*A comparative study of the productivity, mineral regime and floristic composition of the management units found on a Teesdale hill farm*

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# A Comparative Study of the Productivity, Mineral Regime and Floristic Composition of the Management Units Found on a Teesdale Hill Farm.

by

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ABSTRACT

Teesdale, situated in the eastern Pennines, is subject to rather severe climatic conditions which only allow a short growing season. Nevertheless a rich unique flora is found here and hill farming is practised.

The hill farms consist of lush hay meadows on the alluvial soil of the valley bottoms, and of rough grazing on the Fell slopes. The meadows are fertilized, mown and grazed, and some fertilizers have also been applied to the lower Fell slopes.

Originally the Dale was forested and some relic species, e.g. Anemone nemorosa are still found. To-day's vegetation is a mixture, the more "managed" grassland showing affinities to the order ARRHENATHERETALIA Pawloski 1928, and the remainder to the order MOLINIETALIA W.Koch 1926. "Management" seems to aid species of the former order in replacing species of the latter.

The hay meadows are the most productive, the most important contributors being the grasses, especially Holcus lanatus, Alopecurus pratensis, and Festuca rubra. The most productive group of plants higher on the Fell slope were the bryophytes. Calculation of the productivity of each species enables the best "niche" for each species to be determined.

"Management", by increasing productivity and thus organic and inorganic nutrient turn-over, must have affected the natural cycling and retention of nutrients. The more productive communities are less "efficient" in their utilization of potassium. Analysis of the component species could identify the plants between which maximum competition occurs, and which minerals are limiting growth.

A study of this type, including total mineral "budget" of the environment, extending over a sufficient number of years and using a statistically sound number of samples, could lead to the production of seed mixtures which may improve the hay crop and grazing swards. Improvements in "management" especially fertilization, could also be suggested, since increased production depends on increased mineral supply.

## PREFACE

The uplands of the Northern Pennines are covered for their greater part by tracts of "dreary monotonous" moors (Tansley 1911), which contrast markedly with the green of the richer vegetation of the dale bottoms.

Upper Teesdale is one such dale which is noted for its rich and peculiar flora (Pigott 1956). Much attention has been (e.g. Blackhouse 1843 & 1844, Pearsall & Mason 1925), and is at present (e.g. Bellamy et al. 1969) being paid to its unique vegetation. This work sets out to gain at least some comparative data relating to the man-made ecosystems of the Dale.

## INTRODUCTION TO THE STUDY PROBLEM

A typical Upper-Dale farm system consists of the following management units:-

(1) Meadows on the alluvial soils of the valley floor.
(2) Inbyeland consisting of fenced grazing on the valley slopes, which are covered with glacial drift.
(3) Outbyeland consisting of unfenced grazing on the slopes higher on the valley edges.

The pattern is complicated with wet depressions, springs, stream sides, rocky outcrops and major breaks of slope which add a variety of pattern to the landscape and the vegetation. The boundary between units (1) and (2) is a natural one, being the boundary of the alluvial and boulder clay soils. The boundary between units (2) and (3) is mainly one of differing type of "management" and/or length of "management".

The aim of the research is a comparative study of the following aspects of each farm unit:-

(1) Floristic composition.
(2) Productivity-measured as above ground net biomass increase over a set period of time.
(3) Mineral regime of the communities.
(4) Performance of certain selected species-measured as net biomass increase.

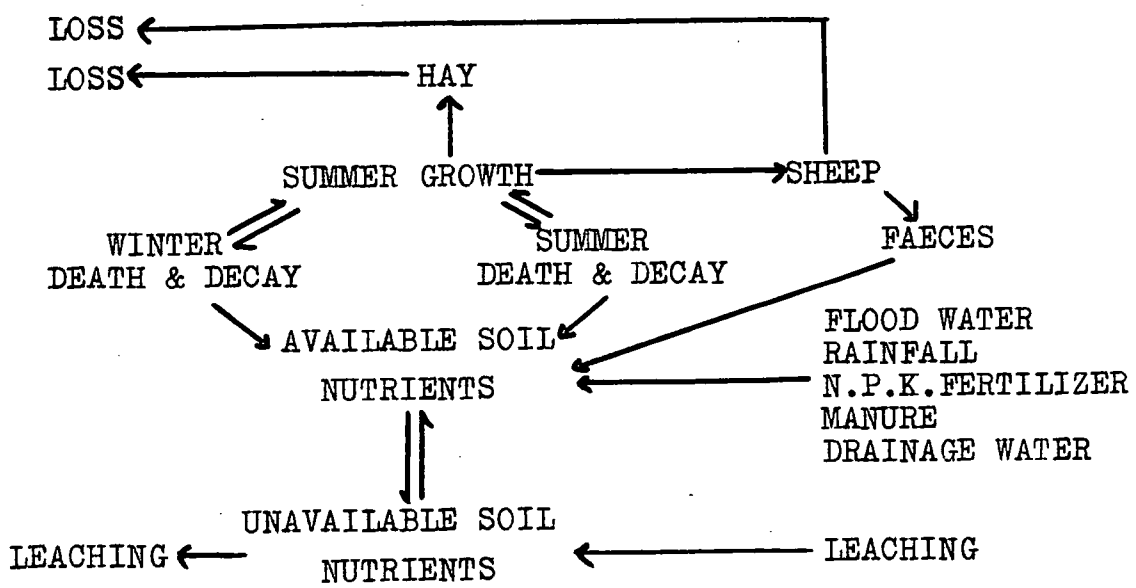
## SITE SELECTION

The research site was chosen after an extensive survey of the Upper Valley and three field systems were selected for study. A transect was laid down from Grid Ref. NY 8[illegible]0290 on the valley side to Grid Ref. NY 8[illegible]293 on the bank of the River Tees. On the basis of the Floristic Survey six areas, representative of the main association variants present, were chosen for detailed study (see sketch map-Fig.1). The relevant ecological and management details of each are given below.

## AREAS 2 AND 3

These are representative of the alluvial meadows. The meadows are grazed by sheep for approximately 9 months of the year. The sheep are removed in early

## MINERAL CYCLE DIAGRAM OF AREAS 2 AND 3




June, and the hay crop is allowed to develop. This is mechanically harvested in late July, the sheep being returned in late August. The whole area receives a light dressing of straw-rich farmyard manure in

FIGURE 1

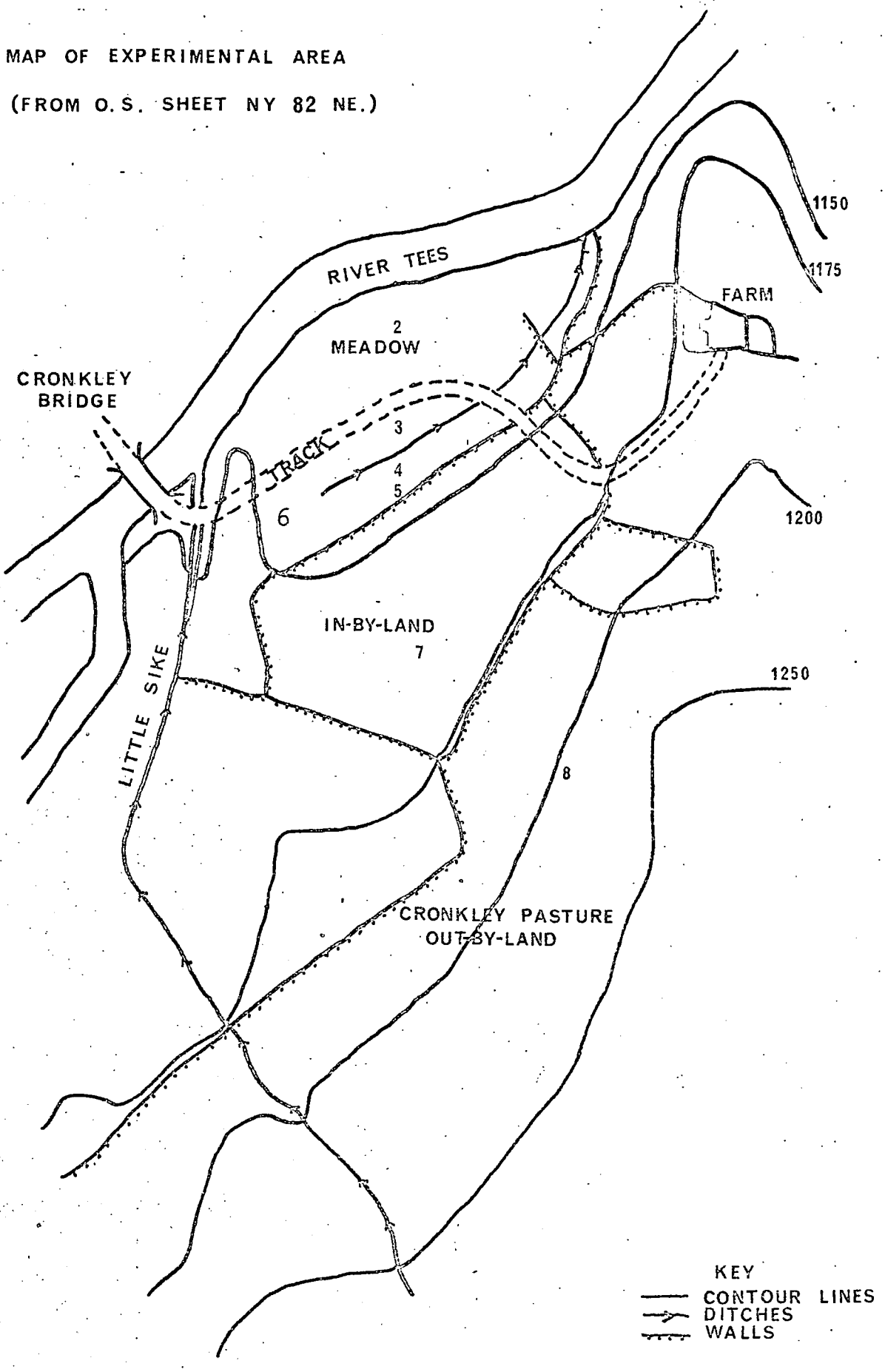


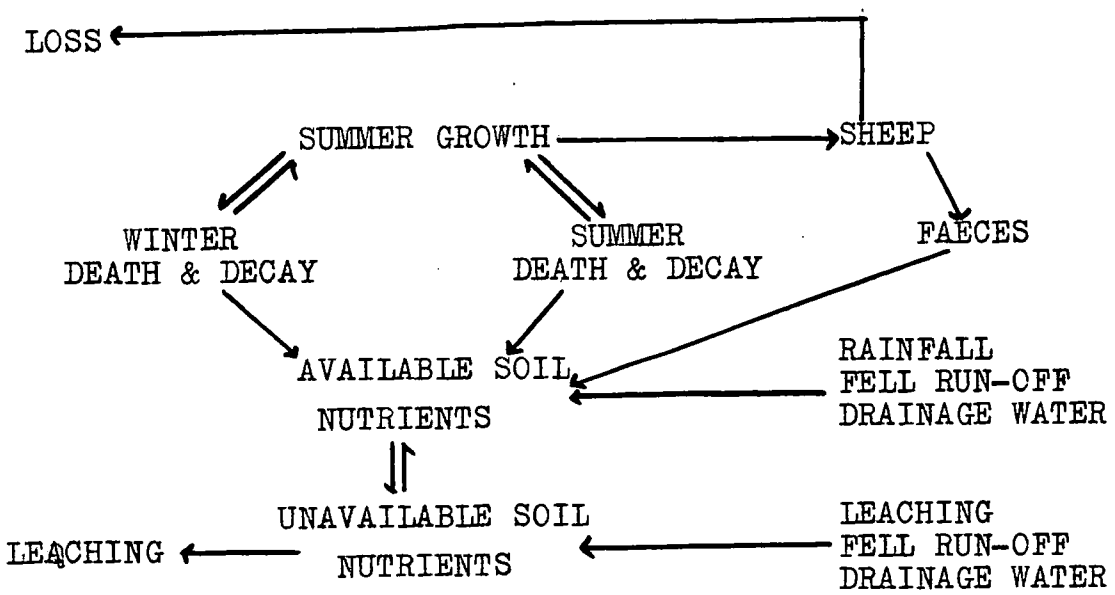

Figure to show position of experimental areas 2, 3, 4, 5, 6, 7 and 8.

November/December and an artificial N.P.K. fertilizer (ICI. 12.12.18) mixture in May. The latter is applied in the form of slow leaching granules, at the rate of 2.5cwt. per acre. Lime is also added at very irregular intervals, the last recorded liming was carried out in 1964. The meadows are also subject to deposition of allochthonous material (silt etc.) during periods of flooding, the more low-lying area (area 2) being more regularly subject to this natural fertilization. Area 3, on the other hand, is situated on a dome of alluvium where leaching might be expected to play a significant role in the mineral balance.

AREA 4

A wet depression in the alluvial soil at the foot of the Fell slope. This area is never mown or fertilized

MINERAL CYCLE DIAGRAM OF AREA 4

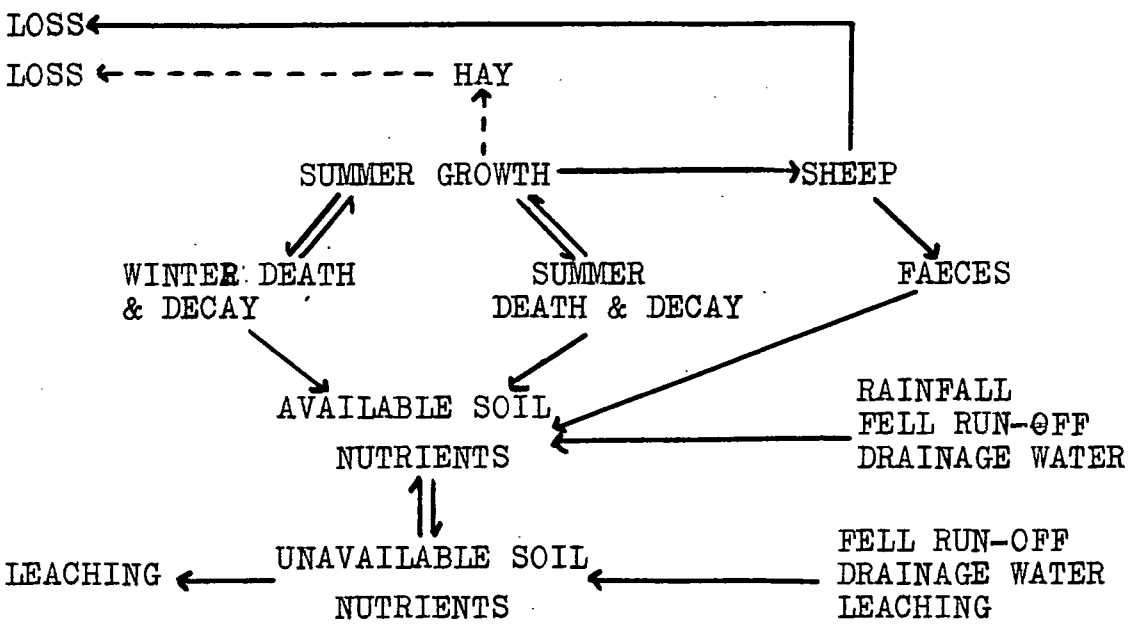



and must be affected by all the water and minerals washed from higher up its catchment.

AREA 5

Situated on the top of a bank of glacial drift in the meadow, is never artificially fertilized and is mown only in good hay seasons. This area has a slope of about $10^{o}$-the previous three are flat.

MINERAL CYCLE DIAGRAM OF AREA 5




AREA 7

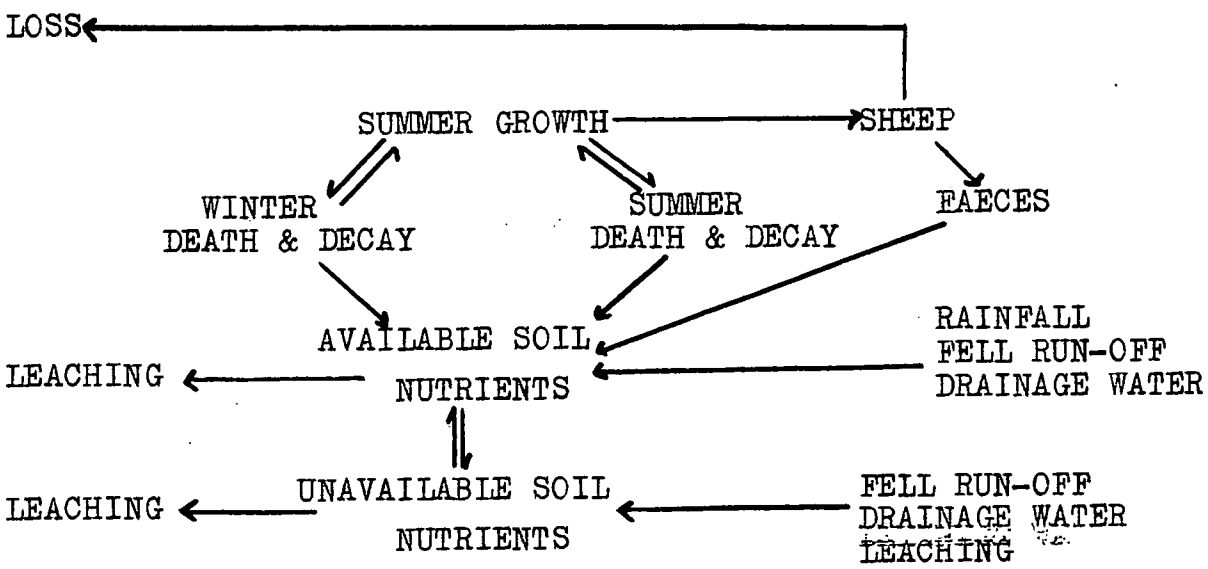
Representative of the inbyeland. This was formed by enclosing an area of rough grazing and moorland (outbyeland) about 15 years ago. For the first few years it was treated with annual applications of lime and artificial fertilizer (unfortunately no exact records are available), now it is grazed for most of the year and is unmown. The slope is irregular-varying around $25^{o}$.

AREA 8

This is higher up the Fell slope in the outbyeland, is lightly grazed all the year and has never had any

fertilizers or lime added. It may be assumed that water draining off the Fell and surface run-off cause considerable leaching of minerals at these three latter areas.

MINERAL CYCLE DIAGRAM OF AREAS 7 AND 8



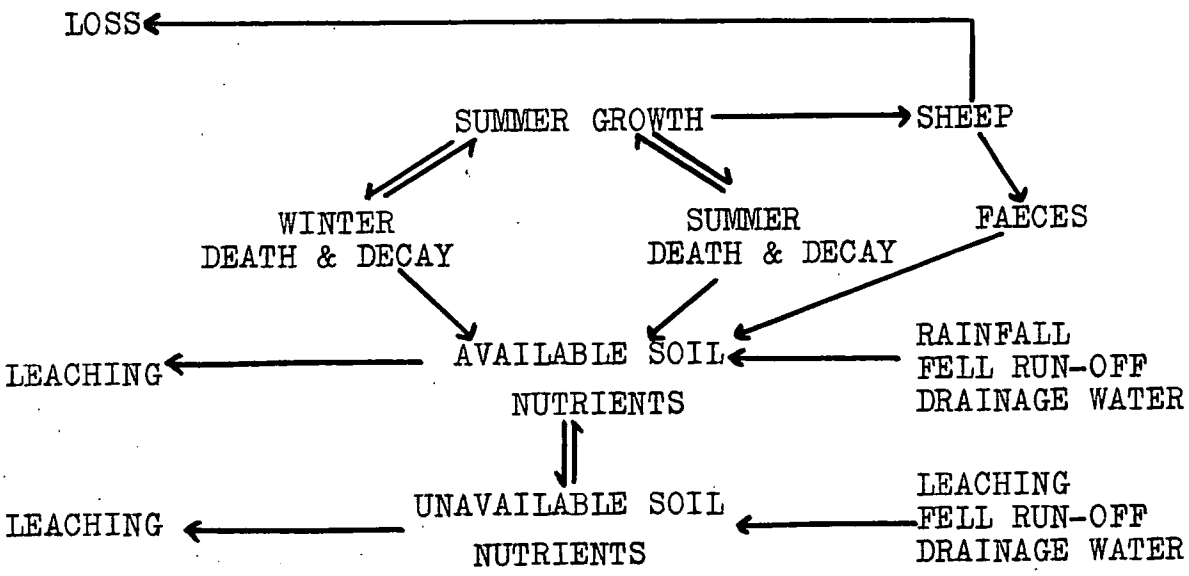

AREA 6

This area is situated away from the transect. It is in a hollow on the bank of glacial drift in the meadow. It is never mown or fertilized, but the flow of the water bringing leached minerals from higher up the slope is probably checked here-due to the sudden reduction in angle of slope-and hence, this area has probably an enriched soil. The soil is very wet but the water is not stagnant.

SOIL PROFILES

The soil of the farm was sampled and tested by Benham (M.Sc.Thesis 1969, see Appendix 1 for his results), and a very brief review of his findings will be given here. The soil samples were collected in May, before

MINERAL CYCLE DIAGRAM OF AREA 6




any artificial fertilizer had been applied. At all areas plant roots only extended to a depth of 32 cm.

The pH values ranged from 5.0 to 6.8. The two most water-logged areas tested by Benham-areas 4 and 8-had the lowest pH values. This would be due to the high rainfall of the area (50-55 inches per year) both leaching the soil (Pigott 1956) and causing a reduction of the oxidation processes due to water-logging (Pearsall 1950). The soil at area 5 (pH 6.6) is leached but well aerated, and at area 2 (pH 6.8) is leached, well aerated and infrequently limed. Fig. 2 compares the oxygen status of these soils.

AREA 8

The soils of this area and of area 7 are gley soils. The profile changes rapidly from an upper humus-rich layer to a pale, rather anaerobic, boulder clay (Fig. 3), typical of gleyed soils (Pearsall 1950). The lower strata of clay are stained with humic material and ferrous salts. The parent material is impermeable clay and the flow of drainage water downhill is along the humus-rich, clay interface. Mineral analysis

**FIGURE 2** Oxygen Status of the Soils.

Ferric iron present (Good aeration)

Ferrous iron present (Poor aeration)

Both present (Moderate aeration)

