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## Diversity of coleopteran insects in the coastal and noncoastal environment of Midnapore (East), West Bengal, India

**Debdas Jana, Dipak Kumar Tamili and Susanta Kumar Chakraborty**

### Abstract

Coleoptera is the largest order in the class Insecta, and contains species that can be found on land, air, and water to a considerable extent. The members of this order occur almost throughout the physiographic zones of India. Coleopteran insects of coastal areas Midnapore (East) district were sampled from November 2008 to October 2011. Altogether 28 Coleopteran insect species belonging to 26 genera and 9 families have been documented from eight different study sites having contrasting ecological characters in the coastal areas of Midnapore (East) district of West Bengal, India. The present study has attempted to record the diversity and distribution of Coleopteran insects. Some site specific species have been described in our study.

**Keywords:** coastal area, coleoptera, diversity, distribution, Midnapore (East), site-specific species

### Introduction

The diversity of life on earth has never been, and never will be static. Global biodiversity has fluctuated through geologic time as evolution has added new species and extinction has taken them away <sup>[1]</sup>. Biological systems are constantly changing in response to environmental stimuli culminating in species richness <sup>[2]</sup>.

Insects are the most diverse groups of organisms on earth and can be found in almost all terrestrial and freshwater habitats, from the driest deserts to freshwater ponds, from the canopy of a tropical rainforest (where their diversity is unbelievably great) to the arctic wastes<sup>[3]</sup>. A few species are even marine. They are a tremendously successful group <sup>[4-5]</sup>. The variation in the distribution of insects may well be linked with some characters of the environment or their host plants. Their feeding habits are similarly varied; almost any substance that has nutritive value is eaten by some group of insects <sup>[6]</sup>. Giri *et al.* <sup>[7]</sup> pointed out that the host specific interactions of herbivore insects is critical to explaining the overall diversity of plants and insects observed in tropical forests. But the concept of host specificity among insects has contributed to the stimulation of total arthropod species richness on the earth.

Insects act as an important bio-indicator species of environmental changes <sup>[8]</sup>. Jana *et al.* <sup>[9]</sup> advocated that insects have the ability to differentiate the more polluted load of air pollution from the non-polluted one. According to Wilson <sup>[10]</sup> density of the insects has been threatened due to various environmental factors *viz.* urban sprawl, use of pesticides, and increasing pollution loads. Human activities at various levels are becoming real threats to conserve biodiversity resources in our country.

Coleoptera (beetles and weevils) is the largest order in the class Insecta belonging to the phylum Arthropoda. As adults, although they may vary in size extensively, most beetles have a hard, dense exoskeleton that covers and protects most of their body surface and their fore wings are modified into protective covers or elytra. Many species are herbivores and variously adapted to feed on the roots, stems, leaves, or reproductive structures of their host plants. Some species live on fungi, others burrow into plant tissues, and still others excavate tunnels in wood or under bark. Many beetles are predators <sup>[11]</sup>. They live in the soil or on vegetation and attack a wide variety of invertebrate hosts. Some beetles are scavengers, feeding primarily on carrion, fecal material, decaying wood, or other dead organic matter. There are even a few parasitic beetles-some are internal parasites of other insects, some invade the nests of ants or termites, and some are external parasites of mammals. Many beetles are regarded as major pests of agricultural plants and stored products.

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They attack all parts of living plants as well as processed fibers, grains, and wood products. Scavengers and wood boring beetles are useful as decomposers and recyclers of organic nutrients. Predatory species, such as lady beetles, are important biological control agents of aphids and scale insects [12].

The present study has been undertaken to explore the diversity, distribution patterns, and interactions with habitats (water, soil, and plants) in the coastal environment of the Bay of Bengal and also in nearby non-coastal areas of Midnapore (East) in contrasting eco-zones. Six study sites have been selected within 5 km stretch of coastal belt and two are located beyond 25 km towards the main land off the sea shore. For qualitative study, 13 host plants belonging to 9 families were selected and for quantitative study one host plant viz. *Calotropis procera*, a medicinal plant commonly known as Madar plant, was selected.

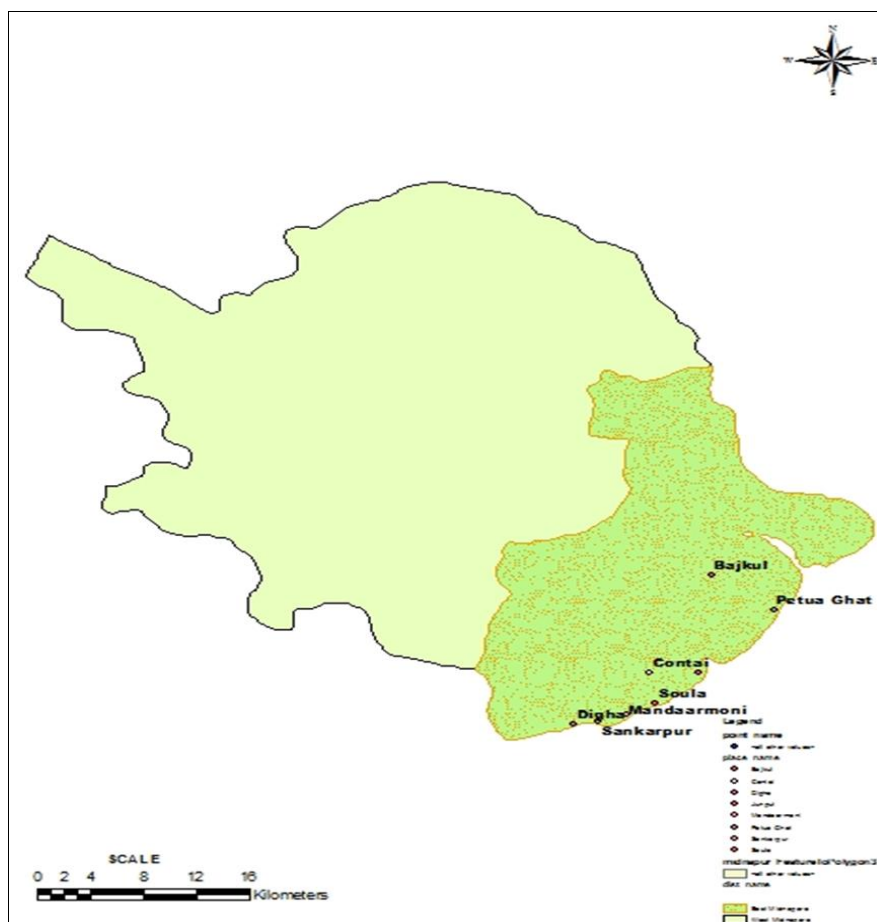
Here, we used three medicinal plants viz. *Calotropis procera*, *Croton bonplandianum* and *Clerodendron infortunatum* for quantitative study and for qualitative study plants of common vegetation were considered.

