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FLUCTUATION IN POPULATION DENSITY AND BIOMASS OF COLEOPTERA IN A TEMPERATE GRASSLAND

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Population dynamics and biomass of Coleoptera were studied in a temperate grassland at Naukuchiatal, Nainital. A total of 38 plant species were recorded in the grassland. The order Coleoptera was represented by 27 species belonging to 7 families.

In natural communities, coleopterans often constitute an important group of entomofauna in terms of their density and biomass and the extent of damage they cause to plants, as most of species of the beetles are plant feeders.

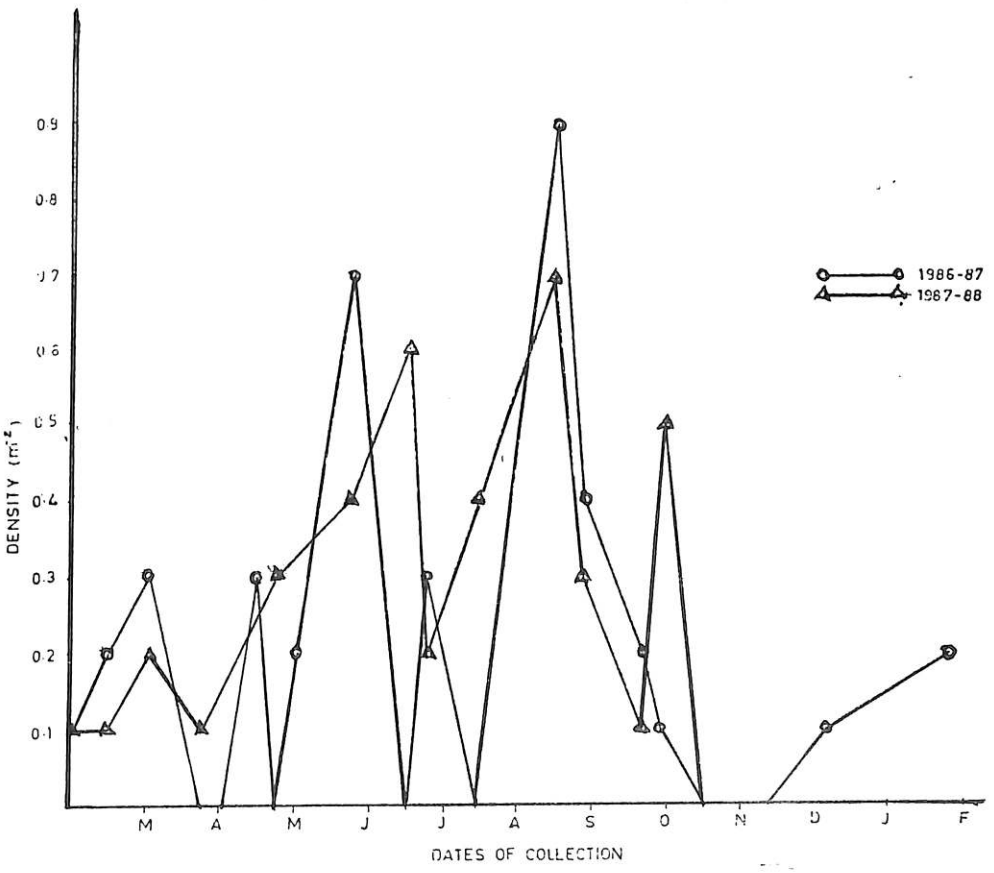

Fig. 1. Variation in the population density of Coleoptera during 1986 - 88.

Table I : Species composition, number of individuals and their per cent contribution to total number of individuals of Coleoptera during 1986 - 88.