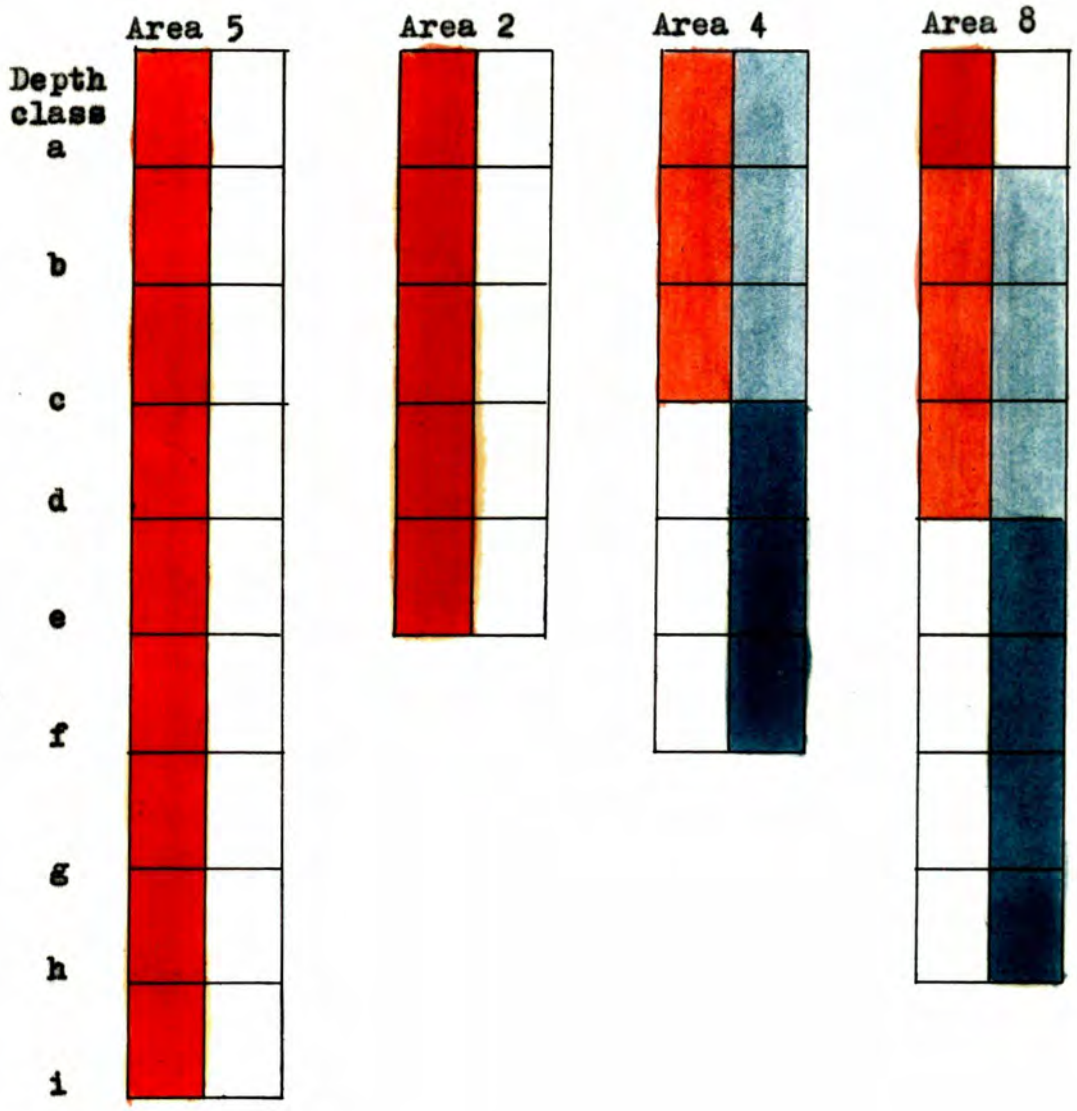


FIGURE 3 Soil Profile of Outbyeland-Area 8

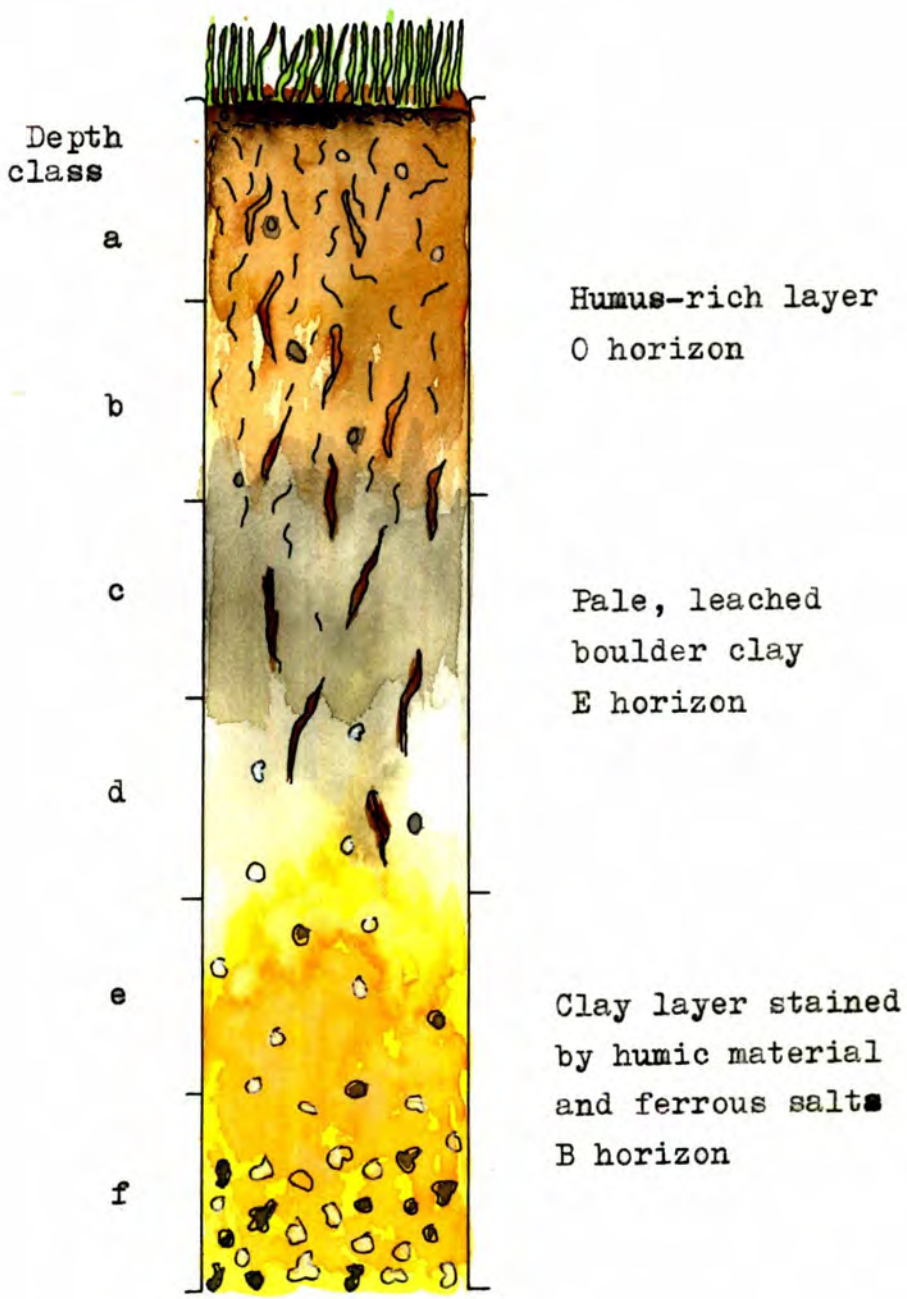


FIGURE 3 contd. Soil Profile of Inbyeland-Area 7

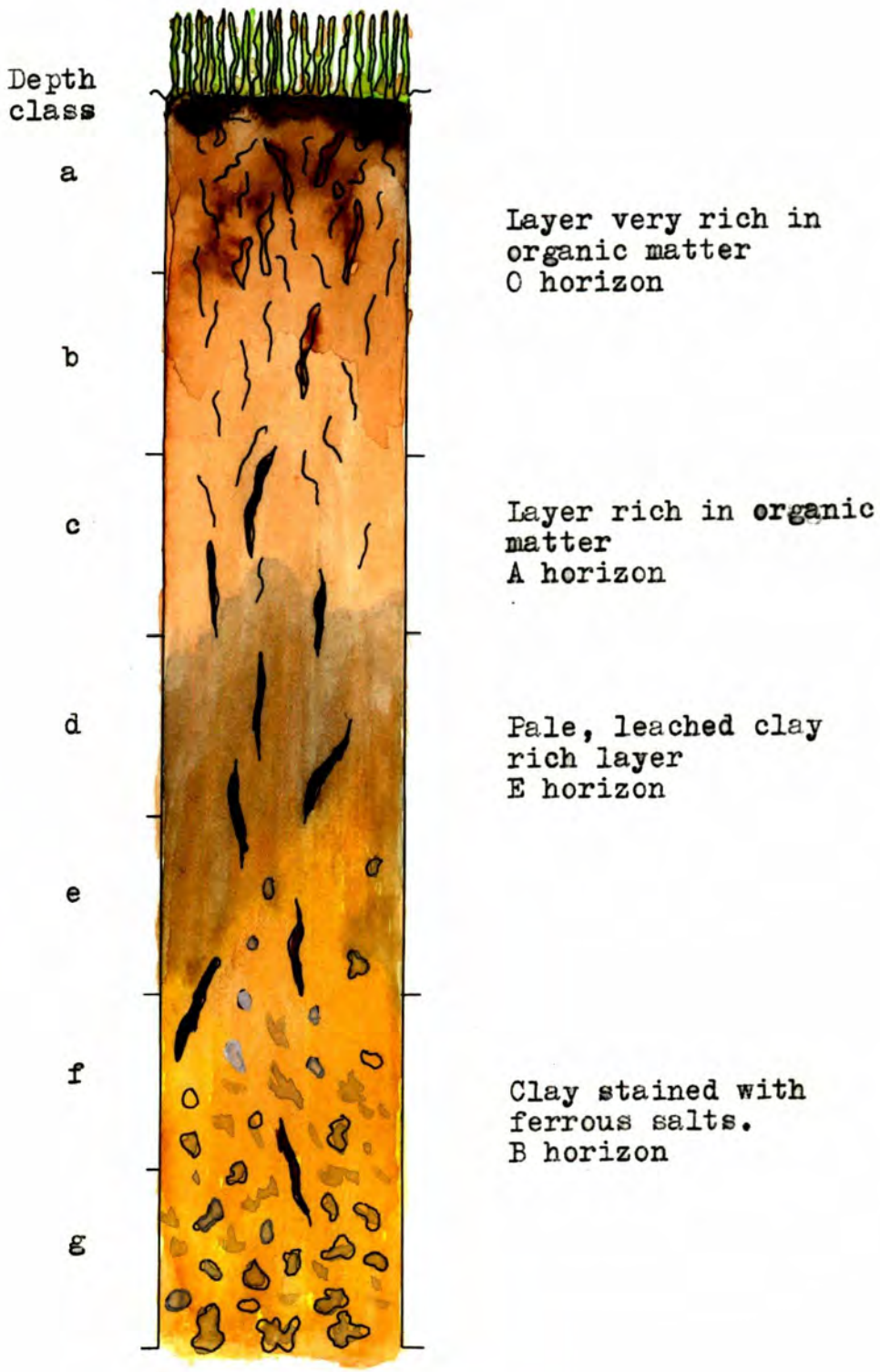
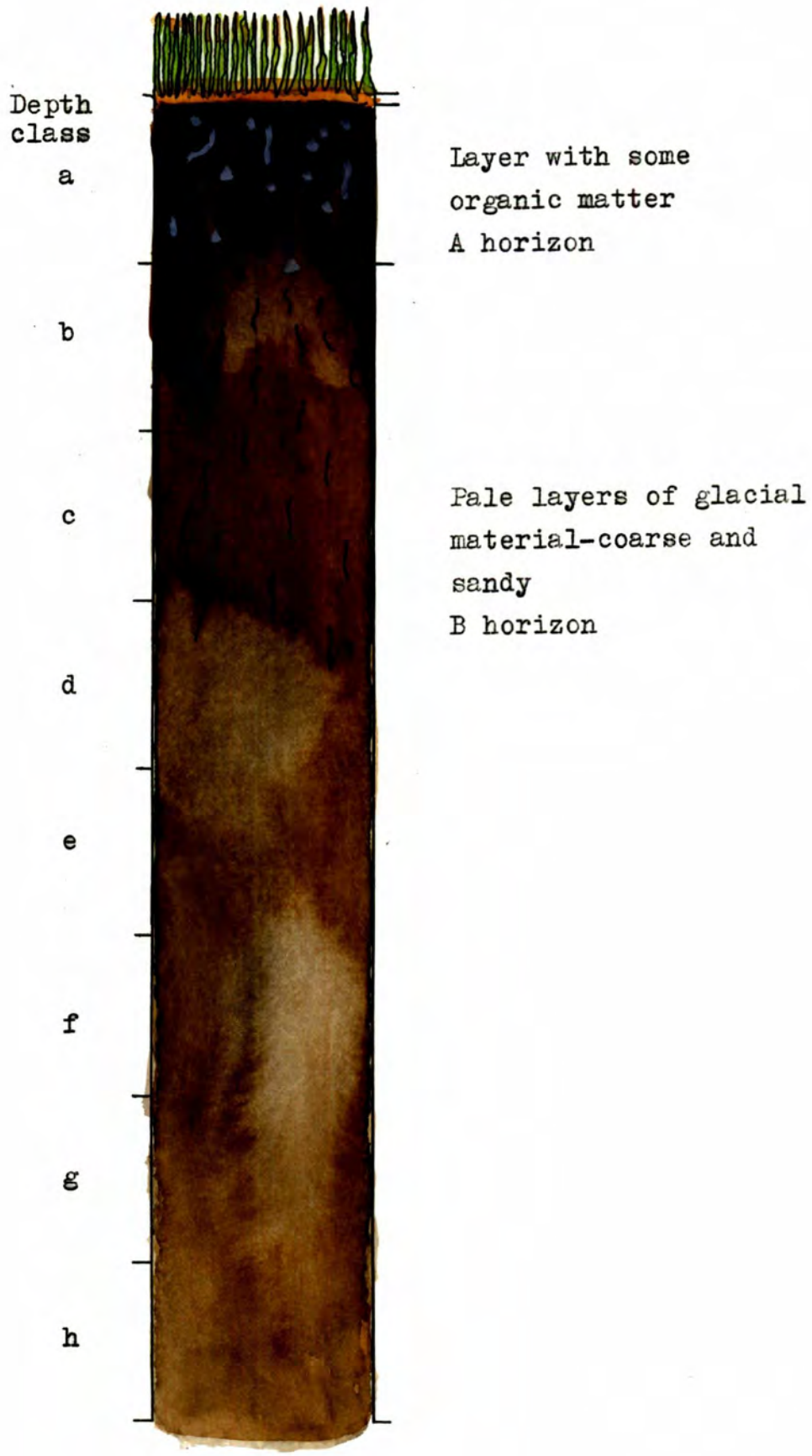


FIGURE 4 Soil Profile of Area 5



shows that there is less sodium, potassium and phosphorous at this interface than elsewhere. As this soil is heavily leached only small amounts of mineral nutrients are present, calcium, magnesium and carbonate ions are at very low levels in the humus-rich surface layers and abundant in the lower clay-rich layers, and nitrate is present in small amounts throughout.

AREA 5

The soil here resembles that of the present day river bank, it is aerobic, free-draining, and coarse, with little organic material. (Fig. 4) Calcium, magnesium and carbonate ion levels increase with depth, nitrate and potassium decrease, sodium and phosphorous show a slight decrease. The sudden drop in mineral content at about 60 cm. of all minerals tested could be due to the leaching effect of the drainage water percolating through the soil at this level, or because the soil has little organic material.

AREA 4

The soil profile (Fig. 5) shows a humus-rich layer overlying an anaerobic clay layer which shows signs of gleying. Under this there is a band of sand on top of a "fossilized meadow soil" developed on the rounded stones typical of a river bed. The soil is peaty, poorly drained with low mineral content. Calcium and carbonate ion contents increase with depth, magnesium and potassium decrease with depth, phosphorous repeats the pattern noted at area 8, and nitrate ions and sodium are in low amounts throughout the profile.

AREA 2

The meadow soil (areas 2 and 3) is shallow, alluvial,

FIGURE 5 Soil Profile of Area 4

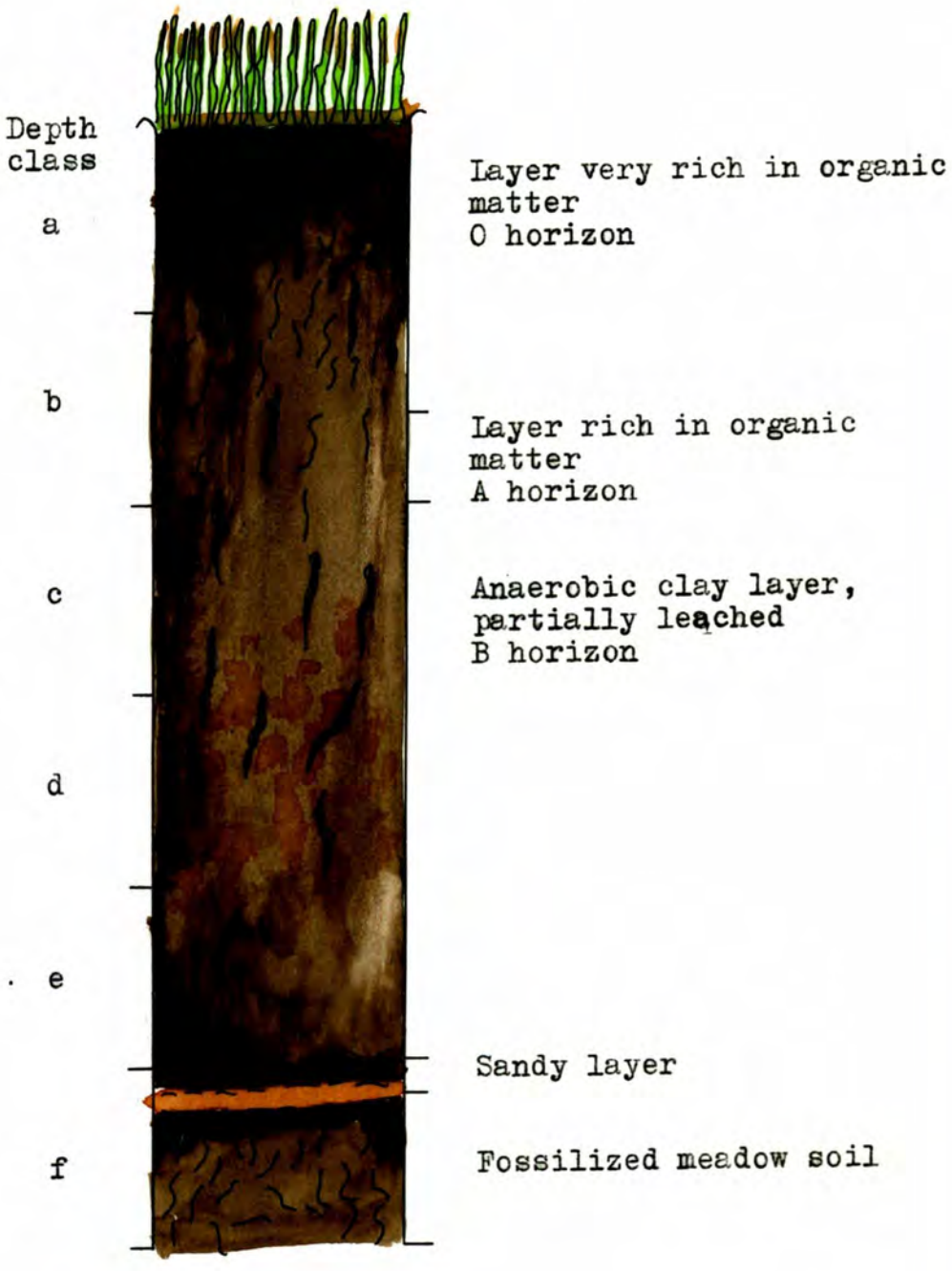


FIGURE 6 Soil Profile of Hay Meadow-Area 2

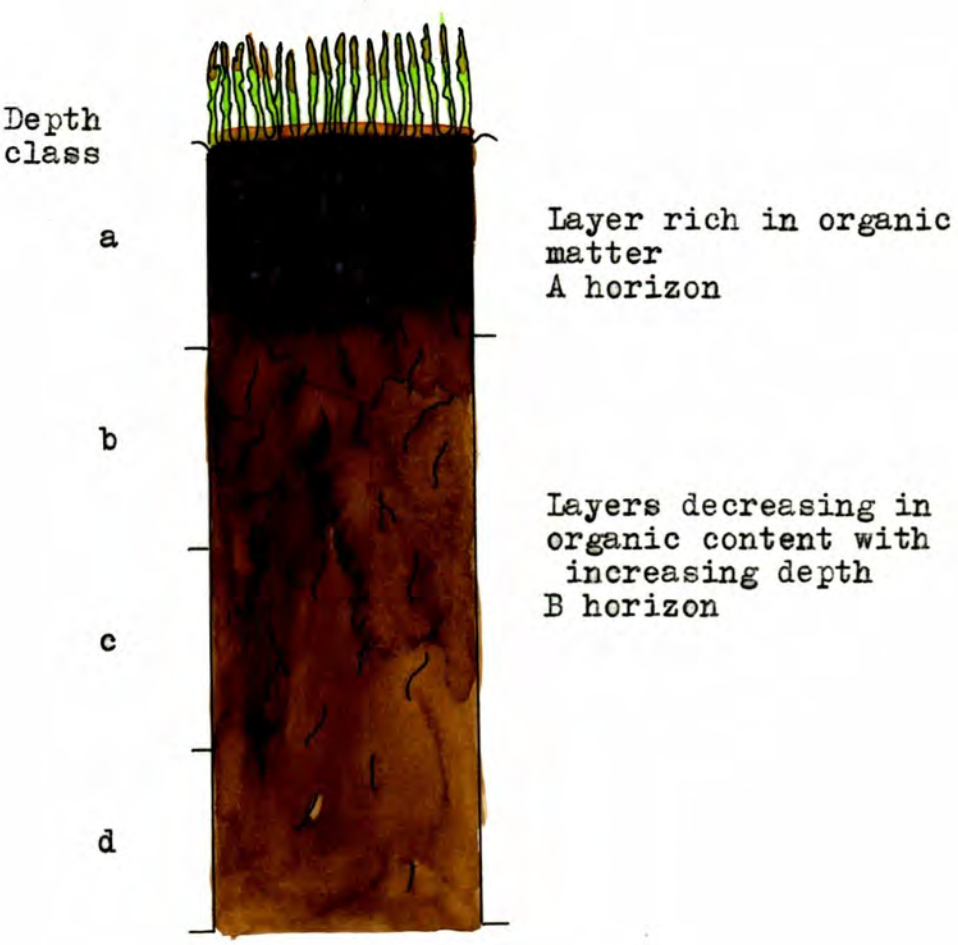
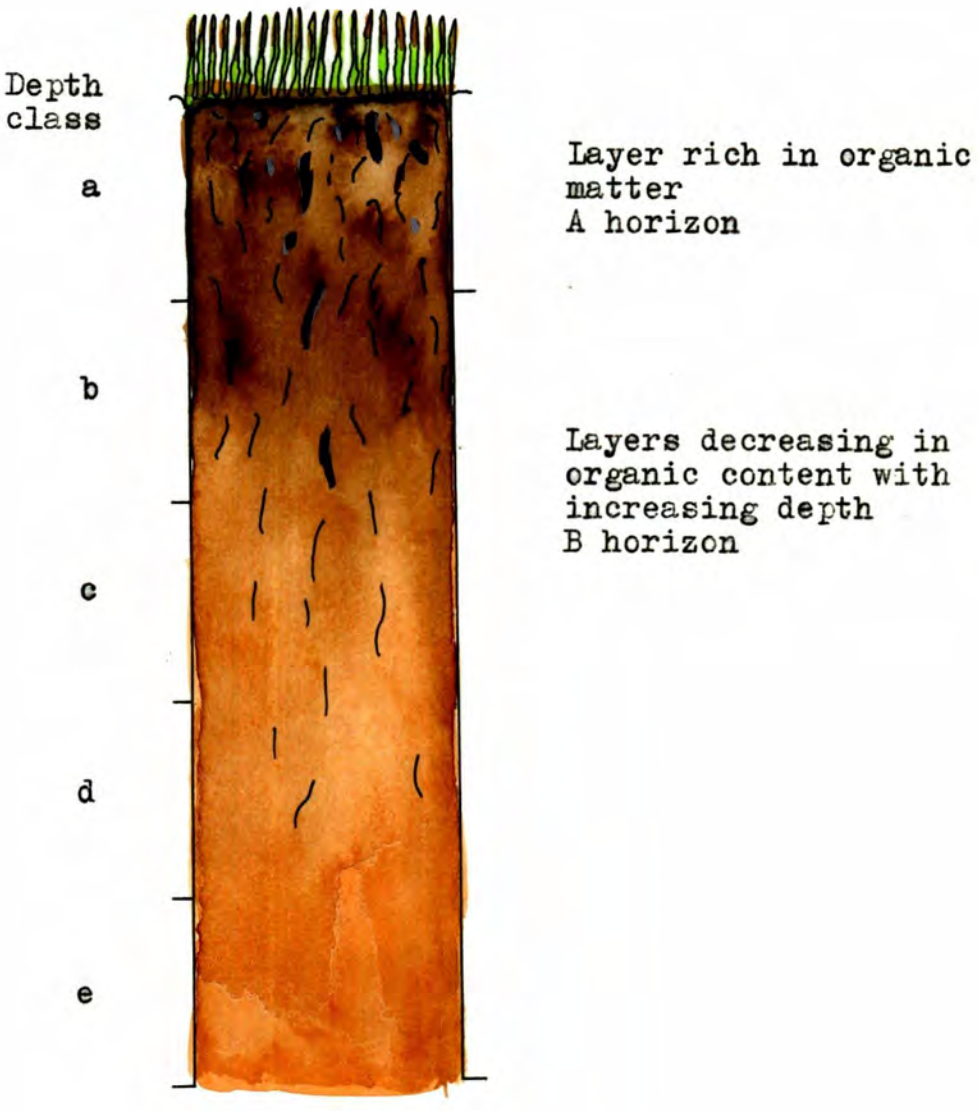


FIGURE 6 contd. Soil Profile of Hay Meadow-Area 3



free-draining and well aerated with a graded humus distribution throughout the profile (Fig. 6). Sodium and magnesium, the two minerals tested for which are not added in the fertilizer, increase with depth. Potassium, calcium, carbonate and phosphorous decrease with depth.

At all areas the percentage organic matter in the soil decreases with depth, it is very low throughout the profile of area 5, and is very high in the surface layers at areas 8, 7 and 4. At these three areas this is probably an important source of minerals.

## FLORISTIC DIFFERENCES BETWEEN THE SIX AREAS

The main floristic differences between the six study areas are given in Table 1. Further analysis of the floristic data is given on pages 57 and 94, together with tentative naming of the units present using the nomenclature of the Zurich-Montpellier School of Phytosociology.

TABLE 1 Floristic Differences of the Six Study Areas

Table of constant and characteristic species-i.e. those found at all four sample times, and the number of quadrats each species was found in on each sampling occasion (5 quadrats were studied at each time).

| SPECIES | AREA 2 | AREA 3 | AREA 4 | AREA 5 | AREA 7 | AREA 8 |
|---|---|---|---|---|---|---|
| Agrostis tenuis | 4522 | | | | | |
| Alopecurus pratensis | 1143 | 2553 | | | | |
| Bromus mollis | 5451 | 2354 | | | | |
| Holcus lanatus | 4555 | | | 5455 | 5453 | |
| Festuca rubra | 3523 | 5552 | | 5555 | 5353 | 1141 |
| Cerastium holostaodes | 4453 | 3242 | | 5442 | | |
| Ranunculus bulbosus | 5325 | 5352 | | 5555 | | |
| Poa trivialis | 5455 | 5345 | | 5333 | | |
| Rumex acetosa | 5545 | 5554 | | 2233 | | |
| Rhinanthus minor | | 2141 | | 5515 | | |
| Brachythecium rutabulum | | 3143 | | 3214 | | |
| Luzula campestris | | | | 2354 | | |
| Carex caryophyllea | | | | 2444 | | |
| Anemone nemorosa | | | | 4334 | | |
| Plantago lanceolata | | | | 5555 | | |
| Centaurea nigra | | | | 2333 | | |
| Acrocladium cuspidatum | | | | 1431 | 3544 | |
| Anthoxanthum odoratum | | | | 4555 | 4353 | 5543 |
| Poa pratensis | | | | | 2211 | |
| Festuca ovina | | | | | 5322 | |
| Prunella vulgaris | | | | | 1121 | |
| Rhytidiadelphus squarrosus | | | | | 1355 | 5555 |
| Agrostis canina | | | | | 1332 | 5545 |
| Nardus stricta | | | | | 4322 | 4544 |
| Carex panicea | | | 5554 | | 4352 | 5435 |
| Carex pulicaris | | | 5134 | | 5225 | |
| Eriophorum angustifolium | | | 5525 | | | |
| Molinia caerulea | | | 5555 | | | |

TABLE 1 contd.

| SPECIES | AREA 2 | AREA 3 | AREA 4 | AREA 5 | AREA 7 | AREA 8 |
|---|---|---|---|---|---|---|
| Thuidium tamariscinum | | | | | | 3324 |
| Hylocomium splendens | | | | | | 3323 |
| Lophocolea bidentata | | | | | | 5444 |

## THE MAIN STUDY

### AIMS

(1) To calculate the productivity, measured as above ground net biomass increase-Part I.
(2) To study the mineral regime of the communities-Part II.
(3) To measure the performance, or net biomass increase of selected species.

### METHODS

In order to be able to obtain the most useful data in the time available it was decided to restrict the study to the period of time during which the hay crop was developing in the meadows, and only to study the following minerals-sodium, potassium, magnesium and calcium. That is, it was decided to compare certain aspects of the production(net increase in the above ground standing crop, or biomass, and distribution of 4 cations within this crop) during the most agriculturally important period of development.

### A. METHOD USED IN FIELD SEASON 1968

Each area was sampled at regular intervals throughout the growing season. Each sample consisted of 5 randomly placed 255 $cm^2$ round quadrats. The vegetation and its supporting column of soil was collected in each case using a post hole auger. Each quadrat sample was placed in a clean polythene bag and brought back to the laboratory for analysis. As it was impossible to positively identify all the components of the litter, all the dead leaves and surface plant debris removed from the 5 quadrats of each sample were bulked

together. Each plant individual was then harvested by cutting off at ground level. The plants from each sample were then sorted into species (or subcrops) and counted, each grass or creeping plant tiller or shoot being counted as one individual. Bryophytes were simply sorted into species.

Each subcrop was then dried to a constant weight in a forced air oven at 99°C. Wherever the dry weight exceeded 0.5 g the subcrop was analysed for minerals. All subcrops from one set of 5 quadrats which weighed less than 0.5 g were bulked for analysis. The minerals were extracted by wet digestion with concentrated nitric acid (10ml), perchloric (5ml) and hydrochloric acid (10ml) (Jefferies & Willis 1964). The clear solution obtained was diluted to 250ml and the concentration of sodium and potassium determined by flame photometry, and of magnesium and calcium by atomic absorbtion spectrophotometry.

## B METHOD USED IN FIELD SEASON 1969

Sheep-proof exclosures were erected in 5 of the areas, 2, 5, 6, 7 and 8. They were 4 $m^2$ in size and the one situated in the hay meadow received the same fertilizer treatment as the area outside. From the results obtained by the above method, 5 species were selected (Holcus lanatus, Festuca rubra, Anthoxanthum odoratum, Rhinanthus minor and Trollius europaeus) and their increase in dry weight during the growing season was followed, both inside and outside the exclosures, by frequent cropping. A minimum of 20 individuals of each species were collected each time. They were cropped by cutting at ground level and all the dead leaves associated with each individual were also collected.

PART I

PRODUCTION OF THE COMMUNITIES

AIM:- MEASUREMENT OF ABOVE-GROUND STANDING CROP AND ESTIMATION OF PRODUCTION

Figures for the above-ground standing crop (designated as biomass below) for each component species at each site were obtained at intervals over the period 24th. May 1968 to 5th. August 1968. The results are expressed as g per $m^2$ per species, and the mean dry weight per plant in mg. Table 2 shows the change in biomass of the main components recorded over the study period. Areas 2 and 3 were mown in late July, hence no figures are presented for the August cropping. It is immediately obvious that figures calculated from single peak crop results are meaningless and that the fuller the actual analysis of the community by increment cropping and sorting of the species present, the more meaningful will be the production figures for comparative purposes. Table 2 does however show the importance of each component group of plants in the total community, showing for example that the Bryophytes are an important part of the ecosystem at area 8 and Dicotyledons at areas 5 and 2. The full biomass results of each species are presented in Tables 3, 4 and 5. Appendix 3 gives the number of individuals of each species per $m^2$.

