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New Forest (Southampton - England) de Ekolojik bir araştırma

An Ecological Investigation in New Forest (Southampton - England)

by

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Özet : Bu tetkike ait arazi çalışmaları 1956 ve 1957 yıllarında İngiltere, Southampton Üniversitesinde Dr. Lambert'in yanında iken yapılmış olup elde edilen sonuçlar avdetimde Ankarada Botanik Enstitüsünde yazılmıştır.

Araştırma için seçilen yer New Forest'in Southampton'a yakın olan meşe-kayın ormanı kesiminin en eski ve ekolojik bakımdan en önemli olan kısmıdır. New Forest'in bu kesiminde şimdiye kadar yapılmış yalnız bir etüd vardır bu da bütün «Nature Reserve 30» u içine alan sathi bir etüd durumundadır. Mamafih bu araştırmamızda kullanılan haritaların iskeleti ve bazı jeolojik ve tarihi bilgiler bu eserden özetlenerek alınmış olduğu için bir hayli faydalı oldu.

Araştırmanın ana hatları ve araştırmadan elde edilen sonuçlar kısaca 6 madde halinde özetlenebilir :

1 — Şekil 2 de görüldüğü gibi araştırma yeri, Denny Wood ve Denny Enclosure, 107 eşit parçaya bölündü. Müteakiben her parçadan 400 m^2 lik birer parsel seçilerek bütün toprak araştırmaları ve vejetasyon analizleri bu parsellerde yapıldı.

2 — Araştırma yerinin, Denny Wood ve Denny Enclosure, topraklarının büyük bir kısmı henüz esmer orman toprağı vasfını muhafaza etmektedir Ancak bazı kısımlarda (Şekil 3) podzollaşma fazlaca görülmüştür.

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3 — Araştırma yerinin bitki örtüsü, üst ağaç katı, alt ağaç katı, çalı, katı, ot katı ve yosun katı olmak üzere beş tabakalı bir orman vejetasyonudur. Ağaç katında *Fagus silvatica* ve *Quercus robur* hakim durumdadır. Bazı kısımlarda sık sık *Acer pseudoplatanus*'a ve seyrek olarak da *Betula pubescens, Castanea sativa* ve *Fraxinus excelsior*'a rastlanır.

4 — Alt ağaç katında *Ilex aquifolium* çalı katında ise *Rubus fruticosus* - *Rosa arvensis* ve *Ilex aquifolium* hakimdir. Ot ve yosun katı ise, çalılardan *Rubus fruticosus* da dahil, *Rubus* grubu, *Rubus - Pteridium* grubu, Yosun grubu olmak üzere 3 ayrı gurupta toplanarak mütalaa edildi.

5 — Araştırma yerinin vejetasyonu ayrıca Goodall'un istatistik metodu ile de tasnif edildi ve bu tasnifteki bitki grupları yukarıda ismi geçen gruplara çok yakın bulunduğu için Goodall'un bu metodunun bu tip orman vejetasyonlarını ekolojik yönden guruplandırmada kullanılabileceği kanaatına varıldı.

6 — Denny Enclosure de kayın gençliğinin hakim durumda olması buranın uzun yıllardır hayvanlardan korunmuş olması ile ve buradaki yaşlı kayın ağaçlarının meşe ağaçlarından daha fazla olması ile izah edilebildi.

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I. INTRODUCTION

Field studies for this work were carried out, under the supervision of Dr. LAMBERT, in the University of Southampton, England, in 1956 and the paper was written in the Science Faculty of Ankara in 1958.

The area which I have chosen for my present work is one of the few valuable places in the New Forest. Though there are some descriptions of this area in CHADWICK'S paper (unpublished, 1955) he does not go farther than a generel description, such as bog vegetation, woodland vegetation etc. In the present paper soil profiles and vegetation have been described in greater detail and it is attempted to give farther ecological information about the present structure of the soil and the present status of the woodland. We wanted to know, especially, how far the soil of the woodland is changing, what is the present position of beech and oak regeneration, and finally how far the statistical method of GOODALL is useful for classification of a climax woodland vegetation. The first two questions are rather important for British Forestry in order to know the stability of the woodland itself. The last one is important theoretically with the scop of ecological classification of vegetation, because in recent years

some ecologists seem to suggest that this method may be more advantageous than previous ones. The skeleton of the map on which the survey carried out during the summer months of 1956,

Table I.

Mean temperatures

	Months												
Years	1	2	3	4	5	6	7	8	9	10	11	12	Means annual
1946	4.0	6.9	5.8	10.7	12.0	13.7	17.1	15.7	14.9	11.2	9.0	3.4	10.3
1947	3.2	—0.4	5.5	9.6	13.6	16.5	18.1	20.7	16.3	11.7	8.2	5.8	10.8
1948	6.6	5.4	8.8	10.2	13.3	14.9	16.9	15.9	14.9	11.0	8.6	6.6	11.1
1949	6.4	6.5	5.9	10.4	12.0	16.0	18.8	12.5	17.6	13.5	8.0	6.8	11.2
1950	5.0	7.1	8.7	9.1	12.7	17.1	17.1	16.8	14.2	11.0	7.3	2.1	10.7
1951	5.2	4.9	5.6	7.9	9.6	15.9	17.5	15.0	15.2	10.8	9.4	7.2	10.4
1952	3.4	3.4	7.0	9.9	13.8	15.0	17.7	16.9	11.4	9.4	4.4	4.1	9.7
1953	3.8	4.6	6.7	9.2	13.8	15.0	15.4	17.8	15.0	11.1	9.2	8.2	10.8
1954	3.6	3.8	7.2	8.5	11.8	14.2	15.2	15.2	14.0	12.4	8.3	7.4	10.1
1955	3.8	3.0	4.1	9.9	10.8	15.3	18.9	19.0	15.0	10.4	8.2	7.5	10.5
1956	4.9	0.6	7.4	8.1	13.3	14.7	17.0	15.2	15.6	10.6	6.7	6.5	10.0
Means monthly	4.5	4.2	6.6	9.4	12.4	15.2	17.3	16.5	14.9	11.2	7.9	6.0	

was taken from NOEL CHADWICK'S unpublished paper (Nature reserve 30 an ecological survey 1955). The distribution of soil and vegetation is shown on it.

II. GENERAL DESCRIPTION OF "NATURE RESERVE 30" AS A WHOLE

"Nature Reserve 30" is over 12 kilometers in extend lying to the South East of Lindhurst. The north boundary of the reserve is Beaulieu River, which drains three bogs and joins into Matley Bog in the North-East. In the East and South-East Blackdown West, Tumulus Head and Woodfidley Head lie on the high land, while Shatterford Bottom and Denny Bog together constitute Southern bog system and drain into Shatton

Water. Denny Wood and Denny Enclosure cover a gently undulating high ground between Matley Bog and Denny Bog. All woodlands including Denny Enclosure, are administered by a forestry comission as a crown woodland, preserved from felling and cleaning since 1939. The headlands and bogs, under the name of common land, are under the juristiction of Verdever's Court at Lindhurst.

A. Topography and geology.

The reserve lies on the tertiary deposites. Matley Head, Blackdown West, including some north parts of Denny Wood and North-East margins of Denny Enclosure, with some parts of plateau gravel caps are scattered in the different parts of the area. Three of the plateau gravel caps occupy a considerable area of Matley Head, Blackdown West and Furzy Brown. All woodlands, except Matley Wood, lie on the sandy clays of Headon Bed. Alluvial clay and sandy clays mainly covering the lowlands including waterlogged areas, while a thin peat occurs in the head lands and dry bogs. Some parts of high groud where stuated Denny Enclosure and Denny Lodge Wood are separated from Denny Lodge Enclosure by Matley Bog. "In the reserve landscape thus may be Eocen".

B. Climate

For the climate of New Forest there were not obtained any useful data except general informations given by YOUNG (1935). However, the data Southampton Meteorlogical Station, which is not farer than 30 km. from the surveying area, may be useful for a general description of its climate. In this part of Great Britain climate is not so variable, and woodlands deep enough inland to escape salt-bearing winds, though the climate is rather costal one.

1. Air Temperature. The distribution of the mean, maximum and minimum temperatures in the months and years are shown in tables (1, 2, 3). For eleven years the lowest mean annual temperature, with 9.7° c., occurred in 1952 and the highest one (11.2° c.) in 1949. The minimum of mean temperature (— 0,4 c.)

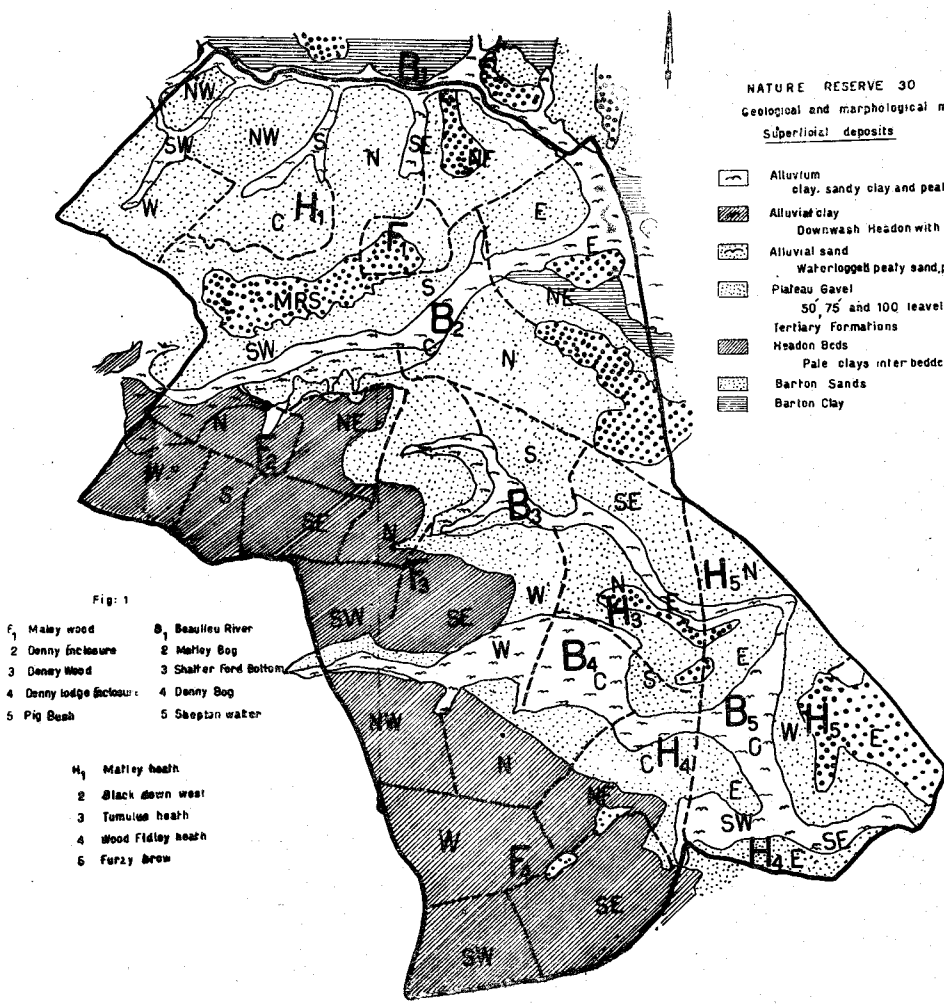
NATURE RESERVE 30
Geological and morphological map
Superficial deposits
Alluvium
clay, sandy clay and peat
Alluvial clay
Downwash Headon with gravel sand
Alluvial sand
Waterlogged peaty sand, peat on sand
Plateau Gavel
50' 75' and 100' leavels
Tertiary Formations
Headon Beds
Pale clays interbedded with sands
Barton Sands
Barton Clay
Fig: 1
F1 Maley wood
2 Denny Enclosure
3 Denny Wood
4 Denny Lodge Enclosure
5 Pig Bush
B1 Beaulieu River
2 Morley Bog
3 Shalter Ford Bottom
4 Denny Bog
5 Sleepton water
H1 Morley heath
2 Black down west
3 Tumulus heath
4 Wood Fidley heath
5 Furzy Brow

Table 2

a) Means of Maximum temperature
b) Means of Minimum temperature

Years		1	2	3	4	5	6	7	8	9	10	11	12	Means annual
1946	a)	7.0	10.1	9.5	16.9	16.6	17.7	22.0	19.8	18.4	14.5	11.9	6.8	15.1
	b)	1.0	3.7	2.1	5.5	7.4	9.6	12.2	11.5	10.7	7.7	6.1	0.2	6.5
1947	a)	6.2	1.7	8.8	14.4	18.6	21.3	21.3	26.7	21.3	16.6	11.6	8.6	14.8
	b)	—0.2	—2.4	2.2	5.3	9.1	11.8	11.0	14.7	11.4	6.8	4.8	3.1	6.5
1948	a)	9.8	8.7	13.8	15.5	19.0	19.3	21.4	20.1	19.4	15.5	12.2	9.4	15.4
	b)	3.5	2.0	3.7	5.0	7.4	10.5	12.4	11.8	10.5	6.6	4.9	3.8	6.8
1949	a)	9.8	10.7	9.9	14.3	17.2	21.4	24.6	24.0	22.5	17.7	11.5	9.9	16.1
	b)	3.0	2.3	1.8	6.5	6.9	10.7	13.0	13.0	12.6	9.3	4.4	3.7	7.3
1950	a)	7.3	10.1	12.9	13.5	17.8	22.2	21.2	21.0	17.8	14.6	10.7	4.8	14.5
	b)	2.7	4.0	4.5	4.7	7.7	12.0	12.0	12.7	10.5	7.4	3.9	—0.6	6.8
1951	a)	8.0	7.0	8.9	12.5	13.4	20.0	22.2	20.1	19.2	15.3	12.3	9.9	14.1
	b)	2.4	1.8	2.3	3.3	5.7	10.1	12.8	11.8	11.2	6.3	6.5	4.7	6.6
1952	a)	6.0	6.7	10.2	15.2	18.8	20.5	22.9	21.4	15.8	12.9	7.2	6.9	13.7
	b)	0.8	0.2	3.9	4.6	8.7	9.8	12.4	12.4	7.1	5.9	1.6	1.3	5.7
1953	a)	6.4	7.7	12.3	13.7	18.3	20.0	20.5	22.2	19.6	15.5	12.3	10.7	14.9
	b)	1.1	1.4	1.1	4.7	9.2	10.9	12.3	12.4	10.4	6.8	6.2	5.7	6.8
1954	a)	6.4	6.7	10.9	13.8	16.6	18.3	19.2	19.1	18.3	15.5	12.2	10.3	13.9
	b)	0.8	1.0	3.5	3.1	6.9	10.1	11.2	11.2	9.7	9.4	4.4	4.4	6.3
1955	a)	6.4	6.2	8.2	14.8	15.5	19.8	24.6	24.6	20.0	14.9	11.6	10.7	14.8
	b)	1.1	—0.2	0.0	4.9	6.1	10.8	13.0	13.4	10.0	5.8	4.8	4.3	6.2
1956	a)	8.6	3.8	11.7	13.1	19.5	19.3	21.3	19.8	19.3	15.0	13.3	8.8	14.4
	b)	1.3	—3.3	3.1	3.2	7.2	10.2	12.7	10.7	11.9	5.9	3.0	4.2	5.9
Means	a)	7.4	7.3	10.6	14.3	17.4	19.9	21.9	21.7	19.2	15.3	11.2	8.8	
monthly	b)	1.5	0.9	2.5	4.6	7.4	10.6	12.3	12.3	10.5	7.1	4.6	3.2	

Table 3 A.

