



Diversity of shorthorned grasshopper in five different ecosystems

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ABSTRACT

Shorthorned grasshoppers surveyed from different ecosystems (forest nursery, organic, grassland, horticulture, integrated farming system) from Dharwad region indicated that forest nursery was more diverse than other ecosystems and least diversity was recorded in case of integrated farming ecosystem. Regarding species similarity results revealed that agriculture and horticulture ecosystems were more similar whereas least similarity was observed between agriculture and grassland ecosystem.

Key words: Diversity, Similarity index, Acrididae, Pyrgomorphidae.

Received 02.07.2017

Revised 12.08.2017

Accepted 26.08.2017

INTRODUCTION

Grasshoppers are widely distributed in all ecological systems with significant economic importance due to their destructive role in almost all type of green vegetation. Orthoptera is one of the largest insect orders, comprising 26,692 species found throughout the world. Acridoidea is the largest super family comprising 11,000 species worldwide of which 290 species representing 138 genera are reported from India. Among these, Acrididae is the most diverse family with 8000 species of which 285 belonging to 135 genera are found in India of which 136 species and 28 genera are endemic (Akthar *et al.*, 2014). Density of shorthorned grasshopper is more in areas where annual rainfall is less than 25 inches. The distribution pattern of grasshoppers is changing rapidly due to the encroachment of grasslands and forests for agricultural and industrial purposes. Locusts and grasshoppers are distributed throughout the world up to the sub-polar regions, but the number of genera and species increases towards the equator. They flourish in most sub tropical and tropical countries (Hirdesh, 2013). Habitat changes brought about by the segregation of land use intensities have an impact on biodiversity and species richness and natural afforestation on abandoned land may lead to a short-term increase in species richness, but it will cause decreasing numbers of species in the long term, especially of species depending on open-land habitats (Steck *et al.*, 2007). Ecological work on grasshoppers (Orthoptera: Acridoidea) fauna of Dharwad region including occurrence of *Eucoptacra ceylonica* Kirby (Coptacridinae: Acridinae: Orthoptera), their host record, ecological distribution, life forms and food habits and morphometrics of life forms has been well documented (Vastrad, 1986; Vastrad *et al.*, 1988; Vastrad *et al.*, 1989; Vastrad *et al.*, 1991 and Vastrad, 1994). Low population of grasshopper effect on food chain and high population of grasshoppers effect on rapid loss of vegetation cause increase runoff soil erosion and destruction of food sources of many animals (Bhusner, 2015). Low population of grasshopper effect on food chain and high population of grasshoppers effect on rapid loss of vegetation cause increase runoff soil erosion and destruction of food sources of many animals (Bhusner, 2015). The aim of this work is to check the diversity and distribution of species in five different ecosystems.

MATERIAL AND METHODS

An intensive survey was conducted in five ecosystems *viz.*, grassland ecosystem (IGFRI), horticulture ecosystem (Hi-tech horticulture), organic farming ecosystem (main agriculture research station), forest nursery (Agroforestry) and integrated farming ecosystem (MARS) from Dharwad region. Grasshoppers

were collected through sweeping a hand net for two hours in predetermined area in the particular locality once in a month in each ecosystem from June (2015) to February (2016). Collected specimens were killed by using ethyl acetate and properly stretched, pinned and labeled. Identification of specimen up to the species level were done with help of taxonomic keys of Prasad and Viraktamath (1991). The following diversity indices were worked out for each ecosystem.

RESULTS:

Diversity of shorthorned grasshoppers in different ecosystems was compared to understand the influence of different agro ecosystems. A significant variation in the species diversity was evident in different agro-ecosystems. Acrididae (15) was more diverse than the Pyrgomorphidae (4) except in integrated farming system ecosystems (Table 1).

Four species were recorded from Pyrgomorphidae among these *Chrotogonus trachypterus* (Blanchard) was not encountered from forest nursery. In Acridinae, *Acrida exaltata* (Walker) was not recorded from integrated farming ecosystem, *Phlaeoba panteli* Bolivar was not encountered from organic and integrated farming ecosystems. In Catantopinae, *Xenocatantops henryi* (I.Bolivar), *Diabolocatantops pinguis innotabilis* (Walker) were encountered only from forest nursery as compared to other ecosystems. *Eucoptacra praemorsa* (Stal) was recorded only from forest nursery and remaining ecosystems it was not encountered from Coptacridinae.

Cyrtacanthacris tatriza (Linnaeus) (Cyrtacanthacridinae) and *Eyprepocnemis alacris alacris* (Serville) (Eyprepocnemidinae) were encountered from horticulture and grassland ecosystems. In Gomphocerinae, *Aulacobothrus* sp. was recorded only in horticulture ecosystem, *Brachycrotaphus longiceps* I. Boliver encountered from horticulture and grassland ecosystems. Two species recorded from Hemiacridinae, among *Parahieroglyphus bilineatus* (I. Boliver) was not encountered from horticulture and integrated farming ecosystems.

