



Click beetle diversity of Buxa Tiger Reserve, West Bengal, India

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ABSTRACT

The present study unfolds the diversity of click beetles of Buxa Tiger Reserve (BTR). A total of 34 elaterid species under 12 genera distributed over 7 subfamilies could be recorded. The forest appears to be a scaled down West Bengal as the area represents $\frac{1}{2}$, $\frac{1}{3}$ rd and $\frac{1}{5}$ th of the elaterid taxa (subfamilies/genera/species). Out of 34 species 13 are considered new to science, while 11 to West Bengal and 9 to Buxa Tiger Reserve. The fauna shows high degree of endemism. These beetles are mainly found during premonsoon (88.88%). The fauna is largely Oriental. *Heteroderes sericeus* Candeze is the most abundant species (45%), followed by *Cardiophorus ferruginosus* sp. nov. (15%). Seventeen species are singletons while 15 species are represented by only two to seven individuals. Find of more number of males suggests more of their response to sex pheromones and dispersal ability.

Keywords: Diversity, click beetles, Buxa Tiger Reserve, West Bengal, *Heteroderes sericeus*, *Cardiophorus ferruginosus*

1. INTRODUCTION

The most wonderful mystery of life is that so much diversity has been created from so little physical matter. Biological diversity refers to the variety and variability of living organisms and the ecological complexes in which they occur. It is now widely recognized that biodiversity is the measure of biological variety from gene to ecosystem. The productive capacity of ecosystem is dependent on biodiversity (Schoener, 1989).

Forest is one such major ecological unit that exists as "home" for a community of both native and exotic organisms. Its community is directly related to species diversity. It is a system that supports all interacting live units like subterranean organisms, insects, animals and man beside trees.

Insects, known by more than one million described species from all over the world and more than this number (approximately six million) is yet to be explored and described. India's insect fauna may approximately represent 6.3% of world's total (Cherian, 1996). About 4030 species of insects are known from West Bengal which represents 6.83% of the insect species recorded from India (Anonymous, 2000).

Beetles (Coleoptera) constitute the largest group of insects; nearly $\frac{1}{4}$ th of life forms are the beetles. There are about 3,60,000 - 4,00,000 named species (Liebherr and McHugh, 2003; Chapman, 2009). The most important feature of the beetles is their "elytra", the hard exoskeletal covering over their wings.

Superfamily Elateroidea includes the familiar click beetles (Elateridae). Elateridae is the largest family of the series Elateriformia and is the 9th most diverse family of beetles, with nearly 12,617 species worldwide (Johnson and Cate, 2010 and GBIF, 2013).

These beetles are of considerable significance as pests, predators and pollinators. Such a name relates to their ability to produce a violent 'click', the prominent biological attribute against predation. It is because of the 'prosternal spine' that fits into a cavity or socket on the mesosternum. Click promotes bouncing the beetle in the air and landing on its ventral surface. It is also used when the beetle is on its back and needs to right itself.

Larvae of elaterids may be pests in a wide range of crops, particularly affecting seedling establishment of cereal and vegetable crops. They tunnel or scar maturing tubers and bulbs making a large part of the crop unmarketable. Some time they are predaceous on numerous species of wood boring larvae.

Globally very few workers are regularly contributing on the elaterids, in India too. Among the regular workers in India, Vats and his coworkers (1991-1996) first made a detail taxonomic study on this group, but their work was limited to North West region of India, mainly Haryana, Himachal Pradesh and Uttar Pradesh. Later Patwardhan *et al.* (2008, '09) initiated studying the group occurring in Maharashtra, mainly Western Ghat region. Two other workers Chakraborty and Chakrabarti (2000, '06) worked on the group and published a monograph on Elateridae of West Bengal.

Their study (op.cit.) was primarily based on the samples that are in the deposition of Zoological Survey of India since 1831. However, their study failed to address the faunal diversity of North Bengal, and therefore the present study.

Present paper aims at unfolding the diversity of click beetles of Buxa Tiger Reserve (BTR).

