

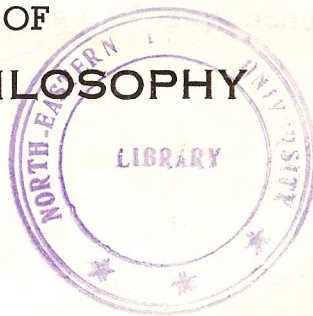
ECOLOGICAL STUDIES ON JHUM FALLOWS OF
BYRNIHAT (MEGHALAYA) WITH PARTICULAR
REFERENCE TO SOIL FAUNA

by

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SUBMITTED IN FULFILMENT OF THE REQUIREMENT OF
THE DEGREE OF
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TO



THE NORTH - EASTERN HILL UNIVERSITY
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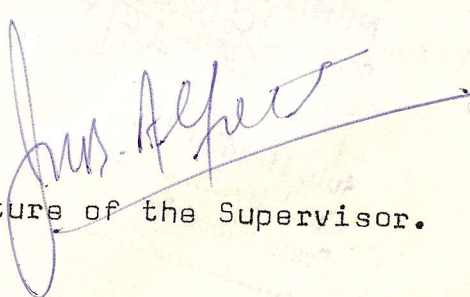
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I certify that the thesis entitled "Ecological Studies of Jhum-fallows of Byrnihat (Meghalaya) with particular reference to soil fauna", submitted by Mr. Pramod Kumar Vatsauliya for the Degree of Doctor of Philosophy of the North Eastern Hill University, 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 Ph.D. Degree. This work has not been submitted for any Degree of any other University.

DATED : 3/11/87
PLACE : SHILLONG.


Signature of the Supervisor.

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CONTENTS

Inner Cover Page	i
Supervisor's Certificate	ii
Acknowledgements	iii
General Introduction	...	...	...	1
Study Area	...	...	...	8
CHAPTER I : POPULATION DYNAMICS				
Introduction	...	...	...	17
Materials and Methods	...	...	...	25
Results	...	...	...	27
Discussion	...	...	...	116
References	...	...	...	149
CHAPTER II : LIFE HISTORY				
Introduction	...	...	...	172
Materials and Methods	...	...	...	175
Results	...	...	...	178
Discussion	...	...	...	197
References	...	...	...	203
CHAPTER III : FOOD AND FEEDING				
Introduction	...	...	...	205
Materials and Methods	...	...	...	210
Results	...	...	...	211
Discussion	...	...	...	227
References	...	...	...	232
General Discussion and Conclusion	...	...	...	236

PLATES

				facing
1a,b	:	Slash and burn area.	... ..	4
2a,b	:	Burnt and cultivated area.	... ..	5
3	:	Typical fallow land.	... ..	6
4a,b	:	1 year old Jhum fallow and soil profile...		11
5a,b	:	5 year old Jhum fallow and soil profile...		12
6a,b	:	10 year old Jhum fallow and soil profile...		13
7a,b	:	20 year old Jhum fallow and soil profile...		14