Absolute Maximum temperatures

Years	1	2	3	4	5	6	7	8	9	10	11	12	Means annual
1946	12.7	19.4	19.9	21.0	21.0	22.2	22.7	31.0	26.0	21.0	17 7	11.9	20.6
1947	12.2	16.6	13.8	21.0	27.7	31.0	30.5	33.8	26.6	23.3	17.2	12.7	22.2
1948	13.1	15.5	20.5	22 2	27.7	24.4	31.6	31.0	23.3	22 2	16 6	14 4	22.8
1949	12.2	13.8	18.2	26.0	21.6	29.9	30.5	29.9	28.3	23.8	15.5	12.7	21.9
1950	12.7	15.0	18.8	18.8	24.9	29.9	24.4	26.0	22.2	19.9	13.3	11.6	19.8
1951	11.6	11.1	13.3	24.9	20.5	23.3	27,7	23.8	24.4	18 8	16.6	12.2	19.0
1952	11.6	12.2	14.9	22.7	27.1	28.8	32.1	25.5	21.0	16.0	14.4	12 2	19.4
1953	9 8	15.0	18.8	21.6	25.5	28.3	23.8	28.8	25.5	21.6	14.9	14.9	20.7
1954	14.0	12.2	15.5	17.2	26.0	22.7	23.3	26.6	23.8	19.9	16.0	14.9	19.3
1955	12.2	13.8	14.4	19.4	21.6	24.4	30.5	29.4	24.4	20.5	17.2	13.8	20.1
1956	14.4	11.6	16.6	18.3	25.5	25.5	27.7	23.8	19.4	14.9	14.9	13.8	19.6
Means monthly	12.4	14.2	16.8	21.2	24.4	26.4	27,7	28.1	24.1	20.2	15.8	15.2	

Table 3 B

Absolute Minimum temperatures

Years	1	2	3	4	5	6	7	8	9	10	11	12	Means annual
1946	—6.1	—5.5	—4.4	—1.6	1.6	6.1	8.3	6.6	6 5	—1.1	1.1	—6.6	0.40
1947	—8.8	—9.4	—4.9	0.5	3.3	6.1	7.7	10.5	4.4	—0.5	—3.8	—6.6	—0.12
1948	—2.7	—8.3	—0.5	1.6	1.1	6.6	7.7	6.6	1.6	1.6	—0.6	—1.4	0.41
1949	—2.2	—4.0	—3.3	0.5	1 6	6.1	8.3	8.3	8.3	0.5	—1.6	—2.7	1.65
1950	—5.0	—2.2	—3.3	0 5	4.4	6.6	9.4	9.4	2.7	—1.6	—0.5	—4.4	1 30
1951	—2.7	—1 6	—2.7	0.0	0.5	6.1	8.3	8.3	5 5	—1.1	—1.1	—3.3	1.34
1952	—8.3	—4.4	—1.6	—2.7	2.7	3.8	5.5	8 3	1.1	—2.7	—5.5	—3.3	—0 60
1953	—4.4	—4.9	—3.8	1.1	1.1	5.5	9.4	8 3	6 1	3.3	0.5	—0 5	1.8
1954	—7.7	—7.7	—4.9	0.5	1.1	6.1	6.1	7.7	3.3	—1.1	—2.7	—4.9	—0.35
1955	- 8.3	—5.0	—5.4	1.1	1.6	4 4	8.3	7.2	4.4	—1.6	—1.6	—2.2	0.24
1956	—2.7	—8.8	—3.8	—0.5	2.2	4.9	9.9	7.7	7.2	0.0	—3.8	—3.3	0.75
Means monthly	—5.3	—5.6	- 3.5	0.0	1.9	5.6	8.0	8.0	4.6	—0.4	—1.6	—3.6	

was in February of 1947, while maximum of mean temperature (20,7° c). occurred in August of 1947. The coldest month of the year is Fabruary, and the hottest month is July. The annual means of maximum temperature for eleven years change between 13, 7 - 16, 1° c., However the highest mean of monthly maximum temperature with 21,9° c. was in July and the lowest one (7,3° c.) in February. The highest mean of monthly absolute maximum temperature (28,1° c.) was in August and the lowest one (12,4° c.) was in January. The highest absolute maximum temperature (33,8° c.) for eleven years was in August. of 1947, while the lowest one (9,8° c.) was recorded in January of 1953. Yearly absolute minimum temperature was changing between (— 0,60° c.) — (1,8° c). The lowest mean of monthly absolute minimum temperature (— 9,4° c), in eleven years, has been recorded in Fabruary of 1947.

2. **Relative Air humidity.** The distribution of air humidity in months and years are shown in Table 4. The highest mean relative humudity recorded at 21.00 o'clock either in years or in months.

3. **Rainfall.** It is shown in Table 5 that the highest yearly rainfall with 1169 mm. occurred in 1951, the lowest one (616 mm.) in 1947. The most rainy month (102,5 mm.) was November. For ten years the most dry months, with 6 mm. and and 9 mm., are April of 1954 and 1955.

III. BIOTIC FACTORS IN "NATURE RESERVE 30"

As YOUNG quated (1935) from the records of LASCELLES (1915) and HEYWOOD SUMMER (1917), New Forest is an ancient royal hunting place, and supposed too that is was so even in Norman times. For the purposes of hunting and sports they preserved all tracks with tickets. It is believed that the extentions of the forest was not so much different from that of to-day (YOUNG 1935), except marginal areas. "Though it is understandable from the Domesday Book that some parts of the forest had been destroyed by neighbour villagers to lay agricultural lands" until WILLIAM THE NORMAND revised the forest

Table 4.

The Relative air humidities

Months	1		2		3		4		5		6		7		8		9		10		11		12		Means annual %	
Hours	9	21	9	21	9	21	9	21	9	21	9	21	9	21	9	21	9	91	9	21	9	21	9	21	9	21
1946	85	87	86	84	79	85	73	73	72	85	75	78	70	83	80	86	83	91	82	83	89	91	92	97	80	85
1947	87	88	95	92	92	88	75	82	69	82	74	66	71	82	90	92	67	67	77	83	91	89	78	86	80	83
1948	90	95	75	90	87	87	76	81	63	78	75	86	66	88	82	87	75	79	79	90	89	96	82	88	75	87
1949	89	89	89	85	82	82	78	83	66	79	71	78	66	74	66	81	84	87	96	89	87	88	88	79	83	81
1950	92	90	85	86	80	82	72	77	66	77	71	82	79	89	78	87	81	87	83	87	87	89	91	91	80	85
1951	77	90	88	86	82	85	85	82	73	78	70	80	74	80	78	85	84	90	87	87	87	89	89	79	81	84
1952	86	86	86	82	83	87	74	78	73	80	69	77	65	77	75	84	75	83	81	84	83	87	90	89	78	82
1653	90	89	87	86	79	81	69	76	70	78	72	81	75	84	70	82	76	84	87	90	90	91	93	92	80	84
1954	88	87	91	92	81	84	63	71	65	78	86	73	83	82	88	80	88	87	91	86	91	89	87	80	85	78
1955	91	89	90	85	70	74	71	81	64	83	74	80	67	77	80	81	74	85	81	73	86	85	90	87	78	81
1956	89	86	90	85	73	78	71	76	66	71	69	79	74	86	82	89	84	85	82	83	93	90	79	81	77	82
Means monthly %	87	90	87	86	80	83	73	78	68	79	73	79	70	81	75	83	79	85	85	87	87	89	88	88		
means of 9,21 %	83.5		86.5		81.5		71.5		73.5		76.0		75.5		79.0		82.0		86.0		88.0		88.0			

lows. The early woodland was a beech and pedonculate oak wood with predominant beech, and there was no conifer tree until the introduction of pine trees in 18^{th}. century. Some other trees such as birch, ash, holly, crab apple, white beam, and some shrubs (hazel, hawthorn, dog wood, rose and alder) were abundant in the forest before. Denny Wait and Denny Wood, with its old oaks and beechs, are considered (by SUMMER 1917) the oldest one of New Forest. In early times the forest was reserved only for deer while domestic animals were restricted to roaming and grazing. However, in different times they permitted even grazing of domestic animals and provided timber from the woodlands. Under these felling for timber and heavy grazing the woods suffered in regeneration of beach and oak trees and in extension of the wood itself until 1483 when the necessity of enclosure had been realized. Since 1600 the forest replanted in some areas (Old Woodfidley) to beech and pedonculate oak with some sessile oak, in Black Bush (1756) pedonculate oak replanted. Later in 1820 Little Holm-Hill enclosed and replanted with pedonculate oak and some beechs, but later in 1870 the West and South parts of Denny Enclosure were felled and replanted with scots pine, american douglas firs. Probably, at that time first Acer introduced (without awaire) into east parts of Denny Wait.

Between 1860-1918, for timber need, introduced some new species such as corsican pine, european and japanese larchs and norway spruce. In the last twenty years nearly three thousand oaks have been replanted on different areas of Denny Wood, and in 1951 nearly twenty acres of oak-beech wood cleared and replanted in the South-East of Denny Wood, which is omitted of my present survey. For more than fifteen years Denny Enclosure has been kept closed to animals and men, although the author of this paper sometimes observed that pig flocks were roaming in Autumn, Besides this some Squirrels Rabits, and hares are present in Denny Enclosure. Except foresters, other people have been prohibited from coming into woodland, while Denny Wood has always been open to animals and men. Some pig flocks and ponies which graze in neighbour bogs often come in Denny Wood. Even people

Table 5.

Distribution of rainfall in the years and months

Years	1	2	3	4	5	6	7	8	9	10	11	12	Total Rainfall
1946	69	77	25	69	108	97	25	110	93	36	139	84	932
1947	75	45	170	55	28	34	23	25	28	28	34	71	616
1948	142	30	23	45	96	59	21	92	86	47	43	112	796
1949	20	36	37	46	63	12	8	24	86	217	96	36	681
1950	20	127	39	62	32	43	112	103	87	13	151	40	829
1951	102	153	109	86	91	29	54	126	86	28	235	70	1169
1952	50	18	62	39	61	35	18	66	100	91	84	71	695
1953	23	36	14	46	67	69	111	47	88	144	34	20	699
1954	37	81	83	6	53	90	66	96	78	81	139	74	884
1955	91	52	30	9	108	69	34	24	43	119	70	107	756
Average rainfall												68.5	
	62.9	65.5	59.2	46.3	70.7	53.7	47.2	71.3	77.5	80.4	102.5		

come for Sundays and Saturdays picnics in Summer months. In both Denny Wood and Denny Enclosure there are some forest paths crossing the woodland in different directions.

IV. MATERIAL AND METHOD

To facilitate the investigation a permanent transect was layed between the North of Denny Enclosure and the west of Denny wood (fig. 2). On this transect for every hundred meter we had some temporary transects which crossed the first one rectangularly. Thus the surveying area is divided into 107 quadrats each of them covering 100×100 m^2. and in each quadrat soil profiles, plant species and diameters of trees are recorded in areas contain 20×20 m^2. In recording the vegetation only some important species are shown in their actual abundance while others are shown only as present (X), though it is rather difficult to estimate the abundance of every species in a large area of 400 m^2. Because shrub layer and lower tree layer (mostly consisting of *Ilex aquifolium*) prevented the observer from seen the whole quadrat

Fig: 2

Distribution of quadrates in the Denny Wood and Denny Enclosure

After recording all data, including soil profiles tree sizes, the vegetation is described according to its structure and composition, then classified by a special statical method which will be explaned later. For this purpose we had 107 punced cards, which were prepared properly, each of them representing one quadrat. The margins of the cards are cut out in those portions which correspond to the species present. Thus if one examines the edges of the cards he can easily see all species present in the quadrats and their proportions Then, for testing homogeneity, for each species 2×2 tables were prepared in order to find out whether both species are positively associated. As a result of this procedure, the vegetation of woodland is divided into three groups. In this classification the main creteira are heterogeneity of vegetation and frequencity of species (for further details see the text).

