystems Kerala which in turn reflects an ample scope for further studies on the host parasitoid associations and taxonomic investigations on Pteromalidae in the agroecosystems of Kerala.

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APPENDIX

GEO-OORDINATES OF COLLECTION LOCALITIES

Districts	Localities	Latitude (°N)	Longitude (°E)
Kasargode	Periya	12.40755	75.09324
	Mavungal	12.33476	75.11221
	Ranipuram	12.42800	75.36162
	Kottamcheri	12.35436	75.41287
	Beminja	12.30747	75.03124
Kannur	Madaayippara	12.03235	75.25666
	Vellikeel	12.00315	75.34196
	Mullul	12.01538	75.34020
	Keezhara	11.99941	75.32755
	Muzhuppilangad	11.79717	75.44696
	Munderikkadavu	11.92253	75.43035
	Chovva	11.87076	75.39481
	Aaralam	11.92238	75.79246
	Paithalmala	12.17667	75.52260
	Kottiyoor Reserve Forest	11.86110	75.86501
	Kannur University	11.86753	75.37451
	Kaitheel	11.72012	75.24324
	Kaiveli	11.70699	75.72215
	Kozhikode	Kakkadampoyil	11.33618
Nechooli		11.30067	75.92909
Chathamangalam		11.29497	75.91439
Annassery		11.37118	75.77494
Vengeri		11.30448	75.79674
Olavanna		11.22419	75.82904
Narenkulam		11.24666	75.78107
Muthukkad		11.60392	75.85035
Kuttyadi		11.65432	75.75355
Payyoli		11.51286	75.61790
Kottooli		11.27131	75.79674
Chelannur		11.35763	75.80772
Medical college Campus		11.27243	75.83722
Mavoor		11.26746	75.94252
Chelavoor		11.29582	75.84613

	Chalappuram	11.24063	75.79092
	Areekkad	11.21094	75.80546
	Kinassery	11.23084	75.81488
	Mahe	11.70272	75.53640
	Kakkayam	11.54730	75.89261
	Mayanad	11.28635	75.85049
	Asokapuram	11.26987	75.78148
	Janakikkadu	11.65231	75.80110
	Kakkavayal	11.49306	75.97390
	Elathur	11.34181	75.74006
	Easthill	11.29374	75.77494
	Feroke	11.17657	75.83141
Wayanad	Kalladi	11.51058	76.13489
	Tholpetty	11.95163	76.05950
	Thirunelli	11.90812	75.99712
	Panamaram	11.73809	76.07400
Malappuram	Nilambur	11.28993	76.24443
	Thalappara	11.07392	75.90155
	Ponnani	10.76772	75.92590
	Kalachal	10.76006	76.01489
	Valancheri	10.88775	76.07379
Palakkad	Thathamangalam	10.66721	76.71602
	Chittur	10.67724	76.71634
	Pattancheri	10.65306	76.73077
	Koduvayoor	10.66323	76.64705
	Sidarkundu	10.55553	76.71441
	Silent Valley	11.06711	76.42160
	Varadimala	11.06812	76.56616
	Pattambi	10.80678	76.19649
	Puthunagaram	10.68298	76.68378
	Pattambi-RARS	10.81139	76.19033
Thrissur	Velupadam	10.42744	76.34347
	Choorakkattukara	10.55741	76.17270
	Kannara	10.53558	76.33623
	Adatt	10.54508	76.14649
	Vazhachal	10.31469	76.58792
	Mangalassery	10.24216	76.36572
	Ottapilav	10.77226	76.36952
Ernakulam	Kolancheri	9.97827	76.47390
	Karumaloor	10.13033	76.29267

	Urulanthanni	10.12812	76.75529
	Thattekkad	10.12979	76.68712
	Kuttipuzha	10.15605	76.30728
	Mulamthuruthy	9.89840	76.38399
Idukki	Puthukkudi	10.10231	77.20211
	Kolukkumala	10.07824	77.22183
	Chinnar	10.30680	77.20602
	Mannavan Shola	10.08893	77.05952
	Mathikettan Shola	9.98467	77.24626
	Pambadum Shola	10.18195	77.19472
	Munnar	10.08893	77.05952
	Eravikulam National Park	10.14374	77.04233
	Mangaladevi	9.59767	77.22198
	Periyar Tiger Reserve	9.46216	77.23685
	Vaguvarai	10.27617	77.16146
	Kottayam	Kuruvalangad	9.75844
Kozha Seed Farm		9.76243	76.56677
Changanassery		9.44589	76.54097
Ramapuram		9.80052	76.66149
Perunna		9.43819	76.54449
Alappuzha	Marari Resort	9.59634	76.30249
	Kainakari	9.51505	76.39267
Pathanamthitta	Perumthuruthy	9.41021	76.55749
	Gavi	9.43585	77.16577
	Thiruvalla	9.38345	76.57406
Kollam	Thuruthikkara	9.04475	76.67622
	Kundara	8.96018	76.67881
Thiruvananthapuram	Vellayini	8.43435	76.99167
	Kadakkavoor	8.68322	76.77103
	Arippa	8.85132	77.04120
	Pandimotta	8.4827	77.1358
	Ananirathi	8.46958	76.97938
	Ponmudi	8.75994	77.11688
	Amaravila	8.38852	77.10537

PLATE 30

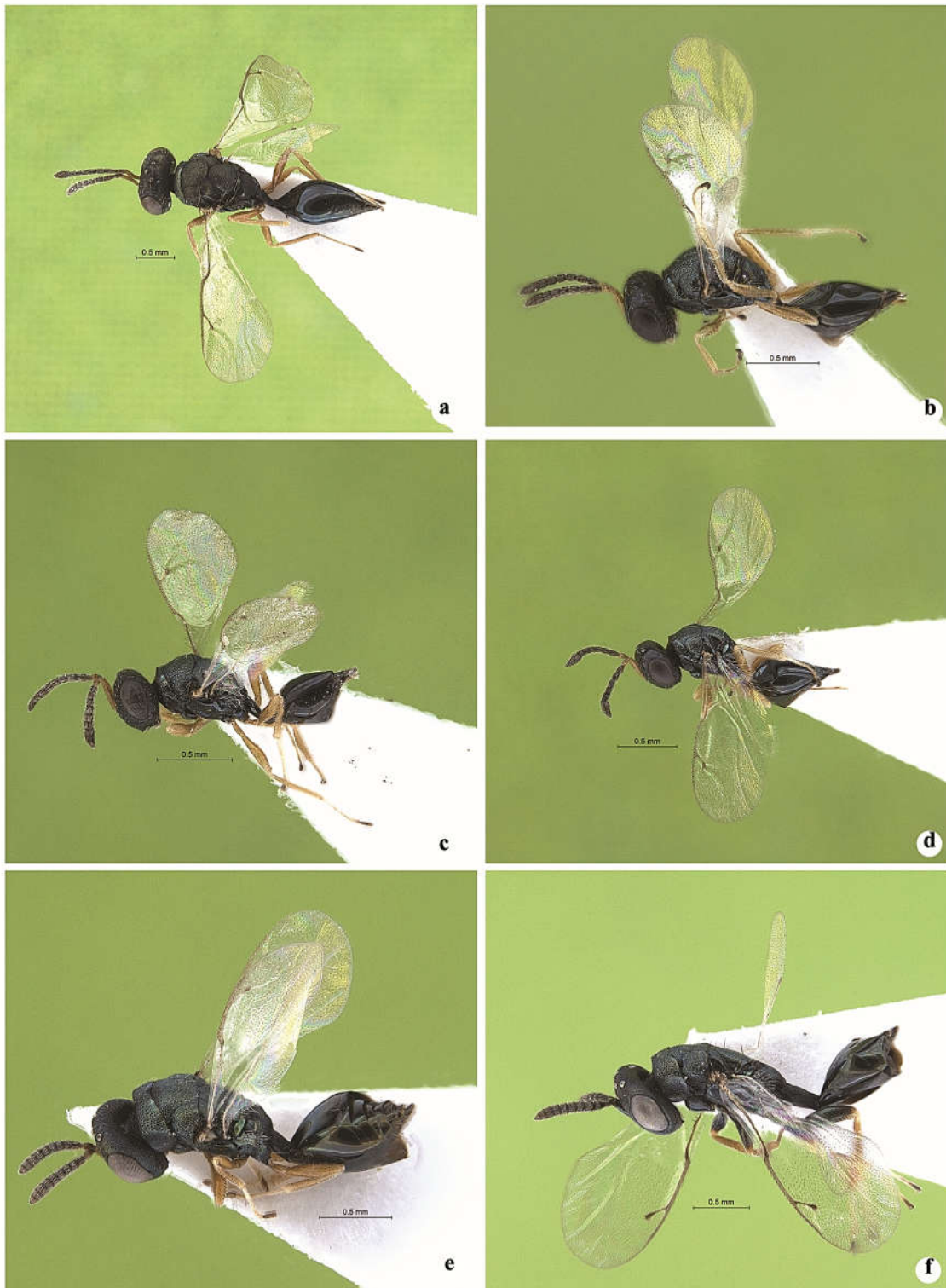


Fig. a. *Sphegigaster anamudiensis* Sureshan & Narendran, **Fig.b.** *Sphegigaster brunneicornis* (Ferrière), **Fig. c.** *Sphegigaster karnatakaensis* Sureshan, **Fig.d.** *Sphegigaster reticulata* Sureshan & Narendran, **Fig.e.** *Syntomopus carinatus* Sureshan & Narendran, **Fig.f.** *Syntomopus rajamalaiensis* Sureshan & Narendran

PLATE 31

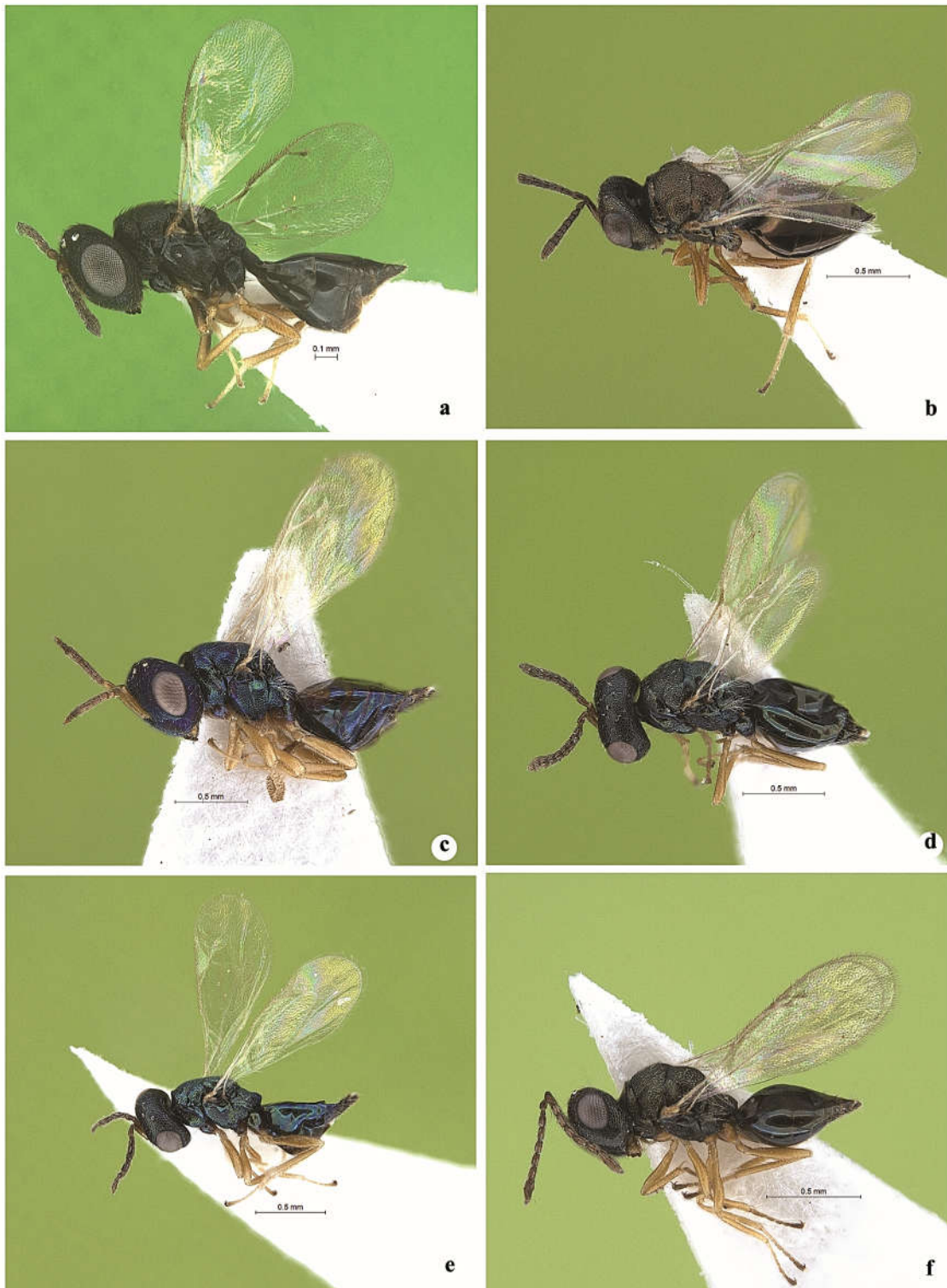


Fig. a. *Toxeumorpha minuta* Sureshan & Narendran, **Fig.b.** *Trichomalopsis acarinata* Sureshan & Narendran, **Fig. c.** *Trichomalopsis apanteloctena* (Crawford), **Fig.d.** *Trichomalopsis deplanata* Kamijo & Grissell, **Fig.e.** *Trichomalopsis neelagastra* Sureshan & Narendran, **Fig.f.** *Trichomalopsis nigra* Sureshan & Narendran

PLATE 32

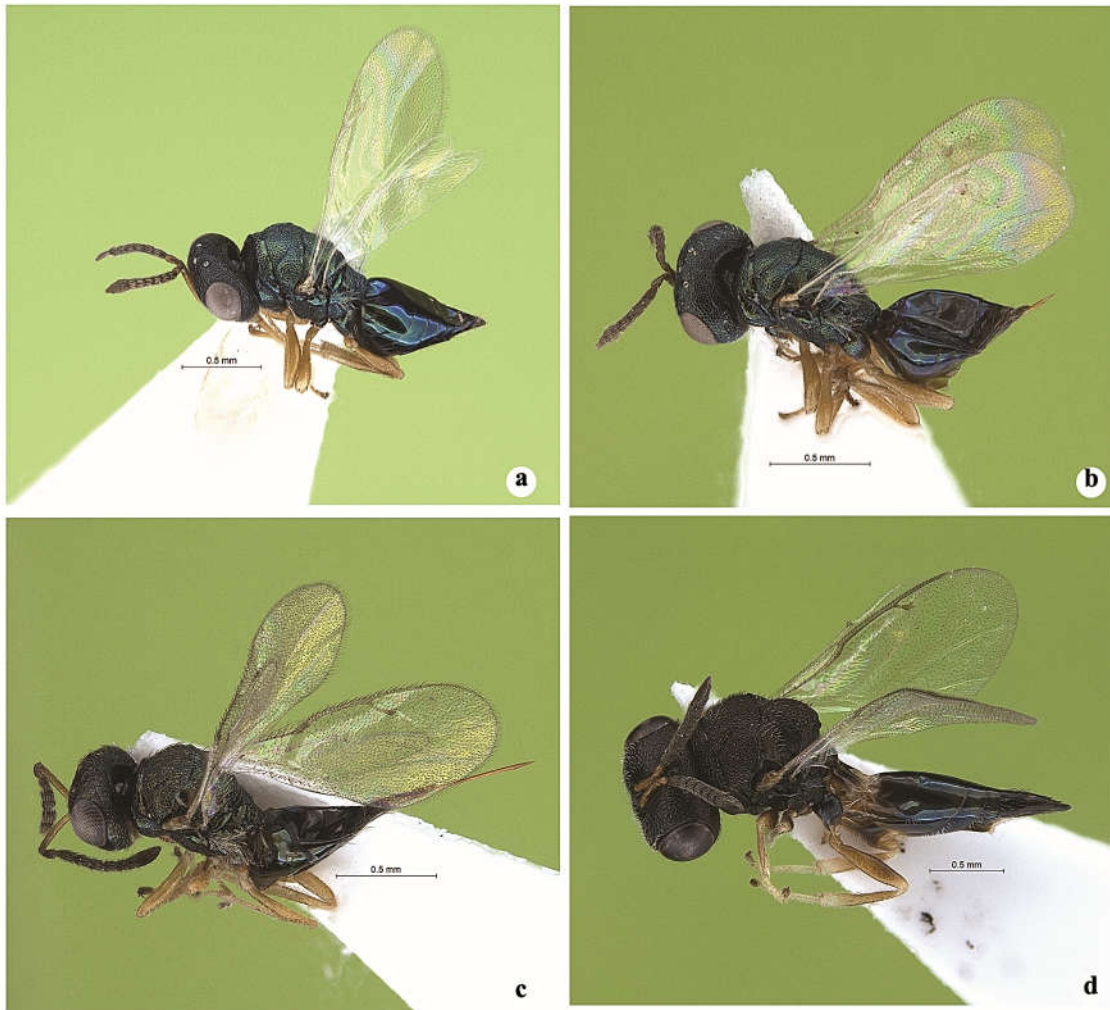
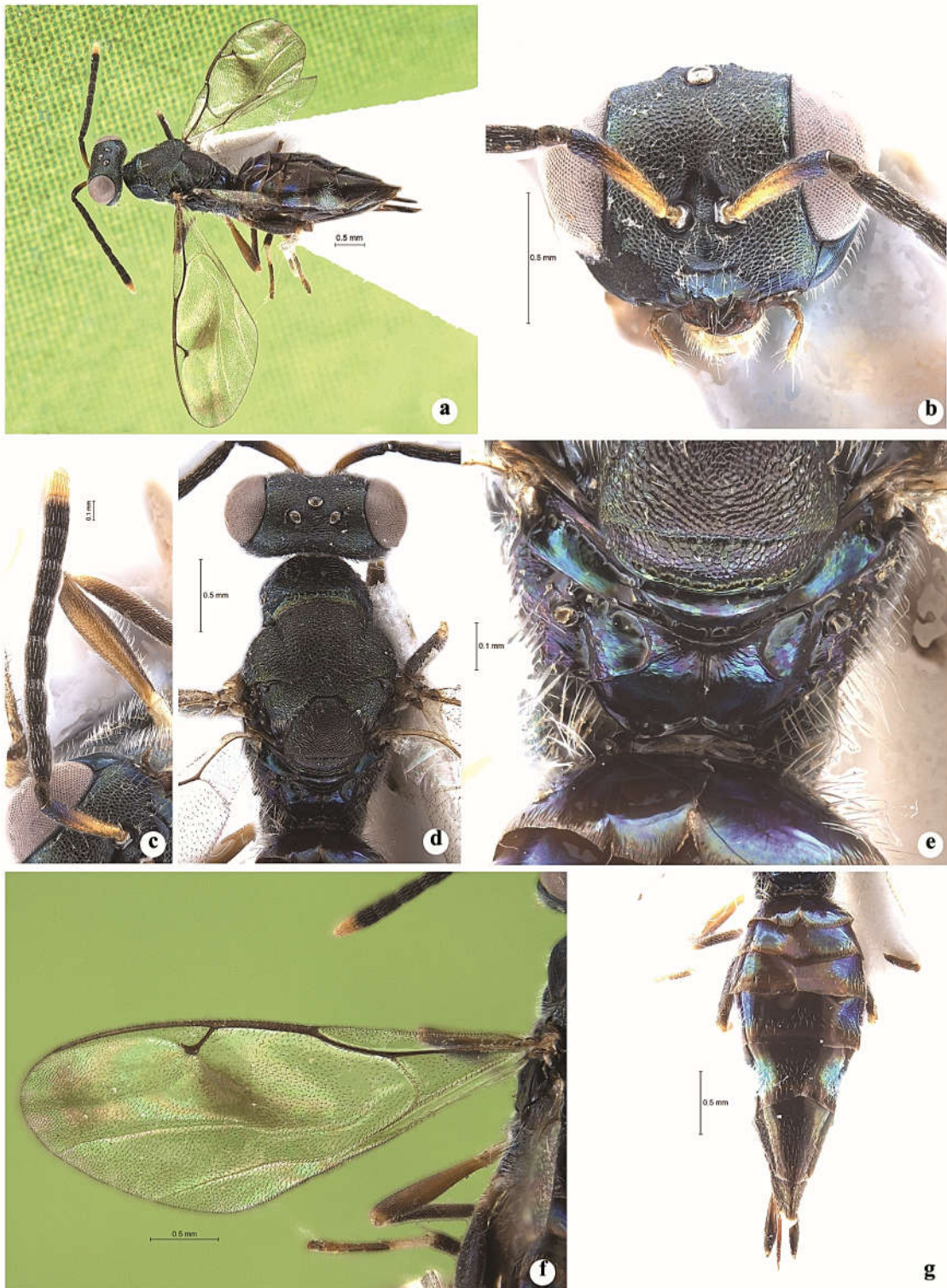


