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A preliminary study on the diversity of coleopterans in a rural area in Changanacherry, Kerala

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Abstract

The order Coleoptera which includes beetles and weevils is the most diverse order of Class Insecta. The Coleopterans of a village in Changanacherry, Kerala were studied during the months of January to April, 2013. 51 species belonging to 19 families were collected and identified from various habitats.

Keywords: Coleoptera, insecta, habitat

1. Introduction

Coleopterans in view of their extremely varied habits, wide distribution and countless adaptations have occupied a dominant position as the largest group in the animal kingdom. India being situated in tropics is well known for richness of Coleopteran fauna. Beetles are found in almost every habitat and range in size from 1-100 mm. It includes more than 3, 50000 identified species and represents about 40% of all insects and 30% of all animals^[1]. About 1, 5088 species of coleopteran insects are known from Indian region^[2]. The forewings of beetles are hardened sheathing cases, protecting the hind wings and much of the body. Perhaps the single most important factor in the success of coleopterans is the development of elytra which protect the folded hind wings permitting occupation of encoded spaces and hidden habitats by adult. Beetles are tiny to very large insects of variable shape and colour but mostly strongly sclerotized, compact and more or less flattened. The compound eyes are normally conspicuous. Some species have reduced wings^[3].

Beetles are exceedingly variable both ecologically and biologically. Most of the beetles are terrestrial herbivores; many are predatory, frequently with highly specialized host ranges or life cycles (Forest Science Project (FSP) Technical Report). While the identity and activity of a few of the forest beetles are well known, most of those other than the major pests have been little studied. Their complex ecosystem roles have not been elucidated. Although some of this deficiency is owing to a general lack of emphasis on total ecosystem function and dynamics, it is well known that lack of identification manuals has severely hindered studies of the whole beetle component of forest diversity^[4].

Kerala, with its variety of ecosystems ranging from high mountains supporting thick tropical evergreen forests, coastal plains, riverine and mangrove vegetation is known for its rich biodiversity. Although, most of the faunal surveys were carried out in North and North-Eastern parts of India, the publications of an earlier worker Sir Guy Marshal contain references to species found in Kerala^[5]. Beetles are known to play an important role in the ecosystem as predators, pests, scavengers and vectors that transmit plant diseases. This attempt to explore the beetle diversity will support the development of ecologically and environmentally sound insect pest management strategies.

2. Materials and Methods

2.1 Study area

The study area is the Nadakkapadom village under Madappally Panchayat of Changanacherry Taluk, Kottayam district in Central Kerala. The study was carried out with special reference to Ward VII of the village. The area is a small village which is 8 KM from Changanacherry town. It is away from the disturbances of the city and has different habitat types such as mixed vegetation, coconut plantations, rubber plantations, grasslands, vegetable gardens, orchards and human settlements. The study was conducted for four months from January to April 2013. The study period was characterised by days with scorching heat and cool mornings with occasional drizzles in the evening hours.

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2.2 Collection and identification of beetles

The beetles were collected mainly during morning and evening hours. Different collecting and trapping methods were used. Most beetles were harmless and were collected by hand. They were collected from ground, from flowers and leaves, from barks and branches of trees, from soil and leaf litter, stored food products and from decaying fruits. Butterfly nets were employed for catching flying beetles. Some beetles were collected during night with a source of white light. Drizzles brought some of them to indoors at night.

The collected beetles were killed by putting them in 70% alcohol for a few minutes. After sometime, they were removed from alcohol and preserved dry. Naphthalene balls were also used for killing. Available monographs in books (Mani 1982) and internet (Arnett 1973, 2000, Choate 2001, Ghate 2006, Kazmi and Ramamurthy 2004, Schimmel and Tarnawski 2010, Vitali 2011) was used for the identification

of beetles.

3. Result

A total of 51 species of coleopterans belonging to 37 genera of 19 families were collected during the study period. Checklist of beetles recorded is given in Table 1. Of the 19 families collected, the family Melolonthidae was the species dominant family, represented by 6 species. Among these 6 species, two of the beetles were identified upto family level only. Families Tenebrionidae, Cerambycidae and Curculionidae were the next dominant families having 5 species. 4 species each was recorded in families Scarabaeidae, Rutelidae and Galerucidae. 2 species each was recorded from families Dynastinae and Eumolpidae. The families Carabidae, Lampyridae, Bostrychidae, Lyctidae, Nitidulidae, Hispidae, Anthribidae and Brentidae were represented by a single species only.