V. THE SITUATION OF ECOLOGICAL FACTORS AND VEGETATION IN DENNY WOOD AND DENNY ENCLOSURE.

A. Soil. The woodland covers a high ground where Denny Enclosure lies on the top, while Denny Wood covers East and South slops. A permanent transect which was layed by author (Fig. 2) between the North of Denny Enclosure and the South West of Denny Wood, divides the woodlands into two sections. As shown on the soil map and the soil profiles in many areas, especially in the temporary transects which cross the numbers 6, 11, 36, 61 of the woodland the soil contain superficial clay and gravel, while in the West parts of the Denny Enclosure (31D″, 36D″. 41, 46, 46A″B″C″D″, 51), it is clearly sand with superficial gravel. In Denny Wood, with exception of temporary transects which cross the numbers 36, 61, 71 and quadrates 41A′, 46A′C′, 51C′, 56B′C′, the soils are sandy or sandy clay, and gravel often starts deeper than 30 cm. However some quadrates (1A′, 16A′B′, 21A′B′C D′, 26, 31C′A″51B′B″G′, 56F′, 61A′, 71G′) are composed of sandy soils and have no superficial gravel (Fig. 3, 4).

The soil of woodland may be divided into two categories from the point of view of their physical structures:

1. **Shallow soils.** These often occured in the high ground, especially along the permanent transect where there is a heavy grey clay with a great deal of gravel overlayed by a superficial grey sand. Profile 46A′ may be typical example for this kind of soils. Here there is a zone of grey sand (10 cm.), which is melanised by decayed humus, and overlayed by three cm. of raw humus (Mor). Below it there is a heavy grey clay, often mottled and patched in orange colour by iron sesquioxydes, associated with a great deal of gravel.

2. **Deep soils.** This kind of soils often occurred in Denny Wood and some areas of Denny Enclosure (profile 16B′), where the dominant soils are yellow sand. Its upper part, blackened by decayed humus, often doesn't exceed 2 cm.

In some parts of the surveying area podzolization occurred, though most areas of woodland are still brown forest soil. As has been known since long time raw humus is a very important factor for podzolization and it occurs very frequently in Western England and North Western Europe where the climate is rather cool and rainfall is high.

B. Vegetation.

Regarding its structure the vegetation of Denny Wood and Denny Enclosure may be described in five layers :

1. **Upper Tree Story.** This layer is mostly composed of beech and oak trees, their average lengths vary between 20-30 m. Beech as an adult tree has a large and thick crown and very superficial roots. For this reason the ground under beech trees are dry and shaded very strongly. The trees may be thrown easily by strong winds because of superficial roots. As shown in Fig 5, 6, 7 in many parts of the surveying areas beech is dominant. In Denny Enclosure, with the exception of transect one (completely) and quadrats 31B′, 36A″B′, all quatrats are dominated by beech. In the South-East parts of Denny Wood (46F′, 56E′F′G′, 61F′, 66E′, 71F′) oak is predominant

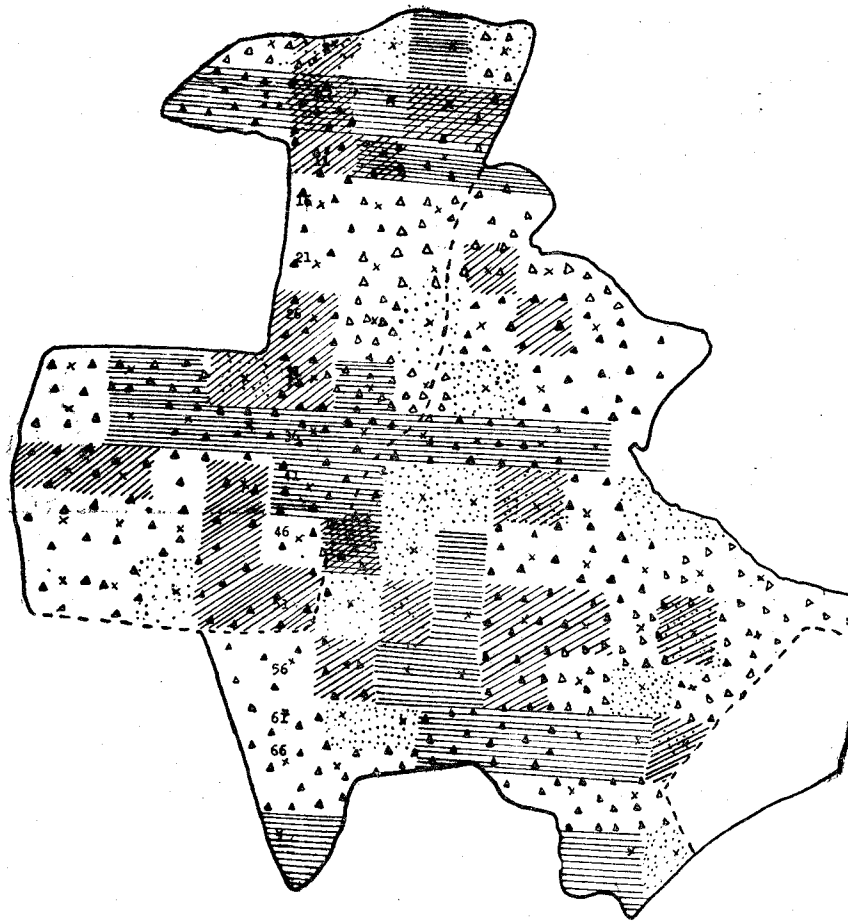

Fig:3 Soil map

Clay not deeper than 28 cm.
Gravel not deeper than 20 cm.
Gravel deeper than 20 cm.
Sandy soils
Podzolic soils

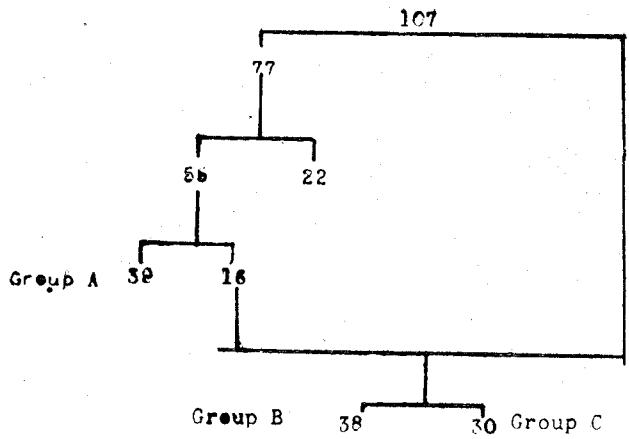

Fig. 4. Stages in the separation and recombination of groups

while in other parts both beech and oak share the dominance between each other. Besides these trees some other such as *Quercus petraea*, *Acer pseudoplatonus*, *Castanea sativa*, *Fraxinus excelsior*, *Betula pubescens*, *Abies procera* occur in the woodland. Among these trees *Acer pseudoplatanus* is frequently present in the marginal areas and very abundant in the quadrats 11B′, 16A′B′ (as seedlings) where beech and oak are not so abundant. Some authors suggested that the introduction of Acer, into this woodland, occurred at that time together with Pinus plantation though its time is not quite certain *Fraxinus excelsior* also occurs (especially as young seedlings) in the moderatly shady areas where soil are wet enough.

2. **Lower Trees Layer**. In this story the dominant tree is *Ilex aquifolium*. Except very few quadrats, this shrub is very abundant in the temporary transects cresses the numbers 31, 36, 41, 46 where the tree canopies are rather closed. *Ilex aquifolium* colonised easily strongly shadowy places and produces a continuous layer, though its density changes in short periods because it seldom lives longer than thirty years. Among the trees of this story *Crataegus monogyna* is often present in places where the canopy is open and soil is rather wet, but it may easily die out, where the canopy gets closer.

3 **Shrub Layer**. Shrubs cover different areas, indifferent thickness, where the tree canopy is not so much closed. Their height does not exceed three meters. Among the shrubs *Rubus fruticosus* often with *Pteridium aquilinum* (from herbs) occurs in many parts and is very abundant in the quadrats 21B′, 31D′, 41E′F′, 56E′, 66, 56F′, 46A′E′ and 71F′ where the tree canopy is open and soil is sandy *Rosa arvensis* with *Rubus fruticosus* together are present in 18 quadrats where the soils are sandy and rather wet. Both shrubs, with their pricky and compact branches, established themselves and have spread out quickly when they had been introduced into woodland, except in the wet areas of the quadrat 51E′. *Calluna vulgaris* also frequently occurs in the quadrats 51A″B″C″D″, 61B′ and is very abundant, with some grasses, *Erica tedralix*, *Sphagnum subsecundum* in the transects 51 where the soil is very wet (ill drained) and fully illuminated.

Table 6 (Group: A)

Numbers are showing percentages of abundances

Covers of trees %	95	80	90	90	70	60	90	80	80	70	70	50	50	85	95	60	95	95	80	70	85	98	.	90	65	65	85	85	40	85	80	80	98	95	75	95	90	90	80	
Numbers of stands	36 A′	36 B′	41 A′	41 D′	41 F′	46 A′	46 B′	46 C′	46 E′	46 F′	46 D″	51	51 A′	51 B′	51 C′	51 D′	51 E′	51 G′	51 H′	56	56 A′	56 B′	56 C′	56 D′	56 E′	56 F′	56 G′	61 C′	61 D′	61 E′	61 F′	61 G′	66 ′	66 A′	66 E′	66 F′	71 ′	71 F′	71 G′		
Quercus robur	x	x	x	x	x	x	x	x	.	.	.	x	x	x	x	x	x	x	.	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	35
Quercus petraea	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
Fagus silvatica	x	x	x	x	.	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	.	x	x	.	x	x	x	x	x	x	x	x	x	36
Acer pseudoplanatus	.	x	.	x	x	.	.	.	x	x	.	.	.	.	.	x	.	.	x	.	.	.	.	x	.	x	.	.	x	x	.	.	.	x	x	.	.	.	.	13
Betula pubescens	x	x	x	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	x	x	x	.	.	x	x	.	.	x	.	.	x	.	12
Castanea sativa	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Fraxinus excelsior	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Pinus silvestris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	x	.	.	.	.	.	x	.	.	.	.	.	4
Ilex aquifolium	20	20	20	20	.	x	20	20	20	20	40	20	.	x	20	20	x	x	x	20	20	20	20	20	x	.	20	20	.	x	.	20	20	x	20	20	20	20	20	34
Crataegus monogyna	x	.	.	.	.	.	.	.	.	x	.	.	.	x	x	x	.	.	.	.	.	.	.	x	.	x	.	x	x	.	x	.	x	x	x	x	x	x	x	17
Rubus fruticosus	x	x	x	x	25	x	x	x	35	10	x	x	x	20	x	x	x	x	20	x	x	x	x	20	30	x	x	x	x	x	x	x	x	x	x	x	x	20	x	39
Rosa arvensis	.	x	x	.	.	.	x	x	.	.	.	.	x	x	x	x	.	.	.	x	.	x	.	x	x	.	.	x	x	x	.	.	x	x	x	.	x	.	x	20
Hedera helix	x	x	x	20	x	x	x	x	x	10	x	x	x	15	x	10	20	x	x	x	20	10	x	50	20	20	10	x	x	x	20	x	x	x	x	x	x	x	x	39
Lonicera periclymenum	.	x	x	x	10	x	.	x	x	.	.	x	x	20	.	x	.	x	x	x	x	x	x	x	x	x	x	x	.	x	x	x	.	x	x	.	x	x	x	30
Ruscus aculeatus	.	.	.	x	.	x	x	x	.	.	.	.	.	x	x	.	.	.	.	x	.	.	x	.	.	.	.	.	.	.	.	.	x	.	.	x	.	.	x	11
Hypericum sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	4
Erica tetralix	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Rhamnus frangula	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Carex silvatica	x	.	.	.	.	.	.	.	.	.	10	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Poa trivialis	.	x	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	3
Juncus effusus	.	x	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	x	x	.	.	.	.	.	x	.	.	x	.	.	.	.	.	.	.	.	.	.	.	6
Anemone nemorosa	.	.	.	.	.	.	.	.	.	.	.	x	.	.	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	x	30	.	.	x	.	.	.	.	.	6
Oxalis acetosella	.	x	10	x	.	.	x	x	x	x	20	x	.	x	x	x	.	x	x	10	x	.	.	x	x	.	40	.	.	.	.	.	.	.	.	.	.	.	.	19
Agrostis stolonifera	x	x	x	x	x	40	x	20	x	x	x	x	80	20	x	60	x	x	x	10	10	x	x	40	40	40	10	x	x	x	65	50	x	x	x	x	50	x	x	39

Table 6 (Group: A) (continued)