Fig. a. *Trichomalopsis thekkadiensis* Sureshan & Narendran, **Fig.b.** *Trichomalopsis travancorensis* Sureshan & Narendran, **Fig. c.** *Trichomalus kannurensis* Sureshan & Narendran, **Fig.d.** *Uniclypea kumarani* Sureshan & Narendran

PLATE 33



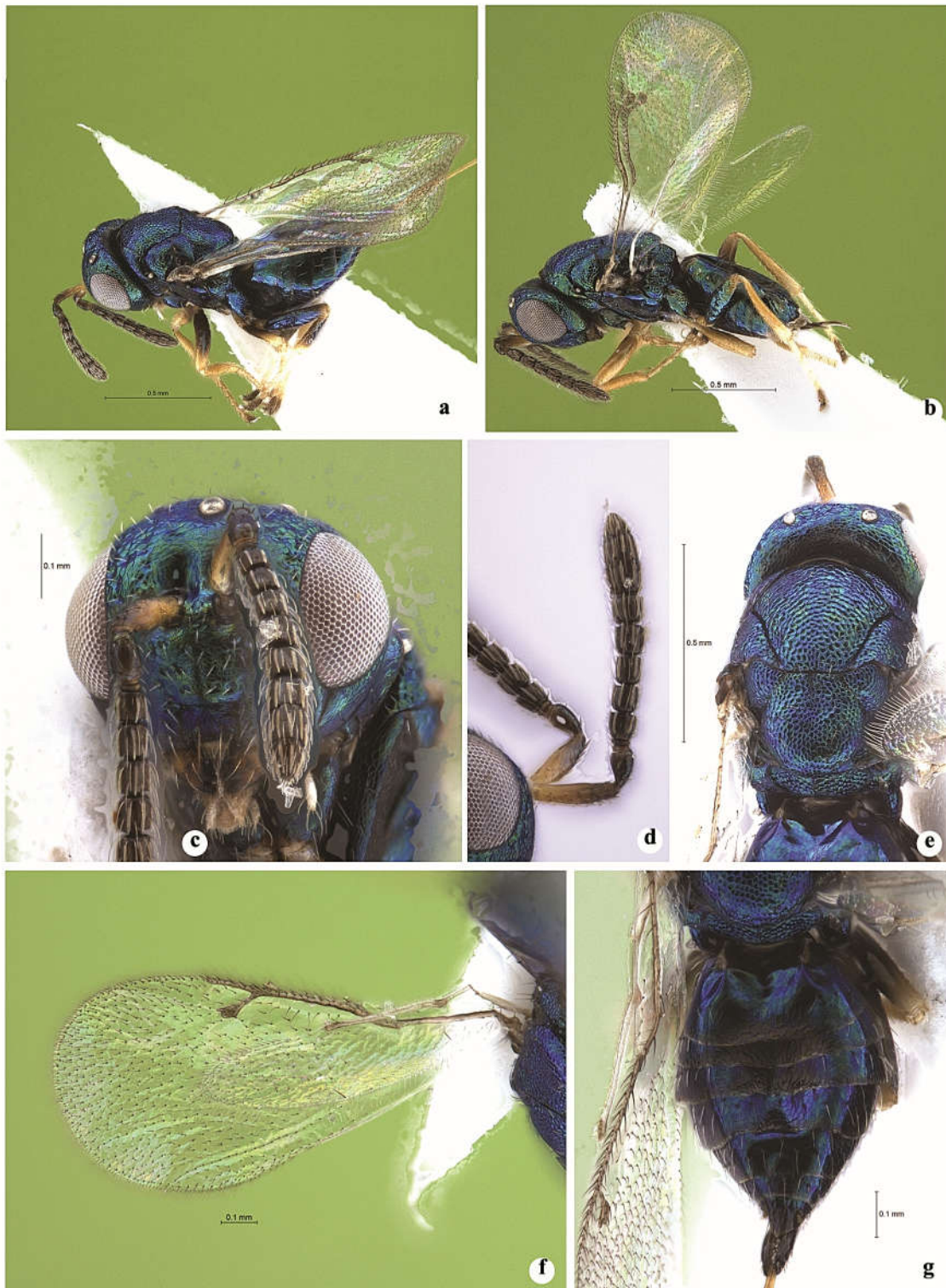
Trigonoderus periyarensis sp. nov. **Fig. a.** Profile, **Fig. b.** Head front view, **Fig. c.** Antenna, **Fig.d.** Mesosoma, **Fig.e.** Propodeum, **Fig.f.** Forewing, **Fig.g.** Gaster

PLATE 34



Fig. a. *Unicypea elongata* Sureshan & Narendran, **Fig. b.** *Spalangia impunctata* Howard, **Fig. c.** *Spalangia simplex* Perkins, **Fig.d.** *Spalangia parfuscipes* Ahmad

PLATE 15



Systasis palakkadensis sp. nov. **Fig. a.** Profile, **Fig. b.** Male, **Fig.c.** Head front view, **Fig. d.** Antenna, **Fig.e.** Mesosoma, **Fig.f.** Forewing, **Fig.g.** Gaster