FIGURES

	...	facing
1. Physiographical map of Meghalaya and Study site.	...	10
2. The seasonal fluctuation of soil fauna.	...	86
3. The seasonal fluctuation of microfauna.	...	87
4. The seasonal fluctuation of Prostigmata and total Protozoa.	...	89
5. The seasonal fluctuation of Flagelata, Ciliate and Amoebae.	...	90
6. The seasonal fluctuation of total Mesofauna.	...	91
7. The seasonal fluctuation of total Collembola and total Acarina.	...	93
8. The seasonal fluctuation of families of Collembola.	...	94
9. The seasonal fluctuation of sub-orders of Acarina	...	95
10. The seasonal fluctuation of families of Araneida.	...	97
11. The seasonal fluctuation of Chelonethii, Diplura, Protura and Isopoda.	...	98
12. The seasonal fluctuation of macrofauna.	...	99
13. The seasonal fluctuation of total insecta, total Myriapoda and total Ants.	...	101
14. The seasonal fluctuation of families of Ants.	...	102
15. The seasonal fluctuation of Endopterygote insects.	...	104
16. The seasonal fluctuation of Exopterygote insects.	...	105
17. The seasonal fluctuation of sub-orders of Myriapoda.	...	106
18. The seasonal fluctuation of Mollusca and Earthworm.	...	108
19. The seasonal fluctuation of Air temperature and Soil temperature.	...	109
20. The seasonal fluctuation of Rainfall and Moisture content.	...	110
21. The seasonal fluctuation of pH and Conductivity.	...	112
22. The seasonal fluctuation of bulk-density & porosity.	...	113
23. The seasonal fluctuation of Carbon and Nitrogen.	...	114
24. The seasonal fluctuation of Potassium & Phosphorus.	...	115
25. The percentage of fungal species in site A and in the guts of <u>Seira indica</u> and <u>Seira lateralis</u>.	...	213
26. The percentage of fungal species in site D and in the guts of <u>Salina yosii</u> and <u>Entomobrya kali</u>.	...	214
27. The seasonal fluctuation of <u>Seira indica</u> and index of electivity.	...	222
28. The seasonal fluctuation of <u>Seira lateralis</u> and index of electivity.	...	223
29. The seasonal fluctuation of <u>Salina yosii</u> and index of electivity.	...	225
30. The seasonal fluctuation of <u>Entomobrya kali</u> and index of electivity.	...	226

TABLES

facing

I	: Soil types and texture in Study Area.	....	15
II	: List of plants in the different study sites.....		16
III	: Numbers and percentages of Total soil fauna, microfauna, mesofauna and macrofauna.	....	29
IV	: Numbers and percentages of total soil fauna, microfauna, mesofauna and macrofauna, in four different depths.	....	30
V	: Numbers and percentages of Prostigmata.	....	35
VI	: Numbers and percentages of Protozoa.	....	35
VII	: Numbers and percentages of Flagellata.	....	38
VIII	: Numbers and percentages of Ciliata.	....	38
IX	: Numbers and percentages of Amoebae.	....	41
X	: Numbers and percentages of Collembola.	....	41
XI	: Numbers and percentages of Entomobryidae.	....	44
XII	: Numbers and percentages of Hypogastridae.	....	44
XIII	: Numbers and percentages of Sminthuridae.	....	46
XIV	: Numbers and percentages of Isotomidae.	....	46
XV	: Numbers and percentages of Acarina.	....	49
XVI	: Numbers and percentages of Mesostigmata.	....	49
XVII	: Numbers and percentages of Cryptostigmata.	....	51
XVIII	: Numbers and percentages of Astigmata.	....	51
XIX	: Numbers and percentages of Araneida.8	....	53
XX	: Numbers and percentages of Clubionidae.	....	53
XXI	: Numbers and percentages of Lycosidae.	....	55
XXII	: Numbers and percentages of Linyphidae.	....	55
XXIII	: Numbers and percentages of Protura.	....	58
XXIV	: Numbers and percentages of Diplura.	....	58
XXV	: Numbers and percentages of Cheloniidae.	....	59
XXVI	: Numbers and percentages of Isopoda.	....	59
XXVII	: Numbers and percentages of Insecta.	....	61
XXVIII	: Numbers and percentages of Ants.	....	61
XXIX	: Numbers and percentages of Myrmicinae.	....	63
XXX	: Numbers and percentages of Ponerinae.	....	65
XXXI	: Numbers and percentages of Pseudomyrmicinae	....	67
XXXII	: Numbers and percentages of Dorylinae.	....	68
XXXIII	: Numbers and percentages of Dolichoderinae.	....	70
XXXIV	: Numbers and percentages of Coleoptera.	....	70
XXXV	: Numbers and percentages of Diptera.	....	72