Buxa Tiger Reserve lies in Alipurduar sub division of Jalpaiguri district of West Bengal. The reserve is the easternmost extension of the extremely bio diverse northeast India. The fragile “Terai Ecosystem” constitutes a part of this reserve. Buxa serves as an international corridor for elephant migration between India and Bhutan (for further detail see Sarkar *et al.*, 2012).

2. MATERIALS AND METHODS

Both extensive and intensive surveys were conducted during April, 1993 to March, 2013 in different beats under different ranges of Buxa Tiger Reserve. Field visits were made in every month of any calendar year. Elaterids were collected by hand picking, sweep net and bush beating. In the evening hours UV light was used to trap the nocturnal elaterids.

Samples after collection were killed in chloroform and preserved in 70% alcohol. Necessary data regarding collector, date of collection, locality etc. were noted in a note book in the field. The samples were then brought to the laboratory where stretching, pinning and labeling were done as per the guidelines of Chakraborty and Chakrabarti (2006).

All materials are in the collection of Department of Agricultural Biotechnology, IRDM Faculty Centre, Ramakrishna Mission Vivekananda University.

The collected samples were studied under Stereo Zoom Binocular Microscopes Zeiss SV11 and Olympus SZX7. Identification of the elaterid samples are based on Candeze (1857, '59, '60 and '63), Vats (1991), Vats and Kashyap (1992c), Chakraborty and Chakrabarti (2006) and Johnson and Cate (2010). Later they are confirmed by comparing with the type specimens deposited in Zoological Survey of India.

3. RESULTS AND DISCUSSION

The elaterid fauna of Buxa Tiger Reserve is found to be composed of 34 species under 12 genera distributed among 7 subfamilies (Table-1; Figs.1- 3). Find of $\frac{1}{5}^{\text{th}}$, $\frac{1}{3}^{\text{rd}}$ and $\frac{1}{2}$ of the states' species, genera and subfamilies speaks high of species richness of the area.

Heteroderes sericeus Candeze is the most abundant species (45%), followed by *Cardiophorus ferruginosus* sp. nov. (15%). Seventeen species are singletons and 15 species are represented by only two to seven individuals. This is in conformity with the data obtained by Thomas (2007).

The most important fact that the present study could unveil, is the high degree of endemism exhibited by the elaterids. 85.29% of the recorded species are endemic to India. These include members of the subfamilies: Agrypninae (15), Elaterinae (9), Cardiophorinae (2), Conoderinae (2) and Chalcolepidiinae (1) (Fig.4). Out of 34 species 13 are considered new to science, while 11 to West Bengal and 9 to Buxa Tiger Reserve. The beetles are found to be predominant during Premonsoon (88.88%) followed by Monsoon (8.33%) and Postmonsoon (2.77%) (Fig. 5). The fauna includes members of Oriental (100%) and Ethiopian (2.94%) regions.

Find of more number of males suggests more of their response to sex pheromones and dispersal ability (Benefer, 2011).

Table 1. Distribution pattern of elaterid taxa recorded.

Taxa	Distribution			
	Buxa Tiger Reserve	India	Zoogeographical	Seasonal
Subfamily - Agrypninae				
1. <i>Agrypnus buxaensis</i> sp. nov. ♣ ▲	Rajabhatkhawa	West Bengal	OR	Pr M
2. <i>Agrypnus coenosus</i> (Hope)	Newland	West Bengal	OR	Pr M
3. <i>Agrypnus bengalensis</i> sp. nov. ♣ ▲	Nimati	West Bengal	OR	M
4. <i>Agrypnus jurulosus</i> (Candeze) ▲	Nimati, Panbari, Poro, South Rydak	Bihar, Sikkim, Tripura, Uttar Pradesh, West Bengal	OR	Pr M
5. <i>Agrypnus concoloris</i> Vats and Kashyap ◻ ▲	Damanpur	Rajasthan, West Bengal	OR	Pr M
6. <i>Agrypnus tuberculosus</i> Vats and Kashyap ◻ ▲	Damanpur, Gadadhar, Nimati, Rajabhatkhawa	Uttar Pradesh, West Bengal	OR	Pr M
7. <i>Agrypnus rajasthanensis</i> Vats and Kashyap ◻ ▲	Rajabhatkhawa	Rajasthan, West Bengal	OR	Pr M
8. <i>Agrypnus indicus</i> sp. nov. ♣ ▲	Rajabhatkhawa	West Bengal	OR	Pr M
9. <i>Agrypnus spinaparamerus</i> Vats and Kashyap ◻ ▲	Damanpur	Haryana, West Bengal	OR	Pr M
10. <i>Agrypnus campestris</i> Vats and Kashyap ◻ ▲	Hatipota, Rajabhatkhawa	Uttar Pradesh, West Bengal	OR	Pr M
11. <i>Agrypnus fuscoluridus</i> Vats and Kashyap ◻ ▲	Rajabhatkhawa	Haryana, Uttar Pradesh, West Bengal	OR	Pr M
12. <i>Agrypnus sinensis</i> (Candeze)	Hatipota, Rajabhatkhawa	West Bengal	OR	Pr M
13. <i>Agrypnus varigatus</i> sp. nov. ♣ ▲	Nimati	West Bengal	OR	M

