

# New records of the terrestrial bugs (Insecta: Hemiptera) from Sundarban Biosphere Reserve and their diversity in Indian mangroves

Bulganin Mitra<sup>1</sup>, Biswabrat Biswas<sup>2</sup>, Koyel Chakraborty<sup>3</sup>, Debapriya Mukhopadhyay<sup>4</sup>, Puja Pati<sup>5,\*</sup>

<sup>1</sup>RKMVC College, Rahara, India. Email: bulganinmitra@gmail.com

<sup>2</sup>Zoological Survey of India, India. Email: biswabrota@gmail.com

<sup>3</sup>South Dum Dum Municipality, India. Email: koyel.02.1992@gmail.com

<sup>4</sup>Vidyasagar College, India. Email: mukherjee.debapriya1993@gmail.com

<sup>5</sup>Kalyani University, India.

\*Corresponding Author. Email: pujapati.007@gmail.com

## Abstract

Being a specialised environment, mangroves support a wide assemblage of animal communities including insects. They may be either harmful or beneficial but plays an important role in the mangrove ecosystem. Present communication reports 29 species under 29 genera belonging to 12 families of Hemiptera as permanent residents or transient visitors in the mangroves of Indian part of Sundarban. Of which, 12 species under 12 genera are new records from the mangrove ecosystem of Sundarban. A total of 160 species under 129 genera belonging to 42 families of order Hemiptera are spreaded over in the mangroves of 8 Indian states and union territories. The highest similarity in species composition is found in between Andhra Pradesh and Tamil Nadu whereas, no similarity in species composition is found in between Maharashtra and other mangrove states.

## Introduction

The mangrove creates unique ecological environment that host rich assemblages of species (Kathiresan & Bingham, 2001). This unique ecosystem serves as the reservoir of species of plants and associated animals (Gopinathan & Selvaraj, 2005).

The order Hemiptera (bugs, cicads, leaf hoppers, scale insects) is directly concerned with the mankind on account of its direct and indirect interaction with plants. Some are very destructive, like leaf hoppers (Cicadellids), the white flies (Aleyrodidae), the plant lice (Aphids) and scale insects (Coccids). But some (Reduvids) are beneficial and as predator they keep check on the population of other insect pests.

In comparison to other ecosystems, the hemipteran diversity and their functional role in mangrove ecosystem is poorly studied in India and West Bengal in particular. Recently, Mitra (2017) documented 70 species of 60 genera belonging to 25 families of the order Hemiptera (both Aquatic and terrestrial) from Sundarban Biosphere Reserve.

Accepted: 04 March 2019  
Published: 09 March 2019

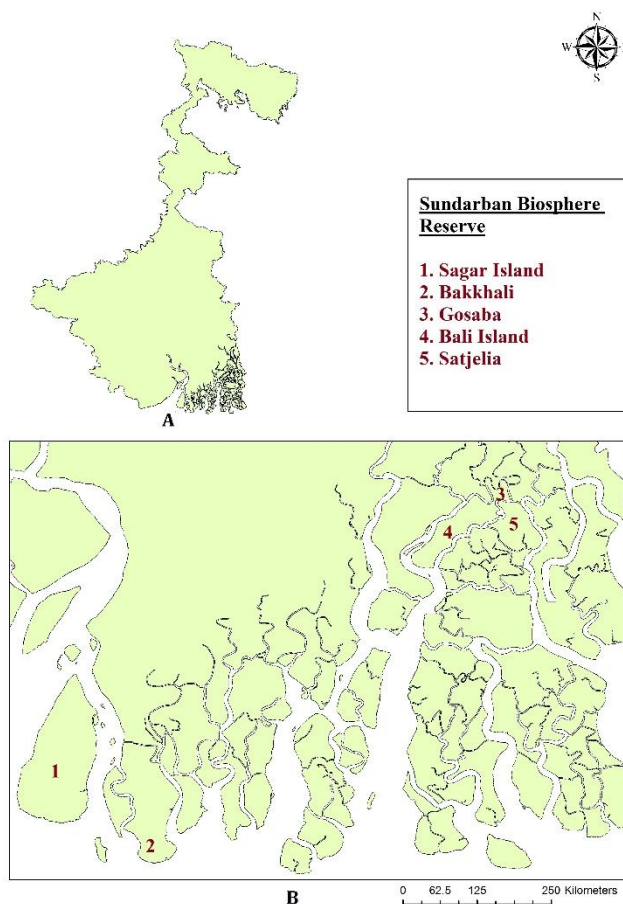
© 2019 Mitra et al.

Distributed under a Creative Commons Attribution 4.0 International License, which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.



### Disclaimer:

I3 Press discourages plagiarism, falsification and exaggeration of contents. We welcome valid and constructive criticisms/ complaints on our published articles, which will be published on upcoming issues without any processing charge or APC.



**Figure 1. Location of Sundarban Biosphere Reserve (SBR)**

(A) Position of SBR in the map of West Bengal. (B) Location of the collection sites in SBR (1-5)

This present communication records 12 species as new addition to the terrestrial hemipteran fauna of Sundarban Biosphere Reserve. In addition, one updated list of 160 species under 129 genera belonging to 42 families of order Hemiptera reported from the mangroves of Indian states and union territories are also provided here.

## Materials and Methods

### Study area

The Indian Sundarban Delta is bounded by the Ichamati- Raimangal River in the east, by the Hoogly River in the west, by the Bay of Bengal in the south, and the Dampier-1 Hodges line drawn in 1829-1830 in the north. The Indian part of Sundarban lies between the coordinates 21°30' to 22°15' N and 88°10' to 89°10' E (Mitra, 2017). Indian Sundarban includes almost 9600 sq. km. area (4200 sq. km. of reserve forest and 5400 sq. km. of non-forest inhabited region) constitute the biosphere region which is known as Sundarban Biosphere Reserve (SBR) (Mitra et al., 2016).