Numbers are showing percentages of abundances

Covers of trees %	95	80	90	90	70	60	90	80	80	70	70	50	50	85	95	60	95	95	80	70	85	93	.	90	65	65	85	85	40	85	80	80	98	95	75	95	90	90	80	
Numbers of stands	36 A′	36 B′	41 A′	41 D′	41 F′	46 A′	46 B′	46 C′	46 E′	46 F′	46 D″	51	51 A′	51 B′	51 C′	51 D′	51 E′	51 G′	51 H′	56	56 A′	56 B′	56 C′	56 D′	56 E′	56 F′	56 G′	61 C′	61 D′	61 E′	61 F′	61 G′	66 ′	66 A′	66 E′	66 F′	66 ′	71 F′	71 G′		
Euphorbia amygdaloides	x	.	x	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	x	6
Viola canina	.	x	.	.	.	.	x	x	.	x	x	.	.	.	x	x	.	.	x	.	.	x	.	x	x	x	x	x	.	x	x	x	.	.	x	x	.	.	x	20
Digitalis purpurea	.	.	.	.	x	.	.	.	x	x	x	.	.	.	.	x	x	.	x	.	.	x	.	x	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	10
Geranium robertianum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Stellaria holestea	.	x	.	.	.	.	.	.	.	.	.	x	x	x	.	.	.	.	x	x	.	.	.	.	x	.	.	x	.	.	.	x	.	.	.	.	.	.	.	9
Ajuga reptans	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	x	.	3
Luzula sp.	.	.	.	x	.	.	.	.	x	x	.	.	x	.	.	.	.	x	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	.	.	.	.	7
Ranunculus acer	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	x	x	.	.	.	.	.	.	x	.	.	.	.	x	.	.	5
Potentilla erecta	.	20	.	x	x	.	.	.	.	.	.	.	x	.	.	.	.	.	x	x	.	x	.	.	x	x	.	x	x	x	x	.	.	.	.	x	x	.	.	15
Anthoxanthum odoratum	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Circa lutetiana	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	x	.	.	x	.	.	.	.	x	x	x	.	.	.	.	.	6
Pteridium aquilinum	x	x	x	x	60	x	x	x	10	60	x	x	30	x	x	40	x	10	x	10	.	x	x	x	40	10	x	x	x	x	15	.	x	.	x	x	.	10	.	34
Galium hercynicum	.	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Chamaenerium angustifolium	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Festuca ovina	.	.	.	.	.	10	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Veronica chamaedrys	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	2
Dicranium scoparium	.	.	.	x	.	.	.	.	.	.	x	x	x	.	x	.	x	.	x	.	.	.	x	.	.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	10
Leucobrium glaucum	x	.	.	.	.	.	.	.	.	.	x	.	x	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	5
Stereodon cupressiformis	x	.	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	.	x	x	x	x	x	x	x	x	x	x	x	x	x	.	x	x	36
Minium hornum	20	x	.	.	x	x	x	x	x	x	x	x	x	x	x	.	.	x	x	.	.	.	x	.	.	.	.	.	.	x	.	x	x	.	.	.	.	.	.	19
Polytrichum formosum	20	x	x	10	x	x	x	x	x	x	x	x	x	x	.	x	x	.	x	x	20	x	x	x	x	x	x	.	.	x	x	x	x	x	x	.	x	x	x	34
Thuidium tamariscinum	x	x	.	.	.	x	x	x	x	.	x	.	.	.	x	x	x	.	.	.	x	.	x	.	x	x	x	x	.	x	x	.	.	x	x	x	x	.	x	23
Sphagnum subsecundum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	.	x	x	x	.	.	.	.	x	.	x	7
Rhacomitrium lanuginosum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	1

Numbers are showing percentages of abundances

Covers of trees %	60	′	80	80	70	80	80	80	80	50	′	85	75	′	90	90	90	50	95	60	′	70	40	85	90	90	65	′	95	95	50	85	70	40	30	10	50	50	
Numbers of stands	1 A″	6 A″	6 B″	6 A′	6 B′	11 A′	16 B′	21	21 A′	21 B′	21 C′	21 D′	21 E′	26	26 A′	26 C′	26 D′	26 E′	31 D″	31 A′	31 B′	31 C′	31 D′	36 A″	36 D″	66 C′	36 D′	36 E′	41	41 D″	41 E′	46 G′	46 H′	51 D″	51 C″	51 B″	51 A″	61	
Quercus robur	x	.	x	x	x	x	.	x	x	x	x	x	x	x	x	.	x	x	.	x	x	x	x	x	x	.	x	.	x	.	.	.	.	x	x	x	x	x	28
Quercus petraea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	.	3
Fagus silvatica	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	38
Acer pseudoplatanus	.	.	20	20	x	20	50	x	x	x	x	x	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	x	.	x	.	.	.	.	x	14
Betula pubescens	x	.	.	.	x	.	.	.	.	x	.	x	.	.	.	.	.	.	.	.	x	x	20	.	.	.	.	x	.	x	.	x	x	x	x	x	x	15
Castanea sativa	.	.	.	.	x	.	x	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
Fraxinus excelsior	.	.	.	.	.	.	.	.	x	x	x	.	.	.	20	x	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
Pinus silvestris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	x	.	x	x	x	5
Ilex aquifolium	20	20	20	.	.	20	x	20	.	x	x	x	x	.	20	20	20	x	20	20	20	20	20	20	.	20	20	x	20	20	x	.	x	x	x	x	x	40	32
Crataegus monogyna	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	x	x	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	5
Rubus fruticosus	x	x	x	20	x	x	x	x	x	25	x	x	x	x	20	x	x	x	x	x	x	x	20	x	x	x	15	20	x	x	x	10	x	x	x	x	x	x	38
Rosa arvensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Hedera helix	20	x	x	x	.	.	.	.	.	x	.	.	.	.	x	.	.	.	x	x	x	.	.	.	x	x	.	.	x	.	.	.	x	.	.	.	x	.	14
Lonicera periclymenum	x	.	x	.	x	.	.	.	x	x	x	x	.	.	.	x	x	.	.	x	x	x	x	.	.	x	x	.	x	.	x	x	x	.	.	.	x	x	21
Vaccinium myrtillus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	2
Erica tetralix	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	x	.	3
Calluna vulgaris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	30	70	x	x	5
Myrica gale	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	20	.	x	.	3
Poa trivialis	x	x	.	x	x	.	.	.	x	x	10	10	.	.	.	.	.	.	.	.	x	.	10	.	.	x	x	x	x	.	.	10	.	.	.	.	.	.	15
Carex silvatica	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	.	.	.	3
Juncus effusus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	x	.	x	.	x	.	.	x	.	.	.	5
Anemone nemorosa	.	.	.	.	.	.	.	.	.	x	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	4
Veronica chamaedrys	.	.	x	x	x	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	x	x	.	.	x	.	.	.	.	.	.	7
Rumex crispus	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	3
Oxalis acetosella	x	x	x	x	x	x	.	30	x	x	10	x	x	.	x	x	x	x	x	.	30	.	x	20	x	.	.	x	20	x	x	x	x	.	.	.	.	.	27
Galium hercynicum	x	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Agrostis stolonifera	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	70	.	.	.	.	.	.	.	20	x	10	.	x	x	20	80	20	9
Euphorbia amygdaloides	.	.	x	x	.	.	.	.	.	x	.	.	.	.	.	.	x	x	x	.	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	8

Table 7 (Group : B) (Continued)

Numbers are showing percentages of abundances

Covers of trees %	60	′	80	80	70	80	80	80	80	50	′	85	75	′	90	90	90	50	95	60	′	70	40	85	90	90	65	′	95	95	50	85	70	40	80	10	50	50	
Numbers of trees	1	6	6	6	6	11	16	21	21	21	21	21	21	26	26	26	26	26	31	31	51	31	31	36	36	36	36	36	41	41	41	46	46	51	51	51	51	61	
	A″	A″	B″	A′	B′	A′	B′		A′	B′	C′	D′	E′		A′	C′	D′	E′	D″	A′	B′	C′	D′	A″	D″	C′	D′	E′		D″	E′	G′	H′	D″	C″	B″	A″		
Viola canina	.	.	.	x	x	.	.	.	x	x	x	x	.	.	.	.	x	x	.	.	.	.	.	.	.	x	.	.	.	.	.	.	x	•	.	.	.	.	10
Digitalis purpurea	.	.	.	x	.	x	.	.	.	.	.	x	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	x	.	.	.	.	6
Arum maculatum	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Endymion nonscriptus	.	.	.	.	.	.	20	.	.	20	10	x	x	.	.	x	x	x	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	9
Geranium robertianum	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Conopodium majus	.	.	.	.	.	.	.	.	.	x	x	x	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4
Stellaria holestea	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	x	.	.	.	3
Ajuga reptans	.	.	.	.	.	x	.	.	.	.	x	x	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4
Lusula sp.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	.	x	.	.	.	.	x	6
Ranunculus acer	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Lysimachia nemorum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Fectuca ovina	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	x	.	x	.	.	3
Potentilla erecta	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	x	.	.	x	.	x	x	x	7
Anthoxanthum odoratum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Juncus articulatus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	2
Pteridium aquilinum	x	x	.	x	x	.	x	.	x	40	30	40	50	.	.	.	x	75	x	.	20	x	70	x	.	x	x	x	x	.	60	10	x	x	50	x	20	40	29
Dicranium scoparium	.	.	.	.	.	x	.	x	.	x	.	.	x	.	x	.	.	x	.	.	x	x	.	.	.	.	x	20	x	x	.	.	.	.	.	x	x	.	14
Leucobryum glaucum	x	x	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	x	.	.	.	.	.	.	x	x	x	x	.	.	.	x	x	20	x	x	13
Stereodon cupressiformis	x	x	.	x	x	.	x	.	x	x	x	x	x	.	x	x	x	x	x	x	x	x	.	x	x	20	x	x	.	x	x	x	x	.	.	x	x	.	29
Ste. cup. var. filiformis	x	x	x	.	.	x	x	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	7
Minium hornum	x	x	x	x	x	.	.	.	.	.	x	.	x	.	x	x	x	x	x	x	x	x	x	.	.	x	x	x	x	x	x	x	x	x	.	x	.	.	26
Polytrichum formosum	x	x	x	x	x	x	.	x	.	.	x	x	x	.	x	.	.	x	10	x	x	x	x	10	x	20	25	20	20	x	x	x	.	.	.	x	x	x	29
Thuidium tamariscinum	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	x	.	.	.	x	.	x	.	.	x	x	x	.	x	.	.	.	x	x	10
Sphagnum subsecundum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	x	.	.	.	x	.	x	x	.	.	.	5
Rhacomitrium lanuginosum	.	.	.	.	.	•	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	1
Dryopteris spinilosa	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2

Table 8 (Group: C)

Numbers are showing percentages of abundances

Covers of trees %	70	60	70	80	70	88	60	90	90	95	90	90	85	90	95	80	95	95	95	95	90	95	97	85	90	95	98	98	20	
Numbers of stands	1	1 A′	1 B′	1 C′	6	11	11 B′	16	16 A′	26 B′	31	31 A″	31 B″	31 C″	36	36 B″	36 C″	41 A″	41 B″	41 C″	41 B′	41 C′	46	46 A″	46 B″	46 C″	46 D′	51 F′	61 A′	61 B′	
Quercus robur	x	x	x	x	x	x	x	.	.	.	x	x	x	x	x	x	x	x	x	.	x	x	x	x	x	x	x	x	x	x	26
Fagus silvatica	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	30
Acer pseudoplanatus	x	x	x	x	.	20	50	x	20	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x		.	10
Betula pubescens	x	x	x	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	5
Castanea sativa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	1
Fraxinus excelsior	.	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Abies procera	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	x	.	.	.	.	.	.	.	.	.	.	.	2
Ilex aquifolium	x	.	.	x	x	20	.	20	x	20	20	20	x	20	20	20	20	20	20	20	20	20	30	50	80	x	x	x	x	27
Crataegus monogyna	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	x	2
Rosa arvensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	1
Hedera helix	x	.	.	.	x	.	.	x	.	x	x	x	x	x	x	.	x	x	x	20	.	20	x	.	x	x	x	x	x	21
Lonicera periclymenum	.	x	x	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	x	6
Poa trivialis	.	x	.	.	x	.	.	.	.	.	x	.	.	.	x	.	20	x	.	.	.	.	.	.	.	.	.	.	.	6
Myrica gale	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	1
Calluna vulgaris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	1
Erica tetralix	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	1
Carex silvatica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	x	.	.	.	.	x	x	.	.	.	x	5
Anemone nemorosa	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	x	3
Oxalis acetosella	.	.	.	.	.	.	.	.	x	x	.	x	.	10	.	x	.	x	.	x	.	x	.	.	x	.	x	.	.	.	10
Agrostis stolonifera	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	x	.	x	.	.	.	4
Euphorbia amygdaloides	.	.	.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Viola canina	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	2

Table 8 (Group: C) (continued)

Numbers are showing percentages of abundances

Covers of trees %	70	60	70	80	70	88	60	90	90	95	90	90	85	90	95	80	95	95	95	95	95	90	95	97	85	90	95	98	98	20	
Numbers of stands	1	1 A′	1 B′	1 C′	6	11	11 B′	16	16 A′	26 B′	31	31 A″	31 B″	31 C″	36	36 B″	36 C″	41 A″	41 B″	41 C″	41 B′	41 C′	46	46 A″	46 B″	46 C″	46 D′	51 F′	61 A′	61 B′	
Arum maculatum	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Endymion nonscriptus	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Conopodium majus	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Stellaria holestea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	1
Luzula sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	x	.	.	.	2
Potentilla erecta	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	1
Circa lutetiana	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	x	2
Pteridium aquilinum	x	x	10	x	.	.	.	.	x	x	.	.	.	x	.	x	.	.	x	.	x	x	x	.	x	.	.	x	.	.	14
Dicranium scoparium	.	x	x	x	x	.	.	.	x	.	.	.	.	.	x	x	x	.	.	.	x	x	x	x	x	x	.	x	.	.	15
Leucobrium glaucum	x	x	x	x	x	.	.	.	.	.	.	.	.	.	x	x	.	x	.	.	.	.	.	x	x	.	.	.	.	.	10
Stereodon cupressiformis	.	x	.	.	x	x	x	x	x	x	x	x	x	x	x	20	x	20	20	x	x	x	x	20	20	.	x	x	x	x	26
St. cup. var. filiformis	.	.	.	.	x	x	x	x	X	.	.	.	.	.	.	.	.	.	.	X	.	.	x	x	.	x	.	.	.	.	9
Minium hornum	.	x	.	x	x	x	.	.	.	x	.	x	x	.	x	20	.	x	20	x	x	x	x	x	x	x	x	x	x	.	21
Polytrichum formosum	.	.	.	.	x	x	.	x	.	.	.	x	.	x	x	x	.	x	x	x	.	x	.	.	20	20	x	x	.	.	15
Thuidium tamariscinum	.	.	.	.	.	.	.	x	.	.	x	x	.	x	x	.	.	.	.	x	.	.	.	.	x	x	x	.	.	x	10
Sphagnum subsecundum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	x	2
Rhtidiodelphus loreus	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Rhacomitrium lanuginosum	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Juncus effusus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	1
Juncus articulatus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	1
Rhinanthus minor	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	1

