Preliminary Assessment of Invertebrate's diversity in Lansdowne Forest Division, Uttarakhand

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Abstract

Effects of various negative ecological processes such as climate change, global warming, increased anthropogenic pressure on forest ecosystem can alter the population of ecologically and economically beneficial insects thus it is the primary need to create competent ecological data to address the future challenges like range shift of animals. Insect conservation is fundamental to not only biodiversity conservation, but also to sustainable agriculture and a sustainable biosphere. Primary objective of this study was documentation of baseline ecological information (distribution, abundance status) on insects in Lansdowne forest division of Uttarakhand. Study area has been stratified on the basis of elevation, habitat and vegetation types to explore the insect diversity along each gradient. Standardized methods of insect collection viz; hand sorting, pitfall trapping, light trapping and vegetation beating have been used to collect insects. About 225 morph species, 11 orders and 44 families of invertebrates have been identified so far.

Keywords: Vulnerability, ecosystem, forest management, climate change

1. Introduction

Insects are most diverse and fascinating group of organisms contributing in ecosystems in order to sustain the mankind on earth. Undisputed dominant role of bees in pollination to secure the food security, bio control agent of various diseases causing mediator (water strider, ladybird beetles, dragonflies, spiders, beetles). Pollinators are also important for the reproduction of more than 65% of the world's wild plants (Kearns et al., 1998; Ashman et al., 2004). Globally, they are responsible for pollinating approximately 30,000 plant species (Buchmann and Nabhan, 1996, Wrattena et al., 2012). Soil nematodes, ants and dung beetles enhance soil fertility. Termites are amongst the main macroinvertebrate decomposers in arid and semi-arid environments, and exert additional impacts through the creation of biostructures

(mounds, galleries, sheetings, etc.) with different soil physical and chemical properties (Jouquet et al; 2011). Their population is facing immense pressure of numerous ecological detrimental activities like forest degradation, deforestation, global warming and climate change. Lansdowne division is situated in Shivalik and Lesser Himalayan landscapes which is home to rich flora and fauna and is under constant threat of increasing anthropogenic pressure, forest fire, climate change and forest fragmentation. Climate change has many direct and indirect effects on an ecosystem. It is one of the triggering factors for forest fires combined with anthropogenic activities. The major observable impacts of climate change phenomenon are drying up of streams and water sources, increased occurrences of disasters like forest fires, landslides, cloud bursts, erratic rainfall and precipitation pattern, increased temperature etc. These alter the forest ecosystem in many ways. Insects, which are one of the most ecologically important taxa, have also been affected in several ways. The effect of climate change on invertebrates can be long lasting or transitory. However, the invertebrates show enormous variability in response climate change. In a forest ecosystem, the inhabitant invertebrates can broadly be divided into those which remain confined to the litter layers and those which inhabit the habitat temporarily or not at all. The invertebrates which survive have specific adaptations like high mobility, limiting their water usage, resistance to high temperatures etc. which are characteristics for adapting to seasonal variations.

These changes have a large impact on the overall functioning of the Himalayan ecosystem and a scientific study of is needed to address and mitigate the effects of the present and emerging consequences of climate change.

2. Materials and Methods

Study Area: Lansdowne Forest Division (LFD), Uttarakhand

Lansdowne forest division is an important division which connects Rajaiji and Corbett national park. It is located in Pauri Garhwal district in northern Himalayas of Uttarakhand, comprising an area of 5,230 square kilometers (2,020 sq. m). It is situated between 29° 45' to 30°15' North Latitude and 78° 24' to 79° 23' East Longitude. This region is immensely rich with 4000 species of plants, having remarkable diversity in its natural vegetation by virtue of its being at a great range of elevation. In addition to its climatic variations, particularly in temperature and precipitation associated with the alignment and altitudes of ranges and nature of valleys, determine the altitudinal growth and variety of vegetation. The landuse pattern of the area indicates the presence of dense forest covering about one-third of the area and open forest covering about half of the area. Rest of the area is occupied by agriculture, habitation, snow-cover, water bodies and open areas. According to the forest classification of Champion and Seth (1968), following forest types can be recognized in Lansdowne Forest Division