In Oedipodinae, *Trilophidia annulata* (Thunberg) was recorded from all the five ecosystems, *Morphocris fasciata* Kirby was not encountered from forest nursery and integrated farming ecosystem. *Gastrimargas africanas africanas* Saussure was not recorded from organic farming and integrated farming ecosystems. *Aiolopus* sp. was the only species recorded from horticulture ecosystem.

Diversity indices of shorthorned grasshopper in different ecosystems during 2015-16

Species richness in different ecosystems was as follows, Horticulture (15) > Grassland (14) > Forest nursery (12) > Organic (9) > Integrated farming ecosystem (6) (Table 7). Diversity was maximum in forest nursery (D= 0.96, H= 1.97) followed by organic farming (D= 0.83, H= 1.92) and grassland ecosystems (D= 0.82, H= 2.11) where as least diversity was recorded in integrated farming ecosystem (D=0.75, H= 1.58) (Table 2). More number of species were common between agriculture and horticulture ecosystem (61 percent) followed by agriculture and forest nursery (52 percent) and least species similarity was evident between agriculture and grassland ecosystem (29 percent) (Table 3).

DISCUSSION

Diversity and distribution of shorthorned grasshopper is recorded for the first time from the forest nursery, horticulture, organic, grassland, and integrated farming ecosystem from Karnataka. Among these different ecosystems maximum species richness was recorded in horticulture ecosystem followed by grassland and least in case of integrated farming ecosystem. High species richness in horticulture ecosystem might be due to maximum host plants in it compared to other ecosystems. These results are supported by the findings of Ambily and Aswathy (2013). While, forest nursery recorded more diversity compared to other ecosystems. It may be due to resource concentration hypothesis. With respect to abundance, Oedipodinae was relatively abundant in all ecosystems among Acrididae (Fig. 1) because of its special characters like good in camouflage better long flight and sturdy build up which make them prominent among all other subfamilies. Results on similarity index revealed that agriculture and horticulture ecosystems were more similar to each other as compared with other ecosystems.

Table 1. Distribution of shorthorned grasshoppers in different ecosystems

Sl. No.	Family / Sub family	Species	Name of the ecosystem				Integrated farming system
			Forest nursery	Horticulture	Organic	Grassland	
1.	Pyrgomorphidae	<i>Atractomorpha crenulata crenulata</i> (Fabricius)	+	+	+	+	+
2.		<i>Chrotogonus oxypterus</i> (Blanchard)	+	+	+	+	+
3.		<i>Chrotogonus trachypterus</i>	-	+	+	+	+

		(Blanchard)					
4.		<i>Pyrgomorpha bispinosa bispinosa</i> (Walker)	+	+	+	+	+
		Total	3	4	4	4	4
	Sub families of Acrididae						
5.	Acridinae	<i>Acrida exaltata</i> (Walker)	+	+	+	+	-
6.		<i>Phlaeoba panteli</i> Bolivar	+	+	-	+	-
		Total	2	2	1	2	0
7.	Catantopinae	<i>Xenocatantops henryi</i> (I.Bolivar)	+	-	-	-	-
8.		<i>Diabolocatantops pinguis innotabalis</i> (Walker)	+	-	-	-	-
		Total	2	0	0	0	0
9.	Coptacridinae	<i>Eucoptacra praemorsa</i> (Stal)	+	-	-	-	-
		Total	1	0	0	0	0
10.	Cyrtacanthacridinae	<i>Cyrtacanthacris tatarica</i> (Linnaeus)	-	+	-	+	-
		Total					
11.	Eyprepocnemidinae	<i>Eyprepocnemis alacris alacris</i> (Serville)	-	+	-	+	-
		Total	0	1	0	1	0
12.	Gomphocerinae	<i>Aulacobothrus</i> sp.	-	+	-	-	-
13.		<i>Brachycrotaphus longiceps</i> l. Boliver	-	+	-	+	-
		Total	0	2	0	1	0
14.	Hemiacridinae	<i>Parahieroglyphus bilineatus</i> (l. Boliver)	+	-	+	+	-
15.		<i>Spathosternum prasiniferum</i> (Walker)	+	+	+	+	+
		Total	2	1	2	2	1
16.	Oediopodinae	<i>Aiolopus</i> sp.	-	+	-	-	-
17.		<i>Gastrimargas africanas africanas</i> Saussure	+	+	-	+	-
18.		<i>Morphocris fasciata</i> Kirby	-	+	+	+	-
19.		<i>Trilophidia annulata</i> (Thunberg)	+	+	+	+	+
		Total	2	4	2	3	1
		Total of Acrididae	9	11	5	10	2
		Grand total (Acrididae + Pyrgomorphidae)	12	15	9	14	6
Total number of species present in Acrididae -15 and Pyrgomorphidae- 4 among all five ecosystems							