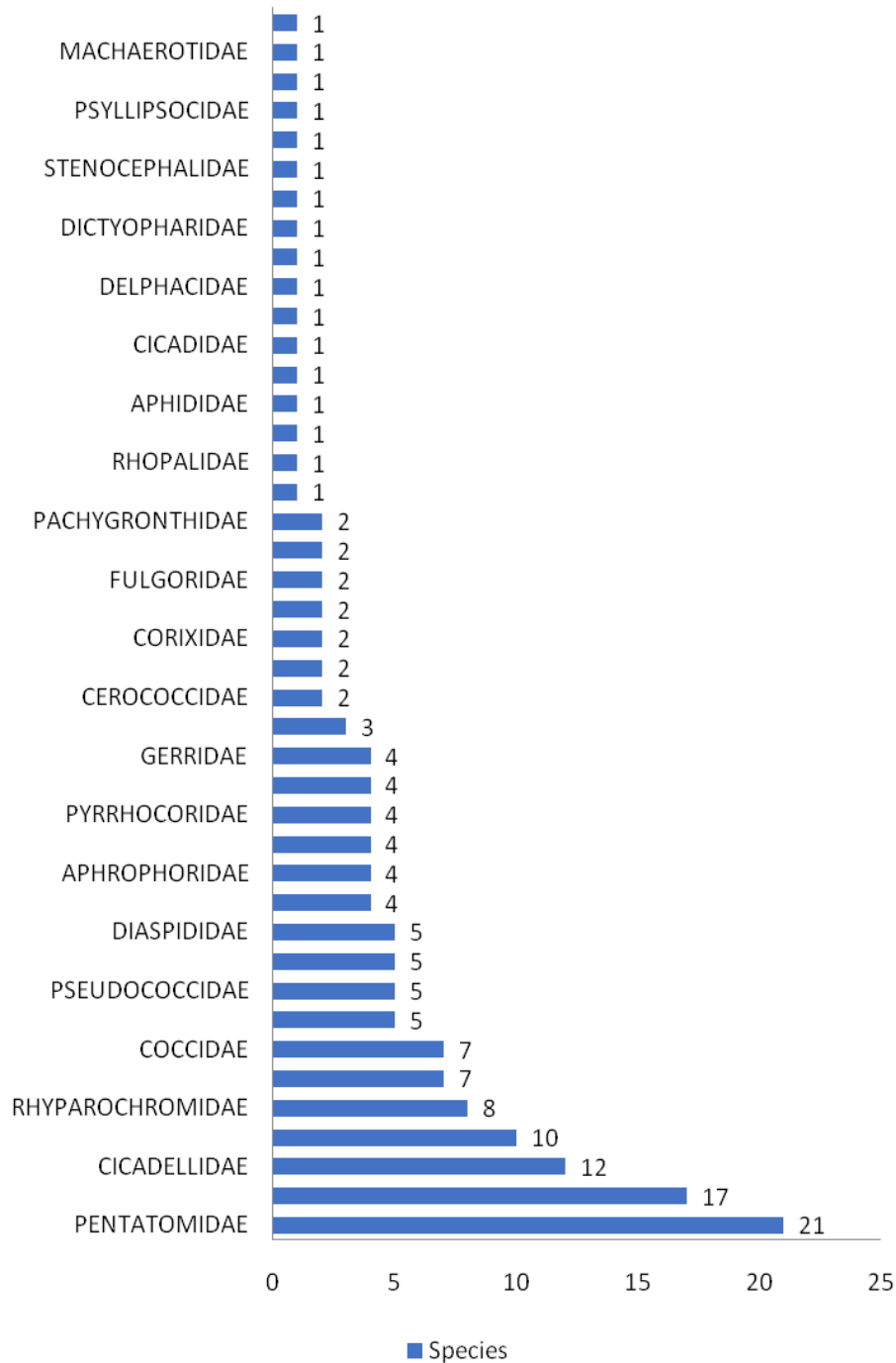


Figure 2. Family-wise number of species.

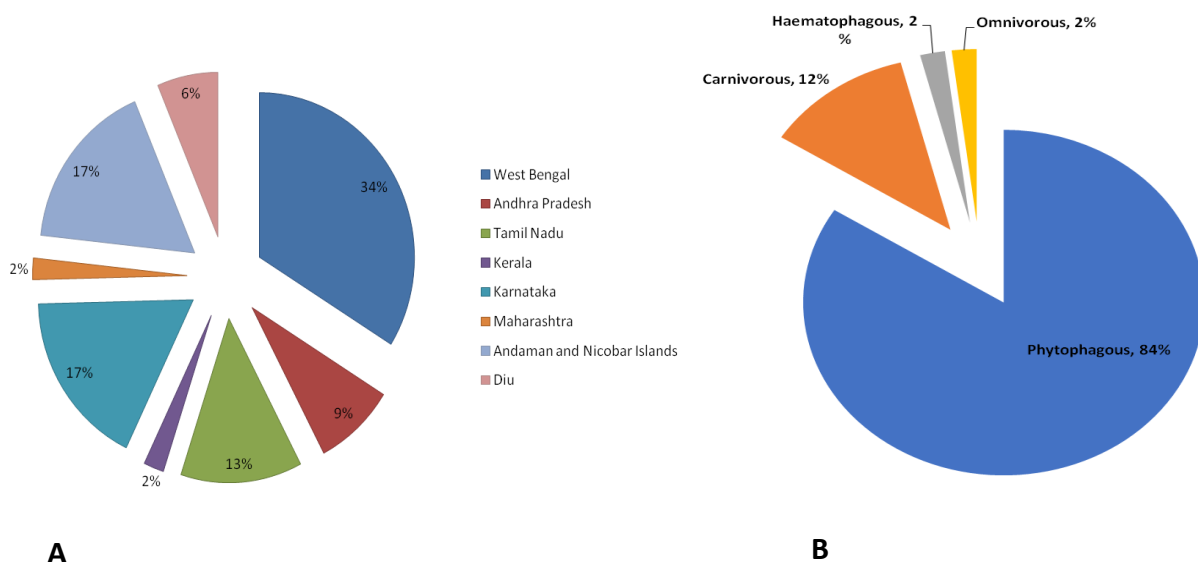
The study has been carried out in the Sundarban Biosphere Reserve from 2014 to 2016 under the project titled 'Role of Insect Pollinators on the Conservation of Major Mangrove Species in Sundarban Islands, West Bengal' funded by Ministry of Environment, Forest and Climate Change, New Delhi. The collected specimens have been dry preserved in the insect envelope in field. After pinning and setting, the specimens were identified with the help of experts in Zoological Survey of India, Kolkata. All the

collections have been made from the islands of Sagar, Bakkhali, Gosaba, Bali and Satjelia by B. Mitra and party (Figure 1A & B).