(1) Sub-type 3C/C2a. Moist Shivalik sal forest
(2) Sub-type 5B/Cla. Dry Shivalik sal forest
(3) Sub-type 5B/Clb. Dry plain sal forest
(4) Type 5B/C2. Northern dry mixed deciduous forest
(5) Sub-type 5/E9. Dry bamboo brakes
(6) Sub-type 9/Cla. Lower or Shivalik chir pine forest

This division also harbors great diversity of fauna species like tiger (Panthera tigris tigris), Himalayan black bear (Selenarctos thibetanus), yellow-throated marten (Martes flavigula), leopard cat (Felis bengalensis), leopard (Panthera pardus), wild boar (Sus scrofa), and Indian muntjac.

3. Sampling methods

The present study is confined to five ranges of Lansdowne Forest Division namely Dugudda, Kothri, Kotdwar, Lansdowne and Laldhaang. A total of 25 sampling sites were chosen across the entire forest division with 5 sites in each range. These sites were representatives of the area within the range. Monitoring the abundance of invertebrate populations is increasingly valuable to understand their population dynamics, plan management strategies and assess the attainment of conservation targets. There are many sampling techniques for the collection of invertebrates like handpicking, sweep netting, beating, aerial netting, pitfall trapping and light trapping. All of these techniques have been used to collect invertebrates from different habitat. These sampling techniques have no detrimental impact on longer-term trend of invertebrate population, since no intensive sampling of a highly localized sampling has been made.

4. Results

During the study conducted, about 225 species of invertebrates falling into eleven orders have been identified as: Blattoida (cockroaches and termites), Coleoptera (beetles), Dermaptera (earwigs), Diptera (flies), Hemiptera (bugs and cicada), Hymenoptera (bees and wasps), Lepidoptera (butterfly and moth), Odonata (dragonfly and damselfly), Orthoptera (grasshoppers and crickets), Plecoptera (stonefly) and Araneae (spiders) were recorded (Table1 and 2).

Figure 3: Insects identified from study area

Table 1: Number of invertebrates (insects & spiders) recorded from Lansdowne Forest Division

Invertebrates orders	Number of families	Number of species
Blattoida	02	03 species
Coleoptera	11	58 species
Dermaptera	01	02 species
Diptera	-	07 species
Hemiptera	03	18 species
Hymenoptera	01	12 species
Lepidoptera	14	62species
Odonata	03	11 species
Orthoptera	-	12 species
Plecoptera	-	02 species
Aranae	10	38 species
Total	**44**	**225**