The most abundant grass species in the mown parts of the meadow were Festuca rubra, Poa trivialis, Holcus lanatus, and Bromus mollis. Cerastium holostioides was the most common dicotyledon. In addition to these species, in area 5, Cynosurus cristatus, Ranunculus bulbosus, Rhinanthus minor and Plantago lanceolata were very numerous. Festuca ovina, Nardus stricta, Agrostis canina and Carex pulicaris were common in

TABLE 2 Total dry weight (g per $m^2$) and change in standing crop of each group of plants during the study period. (see Fig. 7 and Appendix 2)

| Date | Dry weight (g per $m^2$) 24.5.68 | 7.6.68 | 21.6.68 | 11.7.68 | 5.8.68 | Change in dry weight 24.5.68-11.7.68 | 24.5.68-5.8.68 |
|---|---|---|---|---|---|---|---|
| AREA 2 | | | | | | | |
| Grasses | 55 | 74 | 165 | 203 | | +148 | |
| Dicotyledons | 24 | 37 | 127 | 84 | | + 60 | |
| Bryophytes | 3 | 2 | 0 | 1 | | - 2 | |
| Debris | 76 | 64 | 46 | 58 | | - 18 | |
| TOTAL | 158 | 177 | 338 | 346 | | +208-20 | |
| AREA 3 | | | | | | | |
| Grasses | 67 | 76 | 180 | 408 | | +341 | |
| Dicotyledons | 25 | 35 | 83 | 38 | | + 13 | |
| Bryophytes | 6 | 4 | 2 | 1 | | - 5 | |
| Debris | 93 | 98 | 103 | 61 | | - 32 | |
| TOTAL | 191 | 213 | 368 | 508 | | +354-37 | |
| AREA 4 | | | | | | | |
| Grasses | 18 | 20 | 26 | 63 | | + 45 | |
| Dicotyledons | 1 | 2 | 0 | 3 | | + 2 | |
| Bryophytes | 5 | 2 | 1 | 19 | | + 14 | |
| Sedges | 54 | 58 | 86 | 95 | | + 41 | |
| Debris | 115 | 87 | 181 | 137 | | + 22 | |
| TOTAL | 193 | 169 | 294 | 317 | | +123 | |
| AREA 5 | | | | | | | |
| Grasses | 24 | 35 | 61 | 76 | 67 | + 52 | + 43 |
| Dicotyledons | 52 | 41 | 79 | 139 | 198 | + 87 | +146 |
| Bryophytes | 14 | 17 | 7 | 10 | 5 | - 4 | - 9 |
| Sedges | 46 | 38 | 29 | 2 | 44 | - 42 | - 2 |
| Debris | 54 | 84 | 84 | 80 | 97 | + 26 | + 43 |
| TOTAL | 190 | 215 | 260 | 307 | 411 | +165-46 | +232-11 |
| AREA 7 | | | | | | | |
| Grasses | 32 | 28 | 52 | 34 | 54 | + 2 | + 22 |
| Dicotyledons | 7 | 14 | 22 | 27 | 33 | + 20 | + 26 |
| Bryophytes | 90 | 53 | 85 | 72 | 73 | - 18 | - 17 |
| Sedges | 57 | 43 | 46 | 44 | 64 | - 13 | + 7 |
| Debris | 200 | 108 | 101 | 71 | 83 | -129 | -117 |
| TOTAL | 386 | 246 | 306 | 248 | 307 | +22-160 | +55-134 |
| AREA 8 | | | | | | | |
| Grasses | 45 | 44 | 58 | 56 | 62 | + 11 | + 17 |
| Dicotyledons | 3 | 3 | 9 | 3 | 3 | 0 | 0 |
| Bryophytes | 47 | 41 | 90 | 135 | 132 | + 88 | + 85 |
| Sedges | 13 | 9 | 11 | 16 | 22 | + 3 | + 9 |
| Debris | 140 | 141 | 215 | 101 | 185 | - 39 | + 45 |
| TOTAL | 248 | 238 | 383 | 311 | 404 | +102-39 | +156 |

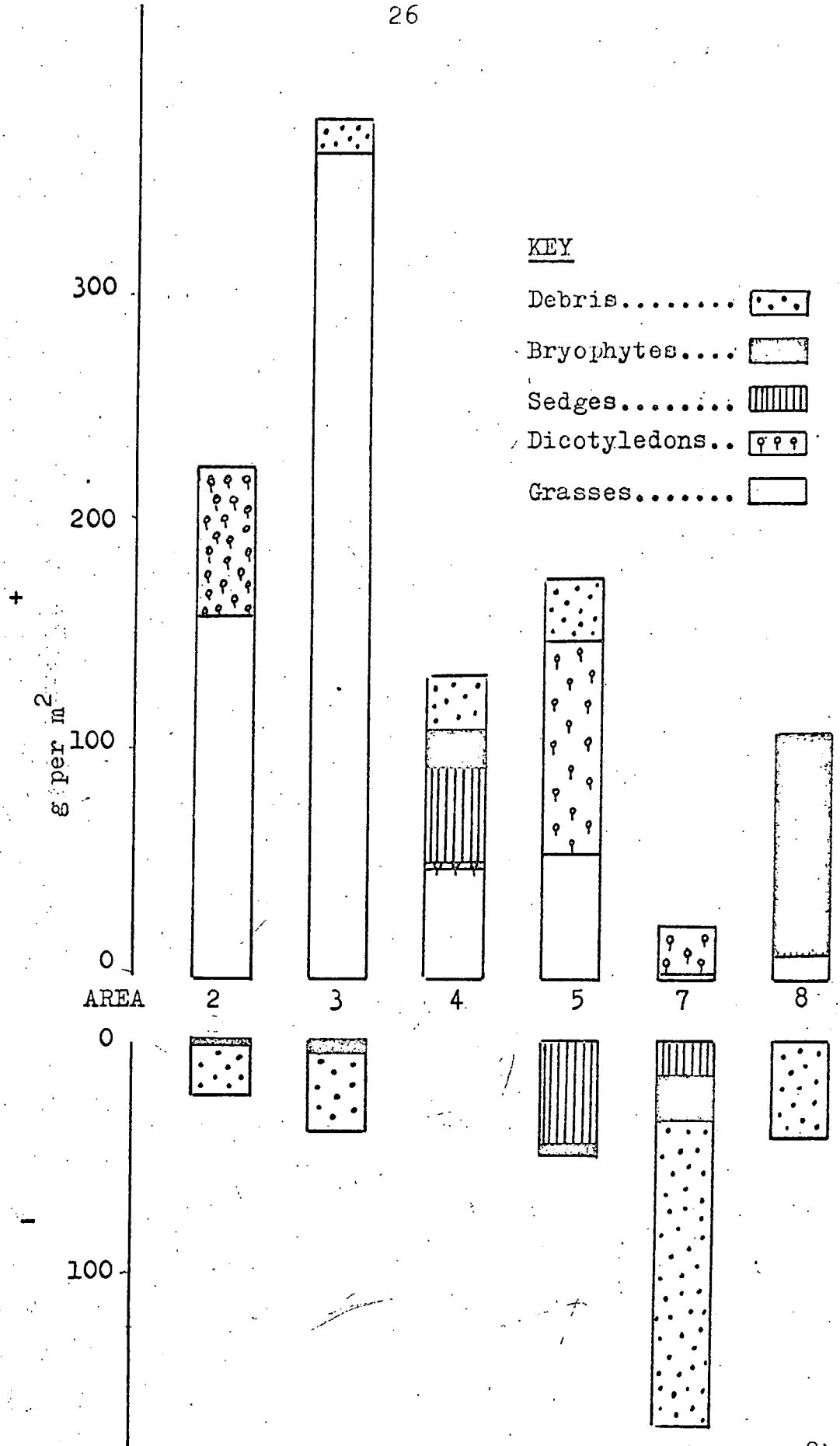



FIGURE 7 Change in dry weight (g per $m^2$) of each component group of plants during the study period. (see Table 2)

TABLE 3

Mean Dry Weight per Plant at each Sample Time (mg)

| | Species | 24.5.68 | 7.6.68 | 21.6.68 | 11.7.68 | |
|---|---|---|---|---|---|---|
| Area 2 | Anthoxanthum odoratum | 33.5 | 17.0 | | 35.9 | B |
| | Holcus lanatus | 6.3 | 8.8 | 35.6 | 63.6 | * |
| | Poa trivialis | 6.4 | 6.0 | 10.9 | 5.8 | * |
| | Alopecurus pratensis | 11.4 | 22.2 | 66.9 | 54.8 | * |
| | Agrostis tenuis | 6.5 | 11.0 | 15.8 | 26.1 | * |
| | Festuca rubra | 7.4 | 4.6 | 6.9 | 6.9 | * |
| | Bromus mollis | 14.1 | 20.4 | 49.7 | 22.6 | * |
| | Cerastium holosteodes | 6.5 | 10.2 | 66.4 | 23.2 | * |
| | Ranunculus bulbosus | 90.1 | 113.0 | 121.2 | 190.7 | * |
| | Rumex acetosa | 27.9 | 34.6 | 293.2 | 133.3 | * |
| | Conopodium majus | 17.6 | 18.0 | 158.1 | | * |
| | Trifolium repens | 24.8 | 26.5 | | 60.3 | * |
| | Rhinanthus minor | | 44.4 | 538.0 | 279.3 | * |
| Area 3 | Helictotrichon pubescens | 18.9 | | 58.0 | 40.1 | * |
| | Holcus lanatus | 9.4 | | 35.8 | 363.8 | * |
| | Poa trivialis | 5.6 | 5.7 | 12.5 | 7.0 | * |
| | Alopecurus pratensis | 7.6 | 17.8 | 43.2 | 193.9 | * |
| | Festuca rubra | 4.4 | 4.3 | 8.3 | 12.6 | * |
| | Bromus mollis | 12.1 | 20.9 | 23.5 | 13.5 | * |
| | Cerastium holosteodes | 8.7 | 12.1 | 37.6 | 24.7 | * |
| | Ranunculus bulbosus | 238.6 | 266.3 | 158.7 | 49.3 | E |
| | Rumex acetosa | 15.0 | 50.7 | 176.9 | 28.8 | * |
| | Conopodium majus | 17.8 | 19.6 | 158.8 | | * |
| | Rhinanthus minor | 15.7 | 62.2 | 185.9 | 294.4 | * |
| | Achillea millefolium | 39.8 | 78.0 | 210.2 | | * |
| Area 4 | Agrostis canina | 25.2 | | 13.2 | 0.5 | E |
| | Molinia caerulea | 9.2 | 10.8 | 14.0 | 34.3 | * |
| | Eriophorum angustifolium | 83.9 | 96.2 | 118.6 | 100.9 | * |
| | Carex pulicaris | 19.9 | 14.1 | 19.9 | 6.2 | B |
| | Carex panicea | 41.0 | 40.1 | 63.1 | 115.7 | * |
| | Carex pilulifera | | 12.0 | 43.8 | 5.3 | * |
| | Potentilla erecta | 16.7 | 11.9 | | 4.4 | E |

TABLE 3 contd.

| | Species | | | | | | |
|---|---|---|---|---|---|---|---|
| | | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | |
| | Helictotrichon pubescens | 39.5 | | 29.2 | 36.6 | 35.5 | B |
| | Anthoxanthum odoratum | 7.5 | 7.7 | 21.2 | 24.8 | 20.0 | * |
| | Holcus lanatus | 3.7 | 6.2 | 9.3 | 18.1 | 11.9 | * |
| | Poa trivialis | 2.2 | 3.9 | 7.9 | 3.6 | 3.4 | * |
| | Poa pratensis | 11.2 | 12.9 | 31.9 | 10.4 | 18.8 | * |
| | Festuca rubra | 4.0 | 5.0 | 4.7 | 5.7 | 8.4 | |
| | Cynosurus cristatus | | 7.6 | 19.5 | 23.3 | 19.4 | * |
| | Carex caryophyllea | 33.1 | 26.7 | 20.0 | | 31.9 | B |
| | Luzula campestris | 20.9 | 35.1 | 38.1 | 33.9 | 19.4 | * |
| | Cerastium holosteodes | 17.2 | 13.3 | 10.3 | 4.4 | 8.3 | E |
| | Ranunculus bulbosus | 13.8 | 19.6 | 34.6 | 58.6 | 21.8 | * |
| | Rumex acetosa | 9.6 | 15.0 | 31.7 | 17.2 | 55.9 | L |
| | Trifolium repens | 16.7 | 21.9 | 34.4 | 48.0 | 32.0 | * |
| | Rhinanthus minor | 2.6 | 7.6 | 6.1 | 105.8 | 57.5 | * |
| Area 5 | Succisa pratensis | 99.5 | | 10.7 | 151.1 | | B |
| | Anemone nemorosa | 49.6 | 46.2 | 41.0 | | 36.0 | E |
| | Taraxacum paludosum | 12.1 | 6.2 | | 166.0 | | * |
| | Plantago lanceolata | 24.1 | 24.6 | 52.4 | 57.5 | 94.1 | * |
| | Centaurea nigra | 7.1 | 17.8 | 72.6 | 144.3 | 501.6 | L |
| | Leontodon hispidus | 23.6 | 23.6 | 24.6 | | 253.5 | L |
| | Leontodon autumnalis | 17.8 | 40.1 | | 50.9 | 89.2 | L |
| | Trollius europaeus | 304.7 | 48.5 | | 15.6 | 7.0 | E |
| | Potentilla erecta | | 13.7 | 19.2 | | 18.9 | * |
| | Euphrasia sp. | | | 13.1 | 16.1 | 25.2 | L |
| | | | | | | | |
| | Anthoxanthum odoratum | 10.0 | 10.0 | 10.5 | 12.0 | 14.5 | L |
| | Holcus lanatus | | 6.1 | 8.2 | 13.0 | 7.8 | * |
| Area 7 | Agrostis tenuis | 5.5 | | | 11.0 | 15.2 | L |
| | Festuca rubra | 5.7 | 3.7 | 6.7 | 4.1 | 8.2 | |
| | Molinia caerulea | 11.2 | 9.2 | | | 37.7 | B |
| | Agrostis canina | 4.2 | 2.9 | 5.3 | 3.4 | 6.1 | |
| | Festuca ovina | 3.7 | 2.3 | | 3.3 | | |
| | Briza media | | 7.6 | 8.8 | 5.6 | | |
| | Nardus stricta | 10.4 | 11.0 | 15.9 | 14.8 | 13.2 | * |

TABLE 3 contd.

| | Species | | | | | | |
|---|---|---|---|---|---|---|---|
| Area 7 contd. | | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | |
| | Carex pulicaris | 27.6 | | | 6.8 | 3.9 | E |
| | Carex panicea | 26.3 | 28.8 | 32.0 | 39.0 | 58.2 | L |
| | Luzula campestris | 11.6 | 20.7 | 22.1 | 22.1 | 9.4 | * |
| | Potentilla erecta | 24.8 | 19.2 | 41.8 | 19.6 | 21.9 | * |
| | Galium saxatile | 3.3 | 2.9 | 2.4 | | 1.0 | E |
| | Viola palustris | 14.8 | 12.8 | | 18.7 | | |
| | Trifolium repens | | | 12.6 | 17.6 | 3.2 | |
| Area 8 | Anthoxanthum odoratum | 13.1 | 10.0 | 8.2 | 9.2 | 12.7 | B |
| | Holcus lanatus | 6.0 | 6.6 | 22.1 | 10.4 | 7.1 | * |
| | Poa trivialis | 4.5 | | 3.1 | 3.1 | 0.8 | E |
| | Poa pratensis | 19.3 | 50.5 | 16.3 | | | |
| | Festuca rubra | 6.2 | 5.1 | 8.3 | 3.6 | 8.3 | |
| | Molinia caerulea | 21.4 | 18.2 | 15.7 | 14.3 | 25.6 | B |
| | Agrostis canina | 3.6 | 5.7 | 3.6 | | 5.4 | |
| | Festuca ovina | 4.1 | 0.6 | 2.3 | 3.9 | 4.6 | |
| | Briza media | | | 10.6 | 7.4 | 103.3 | L |
| | Nardus stricta | 9.0 | 10.5 | 18.0 | 14.9 | 12.3 | * |
| | Eriophorum angustifolium | 45.2 | 41.8 | 32.3 | 67.4 | | B |
| | Carex pulicaris | 15.1 | 14.1 | 9.9 | 7.5 | | E |
| | Carex panicea | 27.5 | 40.5 | 42.2 | 49.4 | 63.3 | L |
| | Juncus squarrosus | 114.0 | 68.5 | 73.9 | 54.0 | 122.9 | B |
| | Juncus articulatus | 54.3 | | 68.9 | 159.3 | 100.0 | * |
| | Carex lepidocarpa | | 42.3 | 31.3 | | 53.0 | B |
| | Luzula campestris | | | 19.9 | 18.7 | 20.2 | |
| | Cerastium holostëodes | 24.5 | | 20.3 | 4.8 | 2.1 | E |
| | Ranunculus bulbosus | 44.2 | 26.7 | 44.8 | 75.0 | 98.9 | B |
| | Cardamine flexuosa | 24.6 | 18.3 | 24.5 | | 3.2 | E |
| | Ranunculus flammula | 35.1 | 72.9 | | | 55.9 | |
| | Campanula rotundifolia | | 31.9 | 0.1 | | 2.3 | E |
| | Trifolium repens | | 13.3 | 26.3 | 27.4 | 34.6 | L |
| | Taraxacum paludosum | | 64.8 | 38.7 | 7.3 | | E |
| | Prunella vulgaris | | 29.2 | 50.1 | 72.3 | 95.3 | L |
| | Potentilla erecta | | | 19.8 | 15.8 | 14.2 | E |
| | Leontodon autumnalis | | | 70.2 | 142.6 | 47.5 | * |

TABLE 4

Dry Weight per square metre at each Sample Time of Each Species (g per $m^2$)

| | Area & Species | 24.5.68 | 7.6.68 | 21.6.68 | 11.7.68 | |
|---|---|---|---|---|---|---|
| Area 2 | Anthoxanthum odoratum | 3.6 | 1.8 | | 3.9 | B |
| | Holcus lanatus | 8.2 | 11.5 | 46.6 | 83.2 | * |
| | Poa trivialis | 14.2 | 13.2 | 24.1 | 12.8 | * |
| | Alopecurus pratensis | 8.1 | 15.7 | 38.7 | 47.3 | * |
| | Agrostis tenuis | 6.2 | 13.5 | 15.3 | 25.1 | * |
| | Festuca rubra | 9.7 | 6.1 | 9.1 | 9.1 | |
| | Bromus mollis | 7.1 | 10.3 | 25.0 | 11.4 | * |
| | Cerastium holosteodes | 2.2 | 3.4 | 22.2 | 7.7 | * |
| | Ranunculus bulbosus | 7.9 | 9.9 | 10.7 | 16.8 | * |
| | Rumex acetosa | 3.8 | 4.7 | 39.9 | 18.1 | * |
| | Conopodium majus | 3.4 | 3.4 | 30.3 | | * |
| | Trifolium repens | 6.4 | 6.8 | | 15.5 | * |
| | Rhinanthus minor | | 1.9 | 23.2 | 12.0 | * |
| | Debris | 76. 0 | 64.0 | 46.0 | 58.0 | |
| | other species | | 6.4 | 7.0 | 24.4 | |
| | Bryophytes | 3.0 | 2.0 | | 1.0 | E |
| | TOTAL | 158 | 117 | 338 | 346 | |
| Area 3 | Helictotrichon pubescens | 6.5 | | 20.1 | 13.9 | * |
| | Holcus lanatus | 3.2 | | 12.1 | 122.9 | * |
| | Poa trivialis | 8.3 | 10.0 | 21.6 | 12.2 | * |
| | Alopecurus pratensis | 6.1 | 14.3 | 34.8 | 156.1 | * |
| | Festuca rubra | 26.9 | 26.5 | 50.9 | 77.6 | * |
| | Bromus mollis | 15.1 | 25.9 | 29.2 | 16.7 | * |
| | Cerastium holosteodes | 2.2 | 2.3 | 10.0 | 6.6 | * |
| | Ranunculus bulbosus | 15.8 | 17.6 | 10.5 | 3.3 | E |
| | Rumex acetosa | 2.1 | 7.2 | 25.2 | 4.1 | * |
| | Conopodium majus | 1.6 | 1.8 | 14.2 | | * |
| | Rhinanthus minor | 1.0 | 4.0 | 11.8 | 18.7 | * |
| | Achillea millefolium | 1.4 | 2.7 | 7.2 | | * |

TABLE 4 contd.

| | Area & Species | 24.5.68 | 7.6.68 | 21.6.68 | 11.7.68 | |
|---|---|---|---|---|---|---|
| | other species | 1.6 | 0.7 | 16.2 | 13.6 | |
| | Bryophytes | 6.0 | 4.0 | 2.0 | | E |
| | Debris | 93.0 | 98.0 | 103.0 | 60.0 | |
| | TOTAL | 191 | 213 | 368 | 508 | |
| Area 4 | Agrostis canina | 0.8 | | 0.4 | + | E |
| | Molinia caerulea | 16.7 | 19.6 | 25.3 | 62.3 | * |
| | Eriophorum angustifolium | 34.1 | 39.1 | 48.2 | 41.1 | * |
| | Carex pulicaris | 5.8 | 4.1 | 5.8 | 1.8 | B |
| | Carex panicea | 14.4 | 14.1 | 22.1 | 40.6 | * |
| | Carex pilulifera | | 0.6 | 2.3 | 0.3 | * |
| | Potentilla erecta | 0.7 | 0.5 | | 0.2 | E |
| | other species | 0.5 | 1.3 | 11.2 | 14.4 | |
| | Debris | 115.0 | 87.0 | 181.0 | 137.0 | |
| | Bryophytes | 5.0 | 2.0 | 1.0 | 19.0 | * |
| | TOTAL | 193 | 169 | 294 | 317 | |

| | | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | |
|---|---|---|---|---|---|---|---|
| | Helictotrichon pubescens | 2.8 | | 2.0 | 2.5 | 2.5 | B |
| | Anthoxanthum odoratum | 3.0 | 3.1 | 8.6 | 9.9 | 8.1 | * |
| | Holcus lanatus | 3.0 | 5.1 | 7.7 | 14.9 | 9.8 | * |
| | Poa trivialis | 1.9 | 3.9 | 6.8 | 3.1 | 2.9 | * |
| | Poa pratensis | 1.3 | 1.5 | 3.7 | 1.2 | 2.2 | * |
| | Festuca rubra | 11.8 | 14.5 | 13.9 | 16.8 | 24.7 | |
| | Cynosurus cristatus | | 7.1 | 18.0 | 21.6 | 17.9 | * |
| Area 5 | Carex caryophyllea | 44.9 | 36.2 | 27.1 | | 43.2 | B |
| | Luzula campestris | 1.2 | 2.1 | 2.2 | 2.0 | 1.1 | * |
| | Cerastium holosteodes | 3.1 | 2.4 | 1.8 | 0.7 | 1.5 | E |
| | Ranunculus bulbosus | 4.6 | 6.5 | 11.5 | 19.4 | 7.2 | * |
| | Rumex acetosa | 0.7 | 1.2 | 2.4 | 1.3 | 4.3 | L |
| | Trifolium repens | 3.0 | 3.9 | 6.1 | 8.5 | 5.7 | * |

TABLE 4 contd.

| | Area & Species | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | |
|---|---|---|---|---|---|---|---|
| Area 5 contd. | Rhinanthus minor | 1.0 | 2.7 | 2.4 | 40.7 | 22.1 | * |
| | Succisa pratensis | 0.7 | | 0.1 | 1.1 | | B |
| | Anemone nemorosa | 2.0 | 1.8 | 1.6 | | 1.4 | E |
| | Taraxacum paludosum | 0.4 | 0.2 | | 4.8 | | * |
| | Plantago lanceolata | 17.4 | 17.8 | 37.8 | 42.4 | 67.9 | * |
| | Centaurea nigra | 0.8 | 2.0 | 8.0 | 15.8 | 55.1 | L |
| | Leontodon hispidus | 0.5 | 0.5 | 0.8 | | 5.3 | L |
| | Leontodon autumnalis | 0.3 | 0.8 | | 1.0 | 1.7 | L |
| | Trollius europaeus | 1.5 | 2.8 | | 0.9 | 0.4 | E |
| | Potentilla erecta | | 0.7 | 1.0 | | 1.0 | * |
| | Euphrasia sp. | | | 2.1 | 2.6 | 4.1 | L |
| | other species | 0.1 | 0.9 | 4.0 | 1.3 | 9.9 | |
| | Debris | 53.0 | 84.0 | 84.0 | 80.0 | 97.0 | |
| | Bryophytes | 14.0 | 17.0 | 7.0 | 10.0 | 5.0 | E |
| | TOTAL | 190 | 215 | 260 | 377 | 411 | |
| Area 7 | Anthoxanthum odoratum | 2.8 | 2.9 | 3.0 | 3.1 | 3.4 | L |
| | Holcus lanatus | | 0.8 | 1.0 | 1.6 | 1.0 | * |
| | Agrostis tenuis | 1.0 | | | 2.0 | 2.8 | L |
| | Festuca rubra | 2.0 | 1.3 | 2.4 | 1.5 | 2.9 | |
| | Molinia caerulea | 2.4 | 1.9 | | | 7.9 | B |
| | Agrostis canina | 5.3 | 3.7 | 6.7 | 4.4 | 7.8 | |
| | Festuca ovina | 3.0 | 1.8 | | 2.6 | | |
| | Briza media | | 1.9 | 2.2 | 1.4 | | |
| | Nardus stricta | 28.3 | 30.1 | 43.5 | 40.5 | 36.2 | * |
| | Carex pulicaris | 5.6 | | | 1.4 | 1.2 | E |
| | Carex panicea | 6.5 | 7.1 | 7.9 | 9.7 | 14.4 | L |
| | Luzula campestris | 0.4 | 0.7 | 0.8 | 0.8 | 0.3 | * |
| | Potentilla erecta | 1.8 | 1.4 | 3.1 | 1.4 | 1.6 | * |
| | Galium saxatile | 1.0 | 0.8 | 0.7 | | 0.3 | E |
| | Viola palustris | 0.6 | 0.5 | | | 0.7 | |
| | Trifolium repens | | | 0.8 | 1.1 | 0.2 | |
| | other species | 0.4 | 0.4 | 5.6 | 5.0 | 7.6 | |

TABLE 4 contd.