## Results

Altogether, 29 species under 29 genera belonging to 12 families of terrestrial Hemiptera were collected during this present study. Of them, 4 species were identified up to generic level. The family Pentatomidae shares maximum number of species (10), followed by Lygaeidae (4), Reduviidae (3), Cicadellidae (2), Coreidae (2), Rhyparochromidae, (2), Alydidae (1), Aphrophoridae (1), Cicadidae (1), Cydnidae (1), Fulgoridae (1) and Scutellaridae (1). 12 species under 12 genera are reported here for the first time from Sundarban mangroves, West Bengal, India (marked with #).

At present, 160 species under 129 genera belonging to 42 families of terrestrial Hemiptera are reported from Indian mangroves (Table 1). Majority of the families are having single species (19 families) and the family Pentatomidae shares maximum number of species (21) in Indian mangroves (Figure 2). Among the 160 species reported here, *Aspidiotus destructor* Signoret, 1869 of the family Diaspididae has been found very common and distributed in 4 Indian states. Among the 8 states and union territories of India, the highest number of species is found in West Bengal (34%) and lowest from Maharashtra (2%) (Figure 3A). Considering to the feeding habits of the terrestrial Hemiptera, Phytophagous (84%) is found as predominant group, followed by Carnivorous (12%), Haematophagous and Omnivorous (2%) in the mangroves of India (Figure 3B).



**Figure 3. Terrestrial hemipteran diversity in Indian mangroves.**

(A) Species Diversity among the states (in %); (B) diversity according to their feeding habit (in %).

## List of Collected Species

### A. FAMILY ALYDIDAE

#### 1. *Leptocorisa oratoria* (Fabricius, 1794)

**Material examined:** 1ex., Bali Island, Banidhal, 12.v.2015; 2exs., Bakkhali, Laxmipur, 6.xi.2015; 7exs., Bakkhali, Laxmipur, 7.xi.2015.

### B. FAMILY APHROPHORIDAE

#### 2. *#Clovia puncta* (Walker, 1851)

**Material examined:** 1ex., Gosaba Island, Pakhirala, 7.x.2015.

### C. FAMILY CICADIDAE

#### 3. *Platypleura octaguttata* (Fabricius, 1798)

**Material examined:** 3exs, Shikarpur, 7.iv.2016.

### D. FAMILY CICADELLIDAE

#### 4. *#Ledra mutica* Fabricius, 1803

**Material examined:** 1ex., Bakkhali forest bungalow, 6.v.2016.

#### 5. *Nephotettix virescens* (Distant, 1908)

**Material examined:** 2exs., Gosaba Island, Pakhirala, 10.xii.2014; 1ex., Gosaba Island, Pakhirala, 14.xii.2014; 1ex., Bali Island, Peyaratoli, 24.iii.2015; 1ex., Bakkhali, Amrabati, 5.xi.2015.

### E. FAMILY COREIDAE

#### 6. *Homoeocerus* sp.

**Material examined:** 1ex., Bakkhali, 14.v.2016; 1ex., Gosaba Island, Pakhirala, 11.x.2015.

#### 7. *Riptortus pedestris* (Fabricius, 1775)

**Material examined:** 2exs., Bakkhali, Kalisthan, 6.xi.2015.

### F. FAMILY CYDNIDAE

#### 8. *#Cydnus indicus* Westwood, 1837

**Material examined:** 1ex., Sagar island, 17.vii.2014.

### G. FAMILY FULGORIDAE

#### 9. *#Dictyophara pallida* (Walker, 1851)

**Material examined:** 1ex., Sagar Island, 10.vi.2015.

### H. FAMILY LYGAEIDAE

10. *#Nysius ceylanicus* (Motschulsky, 1863)

**Material examined:** 1ex., Bali Island, 9. No. Gheri, 21.iii.2015.

11. *Pamerana cuneata* Distant, 1909

**Material examined:** 8exs., Gosaba Island, Pakhirala, 6.x.2015; 1ex., Gosaba Island, Pakhirala, 4.vi.2016; 1ex., Bali Island, 25.v.2014; 1ex., Bakkhali, Debnibas 17.vi.2015; 1ex., Gosaba Island, Dhulki, 4.vi.2016; 1ex., Jatirampur, 9.x.2015.

12. *Paromius* sp.

**Material examined:** 1ex., Gosaba Island, Pakhirala, 6.x.2015.

13. *#Spilostethus pandurus militaris* (Fabricius, 1775)

**Material examined:** 1ex., Gosaba Island, Pakhirala, 9.x.2015.

**I. FAMILY PENTATOMIDAE**

14. *Acrosternum gramineum* (Fabricius, 1787)

**Material examined:** 1ex., Bakkhali forest bungalow, 28.v.2016; 1ex., Bakkhali, Laxmipur, 7.xi.2015.

15. *#Axiagastus rosmarus* Dallas, 1851

**Material examined:** 1ex., Bakkhali forest bungalow, 6.v.2016.

16. *Cantao ocellatus* (Thunberg, 1784)

**Material examined:** 2exs., Satjelia, 2.iv.2016.

17. *#Eocanthecona furcellata* (Wolff, 1811)

**Material examined:** 1ex., Bakkhali, 10.iv.2016.

18. *Eysarcoris ventralis* (Westwood, 1837)

**Material examined:** 1ex., Bakkhali, Kalisthan, 6.xi.2015; 2exs., Bakkhali forest bungalow, 28.v.2016; 2exs., Gosaba Island, Jotirampur, 9.x.2015; 1ex., Bakkhali, 7.xi.2015.

19. *Nezara viridula* (Linnaeus, 1758)

**Material examined:** 1ex., Bakkhali forest bungalow, 28.v.2016.

20. *Nezara* sp.