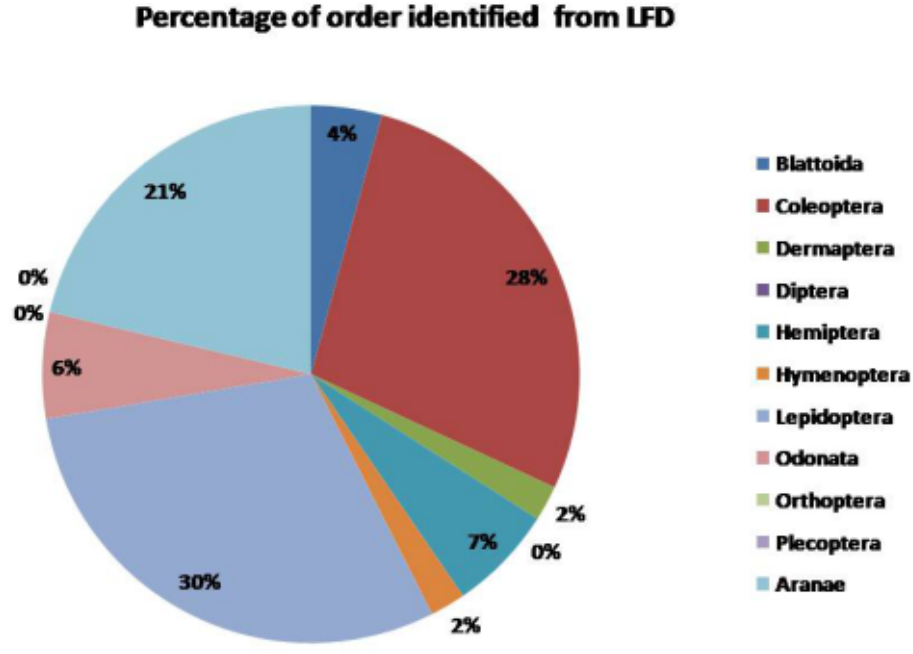

Figure 4: Percentage value of identified species in each order

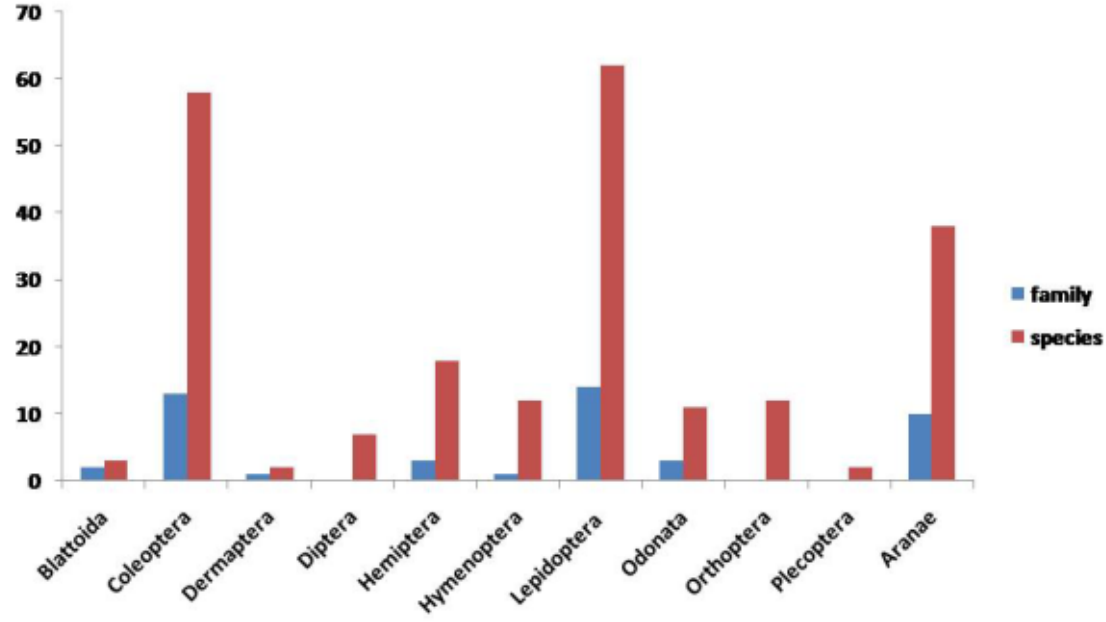

Figure 5: No. of Family and Species identified from LFD

Table 2: Invertebrates recorded from LFD

Invertebrates recorded from LFD, Uttarakhand

Order	Family	Species	Unidentified species
1. Blattoida	Blattidae	*Periplanata amaricana*	
	Ectobiidae	*Blatella germanica*	
	-	Isoptera sp.	01
2. Coleoptera	Carabidae	Carabidae sp.	02
	Cerambycidae	Cerambycidae sp.	03
		Spidimorpha westwoodi	
		Zygogramma bicolorata	
		Chrysomelidae sp.	03
		Spidimorpha sp.	
		Agelastica sp.	
		Chiidopsis bipunctata	
	Coccinellidae	*Coccinella septumpunctata*	
		Henosepilachna sp.	
		Epilachna vigintioctopunctata	