Table 1: Checklist of beetles recorded in the study

| Sl. No. | Family | Genus | Scientific name |
|---------|---------------|----------------------|----------------------------------|
| 1. | Carabidae | <i>Harpalus</i> | <i>Harpalus sp.</i> |
| 2. | Scarabaeidae | <i>Copris</i> | <i>Copris davisoni</i> |
| 3. | Scarabaeidae | <i>Onthophagus</i> | <i>Onthophagus dama</i> |
| 4. | Scarabaeidae | <i>Onthophagus</i> | <i>Onthophagus favrei</i> |
| 5. | Scarabaeidae | - | - |
| 6. | Melolonthidae | <i>Maladera</i> | <i>Maladera sp.</i> |
| 7. | Melolonthidae | <i>Apogonia</i> | <i>Apogonia sp.</i> |
| 8. | Melolonthidae | <i>Serica</i> | <i>Serica sp.</i> |
| 9. | Melolonthidae | <i>Serica</i> | <i>Serica sp.</i> |
| 10. | Melolonthidae | - | - |
| 11. | Melolonthidae | - | - |
| 12. | Rutelidae | <i>Anomala</i> | <i>Anomala varicolor</i> |
| 13. | Rutelidae | <i>Adoretus</i> | <i>Adoretus versutus</i> |
| 14. | Rutelidae | <i>Popillia</i> | <i>Popillia sp.</i> |
| 15. | Rutelidae | - | - |
| 16. | Dynastinae | <i>Oryctes</i> | <i>Oryctes rhinoceros</i> |
| 17. | Dynastinae | <i>Heteronychus</i> | <i>Heteronychus lioderes</i> |
| 18. | Elateridae | <i>Orthostethus</i> | <i>Orthostethus sp.</i> |
| 19. | Elateridae | <i>Agriotes</i> | <i>Agriotes sp.</i> |
| 20. | Elateridae | - | - |
| 21. | Lampyridae | <i>Luciola</i> | <i>Luciola praeusta</i> |
| 22. | Bostrychidae | <i>Xylothrips</i> | <i>Xylothrips flavipes</i> |
| 23. | Lyctidae | - | - |
| 24. | Nitidulidae | <i>Stelidota</i> | <i>Stelidota sp.</i> |
| 25. | Coccinellidae | <i>Epilachna</i> | <i>Epilachna indica</i> |
| 26. | Coccinellidae | <i>Cheilomenes</i> | <i>Cheilomenes sexmaculata</i> |
| 27. | Coccinellidae | <i>Coccinella</i> | <i>Coccinella transversalis</i> |
| 28. | Tenebrionidae | <i>Luprops</i> | <i>Luprops tristis</i> |
| 29. | Tenebrionidae | <i>Tribolium</i> | <i>Tribolium castaneum</i> |
| 30. | Tenebrionidae | <i>Alphitobius</i> | <i>Alphitobius diaperinus</i> |
| 31. | Tenebrionidae | <i>Gonocephalum</i> | <i>Gonocephalum sp.</i> |
| 32. | Tenebrionidae | <i>Eleodes</i> | <i>Eleodes sp.</i> |
| 33. | Cerambycidae | <i>Apomecyna</i> | <i>Apomecyna saltator</i> |
| 34. | Cerambycidae | <i>Acalolepta</i> | <i>Acalolepta sp.</i> |
| 35. | Cerambycidae | <i>Neocerambyx</i> | <i>Neocerambyx sp.</i> |
| 36. | Cerambycidae | <i>Olenecamptus</i> | <i>Olenecamptus bilobus</i> |
| 37. | Cerambycidae | - | - |
| 38. | Hispidae | - | - |
| 39. | Galerucidae | <i>Aulacophora</i> | <i>Aulacophora indica</i> |
| 40. | Galerucidae | <i>Aulacophora</i> | <i>Aulacophora lewisii</i> |
| 41. | Galerucidae | <i>Aulacophora</i> | <i>Aulacophora cincta</i> |
| 42. | Galerucidae | <i>Hoplasoma</i> | <i>Hoplasoma unicolor</i> |
| 43. | Eumolpidae | <i>Chrysochus</i> | <i>Chrysochus auratus</i> |
| 44. | Eumolpidae | <i>Lypsthes</i> | <i>Lypsthes sp.</i> |
| 45. | Anthribidae | - | - |
| 46. | Curculionidae | <i>Sitophilus</i> | <i>Sitophilus oryzae</i> |
| 47. | Curculionidae | <i>Cosmopolites</i> | <i>Cosmopolites sordidus</i> |
| 48. | Curculionidae | <i>Rhynchophorus</i> | <i>Rhynchophorus ferrugineus</i> |
| 49. | Curculionidae | <i>Deporaus</i> | <i>Deporaus marginatus</i> |
| 50. | Curculionidae | - | - |
| 51. | Brentidae | <i>Arrhenodes</i> | <i>Arrhenodes sp.</i> |