**Material examined:** 1ex., Bakkhali, 7.xi.2015.

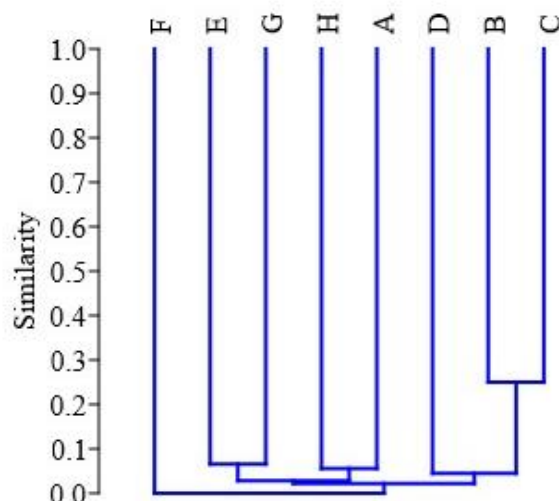
21. *Halys dentatus* (Fabricius, 1775)

**Material examined:** 1ex., 28.v.2016.

**22. *Halys* sp.****Material examined:** 1ex., Gosaba Island, 1.iv.2016.**23. #*Placosternum dama* (Fabricius, 1794)****Material examined:** 1ex., Sundarban, Gosaba Island, Dhulki, 4.vi.2016.**J. FAMILY REDUVIIDAE****24. *Acanthaspis micrographa* Walker, 1873****Material examined:** 1ex., Bakkhali, Kalisthan, 6.xi.2015.**25. #*Cleptocoris lepturoides* (Wolff, 1804)****Material examined:** 1ex., Bakkhali forest bungalow, 28.v.2016.**26. #*Endochus inornatus* (Stål, 1867)****Material examined:** 1ex., Bakkhali, 14.v.2016.**K. FAMILY RHYPAROCROMIDAE****27. *Horridipamera nietneri* (Dohrn., 1860)****Material examined:** 1ex., Gosaba Island, Pakhirala, 9.x.2015.**28. #*Pseudopachybrachius guttus* (Dallas, 1852)****Material examined:** 1ex., Bakkhali, Amrabati, 5.xi.2015.**L. FAMILY SCUTELLERIDAE****29. *Chrysocoris purpureus* (Westwood, 1837)****Material examined:** 1ex., Bakkhali, Henry's Island, 22.v.2015.

## Data analysis

The cluster analysis among 8 mangrove states and union territories show that, the highest similarity in species composition is found in between Andhra Pradesh and Tamil Nadu (S & D index= 0.25). Interestingly, there is no similarity in species composition in between Maharashtra and other mangrove states (Table 2). West Bengal has the maximum similarity in species composition with Diu and vice versa, followed by Andhra Pradesh with Tamil Nadu and vice versa. Though the species composition of Kerala is more similar with Karnataka, but in respect to Karnataka, the similarity in species composition is more with Andaman & Nicobar Islands and vice versa (Table 2 & Figure 4).



**Figure 4. Cluster analysis of species composition among different mangrove states and union territories of India.**

A= West Bengal, B=Andhra Pradesh, C=Tamil Nadu, D=Kerala, E=Karnataka, F=Maharashtra, G= Andaman and Nicobar Islands, H=Diu.

## Discussion

The Indian mangroves support rich faunal resources but unfortunately, insect diversity in mangroves is poorly known. Study of insect biodiversity can help in assess its potential productivity and in better conservation of mangroves.

Mitra (2017) documented 70 species of 60 genera belonging to 25 families of the order Hemiptera from Sundarban Biosphere Reserve. Among these reported species, 18 species under 11 genera belonging to 7 families of aquatic bugs were reported from the freshwater bodies of human-inhabiting islands of Sundarban (Mitra et al., 2016). After new addition of 12 species under 12 genera, the total reported terrestrial bug is now 64 species under 57 genera of 20 families in Sundarban Biosphere Reserve.

Mangrove ecosystems of India are gifted with rich biodiversity. Mangrove forests within India are found along the coastlines of 9 states and 3 union territories. Among them, the members of the order Hemiptera were reported 6 states and 2 union territories. The similarity in hemipteran species composition is very minimum among these states and union territories. This may be due to unique species composition in the mangroves of studied states and union territories.

Herbivory, the direct exploitation of living plant tissue by animals is known to involve crabs, molluscs and insects in the mangrove ecosystem (Murphy, 1990). Among insects, Hemiptera are considered as excellent ecological or environmental indicators due to high species diversity, high



abundances in all the ecosystems, presence in most of the microhabitats, functional importance and especially wide array of feeding strategies (Moir & Brennan, 2007). Majer et al. (2002) stated that the herbivorous order Hemiptera is potentially an important indicator group due to their role in nutrient cycling. Kathiresan (2003) also stated that, the leaf damage caused by herbivores could substantially influence growth and productivity of the mangroves. Figure 4 shows that, 84% hemipteran species found in Indian mangroves are phytophagous, 12 % are carnivorous and 2% each of Haematophagous and omnivorous in nature. Therefore, presence of 160 species of Hemiptera in the Indian mangroves suggests that, they play an important role in the mangrove ecosystem. Unfortunately, very few studies were made on their functional role or ecosystem services in the mangroves of India. Therefore, a long-term monitoring study will definitely unveil the functional role of Hemipteran insects in mangrove ecosystem.

**Table 1.** Terrestrial Hemipteran diversity in Indian Mangroves. 1= West Bengal, 2=Andhra Pradesh, 3=Tamil Nadu, 4=Kerala, 5=Karnataka, 6=Maharashtra, 7= Andaman and Nicobar Islands, 8=Diu.

