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A Study on Pitfall Trapping of Darkling Beetles (Coleoptera: Tenebrionidae)

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A B S T R A C T

A total of seventeen different species of darkling beetles were collected using pitfall traps at agro-forest, ragi field and grassland at Agricultural College, Karekere, Hassan, Karnataka. The beetles exhibited habitat preference. *Rhytinota*s pp. and *Pachycera* spp. were confined to grassland whereas *Menearchus* spp. were limited to ragi field only. Activity of beetles was less at agro-forest. The minimum temperature, maximum temperature, saturation vapour pressure deficit and rainfall had correlation of -0.30, +0.05 +0.29 and +0.50 respectively with trap catches.

Introduction

Tenebrionidae is one of the largest families in the animal kingdom containing more than 18000 species in the world (Watt, 1974) of which 300 species are recorded from India (Lefroy, 1909). Beetles play significant roles in most ecosystems (Ehrenfeld, 1988). Prominent epigeal examples are the tenebrionids that play a relatively major role in tropical and subtropical drylands, more so with increasing aridity (Henschel *et al.*, 2010). Since the inventorying of biodiversity is the first step in any conservation programme. Among the ground dwelling organisms, tenebrionids are relatively abundant, large, readily captured in pitfall traps and the most easily identified. Communities of these beetles integrate factors such as the availability of detritus, plant cover and various soil characteristics like moisture, hardness and grain size composition. Therefore, tenebrionids are considered as sensitive indicators of biodiversity change due to habitat loss and degradation (Parenzee, 2001). Tenebrionids may generally be described as rather slow moving, black, flightless beetles. Adults and larvae are considered as detritivorous (Wallwork, 1982), although adults have been noticed feeding upon carrion (Mckinnerney, 1978) and dung (Buxton, 1924) and some larvae are root feeders (Rafes, 1960). Tenebrionids may play an important role in detritus cycling in

ecosystems (Draney, 1993). Long term monitoring programme of their population can provide valuable insights into how environmental changes affect organisms (Henschel *et al.,* 2003). Pitfall traps are useful in studying seasonal occurrence and relative abundance in a particular habitat. Presumably nothing is known about their ecology, diversity and the important role played by these beetles in the ecosystem. Hence, a study was conducted during January 2018 to December 2019 at Agricultural College, Karekere, Hassan, Karnataka to find out the occurrence of the tenebrionids in different habitats, their relative abundance and influence of weather factors on pitfall trap catches.

Materials and Methods

This study was carried out at three different sites, all situated at Agricultural College, Karekere, Hassan, Karnataka such as agro-forest, ragi field and grassland. Each habitat was measured to be 10,000 sq.m., andthe selected habitat areas were represented their own characteristic features being surrounded by areas of their own habitat nature. Empty tins of 10 cm diameter and 25 cm deep were used as pitfall traps. The trap was buried into the soil upto the rim and funnel of same diameter was placed above this to prevent the escape of beetles trapped. The trapped beetles were recorded once in every week. Traps were run from first week of January 2018 to last week of December 2019. The weekly log (catch +1) were correlated with weather factors namely mean minimum temperature, mean maximum temperature, mean saturation vapour pressure deficit and total rainfall for the respective weeks. A multiple linear regression model $y= a+b_1X_1 + b_2X_2 + b_3X_3 +b_4X_4$ (where y, X_1,X_2, X_3 and X_4 correspond to log (catch +1), mean maximum temperature (^{o}c), mean minimum temperature (^{o}c), mean saturation vapour pressure deficit (%) and total rainfall (mm) respectively of a week was obtained.

Results and Discussion

During the study seventeen species of tenebrionids belonging to eight genera were collected in pitfall traps in different habitats. The number of beetles collected in different habitatsis given in Table.

Gonocephalum oblongum, Pachycera coromandelensis, Rhytinota laevipennis and *Scleronreitteri* were the most commonly found species in pitfall traps. The highest number of beetles were trapped in grassland (130) followed by traps in ragi field (105) and agro-forest (52).

The activity of tenebrionids was found to have relation with undisturbed habitat. Cepeda (1989) reported that soil temperature and moisture regime regulated the life cycles of most of the species living in the area and not vegetation of that area. The number of beetles seemed to be inversely related to the degree of disturbance and permanency of habitats. Accordingly, maximum number of beetles was recorded in the grassland followed by ragi field and agro-forest.

The tenebrionid beetles showed habitat preference. *Menearchus*sp_1 and *Menearchus* sp_2 were limited only to ragi field whereas *Pachycera*sp, *Rhytinota laticollis, Rhytinota* sp_1 and *Rhytinota* sp_2 were restricted only to grassland. No beetle of these species was found in other habitats. This may be because of the propensity of these beetles to thick vegetation.

Some species viz., *Gonocephalum* spp., *Pachycera coromandelensis, Pachycera pondicheryina, Rhytinota laevipennis* and *Scleronreitteri* were found in all habitats. This indicates that these species are capable of

existing in a wide range of habitats (Aldryhim et. al., 1992).

Pachycera coromandelensis was also collected in more number (40) at ragi field than at other habitats. More number of *Rhytinota laevipennis* (45) and *Scleronreitteri* (25) were collected in grassland and agro-forest respectively.

The highest number of tenebrionids were caught during June and same trend continued till the end of October. The good vegetation during rainy season which harboured many insects and activity of tenebrionids coincided here. The catch in traps started declining from first week of November.

The continuous pitfall trapping gave relative abundance of different species in different habitats. *Rhytinota laevipennis* and *Scleronreitteri* were found abundantly in grassland and agro-forest, respectively indicating the affinity of beetles to vegetation and soil moisture.

Weather factors such as saturation vapour pressure deficit and rainfall were significantly correlated with pitfall trap catches. They had correlation coefficient of +0.29 and +0.50 respectively. The rainfall which explained 24 percent variance had influence on trap catches. All the weather factors accounted for 21.5 per cent fluctuations and could be explained by linear regression model $y = -1.46 + 0.07X_1 + 0.09X_2 + 0.04X_3 + 0.09X_4$.

Table.1 Tenebrionids trapped in pitfall traps at different habitats

Sl. No.	Species	Number of beetles trapped in		
		Agro-forest	Ragi field	Grass land
1	*Gonocephalum oblongum*	10	13	8
2	*Gonocephalum* sp.$_1$	1	2	4
3	*Gonocephalum* sp.$_2$	2	3	5
4	*Himatismus fasciculatus* (Fabricius)	-	2	3
5	*Leichenum canaliculatum* (Fabricius)	-	1	2
6	*Menearchus arcuatus* (Audinetserville)	-	10	3
7	*Menearchus* sp.$_1$	-	2	-
8	*Menearchus* sp.$_2$	-	3	-
9	*Notocorax crenatus* (Fabricius)	7	-	1
10	*Pachycera coromandelensis* (Koch)	3	40	2
11	*Pachycerapondicherya* (Koch)	2	8	3
12	*Pachycera* sp.	-	-	2
13	*Rhytinota laevipennis*Fairmaire	2	6	45
14	*Rhytinota laticollis* (Schaufuss)	-	-	2
15	*Rhytinota* sp.$_1$	-	-	5
16	*Rhytinota* sp.$_2$	-	-	8
17	*Scleronreitteri* Gebien	25	15	10
	Total	52	105	130

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