14. <i>Agrypnus crenulatus</i> sp. nov. ♣ ▲	Hatipota, Rajabhatkhawa	West Bengal	OR	Pr M
15. <i>Agrypnus subfaenum</i> Vats and Kashyap ☐ ▲	Hatipota	Haryana, Himachal Pradesh, Uttar Pradesh, West Bengal	OR	Pr M
16. <i>Lanelater fuscipes</i> (Fabricius)	Rajabhatkhawa	Karnataka, New Delhi, Sikkim, Tamil Nadu, Uttar Pradesh, West Bengal	OR, ET	Pr M
17. <i>Lanelater kalimpongensis</i> Chakraborty and Chakrabarti ▲	Damanpur, Nimati, Rajabhatkhawa	West Bengal	OR	Pr M
18. <i>Lanelater cinereus</i> (Candeze) ▲	Rajabhatkhawa	Sikkim, West Bengal	OR	Pr M
Subfamily - Cardiophorinae				
19. <i>Cardiophorus ferruginosus</i> sp. nov. ♣ ▲	Newland, Nimati, Panbari, Poro, Rajabhatkhawa	West Bengal	OR	Pr M
20. <i>Cardiophorus bucculatus</i> Candeze ☐ ▲	Damanpur, Rajabhatkhawa,	Haryana, Uttar Pradesh, West Bengal	OR	Pr M
Subfamily - Chalcolepidiinae				
21. <i>Camososternus gigas</i> Vats ☐ ▲	Rajabhatkhawa	Haryana, Uttar Pradesh, West Bengal	OR	Pr M
Subfamily - Conoderinae				
22. <i>Heteroderes sericeus</i> Candeze ☐ ▲	Damanpur, Garom, Jayanti, Kalchini, Nimati, Poro, Rajabhatkhawa, Silbunglow, South Bholka,	Uttar Pradesh, West Bengal	OR	Pr M M Ps M
23. <i>Heteroderes bicoloris</i> sp. nov. ♣ ▲	Damanpur	West Bengal	OR	Pr M
Subfamily - Oxynopterinae				
24. <i>Pectocera cantori</i> Hope	Kumargram	Assam, West Bengal	OR	Pr M

Subfamily - Elaterinae				
25. <i>Ampedus furunculus</i> sp. nov. ♣ ▲	Rajabhatkhawa	West Bengal	OR	Pr M
26. <i>Ludigenus kalpanas</i> Chakraborty and Chakrabarti ▲	Hatipota, Newland, Rajabhatkhawa	West Bengal	OR	Pr M
27. <i>Aphanobius touffus</i> Vats and Chauhan ▲	Rajabhatkhawa	Himachal Pradesh, Uttar Pradesh, West Bengal	OR	Pr M
28. <i>Melanoxanthus pollex</i> sp. nov. ♣ ▲	Buxaduar	West Bengal	OR	Pr M
29. <i>Melanoxanthus bicoloris</i> sp. nov. ♣ ▲	Dima	West Bengal	OR	Pr M
30. <i>Melanoxanthus penna</i> sp. nov. ♣ ▲	Buxaduar	West Bengal	OR	Pr M
31. <i>Melanoxanthus domesticus</i> sp. nov. ♣ ▲	Rajabhatkhawa	West Bengal	OR	Pr M
32. <i>Melanoxanthus immaculatus</i> sp. nov. ♣ ▲	Jayanti, Raimatang	West Bengal	OR	Pr M
33. <i>Megapenthes variabilis</i> Vats and Chauhan ▣ ▲	Rajabhatkhawa	Himachal Pradesh, Uttar Pradesh, West Bengal	OR	Pr M
Subfamily - Melanotinae				
34. <i>Melanotus fuscus</i> (Fabricius)	Nimati, Rajabhatkhawa, South Rydak,	Sikkim, Tripura, West Bengal	OR	Pr M