		1	2	3	4	5	6	7	8	
	<b>FAMILY ALEYRODIDAE</b>									
1.	<i>Aleurocanthus lobulatus</i> Jesudasan and David,1991					■				Raji & Remadevi 2005
2.	<i>Aleurocanthus martini</i> David, 1993		■							Ragupathy et al., 2005
3.	<i>Aleurocanthus rugosa</i> Singh1931		■							Ragupathy et al., 2005
4.	<i>Aleurocanthus woglumi</i> Ashby, 1915						■			Remadevi et al., 2008
5.	<i>Aleuroclava nagercoilensis</i> Sundararaj & David, 1993					■				Remadevi et al., 2008
6.	<i>Aleuroclava</i> sp. indet.		■							Ragupathy et al., 2005
7.	<i>Aleurodicus dispersus</i> Russell, 1965				■	■				Therrattil, 2017, Remadevi et al., 2008
8.	<i>Aleurolobus marlatti</i> (Quaintance, 1903)		■							Ragupathy et al., 2005
9.	<i>Aleurolobus</i> sp.					■				Remadevi et al., 2008
10.	<i>Aleuroplatus alcocki</i> (Peal, 1903)		■	■						Ragupathy et al., 2005
	<b>FAMILY ALYDIDAE</b>									
11.	<i>Leptocoris acuta</i> (Fabricius,1783)	■		■						Mitra, 2017, Remadevi et al., 2008
12.	<i>Leptocoris oratoria</i> (Fabricius, 1794)	■				■				Mitra, 2017, Remadevi et al., 2008
13.	<i>Leptocoris varisuga</i>		■	■						Rajasekhar et al., 2015, Rahaman, 2002
14.	<i>Riptortus pedestris</i> (Fabricius, 1775)	■				■				Mitra, 2017, Remadevi et al., 2008
	<b>FAMILY APHALARIDAE</b>									
15.	<i>Boreioglycaspis forcipata</i> (Crawford, 1917)							■		Remadevi et al., 2008
	<b>FAMILY APHIDIDAE</b>									
16.	<i>Aphis (Aphis) fabae</i> Scopoli, 1763						■			Grampurohit & Karkhanis, 2013
	<b>FAMILY APHROPHORIDAE</b>									
17.	<i>Clovioa conifera</i> (Walker1851)	■								Mitra, 2017

		1	2	3	4	5	6	7	8	
18.	<i>Clovia puncta</i> (Walker, 1851)	■								Present record
19.	<i>Jembrana</i> sp.					■				Remadevi et al., 2008
20.	<i>Ptyelus nebulus</i> (Turton, 1802)	■								Mitra, 2017
<b>FAMILY CARSIDARIDAE</b>										
21.	<i>Tyora ornata</i> (Kirkaldy, 1908)							■		Remadevi et al., 2008
<b>FAMILY CEROCOCCIDAE</b>										
22.	<i>Callitettix versicolor</i> (Fabricius, 1794)								■	Mitra et al., 2017
23.	<i>Cerococcus</i> sp.							■		Remadevi et al., 2008
<b>FAMILY CICADELLIDAE</b>										
24.	<i>Balclutha</i> sp.					■				Remadevi et al., 2008
25.	<i>Batracomorpha</i> sp.							■		Veenakumari et al., 1997
26.	<i>Cofana unimaculata</i> (Signoret, 1854)	■								Mitra, 2017
27.	<i>Cicadella viridis</i> (Linnaeus, 1758)						■			Grampurohit & Karkhanis, 2013
28.	<i>Deltocephalus</i> sp.					■				Remadevi et al., 2008
29.	<i>Empoasca</i> sp.					■				Remadevi et al., 2008
30.	<i>Empoasca</i> sp.					■				Remadevi et al., 2008
31.	<i>Idioscopus decoratus</i> Viraktamath 1980					■				Remadevi et al., 2008
32.	<i>Ledra mutica</i> Fabricius, 1803	■								Present record
33.	<i>Nephotettix virescens</i> (Distant, 1908)	■								Mitra, 2017
34.	<i>Penthimia</i> sp.							■		Remadevi et al., 2008
35.	<i>Recilia (Inazuma) dorsalis</i> Motschulsky 1859	■								Mitra, 2017
<b>FAMILY CICADIDAE</b>										
36.	<i>Platypleura octoguttata</i> (Fabricius, 1798)	■								Mitra, 2017
<b>FAMILY CIXIIDAE</b>										
37.	<i>Oliarus hodgarti</i> Distant, 1911	■								Mitra, 2017
38.	<i>Ptoleria</i> sp.							■		Remadevi et al., 2008
<b>FAMILY COCCIDAE</b>										
39.	<i>Ceroplastes actiniformis</i> Green, 1896					■				Remadevi et al., 2008
40.	<i>Ceroplastes ceriferus</i> (Fabricius, 1798)					■				Remadevi et al., 2008
41.	<i>Ceroplastes floridensis</i> Comstock, 1881					■				Remadevi et al., 2008
42.	<i>Ceroplastes rubens</i> Maskell, 1893							■		Remadevi et al., 2008
43.	<i>Paralecanium</i> sp.					■				Remadevi et al., 2008
44.	<i>Paralecanium</i> sp. near to <i>expansum</i> (Green, 1904)							■		Remadevi et al., 2008
45.	<i>Pulvinaria</i> sp.					■		■		Remadevi et al., 2008
<b>FAMILY COREIDAE</b>										
46.	<i>Cletus trigonus</i> (Thunberg, 1783)					■				Remadevi et al., 2008
47.	<i>Cletus rubidiventris</i> (Westwood, 1842)								■	Mitra et al., 2017
48.	<i>Dasyneus</i> sp.							■		Remadevi et al., 2008
49.	<i>Homoeocerus</i> sp.					■				Remadevi et al., 2008
50.	<i>Plinactus acicularis</i> (Fabricius, 1803)	■								Mitra, 2017
<b>FAMILY CORIXIDAE</b>										
51.	<i>Sigara (Sigara) striata</i> (Linnaeus, 1758)			■						Balakrishnan & Mohanraj, 2014
52.	<i>Trichocorixa verticalis</i> (Fieber, 1851)			■						Balakrishnan & Mohanraj, 2014
<b>FAMILY CYDNIDAE</b>										
53.	<i>Cydnus indicus</i> Westwood, 1837	■								Present record

