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Diversity of cockroaches from eastern Ghats of Tamil Nadu

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Abstract
Cockroaches are globally known as pest; nearly 1% of the known species are domestic pest. They are cosmopolitan, preferring temperate and dump habitat. In this few species are strictly phytophagous, majority are omnivorous. They are remarkably fast runner and poor in flying. Cockroaches are among the most ancient in pterygote insects, their fossil evidence reveals that their extreme abundance in the precarboniferous period. Blattids specimens were collected from the different localities of Eastern Ghats of Tamil Nadu (Vellore, Salem, Dharmapuri, Vellore and Namakkal districts), during the period from 2017 - 2019. Blattids were collected from different habitats. A total of 260 specimens were studied which resulted in identied 33 species of Blattids under 4 families *viz*., Family Blaberidae is more dominant with 17 species followed by families Ectobiidae & Blattidae contains 6 species both and the family Corydiidae contains 4 species.

Keywords: eastern Ghats, Tamil Nadu blattodea, diversity

Introduction
The Eastern Ghats of India form a chain of discontinuous hill ranges traversing through Odisha, Andhra Pradesh, Tamil Nadu and a part of Karnataka. Undoubtedly it is the most important topographic feature of peninsular India extending from 11º30' N latitude to about 22º N latitude and 76º 50' E to 86º 30' E longitude in a North- east to South-west strike. The study area is Eastern Ghats of Tamil Nadu. This Ghats considered having control over the ecology and biogeography of peninsular mountain range in Tamil Nadu and its rich flora & fauna, constitute a valuable gene pool. It may be having many new and rare species of animals and plants, which are still unknown. Blattids are belonging to one the oldest living group of insects in the world.

The Blattodea comprise the termites (epifamily Termitoidae only) and the cockroaches (all other taxa). Beccaloni and Eggleton (2011) [5] recognized 7314 extant named species of Blattodea, including 2692 termites and 4622 cockroaches. Presently, 7570 living species of Blattodea are currently recognised, of which 2929 are termites (Krishna *et al*. 2013) [7] and 4641 are cockroaches (Beccaloni 2014) [5]. Inward *et al.* (2007) and subsequent phylogenetic studies (Legendre *et al.* 2008; Ware *et al.* 2008; Cameron *et al*. 2012; Djernaes *et al.* 2012) [8, 9, 10, 11] have confirmed that the termites and the cockroach family Cryptocercidae are sister groups and that this clade is nested within the Blattodea.

In India there are 181 species of blattids has been reported belonging to 72 genera under 17 subfamilies and 6 families, the diversity of cockroaches globally only 3.8% of the global species are known to India and stated that Tamil Nadu having 55 species (Gupta & Chandra 2019) [3] among this Eastern Ghats contains 33 species. Terminologies used for male genitalia follow Klass (1977) [2] and Roth (2003) [1] for other characters. All specimens were deposited at the Entomological Collections of the Zoological survey of India, Southern regional centre, Chennai.

Materials and Method
Study area – Blattids specimens were collected from the different localities of Eastern Ghats of Tamil Nadu namely Vellore, Salem, Dharmapuri, Vellore Namakkal, Thiruvanamalai and Madurai districts during the period from 2017 - 2018. Blattids were collected from different habitats. (i.e. Dead woods, Barks of the plant, under the leaf litters, under the wet soil and grass land) They were then kept in Blattid collection envelopes or ethyl alcohol 95% bearing all details of collection such as date of collection, locality, name of host plant or habitat etc. They were then sorted out in family and genus level, based on morphological characters and dissect the genetalia of the male specimen to conform the species.

Location Details

Table 1

District	Locality	Period
Salem	Yercaud	25.11.2017
	Manjakuttai – Yercaud	25.11.2017
	Shevarpry Temple - Yercaud	25.11.2017
	Karumandurai - Thirthakira RF	25.11.2017
	Keel Naripadi – Pachamalai	26.11.2017