♣ : New to World

▣ : New to West Bengal

▲ : Endemic to India

Legends: Pr M: Pre monsoon, M: Monsoon, Ps M: Post monsoon; OR: Oriental, ET: Ethiopian

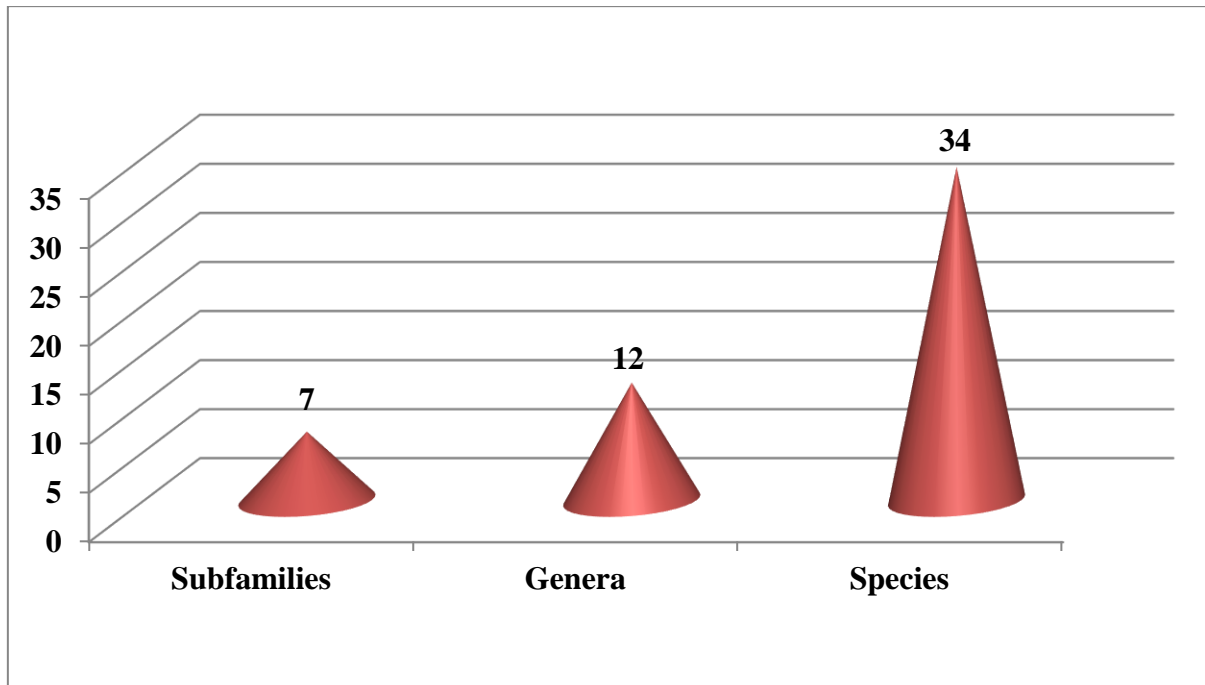


Fig. 1. Total no. of elaterid taxa trapped from Buxa Tiger Reserve, West Bengal.