		1	2	3	4	5	6	7	8	
	<b>FAMILY DELPHACIDAE</b>									
54.	<i>Nilaparvata lugens</i> (Stål, 1854)	■								Mitra, 2017
	<b>FAMILY DERBIDAE</b>									
55.	<i>Kamendaka</i> sp.							■		Remadevi et al., 2008
	<b>FAMILY DIASPIDIDAE</b>									
56.	<i>Aspidiotus destructor</i> Signoret, 1869			■	■	■				Therattil, 2017; Remadevi et al., 2008; Balakrishnan & Mohanraj, 2014
57.	<i>Aspidiotus</i> sp.							■		Remadevi et al., 2008
58.	<i>Aulacaspis</i> sp.							■		Remadevi et al., 2008
59.	<i>Aulacaspis tubercularis</i> Newstead, 1906							■		Remadevi et al., 2008
60.	<i>Fiorinia</i> sp.							■		Remadevi et al., 2008
	<b>FAMILY DICTYOPHARIDAE</b>									
61.	<i>Dictyophara pallida</i> (Donovan, 1800)	■								Present record
	<b>FAMILY DINIDORIDAE</b>									
62.	<i>Coridius brunneus</i> (Thunberg, 1783)	■								Mitra, 2017
	<b>FAMILY ENICOCEPHALIDAE</b>									
63.	<i>Enicocephalus basalis</i> Westwood, 1837		■	■						Remadevi et al., 2008; Rajasekhar et al., 2015; Rahaman, 2002
64.	<i>Oncyclocotis basalis</i> Westwood (1837)		■		■					Therattil, 2017; Rajasekhar et al., 2015
	<b>FAMILY FULGORIDAE</b>									
65.	<i>Kalidasa</i> sp. near <i>lanata</i> (Drury, 1773)							■		Remadevi et al., 2008
66.	<i>Pyrops</i> sp.			■						Sethnil & Varadharajan, 1995
	<b>FAMILY GERRIDAE</b>									
67.	<i>Gerris</i> sp.					■				Remadevi et al., 2008
68.	<i>Halobates (Halobates) galatea</i> Herring				■					Radhakrishnan & Thirumalai, 2004
69.	<i>Halobates (Halobates) germanus</i> (White, 1883)			■						Balakrishnan & Mohanraj, 2014
70.	<i>Halobates micans</i> (Eschscholtz, 1822)			■						Balakrishnan & Mohanraj, 2014
	<b>FAMILY LYGAEIDAE</b>									
71.	<i>Nysius ceylanicus</i> (Motschulsky, 1863)	■								Present record
72.	<i>Oncopeltus nigriceps</i> (Dallas, 1852)	■								Mitra, 2017
73.	<i>Spilostethus hospes</i> (Fabricius, 1794)	■								Mitra, 2017
74.	<i>Spilostethus pandurus militaris</i> (Fabricius, 1775)	■								Present record
	<b>FAMILY MACHAEROTIDAE</b>									
75.	<i>Machaerota</i> sp.							■		Veenakumari et al., 1997
	<b>FAMILY MARGARODIDAE</b>									
76.	<i>Icerya aegyptiaca</i> (Douglas, 1890)					■				Remadevi et al., 2008
	<b>FAMILY MEMBRACIDAE</b>									
77.	<i>Gargara mixta</i> (Buckton, 1903)	■								Mitra, 2017
78.	<i>Leptocentrus taurus</i> (Fabricius, 1775)	■								Mitra, 2017
79.	<i>Otinotus oneratus</i> (Walker, 1858)	■				■			■	Mitra, 2017; Mitra et al., 2017; Remadevi et al., 2008
80.	<i>Oxyrachis</i> sp.					■				Remadevi et al., 2008
81.	<i>Tricentrus cornutus</i> Ananthasubramanian, 1980	■								Mitra, 2017
	<b>FAMILY MIRIDAE</b>									

		1	2	3	4	5	6	7	8	
82.	<i>Campylomma</i> sp.							■		Veenakumari et al., 1997
83.	<i>Lygus lineolaris</i> (Palisot de Beauvois, 1818)			■						Rahaman, 2002
84.	<i>Lygus</i> sp.		■							Rajasekhar et al., 2015
85.	<i>Proboscidoecoris distanti</i> Poppius, 1911	■								Mitra, 2017; reported as <i>Proboscidoecoris longicornis</i>
<b>FAMILY NABIDAE</b>										
86.	<i>Nabis capsiformis</i> Germar, 1838					■				Remadevi et al., 2008
87.	<i>Nabis ferus</i> (Linnaeus, 1758)			■						Balakrishnan & Mohanraj, 2014
88.	<i>Nabis</i> sp.						■			Grampurohit & Karkhanis, 2013
<b>FAMILY NEPIDAE</b>										
89.	<i>Laccotrephes</i> sp.		■	■						Rajasekhar et al., 2015; Rahaman, 2002
<b>FAMILY PACHYGRONTHIDAE</b>										
90.	<i>Pachygrontha bipunctata</i> Stål, 1865	■								Mitra, 2017
91.	<i>Pachygrontha lewisi</i> Distant, 1901	■								Mitra, 2017
<b>FAMILY PENTATOMIDAE</b>										
92.	<i>Acrosternum gramineum</i> (Fabricius) 1787	■							■	Mitra, 2017; Mitra et al., 2017
93.	<i>Antestiopsis cruciata</i> (Fabricius, 1775)					■		■	■	Mitra et al., 2017; Remadevi et al., 2008
94.	<i>Axiagastus rosmarus</i> Dallas, 1851	■								Present record
95.	<i>Brochymena arborea</i> (Say, 1825)		■	■						Rajasekhar et al., 2015; Rahaman, 2002
96.	<i>Carbula biguttata</i> (Fabricius, 1794)								■	Mitra et al., 2017
97.	<i>Dolycoris indicus</i> Stal, 1876	■								Mitra, 2017
98.	<i>Eocanthecona furcellata</i> (Wolff, 1811)	■								Present record
99.	<i>Eysarcoris distanti</i> Rider, 1998	■								Mitra, 2017
100.	<i>Eysarcoris montivagus</i> Distant, 1902	■								Mitra, 2017
101.	<i>Eysarcoris ventralis</i> (Westwood, 1837)	■	■	■					■	Mitra, 2017; Mitra et al., 2017; Rahaman, 2002; Rajasekhar et al., 2015
102.	<i>Halys dentatus</i> Fabricius, 1775	■								Mitra, 2017
103.	<i>Murgantia histrionica</i> (Hahn, 1834)		■	■						Rajasekhar et al., 2015; Rahaman, 2002
104.	<i>Nezara viridula</i> Linnaeus, 1758	■		■						Mitra, 2017; Rahaman, 2002
105.	<i>Placosternum dama</i> Fabricius, 1794	■								Present record
106.	<i>Plautia crossota</i> (Fabricius, 1787)	■								Mitra, 2017
107.	<i>Plautia</i> sp.					■				Remadevi et al., 2008
108.	<i>Perillus bioculatus</i> (Fabricius, 1775)			■						Rahaman, 2002
109.	<i>Perillus</i> sp.		■							Rajasekhar et al., 2015
110.	<i>Podops bispinosa</i> (Fabricius, 1803)					■				Remadevi et al., 2008
111.	<i>Stortheocoris nigriceps</i> Horvath, 1883	■								Mitra, 2017
112.	<i>Zangis dorsalis</i> (Dohrn, 1860)	■								Mitra, 2017
<b>FAMILY PLATASPIDAE</b>										
113.	<i>Brachyplatys</i> sp.nr. <i>subaneus</i> (Westwood)					■				Remadevi et al., 2008
<b>FAMILY PSEUDOCOCCIDAE</b>										
114.	<i>Cataenococcus</i> sp.							■		Remadevi et al., 2008
115.	<i>Dysmicoccus brevipes</i> (Cockerell, 1893)							■		Remadevi et al., 2008

