Proc Indian Natn. Sci. Acad. Vol. 44, Part B, No. 6, pp. 357-363 (1978)

THE RELATIVE ABUNDANCE OF PHOTO-POSITIVE INSECTS AT CENTRAL ARID ZONE RESEARCH INSTITUTE FARM, JODHPUR (RAJ.)

by S.K. PAL *and* J.N. SACHAN, *Division of Animal Studies, Central Arid Zone Research Institute, Jodhpur.*

Light trap catches over a period of two years, viz., 1971 and 1972 at the Farm of the institute revealed that insect population tends to be high during monsoon although Lepidoptorans were found in sufficient numbers during the peak winter also. The activity of insects has also been fairly high in spring. Coleopterans were generally more abundant than other orders. Orthopterans were least observed in winter. Insects belonging to the orders—Hymenoptera, Hemiptera, Neuroptera were also recorded. The order Coleoptera had maximum representation of families Scarabaeidae and Meloidae while the order Lepidoptera had more of insects of the families Arctidae, Pyralidae and Noctuidae. Association between insect abundance and climatic components was also investigated.

INTRODUCTION

Light trap is an important device to study the relation of insect populations with the environmental conditions. Bogush (1938) used the light trap in determining the insect fauna and controlling the pests. Pradhan (1946), Banerjee and Basu (1951), Kundu *et al.*, (1958, 1959 1961) are among the Indian workers who have added to our knowledge of the insect abundance in relation to climate.

The present investigation has been undertaken with a view to find out if the light trap catches of insects have any relation with the meteorological data.

MATERIALS AND METHOD

The light-trap used here consisted of a metal funnel (diam. depth = 18″) with a gradient of 2″ per inch and was placed at a height of 4″ above the ground. A lamp (200 watt) was kept 9″ above the funnel. The trap was stationed in the Institute Farm at Jodhpur and was operated at fortnightly intervals. The photo-positive nocturnal insects were attracted to light and while trying to alight upon the funnel made their way into the jar. They were taken to laboratory in the morning and sorted out.

The individual counts of different species were ascertained by either of the two methods : (i) by counting directly when the number was not large, and (ii) by weighing when number was large. In the latter method the number of insects weighing 5g was plotted on the ordinate of the graph against the days spaced on the abscissa. For graphical representation number of catches was converted to their logs (Williams, 1947), which is represented in Figs. 1 and 2.

Present addrass : *Plant Protection Officer, ICRISAT, 1-11-256, Begumpet, Hyderabad 500 0116.
**Senior Entomologist, RICA Research complease for N.E.H.R., Shillong-4.

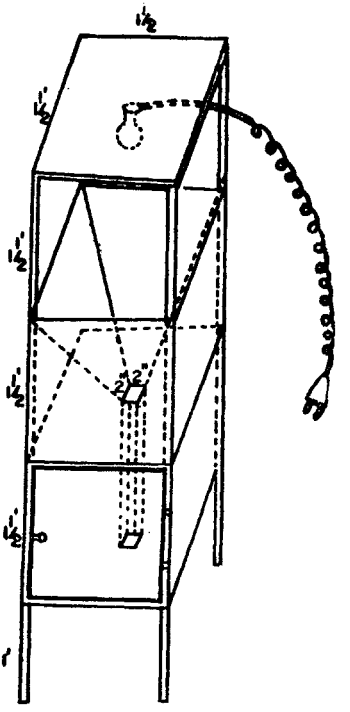

FIG.1. LIGHT TRAP.