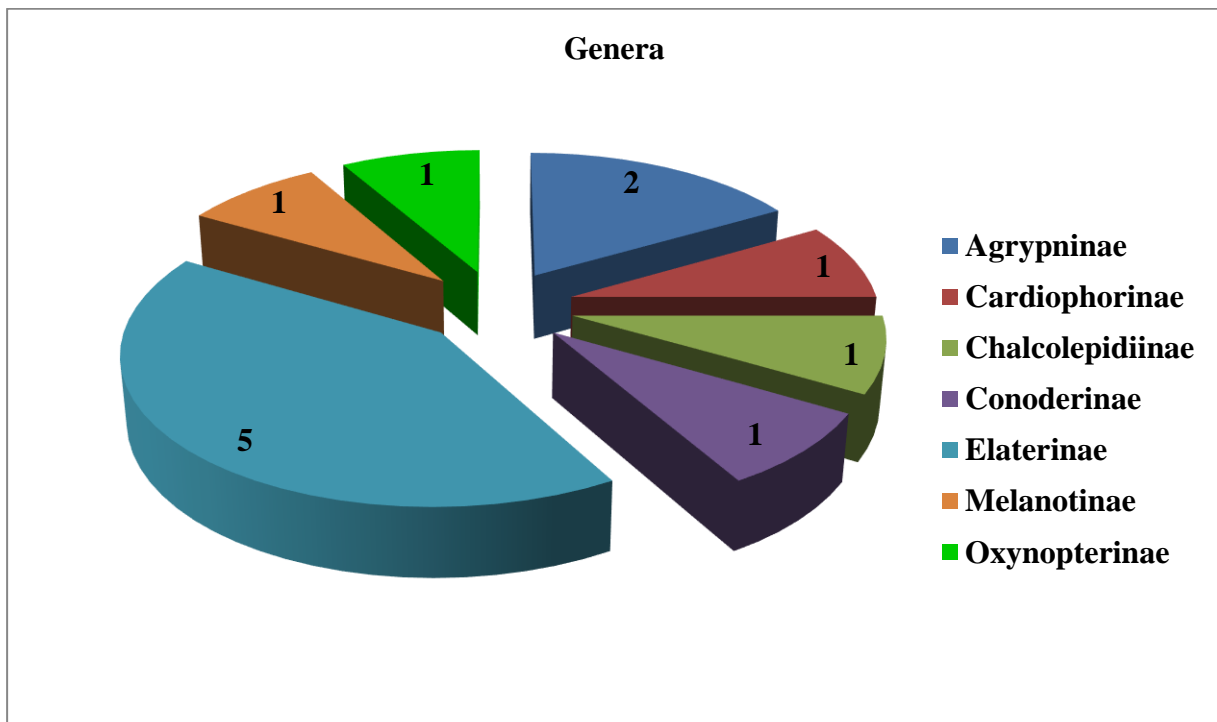


Fig. 2. No. of genera / subfamily.