4. Herb Layer. The distribution of the ground flora and their abundances largely depend on the dominant trees. They may grow sometimes very poorly or very luxuriantly according to the conditions of the habitat factors. Many species of the herb layer expand their vegetative and generative organs befor the dominant trees produce their leaves. As is shown in the Tables 5, 6, 7 the distribution of the ground flora is not homogeneous but is aggregated in different areas. According to the habitat factors we may describe them, including *Rubus fruticosus* from shrub layers, in three different societies:

a. *Rubus* society. This society is quite distinct and covers many marginal quadrats such as 36D″, 46E″, 71F′ in which *Rubus* is often dominant. In some quadrats (21B′, 31D′, 41F′) *Rubus* often associated with Pteridium, and they shared the dominance between each other. Among the plants of this society *Viola canina, Oxalis acetosella, Agrostis stolonifera, Poa trivialis, Potentilla erecta* and *Anemone nemorosa* frequently present in some quadrads Besides these *Endymion nonscriptus, Carex sylvatica Geranium robertianum, Anthoxanthum odoratum, Ajuga reptans, Conopodium majus* are the least frequent species. *Agrotis stolonifera* and *Poa trivialis* mostly occur in the illuminated areas where the soils are rather wet and where there is no litter cover. *Oxalis acetosella* is often present in the shadowy places but scarcely becomes dominant. *Juncus effusus Luzula sp., Ranunculus acer,* and *Circea lutetiana* seldom occured in the moderately illuminated wet areas, while *Anemona nemorosa* is rather abundant in the same areas *Rubus* and *Pteridium* are often abundantly associated with *Potentilla erecta* and *Viola canina* but the two last named ones never become dominant. *Endymion nonscriptus,* which is a geophyte, usually produces its vegetative and generative organs before dominant trees unfold their leaves and produced nearly pure stands in the quadrats 21C D′B′.

b. *Rubus - Pteridium* Society. In this society again *Rubus* and *Pteridium* are often present but in very few quadrts *Rubus* becomes dominant. *Agrostis stolonifera* is dominant up to 20 - 80 % in the quadrats 31C′, 41D″E′, 51A″. Among other plants *Oxalis acetosella, Euphorbia amygdaloides, Endymion*

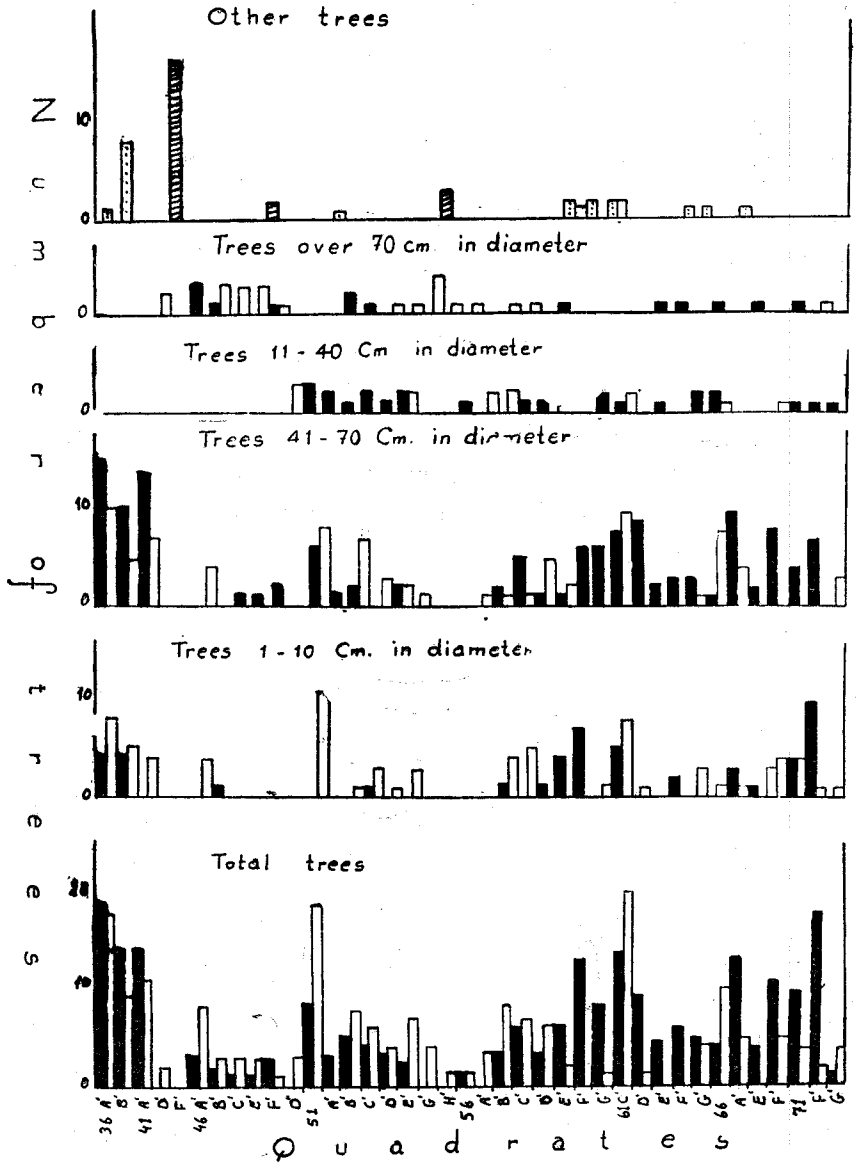

Fig : 5 Size classes of trees in the group A

Quercus
Fagus
Acer
Betula

nonscriptus are more abundant than in the first society and *Endymion nonscriptus* is dominant in the quatrats 21B'C'. *Juncus effusus, Carex silvatica* scarsly and *Poa trivialis* abundantly present in the illuminated wet areas while *Oxalis acetosella* mostly preferred shadowy places. *Arum maculatum, Geranium robertianum, Ranunculus acer, Lysimachia nemorum, Anthoxanthum odoratum* are very rare species in this society.

c. Besides this two societies there is another third society which covers nearly whole Denny Enclosure and some parts of Denny Wood (41B'C', 46D', 51F', 61A'B') where Fagus is often dominant. Here ground flora is very poor both in species and abundances except mosses and *Oxalis acetosella.* A large area which falls into this society is mostly dominated by mosses, such as *Stereodon cupressiformis, Polytrichum formosum, Minium hornum* while in some quadrats (31C') *Oxalis acetsella* is dominant.

5. **Moss Layer.** It is not continuous on the ground and is often restricted to the lower parts of the trunks and to the plant residues on the soil. Among the mosses *Stereodon cupressiformis* and *S. cupressiformis var. filiformis* are commonly abundant in the lower parts on the trunks while *Dicranium scoparium, Polytrichum formosum, Minium hornum* are fairly constant and abundant on the forest floor where the shadow is rather deep. *Leucobrium glacum* is mostly restricted to the wet areas where litter cover is rather thick. *Sphagnum subsecundum* is very rare and it is only present on the very wet (ill drained) and fully illuminated areas. We may say that the mosses are the characteristic plants of the third group though most of them are more less constantly present in the whole areas.

Regarding to regeneration; as we mentioned before our surveying area falls into two sections. One of these, Denny Wood, has been kept open to animals and men. The other, Denny Enclosure, has been closed for fifteen years to the animals and men. As is shown in the Fig. 8, 9, in Denny Enclosure, beech regeneration is completely dominant although with exception of quadrat 1. Among other trees rege-

neration of *Acer pseudoplatanus* is abundant in the quadrats 1B'C', 6A'B', 21A' and completely invaded the stands 6A'B' 11B', 16A'B'. In Denny Wood both beech and oak regeneration are very abundant as compared with Denny Enclosure. However, some areas of Denny Wood (21E', 51A"B"C"D"A', 61, 71G') are dominated by young oak seedlings, while in other quadrats (21D', 26C'D', 41A'D'E', 46D'E'F', 51B'C'D'E'G' and 56A'B'C'D') beech regeneration is dominant. Besides beech and oak *Betula pubescens* is rather frequent and fairly abundant in the quadrats 41E', 46H', 51A'B". *Acer pseudoplatanus* is not so frequent in Denny Wood but very abundant in the quadrats 46H', 51H', while *Fraxinus excelsior* is very high in regeneration in the quadrats 26C'. 26A', 36B'. Among the other trees *Pinus silvestris* and *Castanea sativa* are rarely present. *Crataegus monogyna* regeneration was frequently present in some exposed areas.

C. Grouping vegetation by GOODALL's method.

The study of interspecific relations within a biological community is not new. It has been carried out before by WALSH (1680) and by MOLIOUS (1877) although the first attempt of quantitative measurements on this subject was made by FORBES (1907). Later YOULE (1911, 1912), PEARSON (1911), HERON (1913) and COLE (1946) were interested deeply in it and worked out it in great detail. TUOMIKOSKI (1942) for the first time recognised positive and negative interspesific relations as sign of heterogenity, while GOODALL took into account only the positive interspesific relations (*). Very recently COLE (1949) and GOODALL 1952, 1953) revised the whole literatures on this subject and GOODALL gave a practical example. According to COLE, if in a given biological community, species (A) is present in $(a + b)$ examples and species (B) is present in $(a + c)$ examples, we may expect (from 2×2 table sf probability) that both species may be present in $\frac{(a+b)(a+c)}{n}$ examples. If the observed numbers (actual-

(*) Positif interspesific relation means joined presence of several species in patches in otherwise heterogeneous vegetation.

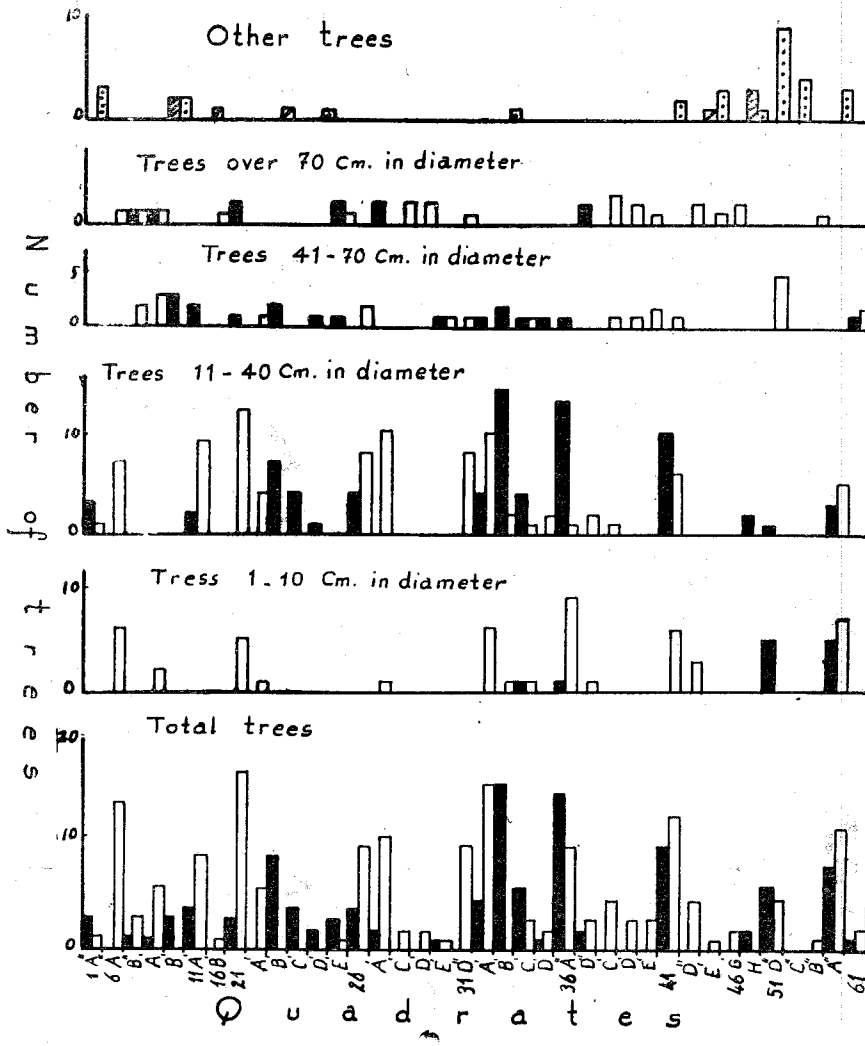

Fig. 6. Size classes of trees in the group B

- Quercus
- Fagus
- Acer
- Betula

numbers) of both species occurring together in the same example are $a = \frac{(a+b)\ (a+c)}{n}$, then there is no correlation between the two species. If $a > \frac{(a+b)\ (a+c)}{n}$ there is a positive correlation between two species. If $a < \frac{(a+b)\ (a+c)}{n}$, then there is a negative correlation between them. By these formules we showed the correlations between two species according to (a), that is to say occurrences of both species in the same examples. It is also possible to show according to b, c, d, which was made by GOODALL (1953). GOODALL, in his paper, considered the species in a given area are nonrandomly distributed and he accepted as a prequisite that vegetation is heterogeneous(*). This heterogeneity may be computed by statistical methods