		facing
XXXVI	: Numbers and percentages of Hemiptera.	72
XXXVII	: Numbers and percentages of Hymenoptera.	74
XXXVIII	: Numbers and percentages of Thysanoptera.	74
XXXIX	: Numbers and percentages of Lepidoptera.	76
XL	: Numbers and percentages of Trichoptera.	76
XLI	: Numbers and percentages of Orthoptera.	78
XLII	: Numbers and percentages of Dermaptera.	78
XLIII	: Numbers and percentages of Myriapoda.	80
XLIV	: Numbers and percentages of Diplopoda.	80
XLV	: Numbers and percentages of Chilopoda.	82
XLVI	: Numbers and percentages of Symphyla.	82
XLVII	: Numbers and percentages of Earthworm.	83
XLVIII	: Numbers and percentages of Mollusca.	83
XLIX	: Coefficient correlation between the major groups of soil fauna and abiotic factors at soil depth 0-10 cms. in site A.	126
L	: Coefficient correlation between the major groups of soil fauna and abiotic factors at soil depth 10-20 cms. in site A.	127
LI	: Coefficient correlation between the major groups of soil fauna and abiotic factors at soil depth 20-30 cms. in site A.	128
LII	: Coefficient correlation between the major groups of soil fauna and abiotic factors at soil depth 30-40 cms. in site A.	129
LIII	: Coefficient correlation between the major groups of soil fauna and abiotic factors at soil depth 0-10 cms in site B.	130
LIV	: Coefficient correlation between the major groups of soil fauna and abiotic factors at soil depth 10-20 cms in site B.	131
LV	: Coefficient correlation between the major groups of soil fauna and abiotic factors at soil depth 20-30 cms in site B.	132
LVI	: Coefficient correlation between the major groups of soil fauna and abiotic factors at soil depth 30-40 cms in site B.	133
LVII	: Coefficient correlation between the major groups of soil fauna and abiotic factors at soil depth 0-10 cms in site C.	134
LVIII	: Coefficient correlation between the major groups of soil fauna and abiotic factors at soil depth 10-20 cms in site C.	135
LIX	: Coefficient correlation between the major groups of soil fauna and abiotic factors at soil depth 20-30 cms in site C.	136

LX	: Coefficient correlation between the major groups of soil fauna and abiotic factors at soil depth 30-40 cms in site C.	.....	137
LXI	: Coefficient correlation between the major groups of soil fauna and abiotic factors at soil depth 0-10 cms in site D.	.....	138
LXII	: Coefficient correlation between the major groups of soil fauna and abiotic factors at soil depth 10-20 cms in site D.	.....	139
LXIII	: Coefficient correlation between the major groups of soil fauna and abiotic factors at soil depth 20-30 cms in site D.	.....	140
LXIV	: Coefficient correlation between the major groups of soil fauna and abiotic factors at soil depth 30-40 cms in site D.	.....	141
LXV	: Life history of <u>Seira indica</u>.	.....	180
LXVI	: Life history of <u>Seira lateralis</u>.	.....	181
LXVII	: Life history of <u>Salina yosii</u>.	.....	183
LXVIII	: Life history of <u>Entomobrya kali</u>.	.....	185
LXIX	: Natality and mortality for all the four species of Collembola.	.....	188
LXX	: Sex ratio in different species of Collembola...	.....	189
LXXI	: Coefficient correlation between the different life stages and environmental factors in <u>Seira indica</u>.	.....	191
LXXII	: Coefficient correlation between the different life stages and environmental factors in <u>Seira lateralis</u>.	.....	193
LXXIII	: Coefficient correlation between the different life stages and environmental factors in <u>Salina yosii</u>.	.....	195
LXXIV	: Coefficient correlation between the different life stages and environmental factors in <u>Entomobrya kali</u>.	.....	196
LXXV	: Percentages and seasonal fluctuations of various fungal species in site A and site D....	.....	216
LXXVI	: Percentages and seasonal fluctuations of various fungal species in the guts of <u>Seira indica</u> and <u>Seira lateralis</u>.	.....	218
LXXVII	: Percentages and seasonal fluctuations of various fungal species in the guts of <u>Salina yosii</u> and <u>Entomobrya kali</u>.	.....	220