		Coccinellidae sp.	01
	Curculionidae	Curculionidae sp.	02
	Elateridae	Elateridae sp.	02
		Athous sp.	
		Carcinops pumilio	
	Hybosoridae	*Hybosorus orientalis*	
	Hydrophilidae	*Hydrophilus* sp.	
	Scarabaeidae	*Aphodius marginellus*	
		Cetonia bensoni	
		Chiloloba acuta	
		Phyllognathus dionysius	
		Xylotrupes gideon	
		Hybosorus orientalis	
		Holotrichia longipennis	
		Holotrichia problematica	
		Melolontha flabellata	
		Apogonia proxinma	
		Catharsius molosus	
		Euoniticellus pallipes	
		Oniticellus cinctus	
		Onitis philemon	
		Onthophagus dama	
		Sisyphus neglectus	
		Adoretus bimarginatus	
		Anomala dorsalis	
		Anomala rufiventris	
		Anomala varicolor	
		Popillia cyanea	
		Scarabaeidae sp.	06
	Tenebrionidae	Tenebrionidae sp.	03
3. Dermaptera	-	Dermaptera sp.	02
4. Diptera	Syrphidae	Syrphidae sp.	02
	-	Diptera sp.	05
5. Hemiptera	Belostomatidae	Belostomatidae sp.	01
	Pseudococcidae	Sternorrhyncha sp.	01
	Pyrrhocoridae	Pyrrhocoris sp.	01
	-	Hemiptera sp.	15

6. Hymenoptera	-	Andrenidae sp.	01
	Apidae	*Xylocopa aestuans*	
		Apis dorsata	
		Apis indica	
		Bombus haemorrhoidalis	
		Xylocopa latipes	
		Xylocopa sp.	01
	-	Hymenoptera sp.	05
7. Lepidoptera	Hesperiidae	*Spialia galba*	
	Hesperiidae	*Sarangesa dasahara*	
	Lycaenidae	*Heliophorus sena*	
		Zizula hylax	
	Nymphalidae	*Acraea violae*	
		Aglais kaschmirensis	
		Ariadne merione	
		Cyretis thydamas	
		Danaus genutia	
		Junonia lemonias	
		Mycalesis perseus	
		Neptis hylas	
		Phalanta phalantha	
		Vanessa cardui	
	Papilionidae	*Pachliopta aristolochiae*	
		Papilio arcturus arius	
	Pieridae	*Catopsilia pomona*	
		Catopsilia pyranthe	
		Cepora nerissa	
		Pieris brassicae	
		Pieris canidia	
	Arctiidae	*Aglaomorpha plagiata*	
		Aloa lactinea	
		Cyana puella	
		Cretanotos transiens	
		Miltochrista cuneonotatas	
		Nannoarctia obliquifascia	
		Nyctemera adversata	

		Arctiidae sp.	02
	Crambidae	Crambidae sp.	05
	Drepanidae	Drepanidae sp.	01
	Erebidae	Erebidae sp.	05
	Eupterotidae	Eupterotidae sp.	01
	Geometridae	Geometridae sp.	07
	Noctuidae	Noctuidae sp.	07
	Nolidae	*Xanthodes transversa*	
	Sphingidae	*Theretra nessus*	
		Theretra clotho	
		Sphingidae sp.	03
8. Odonata	Libellulidae	*Orthetrum trianulate*	
		Neurothemis tullia	
		Orthetrum sabina	
		Rhyothemis variegata	
		Trithemis pallidinervis	
	-	Odonata sp.	06
9. Orthroptera	-	Orthroptera sp.	12
10. Plecoptera	-	Placoptera sp.	02
		Spiders recorded from LFD	
1. Aranae	Agelinidae	Agelena sp.	
	Araneidae	Araneus sp.	01
		Neoscona sp.	
		Argiope sp.	
	Lycosidae	Pardosa sp.	01
	Oxyopidae	Oxyopes sp.	01
	Philodromidae	Philodromus sp.	
	Salticidae	Pseudcius sp.	01
		Plexippus paykulli	
	Sparassidae	*Heteropoda venatoria*	
	Sparassidae	Olios sp.	
		Pseudopoda sp.	
	Thomisidae	Misumena sp.	
	Uloboridae	Ulborus sp.	
	Thomisidae	Xysticus sp.	
	-	Aranae sp.	23

This forest division shows great diversity of invertebrates due to the different type of habitat from teak forest, mixed forest, pine forest and also the vegetation regeneration, and excellent ground cover with leaf liters which is a necessity in order to provide potential reproductive breeding habitats for invertebrates. About 225 morph species, 11 orders and 44 families of invertebrates have been identified so far.

5. References

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