In the present paper the author started from this point of GOODALL and calculated all possible correlations (for each species) according to the third alternative of GOODALL's method (extraction of quadrats containing both species which were shown positively correlated). As a result the vegetation of the woodland divided into three groups. As was mentioned in the methodial chapter, by the aid of the punched carts, we prepared (2×2) tables for each species in its positive correlation to all other species. In the first stage more than 960 correlations occurred and the values of (x^2) is obtained from the (Chi-Square) formula $X = \frac{(ad - bc)\ (a+b+c+d)}{(a+b)(c+d)(a+c)(b+d)}$ while (P), significance of probability, has been taken from FISHER's and YATES table (DÜZGÜNEŞ, 1952 page 109). Many of the interspecific correlations had values (P) smaller than 5 %. Thus there was not any doubt that this vegetation was heterogeneous. Among the present species the most frequent plants were *Quercus petraea* and *Fagus silvatica*, but they didn't show any heterogeneity. Among the shrubs *Rubus fruticosus* was the most frequent species, occurring in 77 quatrates, and was significantly correlated with some other species (Lonicera $X^2 = 16{,}32$, Polytrichum $X^2 = 18{,}9$). For this reason as the first step the 77 quad-

(1) See GOODALL's paper (1953), page 42)

rates containing *Rubus* were extracted. When these 77 quadrates were tested again, it was observed that the most frequent species *Hedera helix Agrostis stolonifera* $X^2 = 8,8$ *Endymion nonscriptus* $X^2 = 21,1$). For this reason in the second step the 55 quadrates containing *Hedera helix* were extracted. These 55 quadrates were still heterogeneous and *Agrostis stolonifera*, present in 39 quadrates, was most frequent species For this reason quadrates containing *Agrostis stolonifera* also were extracted. Thus 39 quatrates, containing *Rubus, Hedera* and *Agrostis*, formed Group (A), lacking any heterogeneity. The remaining quadrates were tested in the same way and *Rubus* showed the highest positive correlation (with *Lonicera* $X^2 = 8,7$, *Oxalis* $X^2 = 8,4$ *Pteridium* $X^2 = 9,5$) For that reason the quadrates, containing *Rubus*, were extracted forming group (B). The remaining 30 quadrates did not show any heterogeneity and there for formed group (C). Thus the vegetation of the woodland has been divided into three groups, each of them was internally homogeneous. Now it was time to recombine them with each other in order to see whether some of them might be united, the union remaining homogeneous, or whether they must be held separated. For this purpose they have been tested for recombination with each other (A — B), (A — C), (B — C), but none might be united definitely. Thus our vegetation may be separated into three groups (group A, B, C) each of them proves internally homogeneous. These procedures are shown diagramatically in Fig. 4.

The conclusion originated from those procedures is that those three groups in themselves are homogeneous, and therefore are the smallest unit to be differentiated objectively within the observed vegetation.

They coincide more or less with the ecological groups as characterised above and thus are proved to be convenient to be facts of nature.

IV. DISCUSSION.

The soil of **Denny wood Denny** and **Denny Enclosure**, especially in the high ground of the temporary transects which cross the numbers 6,11,31,36,66,71, is gravelly and the

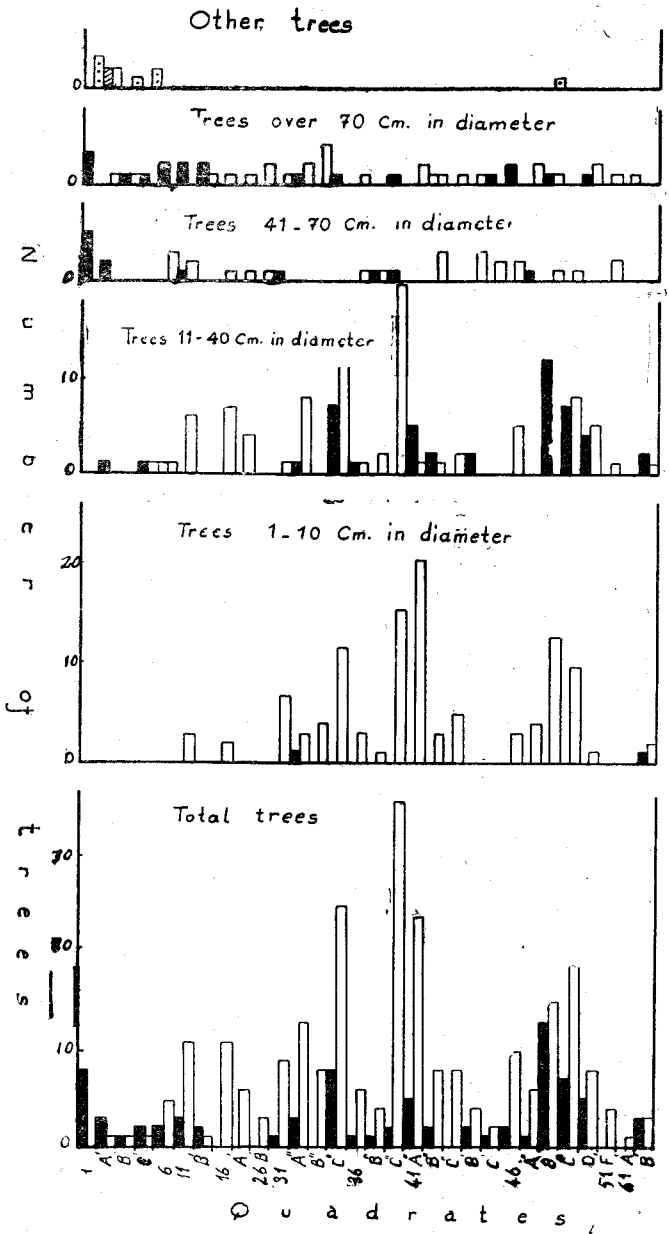

Fig: 7 Size classes of trees in the group C

- Quercus
- Fagus
- Acer
- Betula

clay is verv near to the soil surface. As is shown in the profiles in different parts of woodland two types of podzolization can be distenguished ;

a. The soils are just in the beginning of podzolization
b. Soils containing humus-iron (hard) pan(*)

The first one is present along the permanent transect, in the high ground, where the clay layer begins not deeper than 20 cm. In this kind of podzolization the upper part of the soil (Horizon A) is light grey in colour and very poor in nutrition, which have been washed down by heavy rains. Horizon (B), mostly in black colour with the precipitation of organic matters. The second type of soil is true podzol which has an iron-humus pan in the Horizon (B), it occurred only in some parts of woodland as shown in the profiles.

As a result we may say that in many parts of the woodland especially in the areas dominated by oaks, the soils are brown forest soil type, while in some parts the first or second type of podzolization occurred.

From these observations the question may be derived, whether under present conditions in **England**, brown forest soil is a stable soil type at all, or it will be podzolized later on, too ? In British Forest research these questions remain stil an important problem DIMLEBY (1952).

As was mentioned by some authors (TANSLEY 1953, P. 424) certain kind of dominant trees such as beech, with large and thick crowns and superficial roots will cause degeneration of soil. On the other hand DU CHAUFOUR (1951) considers that the generatin of soil in atlantic woodlans is largely due to biotic factors of the past. However, in the case of New Forest, which is very near to the our surveying area, DIMLEBY (1952) reached certain conclusions about this subject which may be summarised as follow ;

1. Podzolized gravel hills, which are not dominated by oak trees, are due to cutting by men and invasion of heath vegetation.

2. In the woodland areas, where there was no heath vegetation, the soil is brown forest soil.

(*) See soil profiles

3. Compacted litter, preserved without decaying for long time, can produce Mor, and Podsolic soils.

4. For the formation of podzolic soils the type of ground flora is rather important.

5. Beechs can produce raw humus and podzolic soils.

6. The litter of *Ilex* and *Calluna* can revers raw humus into mild humus (Mul).

7. There is no reason for assuming future podzolization of woodland soils where, now, oak trees are dominant.

Our study showed that podzolization had occurred in some oak areas of D e n n y W o o d and D e n n y E n c l o s u r e, but its more widespread in the areas dominated by beechs.

Vegetation. The history of plant ecology is not so YOUNG Nevertheless, surveying methods are still controversial. As a whole, on this subject, there are three well known schools:

The Z u r i c h-M o n t p e l l i e r School

The U p p s a l a School

C l e m e n t s' School

DANSEREAU (1951) and KUCHLER (1951) summarised the view of each school, and DANSEREAU gave an example of this subject During the last ten years some writers showed a tendency to classify the vegetation by statistical methods while others considered them as useless. ASHLEY (1946) and GOODALL (1952) revised the literature about this subject and GOODALL (1955) gave a convencing example. In this example, GOODALL recognised the positive interspecific relations as sign of heterogeneity, and at the end of some statistical procedures he classified a shrub vegetation into homogeneous groups.

The present author came to the conclusion that the application of the third GOODALL's procedure, presente of the both species in the same quadrat, may be usefull for woodland vegetation. The vegetatiod of the area is therefore divided into three homogeneous groups. Here we prefered to use the term group instead of association. The meaning of association is rather different in those three school (VIANNA 1951).

Group (A). Dominant trees are beech and oak, but there are some few *Acer pseudoplatanus* and *Betula pubescens* in the

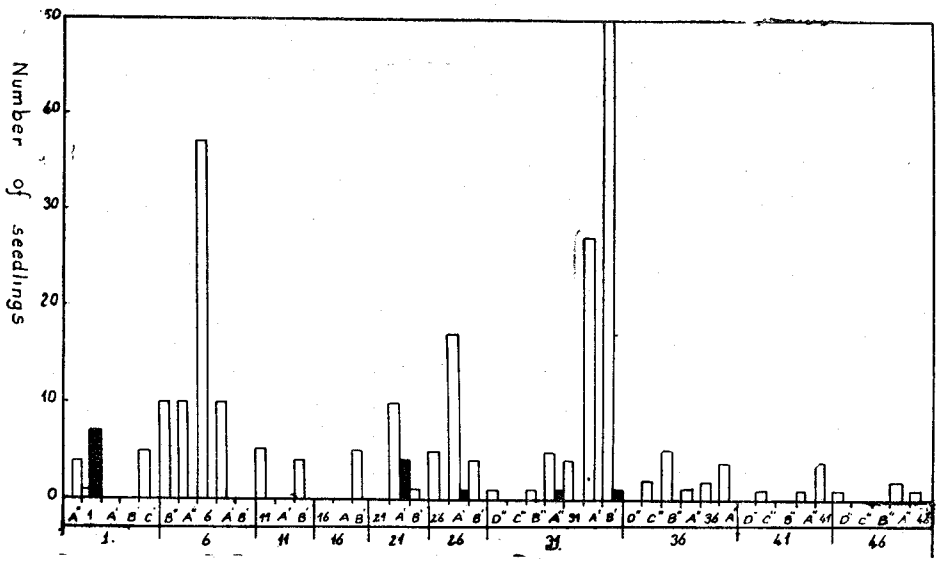

Fig : 8 1_3 Aged seedlings in the Denny Enclosure

quadrates (Fig.5) 41F′, 46 F′, 51 G′. In this group many parts of the area are dominated by oak trees, although in some generations (over 70 cm., and 1-10 cm. of diameters) beech is dominant. There is few *Betula pupescens* in the quadrates 56, E′, 56 G′, 56 F′ and rather much in the quadrate 36 B′.Among the bushes and climbers *Rubus fruticosus* and *Hedera helix* showed the largest heterogeneity. In many areas *Rubus fruticosus*, often with *Pteridium aquilinum*, produce dominant shrub layer. *Rosa arvensis* and *Lonicera periclymenum* are also frequently present, but very few quadrates are dominated by these plants. Among the herbs, *Agrostis stolonifera* showed the largest heterogeneity in some quadrates where the soil is fully illuminated and where there is no litter. In this group, *Rubus fruticosus*, and *Hedera helix* and *Agrostis stolonifera* are present in all quadrates while other plants such as *Viola canina*, *Oxalis acetocella*, *Digitalis purpurea*, *Stellaria holestea* vary in abundances according to the local conditions. *Among the mosses*, *Stereodon cupressiforme*, *Polytrichum formosum*, and *Thuidium tamariscinum* occur frequently in many quadrates, but in very few quadrates they are dominant.

Group (B). This group covers the East and South-East parts of Denny Wood and marginal parts of Denny Enclosure. Dominant trees are beech and oak (Fig. 6). In the marginal areas *Acer pseudoplatanus* and *Betula pubescens* are fairly frequent while some other trees, *Fraxinus excelsior*, *Pinus silvestris* and *Castanea sativa*, occurred in very few quadrates. Broadly speaking, in this group beech is dominant in the whole areas, but its percentage is rather high over 70 cm. and between 1-10 cm. of diameters. *Ilex aquifolium* is very abundant and occuring nearly all the area where it produces a continuous lower tree story, while *Crataegus monogyna* occurrs in few quadrates. *Rubus fruticosus* often with *Pteridium aquilinum* occurs in many quadrates and its abundace vary with local conditions. *Hedera helix* is present frequently, but *Rosa arvensis* is rare. In the herb layer *Pteridium aquilinum* and *Oxalis acetosella* are rather frequent. The former is often dominant under wide open canopies while the latter prefers thick shadowy places under the trees. Among other herbs *Poa trivialis* and *Agrostis stolonifera* are mostly present in the bare

and wet soils. *Endymion nonscriptus* is rather abundant in the quadrates 21 B'C' and present in the quadrats 21 D'E', 26 C'D'E'. *Acer pseudoplatanus* occurs in many quadrates and it is very abundant in quadrates 6 A'B', 11 A'B', 46 H', while Fraxinus excelsior is frequently present in the 21 A'B', 26 A'. In the moss layer, some few quadrates are dominated by *Polytrichum formosum* and *Stereodon cupressiformis*.