### Physiography of the study sites

The coastal area of West Bengal extends over 0.82 million hectares and along 220km of coast land. The entire stretch from Subarnarekha in the west to the mouth of the river Harinbhanga on the east, representing the entire coastal zone of the state, is divided into three main coastal sectors, i.e., the eastern sector, the central sector, and the western sector. The Digha–Rosulpur coastal plain along the Bay of Bengal is situated in Western sector (Fig.-1).

Out of two coastal districts of West Bengal, Purba (East) Midnapore district is characterized by sand dunes and less vegetational coverage when compared with the coastal belt of South 24 Parganas district that is supported by the Sundarban mangrove ecosystem<sup>[13-14]</sup>. The bay water bordering east Midnapore is characterized by longshore currents and high aquatic salinity and less turbidity.

For the current study, eight study sites in East Midnapore were selected, viz., Petuaghat (Site-I), Soula (Site-II), Junput (Site-III), Mandarmoni (Site-IV), Sankarpur (Site-V), Digha (Site-VI), Bajkul (Site-VII) and Contai (Site-VIII). Study sites I to VI may be considered as coastal areas and the rest two as non-coastal areas.



**Fig 1:** Map showing the distribution of study sites

### Materials and Methods

Monthly sampling of beetles was conducted in this study. Camel hair brush, forceps, alcohol, soft brush, long stick, big sized cloth, aerial nets, sweeping nets, etc., were used for insect collection.

For qualitative study, common plants belonging to nine families, and for quantitative study, one medicinal plant, a wild shrub *Calotropis procera*, was considered. *Calotropis procera* is found in every study site throughout the year.

Therefore, various Coleopteran insects were hypothesized to be observed on this plant. For all plants, the younger plants were selected in accordance with the Development age Hypothesis [15], which states that herbivores prefer and perform better on young plants than on old ones because the nutritional quality of plant materials decrease with age. Interestingly, the nutrient level decreases while the non-nutrient chemicals and leaf toughness increase with plant age [16].

### Sampling Method

Transect method [17] as well as visual observation was done during the investigation, following Macan [18], Barnes and Barnes [19], Duffey [20], and Murray [21]. Hard bodied coleopteran insects from the host plants were collected by hand picking, beating with a stick, and net sweeping, and the collected specimens were properly preserved in dry condition by using camphor, carbolic acid, naphthalene, etc. Paper packets, made of oil paper, were used to store the killed coleopterans for sorting and transportation.

For quantitative analyses, the abundance of the insect fauna, determined as the number of insects per 100 leaves of host

plant was counted, following the methods of Broadbent [22] and Jana *et al.* [23-24]. For the collection of larger samples, 100 leaves were also considered. Because the larger samples have the advantage to make the analysis easiest [25-26].

### Results

Altogether, 28 Coleopteran species belonging to 9 families were recorded from the eight study sites, which are presented in Table- 1, highlighting their distribution patterns. The systematic position is- Super Phylum-Arthropoda, Phylum-Entoma; Sub Phylum-Uniramia; Super class- Hexapoda and Class- Insecta.

**Table 1:** Distribution of Coleopteran species in different contrasting coastal areas of Midnapore (East)

Family	Species	S1	S2	S3	S4	S5	S6	S7	S8
1. Coccinellidae	1. <i>Coelophora unicolor</i> (Fab)	+	+	+	+	+	+	-	-
	2. <i>Micraspis discolor</i> (Fab)	+	+	+	+	+	+	+	+
	3. <i>Menochilus sexmaculatus</i> (Fab)	+	+	+	+	+	+	+	+
	4. <i>Coccinella transversalis</i> (Fab)	+	+	+	+	+	+	+	+
	5. <i>Coccinella septempunctata</i> (Linn)	+	+	+	+	+	+	+	+
	6. <i>Pseudaspidimerus circumflexavar. testaceus</i> (Weise)	-	-	-	-	+	+	-	-
	7. <i>Pullusnymphaeus</i> (Kapur)	-	-	-	-	-	-	+	+
	8. <i>Jauravia</i> sp	-	-	-	-	+	+	-	-
2. Chrysomelidae	9. <i>Aspidomorpha indica</i> (Boheman)	-	+	-	-	-	+	-	-
	10. <i>Cassida cruenta</i> (Fab)	-	-	-	-	-	+	-	-
	11. <i>Monolepta</i> sp	+	+	+	+	+	+	+	+
	12. <i>Platycorynus peregrines</i> (Herbst)	+	+	+	+	+	+	+	+
	13. <i>Cryptocephalus vittipennis</i> (Suffrien)	-	-	-	-	-	-	+	-
	14. <i>Altica</i> sp	+	+	+	+	-	-	+	+
	15. <i>Hispa armigera</i> (Oliver)	+	+	+	+	-	-	+	+
	16. <i>Tribolium castaneum</i> (Herbst)	+	+	+	+	+	+	+	+
17. <i>Aulacophora foveicollis</i> (Lucas)	+	+	+	+	+	+	+	+	
18. <i>Bruchus analis</i> (Bjek)	+	+	+	+	+	+	+	+	
3. Lampyridae	19. <i>Luciola vespertina</i> (Fab)	+	+	+	+	+	+	+	+
4. Tenebrionidae	20. <i>Gonocephalum</i> sp	-	-	-	-	+	+	-	-
5. Scarabaeidae	21. <i>Adoretus</i> sp	-	-	-	-	-	-	+	+
6. Curculionidae	22. <i>Blosyrus</i> sp	+	+	+	+	+	-	-	+
	23. <i>Paralixus</i> sp	+	+	-	-	-	-	-	-
	24. <i>Tanymecus</i> sp	-	-	-	+	+	-	-	-
7. Nitidulidae	25. <i>Haptoncus concolor</i> Murr	-	-	-	-	-	-	+	+
	26. <i>Haptoncus ocellaris</i> Fairm	-	-	-	-	-	-	+	+
8. Meloidae	27. <i>Mylabris phalarata</i> Pall	-	-	-	-	-	-	+	-
9. Hydrophilidae	28. <i>Hydrophilus olivaceus</i> Fab.	-	-	-	-	-	-	+	+