PLATE 36

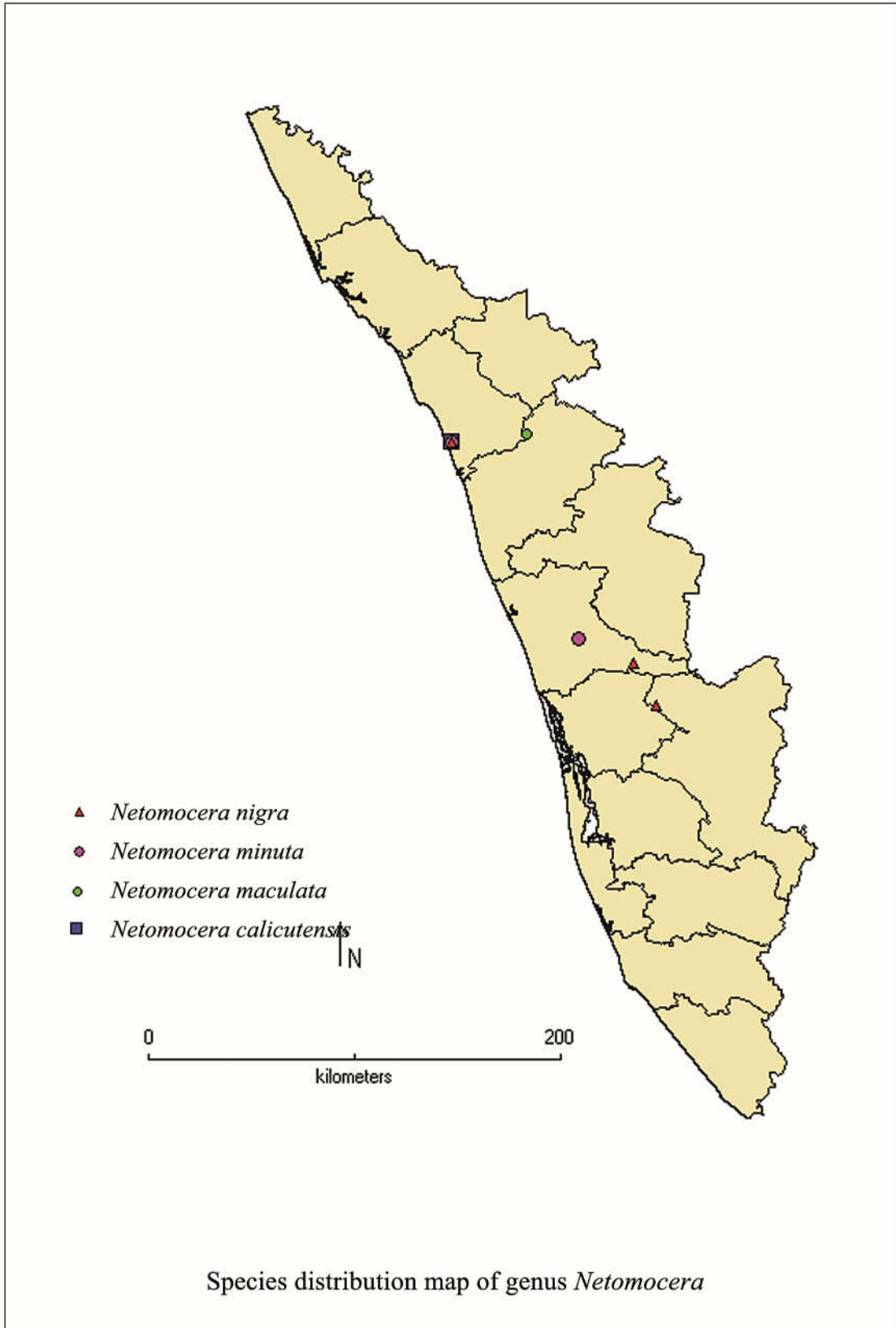


PLATE 37

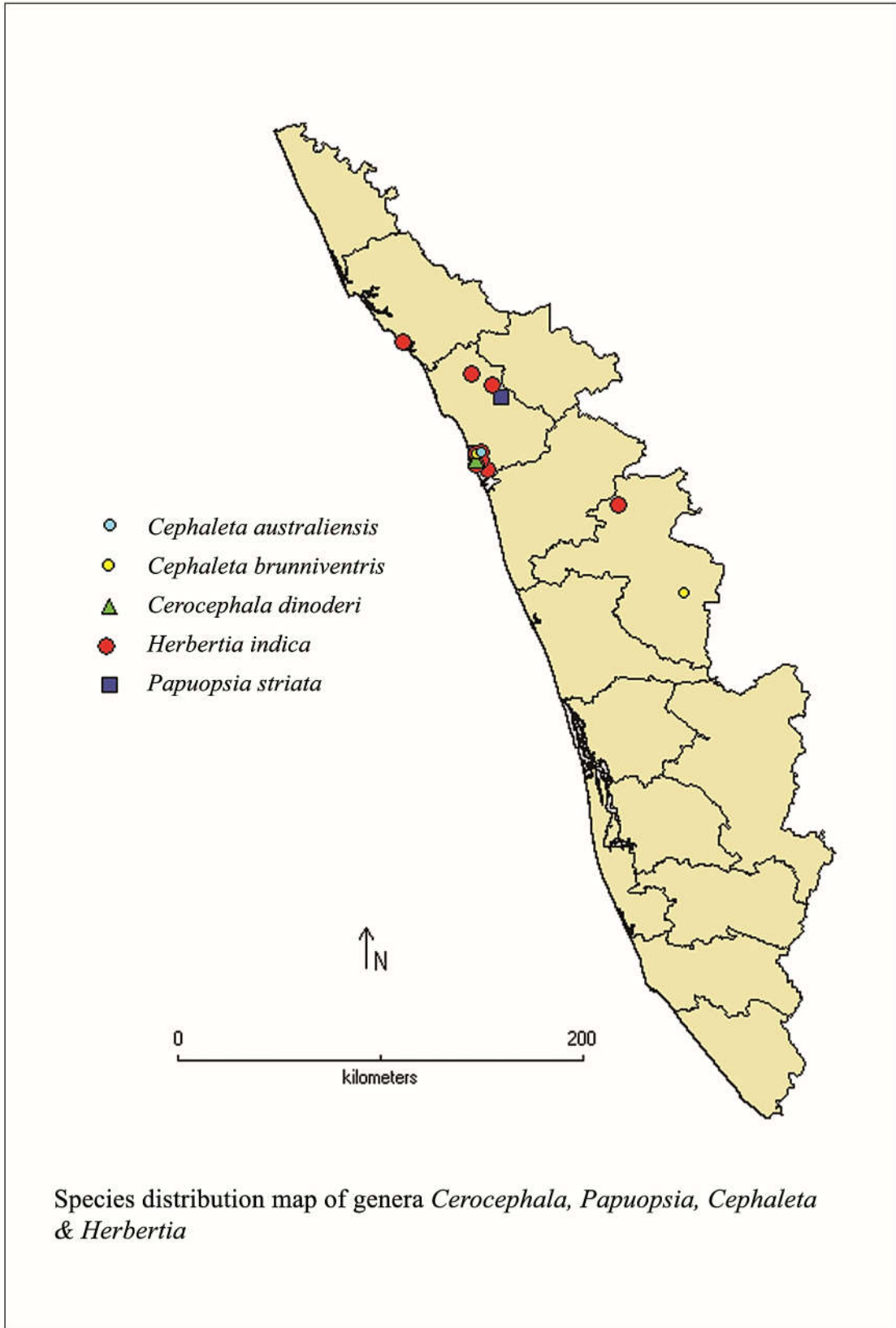


PLATE 38

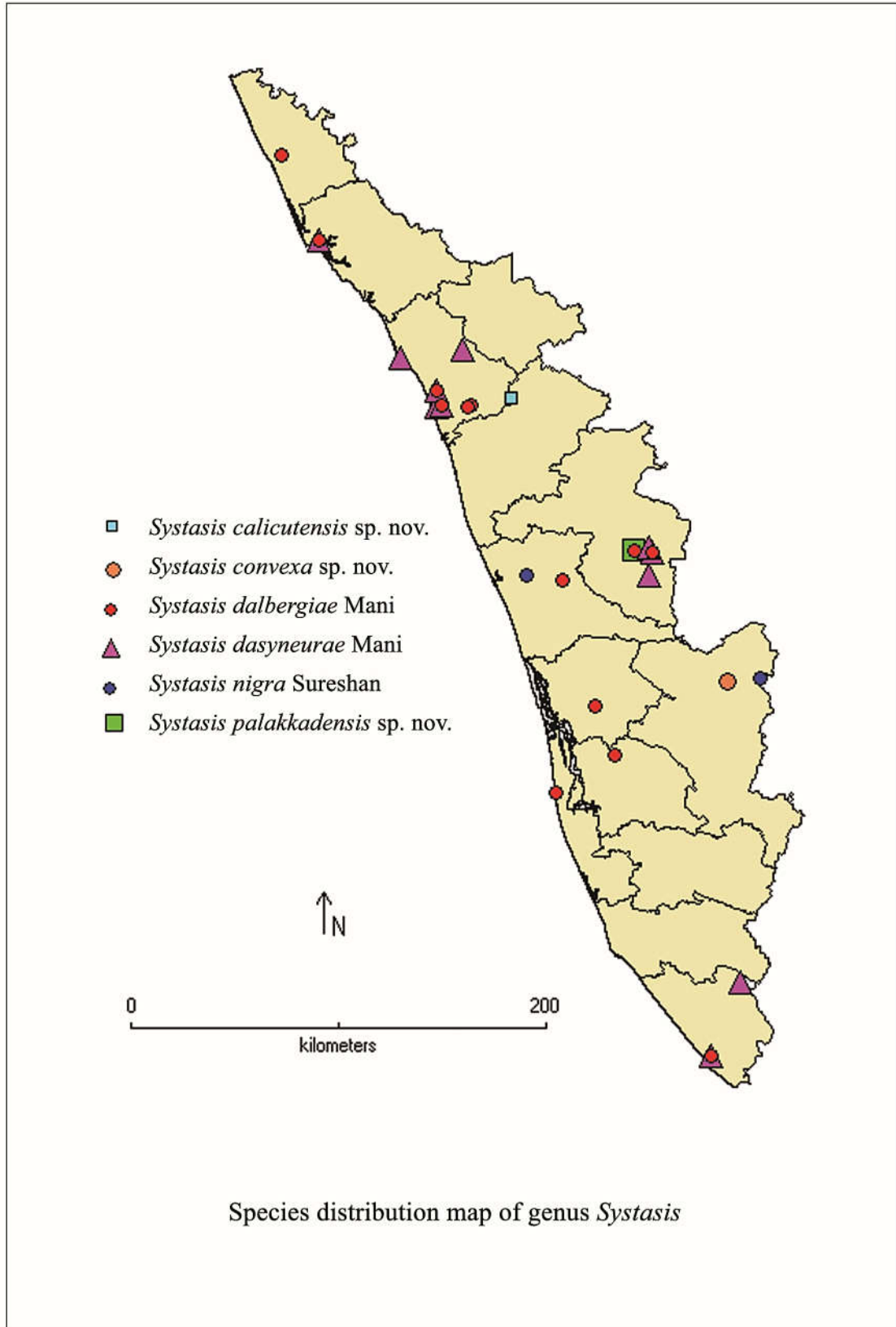


PLATE 39

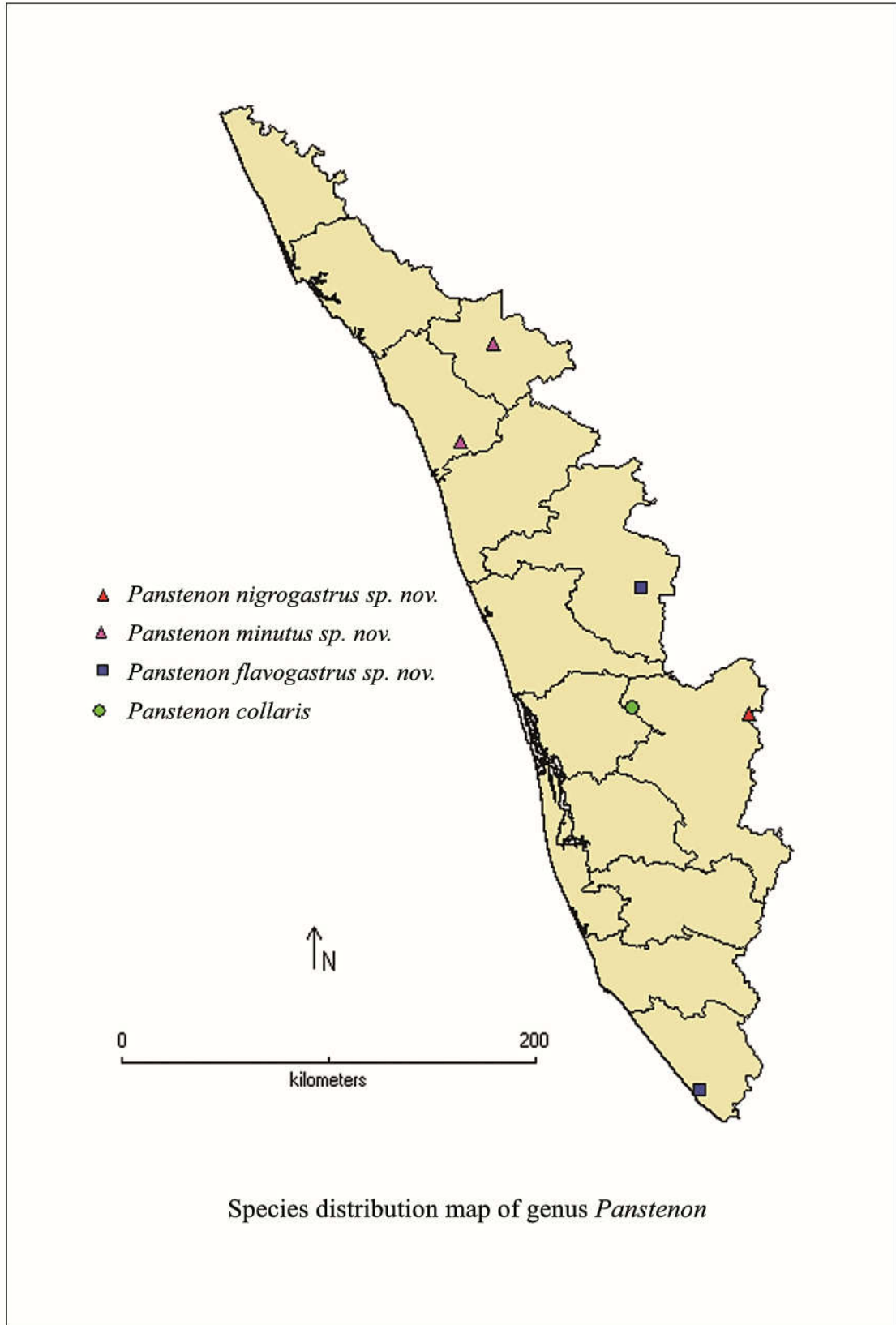


PLATE 40

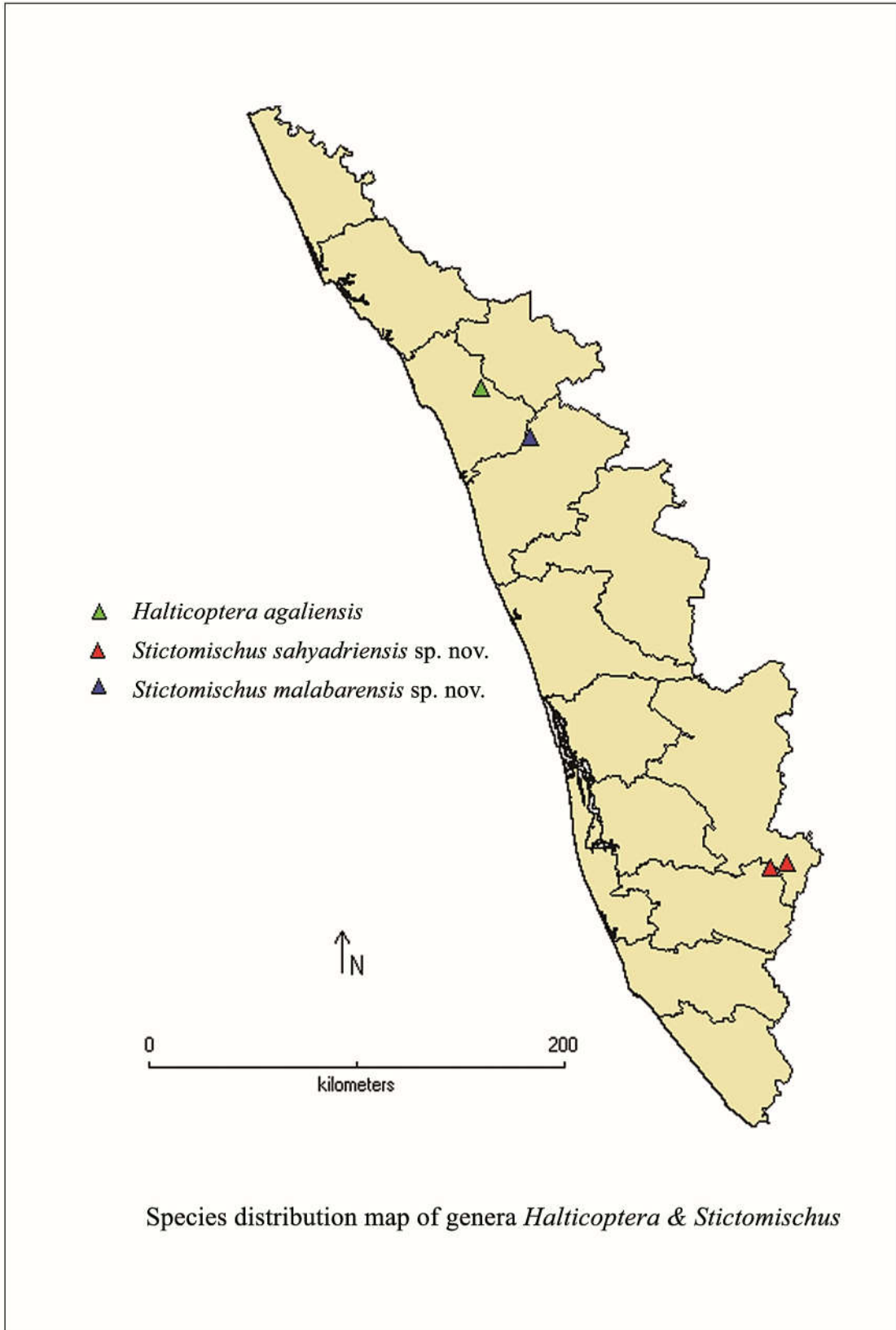


PLATE 42

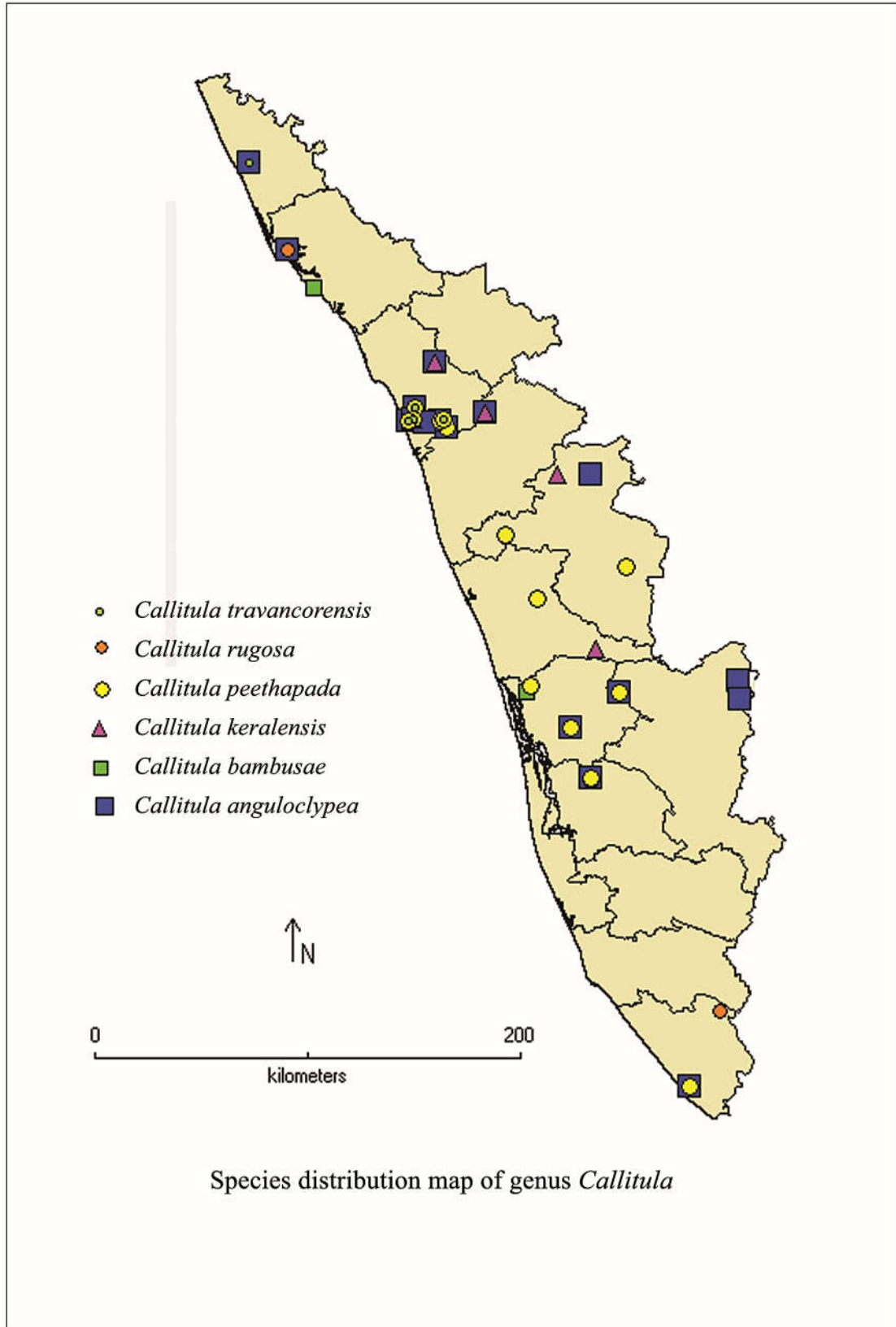


PLATE 43

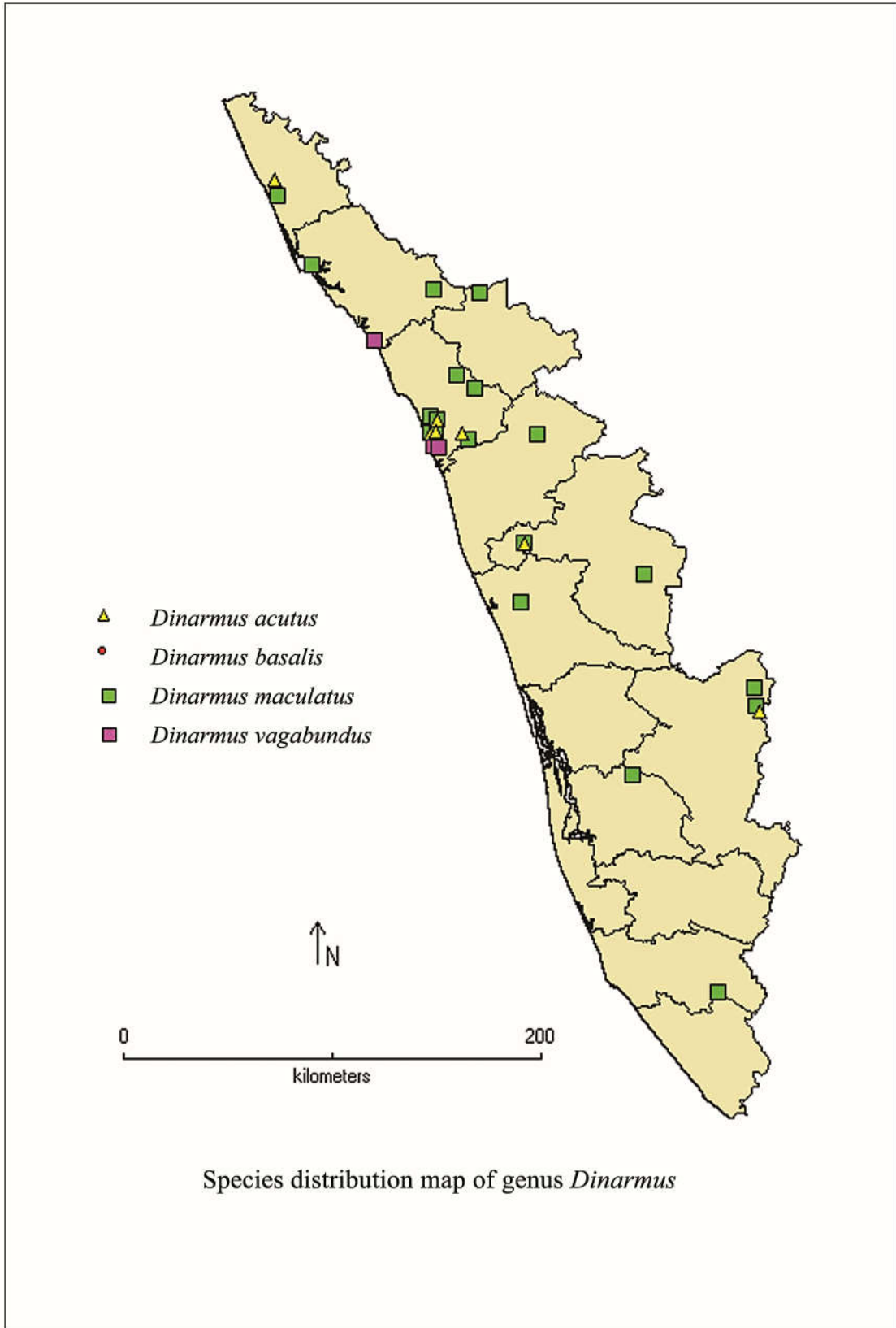


PLATE 44

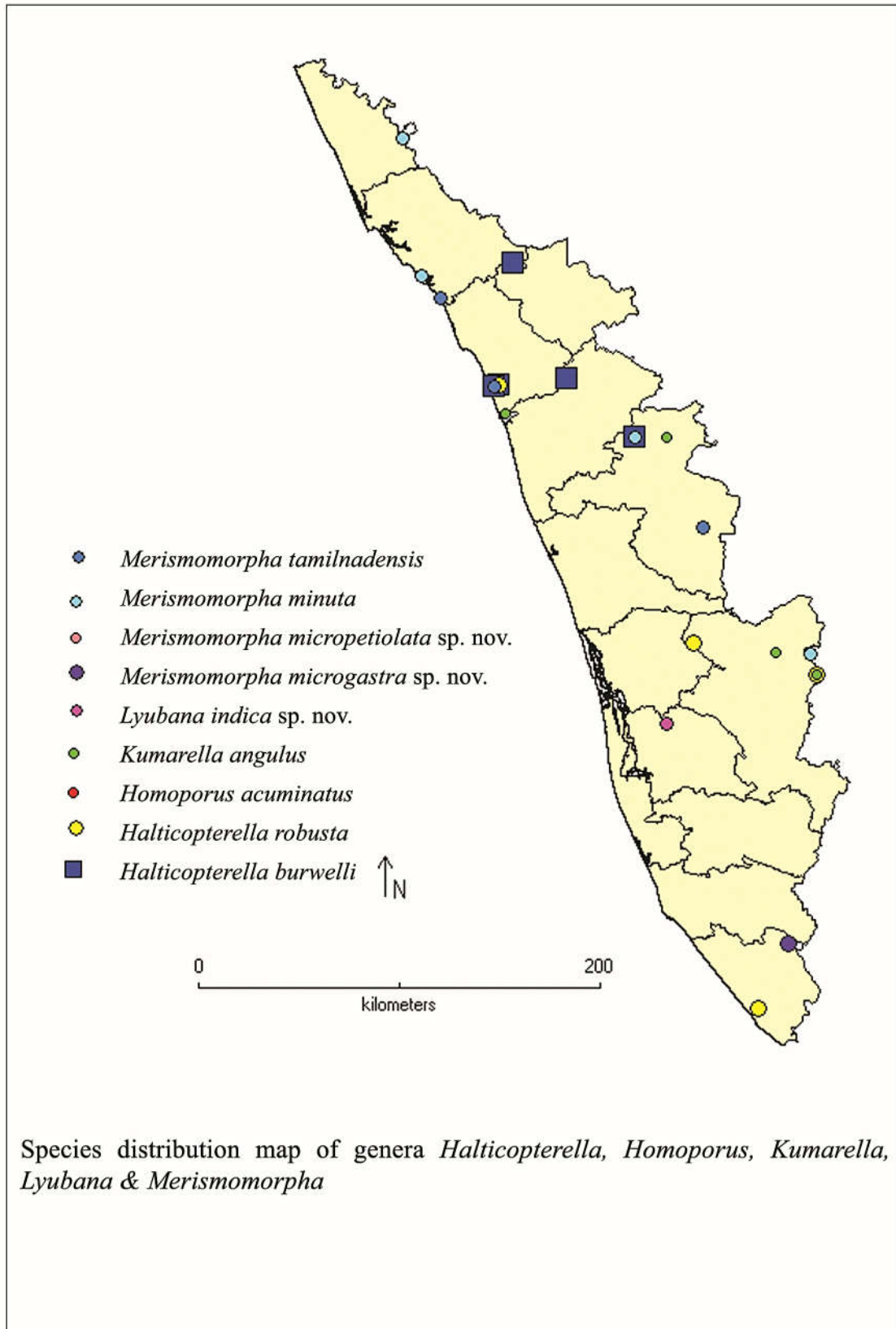


PLATE 45

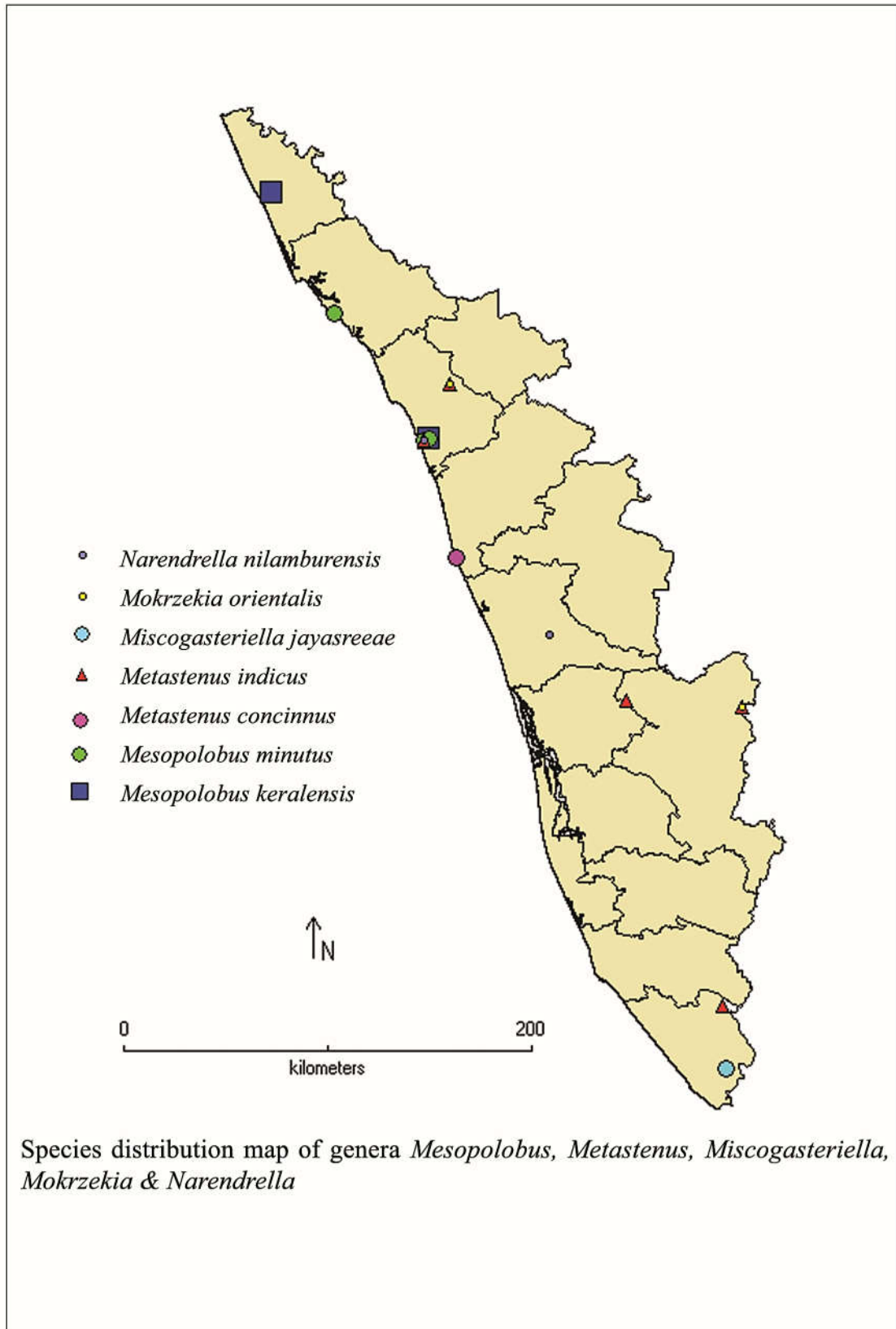


PLATE 46

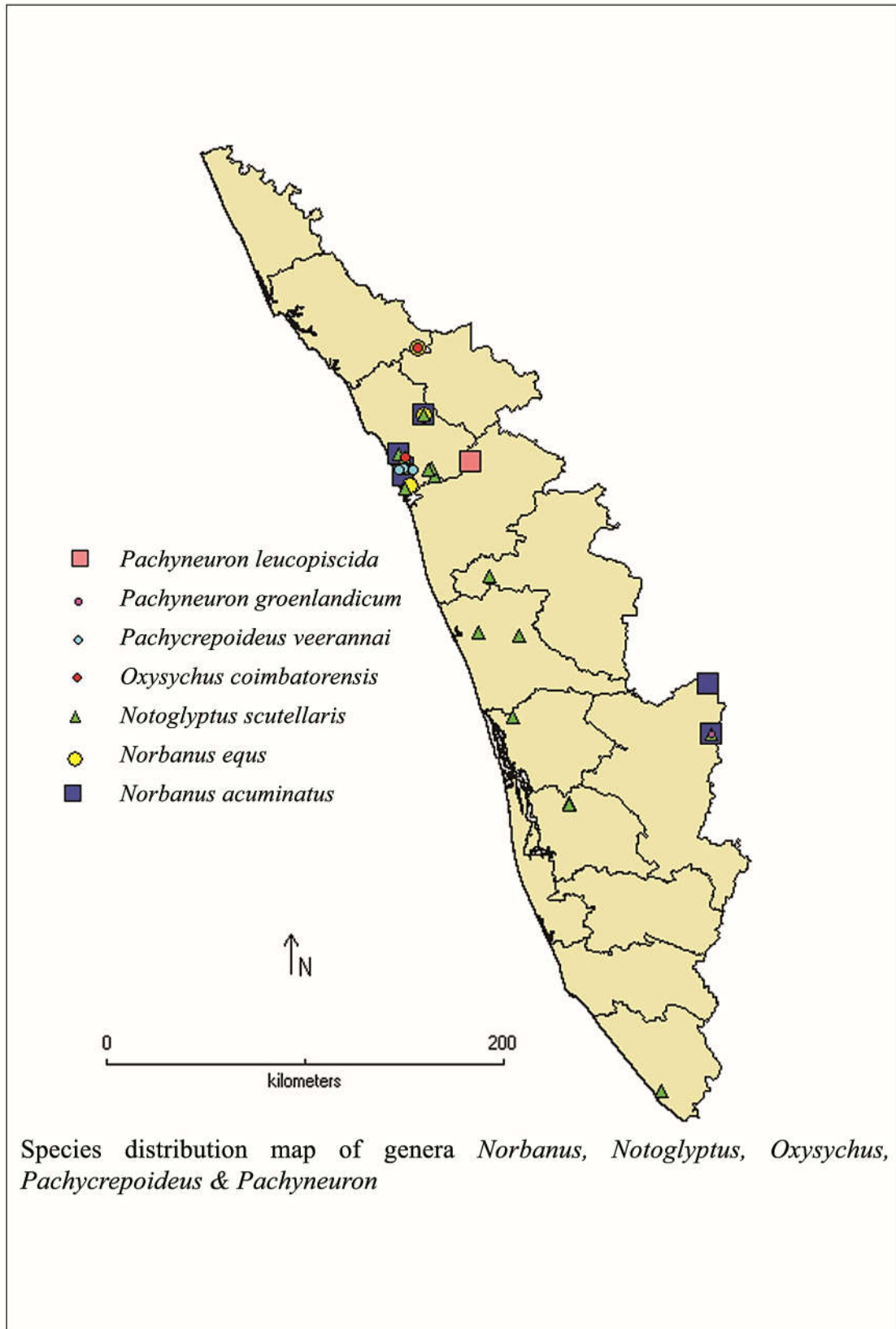


PLATE 47

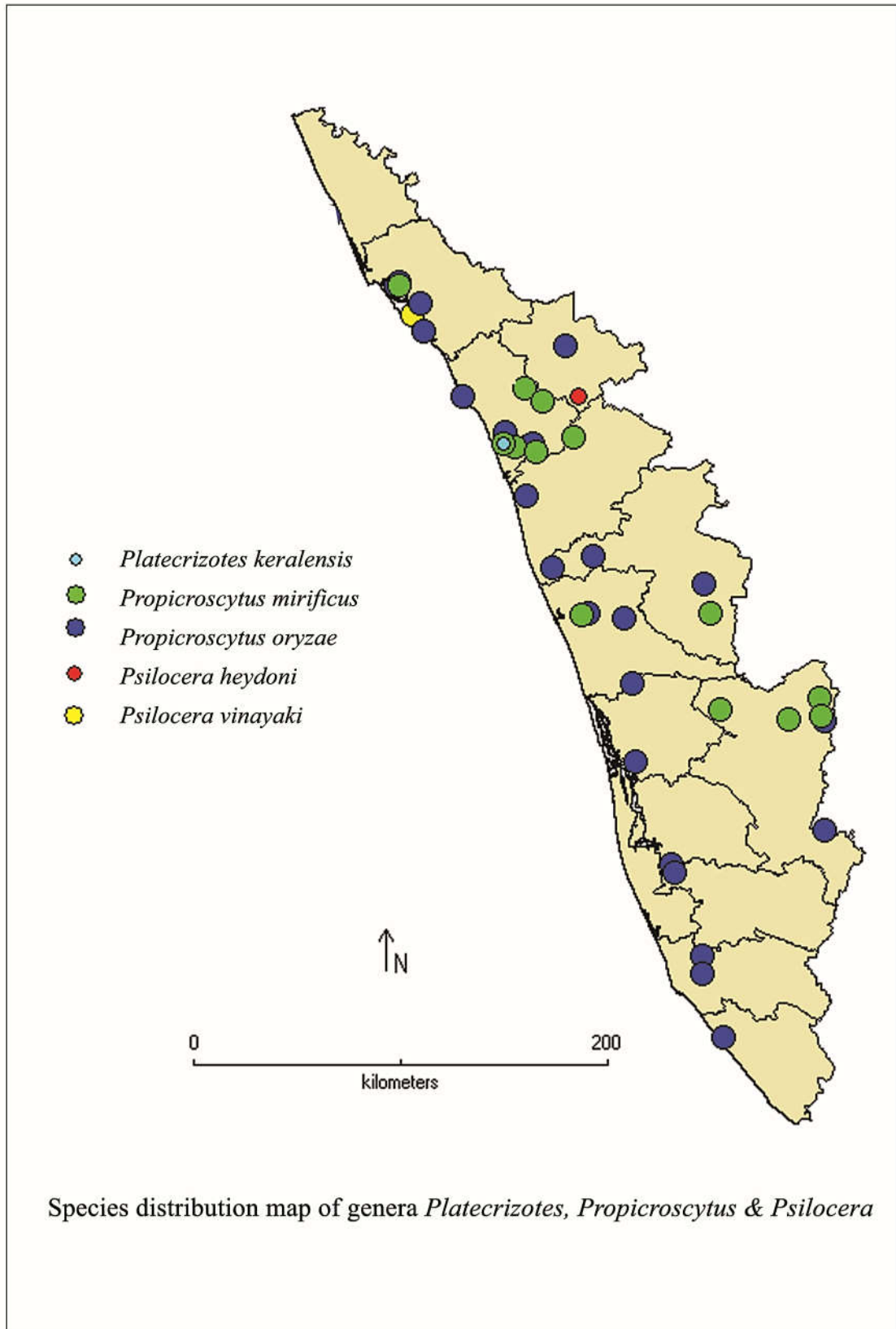


PLATE 48

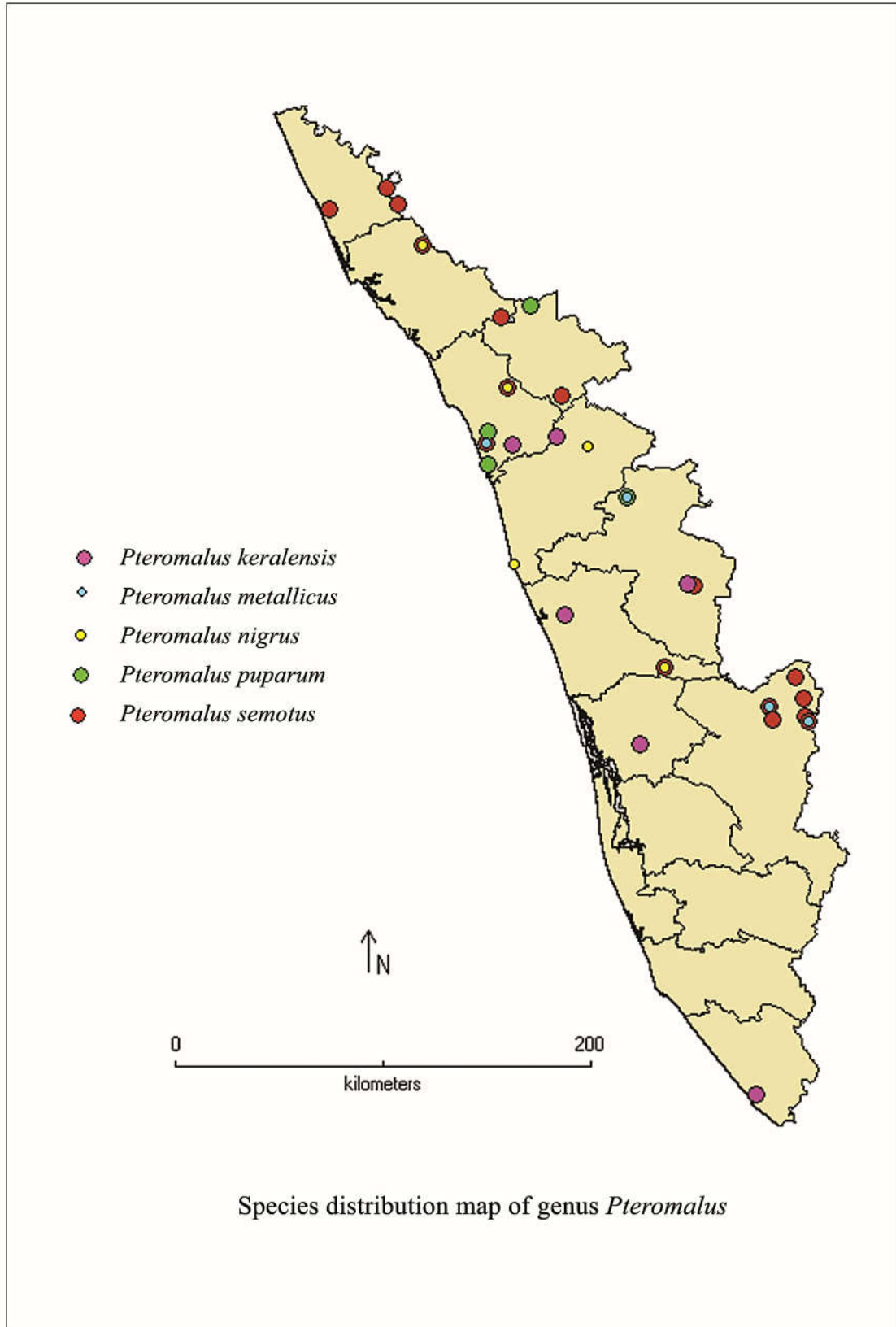


PLATE 49

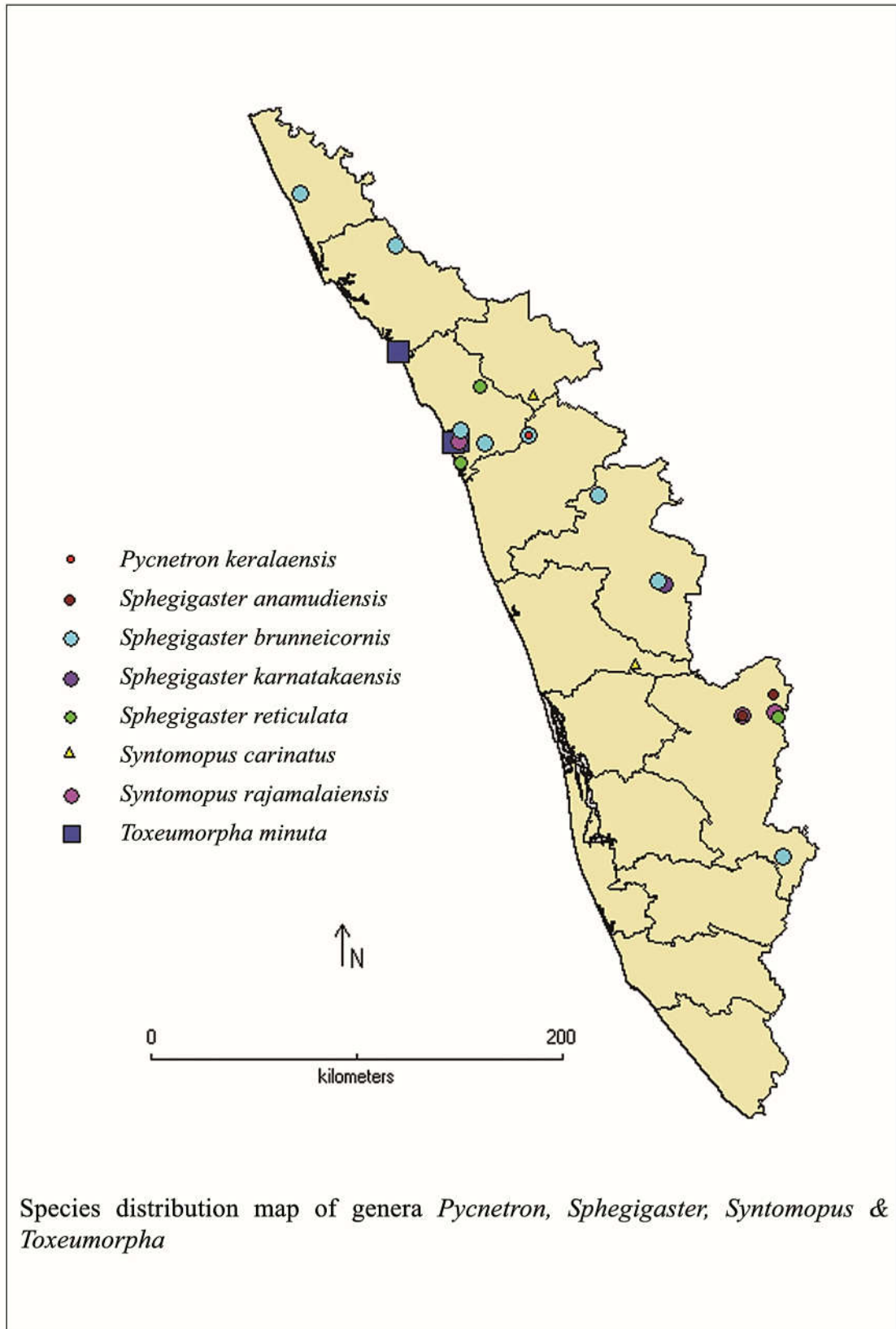


PLATE 50

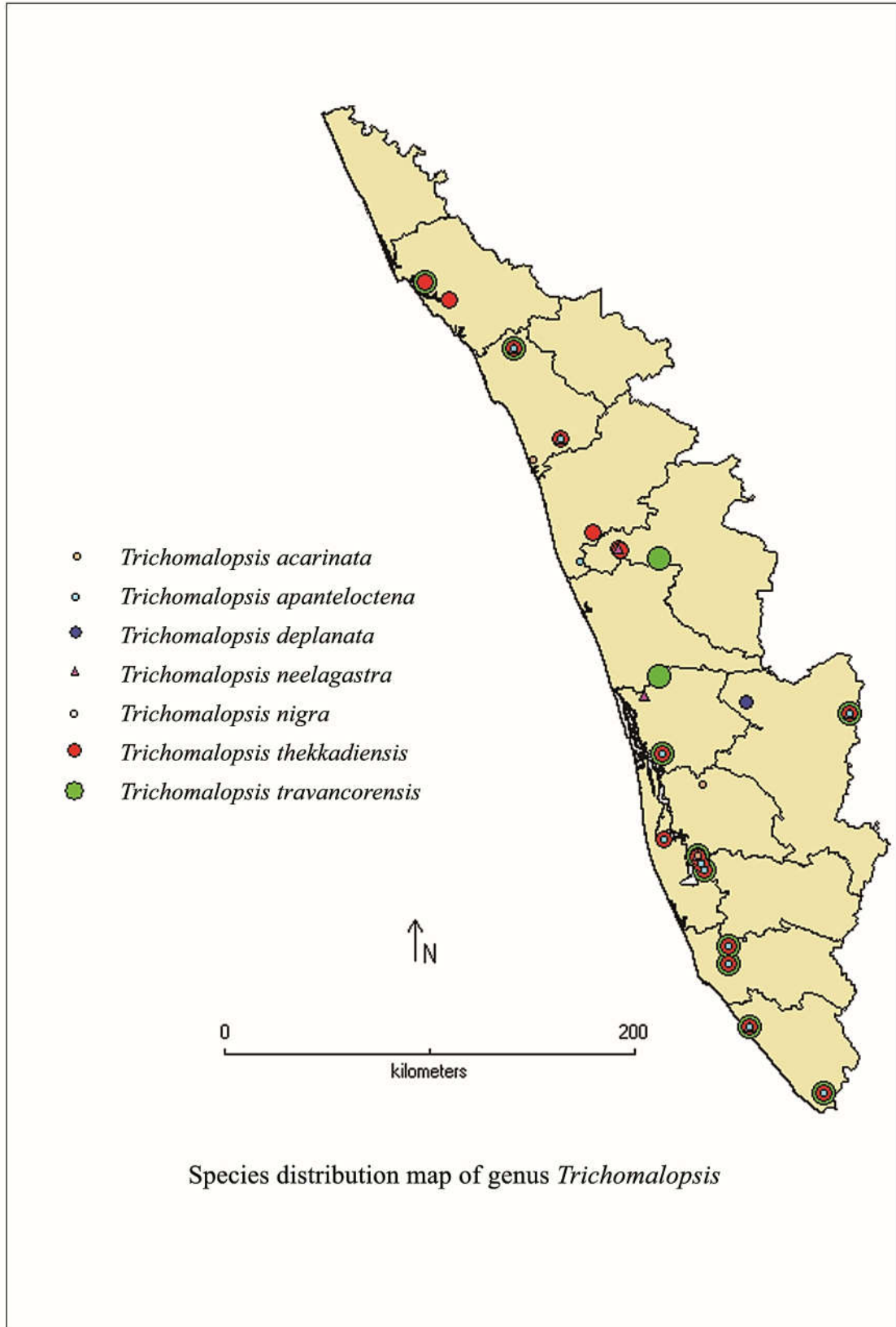


PLATE 51

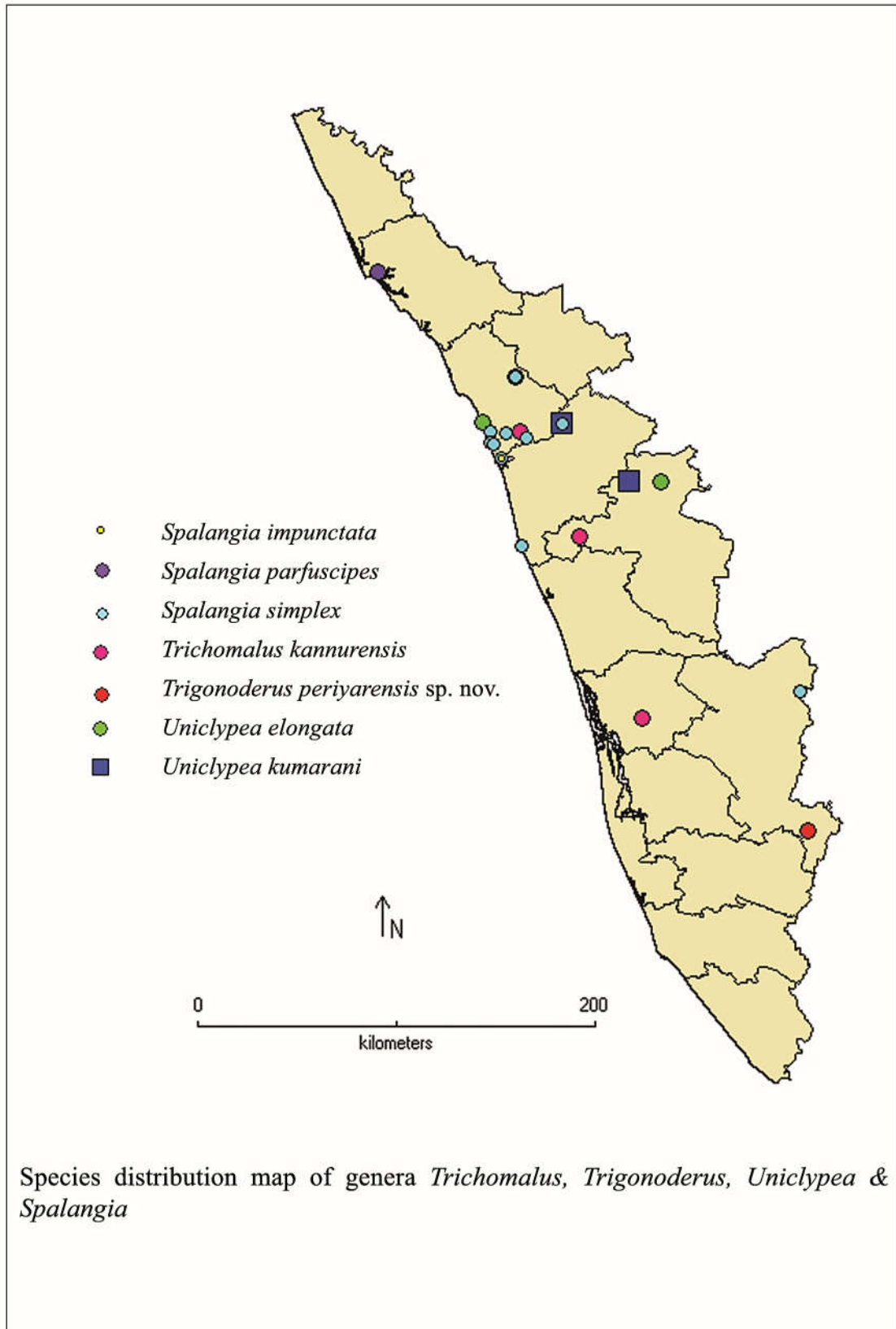