RELATIVE ABUNDANCE OF PHOTO-POSITVE INSECTS OF DIFFERENT ORDERS AT C.A.Z.R.I. FARM, JODHPUR, 1971

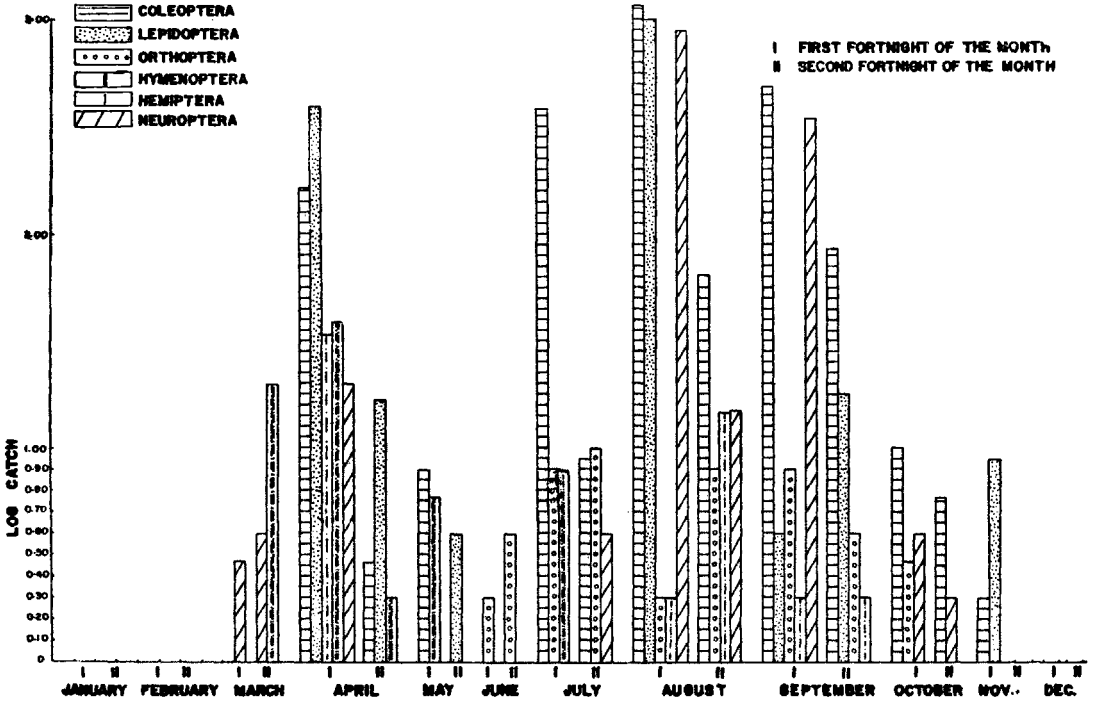

FIG 2.

Results and Discussion

Coleoptera

Among all the insects belonging to different orders, Coleoptera had the maximum representation. Approximately 26 species were found in the collection. The occurrence of the species viz., *Cantharis teunicollis*, *Rhynyptia meridionalis*, *Schizonycha ruficollis*, *Aserica* sp., *Serica assamensis*, *Adoretus* spp., *Bolbocerus* spp. were more common and their abundance was higher than that of others. The occurrence of the beetles was maximum during rainy season (July-September) and started decreasing from October onwards becoming nil during December-March. The increase in population was again observed in the month of April and a gradual decrease was observed in May-June. In 1972, the trend was similar to that of 1971 except that the occurrence started a month ahead. Winter months gave poor catches of the beetles. On comparing the insect occurrence with climatic factors it was found that maximum temperature (33.1°C-36.4°C) and maximum relative humidity (74%-80%) (Fig. 3) favoured the insect abundance. Hibernating beetles (in adult form) start their emergence in the month of March after overwintering. But the sudden population increase was noted with the emergence of the beetles from their hibernating pupae just after the onset of the rains resulting beetle abundance during rainy season.