### Order: Coleoptera

#### Family: Coccinellidae

#### Species: 1. *Coccinella septempunctata* Linn

1758. *Coccinella 7-plittata* Linnaeus, Syst. Nat. (ed X): 365 (T.L. Europe) 1958. *Coccinella septemplittata*, Kapur, Rec. Indian Mus. 53(3-4): 328.

**Materials examined:** 2 exs, from all the study sites.

**Diagnostic characters:** Form oval, strongly convex. Head black, with a pair of semicircular frontal spots, one on either side of inner margin of eyes. Pronotum black, with a pale yellow or white antero-lateral spot.

**Habitat:** Found to inhabit on *Brassica nigra*, *Cucurbita pepo*, and *Solanum melongena*.

**Distribution: India:** Delhi, Uttar Pradesh, Madhya Pradesh, Odisha, Bihar, Kerala, Manipur, and West Bengal (Calcutta, Murshidabad, Malda, Midnapore, Jalpaiguri, Darjeeling).

#### Species: 2. *Coccinella transversalis* Fab

1781. *Coccinella transvrsalis* Fabricius, Spec. IIS.: 97 (Type locality Coromandel) 1781. *Coccinella repanda* Thuberg, Novae Insectorum Species, I: 18. 1966. *Coccinella transversalis* Kapur, Proc. nat. IIS. Sci. India 32B (3-4):178.

**Materials examined:** 3 exs, from all the study sites.

**Diagnostic characters:** Form elongate oval, convex. Head black with a pair of creamy yellow, sub triangular frontal spots, one on either side of the inner margin of eyes.

**Habitat:** Found to inhabit on *Brassica nigra*, *Calotropis procera*, and *Croton bonpandianum*.

**Distribution India:** West Bengal (Birbhum, Bankura, Calcutta, Cochin, Darjeeling, Jalpaiguri, Malda, Midnapore, Murshidabad, North and South 24 Parganas, Purulia); Kerala; Goa, and Andaman Islands

**Species: 3** *Coelophora unicolor* Fab *Coccinella unicolor* Fabricius, 1792: 267. *Coelophora unicolor*: Mulsant, 1850: 413; 1866: 275. Crotch, 1874: 54. Korschefsky, 1932: 297 (cat.). *Lemnia (Microlemnia) unicolor*: Iablokoff-Khznorian, 1982: 262.

**Materials examined:** 5 exs, from all the study sites.

**Diagnostic characters:** Elytra completely black, pronotum black except the lateral flavus portion

**Habitat:** Found to inhabit on *Solanum melongena* and *Croton bonplandianum*

**Distribution: India:** Andhra Pradesh; Odisha; Madhya Pradesh; West Bengal (Nadia, Jhargram, Howrah, Midnapore)

**Species 4:** *Jauravia* sp

1858. *Jauravia* Motschulsky, Elud. Enl., VII: 117-118.

1946. *Jauravia*, Kapur. Ann. Mag. nat. Hist. (II) XIII: 73-77.

**Materials examined:** 2 exs from Sankarpur and 3 exs from Digha.

**Diagnostic characters:** Elytra yellowish brown to brown, without black patches or spots; underside testaceous; penis narrower towards the apex.

**Habitat:** Found to inhabit on *Calotropis procera*

**Distribution India:** Tripura, Meghalaya, West Bengal (Midnapore), Maharashtra, and Tamil Nadu.

**Species: 5.** *Menochilus sexmaculatus* Fab 1781. *Coccinella sexmaculata* Fabricius, Spec. Ins., 96 (T. L. East Indies). 1850. *Chilomenes sexmaculata*. Mulsant, Spec. Tri-n. Seculripalp.: 114. 1943. *Menochillus sexmaculatus*, Timberlake. Bull. Hawaiian Sug. Plrs Ass. Exp. stn. (Ent. Series), No 224 7:40-41.

1966. *Menochillu ssexmaculatus*, Kapur, Proc. nat. Inst. Sci. India, Delhi. 328 (3 & 4): 176-177.

**Materials examined:** 3 exs from all the study sites.

**Diagnostic characters:** Adult beetles oval in shape, elongated, and moderately convex from dorsal side. Elytra with six black macular, including two zig-zag lines in colour, enclosing hind pair of wings.