		1	2	3	4	5	6	7	8	
116	<i>Mutabilicoccus</i> sp.							■		Remadevi et al, 2008
117	<i>Planococcus lilacinus</i> (Cockerell, 1905)							■		Remadevi et al, 2008
118	<i>Pseudococcus cryptus</i> Hempel, 1918							■		Remadevi et al, 2008
<b>FAMILY PSYLLIPSOCIDAE</b>										
119	<i>Psyllipsocus</i> sp.							■		Remadevi et al, 2008
<b>FAMILY PYRRHOCORIDAE</b>										
120	<i>Antilochus coqueberti</i> (Fabricius, 1803)								■	Mitra et al., 2017
121	<i>Dysdercus cingulatus</i> (Fabricius, 1775)			■						Balakrishnan & Mohanraj, 2014
122	<i>Dysdercus koenigii</i> (Fabricius, 1775)							■		Veenakumari et al., 1997
123	<i>Pyrrhocoris apterus</i> (Linnaeus, 1758)			■						Balakrishnan & Mohanraj, 2014
<b>FAMILY REDUVIDAE</b>										
124	<i>Acanthaspis micrographa</i> Walker, 1873	■								Mitra, 2017
125	<i>Cleptocoris lepturoides</i> (Wolff, 1804)	■								Present record
126	<i>Cosmoslestes annulipes</i> Distant, 1879	■								Mitra, 2017
127	<i>Ectrychotes dispar</i> Reuter, 1881								■	Mitra et al., 2017
128	<i>Endochus inornatus</i> Stål, 1867	■				■				Remadevi et al., 2008; Present record
129	<i>Isyndus heros</i> (Fabricius, 1803)					■				Remadevi et al., 2008
130	<i>Lanca</i> sp.							■		Remadevi et al., 2008
131	<i>Lestomerus affinis</i> (Serville, 1831)	■								Mitra, 2017
132	<i>Lisarda annulosa</i> Stal, 1874								■	Mitra et al., 2017
133	<i>Occamus</i> sp.							■		Remadevi et al., 2008
134	<i>Oncocephalus impudicus</i> Reuter, 1882	■								Mitra, 2017
135	<i>Pasira perpusilla</i> (Walker, 1873)	■								Mitra, 2017
136	<i>Pirates flavipes</i> (Walker, 1873)	■								Mitra, 2017
137	<i>Rhynocornis costalis</i> (Stål, 1866)	■								Mitra, 2017
138	<i>Triatoma sanguisuga</i> (LeConte, 1855)			■						Rahaman, 2002
139	<i>Triatoma</i> sp.		■							Rajasekhar et al., 2015
140	<i>Vilius melanopterus</i> Stal, 1863	■								Mitra, 2017
<b>FAMILY RHOPALIDAE</b>										
141	<i>Leptocoris augur</i> (Fabricius, 1781)	■								Mitra, 2017
<b>FAMILY RHYPAROCHROMIDAE</b>										
142	<i>Dieuches coloratus</i> (Distant, 1909)	■								Mitra, 2017
143	<i>Horridipamera nietneri</i> (Dohrn, 1860)	■								Mitra, 2017
144	<i>Melanotelus bipunctata</i> (Dallas, 1852)	■								Mitra, 2017
145	<i>Metochus uniguttatus</i> (Thunberg, 1822)	■							■	Mitra, 2017; Mitra et al., 2017
146	<i>Pamerana nigriflora</i> (Walker, 1872)	■								Mitra, 2017
147	<i>Paromius gracilis</i> (Rambur, 1839)	■								Mitra, 2017
148	<i>Pseudopachybrachius guttus</i> (Dallas, 1852)	■								Present record
149	<i>Rhyparothesus bengalensis</i> (Distant, 1909)								■	Mitra et al., 2017
<b>FAMILY SALDIDAE</b>										
150	<i>Micracanthia ornatula</i> (Reuter, 1881)			■						Sethnil & Varadharajan, 1995
151	<i>Salda dixonii</i>			■						Sethnil & Varadharajan, 1995
<b>FAMILY SCUTELLERIDAE</b>										
152	<i>Cantao ocellatus</i> (Thunberg, 1784)	■								Mitra, 2017
153	<i>Calliphara nobilis</i> (Linnaeus, 1763)							■		
154	<i>Chrysocoris purpureus</i> (Westwood, 1781)	■								Mitra, 2017
155	<i>Chrysocoris stollii</i> (Wolff, 1801)	■	■	■						Mitra, 2017; Remadevi et al., 2008; Rajasekhar et al., 2015

		1	2	3	4	5	6	7	8	
156	<i>Chrysocoris</i> sp					■				Remadevi et al, 2008
157	<i>Fitha ardens</i> (Walker, 1867)	■								Mitra, 2017
158	<i>Scutellera nobilis</i> (Fabricius,1775)					■		■		Remadevi et al, 2008
	<b>FAMILY STENOCEPHALIDAE</b>									
159	<i>Dicranocephalus lateralis</i> (Signoret, 1879)	■								Mitra, 2017
	<b>FAMILY TETTIGOMETRIDAE</b>									
160	<i>Egropa</i> sp.							■		Remadevi et al, 2008

**Table 2.** Similarity in species composition among the mangrove states and union territories of India. A= West Bengal, B=Andhra Pradesh, C=Tamil Nadu, D=Kerala, E=Karnataka, F=Maharashtra, G= Andaman and Nicobar Islands, H=Diu.