PLATE 1
STUDY AREA (KERALA STATE) WITH
COLLECTION LOCALITIES

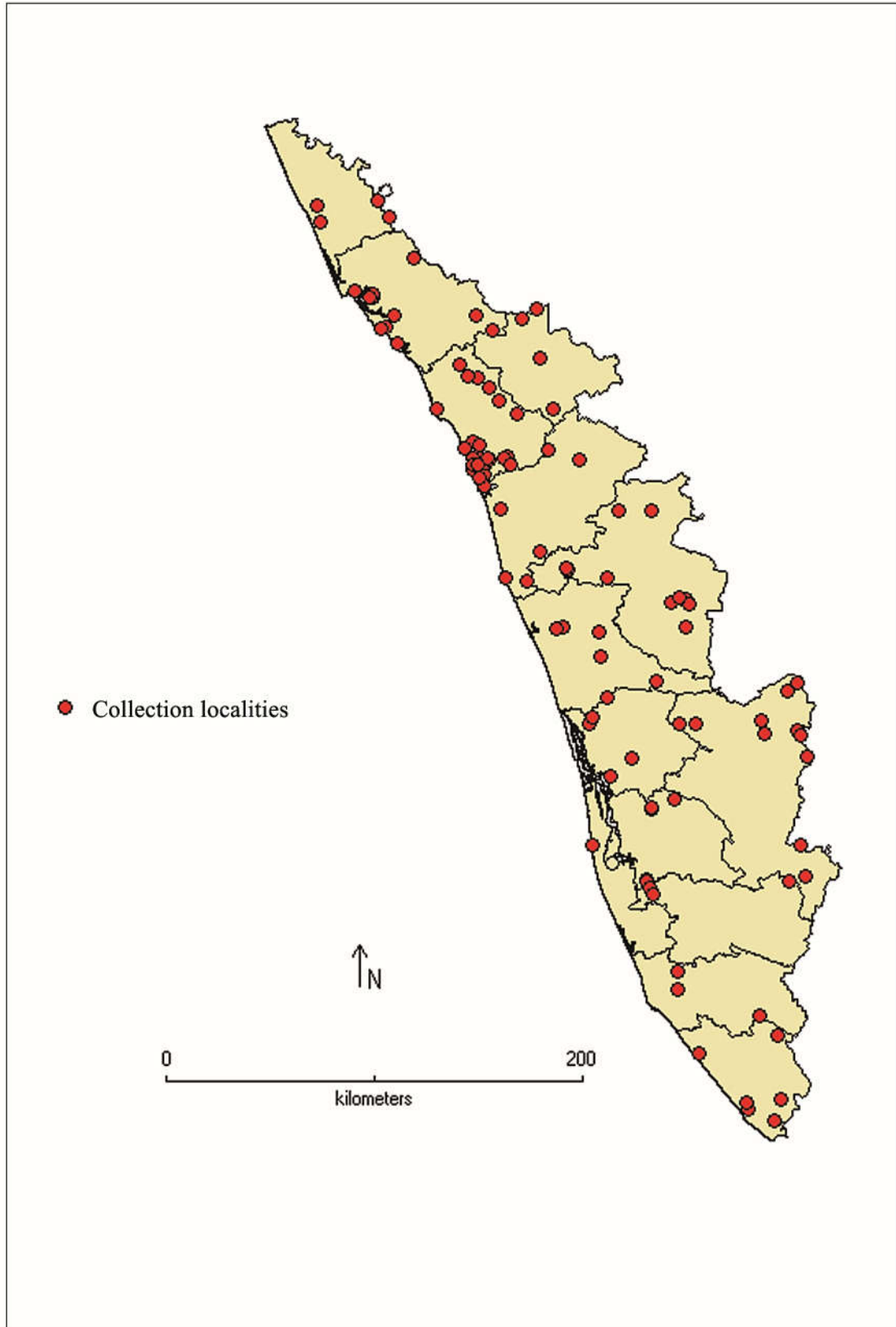


PLATE 2
COLLECTION LOCALITIES

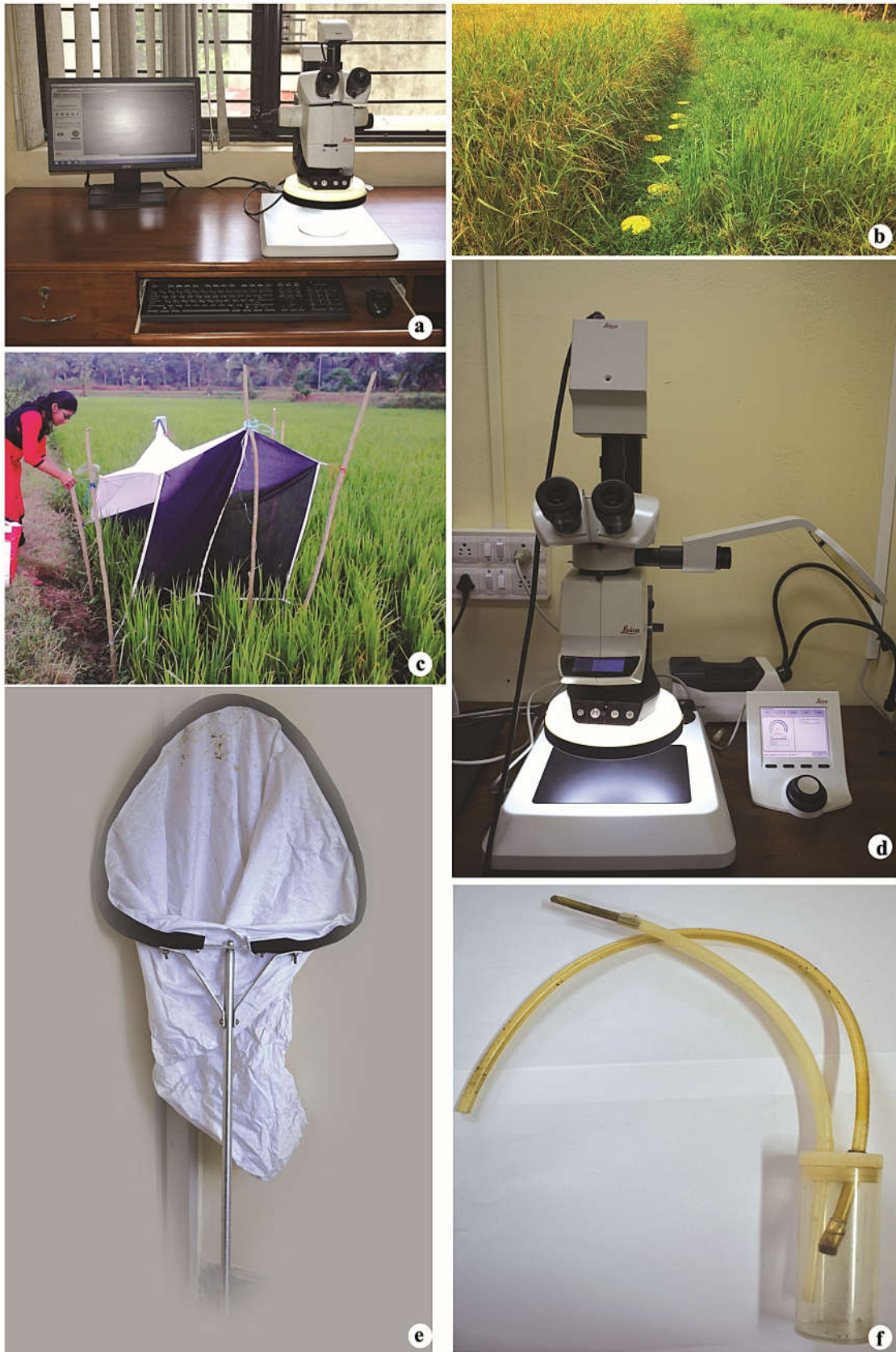


Fig. a. Leica MZ205C Microscope; b. Yellow pan trap; c. Malaise trap; d. Leica DFC500 digital camera; e. Sweepnet; f. Aspirator.

PLATE 3
COLLECTION LOCALITIES

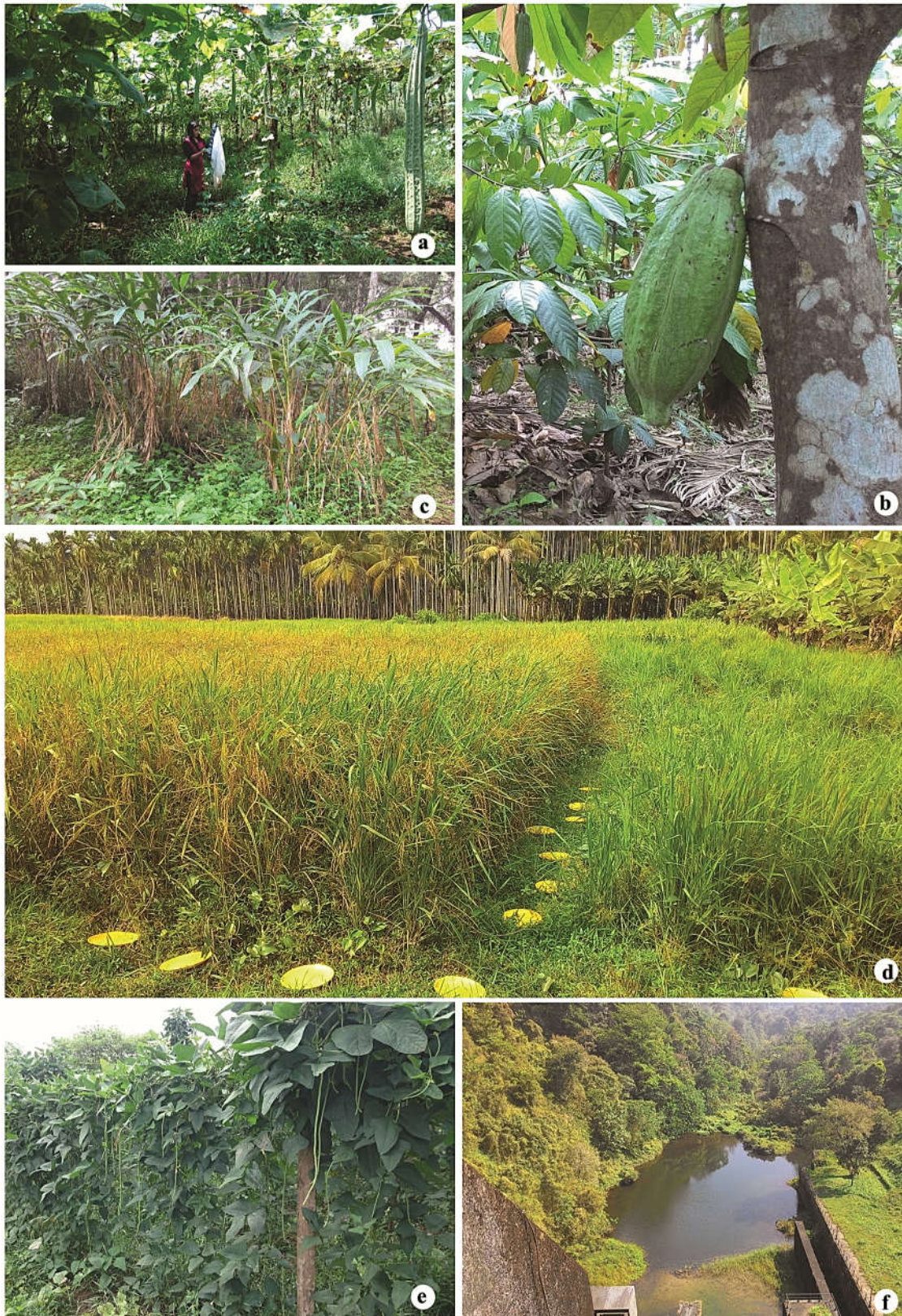


Fig. a. Mixed vegetable field; b. Cocoa plantation; c. Cardamom cultivation; d. Paddy field; e. Mixed vegetable field; f. Forest ecosystem

**PLATE 5
TERMINOLOGY**

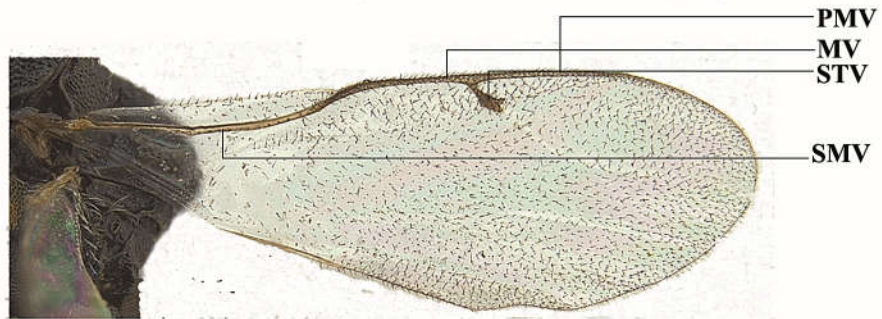
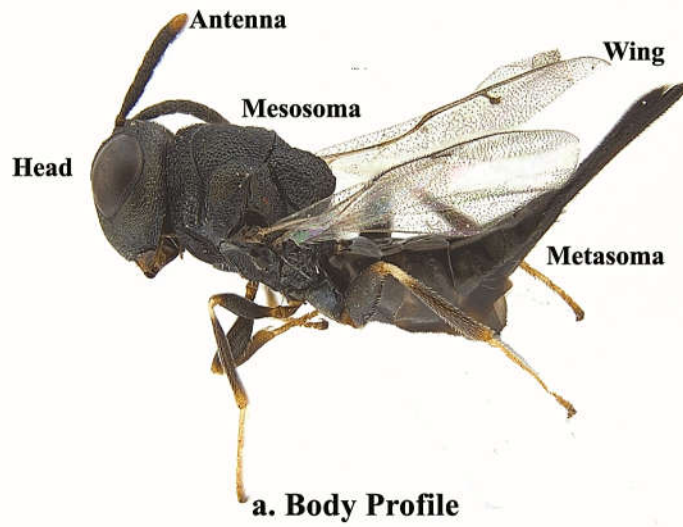


PLATE 7



Fig.a. *Cerocephala dinoderi* Gahan; **Fig. b.** *Dipara bouceki* (Narendran); **Fig.c.** *Dipara eukeralensis* Özdikmen; **Fig.d.