**Habitat:** Found to inhabit on *Calotropis procera* and *Datura metel*.

**Distribution: India:** India: West Bengal (Bankura, Birbhum, Calcutta, Darjeeling, Hooghly, Jalpaiguri, Malda, Midnapore, Murshidabad, North and South 24 Parganas); Meghalaya; Andaman Islands

**Species: 6.** *Micraspis discolor* Fab

1798. *Coccillella discolor* Fabricius, Suppl. Ent. Syst.: 77 (Type Joe. India) 1850. *Verania discolor*, Mulsant, Spec. Trim. Securipalp.: 369. 1932. *Verania discolor*, Korschefsky, Coleopt., Cat., Pars 120: 308. 1965. *Micraspis discolor*, Kamiya, The Memoris of the Faculty of Liberal Arts, Fukui Univ. Ser. II. Natural Sci. No. 15, Part.3., 60-61.

**Materials examined:** 6 exs from all the study sites.

**Diagnostic characters:** Adult beetle red in color. Head small and partly concealed by pronotum, which is black in adult beetles with chewing type of mouth parts.

**Habitat:** Found to inhabit on *Oryza sativa*, *Calotropis procera*, *Brassica nigra*, *Cucurbita pepo*, *Croton bonplandianum*, *Datura metel* and *Solanum tuberosum*.

**Distribution: India:** India: West Bengal (Birbhum, Bankura, Calcutta. Cochinbhar. Darjeeling. Howrah. Hooghly, Jalpaiguri, Malda, Midnapore. Murshidabad. Nadia, North and South 24-Parganas): Goa: Tamil Nadu and Andaman Islands

**Species: 7.** *Pseudaspidimerus circumflexa* var. *testaceus* Weise

1858. *Platynaspis circumflexa* Motschulsky, Etud. ent. 7: 118. (T.L. Ceylon).

1900. *Aspidimerus circumflexa*, Weise, Dtsch. ent. Z.: 423.

1948. *Pseudaspidimerus circumflexa* var. *testaceus* (Weise), Kapur. Trans. R. ellt. Soc. Lond. 99(2) ~ 122.

**Materials examined:** 2 exs. From both Sankarpur and Digha.

**Diagnostic characters:** Groundcolour black, anterior corners of pronotum yellow, elytra with two oval/rounded orange yellow discal/spots

**Habitat:** Found to occur on *Calotropis procera*.

**Distribution: India:** West Bengal (Calcutta, South and North 24 Parganas, Hooghly), Assam, Tamil Nadu, Bihar, and Maharashtra

**Species: 8.** *Pullus nymphaeus* Kapur *Pullus nymphaeus* Kapur & Munshi, 1970: 2

**Materials examined:** 4 exs. from Contai and Bajkul only.

**Diagnostic characters:** *P. nymphaeus* is smaller in size, piceous in colour, except dark brown near the apex.

**Habitat:** Found to occur in *Calotropis procera*.

**Distribution: India:** Uttar Pradesh, Jammu & Kashmir, West Bengal (Midnapore, Kolkata, Jalpaiguri).

**Family: Crysmelidae**

**Species: 9.** *Altica* sp

**Materials examined:** 2 exs. From Petuaghat, Junput, Soula and Mandarmoni, and 3 from Contai and Bajkul.

**Diagnostic characters:** Body is broadly elliptical, convex from lateral view. Colour black with metallic luster. Head is pro-hypognathous, more or less flat from lateral view. Frontal ridge is wide to narrow, forming angular T-shaped structure.

**Habitat:** Found to inhabit on *Calotropis procera*.

**Distribution India:** West Bengal (Midnapore, Purulia,

Howrah, Hoogly)

**Species: 10.** *Aspidomorpha indica* Boheman 1854. *Aspidomorpha indica* Boheman, Monograph Cassidinae, 2: 318. 1919. *Aspidomorpha indica*: Maulik, Fauna British India, Chrysomelidae (Hispinae, Cassidinae): 327.1963. *Aspidomorpha indica*: Gressitt et Kimoto, Pac. Ins. Mon. 1 B: 952.

**Materials examined:** 2 exs. from Junput and Digha.

**Diagnostic characters:** They are identified by their characteristic features.

**Habitat:** Found to occur in the host plant of *Calotropis procera* and *Cucurbita pepo*.

**Distribution: India:** West Bengal (Bankura, Calcutta, Darjiling and 24 Parganas, Midnapore), Arunachal Pradesh, Assam, Orissa, Sikkim and Tamil Nadu

**Species: 11.** *Aulacophora foveicollis* Lucas 1849. *Galeruca foveicollis* Lucas, Explor: Alger. Ent.: 542. 1879. *Aulacophora foveicollis*: Baly, Cist Ent., 2: 445. 1936. *Aulacophora foveicollis*: Maulik, Fauna Brit. India, Chry'. (Gal.): 173.

**Materials examined:** 4 exs. from all the study sites.

**Diagnostic characters:** Body of adults about 7 mm long, bright-red in color except for the black venter of the thorax and abdomen.

**Habitat:** Found to occur in the host plant of *Calotropis procera*, *Cucurbita pepo* and *Clerodendron infortunatum*.

**Distribution India:** West Bengal (Kolkata, Purulia, Midnapore)

**Species: 12.** *Bruchus analis* Bjek 1781. *Bruchus analis* Fabricius, 1781 1847. *Calloso bruchus glaber*, Albert, 1847

**Materials examined:** 2 exs. from all the study sites.

**Diagnostic characters:** The shape of the pronotum, an arrangement of spines or plates on the tibia of the middle leg of the male, and the unique morphology of the male genitalia. The latter are slender and elongated, and the eighth abdominal sternite in particular is large and sclerotized, "with a characteristic boomerang shape"

**Habitat:** Found to occur in the host plant of *Vigna sinensis*.

**Distribution: India:** West Bengal (Midnapore)

**Species: 13.** *Cassida cruenta* Fab 1792. *Cassida cruenta* Fabricius, Ent, Syst. 1:293 1919. *Oocassida cruenta*: Maulik, Fauna Brit. India, Col., Chry. (Hisp. and Cass.): 356

**Materials examined:** 2 exs. from Digha only.

**Diagnostic characters:** General colour varying from pale brown to dark brown; elytra with three faint longitudinal red

stripes, one on each elytron, and one along the suture.