| Area & Species | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | |
|---|---|---|---|---|---|---|
| Bryophytes | 47.0 | 41.0 | 90.0 | 135.0 | 132.0 | |
| Debris | 140.0 | 141.0 | 215.0 | 101.0 | 185.0 | |
| TOTAL | 248 | 238 | 383 | 311 | 404 | |
| Anthoxanthum odoratum | 4.2 | 3.2 | 2.6 | 2.9 | 4.0 | B |
| Holcus lanatus | 4.7 | 5.2 | 1[illegible].2 | 8.1 | 5.5 | * |
| Poa trivialis | 0.8 | | | 0.5 | 0.1 | E |
| Poa pratensis | 0.7 | 1.9 | 1.3 | | | |
| Festuca rubra | 6.3 | 5.1 | 8.3 | 3.6 | 8.3 | |
| Molinia caerulea | 2.5 | 2.1 | 1.8 | 1.6 | 2.9 | B |
| Agrostis canina | 2.2 | 3.5 | 2.2 | | 3.3 | |
| Festuca ovina | 4.5 | 0.7 | 3.5 | 4.3 | 5.1 | B |
| Briza media | | | 1.6 | 1.1 | 16.0 | L |
| Nardus stricta | 6.0 | 7.1 | 12.1 | 10.0 | 8.3 | * |
| Eriophorum angustifolium | 2.6 | 2.4 | 1.9 | 3.9 | | B |
| Carex pulicaris | 5.2 | 4.9 | 3.4 | 2.6 | | E |
| Carex panicea | 6.5 | 9.6 | 10.0 | 11.7 | 15.0 | L |
| Juncus squarrosus | 40.2 | 24.2 | 26.1 | 19.1 | 43.4 | B |
| Juncus articulatus | 2.2 | | 2.8 | 6.5 | 4.1 | * |
| Carex lepidocarpa | | 1.0 | 0.7 | | 1.2 | B |
| Luzula campestris | | | 0.7 | 0.6 | 0.7 | |
| Cerastium holosteodes | 0.4 | | 0.3 | 0.1 | + | B |
| Ranunculus bulbosus | 4.9 | 3.0 | 5.0 | 8.4 | 11.0 | * |
| Cardamine flexuosa | 1.1 | 0.8 | 1.1 | | 0.1 | B |
| Ranunculus flammula | 0.9 | 1.9 | | | 1.5 | |
| Campanula rotundifolia | | 0.2 | + | | + | E |
| Trifolium repens | | 4.2 | 8.3 | 8.7 | 11.0 | L |
| Taraxacum paludosum | | 2.0 | 1.2 | 0.2 | | E |
| Prunella vulgaris | | 2.0 | 3.5 | 5.0 | 6.6 | L |
| Potentilla erecta | | | 0.8 | 0.6 | 0.6 | E |
| Leontodon autumnalis | | | 1.7 | 3.4 | 1.1 | * |
| other species | 0.6 | 2.2 | 2.7 | 0.4 | 1.1 | |
| Bryophytes | 90.0 | 53.0 | 86.0 | 72.0 | 73.0 | E |
| Debris | 200.0 | 108.0 | 101.0 | 71.0 | 83.0 | |
| TOTAL | 386 | 245 | 306 | 248 | 307 | |

Area 8

TABLE 5

Bryophyte Dry Weight at each Sample Time
g per $m^2$ per species.

| Area and Species | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | |
|---|---|---|---|---|---|---|
| Area 2 | | | | | | |
| Brachythecium rutabulum | 0.8 | 0.5 | | 0.2 | | E |
| Eurynchium swartzii | 2.3 | 1.1 | | 0.5 | | E |
| TOTAL | 3.1 | 1.6 | | 0.7 | | |
| | | | | | | |
| Area 3 | | | | | | |
| Acrocladium cuspidatum | | | | + | | |
| Mnium punctatum | + | | | | | |
| Brachythecium rutabulum | 1.6 | 0.5 | 2.2 | 0.3 | | B |
| Eurynchium swartzii | 3.8 | 4.0 | 0.2 | | | E |
| Rhytidiadelphus squarrosus | 0.4 | | | + | | E |
| TOTAL | 5.8 | 4.5 | 2.4 | 0.3 | | |
| | | | | | | |
| Area 4 | | | | | | |
| Acrocladium cuspidatum | | 0.7 | 1.0 | 19.0 | | * |
| Pseudoscleropodium purum | | | | + | | |
| Rhytidiadelphus squarrosus | 2.0 | 0.2 | | | | |
| Hylocomium splendens | 2.5 | 0.7 | | | | E |
| Lophocolea bidentata | 0.4 | | | | | |
| Brachythecium rutabulum | | | | + | | |
| Calypogeia trichomanis | | | | 0.3 | | |
| TOTAL | 4.9 | 1.6 | 1.0 | 19.3 | | |
| | | | | | | |
| Area 5 | | | | | | |
| Acrocladium cuspidatum | 4.1 | 8.0 | 0.3 | 2.1 | 1.2 | E |
| Mnium punctatum | | 0.9 | + | 0.5 | | E |
| Thuidium tamariscinum | | 4.3 | | | | |
| Mnium undulatum | 2.5 | 0.3 | | 0.4 | 1.7 | B |
| Brachythecium rutabulum | 7.0 | 3.1 | 0.4 | 5.8 | | B |
| Eurynchium swartzii | 0.4 | | 1.7 | 7.8 | 1.9 | * |
| Rhytidiadelphus squarrosus | | | 2.7 | | | |
| Pseudoscleropodium purum | | | | + | | |

TABLE 5 contd.

| Area and Species | 24.5 | 7.6. | 21.6 | 11.7 | 5.8 | |
|---|---|---|---|---|---|---|
| Area 5 contd. | | | | | | |
| Lophocolea bidentata | 0.1 | | 2.1 | | 0.3 | |
| Calypogeia trichomanis | | 0.3 | 0.1 | | | |
| Scapania undulata | | 0.2 | | | | |
| TOTAL | 14.1 | 17.1 | 7.4 | 10.1 | 5.1 | |
| | | | | | | |
| Area 7 | | | | | | |
| Acrocladium cuspidatum | 50.2 | 46.1 | 57.6 | 6.2 | 51.8 | |
| Aulocomnium palustre | | | | 34.5 | | |
| Mnium punctatum | 0.3 | 0.7 | | | + | |
| Mnium undulatum | | 0.4 | 8.3 | 8.3 | 0.8 | * |
| Thuidium tamariscinum | | | 2.6 | 1.5 | 2.8 | |
| Brachythecium rutabulum | 1.8 | 0.8 | 2.1 | | 0.6 | |
| Eurynchium swartzii | 5.6 | 0.3 | 0.7 | 0.3 | | E |
| Pleurozium schreberi | 27.5 | | | | | |
| Hypnum cupressiforme | 3.9 | 0.2 | | | 0.6 | E |
| Rhytidiadelphus squarrosus | | 0.5 | 11.3 | 9.5 | 10.7 | |
| Hylocomium splendens | | | 0.6 | 6.8 | 4.1 | * |
| Philonotis fontana | | 1.4 | | + | | |
| Thuidium delicatulum | | 1.3 | 0.2 | 0.9 | + | |
| Pseudoscleropodium purum | | | 2.6 | 0.6 | 1.0 | |
| Fissidens sp. | | | 0.3 | | | |
| Dicranum scoparium | | | | 3.8 | | |
| Riccardia pinguis | | | | | 0.3 | |
| Lophocolea bidentata | | 0.2 | 0.2 | 0.1 | + | |
| Calypogeia trichomanis | 0.6 | 1.3 | | | | |
| Scapania undulata | | 0.1 | | | | |
| TOTAL | 89.9 | 53.3 | 86.3 | 72.5 | 72.8 | |
| | | | | | | |
| Area 8 | | | | | | |
| Acrocladium cuspidatum | | | 47.7 | 37.1 | 0.6 | E |
| Aulocomnium palustre | 3.2 | 2.7 | | 60.3 | 11.2 | * |
| Pseudoscleropodium purum | | 0.8 | 24.0 | 1.6 | 6.2 | |
| Mnium punctatum | | 0.7 | | 13.8 | 4.0 | |
| Mnium undulatum | | | 1.2 | | 0.2 | |

TABLE 5 contd.

| Area and Species | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | |
|---|---|---|---|---|---|---|
| Area 8 contd. | | | | | | |
| Thuidium tamariscinum | 18.2 | 8.0 | 5.1 | 3.1 | 17.1 | B |
| Brachythecium rutabulum | | | 1.0 | | | |
| Pleurozium schreberi | 1.0 | 0.4 | | | | |
| Hypnum cupressiforme | 7.9 | 4.3 | 2.8 | | | |
| Rhytidiadelphus squarrosus | 3.4 | 10.0 | 4.2 | | 76.5 | |
| Hylocomium splendens | 2.3 | 3.6 | 2.9 | 3.5 | 10.6 | L |
| Dicranum scoparium | | I.1 | | 1.4 | 0.6 | |
| Polytrichum commune | 0.3 | 2.6 | | | 4.0 | |
| Climacium dendroides | | | | 5.8 | | |
| Riccardia pinguis | | 0.1 | | 1.6 | + | |
| Lophocolea bidentata | 1.2 | 7.6 | 0.8 | 1.8 | 0.3 | |
| Calypogeia trichomanis | | 0.1 | | + | 0.7 | L |
| Scapania undulata | | 0.3 | | | | |
| Thallose liverwort | | | | 5.3 | | |
| TOTAL | 47.5 | 37.7 | 89.8 | 135.4 | 132.3 | |

areas 7 and 8, also abundant in areas 7 were Holcus lanatus, Festuca rubra and Trifolium repens, and in area 8 Galium saxatile. Molinia caerulea was common only in area 4.

The majority of species studied can be regarded as "conformist", that is they show the expected increase in dry weight over the study period, all these species are marked by an asterisk in Tables 3, 4 and 5. All those marked E would appear to have their main period of development in the spring and over the study period show a continuous decrease in dry weight. These include the Bryophytes, except at area 8, spring flowers, e.g. Anemone nemorosa and Cerastium holostëodes, and the montane species Trollius europaeus. In the arctic-alpine communities of the upper dale Trollius europaeus develops almost a month later (pers. comm. C. Marshall). "Late-developers", marked L, include Leontodon spp., Carex panicea and Centaurea nigra. A number of species, marked B, show an early and a late peak. These include the Carices, like Carex lepidocarpa and Carex caryophyllea, also Juncus squarrosus and Molinia caerulea. This raised a problem of interpretation of results when dealing with species which are biennial-perennials. That is species which produce vegetative tillers in the first year that over-winter and flower in the second year (Rieley 1967). When cropping it is often difficult to distinguish between the two types of shoots. Mixtures of the two types of shoots are probably responsible for the bimodal type of curve under discussion. It is also obvious that in perennials which produce their new shoots (i.e. next year shoots) in the late summer or which store food in some above ground part (e.g. Molinia caerulea stores nutrients in the basal internode-Loach 1968, Jeffries 1915), other difficulties will be encountered unless great care is taken during sorting. Taking all

these points into consideration a series of production figures were calculated from Tables 2 and 4 using the following methods.

(A) Taking the actual overall increase in standing crop (including debris) during the experimental period, i.e. differences between first and last standing crop figures.

(B) Adding the peak standing crop of each species and subtracting from this the minimum dry weight of each species.

(C) Adding to the figures from (B) the difference between maximum and minimum dry weight of debris during the season, as this must represent a season's litter fall.

(D) Using the peak standing crop of each component group of plants, including the season's litter, rather than the final standing crop, and subtracting the minimum standing crops.

The results are shown in Tables 6(A) and 6(B).

A study of the changes in biomass of individual species easily explains the results of Table 6 and also of Table 2. The total grass dry weight increases in all areas up to the time of mowing. Bromus mollis, Poa trivialis and Helictotrichon pubescens in the hay meadow, being early summer grasses, showed a decrease before cutting, but this loss was compensated for by the continued increase of Holcus lanatus, Alopecurus pratensis, Agrostis tenuis and also by Festuca rubra in area 3. Most of the dicotyledons in areas 2 and 3 had finished flowering by the end of June and this explained the decrease in total dicotyledon dry weight between 21.6.68 and 11.7.68 (Table 2).

The fact that different species attained their peak dry weight at different times easily explains why

TABLE 6A(i)

Production Figures calculated by the Four Methods A, B, C and D, of the Communities between 24.5.68 and 11.7.68 (48 days) in g per $m^2$ (see Fig.83).

| | METHOD | | | |
|---|---|---|---|---|
| AREA | A | B | C | D |
| 2 | 188 | 315 | 344 | 283 |
| 3 | 217 | 460 | 503 | 446 |
| 4 | 123 | 125 | 273 | 196 |
| 5 | 119 | 206 | 242 | 234 |
| 7 | -138 | 136 | 275 | 224 |
| 8 | 63 | 130 | 244 | 235 |

TABLE 6A(ii)

Production Figures of Areas 5, 7 and 8 between 24.5.68 and 5.8.68 (73 days)

| | METHOD | | | |
|---|---|---|---|---|
| AREA | A | B | C | D |
| 5 | 221 | 284 | 327 | 308 |
| 7 | -79 | 156 | 285 | 239 |
| 8 | 156 | 150 | 264 | 245 |

TABLE 6B(i)

Rate of Production calculated by the Four Methods A, B, C and D, of the Communities between 24.5.68 and 11.7.68 (48 days) in g per $m^2$ per day.

| | METHOD | | | |
|---|---|---|---|---|
| AREA | A | B | C | D |
| 2 | 3.9 | 6.6 | 7.2 | 5.9 |
| 3 | 4.5 | 9.6 | 10.5 | 9.3 |
| 4 | 2.6 | 2.6 | 5.7 | 4.1 |
| 5 | 2.5 | 4.3 | 5.0 | 4.9 |
| 7 | -2.9 | 2.8 | 5.7 | 4.7 |
| 8 | 1.3 | 2.7 | 5.1 | 4.9 |

TABLE 6B(ii)

Rate of Production of Areas 5, 7 and 8 between 24.5.68 and 5.8.68 (73 days)

| | METHOD | | | |
|---|---|---|---|---|
| AREA | A | B | C | D |
| 5 | 3.0 | 3.9 | 4.5 | 4.2 |
| 7 | -1.1 | 2.1 | 3.9 | 3.3 |
| 8 | 2.1 | 2.0 | 3.6 | 3.5 |

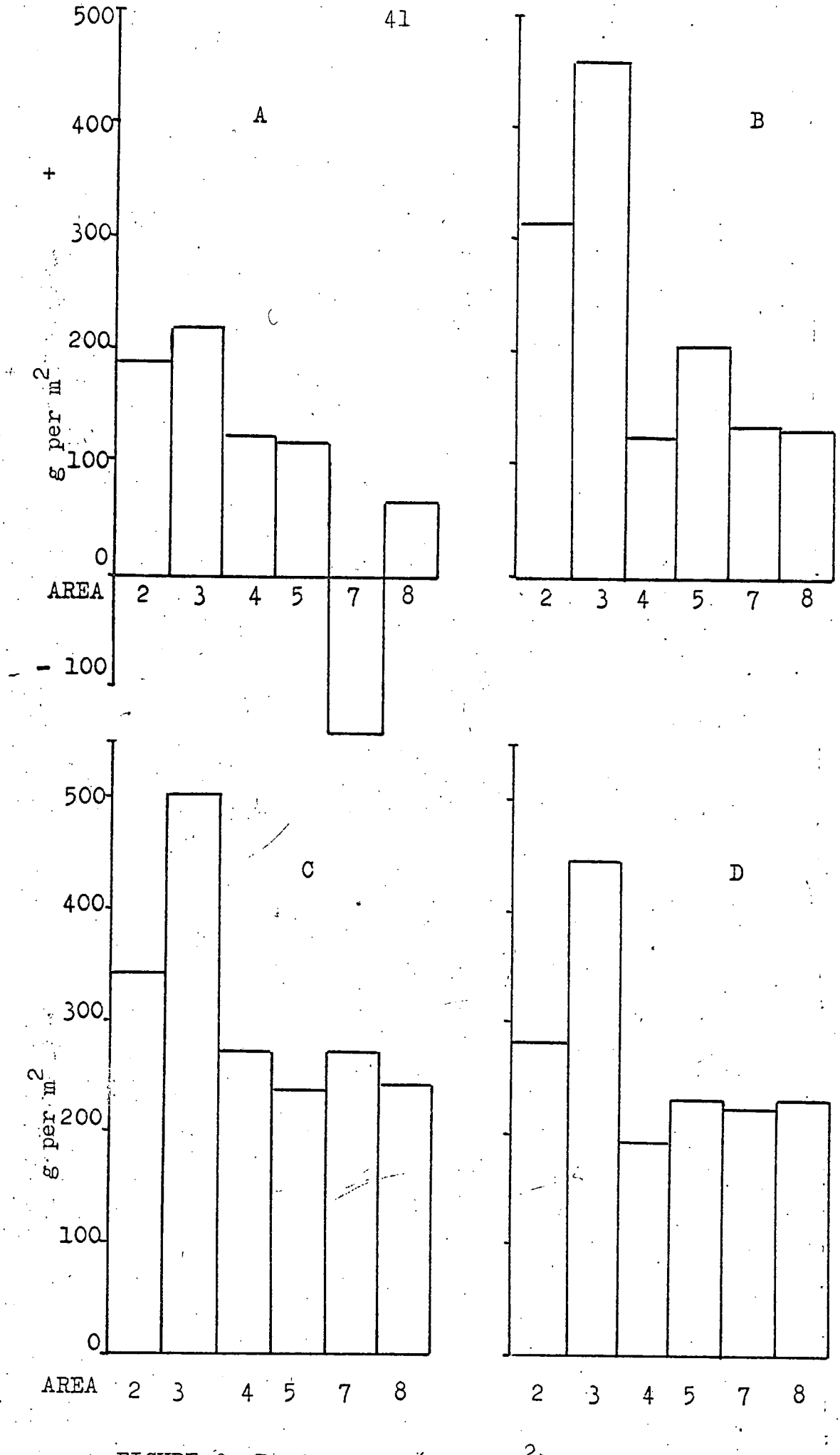



FIGURE 8 Production (g per $m^2$) at the six study areas as calculated by 4 different methods-A,B,C,& D. (see Table 6A(i))

production as calculated by methods (B), (C) and (D) usually exceeds that by method (A), and again shows that the more detailed the cropping programme and analysis the more meaningful the production figures will be.

The much higher final increase in biomass of certain species at area 3, (e.g. Holcus lanatus), than at area 2, is reflected in the higher production figures. All methods show that area 3 is the most productive area studied.

As calculated by methods (C) and (D) (Table 6A(i) and B(i)), production of areas 4, 5, 7 and 8 are very similar, but comparison of results of methods (B) and (C) indicates that in the wet, more natural areas, i.e. areas 4, 7 and 8 which are never mown, nearly half of this production passes rapidly to the litter. The majority of plants from areas 4, 7 and 8 have thick cuticles and would decay only slowly, the wet conditions also hindering decay. At area 7 the large decrease in litter biomass during the study period explains the negative production figure as calculated by method (A). Here, litter accumulates when the plants die in the autumn. The total litter in areas 4, 5 and 8 tends to increase then decrease. The presence of many dicotyledons growing at different times of the year explains why production at area 5 as calculated by method (B) was higher than at areas 4, 7 and 8. The low figure for area 8, as calculated by method (A), could be due to the fact that here the Bryophytes are the dominant group of plants, and the most productive ones. Thus even though the communities may be different and different groups of plants may be important, the total production may be the same, depending on the method of calculation.

Tables 6B(ii) and A(ii) show that by extending the

experimental period a slightly different picture is obtained. The production ($g/m^2/day$) as calculated by methods (B), (C) and (D) has decreased and by method (A) has increased, as compared with the results in Tables 6A(i) and B(i). This could indicate that the last sample was taken when the growing season was nearly finished, the growth rate of the plants decreasing and the rate of accumulation of litter increasing.

Table 7 shows the biomass of all the major component species expressed as percentage of the maximum total above ground living organic matter attained at any of the areas (area 3, 11,7,68). This simply allows comparison of the role of each species in the vegetation complex, i.e. a direct comparative measure of "cover" as biomass. Holcus lanatus and Alopecurus pratensis formed the largest part of the hay meadow communities, Plantago lanceolata and Centaurea nigra at area 5, Molinia caerulea area 4, and the Bryophytes at areas 7 and 8. The most important species, from the point of view of standing crop for fodder, can therefore be identified for each cropping time and a crude "production phenology" can be built up in this way. It is suggested that such information could be of use in the planning of new seed mixtures for improving these areas by reseeding, and of determining the best time for mowing.

Table 8 shows the percentage increase in dry weight of each species, allowing the species with the optimum potential development in each community to be picked out. Species showing definite "preference", estimated as maximum performance during the study period, for each area are listed below:-

| | |
|---|---|
| AREA 2 | Agrostis tenuis |
| | Bromus mollis |

TABLE 7

Dry Weight of each Species expressed as a Percentage of 447-the Maximum Total Dry Weight of Living Material Found (11.7.68, Area 3)

| Area & Species | Date | | | | |
|---|---|---|---|---|---|
| Area 2 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 |
| Holcus lanatus | 1.8 | 2.6 | 10.5 | 18.7 | |
| Alopecurus pratensis | 1.8 | 3.5 | 8.7 | 10.6 | |
| Conopodium majus | 0.8 | 0.8 | | 6.8 | |
| Agrostis tenuis | 1.4 | 3.0 | 3.4 | 5.6 | |
| Rumex acetosa | 0.8 | 1.1 | 9.0 | 4.1 | |
| Ranunculus bulbosus | 1.8 | 2.2 | 2.4 | 3.8 | |
| Trifolium repens | 1.4 | 1.5 | | 3.5 | |
| Poa trivialis | 3.2 | 3.0 | 5.4 | 2.9 | |
| Rhinanthus minor | | 0.4 | 5.2 | 2.7 | |
| Bromus mollis | 1.6 | 2.3 | 5.6 | 2.6 | |
| Festuca rubra | 2.2 | 1.4 | 2.0 | 2.0 | |
| Cerastium holosteodes | 0.5 | 0.8 | 5.0 | 1.7 | |
| Anthoxanthum odoratum | 0.8 | 0.4 | | 0.9 | |
| Bryophytes | 0.7 | 0.4 | | 0.2 | |
| other species | | 1.4 | 1.6 | 5.5 | |
| TOTAL | 18.7 | 25.3 | 65.6 | 64.9 | |
| Area 3 | | | | | |
| Alopecurus pratensis | 1.4 | 3.2 | 7.8 | 35.0 | |
| Holcus lanatus | 0.7 | | 2.7 | 27.6 | |
| Festuca rubra | 6.0 | 5.9 | 11.4 | 17.4 | |
| Rhinanthus minor | 0.2 | 0.9 | 2.7 | 4.2 | |
| Bromus mollis | 3.4 | 5.8 | 6.6 | 3.7 | |
| Rumex acetosa | 0.5 | 1.6 | 5.7 | 0.9 | |
| Ranunculus bulbosus | 3.5 | 4.0 | 2.4 | 0.7 | |
| Conopodium majus | 0.4 | 0.4 | 3.2 | | |
| Helictotrichon pubescens | 1.5 | | 4.5 | 3.1 | |

TABLE 7 contd.

| Area & Species | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 |
|---|---|---|---|---|---|
| Area 3 contd. | | | | | |
| Poa trivialis | 1.9 | 2.2 | 4.8 | 2.7 | |
| Achillea millefolium | 0.3 | 0.6 | 1.6 | | |
| Cerastium holosteodes | 0.5 | 0.5 | 2.2 | 1.5 | |
| Bryophytes | 1.3 | 0.9 | 0.4 | | |
| other species | 0.4 | 0.2 | 3.6 | 3.1 | |
| TOTAL | 22.0 | 26.0 | 60.0 | 100.0 | |
| Area 4 | | | | | |
| Molinia caerulea | 3.7 | 4.4 | 5.7 | 13.9 | |
| Eriophorum angustifolium | 7.6 | 8.7 | 10.8 | 9.2 | |
| Carex panicea | 3.2 | 3.1 | 4.9 | 9.1 | |
| Bryophytes | 1.1 | 0.5 | 0.2 | 4.3 | |
| Carex pulicaris | 1.3 | 0.9 | 1.3 | 0.4 | |
| Carex pilulifera | | 0.1 | 0.5 | 0.1 | |
| Potentilla erecta | 0.2 | 0.1 | | 0.1 | |
| Agrostis canina | 0.2 | | 0.1 | | |
| other species | 0.1 | 0.3 | 2.5 | 3.2 | |
| TOTAL | 17.4 | 18.3 | 25.2 | 40.2 | |
| Area 5 | | | | | |
| Plantago lanceolata | 3.9 | 4.0 | 8.4 | 9.5 | 25.2 |
| Carex nigra | 0.2 | 0.5 | 1.8 | 3.5 | 12.3 |
| Carex caryophyllea | 10.0 | 8.1 | 6.1 | | 9.7 |
| Festuca rubra | 2.6 | 3.2 | 3.1 | 3.7 | 5.5 |
| Rhinanthus minor | 0.2 | 0.6 | 0.5 | 9.1 | 4.9 |
| Cynosurus cristatus | | 1.6 | 4.0 | 4.8 | 4.0 |
| Holcus lanatus | 0.7 | 1.1 | 1.7 | 3.3 | 2.2 |
| Anthoxanthum odoratum | 0.7 | 0.7 | 1.9 | 2.2 | 1.8 |
| Ranunculus bulbosus | 1.0 | 1.4 | 2.6 | 4.3 | 1.6 |
| Trifolium repens | 0.7 | 0.9 | 1.4 | 1.9 | 1.3 |

TABLE 7 contd.

| Area & Species | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 |
|---|---|---|---|---|---|
| Area 5 contd. | | | | | |
| Leontodon hispidus | 0.1 | 0.1 | 0.2 | | 1.2 |
| Taraxacum paludosum | 0.1 | + | | 1.1 | |
| Bryophytes | 3.1 | 3.8 | 1.6 | 2.2 | 1.1 |
| Rumex acetosa | 0.2 | 0.3 | 0.5 | 0.3 | 1.0 |
| Euphrasia sp. | | | 0.5 | 0.6 | 0.9 |
| Poa trivialis | 0.4 | 0.8 | 1.5 | 0.7 | 0.6 |
| Helictotrichon pubescens | 0.6 | | 0.5 | 0.6 | 0.6 |
| Poa pratensis | 0.3 | 0.3 | 0.8 | 0.3 | 0.5 |
| Leontodon autumnalis | 0.1 | 0.2 | | 0.2 | 0.4 |
| Luzula campestris | 0.3 | 0.5 | 0.5 | 0.5 | 0.3 |
| Cerastium holosteodes | 0.7 | 0.5 | 0.4 | 0.2 | 0.3 |
| Anemone nemorosa | 0.5 | 0.4 | 0.4 | | 0.3 |
| Succisa pratensis | 0.2 | | + | 0.2 | |
| Potentilla erecta | | 0.2 | 0.2 | | 0.2 |
| Trollius europaeus | 3.9 | 0.6 | | 0.2 | 0.1 |
| other species | + | 0.2 | 0.9 | 0.3 | 2.2 |
| TOTAL | 30.4 | 29.3 | 39.3 | 50.7 | 70.2 |
| Area 7 | | | | | |
| Bryophytes | 20.1 | 11.9 | 19.2 | 16.1 | 16.3 |
| Juncus squarrosus | 9.0 | 5.4 | 5.8 | 4.3 | 9.7 |
| Briza media | | | 0.4 | 0.2 | 3.6 |
| Carex panicea | 1.4 | 2.1 | 2.2 | 2.6 | 3.4 |
| Juncus bulbosus | 1.1 | 0.7 | 1.1 | 1.9 | 2.5 |
| Trifolium repens | | 0.9 | 1.9 | 1.9 | 2.5 |
| Festuca rubra | 1.4 | 1.1 | 1.9 | 0.8 | 1.9 |
| Nardus stricta | 1.3 | 1.6 | 2.7 | 2.2 | 1.9 |
| Prunella vulgaris | | 0.5 | 0.8 | 1.1 | 1.5 |
| Holcus lanatus | 1.0 | 1.2 | 3.8 | 1.8 | 1.2 |
| Festuca ovina | 1.0 | 0.2 | 0.6 | 0.9 | 1.1 |
| Anthoxanthum odoratum | 0.9 | 0.7 | 0.6 | 0.6 | 0.9 |
| Eriophorum angustifolium | 0.6 | 0.5 | 0.4 | 0.9 | |

TABLE 7 contd.