** *Dipara gastra* (Sureshan & Narendran); **Fig.e.** *Dipara hayati* Sureshan; **Fig.f.** *Dipara intermedia* Sureshan & Narendran

PLATE 8



Fig.a. *Dipara kannurensis* Sureshan & Raseena; **Fig. b.** *Dipara keralensis* (Narendran); **Fig.c.** *Dipara malabarensis* (Narendran & Mini); **Fig.d.** *Dipara miniae* Narendran & Sureshan; **Fig.e.** *Dipara nigra* Sureshan; **Fig.f.** *Dipara yercaudensis* Sureshan

PLATE 9

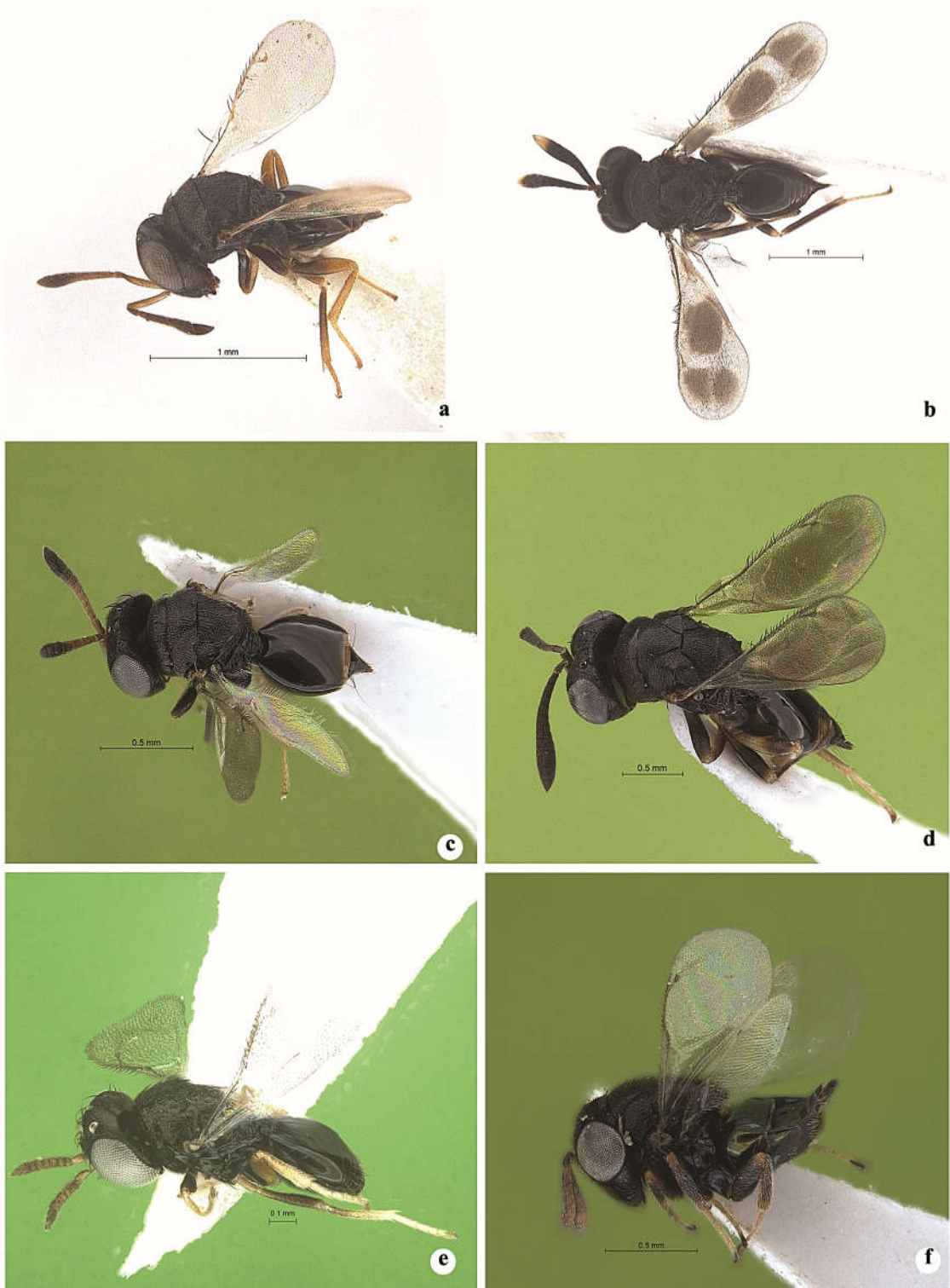


Fig. a. *Netomocera calicutensis* Sureshan & Raseena, **Fig.b.** *Netomocera maculata* Raseena & Sureshan, **Fig. c.** *Netomocera minuta* Sureshan & Nikhil, **Fig.d.** *Netomocera nigra* Sureshan & Narendran, **Fig.e.** *Papuopsia striata* Sureshan, **Fig.f.** *Cephaleta australiensis* (Howard)