Taxa	1986-87		1987-88	
	Number of Individuals	**Percent Contribution**	**Numbers of Individuals**	**Percent Contribution**
Scarabaeidae				
Onitis virens Lansb.	1	2.70	-	-
Cerica - acerica sp.	1	2.70	1	2.43
Sisyphus subsidens Wlk.	2	5.40	1	2.43
Chiloba acuta Wied.	1	2.70	-	
Malendra sp.	1	2.70	-	
Brachmina coriacea Hope	1	2.70	-	
Popilia discalis Wlk.	5	13.50	-	
Anomala lineatopennis Bl.	-	-	4	9.75
Glycyphana horsfieldi	-	0	1	2.43
Adoretris sp.	-	-	1	2.43
Unidentified	2	5.40	9	21.95
Curculionidae				
Myllocerus sp.	2	5.40	5	12.19
Coccinellidae				
Coccinella 7-punctata	4	10.80	7	17.07
Chrysomelidae				
Mimastra cyanura Hope	1	2.70	-	
Ceratabasis nair Lacord	1	2.70	-	
Haplosoma sexmaculata Jack	1	2.70	-	
Colosposoma semicostatum Jack	5	13.50	1	2.43
Lema lacordairei Bely	1	2.70	1	2.43
Lema sp.	1	2.70	1	2.43
Miochira montana Jack	-		1	2.43
Atheodactyla plagiata	-		1	2.43
Tenebrionidae				
Gonocephalum simulatrix Fairm	2	5.40	1	2.43
Gonocephalum sp.	1	5.40	1	2.43
Carabidae				
Acinopus indicola Bates	1	2.70	-	-
Distichus planus Bonella	2	5.40	2	4.86
Chalaenius neplensis Hope	-		2	4.86
Cerogria neplensis Hope	0		1	2.83
Cantharidae				
Mylobris variabilis Poll.	1	2.70	1	2.83
	37	**100.00**	**41**	**100.00**

Detailed studies on population density and biomass of Coleoptera have been done in many temperate and tropical communities (Davis & Gray, 1966; Evans & Murdoch, 1968; Igarshi, 1973; Janzen & Pond, 1975; Vats & Singh, 1978; Kaushal & Vats, 1987). However, such studies were lacking in India as far as temperate grasslands are concern. The present paper describes the population density, biomass and species of the coleopterans in a temperate grassland.

The study site was a 5 ha of grassland completely protected from human activity and grazing. The grassland was situated at Naukuchiatal (29° 20'N 70°35'E and at an altitude of 1500 meters). The area had an average rainfall of 1819 mm, most of which occurred from July to October. The mean maximum temperature varied from 12°C (Feb.) to 25.6°C (June) and mean minimum temperature ranged from 8°C (Dec) to 21.5°C (June).

Estimation of Population density and biomass

The population density of Coleoptera was estimated by removal trapping method (Kaushal & Vats, 1984). Cages each with an area of 1 meter square, were constructed with an entrance of 80 x 40 cm on one side 10 cm above ground level. Wire gauge of 5 meshes cm-1 was fixed in all sides except on the ground surface. This mesh size prevented the escape of coleopterans from the cages. Five cages were used at each sampling date. Sampling was done fortnightly, except in winter because the population density of insects was low.