| Area & Species | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 |
|---|---|---|---|---|---|
| Area 7 contd. | | | | | |
| Juncus articulatus | 0.5 | | 0.6 | 1.5 | 0.9 |
| Agrostis canina | 0.5 | 0.8 | 0.5 | | 0.7 |
| Molinia caerulea | 0.6 | 0.5 | 0.4 | 0.4 | 0.6 |
| Carex pulicaris | 1.2 | 1.1 | 0.8 | 0.6 | |
| Carex lepidocarpa | | 0.2 | 0.2 | | 0.3 |
| Ranunculus flammula | 0.2 | 0.4 | | | 0.3 |
| Leontodon autumnalis | | | 0.4 | 0.8 | 0.3 |
| Poa pratensis | 0.2 | 0.4 | 0.3 | | |
| Luzula campestris | | | 0.2 | 0.2 | 0.2 |
| Potentilla erecta | | | 0.2 | 0.2 | 0.2 |
| Poa trivialis | 0.2 | | | 0.1 | + |
| Cerastium holosteodes | 0.1 | | 0.1 | + | + |
| Cardamine flexuosa | 0.2 | 0.2 | 0.2 | | + |
| Campanula rotundifolia | | + | + | | + |
| Viola palustris | | 0.5 | 0.3 | + | |
| other species | 0.2 | 0.5 | 0.6 | 0.1 | 0.2 |
| TOTAL | 41.6 | 72.4 | 45.8 | 39.5 | 50.1 |
| Area 8 | | | | | |
| Bryophytes | 10.5 | 9.2 | 20.1 | 30.2 | 30.1 |
| Nardus stricta | 6.3 | 6.7 | 9.7 | 9.1 | 8.1 |
| Carex panicea | 1.5 | 1.6 | 1.8 | 2.2 | 3.2 |
| Agrostis canina | 1.2 | 0.8 | 1.5 | | 1.8 |
| Molinia caerulea | 0.5 | 0.4 | | | 1.8 |
| Anthoxanthum odoratum | 0.6 | 0.6 | 0.7 | 0.7 | 0.8 |
| Agrostis tenuis | 0.2 | | | 0.5 | 0.6 |
| Festuca rubra | 0.5 | 0.3 | 0.5 | 0.3 | 0.6 |
| Festuca ovina | 0.7 | 0.4 | | 0.6 | |
| Potentilla erecta | 0.4 | 0.3 | 0.7 | 0.3 | 0.4 |
| Briza media | | 0.4 | 0.5 | 0.3 | |
| Carex pulicaris | L.2 | | | 0.3 | 0.3 |
| Viola palustris | 0.2 | 0.1 | | | 0.2 |

TABLE 7 contd.

| Area & Species | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 |
|---|---|---|---|---|---|
| Area 8 contd. | | | | | |
| Holcus lanatus | | 0.2 | 0.2 | 0.4 | 0.2 |
| Luzula campestris | 0.1 | 0.2 | 0.2 | 0.2 | 0.1 |
| Trifolium repens | | | 0.2 | 0.2 | + |
| Galium saxatile | 0.2 | 0.2 | 0.2 | | 0.1 |
| other species | 0.1 | 0.1 | 1.3 | 1.2 | 1.7 |
| TOTAL | 24.1 | 21.7 | 37.5 | 46.9 | 48.9 |

TABLE 8

PERCENTAGE INCREASE IN DRY WEIGHT OF EACH SPECIES

$$\left(\frac{\text{maximum dry weight - minimum dry weight}}{\text{minimum dry weight}}\right) \times 100$$

| Species | Area 2 | Area 3 | Area 4 | Area 5 | Area 7 | Area 8 |
|---|---|---|---|---|---|---|
| Anthoxanthum odoratum | 111 | | | 228 | 60 | 45 |
| Holcus lanatus | 909 | 3933 | | 350 | 267 | 117 |
| Poa trivialis | 89 | 140 | | 300 | 463 | |
| Alopecurus pratensis | 487 | 2325 | | | | |
| Agrostis tenuis | 301 | | | | | 176 |
| Festuca rubra | 240 | 186 | | 100 | 100 | 100 |
| Bromus mollis | 257 | 93 | | | | |
| Helictotrichon pubescens | | 205 | | 33 | | |
| Agrostis canina | | | 25 | | 56 | 100 |
| Molinia caerulea | | | 278 | | 86 | 322 |
| Poa pratensis | | | | 220 | 213 | |
| Festuca ovina | | | | | 583 | 61 |
| Briza media | | | | | 1371 | 57 |
| Nardus stricta | | | | | 100 | 45 |
| Cynosurus cristatus | | | | 187 | | |
| Carex pilulifera | | | 780 | | | |
| Carex pulicaris | | | 235 | | 100 | 600 |
| Carex panicea | | | 190 | | 133 | 123 |
| Carex caryophyllea | | | | 65 | | |
| Carex lepidocarpa | | | | | 71 | |
| Eriophorum angustifolium | | | 42 | | 109 | |
| Juncus squarrosus | | | | | 128 | |
| Juncus articulatus | | | | | 194 | |
| Luzula campestris | | | | 100 | 9 | 134 |
| Cerastium holosteodes | 1000 | 322 | | 325 | 1100 | |
| Ranunculus bulbosus | 121 | 443 | | 321 | 259 | |
| Rumex acetosa | 946 | 1080 | | 460 | | |
| Conopodium majus | 778 | 783 | | | | |
| Trifolium repens | 140 | | | 182 | 170 | 450 |
| Rhinanthus minor | 1100 | 1738 | | 3433 | | |
| Achillea millefolium | | 425 | | | | |
| Potentilla erecta | | | 325 | 36 | 43 | 32 |
| Cardamine flexuosa | | | | | 733 | |
| Ranunculus flammula | | | | | 109 | |
| Campanula rotundifolia | | | | | 1500 | |
| Taraxacum palustre | | | | 2666 | 829 | |
| Prunella vulgaris | | | | | 228 | |
| Leontodon autumnalis | | | | 395 | 204 | |
| Succisa pratensis | | | | 1273 | | |
| Anemone nemorosa | | | | 31 | | |
| Plantago lanceolata | | | | 292 | | |
| Centaurea nigra | | | | 7071 | | |
| Leontodon hispidus | | | | 954 | | |
| Trollius europaeus | | | | 4257 | | |
| Euphrasia spp. | | | | 169 | | |
| Galium saxatile | | | | | | 230 |
| Viola palustris | | | | | | 46 |

| | |
|---|---|
| AREA 3 | Holcus lanatus |
| | Alopecurus pratensis |
| | Festuca rubra |
| | Helictotrichon pubescens |
| | Ranunculus bulbosus |
| | Rumex acetosa |
| | Conopodium majus |
| AREA 4 | Carex panicea |
| | Potentilla erecta |
| AREA 5 | Anthoxanthum odoratum |
| | Rhinanthus minor |
| | Taraxacum paludosum |
| | + other dicotyledons |
| AREA 7 | Poa trivialis |
| | Festuca ovina |
| | Briza media |
| | Nardus stricta |
| | Eriophorum angustifolium |
| | Juncus spp. |
| | Cerastium holosteodes |
| AREA 8 | Agrostis canina |
| | Molinia caerulea |
| | Carex pulicaris |
| | Luzula campestris |
| | Trifolium repens |

Again, although only crude, these figures allow at least a statement to be made concerning the community which offers the best niche for the development of each species.

Table 9 shows the data expressed in another way. Here the maximum dry weight attained by each species in each area is shown, again helping to identify their best niche within the community complex. The optimum

TABLE 9 Showing the maximum average dry weight (mg per plant) attained by some species during the experimental period.

| | AREA | | | | | |
|---|---|---|---|---|---|---|
| SPECIES | 8 | 7 | 5 | 4 | 3 | 2 |
| Anthoxanthum odoratum | 14.5 | 13.1 | 24.6 | | | 25.9 |
| Holcus lanatus | 13.0 | 22.1 | 18.1 | | 363.8 | 63.6 |
| Nardus stricta | 15.9 | 18.0 | | | | |
| Festuca rubra | 11.4 | 8.3 | 8.4 | | 12.6 | 7.4 |
| Molinia caerulea | 37.7 | 25.6 | | 34.3 | | |
| Poa trivialis | | 4.5 | 7.9 | | 12.5 | 18.6 |
| Carex panicea | 58.2 | 63.3 | | 115.7 | | |
| Carex pulicaris | 27.6 | 15.1 | | 19.9 | | |
| Eriophorum angustifolium | | 67.4 | | 118.6 | | |
| Rumex acetosa | | | 55.9 | | 176.9 | 293.2 |
| Cerastium holostëodes | | | 17.2 | | 32.6 | 66.4 |
| Ranunculus bulbosus | | 98.9 | 58.6 | | 266.3 | 190.7 |
| Trifolium repens | 17.6 | 34.6 | 48.0 | | | 60.3 |
| Rhinanthus minor | | | 105.8 | | 294.4 | 538.0 |

The underlined species attained a higher dry weight the lower they grew on the Fell Slope.

niche for these species as indicated by this method is only the same as by the previous method in the cases of the underlined species in the following list.

| | |
|---|---|
| AREA 2 | Anthoxanthum odoratum |
| | Poa trivialis |
| | Rumex acetosa |
| | Cerastium holosteodes |
| | Trifolium repens |
| | Rhinanthus minor |
| AREA 3 | Holcus lanatus |
| | Festuca rubra |
| | Ranunculus bulbosus |
| AREA 4 | Carex panicea |
| | Eriophorum angustifolium |
| AREA 7 | Nardus stricta |
| AREA 8 | Molinia caerulea |
| | Carex pulicaris |

The percentage increase in dry weight is considered a better indication of performance than maximum dry weight. This table also shows that the maximum biomass of some species was higher, the lower they grew on the Fell slope, e.g. Carex panicea and Trifolium repens. Such species are underlined in Table 9.

This line of work was enlarged upon in the second year of the study. Exclosures were erected and the development of Holcus lanatus, Festuca rubra, Anthoxanthum odoratum, Rhinanthus minor and Trollius europaeus was followed in detail over the growing season, both inside and outside the exclosures. The full data are given in Appendix 4, and is summarised below (Table 10 and Table 11).

TABLE 10

Increase in Dry Weight (mg per plant), and Rate of Increase (mg per plant per day x 1000) of 5 Selected Species between 1.5.69 and 11.7.69, (72 days) and between 1.5.69 and 5.8.69 (97 days).

n.r.=no record

| Area | Increase in 72 days mg/ plant | Rate of increase x 1000 mg/day | Increase between days 72 & 97 mg | Rate of increase x1000 bet. day 72 & 97 | Increase in 97 days mg/ plant | Rate of increase x1000 in 97 days |
|---|---|---|---|---|---|---|
| HOLCUS LANATUS | | | | | | |
| in 2 | 123.2 | 1710 | 37.2 | 1488 | 160.4 | 1650 |
| out 2 | 68.1 | 945 | n.r. | n.r. | n.r. | n.r. |
| 3 | 43.8 | 608 | n.r. | n.r. | n.r. | n.r. |
| in 5 | 68.5 | 951 | 47.9 | 1916 | 116.4 | 1190 |
| out 5 | 64.7 | 898 | 101.1 | 4040 | 165.8 | 1710 |
| in 6 | 92.4 | 1283 | 152.8 | 6110 | 245.2 | 2520 |
| out 6 | 77.9 | 1081 | 40.4 | 1616 | 118.3 | 1210 |
| in 7 | 82.4 | 1144 | 29.7 | 1188 | 112.1 | 1150 |
| out 7 | 58.6 | 813 | 48.3 | 1940 | 107.1 | 1100 |
| in 8 | n.r. | n.r. | n.r. | n.r. | 85.9 | 885 |
| out 8 | 24.0 | 333 | 55.2 | 2208 | 79.2 | 816 |
| FESTUCA RUBRA | | | | | | |
| in 2 | 18.2 | 252 | 8.3 | 332 | 26.5 | 273 |
| out 2 | 24.0 | 333 | n.r. | n.r. | n.r. | n.r. |
| 3 | 21.5 | 298 | n.r. | n.r. | n.r. | n.r. |
| in 5 | 17.4 | 241 | 6.3 | 252 | 23.7 | 244 |
| out 5 | 14.5 | 201 | 26.2 | 1048 | 40.7 | 419 |
| in 6 | 13.3 | 184 | 8.9 | 356 | 22.2 | 228 |
| out 6 | 42.1 | 584 | 15.8 | 632 | 57.9 | 596 |
| in 7 | 25.4 | 352 | 8.7 | 348 | 34.1 | 351 |
| out 7 | 21.6 | 298 | 21.4 | 856 | 43.0 | 443 |

TABLE 10 contd.

ANTHOXANTHUM ODORATUM

| | | | | | | |
|---|---|---|---|---|---|---|
| in 2 | 51.5 | 715 | 40.7 | 1628 | 92.2 | 950 |
| out 2 | 54.5 | 756 | n.r. | n.r. | n.r. | n.r. |
| in 5 | 63.6 | 883 | 35.2 | 1408 | 98.8 | 1018 |
| out 5 | 39.8 | 552 | 52.8 | 2112 | 92.6 | 954 |
| in 6 | 51.6 | 715 | 73.8 | 2952 | 125.4 | 129 |
| out 6 | 47.9 | 665 | 60.6 | 2424 | 108.5 | 111 |
| in 7 | n.r. | n.r. | n.r. | n.r. | 45.5 | 469 |
| out 7 | n.r. | n.r. | n.r. | n.r. | 104.3 | 1070 |
| in 8 | 50.1 | 696 | 8.0 | 320 | 58.1 | 598 |
| out 8 | 70.1 | 973 | 29.0 | 1160 | 99.1 | 102 |

RHINANTHUS MINOR

| | | | | | | |
|---|---|---|---|---|---|---|
| out 2 | 214.3 | 3000 | n.r. | n.r. | n.r. | n.r. |
| 3 | 146.7 | 2000 | n.r. | n.r. | n.r. | n.r. |
| in 5 | 105.9 | 1500 | n.r. | n.r. | n.r. | n.r. |
| out 5 | 58.6 | 800 | 8.5 | 340 | 67.1 | 730 |
| out 6 | 168.9 | 2300 | 41.7 | 1680 | 210.6 | 2160 |

TROLLIUS EUROPAEUS

| Area | day number with maximum biomass mg per plant | increase in biomass mg per plant | rate of increase mg per plant per day |
|---|---|---|---|
| out 5 | 82 | 1571.6 | 19.2 |
| out 6 | 91 | 1760.9 | 19.5 |

in 2 = inside exclosure at area 2

out 2 = outside exclosure at area 2.

TABLE 11

Comparing Productivity of Three Grass Species in each of the Areas (A) Over 72 Days, and (B) Over 97 Days.

| SPECIES | AREA | Rate of increase mg/day x 1000 | AREA | Rate of increase mg/day x 1000 |
|---|---|---|---|---|
| *Holcus lanatus* | 2 | 1328 | 6 | 1865 |
| | 6 | 1182 | 2 | 1650 |
| | 7 | 979 | 5 | 1450 |
| | 5 | 925 | 7 | 1125 |
| | 3 | 608 | 8 | 851 |
| | 8 | 333 | | |
| *Festuca rubra* | 6 | 384 | 6 | 412 |
| | 7 | 325 | 7 | 397 |
| | 3 | 298 | 5 | 332 |
| | 2 | 293 | 2 | 273 |
| | 5 | 221 | | |
| *Anthoxanthum odoratum* | 8 | 835 | 5 | 986 |
| | 2 | 736 | 2 | 950 |
| | 5 | 718 | 7 | 770 |
| | 6 | 690 | 8 | 350 |
| | | | 6 | 120 |

The above rates were calculated as a mean of the rates inside and outside the exclosures at each area.

Thus by using what are very crude methods it is possible:-

(i) to begin to understand the phenology of development of each farm unit, and

(ii) to identify what could be optimum niches for each species within the farm system.

SUMMARY

Table 12 shows the floristic and "performance" characteristics of each vegetation type studied. The widespread presence and dominance of Holcus lanatus, Festuca rubra, Cerastium holosteodes, Poa trivialis, Rumex acetosa, Plantago lanceolata, Anthoxanthum odoratum and Prunella vulgaris (all underlined in Table 12), which are all character species of the class MOLINIO-ARRHENATHERETEA R.Tx 1937 (see Oberdorfer 1956 and Westoff et al. 1969), indicate that the vegetation complex belongs primarily to that class, and to the order MOLINIETALIA W.Koch 1926.

The communities of areas 2 and 3 on the better drained alluvial soils show an affinity to the associations of the order ARRHENATHERETALIA Pawlowski 1928. These communities are the most productive, at area 2 the maximum standing crop is 346g per $m^2$ and the net above ground production 7.2 g per $m^2$ per day, and at area 3 the maximum standing crop is 508 g per $m^2$ per day and the production 10.5 g per $m^2$ per day. The species showing their maximum production, as calculated by percentage dry weight increase and maximum dry weight attained, in these areas are marked in Table 12.

The Fell slopes (areas 7 and 8) support a mixture of communities. Associations of the alliance MOLINION W.Koch 1926 mixed with species of the two classes NARDO-CALLUNETEA Prsg. 1949 and OXYCOCO-SPHAGNETEA Br.Bl. and R.Tx 1943. Associations of these latter two classes are widespread higher on the Fell slope which has been less affected by man. At area 7-the inbyeland-maximum standing crop is 386 g per $m^2$ and production 5.7 g per $m^2$ per day, and at area 8-the outbyeland-maximum standing crop is 383 g per $m^2$ and production 5.1 g per $m^2$ per day.

TABLE 12 Showing (a) constancy of each species. All sets of quadrats at each area bulked (20 quadrats), and the percentage of times that a species was found was calculated, 5 = 80-100%, 4 = 60-80%, 3 = 40-60%, 2 = 20-40%, 1 = 5-20%, + = 1-5%. Roman numerals indicate species found at every sample time.
(b) the area in which certain species show maximum performance,

(i) as calculated by % dry weight increase (*),

(ii) as calculated by maximum dry weight attained (x).

and (c) the character species of the class MOLINIO-ARRHENATHERETEA R.Tx 1937 (these are underlined).

| SPECIES | AREA 2 | AREA 3 | AREA 4 | AREA 5 | AREA 7 | AREA 8 |
|---|---|---|---|---|---|---|
| Agrostis tenuis | IV * | 2 | | 1 | + | 2 |
| Alopecurus pratensis | III | IV * | | + | 1 | + |
| Bromus mollis | IV * | IV | | 2 | | |
| Holcus lanatus | V | 3 *x | + | V | V | 2 |
| Festuca rubra | IV | IV *x | | V | V | II |
| Cerastium holosteodes | V x | IV | | IV | 2 * | + |
| Ranunculus bulbosus | IV | IV *x | | V | 3 | |
| Poa trivialis | V x | IV | | | V * | |
| Rumex acetosa | V x | V * | | III | | |
| Rhinanthus minor | 2 x | III | | V * | | |
| Brachythecium rutabulum | 1 | III | | III | 2 | + |
| Luzula campestris | | | + | IV | 1 | 2 * |
| Carex caryophyllea | | | | IV | | |
| Anemone nemorosa | | 1 | | IV | | 1 |
| Plantago lanceolata | 1 | 1 | 1 | V | 1 | |
| Centaurea nigra | | 1 | | III | | |
| Acrocladium cuspidatum | | | 2 | III | V | 3 |
| Anthoxanthum odoratum | 1 x | 1 | + | V * | V | V |
| Poa pratensis | 3 | 3 | | 3 | II | |
| Festuca ovina | | | 1 | | IV * | 3 |
| Prunella vulgaris | | | | 1 | II | |
| Rhytidiadelphus squarrosus | | + | 2 | 2 | IV | IV |
| Agrostis canina | | | 2 | 1 | III | V * |
| Nardus stricta | | | 2 | | III *x | V |

TABLE 12 contd.

| SPECIES | AREA 2 | AREA 3 | AREA 4 | AREA 5 | AREA 7 | AREA 8 |
|---|---|---|---|---|---|---|
| Carex panicea | | | V ⁂x | | IV | V |
| Carex pulicaris | | | IV | | IV | 3 ⁂x |
| Eriophorum angustifolium | | | V x | | 2 ⁂ | 1 |
| Molinia caerulea | | | V | | 3 | 2 ⁂x |
| Thuidium tamariscinum | | | | 1 | 2 | IV |
| Hylocomium splendens | | | 2 | | 1 | III |
| Lophocolea bidentata | | | + | 2 | 2 | V |
| Hieracium pilosella | 1 | | | | | |
| Conopodium majus | 3 | 3 ⁂ | | 1 | | |
| Trifolium repens | 2 x | 1 | | 4 | 4 | 2 ⁂ |
| Achillea millefolium | 2 | 3 | | | | |
| Trisetum flavescens | 1 | 1 | | | | |
| Geranium sylvaticum | 1 | | | | | |
| Dactylis glomerata | 1 | 1 | | | | |
| Vicia cracca | 1 | 1 | | | | |
| Eurhynchium swartzii | + | | | | | |
| Lathyrus pratensis | 1 | | | 1 | | |
| Taraxacum paludosum | 1 | | | 1 ⁂ | 2 | |
| Eurhynchium praelongum | 3 | 3 | | 2 | 2 | 1 |
| Helictotrichon pubescens | | 2 ⁂ | | 2 | | + |
| Saxifraga granulata | | 1 | 1 | 1 | | |
| Alchemilla glabra | | 1 | | | | |
| Veronica chamaedrys | | 1 | | | | |
| Trifolium pratense | | + | | | | |
| Myosotis arvensis | | 1 | | 2 | | |
| Carex pilulifera | | | 2 | | | |
| Campanula rotundifolia | | | 1 | 1 | 1 | |
| Potentilla erecta | | | 3 ⁂ | 3 | 2 | 2 |
| Succisa pratensis | | | 1 | 1 | + | |
| Carex nigra | | | 1 | | | |
| Viola palustris | | | 1 | | + | 3 |
| Juncus articulatus | | | + | | 2 | 1 |
| Deschampsia caespitosa | | | 1 | | 1 | |
| Sphagnum palustre | | | 2 | | | 2 |
| Carex echinata | | | 1 | | | 1 |

TABLE 12 contd.

| SPECIES | AREA 2 | AREA 3 | AREA 4 | AREA 5 | AREA 7 | AREA 8 |
|---|---|---|---|---|---|---|
| Juncus bulbosus | | | + | | | |
| Sphagnum recurvum | | | 2 | | | |
| Pseudoscleropodium purum | | | + | 1 | 2 | 2 |
| Calypogeia trichomanis | | | + | 1 | 2 | 1 |
| Leontodon hispidus | | | | 2 | + | |
| Briza media | | | | 1 | 2 * | |
| Leontodon autumnalis | | | | 2 | | |
| Trollius europaeus | | | | 2 | | |
| Trifolium arvense | | | | + | | |
| Helictotrichon pratensis | | | | 1 | | |
| Ajuga reptans | | | | 1 | | |
| Lotus corniculatus | | | | 1 | | |
| Viola lutea | | | | 2 | | |
| Euphrasia spp. | | | | 1 | | |
| Bellis perennis | | | | 1 | + | |
| Brachythecium rivulare | | | | 1 | + | |
| Scapania undulata | | | | 1 | + | 1 |
| Mnium punctatum | | | | 2 | 2 | 2 |
| Galium saxatile | | | | 1 | | 2 |
| Hypnum cupressiforme | | | | 1 | | 2 |
| Montia fontana | | | | | + | |
| Cardamine flexuosa | | | | | 1 | |
| Sagina procumbens | | | | | 1 | |
| Carex flacca | | | | | 1 | |
| Juncus squarrosus | | | | | 2 | |
| Philonotis fontana | | | | | 1 | |
| Fissidens sp. | | | | | + | |
| Thuidium delicatulum | | | | | + | |
| Ranunculus flammula | | | | | 2 | 1 |
| Lysimachia nemorum | | | | | + | + |
| Carex demissa | | | | | 1 | + |
| Achillea ptarmica | | | | | 1 | 1 |
| Cynosurus cristatus | | | | | 2 | + |
| Aulocomnium palustre | | | | | 2 | 3 |

TABLE 12 contd.

| SPECIES | AREA 2 | AREA 3 | AREA 4 | AREA 5 | AREA 7 | AREA 8 |
|---|---|---|---|---|---|---|
| Mnium undulatum | | | | | 3 | 2 |
| Dicranum scoparium | | | | | 1 | + |
| Pleurozium schreberi | | | | | | + |
| Polytrichum commune | | | | | | 1 |
| Climacium dendroides | | | | | | 1 |
| Riccardia pinguis | | | | | | 1 |
| Juncus conglomerata | | | | | | 1 |
| Cirsium palustre | | | | | | 1 |

The wet "sump" communities of area 4 have character species of both the order MOLINIETALIA W.Koch 1926 and of the class SCHEUCHZERIETEA Den Held, Barkman and Westoff cl. nov. Here are found some of the purest MOLINION W.Koch 1926 communities present in the study areas. The maximum standing crop is 317 g per $m^2$, and production is 5.7 g per $m^2$ per day.

The species-rich area 5 on the bank of glacial soil in the meadow belongs to the order MOLINITALIA W.Koch 1926 with affinities to the order ARRHENATHERETALIA Pawlowski 1928. Here, however, Luzula campestris, Carex caryophyllea, Anemone nemorosa, Plantago lanceolata, Centaurea nigra, Acrocladium cuspidatum and Anthoxanthum odoratum are more abundant and other additional species (see Table 12) are present. Species characteristic of the alliance FILIPENDULION (Duvien 1946) Segal 1966 are found here. The maximum standing crop is 307 g per $m^2$ and production-the lowest of all the areas studied-is 5.0 g per $m^2$ per day.

All the above figures for maximum standing crop and production are calculated from results obtained from cropping experiments during the 1968 growing season. For a further account of the phytosociology of areas 4, 5 and along the river bank, based on a more detailed survey of the area, see page 94 and Appendix 10.

PART II

MINERAL REGIME OF THE COMMUNITIES

AIM:- TO STUDY THE MINERAL REGIME OF THE COMMUNITIES

The complete results of the mineral analyses for each cropping date, expressed as
(a) mineral content in mg per g dry weight per species,
(b) mean mineral content in mg per plant x 1000,
(c) mineral content in mg per $m^2$ per species, and
(d) mineral content of each species expressed as a percentage of the total mineral content of the community, are presented in Appendix 5, and (a) and (c) are plotted, with dry weight and increase in dry weight for comparison as graphs.

To compare the mineral balance of each ecosystem the total content of each mineral (mg per $m^2$) at each sampling time of
(a) the whole community,
(b) the living plant material, and
(c) the plant debris
were calculated and are presented in Appendix 6. Table 6.1 is regarded as presenting the above ground standing crop of each mineral at each cropping time. The mineral content of each ecosystem increased during the study period, there was some fluctuation at areas 7 and 8. A high proportion of the minerals at all areas was present in the dead plant material, and in areas 7 and 8 between 20% and 25% of the minerals in the living plant material was present in the cryptogams.

A similar picture is obtained from Appendix 7, which presents the mineral content as a percentage of the maximum total of all four minerals found during the study period (area 3, 11.7.68 in the cases of the

whole community and living plant material, and area 3, 21.6.68 in the case of the dead plant material).

Appendix 8 shows the proportion of each mineral present in the whole community, the living plant material, and the plant debris, expressed as a ratio x 10.

Appendix 9 compares the above ground biomass and mineral contents of 5 hay meadow communities just prior to mowing.

When primary production of each community, as measured in PART I, was compared with either the maximum standing crop of any mineral or the uptake of any mineral (Table 13, calculated from Table 6.1 by subtracting the lowest mineral content of the whole community from the maximum mineral content) little correlation was seen. The best correlation being with potassium. (Table 14).

It is interesting to note that the two communities-areas 4 and 8-which have the lowest standing crops of potassium, are the ones which receive the least management. Of all the areas studied these come nearest to associations of the class SCHEUCHZERIETEA cl. nov. This class includes vegetation of poor fen and extreme poor fen where the nutrient supply is low and hence the ecosystem must rely on efficient mineral retention and recycling (Sjors 1950).