+ Present

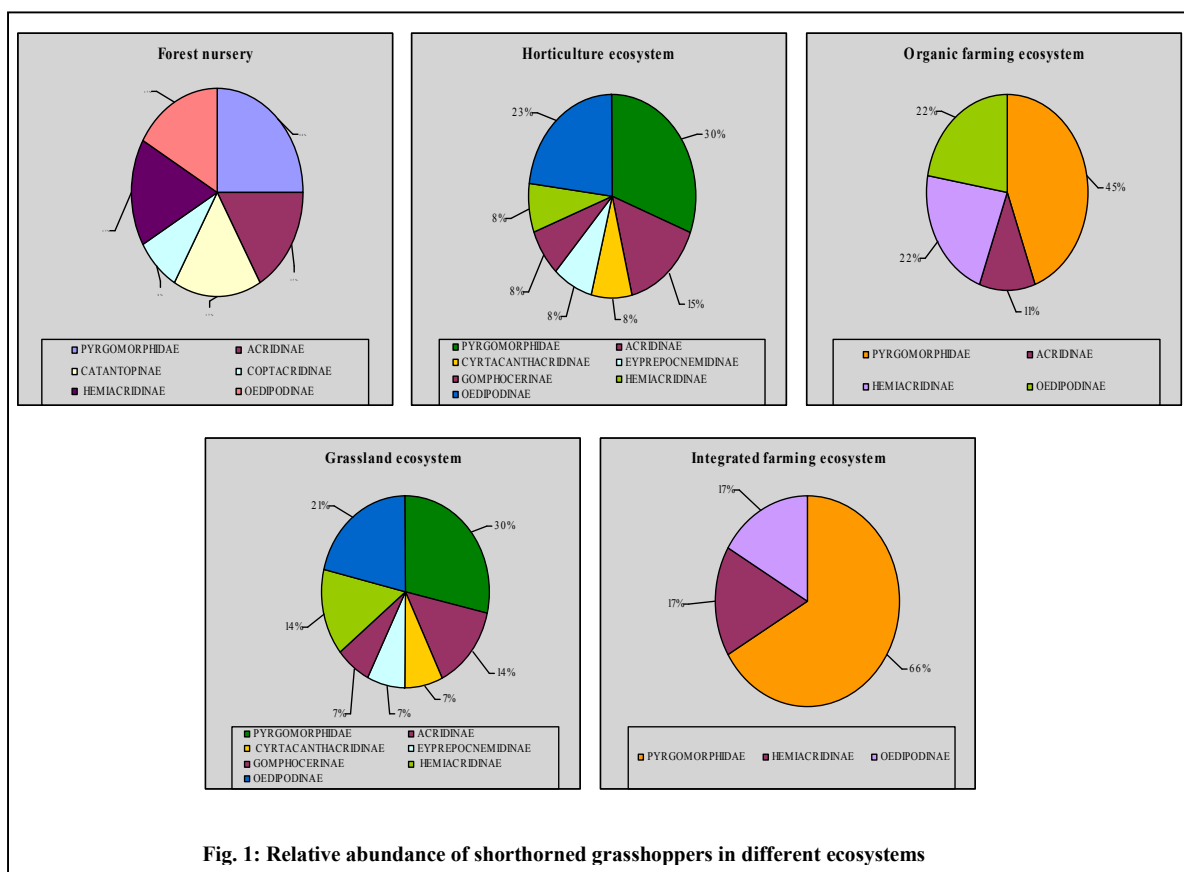
- Absent

Table 2. Diversity of shorthorned grasshoppers in different ecosystems

Name of a ecosystem	Simpson index (1-D)	Shannon index (H)
Integrated farming system	0.75	1.58
Horticulture	0.80	1.96
Grassland	0.82	2.11
Organic farming	0.83	1.92
Forest nursery (Sbi)	0.96	1.97

Table 3. Similarity indices of different ecosystems

Name of a ecosystem	Similarity index
Agriculture * Grassland ecosystem	29
Agriculture * Integrated farming system	30
Agriculture * Organic farming ecosystem	41
Agriculture * Forest nursery (Sbi)	52
Agriculture * Horticulture ecosystem	61



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CITATION OF THIS ARTICLE

Raghavender. B and Vastrad A. S. Diversity of shorthorned grasshopper in five different ecosystems. *Bull. Env. Pharmacol. Life Sci.*, Vol 6 Special issue 2, 2017: 486-489