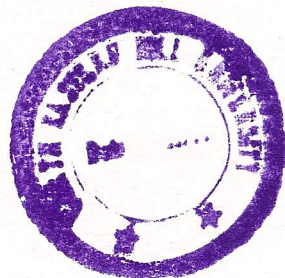


SURVEY OF INSECTS AND BIOLOGY AND CONTROL OF
CERTAIN INSECT PESTS OF THE BALPHAKRAM
SANCTUARY, MEGHALAYA

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July 11, 1988.

I certify that the thesis entitled "SURVEY OF INSECTS AND BIOLOGY AND CONTROL OF CERTAIN INSECT PESTS OF THE BALPHAKRAM SANCTUARY, MEGHALAYA" submitted by Mr. Anupam Kumar Roy for the Degree of Doctor of Philosophy of the North Eastern Hill University, Shillong, embodies the record of original investigation carried out by him under my supervision. He has been duly registered and the thesis presented is worthy of being considered for the award of the Ph.D. degree. This work has not been submitted for any degree of any other University.

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INTRODUCTION

The insects comprise approximately half (50.8%) of the total living species and 72% of all animals on this earth. In a forest system they occupy wide range of micro and macro habitats. They get food from the plant and interact with environmental influences and form an important element in a complex web of plant and animal life. Naturally they have tremendous influence on the forest ecosystem. The insects may impair or enhance the aesthetic values of any system they occupy. Their attack on forest trees may increase chances of fire hazard.

Forest Entomology is a major branch of forest ecology. It deals with the problem of interactions of insects to the forest and forest produce. It includes mainly the study of forest insects and their population dynamics. Forest Entomology covers identification, forecasting, measurement of injurious insect population, assessment of insect causing damage, analysis of the causes of outbreak and evolving principles and procedures to protect the forests and forest products from insects (Graham, 1963).

Forest Entomologists have great task for understanding forest system and providing measures of control both for the benefit of the forest system as well as the insects. A knowledge of insect fauna of a forest have been felt to be of primary

necessity in view of the increasing emphasis being laid in the creation of National Parks and Wild-life Sanctuaries and their maintenance.

Balphakram National Wild-life Sanctuary is situated in adjoining border areas of West Garo Hills District and West Khasi Hills District (290 sq. km.) of the Meghalaya State. It is a natural Sub-tropical semi-evergreen forest of mixed vegetation. The people of this area practise jhum or shifting cultivation. This forest is one of the last resorts of wild elephants and other wild lives in the North-eastern hills region in India. Till recent past Balphakram National Wild-life Sanctuary was a scientifically unexplored area.

The present investigation was started in 1979. During the first two years survey was conducted and after a thorough annual survey, two major insect pests of important forest trees were identified and investigations on their development, life-table and control measures were taken up.

This Thesis incorporates the study on three aspects :

(1) SURVEY OF INSECT FAUNA :

Reports on faunistic surveys of insects are scanty and limited to certain pockets only so far as North-eastern hills of India have is concerned though some reports on insects

from India have been mentioned in Imms General Text Book of Entomology revised by Richards and Davis (1977). Forest Research Institute of ^{Dehradun} India and Zoological Survey of India have conducted faunistic surveys in different parts of the Country from time to time. As insects form a major group of primary consumers, survey and identification of insect fauna is of fundamental importance in the management of any forest ecosystem. As there is no report on insect fauna of Balphakram National Wild-life Sanctuary the present investigation was undertaken. The description of the sanctuary has been provided in the Chapter 2. Some idea of its inhabitants and their living has been provided.

In our present survey insects were collected by sweeping net and by hand picking during day time and by light-trap during night time at monthly intervals from September, 1979 to October, 1981. Though many insects were collected during day time, the light-trap was found very convenient and the study on survey of the insects was based mainly on this technique. Hanna (1969) reported light-trap as a convenient tool for investigating insect fauna, its population dynamics and seasonal activity in any given area. Certain workers, such as, Falcon et. al. (1967 a, b) have combined black light-trap with field sampling for detecting and assessing the attack of pests in certain crops. Similarly, black light-traps have been used in association with sex pheromones for the same purpose. (Ford, Wolf and Vaid, 1972). With the help of regular light-trap collection

population dynamics of various insect groups can be studied. Some workers such as, Belts et. al. (1971), Odiyo (1973) have used such data for fore-casting out-breaks of certain serious pests. Light-traps have been useful in taxonomic studies (James, 1943; Back, 1958; Linley, Evans and Evans, 1970; Kline and Axtell, 1976) as well as for analysis of population dynamics (Henneberry, Howland and Wolf, 1967; Alma, 1973; Reddy and Alfred, 1977).

The Light-trap experiments were conducted at the Balphakram Forest Beat Office varandah which is situated on a hill-top (862 m. a.s.l.), surrounded by thick deciduous forest. Insects attracted to light in between 17.00 hrs. to 05.00 hrs. were collected at hourly intervals. The analysis of insects collected has been carried out on hourly as well as monthly basis and a picture of their population dynamics has been provided in relation to atmospheric temperature, humidity and rainfall.

(2) BIOLOGY AND LIFE-TABLE OF MAJOR INSECT PESTS :

The outbreaks and population dynamics of the forest insect pests have always been a point of special concern (see Graham, 1963). The outbreaks are associated with the changes in the ecology and other environmental factors (Tinbergen, 1960; Sippell, 1962; Graham, 1963;

Furniss and Barr, 1967; Miller, 1970; Ives, 1976; Valentine and Talerico, 1980). For predicting the outbreaks and devising control measures it is necessary to have an idea of the biology and life table of the insect pests (Witter, Mattson and Kulman, 1975; Mason, 1976).

During the first year of survey we found 11 species of insects feeding on different trees and plants in large numbers. Out of these, Cyclosia panthona Cram. and Diaphania laticostalis Guene were found to be serious defoliators of Aporosa roxburghii Bull. and Holarrhena antidysentrica (Lin.), respectively. These trees grow abundantly in Balphakram forest. We conducted detailed investigations on biology and population dynamics of C. panthona Cram. and constructed its life tables and survivorship curves. Detailed biology of D. laticostalis Guene was also carried out. For the rest of the insects their host plants and period of occurrence have been recorded.

(3) RELATIVE TOXICITY EXPERIMENTS :

Chemical control measures are widely practised to control insect pests in agriculture as well as in forests. To select suitable insecticides, relative toxicity of candidate insecticides are performed. In the recent past certain workers such as, Saini and Sharma (1970), Teotia and Lal (1972), Takahashi and Kiritani (1973), Ciesla (1977), Singh and Gupta (1978)

among others conducted experiments on relative toxicity of different insecticides in laboratory and evaluated their relative effectiveness to control the particular insect pest species. Based on the results of the laboratory, insecticides can be selected for use in the field. Keeping this in view 4 locally available insecticides (Nuvacron, Cythion, Ekalaux and Thiodan) have been tested in the present investigation to find out their relative toxicity against Cyclesia panthena and Diaphania laticestalis larvae. The findings presented in this thesis are expected to be of use to the Foresters as well as Government Departments in the management of insect fauna and control of major insect pests not only in Balphakram National Wild-life Sanctuary but also in the neighbouring forests.