	Kuttalampatti - Mallur RF	26.11.2017
	Edayapatti - Salem	26.11.2017
	Thumbal - Salem	26.11.2017
	Chettichavadi	26.11.2017
	Mettur	26.11.2017
	Ariyurnadu	26.11.2017
Dharmapuri	Panapalli Krishnagiri	20.01.2018
	Samanur Krishnagiri	20.01.2018
	Panchapalli Krishnagiri	20.01.2018
Vellore	Ambur - Balur	30.06.2018
	Ambur – Nanguneri	30.06.2018
	Mangalam -swamy mallei	30.06.2018
	Yelagiri	30.06.2018
Namakkal	Solaikadu	28-04-2018
	Vasalur Patti, Thinanur Nadu	28-04-2018
	Sakarai Patti	28-04-2018
	Valappurnadu	28-04-2018
	Belukurichi	29-04-2018
	Palaniyappar Koil, Belukuruchi	29-04-2018
	Pallamparai	30-04-2018
	Vasalurpatti	29.12.2018
	Solaikadu	29.12.2018
	Veerahanur patti	29.12.2018
	Valabur Road, Arpulishwar Temple	29.12.2018
	Pelapadinadu adjacent	30.12.2018
	Pallamparai	30.12.2018
	Belukurichi	30.12.2018
	Valavanthinadu	30.12.2018
	Ariyurnadu,	30.12.2018

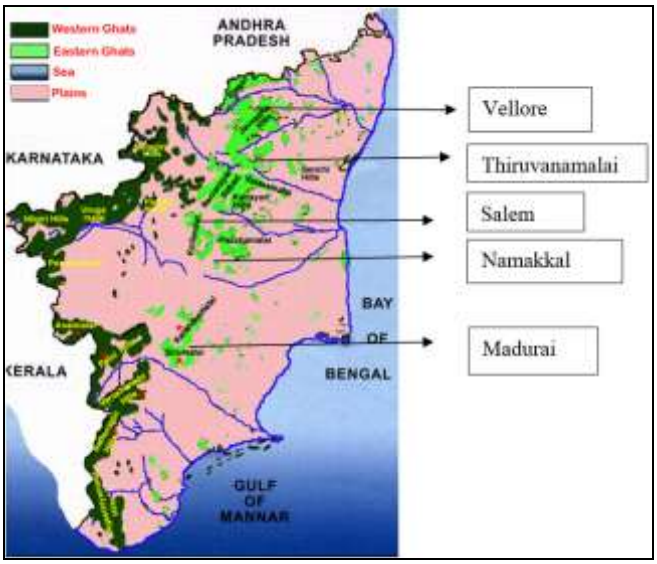

Fig 1

Procedure for Preparation of Permanent Sides for Male Genetalia

Collected specimens were preserved in 95% ethyl alcohol, and slide mounted using Canada balsam. Male specimens were dissected and cold macerated by soaking in 10% aqueous Potassium Hydroxide (KOH) solution for 12 hours. They were then washed in distilled water to remove unwanted undissolved internal contents, and then with alcohol series and anhydrous clove oil to remove excess water. Finally, they were mounted on microscope slides using Canada balsam. The specimens used in this study are deposited in the collections of the Southern Regional Centre, Zoological Survey of India (ZSI), Chennai. Observations, micro-measurements and drawing of collected Blattids were made by using Leica MZ4 microscope and the identities of the Blattids were confirmed.

Results

In the present study to explore the faunal diversity of Indian Blattids in the Eastern Ghats of Tamil Nadu were collected from different localities (34 locations). A total of 260 specimens were studied which resulted in identification of 33 species of Blattids under 21 genera.

Systematic List of the species

The list of the species of cockroaches so far recorded from the Eastern Ghats of Tamil Nadu is providing below. The species marked with * are endemic to India.

Order Blattodea

Superfamily: Blaberoidea Saussure, 1864

Family: Blaberidae Saussure, 1864

Subfamily: Epilamprinae Brunner von Wattenwyl, 1865 [5]

Tribe *Morphnini* McKittrick, 1964

1. Genus *Haanina* Hebard, 1929
1. *Haanina cariniceps* (Bolívar, 1897)*
2. *Haanina patinifera* (Bolívar, 1897)*
2. Genus *Morphna* Shelford, 1910
3. *Morphna decolyi* (Bolívar, 1897)*
4. *Morphna plana* (Brunner von Wattenwyl, 1865) [5]*
3. Genus *Rhabdoblatta* Kirby, 1903
5. *Rhabdoblatta lineaticollis* (Bolívar, 1897)*