In the arid region of Rajasthan, higher population of Coleopterans over other orders is also mainly due to their ability to withstand adverse climatic condition due

RELATIVE ABUNDANCE OF PHOTO- POSITIVE INSECTS OF DIFFERENT ORDERS AT C.A.Z.R.I. FARM JODHPUR, FOR 1972

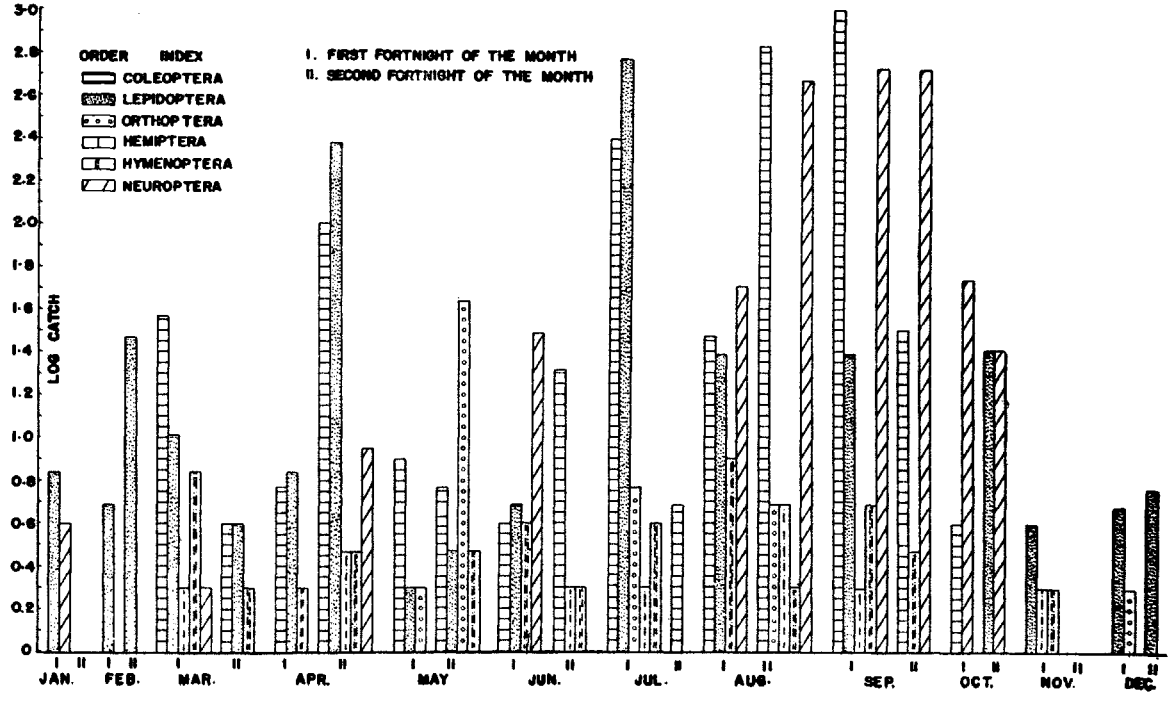

FIG 3.

TABLE I

Number of insects collected on different months of the year at fortnightly interval

Order/month	January		February		March		April		May		June	
	I*	II*	I	II	I	II	I	II	I	II	I	II
						1971						
Coleoptera	—	—	—	—	—	—	168 (2.2253)	3 (0.4771)	8 (0.9031)	1 (0.0000)	1 (0.0000)	—
Lepidoptera	—	—	—	—	—	—	432 (2.6355)	17 (1.2304)	—	4 (0.6021)	—	1 (0.0000)
Orthoptera	—	—	—	—	—	—	—	—	—	4	2 (0.3010)	4 (0.6021)
Hemiptera	—	—	—	—	—	—	34 (1.5315)	—	—	—	—	—
Hymenoptera	—	—	—	—	3 (0.4771)	4 (0.6021)	39 (1.5911)	2 (0.3010)	6 (0.7782)	—	—	—
Neuroptera	—	—	—	—	—	20 (1.3010)	20 (1.3010)	—	1 (0.0000)	—	—	—
						1972						
Coleoptera	—	—	—	—	38 (1.5798)	4 (0.6021)	6 (0.7782)	106 (2.0253)	8 (0.9031)	6 (0.7782)	4 (0.6021)	21 (1.3222)
Lepidoptera	7 (0.8451)	—	5 (0.6990)	30 (1.4771)	13 (1.1139)	4 (0.6021)	7 (0.8451)	240 (2.3802)	2 (0.3010)	3 (0.4771)	5 (0.6990)	1 (0.0000)
Orthoptera	—	—	—	—	—	—	—	—	2 (0.3010)	44 (1.6435)	1 (0.0000)	—
Hemiptera	—	—	—	—	2 (0.3010)	—	—	3 (0.4771)	—	1 (0.0000)	—	2 (0.3010)
Hymenoptera	—	—	—	—	7 (0.8451)	2 (0.3010)	2 (0.3010)	3 (0.4771)	—	3 (0.4771)	4 (0.6021)	2 (0.3010)
Neuroptera	4 (0.6021)	—	—	—	2 (0.3010)	—	—	9 (0.9542)	—	—	31 (1.4914)	1 (0.0000)

