

**ECOSYSTEM STRUCTURE OF A PINE FOREST
IN NORTH-EAST INDIA
WITH PARTICULAR REFERENCE TO
CONSUMER AND DECOMPOSER ARTHROPODS**

by

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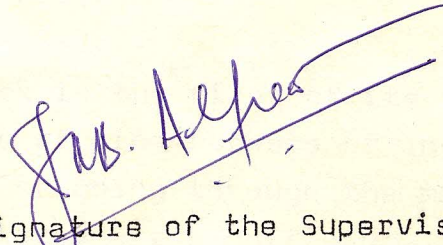
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I certify that the thesis entitled "Ecosystem structure of a pine forest in Northeast India with particular reference to consumer and decomposer arthropods", submitted by Mr. M. Vikram Reddy for the Degree of Doctor of Philosophy of the North-Eastern 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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Mr. M. Vikram Reddy had worked as a Research Fellow at this Department from 12th December, 1975 to 11th June, 1979 under a NEHU Fellowship. He carried out these studies under the guidance of my colleague, Dr. J.R.B. Alfred. The results of his investigations are compiled and supplicated in the form of a doctoral thesis entitled "ECOSYSTEM STRUCTURE OF A PINE FOREST IN NORTHEAST INDIA WITH PARTICULAR REFERENCE TO CONSUMER AND DECOMPOSER ARTHROPODS".

To my knowledge, this work is the first of its kind, particularly on faunal aspects of pine forests of India. I had the personal experience of going through the manuscript and find that the results achieved are significant. This functional study will be of value in furthering our knowledge of underlying mechanisms in forest ecosystems. In my opinion the data gathered, the presentation of results and discussions offered are adequate for consideration of the award of the Doctoral Degree.

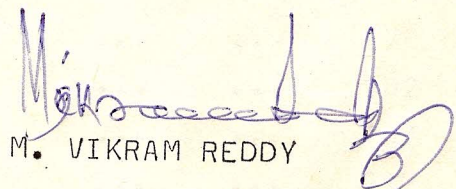

(R. GEORGE MICHAEL)

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GENERAL INTRODUCTION

Forests vary greatly in structure, their productivity and turnover rates in general, though offering a *stable micro-habitat*. The physical conditions of the microclimate and consequently the microhabitats are generally important in determining the composition of fauna (Stout, 1974).

Trees and forests have always been subjected to dual attitude, on the one hand a feeling of beauty, awe, reverence or mystery and on the other a sense of utility, a desire to cut them down, make houses and bridges and clear the land for farming, as seen throughout man's history (Botkin and Miller, 1974). The need to study forest systems, stems from the need to understand, not only as a value for man's soul - his recreation and aesthetic appreciation, but to understand those organisms that exist in communities involving many biological interactions. It is in this context, that the forest ecosystem is relevant not only to professional ecologists but also in view of man's present day environmental problems that it has been studied in greater detail than ever before. This led Odum (1971) to define ecosystem from both anthropocentric and professional angles. Either definition involves the structure and function of a system under consideration. The word "Ecosystem" coined by Tansley (1935) had passed through a phase of related terminologies like "Biocenosis" (Möbius, 1877), "Microcosm" (Forbes, 1887) and "Biogeocenosis" (Sukacheva, 1944). However, no one has expressed the ecosystem concept to man better than Leopold (1933) who wrote, that christianity tries to integrate the individual to society, democracy to social organisation in the individual, with no

ethic of man's relation to his environment. It is for these reasons that ecological processes have been traditionally studied from convenient vantage points. Three of these could be identified, (1) the geographical distribution of species and their relationships between species diversity and area, (2) species interactions in terms of population dynamics and (3) energy flow in ecological communities from primary producers to consumers through higher trophic levels (Rapport and Turner, 1975).

With these in mind the present investigation was undertaken from a merological point of view where parts of the system could be studied and finally to build up a whole. The ambition was soon realised to be far fetched when, as the work progressed, it dawned, that we had to start from scratch. Though ideal to study all the three components defined above, a total understanding of all aspects and from all points of view was virtually unattainable. The present study was therefore, confined to the understanding which was required to use it for some specific purpose and the nature of this purpose was the outcome of the present work.

As mentioned earlier, about the diversity in forest ecosystems, the present work was confined to a very restricted range of trees dominated primarily by pine (Pinus kesiya Royle). Investigations on the kinds of invertebrate fauna, particularly arthropods, which were associated within a range of ecological conditions were studied in detail. The forest sites undertaken were near-to-natural ecosystems, since they were an outcome of plantations managed over several years. Two major factors affecting this system were the consumers and

decomposers. The questions we asked ourselves, to enable the realisation of the objectives of the present study were, (1) What were the dominant arthropod groups?, (2) What were their population dynamic relationships?, (3) What were the detrimental and beneficial effects of these, on the forest stands?, and (4) How much was their functional interplay?

At the outset we divided the forest into two major divisions for easier analyses of the consumer populations. The young plantations were analysed for sap-sucking consumers and the older ones for chewing and mining insect consumers, the latter by the light-trap method. For the decomposer studies both soil and litter fauna were analysed to help in elucidating the return of nutrients to the soil. An attempt has been made to interrelate these different components to get a total understanding of the ecosystem considered. A lack in the understanding of species differences of the fauna became very obvious and therefore the establishment of the relationship on firm grounds required the specialized, detailed knowledge, which was unlikely to be found in one person. The present study revealed the need for a range of specialists combined with a knowledge of whole system behaviour leading to requirement of a multi-disciplinary research team. However, the components analysed have been discussed with confidence, wherever possible, to reflect the scene in its totality.

The specific goals of these studies were to advance the understanding of ecosystems through measurements of rates of change in system components, expand the data to base on the whole system, increase the reliability of production

estimates and improve the scientific basis for determining the resource management practices.

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