Group (C). In this group all the area is dominated by beech except some oak and very few *Acer* and *Abies* (Fig. 7). In many quadrates *Ilex Aquifolium* is abundant and produces a continuous lower tree layer. *Hedera helix* is frequently present on the trees or in the ground flora. Here the ground flora is very poor. Among the ground flora *Oxalis acetosella* and mosses are often dominant in many quadrates.

If we compare the plants in these three groups, under the view point of heterogeneity, Group (A,B) show more heterogeneity than Group (C). That means heterogeneity is positively related to interference of animals and men with the vegetation. This case supports the view of GREIG-SMITH (1952) who worked on "The vegitation of Degraded and Secondory Forest, in Trinidad, British West Indies.„ In our surveying area the distribution of the ground flora depended largely on the dominant trees, edaphic and biotic factors, though one should conced that its ecological factors have not been studied enough, The fully illuminated and very wet areas are dominated by *Sphagnum subsecuudum*, *Juncus effusus*, *Carex silvatica, Erica tedralix*, *Calluna vulgaris Vacciniun myrtillus* while *Agrostis stolonifera* prefers half illuminated bare areas and road sides in the woodland. *Rubus fruticosus* and *Pterdium aquilinum* are often dominant in the areas where the soil is sandy and tree canopy is rather open while *Oxalis acetosella* often is very abundant under closed canopies. As a matter of fact even in the literatures we may find that in the woodlands some plants clearly prefer especial habitats. For example *Tansley* (1953) and *Watt* (1934) mentioned *Pteridium aquilinum* mostly prefers sandy soils and they are rather poor in lime, while *Hedera-helix* is fairly abundant in the areas where the canopy is rather close, the soil is wet and almost neutral. Again *Harley* (1949) reported that *Fagus silvatica* seedlings were groving satisfactorily in the

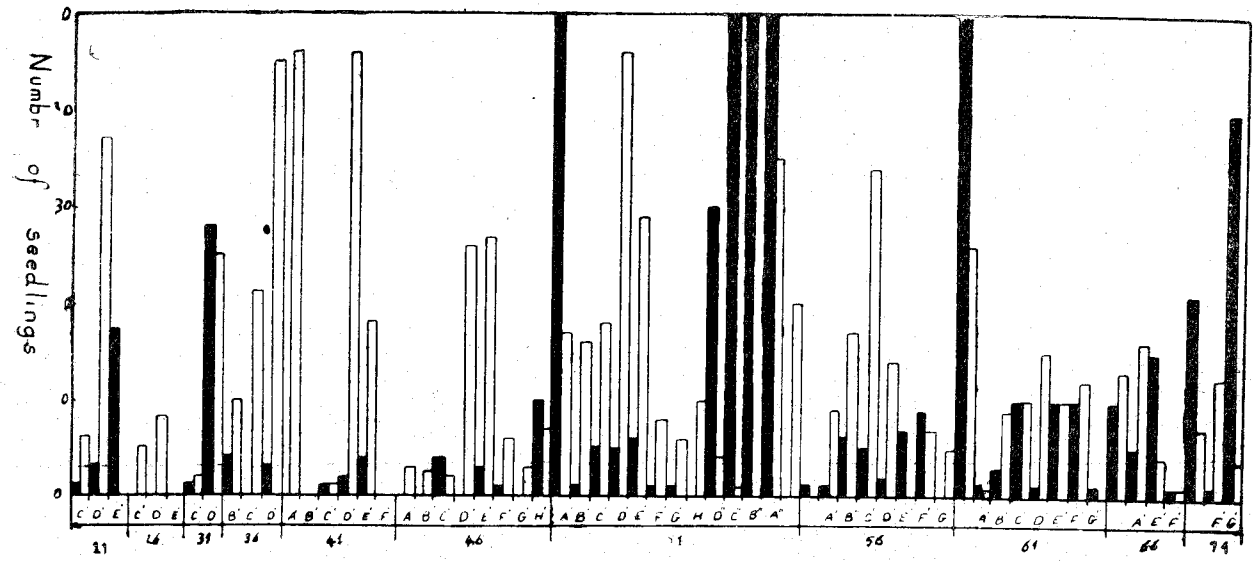

Fig : 9 1 - 3 Aged seedlings in the Denny Wood

non calcarious soils, but on limestone soils it produced long leafless branchs. GORHAM (1954) showed that the distribution of some species such as *Lysimachia nemorum, Viola riviniana* and *Agrostis tenuis* are very closely correlated to more (raw humus) but others *(Oxalis acetosella* and *Thuidium tamariscinum*) didn't show any preference.

As a result of grouping of plants by the third alternative of GOODALL's Method one may say that it corresponds closely to the actual distribution of the species in the surveyed areas the same holds, if one tries to clasify them according to structure and composition.

Regarding the status and regeneration of the dominant trees in woodland : For a long time there has been a problem in which British Forestry is deeply interested. Either under the present conditions might woodland survives unchanged or would it change by the time in structure and percentage of germination of the dominant trees ? As shown in the figures the dominant trees are beech and oak. In the Group (C) *Fagus silvatica* is rather dominant though this domination varies to a great deal within the generations. Over 70 cm. of diameters domination of *Fagus silvatica* is nearly 60 % while in the classes 11-40 cm. and 41-70 cm. this percentage is about 70 %. Between 1-10 cm. diameters there are only two oaks. This means that, by the time, in the oak regeneration occurring a big decrease.

As for Group (B) : These aras are also dominated by beech, although in the generation of 1-10 cm. of diameters the ratio is smaller than 1/4 . with exeption of marginal areas (21E', 31D' and 46 H'), in the other quadrates regeneration of beech seedlings are higher than oak seedlings. Exeeding oak seedlings regeneration comparison to beech seedlings in the 51 B'C'D' is due to the road, which crosses the forest just in these places.

The situation of group (A) is little different. In the generation of 1-10 cm. of diameters oak is dominant while in others beech is dominant with a very small differences. As to young seedlings some quadrates are dominated by oak, others by beech. As far as we can derive from the figures, regeneration of oak in the woodland, especially in Group (C), is gradually decreasing, that means that in time oak may be completely eliminated by beech. However, some writers, WATT (1934) and DIMLEBY (1952) mentioned that *Fagus silvatica* gradually causing degeneration

of its soils and eliminates all the other plants. Even Fagus seedlings have much difficulty establishing themselves in the same soils as their parents.

As far as the subject of enclosure of the woodlands is concerned; as is known from the text. Denny Enclosure have been closed nearly fifteen years to the animals and men, while Denny Wood was kept open. When we compare them with each other in the regeneration of the young seedlings (Fig. 8, 9) we may come to the conclusion that in the Denny Enclosure oak is almost incapable of seed germination though even beach regeneration is not high. In Denny Wood regeneration of both species is very high. As we mentioned before, this differences may depend partly on the dominant trees and partly on enclosing. By the wandering of animals in the woodland the litter will be removed and seeds find more chance to touch the soil. As *Watt* (1919) said this situation is very imrortant for oak seeds, because one should not keep away all animals, so one should cause moving of litter and being wet soil into touch with seeds.

VII. SUMMARY

1. The area surveyed (Denny Wood and Denny Enclosure is the oldest in the New-Forest and had been kept in natural condition for long years except for a little replanting in some parts. According to some authors, The New Forest is an ancient hunting place of old English Royal families and it was so even in Norman times. It is supposed too at that time the woodland covered, nearly the same area and was dominated equally by beech and oak.

2. As is shown in the geological and soil maps the area surveyed covers the sandy clays of headon bed and lies on the tertiary deposits. In most parts of Denny Wood and Denny Enclosure the soil is mostly brown forest soil while in some areas podzolization has occurred.

3. The vegetation of the woodland contains five layers, namely upper tree layer, lawer tree layer, shrub layer, herb layer and moss layer. The upper tree layer is composed of beech

and oak while the lower tree layer and shrub layer are often dominated by *Ilex aquifolium* and *Rubus fruticosus*. The plants in the ground flora including *Rubus fruticosus* from the shrub layer may be divided into tree different groups, namely *Rubus* society, *Rubus-Pteridium* society, and moss society.

4. By means of the tests which I carried out according to GOODALL s statistical method the vegitation of the woodland may be devided in to three groups A, B, C. It can be said that this groups correspond rather closely to the actual distribution of the ecological groups which I have mentioned above.

5. As is shown in fig. 8 the oak regeneration and ground flora are very poor in the Deeny Enclosure due to dominant beech, and the fact that animals and men have been excluded for fifteen years.