**Habitat:** Found to inhabit on *Croton bonplandianum*.

**Distribution: India:** Odisha, Tamil Nadu, West Bengal (Jalpaiguri, Midnapore)

**Species: 14.** *Cryptocephalus vittipennis* Suffrien 1854. *Cryptocephalus vittipennis* Suffrian, Linn. ent., 9: 31. 1908. *Cryptocephalus vittipennis*: Jacoby. Fauna Brit. India, Col. Chry., 1: 230.

**Materials examined:** 4 exs. from Bajkul only.

**Diagnostic characters:** Thorax closely fitted to base of elytra, base of prothorax not margined.

**Habitat:** Found to occur on the host plant of *Croton bonplandianum*.

**Distribution: India:** West Bengal (Calcutta, Hugli and Maldah, Midnapore). Bihar, Haryana and Uttar Pradesh.

**Species: 15.** *Hispa armigera* Oliver *Hispa armigera* (Oliver, 1808). *Hispa similes* (Uhmann, 1927). *Diclidispa armigera similes* (Uhmann).

**Materials examined:** 4 exs. from all the study sites.

**Diagnostic characters:** Adult beetle is metallic blue-black coloration. Body covered with short and long spines in the thorax and fore wings.

**Habitat:** Found to inhabit on *Oryza sativa*.

**Distribution India:** Tripura (North, South and West Tripura), Assam, Orissa, Tamil Nadu and West Bengal (Midnapore, Jalpaiguri)

**Species: 16.** *Monolepta* sp

**Materials examined:** 3 exs. from all the study sites.

**Habitat:** Found to inhabit on *Calotropis procera*.

**Distribution: India:** West Bengal (Darjiling, Midnapore), Assam.

**Species: 17.** *Platycorynus peregrines* (Herbst) 1783. *Cryptocephalus peregrines* Herbst, In Fuessly, Arch. Ins.: 63 1865. *Corynodes peregrines*: Marshall, 1. Linn. Soc. Lond., 8:34. 1908. *Corynodes peregrines*: Fauna Brit. India, Col., Chry., 1: 493. 1961. *Platycorynus peregrines*: Gressitt & Kimoto, Pac. Ins. Mongr., 1A: 294.

**Materials examined:** 3 exs. from all the study sites.

**Diagnostic characters:** *Platycorynus peregrines* can reach a length of 9–11.5 millimetres (0.35–0.45 in) and a width of 5–6 millimetres (0.20–0.24 in). The body is usually metallic blue, sometimes blue-black or blue-violet.

**Habitat:** Found to inhabit on *Calotropis procera*.

**Distribution India:** West Bengal (Calcutta, 24-Parganas, Hugli, Haorah. Bardhaman, Darjiling, Midnapore). Orissa and Sikkim.

**Species: 18.** *Tribolium castaneum* Herbst 1797. *Colidiu castaneum* Herbst, *Nature Kafer* 7:2 *Tribolium castaneum* Macleay, 1825 *Annulora javanica*: 50.

**Materials examined:** 2 exs. from all the study sites.

**Diagnostic characters:** Body oblong-parallel, depressed and reddish brown. Head without fronto clypeal suture and genae widened moderately, eyes enlarginatc, clnervation extending backward for about 1/3rd. its length;

**Habitat:** Found to occur on *Oryza sativa* and *Hibiscus rosa-sinensis*.

**Distribution India:** West Bengal (Howra, Calcutta, North 24-Parganas, Midnapore) throughout India and Cosmopolitan.

**Family: Lampyridae**

**Species: 19.** *Luciola vespertina* Fab

**Materials examined:** 3 exs. from Junput and Petuaghat only.

**Diagnostic characters:** Unlike some other fireflies, the females of *Luciola* are fully winged. Unlike some other fireflies, the females of *Luciola* are fully winged.

**Habitat:** Found to inhabit on *Clerodendron infortunatum*.

**Distribution India:** West Bengal (Midnapore, Hoogly, Howrah)

**Tenebrionidae**

**Species: 20.** *Gonocephalum* sp

**Materials examined:** 2 exs., from Sankarpur and Digha only.

**Diagnostic characters:** Pronotum and elytra have not with strong setae. Length is 10-14mm. and moderately oblong in shape. Head, pronotum and elytra strongly flattened.

**Habitat:** Found to occur in the host plant of *Calotropis procera*.

**Distribution India:** West Bengal (Midnapur, Bankura, Nadia, Darjeeling, Murshidabad, Malda.)

**Scarabaeidae**

**Species: 21.** *Adoretus* sp

**Materials examined:** 2 exs. from Bajkul and Contai.

**Diagnostic characters:** Total body length 10.0–12.0 mm (0.39–0.47 in). Body elongate oval. Color brownish with numerous distinctive, cream-white setae; setae sometimes missing in worn specimens. Front tibia with 3 teeth at lateral margin; teeth may be worn in older specimens. Last sternite of female with apex rounded posterior; weakly quadrate in male.

**Habitat:** Found to occur in the host plant of *Cucumis sativus*.

**Distribution: India:** West Bengal (Midnapore)

**Curculionidae**

**Species: 22.** *Blosyrus* sp

**Materials examined:** 2 exs. from Petuaghat and Junput, 3 exs. from Soula, Madarmoni and Sankarpur, 1 ex. From Contai.

**Diagnostic characters:** The adult weevils are about 8 mm long and 4 mm wide. They are completely brownish or blackish, and the surface of the elytra is ridged and rough. This makes them look like a lump of soil.