	A	B	C	D	E	F	G	H
A	*	0.025641	0.047619	0	0.043011	0	0	0.055556
B	0.025641	*	0.25	0.052632	0	0	0	0.037037
C	0.047619	0.25	*	0.037037	0.017857	0	0.018182	0.028571
D	0	0.052632	0.037037	*	0.057143	0	0.028571	0
E	0.043011	0	0.017857	0.057143	*	0	0.065574	0.046512
F	0	0	0	0	0	*	0	0
G	0	0	0.018182	0.028571	0.065574	0	*	0.023256
H	0.055556	0.037037	0.028571	0	0.046512	0	0.023256	*

## References

- Balakrishnan S., & Mohanraj J. (2014) Diversity of Some Insect Fauna in Different coastal Habitats of Tamil Nadu, Southeast Coast of India. *Journal of Asia-Pacific Biodiversity*. 7(4), 408-414.
- Gopinathan, C. P. & Selvaraj, G. S. D. (2005) The mangroves - importance, conservation and management. *Marine Biodiversity Conservation and Management*. 4-15.
- Grampurohit, B. & Karkhanis, H. (2013) Insect Biodiversity at mangrove Ecosystem. National Conference on Biodiversity: Status and challenges in conservation-Faveo-2013. pp. 126
- Kathiresan, K. & Bingham, B. L. (2001) Biology of mangroves and mangrove ecosystems. *Advances in Marine Biology*. 40, 81-251.
- Kathiresan, K. (2003) Insect folivory in mangroves. *Indian Journal of Marine Sciences*. 32 (3), 237-239.
- Majer, J. D., Brennan, K. E. C. & Bisevac, L. (2002) Terrestrial invertebrates. In: Perrow, M. R. & Davy, A. J. (eds.) *Handbook of Ecological Restoration*. Cambridge, Cambridge University Press, pp. 279-299.
- Mitra, B., Roy, S., Biswas, O., Chakraborti, U. & Jehamalar, E. E. (2016) New records of aquatic bugs (Insecta: Hemiptera) from Sunderban biosphere

- reserve, West Bengal, India. *Journal of Entomology and Zoology Studies*. 4(4), 8-11.
- Mitra, B. (2017) Insect faunal diversity and their ecosystem services in Sundarban Biosphere Reserve. Fauna of Sundarban Biosphere Reserve. In: Chandra, K., Alfred, J. R. B., Mitra, B. & Roy, C. B. (eds) Zoological Survey of India, Kolkata. pp. 137-173.
- Mitra, B., Shah, S. K., Das, S. K., Mukherjee, P., Chakraborty, K., & Mukhopadhyay, D. (2017) First report on insect faunal diversity from the mangrove ecosystem of Diu, Union Territories of India. *International Journal of Entomology Research*. 2, 76-78
- Moir, M. L. & Brennan, K. E. C. (2007) Using Bugs (Hemiptera) as Ecological and Environmental Indicators in Forest Ecosystems. In: Muñoz, S. I. (ed) *Ecology research progress*. pp. 79-116.
- Murphy, D. H. (1990) The natural history of insect herbivory on mangrove trees in and near Singapore. *Raffles Bulletin of Zoology*. 38(2), 119-203.
- Radhakrishnan, C. & Thirumalai, G. (2004) A report on the occurrence of sea skater, *Holobates galatea* herring (Insecta: Hemiptera: Gerridae) in a mangrove habitat at Dharmadam, Kannur District, Kerala India. *Records Zoological Survey of India*. 102(Part 1-2), 7-10.
- Ragupathy, E., Jesudasan, R. W. A. & David, B. V. (2005) New Record of Whiteflies (Aleyrodidae:Hemiptera: insecta) in Mangrove Forests of Southern India. *Entomon*. 30(1), 31-37.
- Rahaman, A. A. (2002) Mangrove insect fauna of Muthupet, Tamil Nadu. In: *National Seminar on Conservation of Eastern Ghats*. pp. 24-26.
- Raji, B. & Remadevi, O. K. (2005) Entomofaunal diversity in mangrove forest of West Coast (South India). *Annals of Forestry*. 13, 323-331.
- Rajasekhar, M., Chakrapani, I. S., Srinivasulu, A. & Nagendra Prasad, S. V. (2015) Insect Fauna of Mangroves of Nellore district, south coastal Andhra Pradesh, India. In: Viswanath, B. & Indravathi, G. (eds.) *New Horizons in Biotechnology*. Paramount Publishing House. India, pp. 312-316.
- Remadevi, O. K., Latheef, A., Chatterjee, D & Raji, B. (2008) Entomofauna of mangrove ecosystem of India – an annotated check list. *Biosystematica*. 2(2), 33-80.
- Senthil, R., & Varadharajan, M. (1995) *Proceedings of the National Symposium on recent Trends in Wild Life Research*. A.V.C. College, Mayiladuthurai 1995; 609(35), 0-35.
- Therattil, J. J. (2017) Role of Interaction of Insect pest in mangrove vegetation of central Kerala. *International Journal of Applied Research*. 3(1).
- Veenakumari, K., Mohanraj, P. & Bandyopadhyay, A. K. (1997) Insects herbivores and their natural enemies in mangals of the Andamans and Nicobars Islands. *Journal of Natural History*. 31(7), 1105-1126.