The above correlation of production with potassium uptake appears to indicate that management aids in making more potassium available to the community. Table 13 shows that the ecosystem at area 4 tends to remove less mineral nutrients from the mineral store-i.e. the minerals contained in the soil, also

TABLE 13

Maximum standing crop (mg per $m^2$) of each mineral in the whole plant community.

| Area | Sodium | Potassium | Calcium | Magnesium |
|---|---|---|---|---|
| 2 | 938 | 5511 | 2264 | 1052 |
| 3 | 591 | 6818 | 5510 | 1879 |
| 4 | 203 | 1830 | 1925 | 857 |
| 5 | 907 | 3063 | 4195 | 1693 |
| 7 | 850 | 3359 | 2614 | 1205 |
| 8 | 309 | 1816 | 4642 | 4642 |

Uptake of each mineral (mg per $m^2$) during the study period.

| Area | Sodium | Potassium | Calcium | Magnesium | Total Uptake |
|---|---|---|---|---|---|
| 2 | 740 | 3110 | 1530 | 627 | 6007 |
| 3 | 300 | 4756 | 2823 | 1391 | 9270 |
| 4 | 92 | 408 | 499 | 438 | 1437 |
| 5 | 701 | 665 | 2465 | 715 | 4546 |
| 7 | 571 | 1750 | 1467 | 556 | 4344 |
| 8 | 119 | 479 | 4052 | 537 | 5087 |

TABLE 14 Comparing Productivity, Maximum standing crop of potassium and Potassium uptake.of each area

| Area | Productivity mg per $m^2$ per day | Maximum standing crop of K g per $m^2$ | Potassium uptake mg per $m^2$ |
|---|---|---|---|
| 3 | 10.3 | 6818 | 4756 |
| 2 | 7.2 | 5511 | 3110 |
| 7 | 5.7 | 3359 | 1750 |
| 5 | 5.0 | 3063 | 665 |
| 4 | 5.7 | 1830 | 408 |
| 8 | 5.1 | 1816 | 479 |

the plant debris can be regarded as part of the mineral store-than do the more highly managed ones at areas 2 and 3. Table 15 shows tentative figures for the "efficiency"-the number of mg of each mineral required to produce 1 g dry weight of living plant material-for each community. These were estimated by dividing the figures calculated from Table 5.3 for the actual uptake of minerals into the living material by the production figures as obtained by method (B) (see page 38, litter being regarded as part of the mineral store).

Potassium is efficiently utilized by the "unmanaged" communities-areas 4 and 8. The ecosystem at area 4 is also very efficient in the utlization of sodium and calcium. Thus it would appear that increased production is obtained at the expense of "efficiency" in relation to an important nutrient, which may under natural conditions be in short supply or be unavailable. Benham's results (Appendix 1) show that potassium concentration in the soil is only slightly lower in the "unmanaged" areas, although the soil was sampled before any fertilizer had been applied to it.

The results show a lack of really distinct differences in mineral content at the level of the total community. A larger number of samples needed to be taken from each area. Any differences at the level of component species are unlikely to be statistically valid in the present study. Unfortunately there was not enough time available to collect and analyse a significantly sized number of samples. The following analysis is therefore simply presented in an attempt to explore the possibility of a more detailed study.

Table 16 shows "concentration"-mg per g dry weight-of each mineral in the total standing crop, the living plant material, and the dead plant material. Unfortun-

TABLE 15 Drain on Mineral Store

(A) Actual increment of each mineral into the live standing crop between 24.5.68 and 11.7.68 (mg per $m^2$)

| AREA | Sodium | Potassium | Magnesium | Calcium |
|---|---|---|---|---|
| 2 | 805.0 | 5115.2 | 844.3 | 1547.4 |
| 3 | 731.9 | 6013.4 | 1802.3 | 5224.9 |
| 4 | 52.4 | 857.2 | 286.5 | 408.1 |
| 5 | 733.8 | 2161.3 | 990.5 | 2269.8 |
| 7 | 499.5 | 2027.4 | 679.7 | 1967.5 |
| 8 | 221.2 | 1173.3 | 529.4 | 2440.7 |

(B) Actual increment of each mineral into the live standing crop between 24.5.68 and 5.8.68 (mg per $m^2$)

| AREA | Sodium | Potassium | Magnesium | Calcium |
|---|---|---|---|---|
| 5 | 822.3 | 2635.6 | 1687.3 | 2868.3 |
| 7 | 517.2 | 2492.6 | 952.4 | 2955.1 |
| 8 | 290.8 | 1547.7 | 718.2 | 3182.7 |

Production Figures as Calculated by Method (B)-total of maximum increase in dry weight of all species.

| AREA | (a) in 48 days | (b) in 73 days (mg per $m^2$) |
|---|---|---|
| 2 | 315 | |
| 3 | 460 | |
| 4 | 125 | |
| 5 | 206 | 284 |
| 7 | 136 | 156 |
| 8 | 130 | 150 |

Actual uptake of each mineral was calculated by subtracting the sum of the minimum mineral contents from the sum of the maximum mineral contents (mg per $m^2$) of the species present-Appendix 5, Table 5.3.

TABLE 15 contd.

"Efficiency" of each system–mg used to produce 1 g dry weight of live standing crop.

(a) between 24.5.68 and 11.7.68, i.e. 48 days

| AREA | Sodium | Potassium | Magnesium | Calcium |
|---|---|---|---|---|
| 2 | 2.55 | 16.23 | 2.68 | 4.91 |
| 3 | 1.59 | 13.07 | 3.91 | 11.35 |
| 4 | 0.42 | 6.86 | 2.29 | 3.26 |
| 5 | 3.56 | 10.49 | 4.81 | 11.01 |
| 7 | 3.67 | 14.90 | 5.00 | 14.46 |
| 8 | 1.70 | 9.02 | 4.07 | 18.77 |

(b) between 24.5.68 and 5.8.68, i.e. 73 days

| AREA | Sodium | Potassium | Magnesium | Calcium |
|---|---|---|---|---|
| 5 | 2.90 | 9.28 | 5.94 | 10.09 |
| 7 | 3.32 | 15.97 | 6.11 | 18.94 |
| 8 | 1.94 | 10.31 | 4.79 | 21.21 |

TABLE 16 Individual and Total Mineral "Concentration" (mg per g dry weight) of the Whole Community.

| Area & Date | Mineral "concentration" mg per g dry weight | | | | "Concentration" of total minerals mg/g |
|---|---|---|---|---|---|
| | Sodium | Potassium | Magnesium | Calcium | |
| AREA 2 | | | | | |
| 24.5.68 | 1.3 | 15.1 | 2.7 | 4.6 | 25.7 |
| 7.6.68 | 2.5 | 16.8 | 2.9 | 5.4 | 27.6 |
| 21.6.68 | 2.0 | 16.3 | 3.1 | 6.6 | 28.1 |
| 11.7.68 | 2.7 | 14.5 | 2.8 | 4.4 | 24.4 |
| AREA 3 | | | | | |
| 24.5.68 | 1.6 | 10.8 | 2.5 | 18.2 | 33.1 |
| 7.6.68 | 2.2 | 12.2 | 4.0 | 12.6 | 30.9 |
| 21.6.68 | 2.0 | 19.4 | 7.0 | 20.6 | 49.0 |
| 11.7.68 | 1.2 | 13.5 | 3.1 | 8.7 | 26.4 |
| AREA 4 | | | | | |
| 24.5.68 | 0.8 | 8.0 | 2.2 | 10.0 | 21.0 |
| 7.6.68 | 0.8 | 8.5 | 3.0 | 11.4 | 23.7 |
| 11.7.68 | 0.6 | 5.8 | 2.7 | 4.5 | 13.6 |
| AREA 5 | | | | | |
| 24.5.68 | 1.9 | 13.6 | 5.4 | 9.1 | 30.0 |
| 7.6.68 | 1.6 | 13.3 | 4.5 | 11.4 | 30.8 |
| 21.6.68 | 2.5 | 9.2 | 6.5 | 12.3 | 30.5 |
| 11.7.68 | 2.9 | 10.0 | 4.9 | 13.7 | 31.9 |
| 5.8.68 | 2.1 | 9.5 | 5.6 | 7.9 | 25.1 |
| AREA 7 | | | | | |
| 24.5.68 | 2.2 | 5.5 | 3.1 | 6.7 | 17.5 |
| 7.6.68 | 1.5 | 6.5 | 3.1 | 4.7 | 15.8 |
| 21.6.68 | 0.9 | 10.9 | 3.5 | 6.4 | 21.7 |
| 11.7.68 | 1.1 | 7.8 | 2.6 | 4.8 | 16.3 |
| 5.8.68 | 1.0 | 10.2 | 3.6 | 12.4 | 27.2 |
| AREA 8 | | | | | |
| 24.5.68 | 0.8 | 5.4 | 1.5 | 7.4 | 15.1 |
| 7.6.68 | 0.8 | 6.7 | 1.3 | 2.5 | 11.3 |
| 21.6.68 | 0.8 | 4.7 | 2.2 | 12.1 | 19.8 |
| 11.7.68 | 0.8 | 5.2 | 2.3 | 6.9 | 15.2 |
| 5.8.68 | 1.0 | 4.2 | 1.5 | 8.2 | 14.9 |

TABLE 16 contd. Individual and Total Mineral "Concentration" (mg per g dry weight) of the Living Plant Material.

| Date & Area | Mineral "coneentration" mg per g dry weight | | | | "Concentration" of total |
|---|---|---|---|---|---|
| | Sodium | Potassium | Magnesium | Calcium | minerals mg/g |
| AREA 2 | | | | | |
| 24.5.68 | 1.8 | 24.1 | 3.1 | 5.2 | 34.1 |
| 7.6.68 | 3.3 | 22.5 | 3.2 | 5.1 | 34.1 |
| 21.6.68 | 2.1 | 17.3 | 3.1 | 6.0 | 28.5 |
| 11.7.68 | 2.9 | 16.3 | 2.7 | 3.9 | 25.8 |
| AREA 3 | | | | | |
| 24.5.68 | 2.1 | 17.7 | 3.0 | 20.5 | 43.3 |
| 7.6.68 | 2.6 | 16.4 | 5.0 | 14.4 | 38.4 |
| 21.6.68 | 1.4 | 18.0 | 2.6 | 12.6 | 34.6 |
| 11.7.68 | 1.3 | 14.6 | 3.2 | 8.4 | 27.6 |
| AREA 4 | | | | | |
| 24.5.68 | 1.2 | 17.1 | 3.0 | 11.0 | 32.2 |
| 7.6.68 | 0.9 | 16.0 | 3.0 | 10.0 | 29.9 |
| 11.7.68 | 0.7 | 9.1 | 2.9 | 3.8 | 16.3 |
| AREA 5 | | | | | |
| 24.5.68 | 1.3 | 16.5 | 6.3 | 9.3 | 33.4 |
| 7.6.68 | 2.2 | 19.2 | 5.6 | 15.5 | 42.5 |
| 21.6.68 | 3.5 | 11.7 | 7.6 | 8.7 | 31.5 |
| 11.7.68 | 3.7 | 12.7 | 5.6 | 13.8 | 35.8 |
| 5.8.68 | 2.6 | 11.7 | 6.1 | 7.2 | 27.6 |
| AREA 7 | | | | | |
| 24.5.68 | 3.0 | 8.3 | 3.8 | 9.1 | 24.2 |
| 7.6.68 | 2.1 | 9.9 | 3.6 | 5.4 | 21.0 |
| 21.6.68 | 1.0 | 13.8 | 3.6 | 7.9 | 26.3 |
| 11.7.68 | 1.3 | 9.8 | 2.8 | 4.3 | 18.3 |
| 5.8.68 | 1.2 | 12.3 | 4.2 | 13.6 | 31.3 |
| AREA 8 | | | | | |
| 24.5.68 | 0.9 | 8.7 | 1.8 | 7.7 | 19.1 |
| 7.6.68 | 1.1 | 10.0 | 2.0 | 4.2 | 17.3 |
| 21.6.68 | 0.9 | 7.9 | 2.5 | 13.6 | 24.9 |
| 11.7.68 | 1.0 | 6.4 | 2.5 | 7.3 | 17.2 |
| 5.8.68 | 1.1 | 6.1 | 2.3 | 8.8 | 18.3 |

TABLE 16 contd. Individual and Total Mineral "Concentration" (mg per g dry weight) of the Plant Debris.

| Area & Date | Mineral "concentration" mg per g dry weight | | | | "Concentration" of total |
|---|---|---|---|---|---|
| | Sodium | Potassium | Magnesium | Calcium | minerals mg/g |
| AREA 2 | | | | | |
| 24.5.68 | 0.7 | 5.0 | 2.2 | 3.9 | 11.8 |
| 7.6.68 | 1.0 | 6.8 | 2.3 | 5.8 | 15.9 |
| 21.6.68 | 1.6 | 8.8 | 2.8 | 11.3 | 24.5 |
| 11.7.68 | 1.7 | 6.2 | 3.1 | 6.8 | 17.8 |
| AREA 3 | | | | | |
| 24.5.68 | 0.9 | 3.5 | 2.1 | 15.8 | 22.3 |
| 7.6.68 | 1.7 | 7.1 | 2.7 | 10.3 | 21.8 |
| 21.6.68 | 1.6 | 4.0 | 8.8 | 20.9 | 35.3 |
| 11.7.68 | 0.3 | 4.7 | 2.0 | 11.0 | 18.0 |
| AREA 4 | | | | | |
| 24.5.68 | 0.6 | 1.9 | 1.6 | 9.3 | 13.4 |
| 7.6.68 | 0.7 | 1.5 | 2.7 | 12.8 | 17.7 |
| 11.7.68 | 0.6 | 1.4 | 2.4 | 5.5 | 9.9 |
| AREA 5 | | | | | |
| 24.5.68 | 0.5 | 6.1 | 3.1 | 8.7 | 18.4 |
| 7.6.68 | 0.8 | 4.4 | 2.8 | 5.0 | 13.0 |
| 21.6.68 | 1.5 | 3.7 | 3.6 | 19.2 | 28.0 |
| 11.7.68 | 1.2 | 2.9 | 3.4 | 14.1 | 21.6 |
| 5.8.68 | 0.8 | 3.2 | 4.8 | 11.1 | 19.9 |
| AREA 7 | | | | | |
| 24.5.68 | 1.5 | 2.8 | 2.4 | 4.5 | 11.2 |
| 7.6.68 | 0.7 | 2.1 | 2.4 | 3.6 | 8.8 |
| 21.6.68 | 0.7 | 5.0 | 3.4 | 3.2 | 12.3 |
| 11.7.68 | 0.6 | 2.8 | 2.0 | 6.0 | 11.4 |
| 5.8.68 | 0.6 | 4.5 | 1.8 | 9.3 | 16.2 |
| AREA 8 | | | | | |
| 24.5.68 | 0.7 | 2.8 | 1.2 | 7.1 | 11.8 |
| 7.6.68 | 0.6 | 4.6 | 0.9 | 1.2 | 7.3 |
| 21.6.68 | 0.8 | 2.2 | 2.0 | 10.9 | 15.9 |
| 11.7.68 | 0.5 | 2.7 | 1.7 | 6.0 | 10.9 |
| 5.8.68 | 0.8 | 2.1 | 0.5 | 7.6 | 11.0 |

TABLE 16 contd. "Concentration" of Sodium, Potassium, Calcium and Magnesium in (A) the Phanerogams and (B) the Cryptogams at areas 7 and 8 in mg per g dry weight.

Phanerogams

| AREA | DATE | Sodium | Potassium | Magnesium | Calcium |
|---|---|---|---|---|---|
| 7 | 24.5.68 | 23.2 | 10.9 | 3.7 | 6.2 |
| | 7.6.68 | 2.7 | 12.5 | 3.6 | 4.4 |
| | 21.6.68 | 1.2 | 18.8 | 3.8 | 6.8 |
| | 11.7.68 | 1.6 | 12.5 | 2.5 | 2.9 |
| | 5.8.68 | 1.4 | 14.7 | 3.9 | 9.7 |
| 8 | 24.5.68 | 0.8 | 11.9 | 1.4 | 7.8 |
| | 7.6.68 | 1.3 | 12.6 | 1.9 | 4.6 |
| | 21.6.68 | 1.0 | 12.7 | 2.3 | 7.6 |
| | 11.7.68 | 2.0 | 12.3 | 2.8 | 4.7 |
| | 5.8.68 | 1.6 | 9.6 | 2.8 | 6.4 |

Cryptogams

| AREA | DATE | Sodium | Potassium | Magnesium | Calcium |
|---|---|---|---|---|---|
| 7 | 24.5.68 | 2.7 | 5.3 | 4.0 | 12.2 |
| | 7.6.68 | 1.0 | 5.4 | 3.7 | 6.7 |
| | 21.6.68 | 0.8 | 6.7 | 3.2 | 9.5 |
| | 11.7.68 | 0.9 | 5.9 | 3.3 | 6.4 |
| | 5.8.68 | 0.7 | 7.2 | 4.7 | 21.5 |
| 8 | 24.5.68 | 1.0 | 4.4 | 2.4 | 7.6 |
| | 7.6.68 | 0.8 | 6.2 | 2.0 | 3.7 |
| | 21.6.68 | 0.7 | 3.7 | 2.6 | 18.8 |
| | 11.7.68 | 0.7 | 4.8 | 2.8 | 9.4 |
| | 5.8.68 | 0.7 | 3.7 | 1.9 | 10.4 |

ately the values for the "concentration" of these minerals within the plant material fluctuate a good deal so that it is difficult to pick out overall trends. This fluctuation must of course be in part due to the variability in the mineral content of the subcrops-the species themselves (Table 5.1). However, if a particular community or species was under the stress of limited supplies of a particular nutrient then it might be expected that either
(a) the "concentration" of that nutrient within the plant material would dimish, or
(b) the "concentration" would remain the same, productivity being retarded. Only at areas 4 and 5 is there an overall reduction in the "concentration" of potassium. At areas 3 and 7 there is a sustained increase in "concentration" of potassium throughout development pointing to abundant available potassium, whereas at areas 2 and 8 there is simply slight fluctuation in the level of this mineral. Potassium "concentration" of the individual plant species (Table 5.1) shows much variation, the limited data gained from a broad study of this type not allowing conclusions to be drawn. However, possible fruitful lines of future research are indicated.

From Appendix 5 the average "concentration" of each mineral for a range of species over the study period was calculated and the results given in Table 17, and for the whole community in Table 17B. At each area the species which show their maximum performance (percentage increase in dry weight) are underlined, and those characterising the community type are marked with an asterisk. The maximum and minimum values for the "concentration" of each mineral are ringed. Again there are no strong correlations, but this kind of analysis, if carried out on a statistically sound number of samples, could indicate the species between which maximum competition for each nutrient might be expected.

TABLE 17 Average Mineral "Concentration" of Various Species During the Study Period. (mg per g dry weight) Plants showing their maximum performance (as calculated by percentage increase in dry weight) in each area are underlined. Character species are marked *. Maximum and minimum values are bracketed.

| Species & Area | Sodium | Potassium | Magnesium | Calcium |
|---|---|---|---|---|
| Area 2 | | | | |
| Holcus lanatus * | 2.8 | 23.6 | 2.3 | 4.1 |
| Poa trivialis * | 1.2 | 23.1 | 2.7 | 5.1 |
| Alopecurus pratensis * | 1.9 | 25.2 | 2.1 | (2.9) |
| Agrostis tenuis | 3.2 | 19.5 | 3.0 | 3.7 |
| Festuca rubra * | (0.7) | 21.9 | (1.8) | 3.2 |
| Bromus mollis | 2.5 | (12.1) | 2.4 | 3.0 |
| Ranunculus bulbosus | 4.5 | 12.3 | 3.9 | 6.5 |
| Rumex acetosa * | (4.8) | (25.3) | (4.6) | 7.5 |
| Trifolium repens * | 4.1 | 21.7 | 4.2 | (10.3) |
| Rhinanthus minor | 2.9 | 22.5 | 4.1 | 8.3 |
| Area 3 | | | | |
| Holcus lanatus * | 3.1 | 18.5 | 2.9 | 10.7 |
| Poa trivialis * | 1.0 | 21.2 | 3.4 | 15.2 |
| Alopecurus pratensis * | 1.6 | 15.7 | 3.7 | 17.3 |
| Festuca rubra * | (0.6) | 22.8 | 2.2 | 12.1 |
| Bromus mollis | 1.6 | (7.9) | 4.6 | (7.5) |
| Helictotrichon pubescens | 0.4 | 16.7 | (2.0) | 8.6 |
| Ranunculus bulbosus | (5.1) | 17.0 | (5.8) | 17.8 |
| Rhinanthus minor | 1.3 | 18.7 | 5.1 | (21.3) |
| Cerastium holosteodes * | 2.4 | (24.4) | 4.8 | 19.0 |
| Area 4 | | | | |
| Molinia caerulea | (0.7) | 14.6 | (2.2) | 8.4 |
| Eriophorum angustifolium | (1.2) | (14.2) | 2.9 | (6.2) |
| Carex panicea | 0.8 | (17.4) | (3.9) | (10.4) |

TABLE 17 contd.

| Species & Area | Sodium | Potassium | Magnesium | Calcium |
|---|---|---|---|---|
| Area 5 | | | | |
| Anthoxanthum odoratum * | 1.5 | 14.7 | 3.3 | 9.0 |
| Holcus lanatus * | 3.0 | 14.8 | 4.0 | 11.9 |
| Poa trivialis * | 1.3 | (16.0) | 4.2 | 8.3 |
| Festuca rubra * | (0.7) | 15.6 | 2.9 | 8.4 |
| Cynosurus cristatus | 2.8 | 14.4 | (2.5) | (5.4) |
| Ranunculus bulbosus | 3.5 | 15.1 | 4.4 | 15.9 |
| Rumex acetosa * | 2.1 | 12.8 | 7.5 | 14.7 |
| Trifolium repens | 2.9 | 10.6 | 6.1 | (19.2) |
| Plantago lanceolata * | (5.3) | (8.6) | (9.5) | 13.2 |
| Area 7 | | | | |
| Anthoxanthum odoratum * | 0.9 | 19.6 | 3.2 | 7.2 |
| Holcus lanatus * | 1.3 | (23.3) | 3.2 | 6.7 |
| Festuca rubra * | (0.6) | 16.3 | 3.1 | 5.1 |
| Nardus stricta | 0.7 | 10.7 | 2.1 | 4.9 |
| Carex pulicaris | 0.7 | 14.8 | 3.5 | 5.2 |
| Carex panicea | 0.9 | 18.6 | 3.7 | 8.9 |
| Juncus squarrosus | 2.6 | (10.4) | (2.1) | (2.1) |
| Ranunculus bulbosus | (5.2) | 17.9 | 7.1 | (17.7) |
| Trifolium repens | 2.5 | 14.9 | (9.8) | 14.6 |
| Area 8 | | | | |
| Festuca rubra * | 1.1 | 9.8 | 1.8 | (7.8) |
| Nardus stricta | 1.3 | (9.3) | (1.4) | (1.9) |
| Agrostis canina | (1.5) | 12.4 | 2.6 | 6.3 |
| Carex panicea | (0.9) | (14.2) | (3.0) | 6.3 |

TABLE 17B

Average Mineral "Concentration" (mg per g dry weight) of the Debris

| AREA | Sodium | Potassium | Magnesium | Calcium |
|---|---|---|---|---|
| 2 | 1.2 | 6.7 | 2.6 | 6.9 |
| 3 | 1.1 | 4.8 | 3.9 | 14.5 |
| 4 | 0.6 | 1.6 | 2.2 | 9.2 |
| 5 | 1.0 | 4.1 | 3.9 | 9.6 |
| 7 | 0.8 | 3.4 | 2.4 | 5.3 |
| 8 | 0.7 | 2.9 | 1.3 | 6.6 |

Average Mineral "Concentration" (mg per g dry weight) of the Whole Community

| AREA | Sodium | Potassium | Magnesium | Calcium |
|---|---|---|---|---|
| 2 | 2.1 | 15.7 | 2.9 | 5.2 |
| 3 | 1.7 | 14.0 | 4.2 | 15.0 |
| 4 | 0.7 | 7.4 | 2.7 | 8.6 |
| 5 | 2.2 | 11.1 | 5.4 | 10.9 |
| 7 | 1.3 | 10.2 | 3.2 | 6.7 |
| 8 | 0.9 | 5.2 | 2.2 | 7.4 |

Average Mineral "Concentration" (mg per g dry weight) of the Living Plant Material

| AREA | Sodium | Potassium | Magnesium | Calcium |
|---|---|---|---|---|
| 2 | 2.5 | 20.1 | 3.0 | 5.1 |
| 3 | 1.7 | 16.7 | 3.5 | 14.0 |
| 4 | 0.9 | 14.1 | 3.0 | 8.3 |
| 5 | 2.7 | 14.5 | 6.2 | 10.9 |
| 7 | 1.7 | 10.8 | 3.6 | 8.1 |
| 8 | 1.0 | 7.8 | 2.3 | 8.3 |

When the average "concentration" of the four minerals were totaled, and the results from species occuring in more than one area were compared, it was noted that these totals were similar (Table 18). On the supposition given above, it would appear that there is an excess, or greater ease of obtaining, certain of the minerals for Festuca rubra and Poa trivialis at area 3, and that certain nutrients are in short supply for Carex panicea and Nardus stricta in area 8 when compared with area 7. From Table 18B it seems that calcium is that mineral nutrient. Potassium and magnesium also seem more readily available at area 7 than area 8. Banham's results (Appendix 1) show that the meadow soils are richer in calcium than the other soils. Soil from area 7 was not tested but it has been limed in the past.

Calculation of the ratios of the average "concentration" of each mineral in each plant (Table 19) and comparison of the results of plants from different areas could also indicate if, and in which community, a particular mineral was less readily available for certain species. Table 20 comparing the mineral ratios of the four above mentioned species leads to the same conclusions as Table 18B. It also shows that there can be some similarity in the proportions of the four minerals for a species in different ecosystems, e.g. Ranunculus bulbosus. Table 20 also compares total average mineral "concentration", percentage dry weight increase, and maximum dry weight per plant for certain species. There is a marked correlation between all three values in the cases of Rumex acetosa, Carex panicea and Nardus stricta, and some correlation between these values for Ranunculus bulbosus, Festuca rubra, Poa trivialis and Holcus lanatus.

The "efficiency" with which the various plant species can utilize the different minerals at each area would also be data useful in the understanding of the

TABLE 18 Total "Concentration" of the Four Minerals (mg per g dry weight).in Certain Species.

| SPECIES | AREA 2 | AREA 3 | AREA 4 | AREA 5 | AREA 7 | AREA 8 |
|---|---|---|---|---|---|---|
| Holcus lanatus | 32.8 | 35.2 | | 33.7 | 34.5 | |
| Poa trivialis | 32.1 | 40.8 | | 29.8 | | |
| Festuca rubra | 27.6 | 37.7 | | 27.6 | 25.1 | |
| Carex panicea | | | 32.5 | | 32.1 | 24.4 |
| Nardus stricta | | | | | 17.7 | 13.9 |
| Ranunculus bulbosus | 27.2 | 45.6 | | 38.9 | 47.9 | |
| Alopecurus pratensis | 32.1 | 38.3 | | | | |
| Bromus mollis | 20.0 | 21.6 | | | | |
| Rumex acetosa | 42.2 | 46.4 | | 37.1 | | |
| Trifolium repens | 40.3 | | | 38.8 | 41.8 | |
| Rhinanthus minor | 37.8 | 46.4 | | | | |
| Anthoxanthum odoratum | | | | 28.5 | 30.9 | |

TABLE 18B

Average "concentration" (mg per g dry weight) of each mineral in Poa trivialis, Festuca rubra, Carex panicea, and Nardus stricta during the study period.