4. Discussion

The dominant families observed in the present study was almost similar to the studies conducted in different parts of the country. A total of 12 species belonging to 5 different families of beetles viz. Gyrinidae, Tenebrionidae, Carabidae, Scarabaeidae and Meloidae were collected and identified from various habitats in an investigation conducted on the coleopteran diversity from the vicinity of Semadoh-Makhala Road, Sipna Range, and Melghat Tiger Reserve of India in the month of October-November 2009 [6]. Another investigation in and around Tarubanda village, Gugamal Range, Melghat Tiger Reserve was conducted from October 2010 to November 2010 and a total of 16 species of beetles were collected and examined, out of which 13 species belonging to 6 different families were identified from various habitats [7]. In a study on the diversity pattern of beetles in and around Joysagar Tank of Assam, India, 10 species of beetles belonging to 8 different families viz., Dytiscidae, Gyrinidae, Carabidae, Hydrophilidae, Chrysomelidae, Coccinellidae, Cerambycidae and Tenebrionidae were collected and identified. Dytiscidae was the predominant family with respect to number and abundance [8]. The study on species diversity of Family Scarabaeidae and Hybosoridae of Jabalpur, Madhya Pradesh presented new records of 29 species under the two families. Family Scarabaeidae included 27 species belonging to 18 genera while Hybosoridae was represented only by 2 species belonging to a single genus [9]. Studies on the Scarabaeid beetles of Govind Wildlife Sanctuary, Uttarakhand, India presented 11 species belonging to 11 genera [10]. Diversity and relative abundance of Pleurostict Scarabaeidae (Coleoptera: Scarabaeidae; Rutelinae, Melolonthinae, Dynastinae, Cetoniinae) were studied and analyzed in Achanakmar-Amarkantak Biosphere Reserve, Chhattisgarh. Scarab sampling during the years 2004 and 2008 yielded a total of 426 beetles belonging to 26 species distributed in 13 genera and four subfamilies. The subfamily Rutelinae with 16 species was dominating over other subfamilies. *Anomala* (9 species) was found the most dominant genus in the scarab population [11]. Study on insect diversity in disturbed and undisturbed forests in the Kerala parts of Western Ghats showed maximum number of species from order Coleoptera. Families Chrysomelidae, Cerambycidae and Tenebrionidae were the dominant families [12]. In a study on the insect fauna of Peechi-Vazhani Wildlife Sanctuary, 374 species of insects were recorded of which Coleoptera contributed 78 species. The beetles belonged to the families Chrysomelidae, Cerambycidae, Buprestidae, Bostrychidae, Platypodidae, Curculionidae and Scarabaeidae [13]. A reconnaissance study of animal diversity in Periyar Tiger Reserve, Kerala with special reference to invertebrates for a period of 15 days resulted in documenting 27 species of Coleopterans belonging to 20 families. Of these Scarabaeidae showed greater abundance when compared to all other families [14]. A study on the abundance and richness of insects in Kazhakuttam Grama Panchayat in Kerala showed that most dominant insect order was Coleoptera represented by 10 families. Coccinellidae was the most dominant family [15].

Maladera, *Serica* and *Apogonia* species of the family Melolonthidae are phytophagous and are attracted to light. They are pests of various plant families. In Tenebrionidae, *T. castaneum* is a pest of stored products [16]. *Alphitobius* is a general stored products pest, a vector and competent reservoir of several poultry pathogens and parasites [17]. Litter-dwelling detritivorous beetle, *Luprops tristis* is a very

serious nuisance pest in rubber plantation tracts in the Western Ghats in southern India [18]. The Cerambycid *Apomecyna saltator* is a pest of various Cucurbitaceae and infrequent pests of cucumbers, pumpkins, squashes, watermelons, and gourds [19]. *Acalolepta* is a bark borer [20] and *Olenecamptus bilobus* is a pest of various figs [21]. In Curculionidae, 4 out of the 5 species recorded are pests. *Sitophilus oryzae* is a serious pest of stored rice, *Cosmopolites sordidus* pest of banana, *Rhynchophorus ferrugineus* pest of Palm and *Deporaus marginatus* pest of *Mangifera* [16].

Scarabaeidae contain dung beetles which feed on and breeds in dung of mammals. The beetles recorded in family Rutelidae are all serious pests of plants. *Anomala* grubs feed on root of grasses. *Popillia* adults feed on rose petals leading to their heavy destruction. *Adoretus versutus* feed on the leaves of rose plant [16]. Galerucidae are cucumber beetles and their larvae feed on roots and underground stems of cucurbitaceous plants [16]. Families Elateridae and Coccinellidae contained 3 species each. Except *Epilachna* which is a vegetable pest, a large number of Coccinellids are predaceous on aphids, coccids, mites etc and can play a great role in the natural control of many pests [16]. Larvae of *Agriotes* species in Elateridae are important pests for several crops, and they feed almost exclusively on the seeds of plant species [22]. *Oryctes rhinoceros* of family Dynastinae is very serious pest of coconut palms [16]. Chrysochus beetle recorded in family Eumolpidae feed almost exclusively on the plants of genus *Apocynum*. Adults feed on their leaves while the larvae feed on roots [23]. Carabids are predator beetles [16]. *Xylothrips flavipes* representing Bostrychidae is a powder post beetle of dried rubber wood. They can extensively damage dried and seasoned wood and wooden artifacts through the boring behavior of both adults and larvae [24].

5. Conclusion

The study revealed the presence of large number of beetle pests in the study area. This shows that the area provides favourable conditions for the growth and existence of different pests. This result highlights the need for proper control measures to keep them under check. Beneficial beetles like *Coccinella* and *Cheilomenes* which can act as predators of various insect pests were also recorded in the study. The study identified 19 families of beetles. Different families of beetles confirm different habitat association. Therefore the different vegetation types should be protected from being devastated.

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