PLATE 10

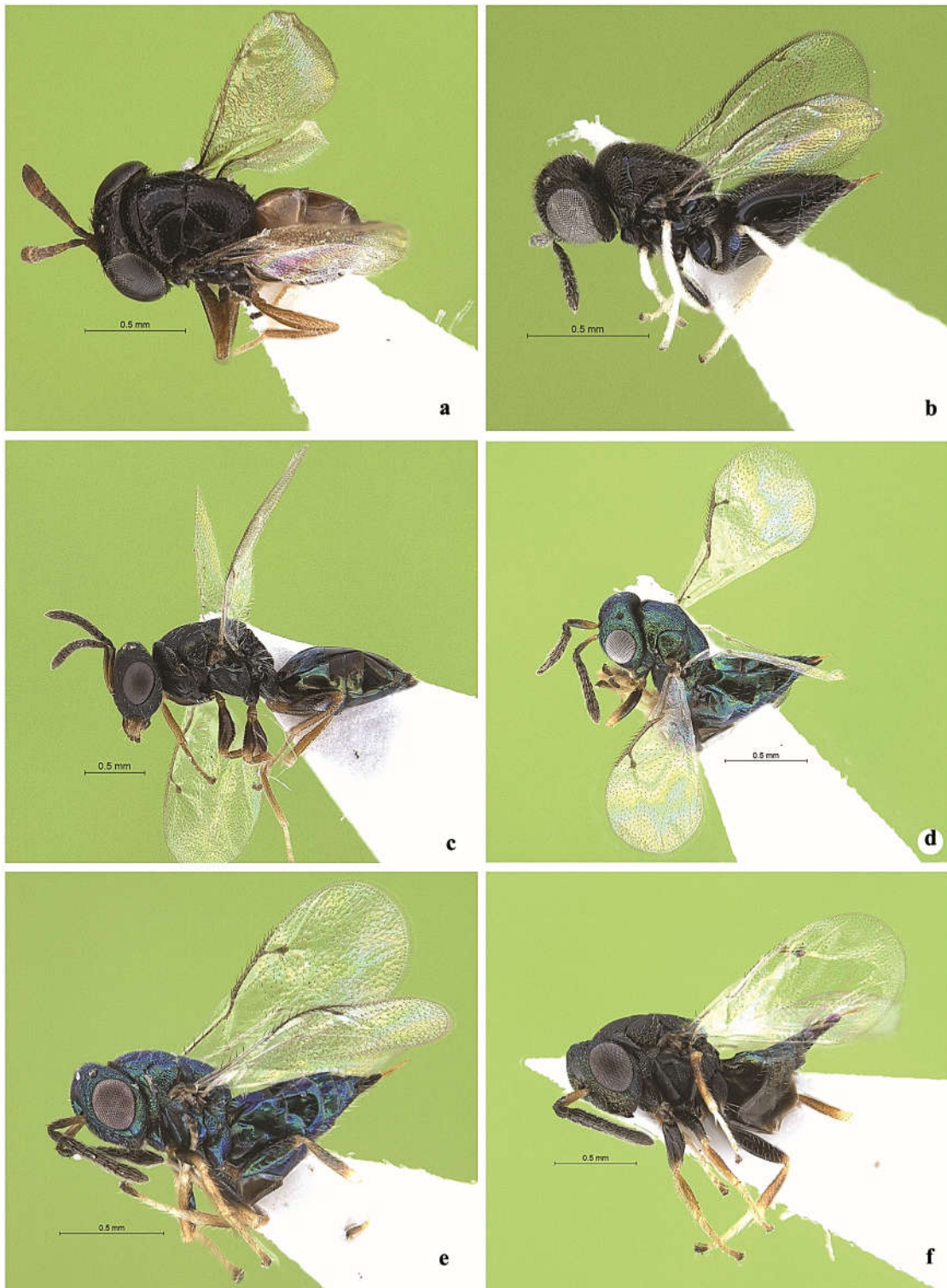


Fig. a. *Cephaleta brunniventris* Motschulsky, **Fig.b.** *Herbertia indica* Burks, **Fig. c.** *Halticoptera agaliensis* Sureshan, **Fig.d.** *Systasis dalbergiae* Mani, **Fig.e.** *Systasis dasyneuræ* Mani, **Fig.f.** *Systasis nigra* Sureshan

PLATE 11



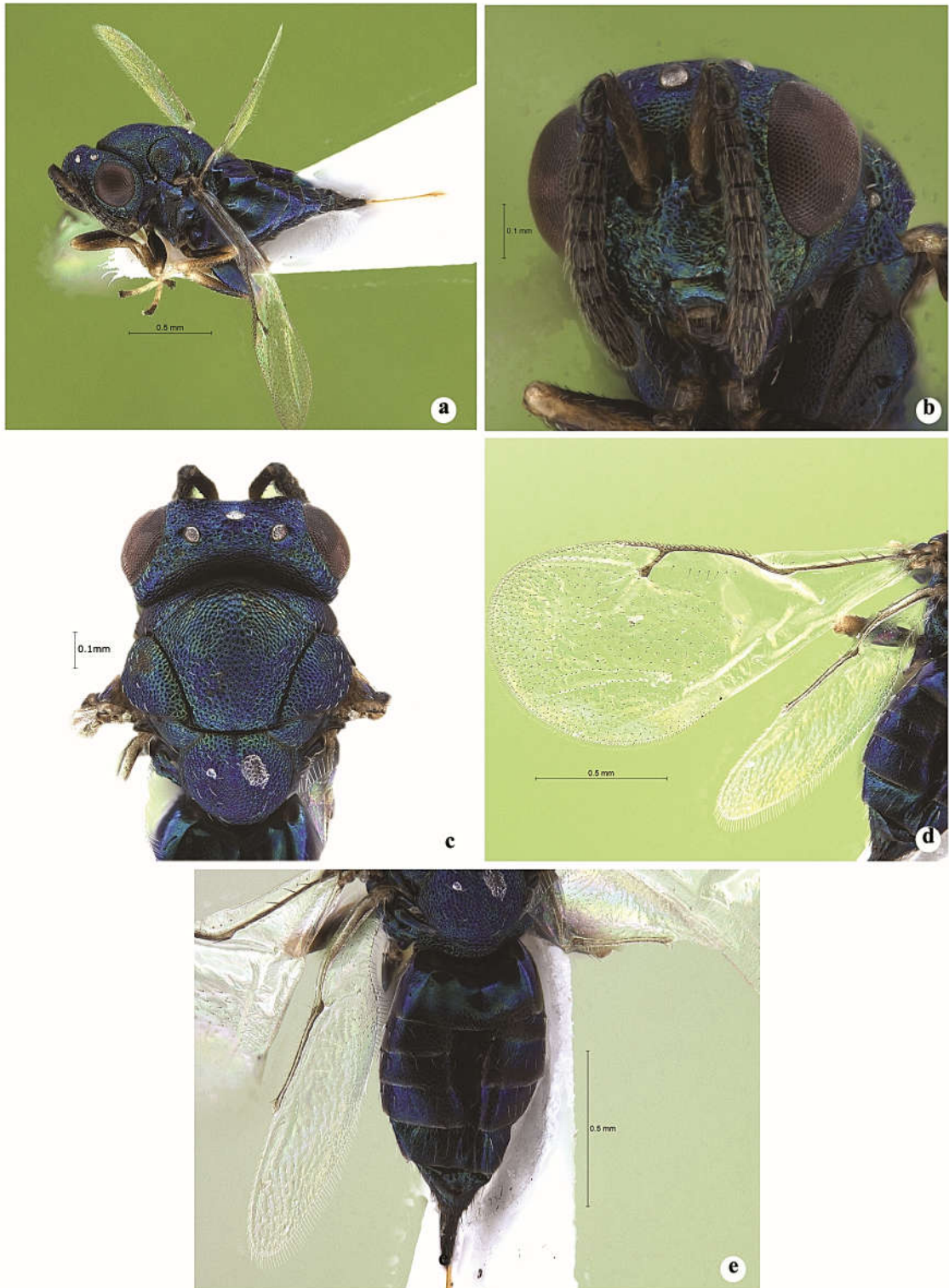
Stictomischus malabarensis sp. nov. **Fig. a.** Profile, **Fig.b.** Head front view, **Fig. c.** Antenna, **Fig.d.** Mesosoma, **Fig.e.** Propodeum, **Fig.f.** Forewing, **Fig.g.** Gaster

PLATE 12



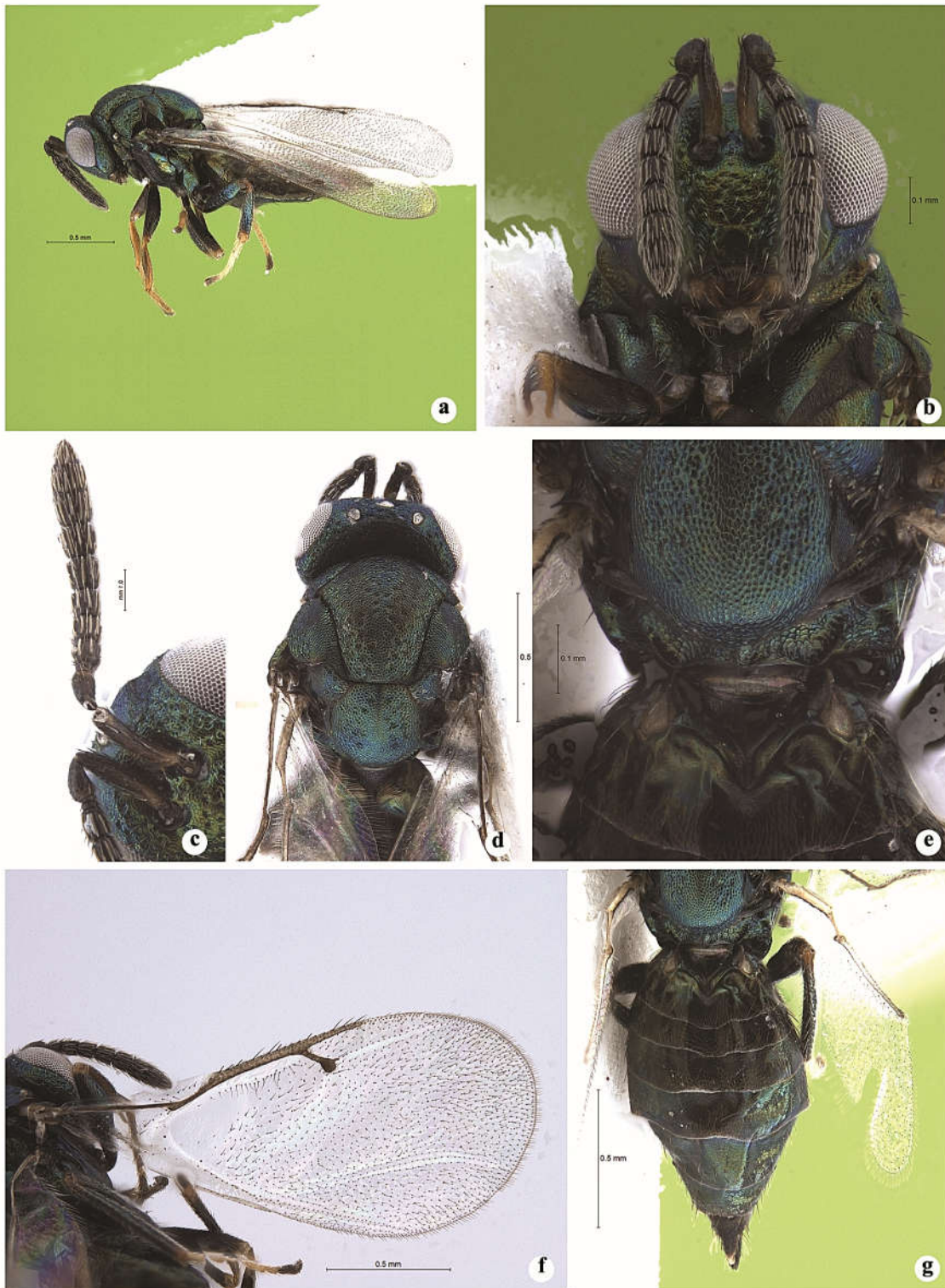
Stictomischus sahyadriensis sp. nov. **Fig. a.** Profile, **Fig.b.** Head front view, **Fig. c.** Antenna, **Fig.d.** Propodeum, **Fig.e.** Forewing, **Fig.f.** Gaster

PLATE 13



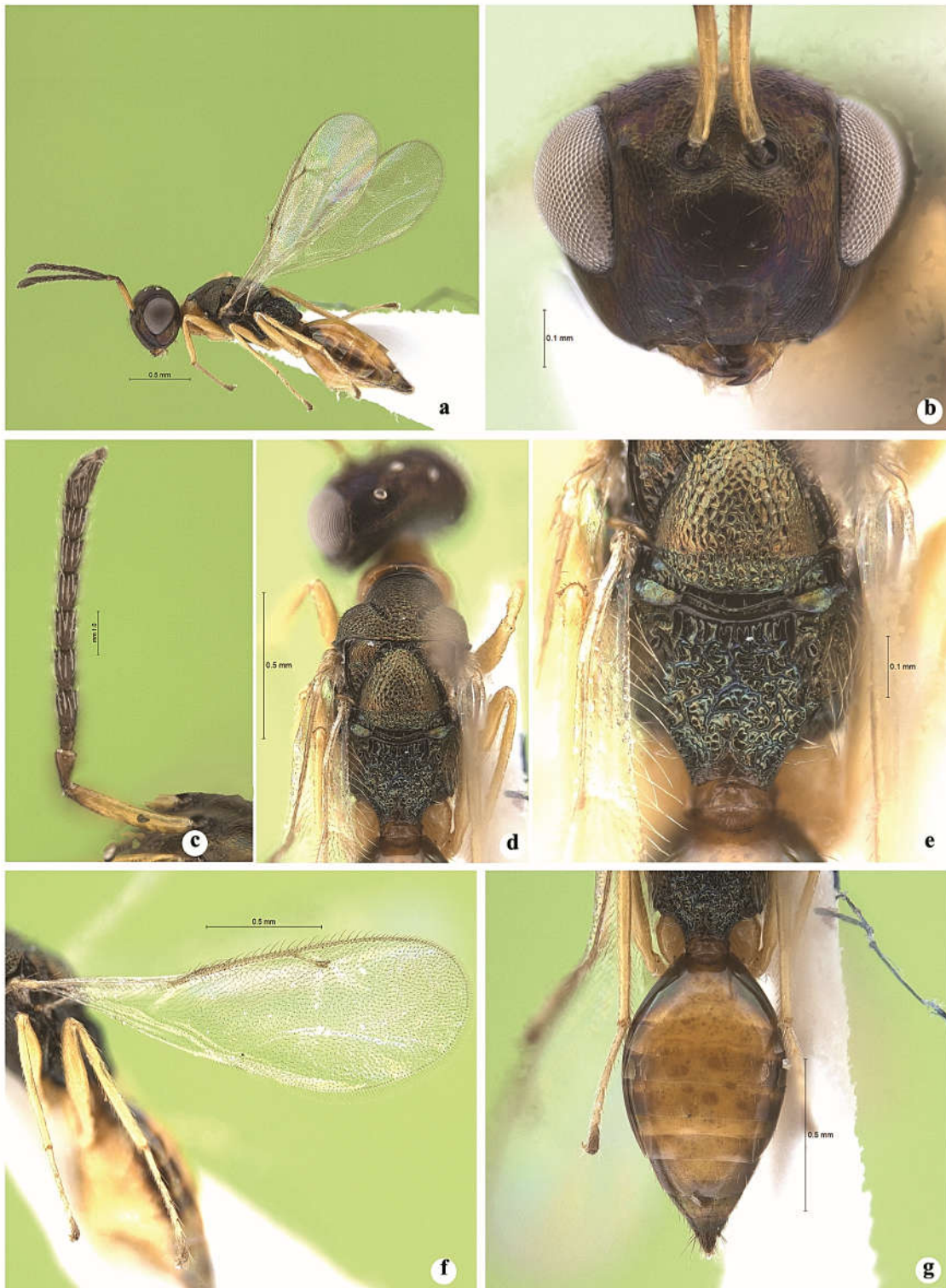
Systasis calicutensis sp. nov. **Fig. a.** Profile, **Fig.b.** Head front view, **Fig.c.** Mesosoma, **Fig.d.** Forewing, **Fig.e.** Gaster

PLATE 14



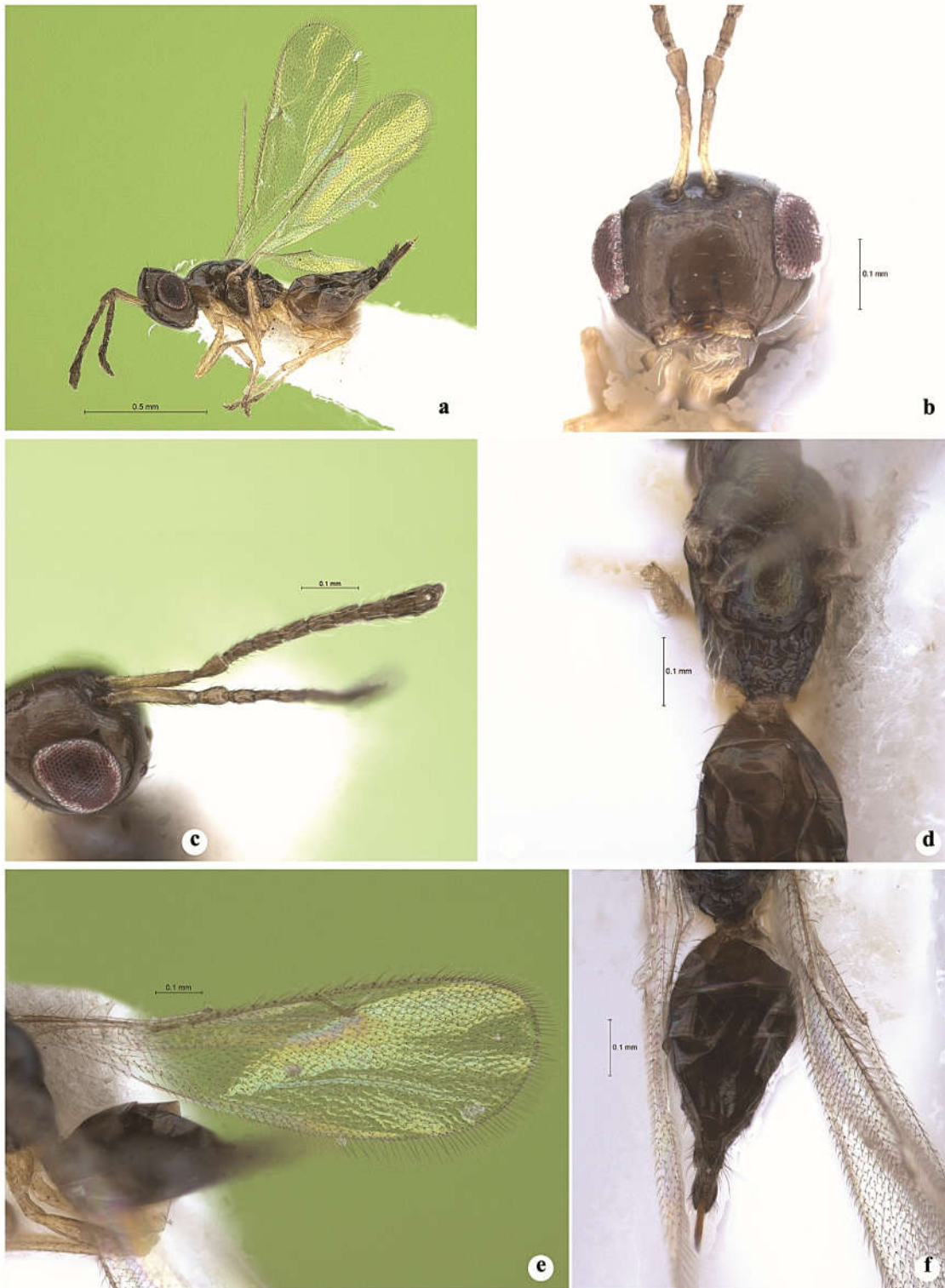
Systasis convexa sp. nov. **Fig. a.** Profile, **Fig. b.** Head front view, **Fig. c.** Antenna, **Fig.d.** Mesosoma, **Fig.e.** Propodeum, **Fig.f.** Forewing, **Fig.g.** Gaster