**Habitat:** This species have been found to occur on *Calotropis procera*.

**Distribution India:** West Bengal (Midnapore).

**Species: 23.** *Paralixus* sp

**Materials examined:** 3 exs. from Petuaghat and Junput.

**Diagnostic characters:** They are recognized by their distinctive long snouts and geniculate antennae with small clubs; beyond that, curculionids have considerable diversity of form and size, with adult lengths ranging from 1 to 40 mm (0.04 to 1.57 in).

**Habitat:** This species have been found to occur on the host plant of *Calotropis procera*.

**Distribution India:** West Bengal (Midnapore).

**Species: 24.** *Tanymecus* sp

**Materials examined:** 2 exs. from Mandarmoni and sankarpur.

**Diagnostic characters:** *Tanymecus* is a genus of broad-nosed weevils in the beetle family Curculionidae.

**Habitat:** Found to occur in the host plant of *Calotropis procera*.

**Distribution India:** West Bengal (Midnapore, South 24 Parganas, Birbhum)

**Nitidulidae**

**Species: 25.** *Haptoncus concolor* Murr

1864. *Epuraea (Haptoncus) concolor* Murray, 1864

**Materials examined:** 3 exs. from Bajkul and Contai.

**Diagnostic characters:** Body oval, flatly convex, yellow; scutellum infusate, brown; each elytron with black square spot behind humeral bulge and common black cuneiform apical area reaching anteriorly to the midlength of suture.

**Habitat:** This species have been found to occur in the host plant of *Clerodendron infortunatum*.

**Distribution India:** West Bengal (Midnapore).

**Species: 26.** *Haptoncus ocellaris* Fairm 1841. *Haptoncus ocellaris* (Fairmaire, 1841) (Fauvel 1903, Heller 1916)

**Materials examined:** 3 exs. from Bajkul and Contai.

**Diagnostic characters:** Broadly elongate, moderately convex dorsally and sub-depressed ventrally, moderately shiny, punctate-pubescent, color testaceous to black, antenna with loosely arranged three segmented club.

**Habitat:** This species have been found to occur in the host plant of *Clerodendron infortunatum*.

**Distribution: India:** Assam, Uttar Pradesh, West Bengal (Derjiling, Nadia, Midnapore).

#### Meloidae

**Species: 27.** *Hydrophilus olivaceus* Fab 1781. *Hydrophilus olivaceus* Fabricius, Spec. ins., 1: 289.

**Materials examined:** 2 exs. from Bajkul and Contai.

**Diagnostic characters:** The anterior femora only are clothed with pubescence at base. Antenna club per foliate and asymmetrical.

**Habitat:** Found to occur on *Cynodon dactylon*.

**Distribution: India:** Andhra Pradesh, Madhya Pradesh, Maharashtra, Manipur and West Bengal (Bankura, Midnapur, kalyani).

**Species: 28.** *Mylabris phalerata* Pall 1781. *Meloe phalerata* Pallas. *Icones Insectorum* Ross. Sibir:78. ] 798. *Mylabris sidae* Fabricius, *Ent. Syst. Suppl.*: 120.

1872. *Mylabris phalerata* Marseul, Mem. Soc. Liege: 446.  
1917. *Mylabris phalerata* Borchmann. Junk's Col. Cat., 17 (69): 45.  
1954. *Muyblaris (Euzonabris) phalrata* Kuzin. Trudi Ent. Obs., 44: 358, Saha, 1979, *Mon. Rec. zool. Surv. India*, 74 (1): 77.

**Materials examined:** 3 exs. from Bajkul.

**Diagnostic characters:** The larva with 6 instars passed through hyper metamorphosis. Average body length and width of first, second, third, fourth, fifth and sixth instars were 3.41, 5.83, 10.06, 16.90, 15.46, 14.46 and 0.58, 1.98, 3.09, 4.86, 4.73, 3.90 mm respectively, being minimum in first and maximum in fourth instar. Female genitalia carried two styli, which were absent in male.

**Habitat:** Found to inhabit on *Clerodendron infortunatum*.

**Distribution: India:** West Bengal (Calcutta, Nadia, N. 24-Parganas, Hugli, 24-Parganas(s), Howrah, Bankura, Jalpaiguri, Midnapur, Darjiling); Bihar, Orissa, Uttar Pradesh, Punjab, Jammu, Madhya Pradesh, Gujarat, Karnataka, Andhra Pradesh, Tamil Nadu.

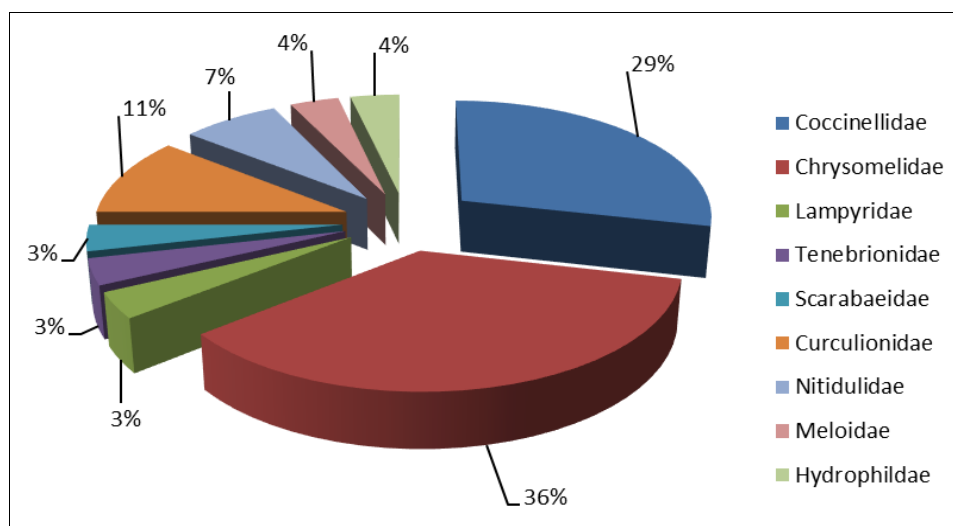
Out of the eight study sites, two study sites viz. Bajkul and Contai, are regarded as semi urbanized areas where rapid conversion of agricultural lands for human settlement and other institutional developments has become a continuous process. In these two semi urbanized areas, salinity of soil and dew drops was less in comparison to the other six study sites. Another three study sites viz. Digha, Sankarpur, and Mandarmoni have been under increasing anthropogenic pressure from tourism-related activities. Rest of the three study sites represent the virgin coastal belt. Variations in air temperature, relative humidity, and salinity were previously reported for all study sites [27].