	July		August		September		October		November		December	
	I	II	I	II	I	II	I	II	I	II	I	II
						1971						
Coleoptera	390 (2.5911)	9 (0.9542)	1198 (3.0785)	65 (1.8129)	490 (2.6902)	86 (1.9345)	10 (1.0000)	6 (0.7782)	—	2 (0.3010)	—	—
Leipdoptra	—	10 (1.0000)	1000 (3.0000)	—	4 (0.6021)	18 (1.2553)	1 (0.0000)	—	9 (0.9542)	1 (0.0000)	—	—
Orthoptera	8 (0.9031)	—	2 (0.3010)	8 (0,9031)	2 (0.3010)	4 (0.6021)	4 (0.4771)	—	—	—	—	—
Hymeptera	—	—	2 (0.3010)	15 (1.1761)	2 (0.3010)	2 (0,3010)	1 (0.0000)	—	1 (0.0000)	—	—	—
Hymenodtera	8 (0.9031)	1 (0.0000)	1 (0.0000)	—	—	—	—	—	—	—	—	—
Neuroptera	—	4 (0.6021)	910 (2.9590)	67 (1.8261)	350 (2.5441)	—	4 (0.6021)	2 (0.3010)	—	—	—	—
						1972						
Coleoptera	245 (2,3892)	5 (0,6990)	30 (1.4771)	685 (2,8357)	1019 (3.0082)	32 (1.5051)	4 (0.6021)	1 (0.0000)	1 (0.0000)	—	—	1 (0.0000)
Lepidoptera	599 (2.7774)	—	25 (1.3979)	—	25 (1.3979)	—	1 (0.0000)	26 (1.4150)	4 (0.6021)	—	5 (0.6990)	6 (0.7782)
Orthoptera	6 (2,7782)	—	—	5 (0.6990)	—	—	—	—	—	—	2 (0.3010)	—
Hemiptera	2 (0.3010)	—	—	5 (0.6990)	2 (0.3010)	1 (0.0000)	—	—	2 (0,3010)	—	—	1 (0.0000)
Hymenptera	4 (0.6021)	—	8 (0-9031)	2 (0.3010)	5 (0.6990)	3 (0.4771)	1 (0.0000)	—	2 (0.3010)	—	—	—
Neuroptera	—	—	52 (1.7160)	475 (2.6767)	542 (2.7364)	545 (1.7404)	55 (1.7404)	55 (1.7404)	— (1.4150)	—	—	—

to hard cuticular structure which prevents the body water losses and also helps in their easy shelter in the soil, without body abrasions.

Plenty of food supply during rainy season is also responsible for their multiplication and profuse egg-laying. At CAZRI Farm, the crops grown during rainy season were bajra, moong, moth, Jowar, etc. Adults of these beetles defoliate the cultivated crops and their larvae feed on the roots of the various crops.