Poa trivialis

| Area | Sodium | Potassium | Magnesium | Calcium |
|---|---|---|---|---|
| 2 | 1.2 | 23.1 | 2.7 | 5.1 |
| 3 | 1.0 | 21.2 | 3.4 | 15.2 |
| 5 | 1.3 | 16.0 | 4.2 | 8.3 |

Festuca rubra

| Area | Sodium | Potassium | Magnesium | Calcium |
|---|---|---|---|---|
| 2 | 0.7 | 21.9 | 1.8 | 3.2 |
| 3 | 0.6 | 22.8 | 2.2 | 12.1 |
| 5 | 0.7 | 15.6 | 2.9 | 8.4 |
| 7 | 0.6 | 16.3 | 3.1 | 5.1 |

Carex panicea

| Area | Sodium | Potassium | Magnesium | Calcium |
|---|---|---|---|---|
| 4 | 0.8 | 17.4 | 3.9 | 10.4 |
| 7 | 0.9 | 18.6 | 3.7 | 8.9 |
| 8 | 0.9 | 14.2 | 3.0 | 6.3 |

Nardus stricta

| Area | Sodium | Potassium | Magnesium | Calcium |
|---|---|---|---|---|
| 7 | 0.7 | 10.7 | 2.1 | 4.9 |
| 8 | 1.3 | 9.3 | 1.4 | 1.9 |

TABLE 19

RATIOS OF THE AVERAGE MINERAL CONCENTRATION X 10

| | Na | K | Mg | Ca |
|---|---|---|---|---|
| **AREA 2** | | | | |
| Holcus lanatus | 12 | 103 | 10 | 18 |
| Poa trivialis | 10 | 193 | 23 | 43 |
| Alopecurus pratensis | 10 | 133 | 11 | 24 |
| Agrostis tenuis | 11 | 65 | 10 | 12 |
| Festuca rubra | 10 | 312 | 26 | 46 |
| Bromus mollis | 10 | 50 | 10 | 13 |
| Ranunculus bulbosus | 11 | 32 | 10 | 17 |
| Rumex acetosa | 10 | 55 | 10 | 16 |
| Trifolium repens | 10 | 53 | 10 | 25 |
| Rhinanthus minor | 10 | 78 | 14 | 29 |
| **AREA 3** | | | | |
| Holcus lanatus | 11 | 64 | 10 | 37 |
| Poa trivialis | 10 | 212 | 34 | 152 |
| Alopecurus pratensis | 10 | 98 | 23 | 108 |
| Festuca rubra | 10 | 380 | 37 | 201 |
| Bromus mollis | 10 | 49 | 29 | 47 |
| Helictotrichon pubescens | 10 | 418 | 50 | 21 |
| Ranunculus bulbosus | 10 | 33 | 11 | 35 |
| Rhinanthus minor | 10 | 144 | 49 | 164 |
| Cerastium holosteodes | 10 | 102 | 20 | 79 |
| **AREA 4** | | | | |
| Molinia caerulea | 10 | 209 | 31 | 120 |
| Eriophorum angustifolium | 10 | 118 | 24 | 52 |
| Carex panicea | 10 | 218 | 49 | 130 |
| **AREA 5** | | | | |
| Anthoxanthum odoratum | 10 | 98 | 22 | 60 |
| Holcus lanatus | 10 | 49 | 13 | 40 |
| Poa trivialis | 10 | 123 | 32 | 64 |
| Festuca rubra | 10 | 223 | 41 | 120 |
| Cynosaurus cristatus | 11 | 58 | 10 | 22 |
| Ranunculus bulbosus | 10 | 43 | 13 | 45 |
| Rumex acetosa | 10 | 61 | 36 | 70 |
| Trifolium repens | 10 | 36 | 21 | 66 |
| Plantago lanceolata | 10 | 16 | 18 | 25 |

TABLE 19 contd.

| | Na | K | Mg | Ca |
|---|---|---|---|---|
| AREA 7 | | | | |
| Anthoxanthum odoratum | 10 | 218 | 36 | 80 |
| Holcus lanatus | 10 | 179 | 25 | 51 |
| Festuca rubra | 10 | 272 | 52 | 85 |
| Nardus stricta | 10 | 153 | 30 | 70 |
| Carex pulicaris | 10 | 212 | 50 | 74 |
| Carex panicea | 10 | 207 | 41 | 99 |
| Juncus squarrosus | 12 | 50 | 10 | 10 |
| Ranunculus bulbosus | 10 | 34 | 14 | 34 |
| Trifolium repens | 10 | 60 | 39 | 58 |
| AREA 8 | | | | |
| Festuca ovina | 10 | 89 | 16 | 71 |
| Nardus stricta | 10 | 72 | 10 | 15 |
| Agrostis canina | 10 | 83 | 17 | 42 |
| Carex panicea | 10 | 158 | 33 | 70 |

TABLE 19 contd.

RATIOS OF TOTAL AVERAGE MINERAL CONCENTRATION IN DEBRIS

| | Na | K | Mg | Ca |
|---|---|---|---|---|
| Area 2 | 10 | 56 | 22 | 57 |
| Area 3 | 10 | 44 | 35 | 132 |
| Area 4 | 10 | 27 | 37 | 153 |
| Area 5 | 10 | 41 | 39 | 96 |
| Area 7 | 10 | 43 | 30 | 66 |
| Area 8 | 10 | 41 | 20 | 94 |

RATIOS OF TOTAL AVERAGE MINERAL CONCENTRATION IN WHOLE COMMUNITY

| | | | | |
|---|---|---|---|---|
| Area 2 | 10 | 75 | 14 | 25 |
| Area 3 | 10 | 79 | 24 | 87 |
| Area 4 | 10 | 106 | 39 | 123 |
| Area 5 | 10 | 50 | 25 | 50 |
| Area 7 | 10 | 78 | 25 | 52 |
| Area 8 | 10 | 58 | 20 | 82 |

RATIOS OF TOTAL AVERAGE MINERAL CONCENTRATION IN LIVING PART OF COMMUNITY

| | | | | |
|---|---|---|---|---|
| Area 2 | 10 | 80 | 12 | 20 |
| Area 3 | 10 | 89 | 18 | 78 |
| Area 4 | 10 | 157 | 33 | 92 |
| Area 5 | 10 | 54 | 23 | 40 |
| Area 7 | 10 | 63 | 21 | 48 |
| Area 8 | 10 | 78 | 23 | 83 |

TABLE 20

(i) Compares the ratios of mineral "concentration" between areas for certain species.

(ii) Shows the correlation between maximum dry weight, total average mineral "concentration" and percentage increase in dry weight.

| Species | Area | Mineral ratio x 10 Na | K | Mg | Ca | Maximum dry weight per plant mg | Total average min. "conc". | % increase in dry weight. |
|---|---|---|---|---|---|---|---|---|
| Ranunculus bulbosus | 2 | 11 | 32 | 10 | 17 | 190.7 | 27.2 | 121 |
| | 3 | 10 | 33 | 11 | 35 | 266.2 | 45.6 | 443 |
| | 5 | 10 | 43 | 13 | 45 | 58.6 | 38.9 | 321 |
| | 7 | 10 | 34 | 14 | 34 | 98.9 | 47.9 | 259 |
| Festuca rubra | 2 | 10 | 312 | 26 | 46 | 7.4 | 27.6 | 40 |
| | 3 | 10 | 380 | 37 | 201 | 12.6 | 37.7 | 180 |
| | 5 | 10 | 223 | 41 | 120 | 8.4 | 27.6 | 100 |
| | 7 | 10 | 172 | 52 | 85 | 8.3 | 25.1 | 100 |
| Poa trivialis | 2 | 10 | 193 | 23 | 43 | 18.6 | 32.1 | 89 |
| | 3 | 10 | 212 | 34 | 152 | 12.5 | 40.8 | 140 |
| | 5 | 10 | 123 | 32 | 64 | 7.9 | 29.8 | 300 |
| Holcus lanatus | 2 | 12 | 103 | 10 | 18 | 63.6 | 32.8 | 909 |
| | 3 | 11 | 64 | 10 | 37 | 363.8 | 35.2 | 3933 |
| | 5 | 10 | 49 | 13 | 40 | 18.1 | 33.7 | 350 |
| | 7 | 10 | 179 | 25 | 55 | 22.1 | 34.5 | 267 |
| Rumex acetosa | 2 | 10 | 55 | 10 | 16 | 293.2 | 42.2 | 946 |
| | 5 | 10 | 61 | 36 | 70 | 55.9 | 37.1 | 460 |
| Carex panicea | 4 | 10 | 818 | 49 | 130 | 115.7 | 32.5 | 190 |
| | 7 | 10 | 207 | 41 | 99 | 63.3 | 32.1 | 133 |
| | 8 | 10 | 158 | 33 | 70 | 58.2 | 24.4 | 123 |
| Nardus stricta | 7 | 10 | 153 | 30 | 70 | 18.0 | 17.7 | 100 |
| | 8 | 10 | 72 | 10 | 15 | 15.9 | 13.9 | 45 |

community. Also the uptake ability of the component species is one of the important factors determining the amount of minerals in the standing crop. Table 21 presents the "efficiency" of Carex panicea, Festuca rubra and Ranunculus bulbosus.

Carex panicea shows its maximum development, or production "efficiency" (percentage increase in dry weight) at area 4. This is correlated with maximum "efficiency" in relation to the utilization of sodium, calcium and to a lesser extent potassium, and to an overall total "efficiency".

Festuca rubra shows its maximum production "efficiency" at area 3. This is correlated with an "efficient" use of calcium. It has already been shown that at this area this plant has a higher calcium "concentration" than elsewhere.

Ranunculus bulbosus shows its maximum production "efficiency" at area 3. This is correlated with "inefficient" mineral utilization.

As already pointed out much more intensive work is necessary before such results could be accepted as anything more than indications. It is suggested that the work could be developed by detailed study of simple communities which would permit the collection and analysis of a statistically sound number of replicates. It must however be realised that any measurements of this kind must be viewed in relation to the overall mineral "budget" of each farm unit studied. This is attempted below with the results obtained from this study.

TABLE 21

Dry Weight Increment, Percentage Increase in Dry Weight, Nutrient Uptake and "Efficiency" of *Carex panicea*, *Festuca rubra* and *Ranunculus bulbosus*.

CAREX PANICEA

| | | Area 4 | 7 | 8 |
|---|---|---|---|---|
| Dry Weight increment g per $m^2$ | | 26.5 | 8.5 | 7.9 |
| % increase in dry weight | | 190 | 133 | 123 |
| Nutrient uptake mg per $m^2$ | Na | 2.4 | 4.5 | 9.3 |
| | K | 238.0 | 125.0 | 48.0 |
| | Mg | 94.6 | 10.7 | 15.1 |
| | Ca | 89.5 | 109.6 | 48.6 |
| "Efficiency" mg per g dry weight | Na | 0.09 | 0.53 | 1.18 |
| | K | 8.98 | 14.7 | 6.07 |
| | Mg | 3.57 | 1.25 | 1.91 |
| | Ca | 1.49 | 12.8 | 6.15 |
| TOTAL "EFFICIENCY" | | 14.13 | 29.28 | 15.31 |

FESTUCA RUBRA

| | | Area 2 | 3 | 5 | 7 |
|---|---|---|---|---|---|
| Dry Weight increment g per $m^2$ | | 3.6 | 51.1 | 12.9 | 4.7 |
| % increase in dry weight | | 40 | 180 | 100 | 100 |
| Nutrient uptake mg per $m^2$ | Na | 3.2 | 19.4 | 11.5 | 0.9 |
| | K | 99.0 | 1100.7 | 143.8 | 67.2 |
| | Mg | 5.9 | 100.0 | 36.0 | 10.0 |
| | Ca | 19.4 | 184.4 | 270.7 | 19.1 |
| "Efficiency" mg per g dry weight | Na | 0.89 | 0.38 | 0.89 | 0.19 |
| | K | 27.50 | 21.50 | 11.14 | 14.29 |
| | Mg | 1.64 | 1.95 | 2.79 | 2.12 |
| | Ca | 5.38 | 3.6 | 20.98 | 4.06 |
| TOTAL "EFFICIENCY" | | 35.41 | 27.43 | 35.80 | 20.66 |

TABLE 21 contd.

RANUNCULUS BULBOSUS

| | | Area 2 | 3 | 5 | 7 |
|---|---|---|---|---|---|
| Dry Weight increment g per $m^2$ | | 8.9 | 14.3 | 14.8 | 5.4 |
| % increase in dry weight | | 121 | 443 | 321 | 259 |
| Nutrient uptake mg per $m^2$ | Na | 109.7 | 124.2 | 72.2 | 28.9 |
| | K | 135.9 | 277.6 | 154.0 | 70.3 |
| | Mg | 72.2 | 199.9 | 129.7 | 6.2 |
| | Ca | 153.6 | 349.4 | 336.3 | 45.5 |
| "Efficiency" mg per g dry weight | Na | 12.3 | 8.68 | 4.88 | 3.35 |
| | K | 15.2 | 19.41 | 10.4 | 13.01 |
| | Mg | 8.11 | 13.97 | 8.76 | 1.15 |
| | Ca | 17.2 | 24.43 | 22.72 | 8.42 |
| TOTAL "EFFICIENCY" | | 52.81 | 67.49 | 46.76 | 27.93 |

## MINERAL "BUDGET" OF EACH COMMUNITY

Once the "drain"-actuall uptake of each mineral by the living plants-on the "mineral store" has been calculated it is possible to draw up a "mineral balance sheet" (Table 23). As the values used for minerals leached by rain (Park et al. 1962), contained in the soil (Benham 1969), supplied in sheep dung (Park et al. 1962), by rain (Gore 1956), and by manure (Hemingway 1961, Boyd et al. 1961) are not the results of analyses carried out during 1968 in Upper Teesdale, this table can only give some idea as to the mineral balance of each ecosystem.

Areas 2 and 3 are sometimes flooded in the spring when the snow melts, the extent and duration of flooding is very variable, in March 1968 the river rose up to the level of Cronkley Bridge. It is very difficult to estimate the amount of minerals deposited in the silt. Figures presented by Crisp (1966) for the analysis of water and suspended peat from Rough Sike (NY 758329) are given in Table 22. These could be

TABLE 22

Stream water output, the amount of suspended peat and the quantities of five elements contained in this water and peat estimated for 1963.

| | Quantity | Elements | | | | | |
|---|---|---|---|---|---|---|---|
| | | Na | K | Ca | P | N | (Kg per year) |
| Stream water | 1368 $m^3$ x 10 | 3755 | 744 | 6461 | 33 | 244 | |
| Suspended peat | 9306 Kg dry weight | 23 | 171 | 401 | 37 | 1214 | |

some indication as to the proportions of the various minerals in the waters of the River Tees, and do show that flood water would be a rich source of minerals.

TABLE 23 MINERAL BALANCE SHEET

| | Area | INPUT NPK Fert. | Rain | Sheep Dung | F.Y.M. | STORE Debris | Soil | OUTPUT Leaching | "Drain" |
|---|---|---|---|---|---|---|---|---|---|
| SODIUM | 2 | | 2.19 | | | 0.1 | 15.10 | | 0.8 |
| | 3 | | 2.19 | | | 0.2 | | | 0.7 |
| | 4 | | 2.19 | | | 0.1 | 12.63 | | 0.05 |
| | 5 | | 2.19 | | | 0.1 | 16.44 | | 0.7 |
| | 7 | | 2.19 | | | 0.3 | | | 0.5 |
| | 8 | | 2.19 | | | 0.2 | 14.15 | | 0.2 |
| POTASSIUM | 2 | 2.67 | 0.16 | 0.29 | 1.29 | 0.4 | 10.13 | 0.20 | 5.1 |
| | 3 | 2.67 | 0.16 | 0.29 | 1.29 | 0.7 | | 0.20 | 6.0 |
| | 4 | | 0.16 | | | 0.2 | 9.35 | 0.20 | 0.9 |
| | 5 | | 0.16 | 0.29 | | 0.4 | 10.95 | 0.20 | 2.2 |
| | 7 | | 0.16 | 0.29 | | 0.6 | | 0.20 | 2.0 |
| | 8 | | 0.16 | 0.29 | | 0.6 | 8.72 | 0.20 | 1.2 |
| MAGNESIUM | 2 | | 0.31 | | 0.34 | 0.2 | 42.40 | | 0.8 |
| | 3 | | 0.31 | | 0.34 | 0.9 | | | 1.8 |
| | 4 | | 0.31 | | | 0.3 | 23.74 | | 0.3 |
| | 5 | | 0.31 | | | 0.5 | 66.38 | | 1.0 |
| | 7 | | 0.31 | | | 0.5 | | | 0.7 |
| | 8 | | 0.31 | | | 0.4 | 25.03 | | 0.5 |
| CALCIUM | 2 | | 0.65 | | 0.74 | 0.5 | 309.41 | 3.34 | 1.5 |
| | 3 | | 0.65 | | 0.74 | 2.2 | | 3.34 | 5.2 |
| | 4 | | 0.65 | | | 1.1 | 138.12 | 3.34 | 0.4 |
| | 5 | | 0.65 | | | 1.6 | 384.91 | 3.34 | 2.3 |
| | 7 | | 0.65 | | | 1.0 | | 3.34 | 2.0 |
| | 8 | | 0.65 | | | 2.3 | 90.80 | 3.34 | 2.4 |

Most of the figures presented in this balance sheet had to be corrected to g per $m^2$ per year. The soil mineral content was estimated by totaling the minerals present in the top 32cm (Benham 1969, plant roots were not found at a greater depth).

For the quantity of minerals stored in the plant debris the maximum value found at each area during the experimental period was used.

Park et al. (1962) in their paper give the average amount of minerals contained in sheep dung deposited on a known area of Festuca-Agrostis sward near Moor House in 1957. By assuming that grazing pressures were comparable these figures could show the quantity of minerals available from this source. In the meadow sheep would graze areas 2 and 3 preferentially, and area 4 only lightly. For 2-3 months in the summer the sheep are absent from the meadows, and during the harder winter months they are absent from areas 7 and 8. Also given in this paper were the values for the amounts of minerals leached from the soil during 1959 and 1960:-

| | 1959 | 1960 | |
|---|---|---|---|
| Ca | 2.24 | 4.44 | Corrected |
| K | 0.21 | 0.18 | to g per |
| P | 0.02 | 0.02 | $m^2$ per |
| Total N | 0.01 | 0.02 | year. |

An average of these two years' results was used. This can only be used as very rough approximation due to the soil differences between the two areas.

Gore's (1956) figures for the mineral analysis of rain water were used in preference to Crisp's (1966), as they were the result of several years' work.

The mineral content of farmyard manure (Hemingway 1961)

was calculated by analysing partly rotted manure from byres in West Scotland. The quantity of manure applied to Upland farms varies between 1.4-2.5 tons per acre (Boyd et al 1961) and in this table it is assumed that about 2 tons per acre was the quantity used.

The above account illustrates the basic problems of all studies of production ecology, showing the crudity of the estimates, and emphasising the need for much more basic research before conclusions can be drawn.

## CONCLUSIONS

The aim of the study was to obtain data relating to the floristic composition, productivity and mineral regime of the main component ecosystems of a typical farm in Upper Teesdale. The floristic data has been summarised in Table 12, on page 57 and in more detail on page 94. The production and mineral regimes are summarised in Table 24.

The main conclusions are that production and mineral regime are related to the amount of "management"- grazing, fertilization, mowing and drainage. "Management" results in increase in productivity, not only in terms of increased production of biomass, but also of the type of biomass. The more palatable grasses, typical of the ARRHENATHERETALIA Pawloski 1928, replacing the abundant cryptograms of the MOLINIETALIA W.Koch 1926. As only above ground biomass was sampled the production as calculated in this study may only be $\frac{1}{3}$ of the total-above and below ground-production of plant material (Malmer 1969).

Increased production is accomplished at the expense of production "efficiency", especially in relation to potassium utilization. The more rapid turn-over of organic and inorganic nutrients accompaning increased production must cause a breakdown of the natural retention and recycling of nutrients by the more natural ecosystems. Available nutrients can limit plant growth, Malmer (1969) noted that potassium, nitrogen and phosphorous were the main limiting mineral macro-elements for meadow production in South Sweden. Hence in order to maintain productivity man must provide sufficient nutrients to compensate for those removed, and to satisfy the demand.

Although the results presented here are not statistically

TABLE 24 Summary of the Production and Mineral Regime of the Six Study Areas.

| Area | | 2 | 3 | 4 | 5 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| Maximum standing of plant material g dry weight per $m^2$ | | 346 | 508 | 317 | 307 | 386 | 383 |
| Productivity g per $m^2$ per day | | 7.2 | 10.5 | 5.7 | 5.0 | 5.7 | 5.1 |
| Maximum standing crop of each mineral mg per $m^2$ | K | 5511 | 6818 | 1830 | 3063 | 3359 | 1816 |
| | Na | 938 | 591 | 203 | 907 | 850 | 309 |
| | Mg | 1052 | 1879 | 857 | 1693 | 1205 | 851 |
| | Ca | 2264 | 5510 | 1925 | 4195 | 2614 | 4642 |
| Overall uptake of each mineral mg per $m^2$ | K | 5115 | 6013 | 857 | 2161 | 2027 | 1173 |
| | Na | 805 | 732 | 52 | 734 | 500 | 221 |
| | Mg | 844 | 1802 | 287 | 991 | 680 | 529 |
| | Ca | 1547 | 5225 | 408 | 2270 | 1968 | 2441 |
| "Efficiency" of utilization of each mineral mg per g dry weight | K | 16.23 | 13.07 | 6.86 | 10.49 | 14.90 | 9.02 |
| | Na | 2.55 | 1.59 | 0.42 | 3.56 | 3.67 | 1.70 |
| | Mg | 2.68 | 3.91 | 2.29 | 4.81 | 5.00 | 4.07 |
| | Ca | 4.91 | 11.35 | 3.26 | 11.01 | 14.46 | 18.77 |

sound they do indicate that this is a useful line for a more detailed future investigation. The results obtained could eventually be used to improve the hay crop and grazing swards by suggesting new seed mixtures and improving the added fertilizers.

## PHYTOSOCIOLOGICAL SURVEY OF UNMOWN AREAS OF MEADOW

To further investigate the vegetation of the valley bottom, and especially that of the alluvial meadows, the floristic composition of 137, 2m x2m quadrats was analysed. All quadrats were placed in areas of the alluvial meadow which are not mown for hay, either because they are too near ditches and streams, or the slope is too great, or the soil too wet (see map, Fig.10.1). It is thought that the vegetation of the whole alluvial area may have been the same, or similar, to that of these areas before "management".

Association analysis (Williams and Lambert, 1959) of the data was done using a computer. $\chi^2$ (with Yates' correction)was used as a test of significance. Species with the highest $\Sigma\chi^2$ (without Yates' correction, and all $\chi^2$ values were considered whether they were significant or not) were used to divide the quadrat groups. When the highest $\chi^2$ value (with Yates' correction) was less than 3.841 (regarded as non-significant) or the number of quadrats was less than 8 the group was not subdivided, and was considered as a "final group". This resulted in 35 "final groups", but as some of these were very similar, or consisted of a small number of quadrats, they were clumped together to form 17 groups. (Fig 10.2). Only presence and absence data were used in this method and it is possible that spurious groupings may have been formed. The percentage frequency of occurrence of each species in each of the 17 quadrat groups was also calculated by the computer (Table 10.1).

The table (Table 10.1) shows that the vegetation belongs primarily to the class MOLINIO-ARRHENATHERETEA R.Tx.1937, order MOLINIETALIA W.Koch 1926, and alliance MOLINION CAERULEAE W.Koch 1926. As the survey was very detailed over a small area it is very difficult to name the

vegetation types present. However, it does appear that there are three communities present.

The quadrat groups A-H (not C) show affinity to the order ARRHENATHERETALIA Pawloski 1928, and are characterised by the absence of Molinia caerulea. The quadrats belonging to these groups were all situated in the drier unmown meadow areas, e.g. the river bank.

The remaining quadrat groups, situated in damp to wet areas, are characterised by the presence of Molinia caerulea and are more typical of the order MOLINIETALIA W.Koch 1926. They can be divided into two varieties:-
(a) groups C,I,J and K possessing most of the differential species, e.g. Centaurea nigra and Alchemilla glabra, and
(b) groups L-Q lacking most of the differential species but Festuca ovina and Viola palustris are very constant.

Much more phytosociological work must be undertaken on the grasslands of Teesdale in Britain before further conclusions are possible. However, it does seem safe to conclude that the communities on the lower Fell slopes and the valley bottoms, which developed when the forests were destroyed (Pigott 1956), can be classified within the great pan-European class of grasslands. Anemone nemorosa, Conopodium majus, Mnium hornum, Thuidium tamariscinum and Holcus mollis are probably the last remnants of the woodland flora.

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SITE 5

| Depth Class | Carbonate gms./$m^2$. | Potassium gms./$m^2$. | Sodium gms./$m^2$. | Calcium gms./$m^2$. | Magnesium gms./$m^2$. | Phosphorous gms./$m^2$. | Nitrate Nitrogen gms./$m^2$. |
|---|---|---|---|---|---|---|---|
| a | 324.77 | 4.19 | 3.97 | 82.27 | 15.6 | 0.65 | 0.51 |
| b | 326.45 | 2.49 | 4.66 | 83.94 | 16.71 | 0.66 | 0.93 |
| c | 394.44 | 2.46 | 4.11 | 119.96 | 19.72 | 0.38 | 0.33 |
| d | 394.49 | 1.81 | 3.70 | 88.74 | 14.79 | 0.44 | 0.25 |
| e | 474.67 | 1.66 | 3.54 | 105.76 | 19.57 | 0.35 | 0.25 |
| f | 512.97 | 1.97 | 3.85 | 137.65 | 24.79 | 0.26 | 0.17 |
| g | 468.34 | 1.97 | 3.90 | 130.64 | 22.18 | 0.23 | 0.16 |
| h | 311.78 | 2.40 | 3.60 | 106.33 | 19.59 | 0.40 | 0.32 |
| i | 65 .95 | 0.32 | 0.60 | 13.00 | 2.50 | 0.22 | 0.12 |

SITE 2

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| a | 429.95 | 2.71 | 3.03 | 95.72 | 7.68 | 11.32 | 1.54 |
| b | 375.89 | 2.80 | 3.46 | 91.40 | 8.11 | 0.99 | 0.74 |
| c | 354.71 | 2.44 | 4.53 | 70.94 | 12.61 | 0.37 | 0.55 |
| d | 280.08 | 2.18 | 4.08 | 51.35 | 14.00 | 0.32 | 0.47 |
| e | 46 .68 | 0.52 | 1.35 | 9.80 | 2.10 | 0.17 | 0.10 |

SITE 4

| Depth Class | Carbonate gms./$m^2$. | Potassium gms./$m^2$. | Sodium gms./$m^2$ | Calcium gms./$m^2$. | Magnesium gms./$m^2$. | Phosphorous gms./$m^2$. | Nitrate Nitrogen gms./$m^2$. |
|---|---|---|---|---|---|---|---|
| a | 162.11 | 3.80 | 3.46 | 27.24 | 9.29 | 0.07 | 0.17 |
| b | 167.62 | 2.51 | 3.20 | 32.25 | 7.17 | 0.06 | 0.20 |
| c | 221.85 | 1.59 | 2.84 | 36.40 | 3.98 | 0.03 | 0.17 |
| d | 237.55 | 1.45 | 3.13 | 42.23 | 3.30 | 0.02 | 0.20 |
| e | 231.56 | 1.48 | 3.02 | 51.01 | 3.36 | 0.08 | 0.20 |
| f | 279.53 | 1.58 | 3.76 | 47.30 | 5.02 | 0.88 | 0.14 |

SITE 8

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| a | 213.63 | 4.07 | 3.63 | 18.02 | 6.68 | 0.12 | 0.20 |
| b | 274.21 | 2.36 | 4.66 | 20.18 | 7.24 | 0.10 | 0.23 |
| c | 277.82 | 0.97 | 2.42 | 20.63 | 5.05 | 0.02 | 0.21 |
| d | 264.59 | 1.32 | 3.44 | 31.97 | 6.06 | 0.01 | 0.22 |
| e | 367.12 | 2.22 | 4.26 | 64.52 | 11.12 | 0.12 | 0.23 |
| f | 389.37 | 2.45 | 4.45 | 65.26 | 11.87 | 0.57 | 0.24 |
| g | 433.86 | 2.67 | 4.82 | 78.62 | 14.09 | 0.62 | 0.22 |
| h | 456.11 | 2.67 | 4.45 | 92.71 | 17.80 | 0.85 | 0.22 |

The soil profile was divided into "depth classes"- each 8 cm deep.