**Table 2:** Distribution pattern of the insects belonging to the order Coleoptera in the study sites

Insects			Site of Occurrence									
Family	Species	Host plant	Family	S-I	S-II	S-III	S-IV	S-V	S-VI	S-VII	S-VIII	
Coccinellidae	<i>Coleophora unicolor</i>	<i>Croton bonplandianum</i>	Euphorbiaceae	+	+	+	+	+	+	-	-	
		<i>Solanum melongena</i>	Solanaceae	+	+	+	+	+	+	-	-	
	<i>Micraspis discolor</i>	<i>Oryza sativa</i>	Poaceae	+	+	+	+	+	+	+	+	+
		<i>Calotropis procera</i>	Asclepiadaceae	+	+	+	+	+	+	+	+	+
		<i>Brassica nigra</i>	Crucifereae	+	+	+	+	+	+	+	+	+
		<i>Cucurbita pepo</i>	Cucurbitaceae	+	+	+	+	+	+	+	+	+
		<i>Croton bonplandianum</i>	Euphorbiaceae	+	+	+	+	+	+	+	+	+
		<i>Datura metel</i>	Solanaceae	+	-	+	+	+	+	-	+	+
		<i>Solanum tuberosum</i>	Solanaceae	+	+	+	+	+	+	+	+	+
	<i>Menochilus sexmaculatus</i>	<i>Calotropis procera</i>	Asclepiadaceae	+	+	+	+	+	+	+	+	+
		<i>Datura metel</i>	Solanaceae	+	+	+	+	+	+	+	+	+
	<i>Coccinella transversalis</i>	<i>Calotropis procera</i>	Asclepiadaceae	+	+	+	+	+	+	+	+	+
		<i>Brassica nigra</i>	Crucifereae	+	+	-	-	-	-	-	-	-
		<i>Croton bonplandianum</i>	Euphorbiaceae	+	+	+	+	+	+	+	+	+
	<i>Coccinella septempunctata</i>	<i>Brassica nigra</i>	Crucifereae	+	+	+	+	+	+	+	+	+
		<i>Cucurbita pepo</i>	Cucurbitaceae	+	+	+	+	+	+	+	+	+
<i>Solanum melongena</i>		Solanaceae	-	-	-	-	-	-	-	-	+	
<i>Pseudaspidimerus circumflexavar. testaceus</i>	<i>Calotropis procera</i>	Asclepiadaceae	-	-	-	-	+	+	-	-		
<i>Pullus nymphaeus</i>	<i>Calotropis procera</i>	Asclepiadaceae	-	-	-	-	-	-	+	+		
<i>Jauravia</i> sp	<i>Calotropis procera</i>	Asclepiadaceae	-	-	-	-	+	+	-	-		
Chrysomelidae	<i>Aspidomorpha indica</i>	<i>Calotropis procera</i>	Asclepiadaceae	-	+	-	-	-	+	-	-	
		<i>Cucurbita pepo</i>	Cucurbitaceae	-	+	-	-	-	+	-	-	
	<i>Cassida cruenta</i>	<i>Croton bonplandianum</i>	Euphorbiaceae	-	-	-	-	-	+	-	-	
	<i>Monolepta</i> sp	<i>Calotropis procera</i>	Asclepiadaceae	+	+	+	+	+	+	+	+	
	<i>Platycorynus peregrines</i>	<i>Calotropis procera</i>	Asclepiadaceae	+	+	+	+	+	+	+	+	

	<i>Cryptocephalus vittipennis</i>	<i>Croton bonplandianum</i>	Euphorbiaceae	-	-	-	-	-	-	+	-
	<i>Altica</i> sp	<i>Calotropis procera</i>	Asclepiadaceae	+	+	+	+	-	-	+	+
	<i>Hispa armigera</i>	<i>Oryza sativa</i>	Poaceae	+	+	+	+	-	-	+	+
	<i>Tribolium castaneum</i>	<i>Oryza sativa</i>	Poaceae	+	+	+	+	+	+	+	+
		<i>Hibiscus rosa sinensis</i>	Malvaceae	+	+	+	+	+	+	+	+
	<i>Aulacophora foveicollis</i>	<i>Calotropis procera</i>	Asclepiadaceae	+	+	+	+	+	+	+	+
		<i>Cucurbita pepo</i>	Cucurbitaceae	+	+	+	+	+	+	+	+
		<i>Clerodendron infortunatum</i>	Verbenaceae	+	+	+	+	+	+	+	+
	<i>Bruchus analis</i>	<i>Vigna sinensis</i>	Leguminaceae	+	+	+	+	+	+	+	+
Lampyridae	<i>Luciola vespertine</i>	<i>Clerodendron infortunatum</i>	Verbenaceae	+	+	+	+	+	+	+	+
Tenebrionidae	<i>Gonocephalum</i> sp	<i>Calotropis procera</i>	Asclepiadaceae	-	-	-	-	+	+	-	-
Scarabaeidae	<i>Adoretus</i> sp	<i>Cucumis sativus</i>	Cucurbitaceae	-	-	-	-	-	-	+	+
Curculionidae	<i>Blosyrus</i> sp	<i>Calotropis procera</i>	Asclepiadaceae	+	+	+	+	+	-	-	+
	<i>Paralixus</i> sp	<i>Calotropis procera</i>	Asclepiadaceae	+	+	-	-	-	-	-	-
	<i>Tanymecus</i> sp	<i>Calotropis procera</i>	Asclepiadaceae	-	-	-	+	+	-	-	-
Nitidulidae	<i>Haptoncus concolor</i>	<i>Clerodendron infortunatum</i>	Verbenaceae	-	-	-	-	-	-	+	+
	<i>Haptoncus ocularis</i>	<i>Clerodendron infortunatum</i>	Verbenaceae	-	-	-	-	-	-	+	+
Meloidae	<i>Mylabris phalarata</i>	<i>Clerodendron infortunatum</i>	Asclepiadaceae	-	-	-	-	-	-	+	-
Hydrophilidae	<i>Hydrophilus olivaceus</i>	<i>Cynodondactylon</i>	Asclepiadaceae	-	-	-	-	-	-	+	+