Lepidoptera

The catches of Lepidopterans were next to Coleopterans in 1971. But in 1972, Neuropterans superceded the Lepidopterans by few hundreds. The maximum representation was of families Noctuidae (*Heliothis armigera*, *Agrotis* sp., *Spodoptera litura*, *Plusia* sp., *Chilo zonellus* and *Sesamia inferens*), Arctiidae (*Utethesia pulchella* and *Amsacta* sp.), and Lymantridae (*Euproctis* sp. and Gelechids, etc.).

In 1971, the occurrence of the moths was recorded from April-November, with peaks during April and August-September. No population was observed during December-March. In 1972, the population was observed throughout the year. However, the peaks were during July-October and April. During December-February the population existed in sparse manner. The reason for survival of Lepidopterans during winter of 1972 was the availability of food material (green vegetation) as the light trap was shifted in September near the tube well command area where cabbage, potato, wheat, mustard and sunflower were grown. In case of Lepidopterans also, the rainy season was found most congenial for their abundance. The reason for abundance of population in April is correlated with the approach of the spring season which coincides with the emergence of the moths from the hibernating pupae. Extreme hot climate during May-June (max. temp. 39.5-41.1°C) adversely affected Lepidopteran population.

The recorded species of this order are important pests of crops like jowar bajra, til, moong, moth, lobia and castor during Kharif; and wheat, mustard and sunflower in Rabi.

Orthoptera

No catches were recorded from second fortnight of October-May 1971 and September-April 1972. The occurrence was restricted from June-September. On the whole the catches of Orthopterans were rather poor. This shows photo-negative behaviour of these insects. The common species which were recorded are *Chrotogonus* spp. and *Thisiocetrus littoralis*.

Hemiptera

The occurrence of Hemipterans was poor throughout the year. The common species were *Halys dentatus* and *Nezara* spp. In 1971, the bugs started their appearance during August-September and peak was observed in April. During rest of the months no bug could be recorded. In 1972, sparse and uneven population was recorded from March-November. On the basis of these observations no correlation can be made with the prevailing climatic factors.

Hymenoptera

Dorylus labiatus was the only insect species which was found in the light trap catches in 1971. Its occurrence was recorded from March to first fortnight of May with peaks during first fortnight of April. No population was observed from 2nd fortnight of August-February. During 1972, the occurrence was noted from March-November. However, no catches were made during winter.

Neuroptera

The insects of this order were maximum during August-September. A sparse population was also recorded during March-April and June. Other months of the year had no catches. The most common species was *Chrysopa* sp. which feeds on aphids, jassids and mites, etc.

ACKNOWLEDGEMENTS

The authors are thankful to the Director and Head of Animal Studies Division, Central Arid Zone Research Institute, Jodhpur, for the facilities provided. Thanks are also due to Shri Ved Prakash, J.S.A., for his help.

REFERENCES

Banerjee, S.N. & Basu, A.C. (1951). On the suitability of light trap for quantitative studies on insect population. *Proc. 38th Indian Sci. Cong.*, 215.

Bogush, P.P. (1938). Some results of a study of insects by means of a light trap in Central Asia. *Bull. ent. Res.*, **27**, 377-380.

Kundu, H.L., Dutta Gupta, A.K. & Gupta, B.B. (1958). Studies on the insect population of Pilani (Raj.). I.A preliminary survey with light trap. *Abst. Proc. 45th Indian Sci. Congr.*, Pt. III, p. 358.

Kundu, H.L. & Dutta Gupta, A.K. (1959). Studies on the insect population of Pilani (Raj.). II. A survey of Coleopterans with the light trap. *Abst. Proc. 46th Indian Sci. Congr.* Pt. III, 390-391.

Kundu, H.L., Dutta Gupta, A.K. & Gupta, B.B. (1961). A study of the abundance of certain insects of Pilani with the help of light trap. *Proc. Raj. Aca. Sci*, **8**, 79-87.

Pradhan, S. (1946). Insect Population Studies III. Idea of biograph and biometer. *Proc. natn. Inst. Sci., India*, **12**, 301-314.

Williams, C.B. (1947). The logarithmic series and its application to biological problem. *J. Ecol.*, **34**, 253-272.