Tribe Thoracini Rehn, 1951

4. Genus *Phlebonotus* Saussure, 1862
6. *Phlebonotus anomalus* Saussure, 1863*
7. *Phlebonotus pallens* (Serville, 1831)
5. Genus *Thorax* Saussure, 1862
8. *Thorax porcellana* (Saussure, 1862)

6. Genus *Calolamprodes* Bei-Bienko, 1969
9. *Calolamprodes* (*Calolamprodes*) *characterosa* (Walker , 1868)*
7. Genus *Indoapterolampra* Anisyutkin, 2014
10. *Indoapterolampra rugosiuscula* Anisyutkin, 2014*
8. Genus *Princisola* Gurney & Roth, 1976
11. *Princisola pulchra* (Shelford, 1910)*

Subfamily Panesthiinae

9. Genus *Panesthia* Serville, 1831
12. *Panesthia birmanica* Brunner von Wattenwyl, 1893 [5]*
13. *Panesthia quinquedentata* Kirby, 1903*
10. Genus *Salganea* Stål, 1877
14. *Salganea erythronota* Bolívar, 1897*

Subfamily Perisphaerinae Brunner von Wattenwyl, 1865 [5]

11. Genus *Pseudoglomeris* Brunner Von Wattenwyl, 1893 [5]
15. *Pseudoglomeris humbertiana* (Saussure, 1863)
12. Genus *Perisphaerus* Serville, 1831
16. *Perisphaerus flavicornis* (Burmeister, 1838)

Subfamily Pycnoscelinae

13. Genus Pycnoscelus Scudder, 1862
17. *Pycnoscelus surinamensis* (Linnaeus, 1758)

Family Ectobiidae Brunner von Wattenwyl, 1865

14. Genus: *Blattella* Caudell, 1903
18. *Blattella biligata* (Walker,1868)
19. *Blattella germanica* (Linnaeus,1767)
20. *Blattella humbertiana* (Saussure, 1863)
15. Genus *Hemithyrsocera* Saussure, 1893
21. *Hemithyrsocera palliata* (Fabricius, 1798)*

Subfamily Pseudophyllodromiinae Hebard, 1929

Subgenus Supella Shelford, 1911

16. Genus Supella Shelford, 1911
22. *Supella (Supella) longipalpa* (Fabricius, 1798)
17. Genus *Allacta* Saussure & Zehntner, 1895
23. *Allacta kalakadensis* Prabakaran and Senraj 2019*

Superfamily Blattoidea Latreille, 1810
EpifamilyBlattoidaeLatreille, 1810
Family Blattidae Latreille, 1810

Subfamily Blattinae Latreille, 1810

18. Genus *Blatta* Linnaeus, 1758
24. *Blatta orientalis* Linnaeus, 1758
19. Genus *Hebardina* Bei-Bienko, 1938
25. *Hebardina concinna* (Haan, 1842)*
20. Genus *Neostylopyga* Shelford, 1911
26. *Neostylopyga rhombifolia* (Stoll, 1813)
27. *Neostylopyga sexpustulata* (Walker, 1871)
21. Genus *Periplaneta* Burmeister, 1838
28. *Periplaneta americana* (Linnaeus, 1758)
29. *Periplaneta australasiae* (Fabricius, 1775)

Superfamily Corydioidea Saussure, 1864
Family Corydiidae Saussure, 1864

Subfamily Corydiinae Saussure, 1864

22. Genus *Therea* Billberg, 1820
30. *Therea bernhardti* Fritzsche, 2009*
31. *Therea defranceschii* Grandcolas, 1993*
32. *Therea petiveriana* (Linnaeus, 1758)*
33. *Therea regularis* Grandcolas, 1993*

Discussion

In India there are 181 species of cockroaches are reported. Out of which 89 species were endemic to India. In Tamil Nadu there 55 species were reported out of which in Eastern Ghats having 33 species nearly 60% of the total cockroach fauna of Tamil Nadu. The extensive survey is need for the exact updated cockroach fauna from Eastern Ghats. Collection is very difficult due to nocturnal habitat of cockroaches.

Fig 2: Cockroach Species from Study Area

Conclusion

In the present work stated that the Eastern Ghats Cockroach fauna of Tamil Nadu well diverse compare to Western Ghats, Eastern Ghats still lack in the study in the field of Cockroach fauna and need to made extensive surveys to explore the exact cockroach fauna of Eastern Ghats.

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