PLATE 16



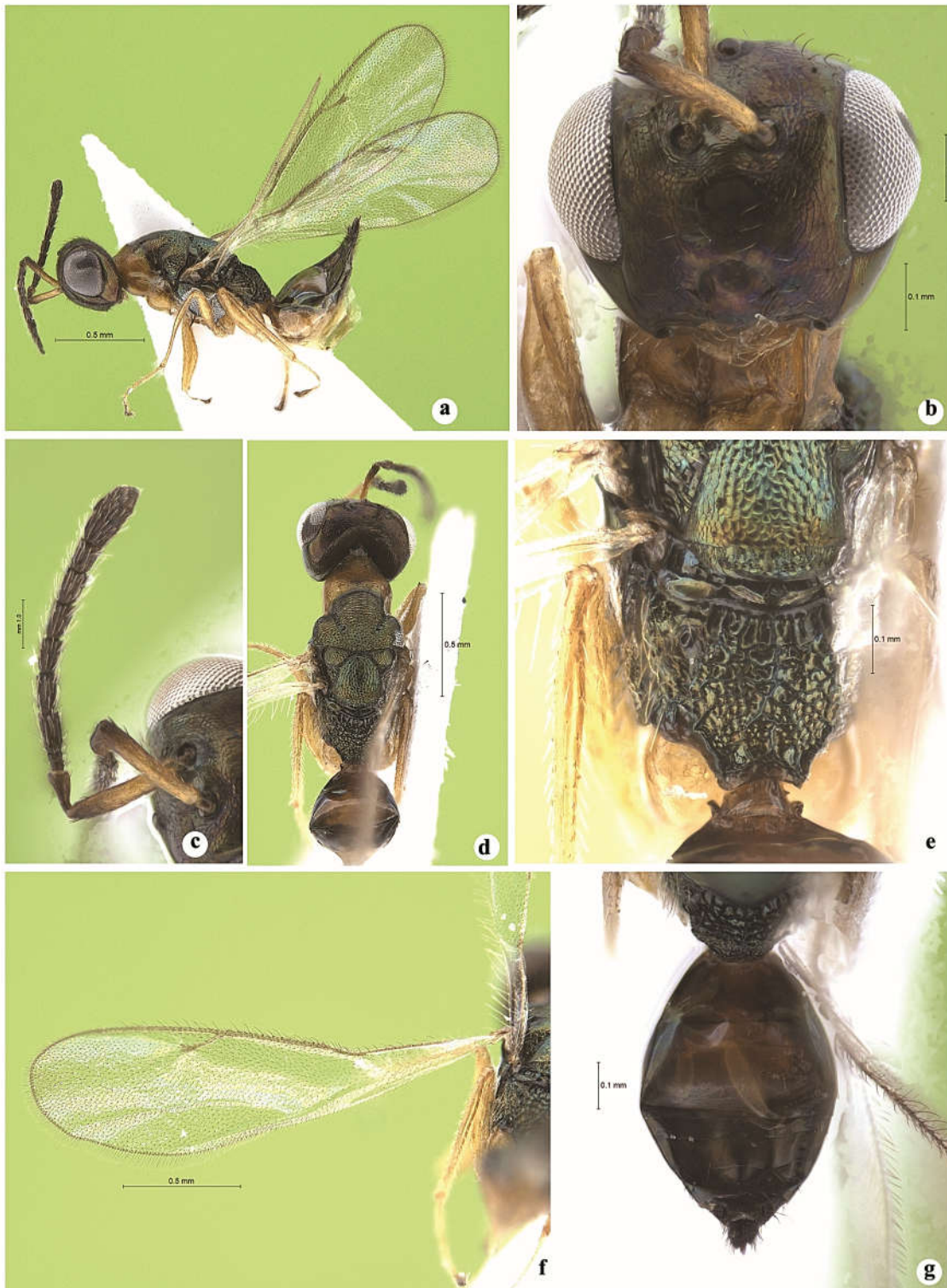
Panstenon flavogastrus sp. nov. **Fig.a.** Profile; **Fig.b.** Head front view; **Fig. c.** Antenna, **Fig.d.** Mesosoma, **Fig.e.** Propodeum, **Fig.f.** Forewing, **Fig. g.** Gaster

PLATE 17



Panstenon minutus sp. nov. **Fig. a.** Profile; **Fig.b.** Head front view; **Fig. c.** Antenna; **Fig.d.** Propodeum; **Fig.e.** Forewing; **Fig.f.** Gaster

PLATE 18



Panstenon nigrogastrus sp. nov. **Fig. a.** Profile; **Fig.b.** Head front view; **Fig. c.** Antenna; **Fig.d.** Mesosoma; **Fig.e.** Propodeum; **Fig.f.** Forewing; **Fig.g.** Gaster

PLATE 19

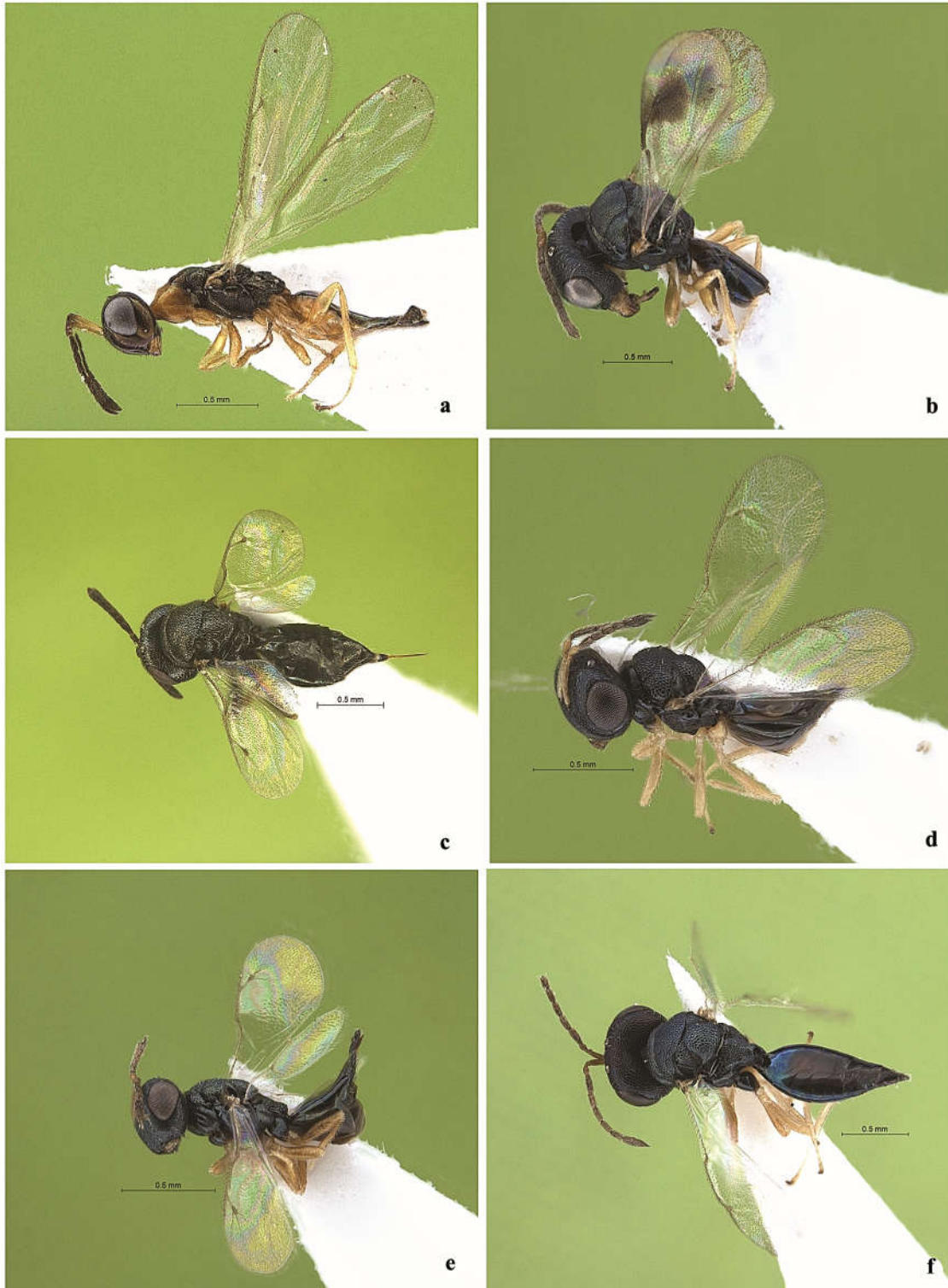


Fig. a. *Panstenon collaris* Bouček; **Fig.b.** *Acroclisoides maculatus* Sureshan & Narendran; **Fig. c.** *Anisopteromalus calandrae* (Howard); **Fig.d.** *Callitula anguloclypea* Sureshan; **Fig.e.** *Callitula bambusae* Narendran & Jobiraj; **Fig.f.** *Callitula keralensis* Sureshan

PLATE 20

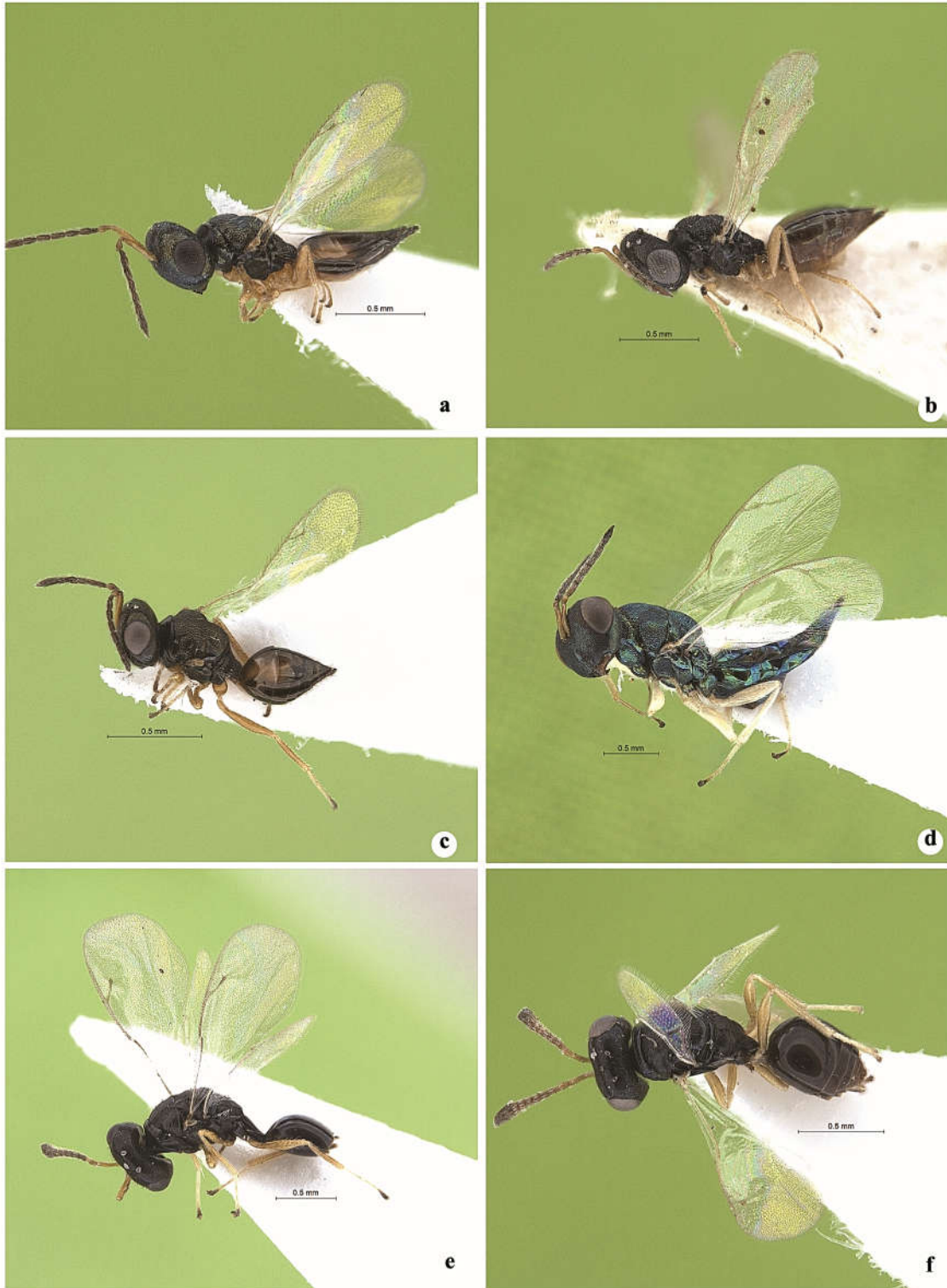


Fig. a. *Callitula peethapada* Narendran & Mohana; **Fig.b.** *Callitula rugosa* (Waterston); **Fig. c.** *Callitula travancorensis* Sureshan; **Fig.d.** *Chlorocytus indicus* Sureshan; **Fig.e.** *Cryptoprymna elongata* Sureshan & Narendran; **Fig.f.** *Cryptoprymna indiana* Sureshan & Narendran

PLATE 21

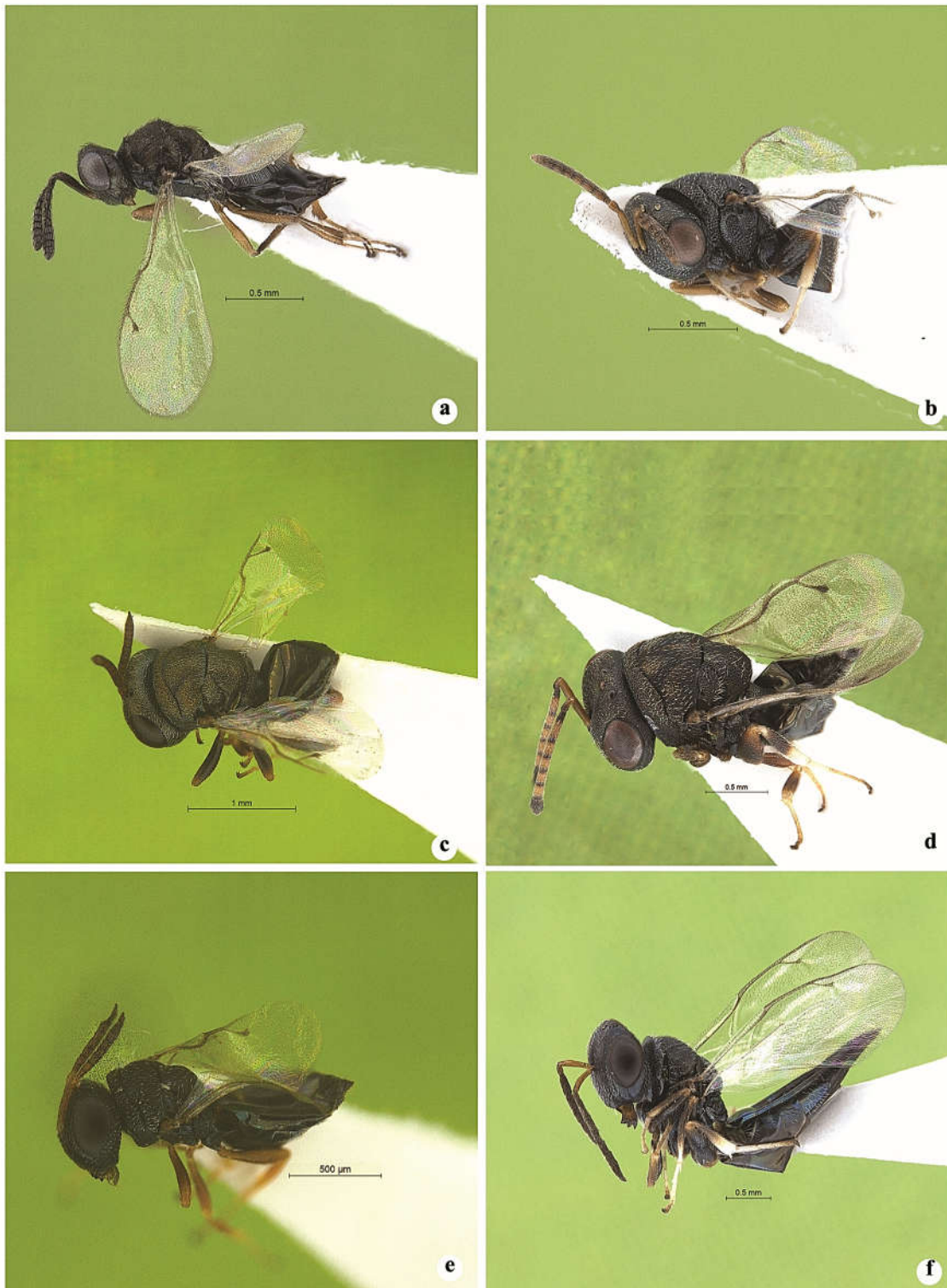


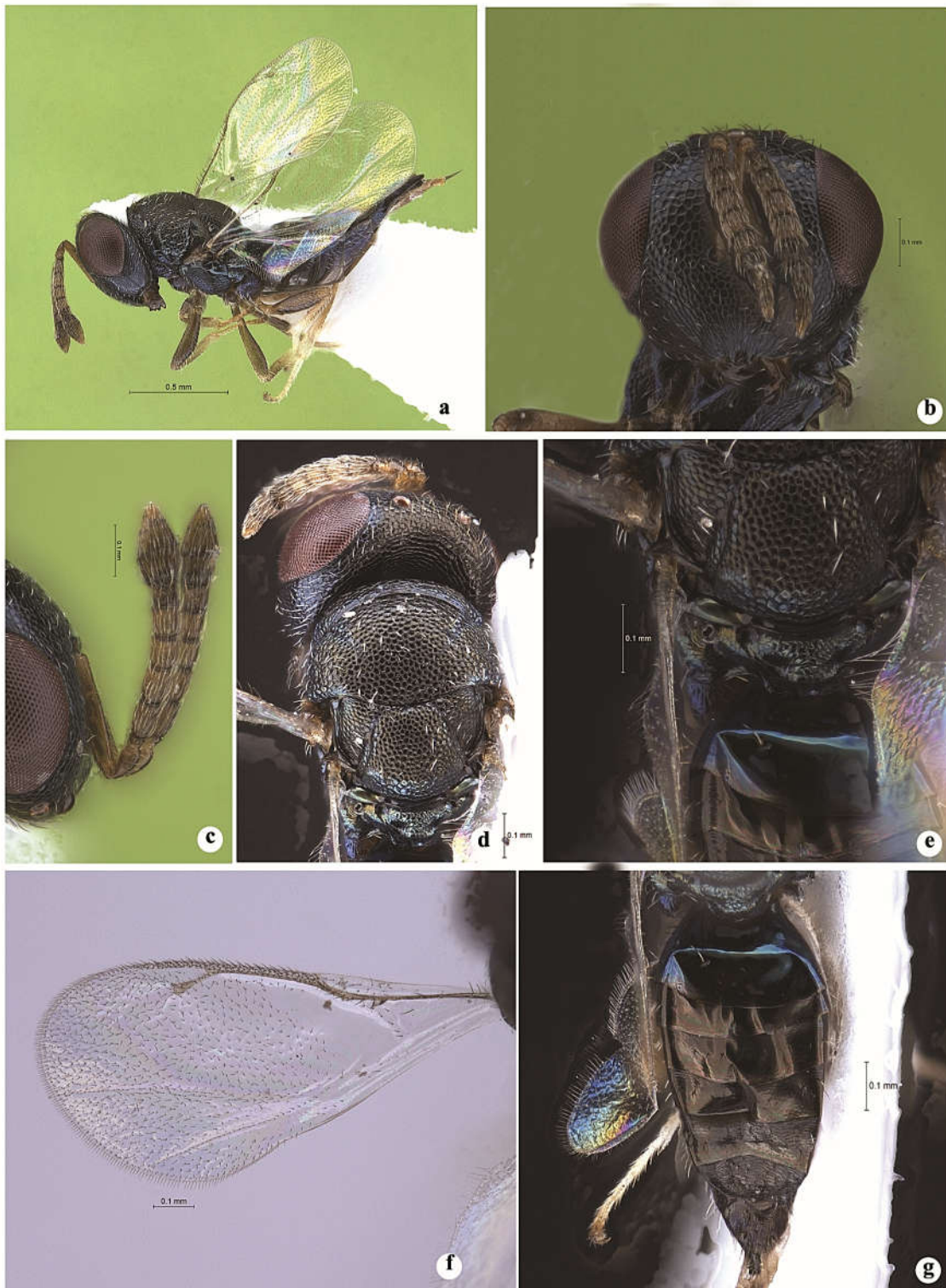
Fig. a *Cyrtogaster clavicornis* Walker; **Fig.b.** *Dinarmus acutus* (Thomson); **Fig. c.** *Dinarmus basalis* (Rondani); **Fig.d.** *Dinarmus maculatus* (Masi); **Fig.e.** *Dinarmus vagabundus* (Timberlake); **Fig.f.** *Halticopterella burwelli* Sureshan