S-I = Petuaghat; S-II = Junput; S-III = Soula; S-IV = Mandarmoni; S-V = Sankarpur; S-VI = Digha; S-VII = Bajkul; S-VIII = Contai



**Fig 2:** Insect species composition under different families belonging to the order Coleoptera recorded from different study sites (S-I to SVIII), in and around coastal environment of Midnapore (East), West Bengal

## Discussion

The present research work was undertaken to explore the diversity of different groups of Coleopteran insect fauna in eight contrasting study sites (S-I to S-VIII) along the coastal tract of Midnapore (E) district of West Bengal, India. Altogether 28 species of coleopteran insects comprises of 9 families were collected and recorded in my investigation. These insect species were collected from 13 host plants of 9 families. Among 28 species of insects, 10 were recorded in the family chrysomellidae followed by 8 species under the family coccinellidae. Family Curculionidae and Nitidulidae comprises of 3 species and 2 species respectively. One species of insect was recorded from each family of Lampyridae, Tenebrionidae, Scarabidae, Meloidae and Hydrophilidae within the stipulated study sites (Table-1, 2; Fig.- 2).

In the present study, fig-2 indicates the percentage of distribution of insects species based on their family. The family chrysomellidae comprises of 36% among the 9 families indicating their positive sign of tolerance to the environmental stimuli.

Among these species of insects, *Mylabris phalarata* and *Cassida cruenta* were recorded from Bajkul and Digha, respectively, and these may be the site specific species. Insect species viz. *Micraspis discolor*, *Menochilus sexmaculatus*, *Coccinella transversalis*, and *Coccinella septempunctata* under the family Coccinellidae, *Monolepta* sp, *Platycorynus peregrines*, *Tribolium castaneum*, *Aulacophora foveicollis*, *Bruchus analis* belonging to the family Chrysomelidae and *Luciola vespertina* comprising with the family Lampyridae were found to occur widely in the present study, which indicates their tolerance to the environmental changes.

The insect species viz. *Coleophora unicolor*, *Micraspis discolor*, *Menochilus sexmaculatus*, *Coccinella transversalis*, *Coccinella septempunctata*, *Aspidomorpha indica*, *Tribolium castaneum*, *Aulacophora foveicollis* belonging to the order Coleoptera inhabit on more than one or two families of hostplants and thereby they are polyphagous in nature [28]. Monthly sampling at different study sites indicates the nature and ecological conditions of coastal belt of Midnapore (East). The present study at sampling stations showed that Digha,



Sankarpur, Junput, Petuaghat and Haldia becomes complicated in nature due to the effect of rapid salinity fluctuation, gradual human interference to environment, pollution stress, tourism, fishing etc<sup>[29]</sup>. Digha, Sankarpur, Mandarmoni may be regarded as the places of tourism where at least 10 lacs people have gathered every year, exploits environment by releasing the waste material and many other non-biodegradable things<sup>[30]</sup>. The development of fishing harbor at Petuaghat and Sankarpur, tourism places at Digha, Sankarpur and Mandarmoni, thermal power plants at Kolaghat, petrochemical industries at Haldia, academic institutions and offices at semi urbanized areas have major adverse effect on natural floral and faunal diversity<sup>[31]</sup>.

*Mylabris phalarata*, *Haptoncus ocellaris*, *Haptoncus concolor*, *Adoretus* sp, *Pullus nymphaeus* were found to occur only in non-coastal zone indicating their salinity sensitivity in the coastal zone as salinity is less in non-coastal zone. *Cassida cruenta* may be the positive indicator of pollution as it was found only in the study site-VI (Digha), which is under the places of tourism where anthropogenic perturbations and pollution levels were high in comparison to other places of this study.

Food web structure and cascading species extinction controls the insects' biodiversity<sup>[32]</sup>. In the present study it had been clearly found that there was a great change in the pattern of insect - host plant association; a source of new light in the diversity patterns in stipulated ecozones to the researchers.

Effects of intense anthropogenic disturbances may lead to the reduction of species diversity where as moderate levels of persecution in the community may increase its diversity<sup>[33]</sup>. Tourism activities in popular tourist places (Site-IV, Site-V, and Site-VI); industrial, official and educational activities in semi urbanized areas (Site- VII and S-VIII) creates high levels of pollutants resulting in alteration in species richness as air quality is changed<sup>[34]</sup>.

It may be assumed that in this study most of the insect population preferred virgin coastal belts and places of tourism than the semi urbanized areas. Thus, it can be proposed that studies on insect host plant association will provide more information towards the understanding of change in diversity pattern and establishment of these insects as bioindicators.

### Conclusion

From the above study, it may be concluded that Midnapore (East) coastal tract harbours a good number and diversity of Coleopteran insects. Both salinity sensitive and tolerant species were found. Due to rapid destruction of host plants insects' diversity may be reduced at an accelerated rate which needs immediate step for their proper conservation.

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