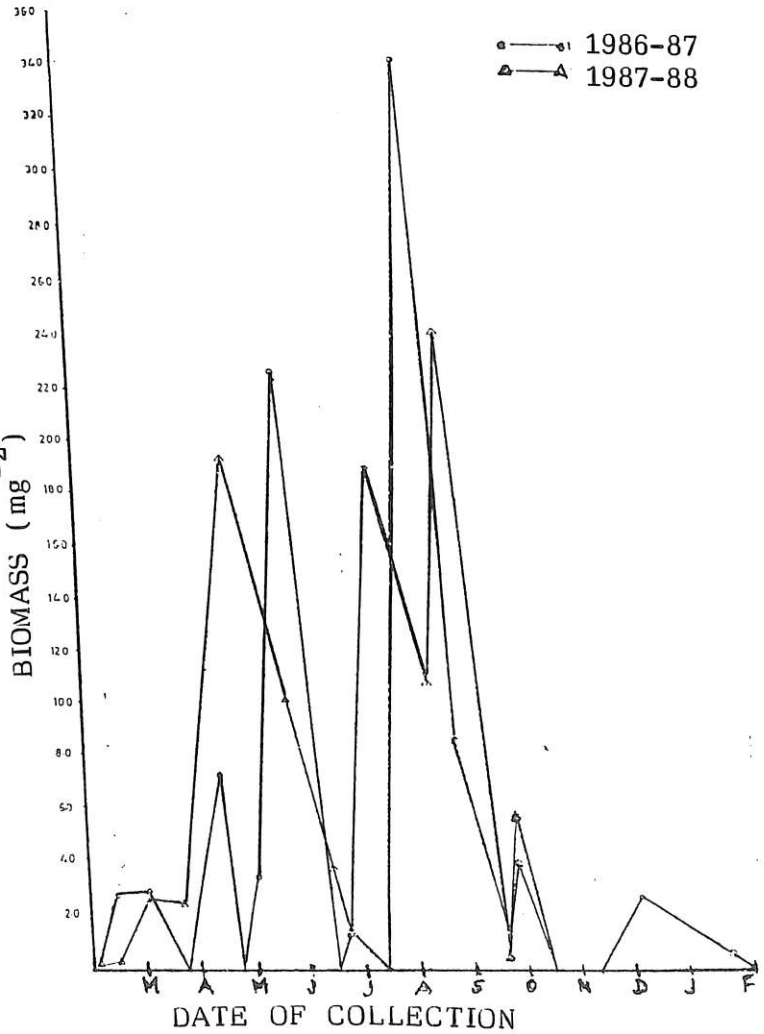

Fig. 2 : Variation in the biomass of Coleoptera during 1996 - 88.

Collected insects were oven dried to constant weight at 60°C for 72 hours and biomass of each specimen was determined.

The population density of Coleoptera varied from 0.1m^{-2} (2nd Mar., 1986) to 0.9m^{-2} (8th Sept., 1986) during 1986-87, and from 0.1m^{-2} (2nd Mar., 1987) to 0.7m^{-2} (8th Sept., 1987) during 1987-88. Fig.1. shows variation in the population density of Coleoptera during 1986-1988.

A total of 27 species belonging to 7 families of order Coleoptera were recorded (Table I) from the grassland during 1986-88. Scarabaeidae was the most dominant family in terms of density (38.6%) and biomass (56.6%) within Coleoptera (Table II).

Table II : Precent contribution of different families to total density and biomass within Coleoptera in the grassland during 1986 - 88.

Family	1986-87		1987-88		Average	
	Density	Biomass	Density	Biomass	Density	Biomass
Scarabaeidae	36.8	63.9	40.0	49.2	38.6	56.6
Cantharidae	2.6	2.8	2.4	20.0	2.5	11.4
Chrysomelidae	28.9	10.8	14.3	9.3	21.6	10.0
Tenebrionidae	7.9	11.9	2.4	4.1	5.2	8.0
Carabidae	7.9	5.1	11.9	9.4	9.9	7.3
Coccinellidae	10.5	3.7	16.7	6.5	13.6	5.1
Curculionidae	5.4	1.8	11.9	1.5	8.6	1.6

Popilia discalis Wlk. was the most dominant species both in terms of density (0.5m^{-2}) and biomass (20.8mgm^{-2}), respectively.

The maximum population density (0.9m^{-2}) and biomass (34.2 mgm^{-2}) recorded for Coleoptera in the present study are lower than reported in other studies 11.74m^{-2} and 59.83 mgm^{-2} in the grasslayer of Lamto Savanna; 5.33m^{-2} and 59.33 mgm^{-2} in the natural untreated grassland at Matador, Riegert *et al.*, 1974; 1.68m^{-2} and 38.85 mgm^{-2} in a tropical savanna at Lamto, and 1.59m^{-2} and 54.0 mgm^{-2} in a grassland at Kurukshetra (Kaushal & Vats, 1987). McDaniel (1971) has reported maximum density of 1.6m^{-2} in a mixed grass prairie, Cottonwood, Colorado, whereas Vats & Singh (1978) reported this order to be insignificant in terms of density and biomass in a grassland.

Davis & Gray (1966) reported 10 species in salt marsh of North Carolina. Evans & Murdoch (1968) reported as many as 169 species of Coleoptera from an alfa-alfa field. Igarshi (1973) reported 21 species at Kawatabi, IBP area, Japan, whereas Janzen & Pond (1975) reported 30 & 29 species of Coleoptera at Bridford and Michigan sites, respectively. Vats & Singh (1978) reported only 5 species in the grassland at Kurukshetra. A total of 30 species belonging to 7 families were recorded in the grassland at Kurukshetra by Kaushal & Vats (1987). In comparison 27 species of coleopterans belonging to 7 families were recorded in present study.

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