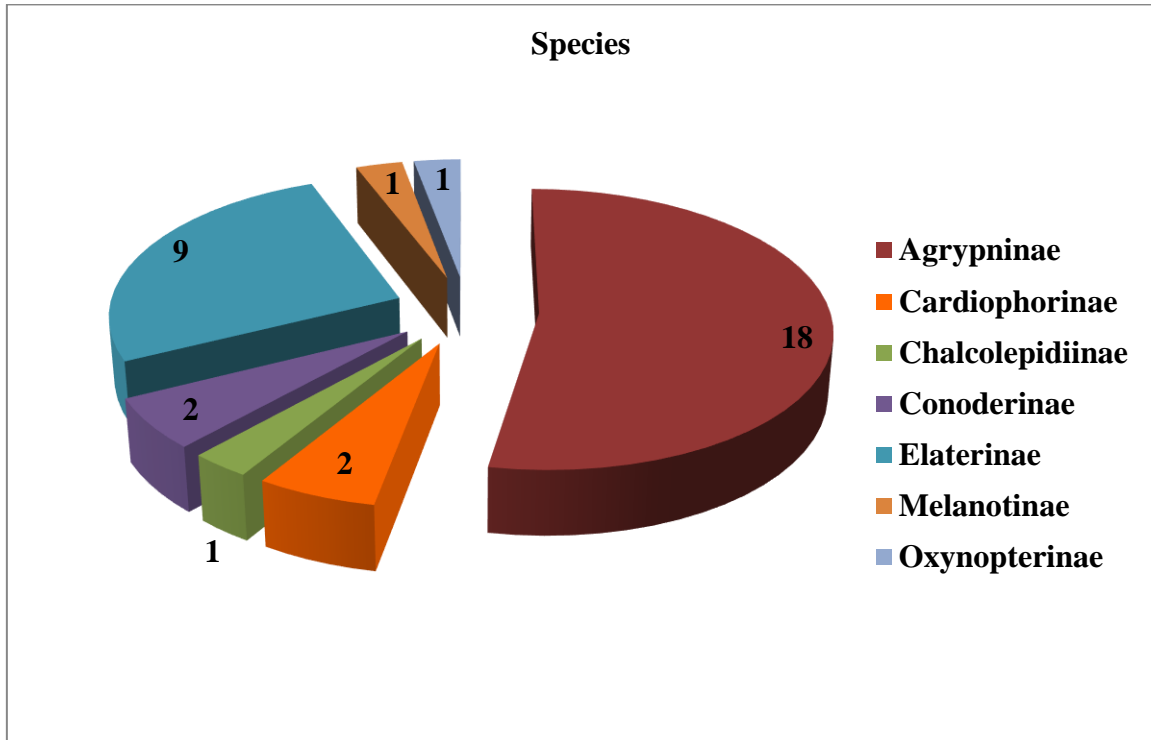


Fig. 3. No. of species /subfamily.

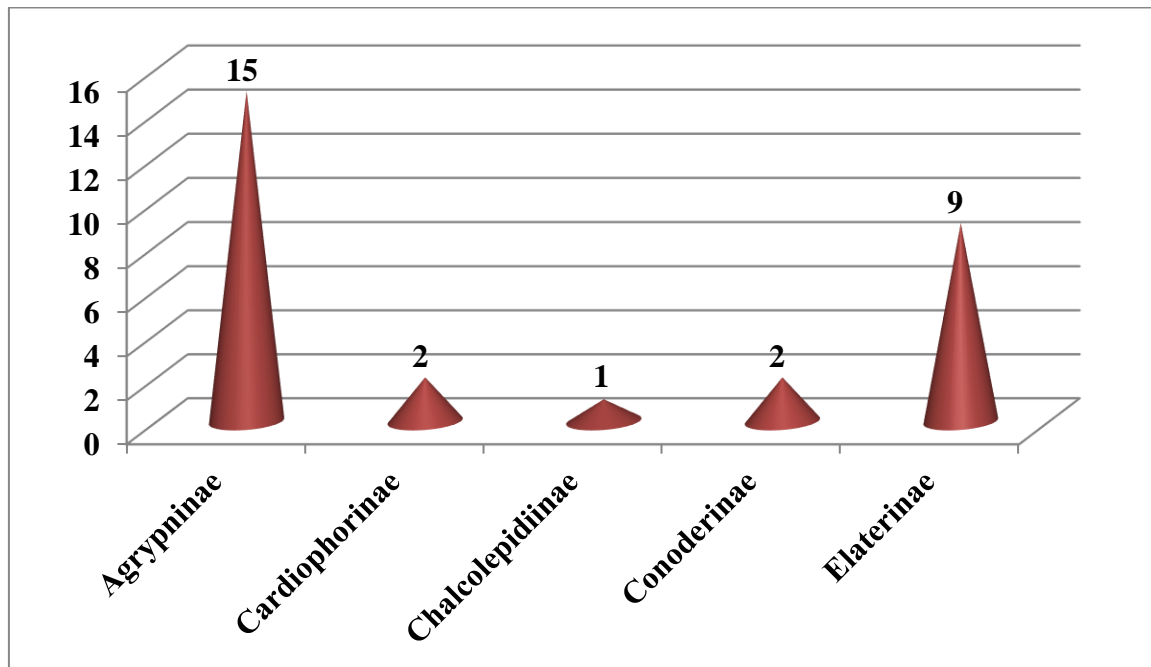


Fig. 4. Total no. of endemic species trapped under different subfamilies.