GENERAL INTRODUCTION

Soil fauna and its studies are a relatively recent field in biology, not only in the temperate latitudes but more so in tropics. Other than the initial general studies today the interaction and interrelationships of soil fauna and its habitats is seen from the Anthropogenic gradient. This relates to the study, taking "natural" as baseline ecosystems, the measurements of dynamic aspects of soil faunal variables, in systems which are subjected to either agricultural activities or to degrees of manipulation and perturbation by the impact of man. This was what is referred to as "rule of the zonal change of strata" (Ghilyarov, 1964). Studies on the ecology of the soil invertebrates, though have been undertaken in the humid tropics (Dammerman, 1945; Williams, 1947; Beak, 1962; Maldague and Hilger, 1963; Toye, 1967; Madge, 1969; Fittkau and Klinge, 1973), yet only that of Lasebikan (1975) is directly concerned with the impact of agricultural practices on the soil fauna. Other than the above studies on the immediate effects on land usage, interest in the restoration of severely damaged landscape is of very recent time, primarily due to increasing human populations and the threat of nuclear devastation.

With this background in mind the present study was undertaken to see the effects of excessive land use on soil faunal dynamics in tropical environments of this part of the world, particularly to aspects of recycling, succession and stabilization of soil fauna in lands left fallow after intensive agriculture for a number of years. The uniqueness of the situation was that these fallow lands were the results of shifting cultivation, as

practiced in many regions of the world. Shifting cultivation, though is regarded as the primitive agricultural systems of the tropics, it is not only confined to tropics, but elsewhere also in the world. In these regions of North-Eastern India, shifting cultivation is referred to as "Jhumming" where farmers move their homes and settlements as well as the fields they cultivate, at frequent intervals (UNESCO, 1952). Jhumming, as for general shifting cultivation involves a similar clearing of the forest by felling, logging and finally burning the undergrowth, then ploughed for agriculture (Plates 1,2,3). Hence it is frequently called as "Slash and burn" agriculture referred to as Swidden farming (Ekwall, 1955). Many studies have existed on the immediate effects of disturbing the ecosystem by either burning, logging or agriculturing (Nye and Greenland, 1960). However very little if at all exist on the land after such usage and the agricultural yield falls well below the inputs when it is left abandoned or fallow for a number of years. It is with this reason, that we were interested in such fallows left abandoned for a considerable time, to investigate the influences of soil fauna and soil on one another on an ecological approach. This was primarily due to the fact that land after cultivation, when abandoned, the life forms passes through several secondary successional stages with acute competition of elimination of undesirable species all directly correlated to the length of the fallow period.

The present investigation was taken up therefore on abandoned fallows of different ages from a period of one year to twenty years. It was seen in these fallows the general population dynamics of various groups of soil fauna in relation to the age of these fallows and to identify the colonization and successional

trend if existing in relation to the general physical factors of the environment and chemical nature of the soil. In addition to find out whether the biology and the nutrition affects the soil fauna for dominant species of Collembola, two from the youngest aged fallow and two from the oldest aged fallow were taken up for detail study. The second aspect therefore deals with these four species life history studies under the impact of various combinations of three environmental factors like temperature, pH and salinity, helping in the identification of the fecundity and mortality, therefore the population status comparable to the field. The third investigation was directed to the understanding of the nutritional status of these same four species and compared with field. This was thought to help in finding out the strategies involved in the life history processes and therefore the population dynamics in relation to either the abundants and scarcity of food resources studies.

The study though was aimed at the academic understanding of such disturbed ecosystems, yet it was thought to bring recommendation of land use practice based on such studies to the regional government.