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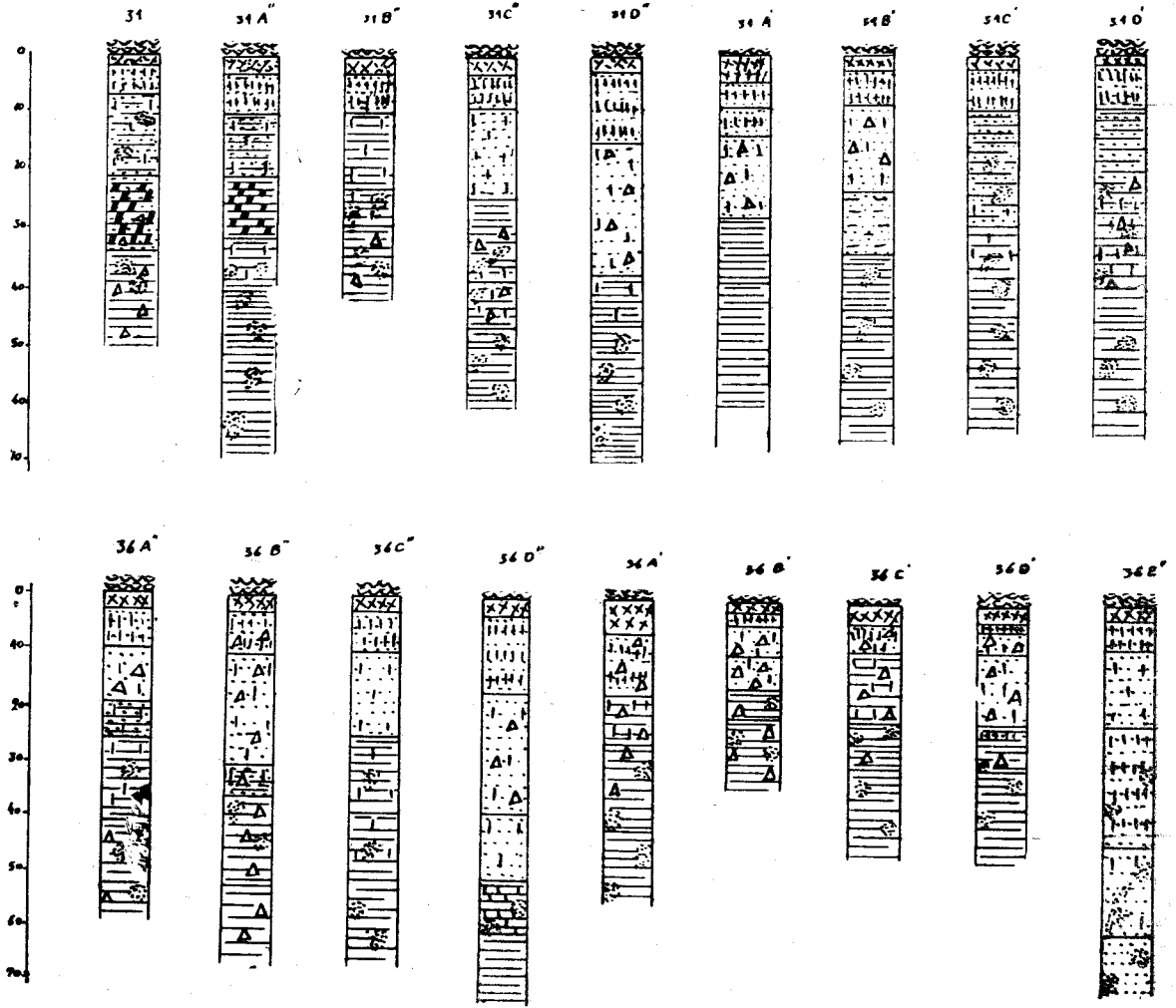
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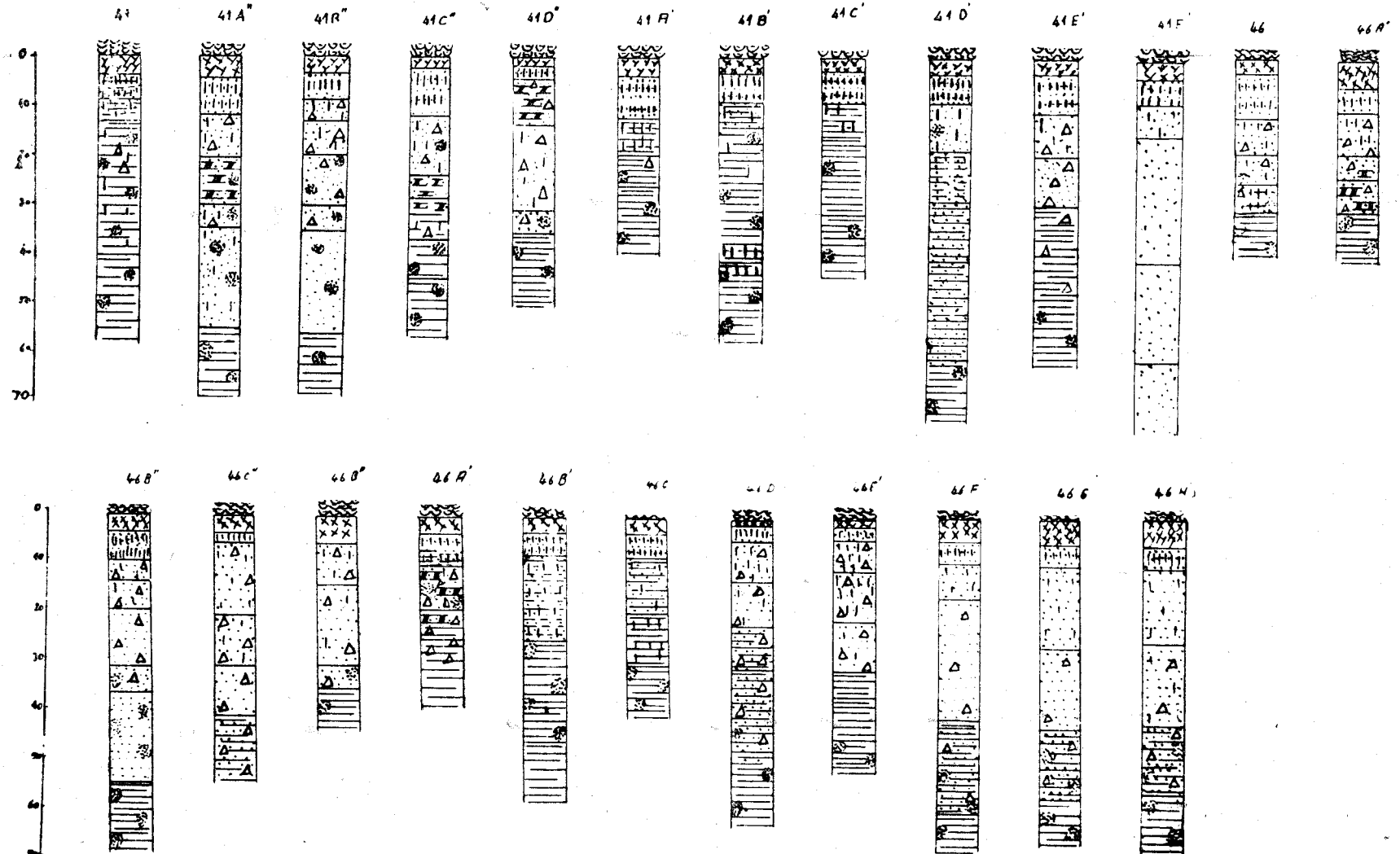
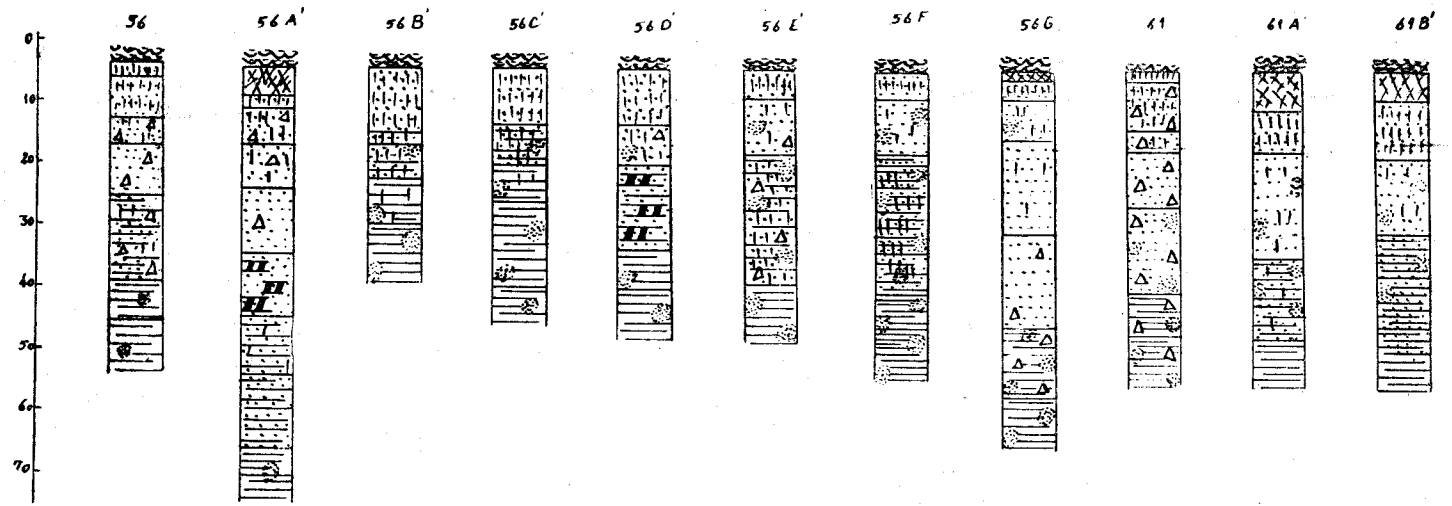
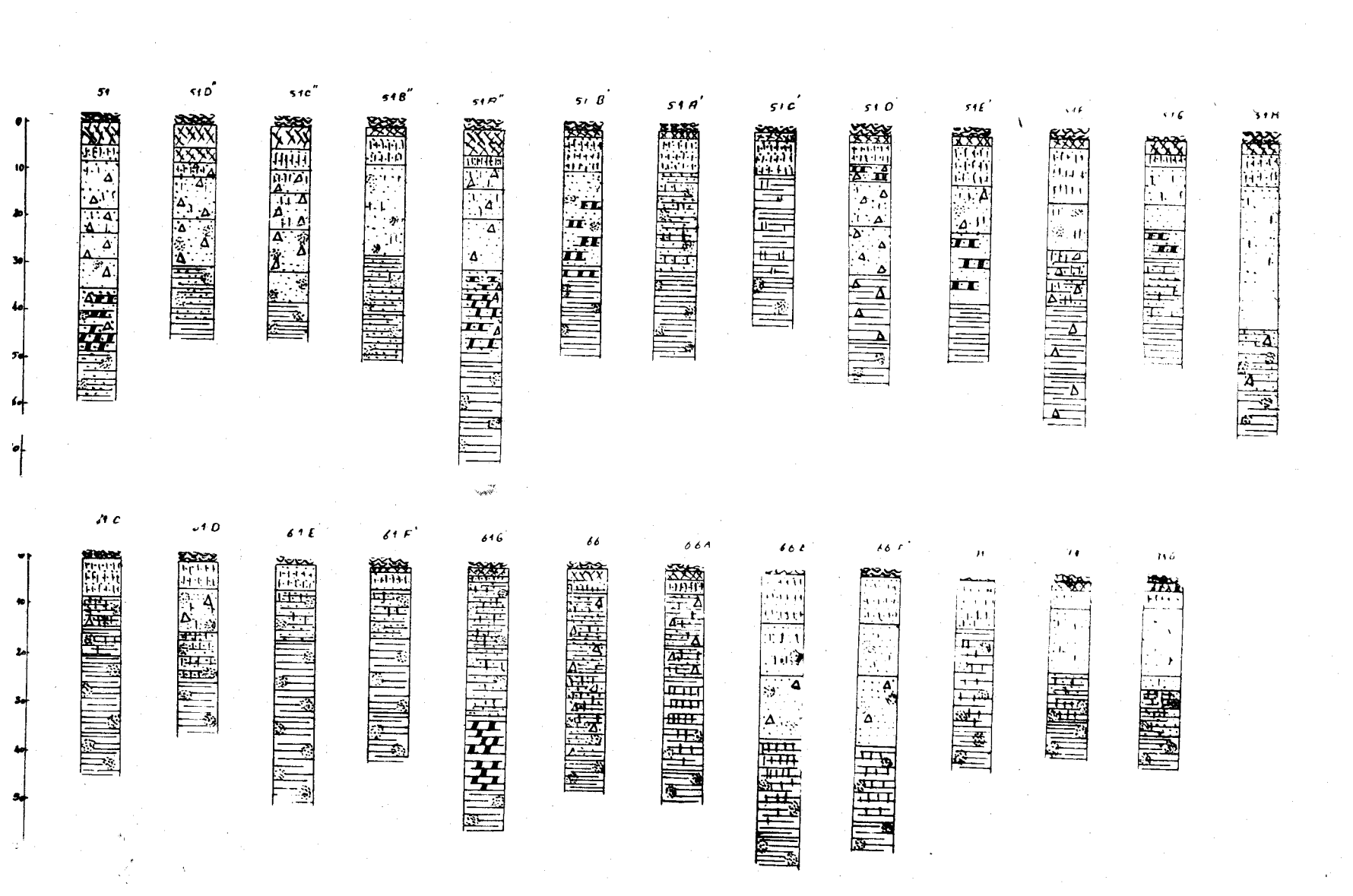
36 D'
36 E'


41
41A"
41B"
41C"
41D"
41A'
41B'
41C'
41D'
41E'
41F'
46
46A'
46B"
46C"
46D"
46A'
46B'
46C
46D
46E'
46F
46G
46H
0
10
20
30
40
50
60
70


56
56 A'
56 B'
56 C'
56 D'
56 E'
56 F
56 G
61
61 A
61 B'
0
10
20
30
40
50
60
70


51
51D"
51C"
51B"
51A"
51B'
51A'
51C'
51D'
51E'
51F
51G
51H
0
10
20
30
40
50
60
0
61C
61D
61E
61F'
61G
66
66A
66B
66F'
11
19
11G
0
10
20
30
40
50

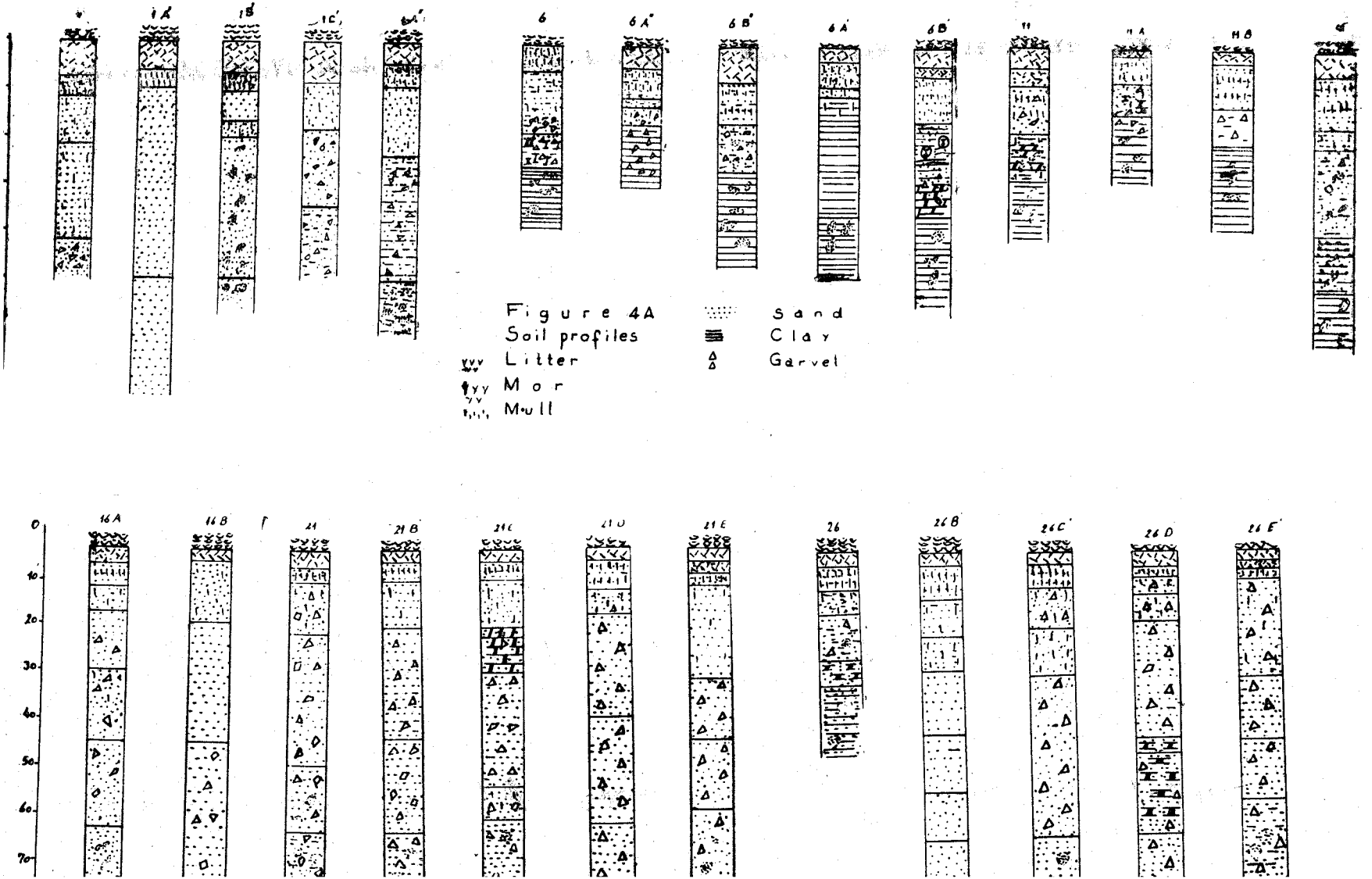


Figure 4A
Soil profiles