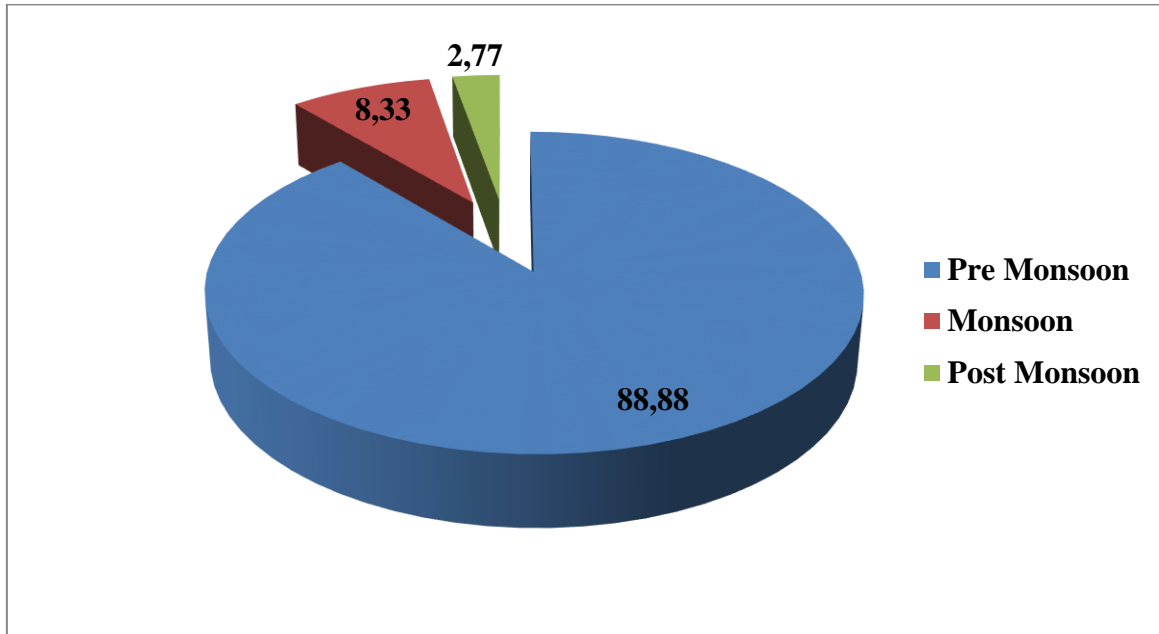


Fig. 5. Seasonal distribution (%) of elaterid taxa trapped from Buxa Tiger Reserve, West Bengal.

Elaterids are one of the classical example of insects exhibiting a wide range of diversity by virtue of their occurrence in the entire zoogeographical region. Despite of their wide distributional range the taxonomy of Elateridae is still insufficiently developed. This is primarily because most of the external characters used to establish genus and species level taxa show very high variability within subfamilies. Species of click beetles are characterized by a peculiar morphology of the male genitalia. It is therefore possible that the taxonomic position of some species and genera could be characterized more precisely by using the genital characters together with characters of external morphology (Prosvirov and Savitsky, 2011). Our taxonomic approach (to be dealt elsewhere) gains support of the above referred remark.

4. CONCLUSIONS

They show a wide range of structural variation in terms of body colour, different size of the body parts and many more. During the present discourse, the body colour of the beetles is found to vary greatly from somber or blackish to red, yellow, yellow brown to red brown, often with bluish and greenish reflection and even metallic; some of them are bicoloured. Most are small to medium sized, and usually elongate, flat, ovoid to shell shaped.

Phenotypic variation is a fundamental prerequisite for bevolution by natural selection. It is the living organism as a whole that contributes (or not) to the next generation, so natural selection affects the genetic structure of a population indirectly via the contribution of phenotypes. Present attempt leaves a scope for further intensive survey in other reserve forests and non forest areas of North Bengal.

ACKNOWLEDGEMENTS

Authors are indebted to West Bengal Biodiversity Board (Sanction no. 326/5k(Bio)-3/2007 dt. 11.12.2008 & 21/5k(Bio)-3/2007 dt. 14.01.2009) for sponsoring the project, The Head, Department of Zoology, University of Calcutta and Hon'ble Vice Chancellor, Ramakrishna Mission Vivekananda University for necessary support. The first author is also thankful to UGC, New Delhi, for awarding RFSMS fellowship (Sanction no.F.4-1/2006(BSR)/7-45/2007 (BSR) dated 25.10.2011).

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(Received 08 August 2015; accepted 23 August 2015)