PLATE 22



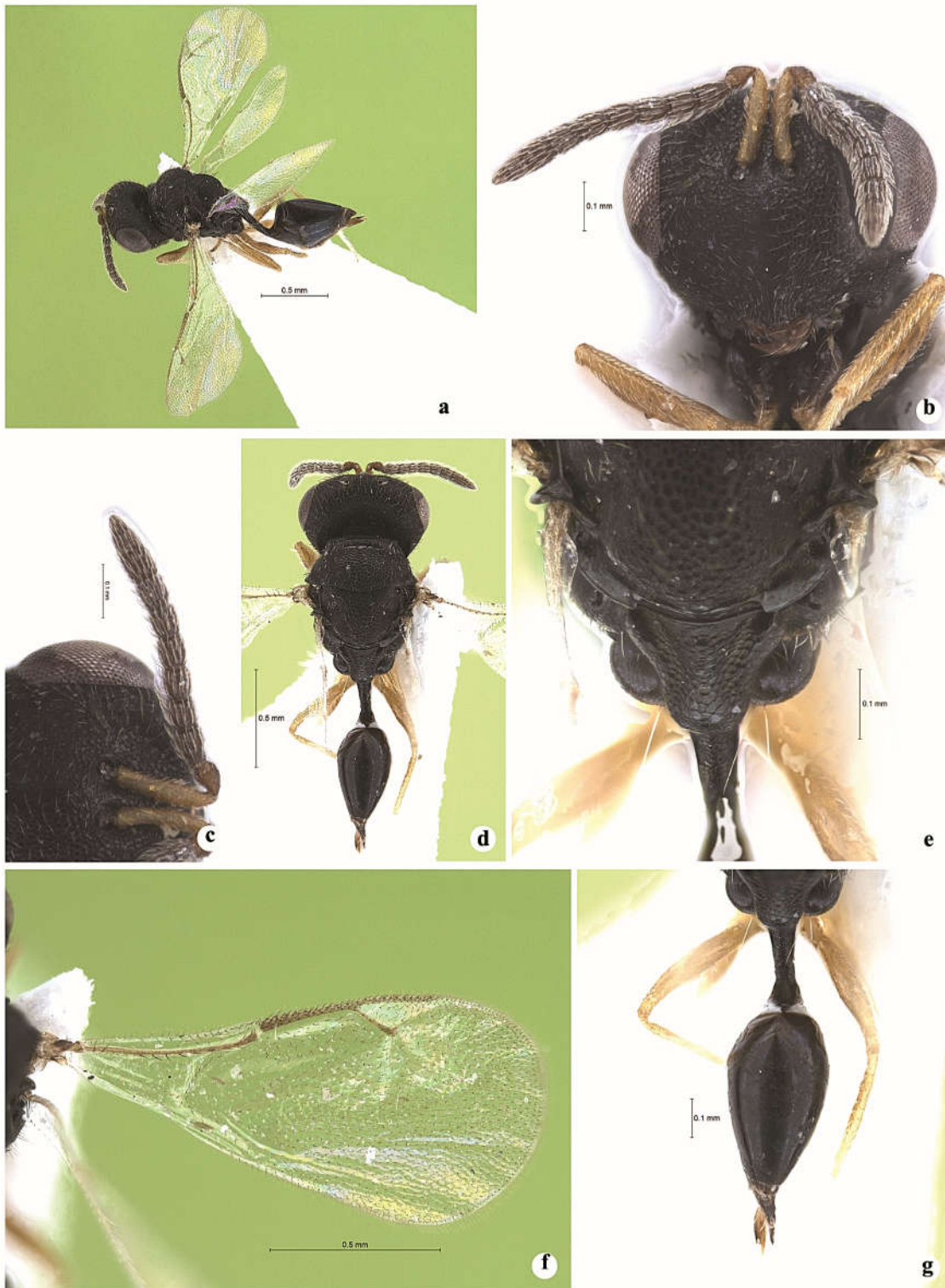
Fig. a. *Halticopterella robusta* Sureshan; **Fig. b.** *Homoporus acuminatus* Sureshan & Narendran, **Fig. c.** *Kumarella angulus* Sureshan, **Fig.d.** *Merismomorpha minuta* Sureshan, **Fig. e.** *Merismomorpha tamilnadensis* Sureshan *et al.*, **Fig. f.** *Mesopolobus keralensis* Sureshan & Narendran

PLATE 23



Lyubana indica sp. nov. **Fig. a.** Profile; **Fig. b.** Head front view; **Fig. c.** Antenna; **Fig. d.** Mesosoma; **Fig. e.** Propodeum; **Fig. f.** Forewing; **Fig. g.** Gaster

PLATE 24



Merismomorpha microgastra sp. nov. **Fig. a.** Profile, **Fig. b.** Head front view, **Fig. c.** Antenna, **Fig. d.** Dorsal view, **Fig. e.** Propodeum, **Fig. f.** Forewing, **Fig. g.** Gaster

PLATE 25



Merismomorpha micropetiolata sp. nov. **Fig. a.** Profile; **Fig.b.** Male; **Fig.c.** Dorsal view; **Fig.d.** Head front view; **Fig. e.** Antenna, **Fig.f.** Propodeum; **Fig.g.** Forewing, **Fig.h.** Gaster

PLATE 26

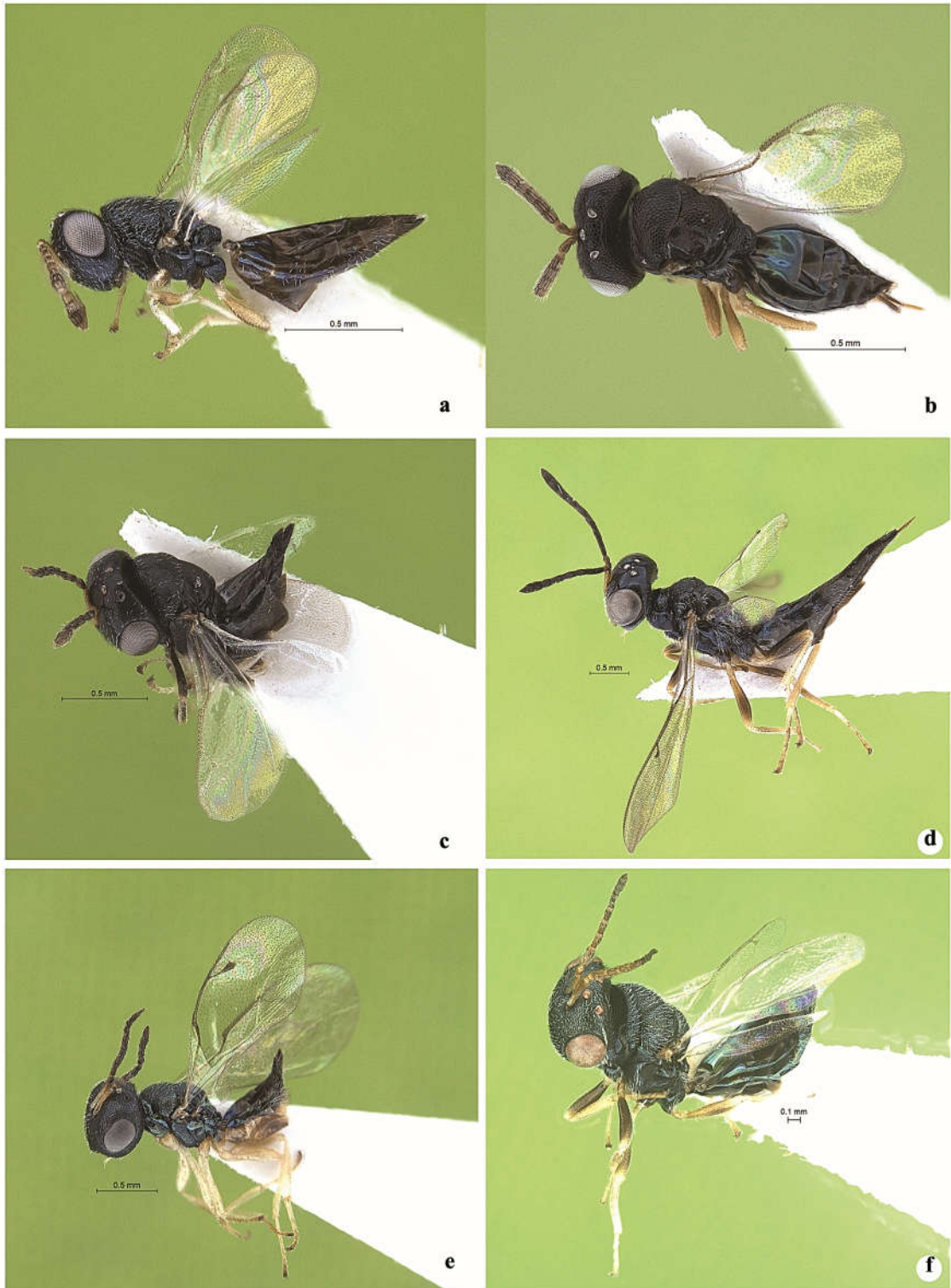


Fig. a. *Mesopolobus minutus* Sureshan & Narendran, **Fig.b.** *Metastenus concinnus* Walker, **Fig. c.** *Metastenus indicus* Sureshan & Narendran, **Fig.d.** *Miscogasteriella jayasreeae* Sureshan, **Fig.e.** *Mokrzekia orientalis* Subba Rao, **Fig.f.** *Narendrella nilamburensis* Sureshan

PLATE 27

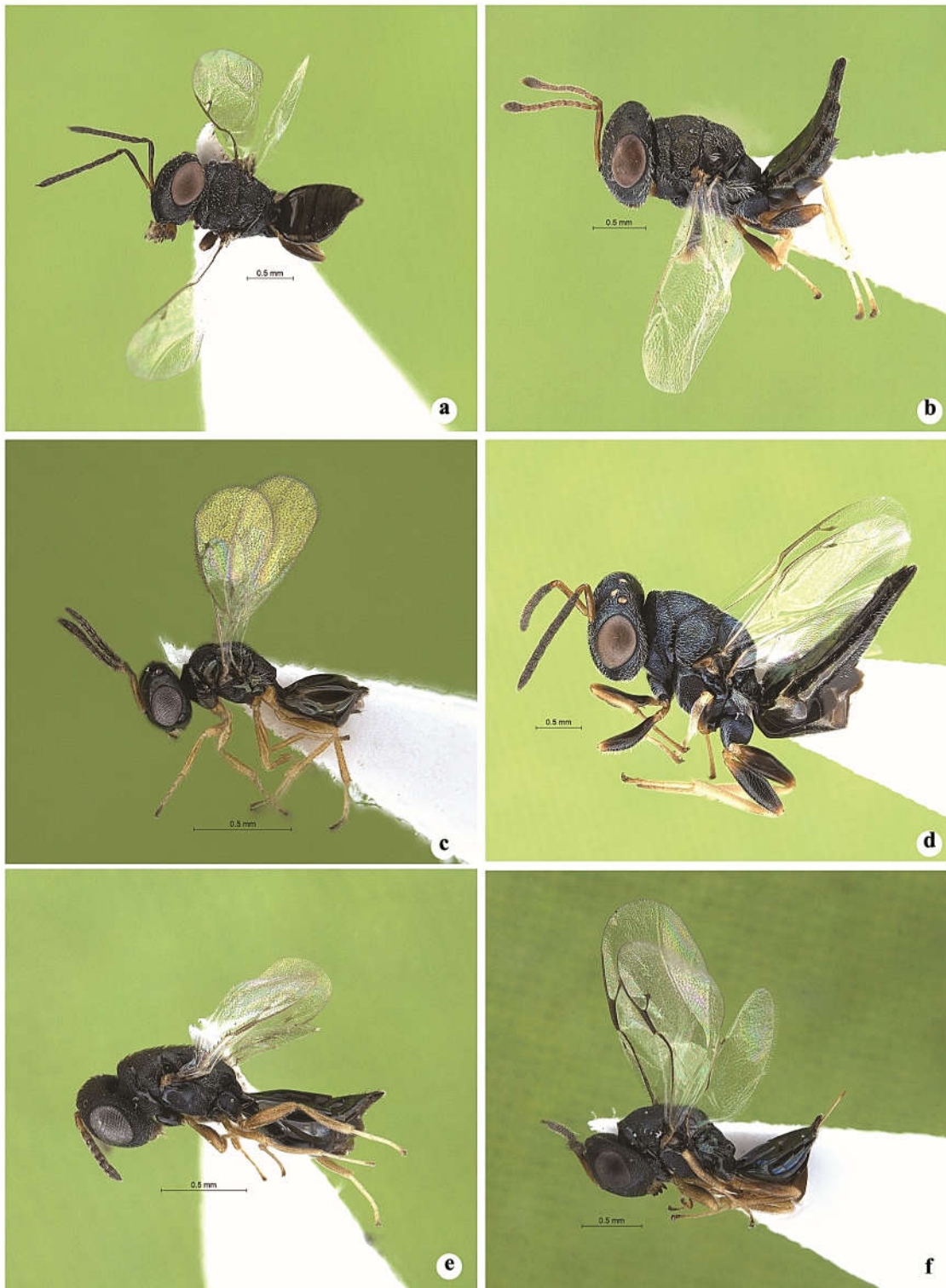


Fig. a. *Norbanus acuminatus* Dutt & Ferrière, **Fig.b.** *Norbanus equus* Sureshan, **Fig. c.** *Notoglyptus scutellaris* (Dodd & Girault), **Fig.d.** *Oxysychnus coimbatorensis* (Ferrière), **Fig.e.** *Pachycrepoideus veerannai* Narendran & Anil, **Fig.f.** *Pachyneuron groenlandicum* (Holmgren)

PLATE 28

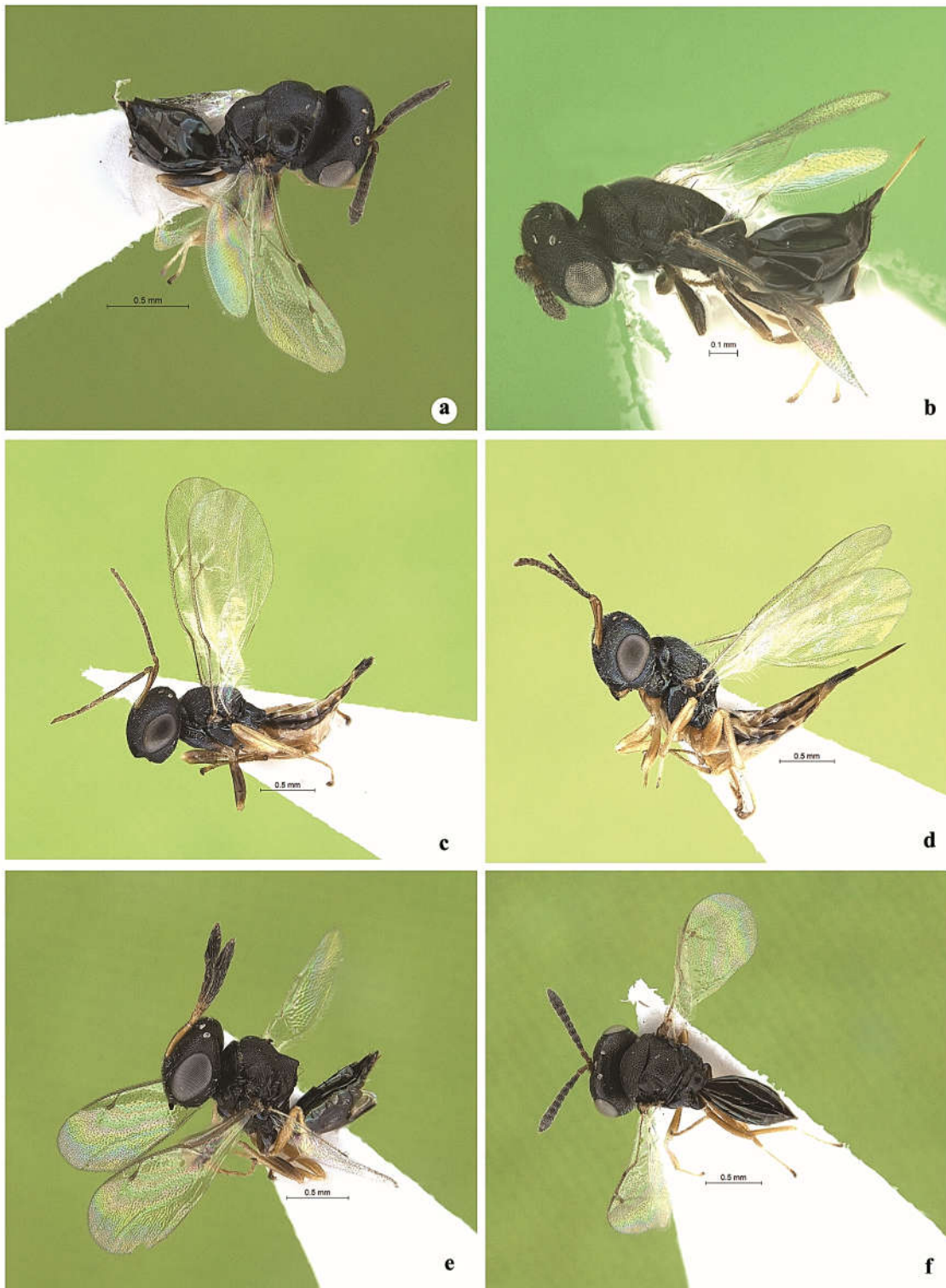


Fig. a. *Pachyneuron leucopiscida* Mani, **Fig.b.** *Platecrizotes keralensis* Sureshan & Raseena, **Fig. c.** *Propicroscythus mirificus* (Girault), **Fig.d.** *Propicroscythus oryzae* (Subba Rao), **Fig.e.** *Psilocera heydoni* Sureshan, **Fig.f.** *Psilocera vinayaki* Sureshan & Narendran

PLATE 29

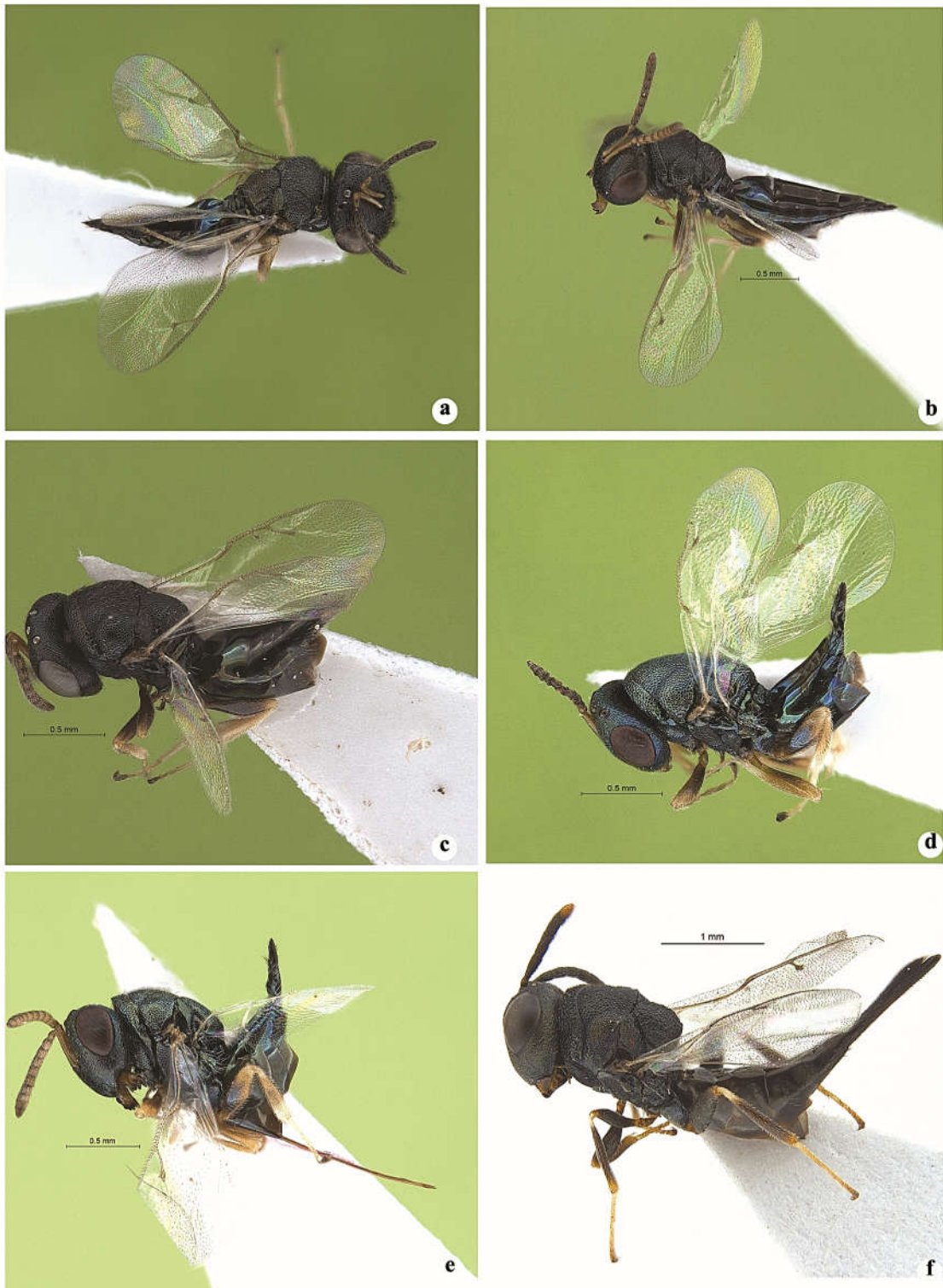


Fig. a. *Pteromalus keralensis* Sureshan, **Fig.b.** *Pteromalus metallicus* Sureshan, **Fig. c.** *Pteromalus nigrus* Sureshan, **Fig.d.** *Pteromalus puparum* (Linnaeus), **Fig.e.** *Pteromalus semotus* (Walker), **Fig.f.** *Pycnetron keralaensis* Raseena & Sureshan