APPENDIX 12, TABLE 12

| Sample depth | Fresh wt. (gms.) | Dry wt. (gms.) | Water content (% fresh) (wt.) | Ash wt. (gms.) | Organic matter (% dry) (wt.) |
|---|---|---|---|---|---|
| SITE 5 | | | | | |
| 0- 8cms. | 28.0 | 18.2 | 35 | 16.5 | 9.3 |
| 8-16cms. | 29.0 | 21.3 | 30 | 19.9 | 6.6 |
| 16-24cms, | 28.5 | 21.2 | 26 | 20.1 | 6.1 |
| 24-32cms. | 34.5 | 25.5 | 26 | 24.0 | 5.9 |
| 32.40cms. | 20.9 | 15.6 | 25 | 14.8 | 5.1 |
| 40-48cms. | 30.7 | 23.6 | 23 | 22.6 | 4.2 |
| 48-56cms. | 28.4 | 21.0 | 26 | 19.9 | 5.2 |
| 56-64cms. | 30.0 | 21.6 | 28 | 20.4 | 5.5 |
| SITE 2 | | | | | |
| 0- 8cms. | 16.4 | 8.2 | 50 | 7.0 | 17.0 |
| 8-16cms. | 16.4 | 11.8 | 28 | 11.1 | 6.3 |
| 16-24cms. | 17.0 | 13.1 | 23 | 12.5 | 5.0 |
| 24-32cms. | 18.6 | 14.2 | 24 | 13.6 | 4.0 |

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APPENDIX 1 Table 1.2 contd.

SITE 3

| Sample depth | Fresh wt. (gms.) | Dry wt. (gms.) | Water content (% fresh) (wt.) | Ash wt. (gms.) | Organic matter (% dry) (wt.) |
|---|---|---|---|---|---|
| 0- 8cms. | 36.1 | 18.0 | 50 | 15.5 | 14.0 |
| 8-16cms. | 19.0 | 13.4 | 35 | 12.5 | 6.7 |
| 16-24cms. | 21.9 | 15.8 | 32 | 14.8 | 6.3 |
| 24-32cms. | 14.4 | 10.2 | 29 | 9.6 | 5.9 |
| 32-40cms. | 23.0 | 16.7 | 27 | 15.7 | 6.0 |

SITE 4

| | | | | | |
|---|---|---|---|---|---|
| 0- 8cms. | 20.6 | 7.8 | 62 | 6.0 | 23.1 |
| 8-16cms. | 17.0 | 7.7 | 55 | 6.3 | 18.2 |
| 16-24cms. | 24.2 | 12.2 | 50 | 10.5 | 13.9 |
| 24-32cms. | 23.3 | 13.4 | 42 | 12.4 | 7.5 |
| 32-40cms. | 21.1 | 12.5 | 41 | 11.4 | 8.8 |
| 40-48cms. | 28.5 | 17.9 | 37 | 16.8 | 6.1 |

APPENDIX 1 Table 1.2 contd.

SITE 7

| Sample depth | Fresh wt. (gms.) | Dry wt. (gms.) | Water content (%fresh) (wt.) | Ash wt. (gms.) | Organic matter (% dry) (wt.) |
|---|---|---|---|---|---|
| 0- 8cms. | 18.2 | 6.0 | 67 | 4.1 | 31 |
| 8-16cms. | 19.5 | 9.3 | 52 | 7.8 | 16 |
| 16-24cms. | 18.9 | 9.0 | 52 | 7.7 | 14 |
| 24-32cms. | 19.0 | 10.1 | 47 | 8.9 | 12 |
| 32-40cms. | 23.0 | 15.5 | 33 | 14.4 | 7 |
| 40-48cms. | 24.9 | 18.5 | 26 | 17.7 | 4 |
| 48-56cms. | 32.0 | 23.5 | 27 | 22.5 | 4 |

SITE 8

| | | | | | |
|---|---|---|---|---|---|
| 0- 8cms. | 13.5 | 3.9 | 71 | 2.5 | 36 |
| 8-16cms. | 16.3 | 6.2 | 62 | 5.0 | 19 |
| 16-24cms. | 15.4 | 6.4 | 58 | 5.2 | 19 |
| 24-32cms. | 15.9 | 8.8 | 45 | 8.0 | 9 |
| 32-40cms. | 15.2 | 11.2 | 26 | 10.9 | 3 |
| 40-48cms. | 14.2 | 10.5 | 26 | 10.2 | 3 |

FIGURE 1.1 Total alkalinity of areas 5, 2, 4 and 8 (Expressed as Carbonate)

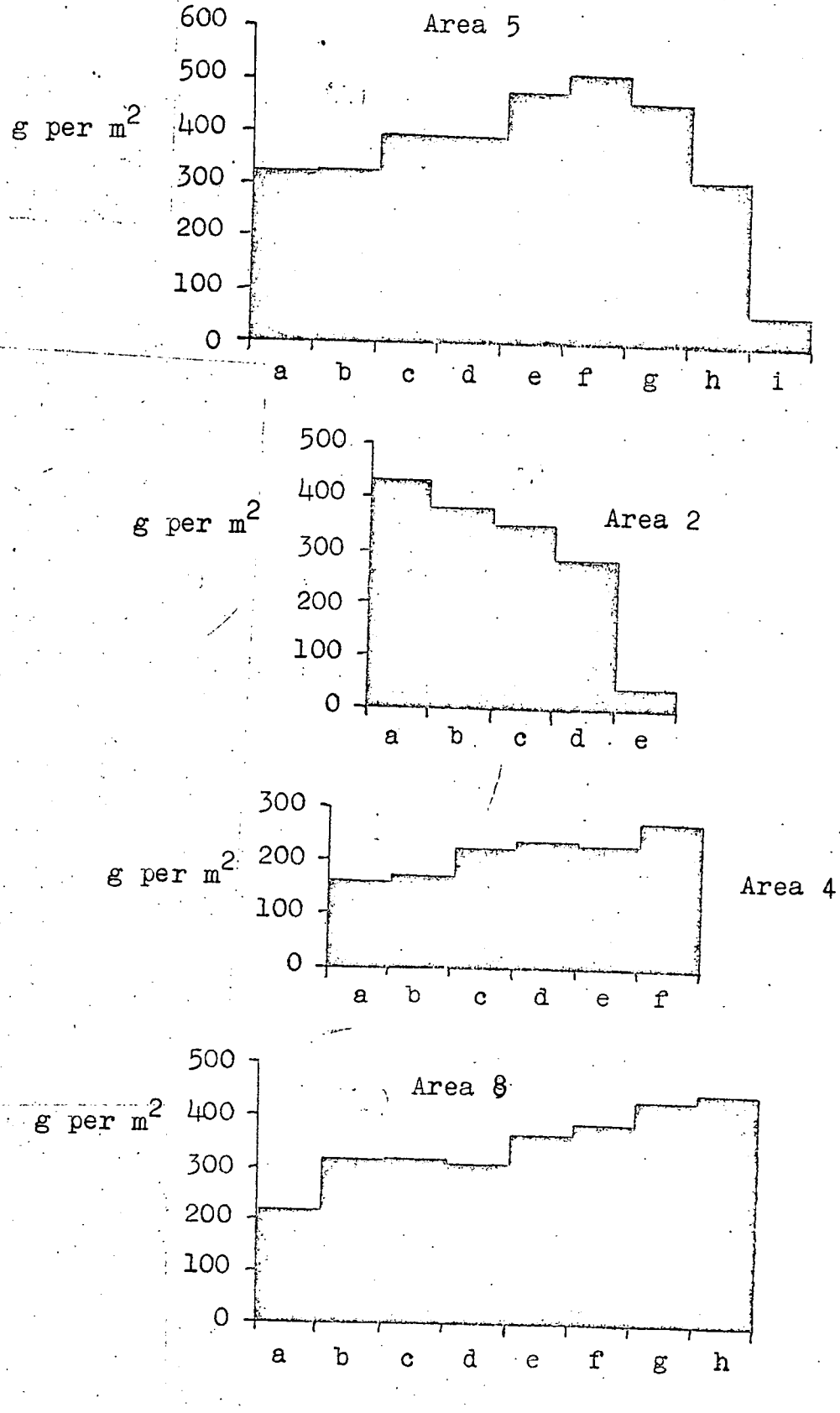


FIGURE 1.2 Potassium levels of the soil at areas 5, 2, 4 and 8

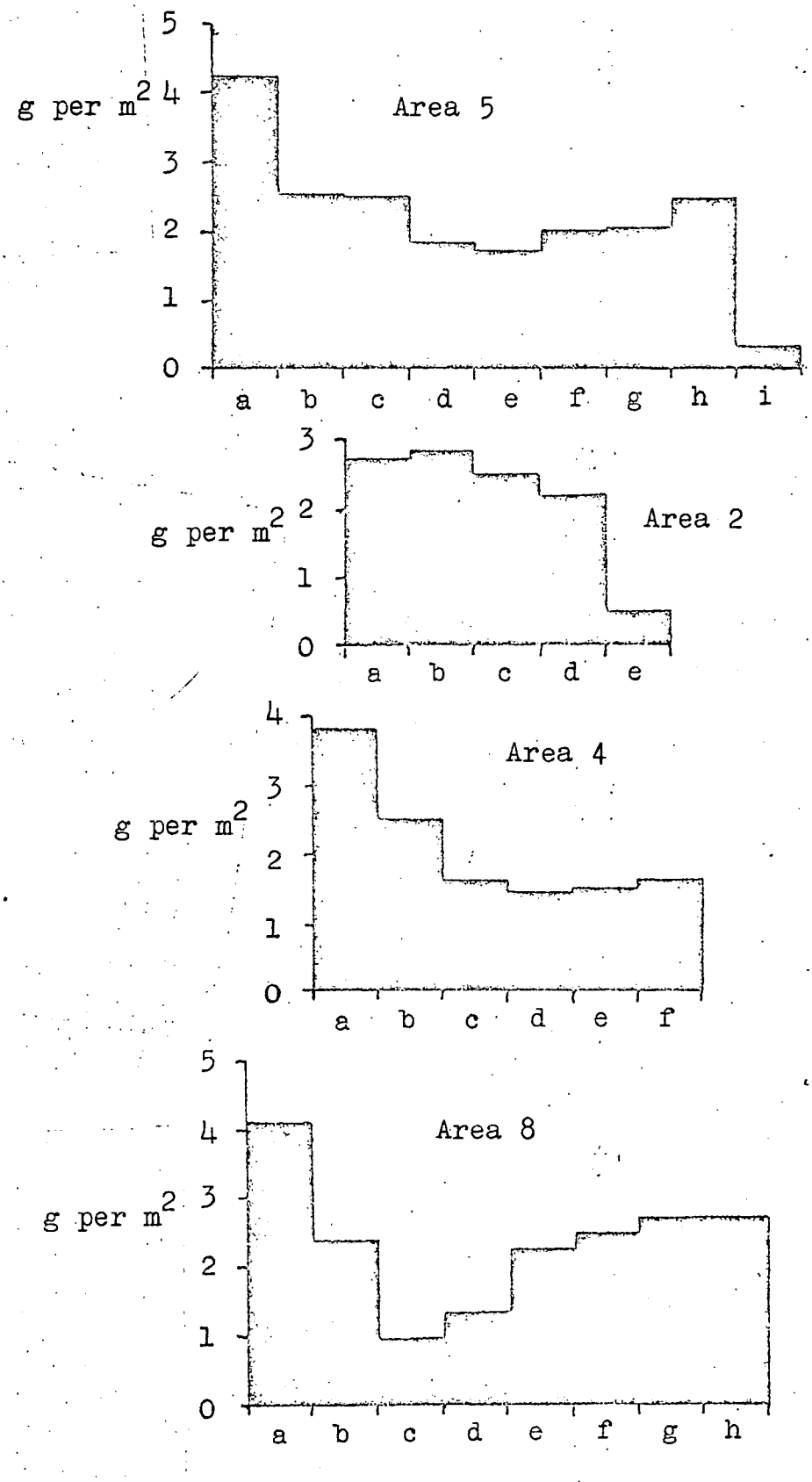


FIGURE 1.3 Sodium levels of the soil at areas 5, 2, 4 and 8

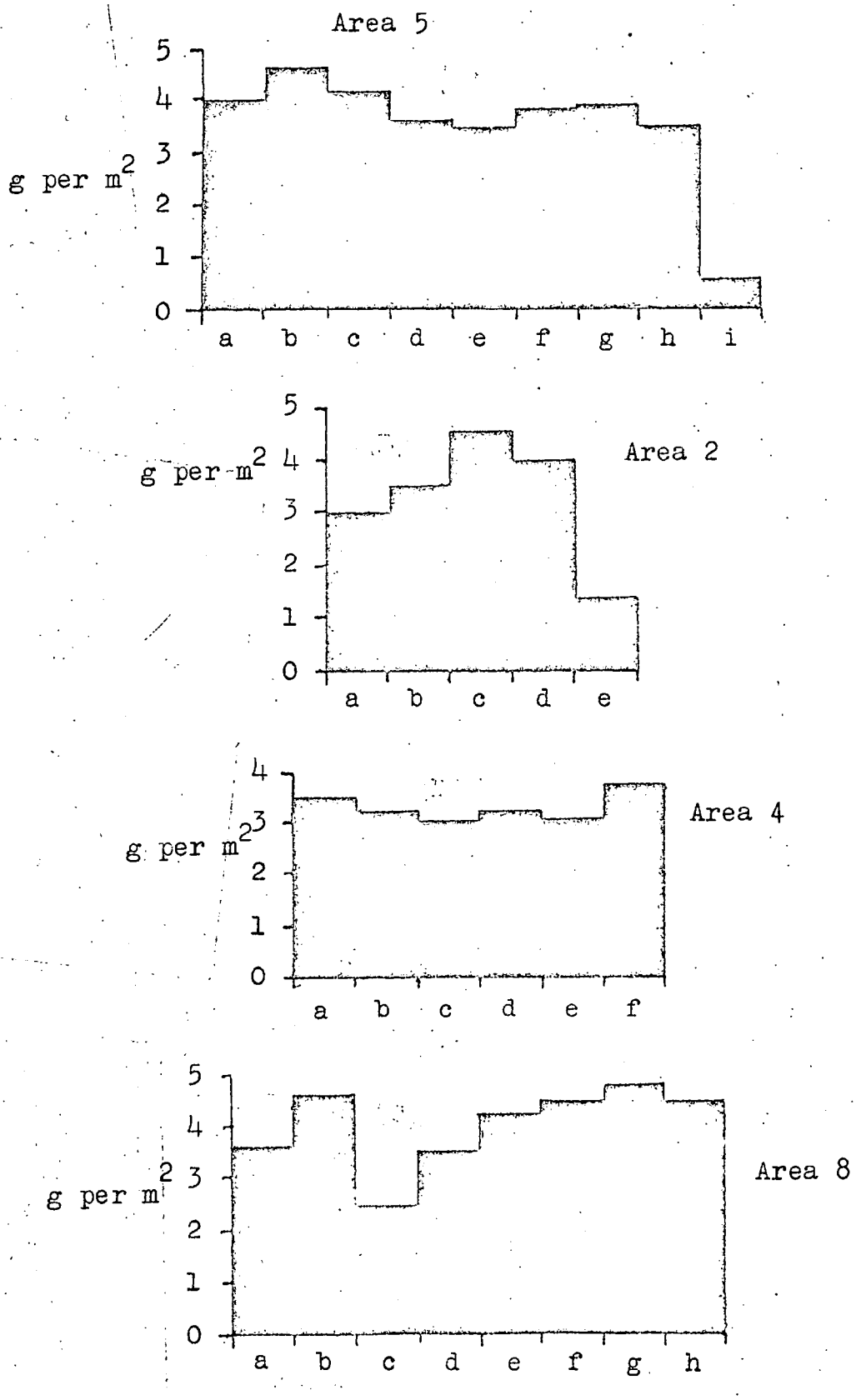


FIGURE 1.4 — Magnesium levels of the soil at areas 5, 2, 4 and 8

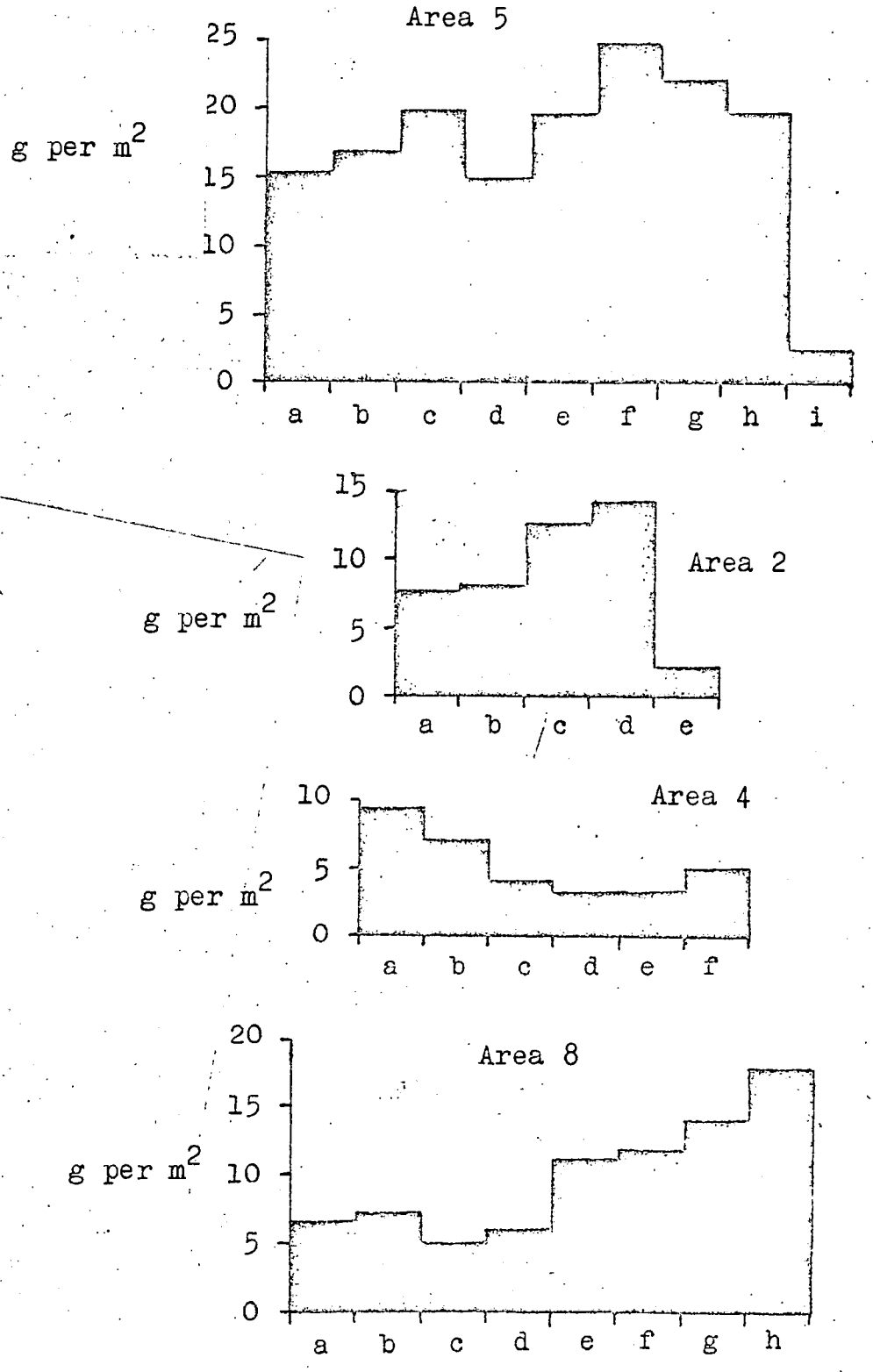


FIGURE 1.5 Calcium levels of the soil at areas 5, 2, 4 and 8

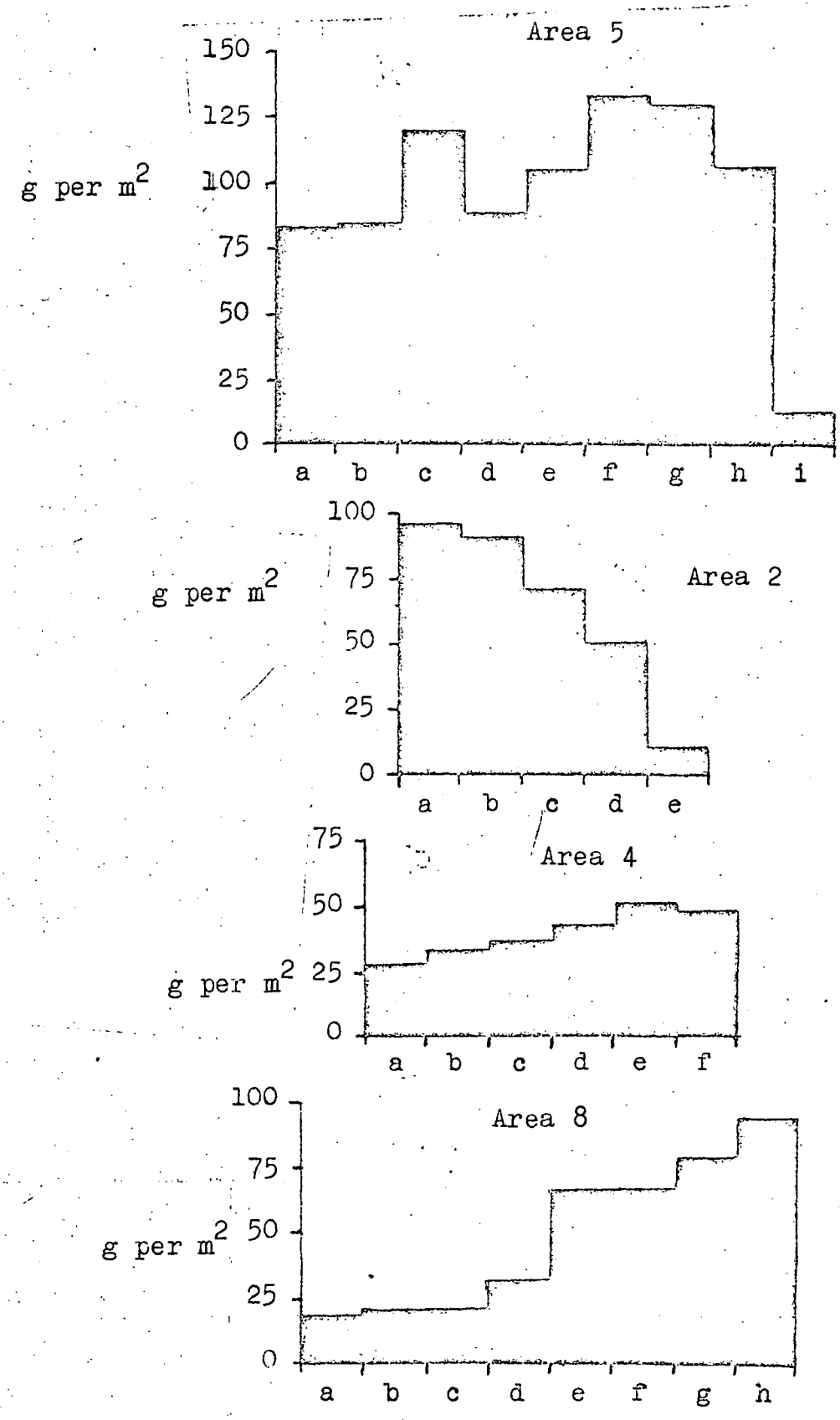


FIGURE 1.6 Phosphorus levels of the soil at areas 5, 2, 4 and 8 (log. scale)

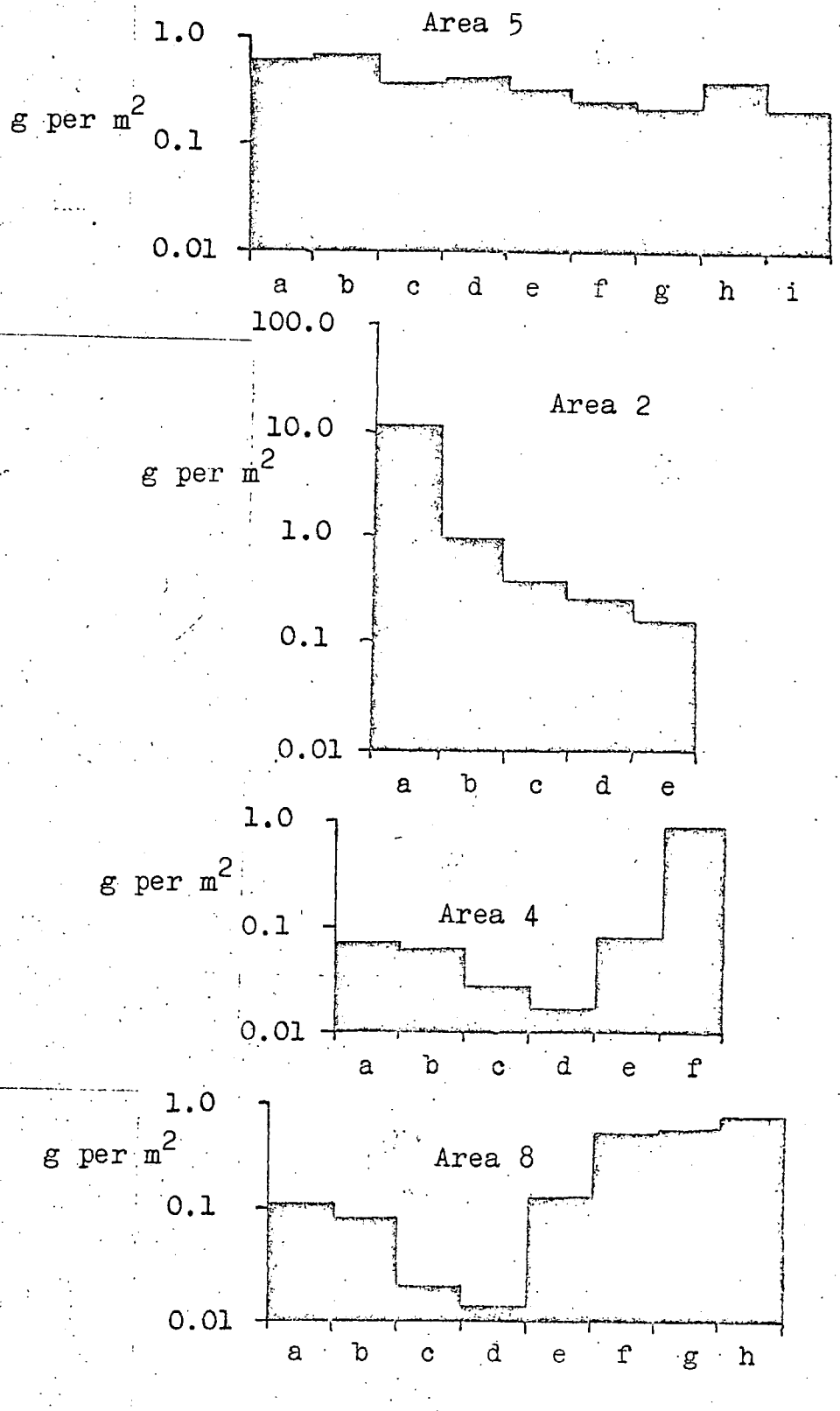


FIGURE 1.7 Nitrate nitrogen levels in the soil at areas 5, 2, 4 and 8

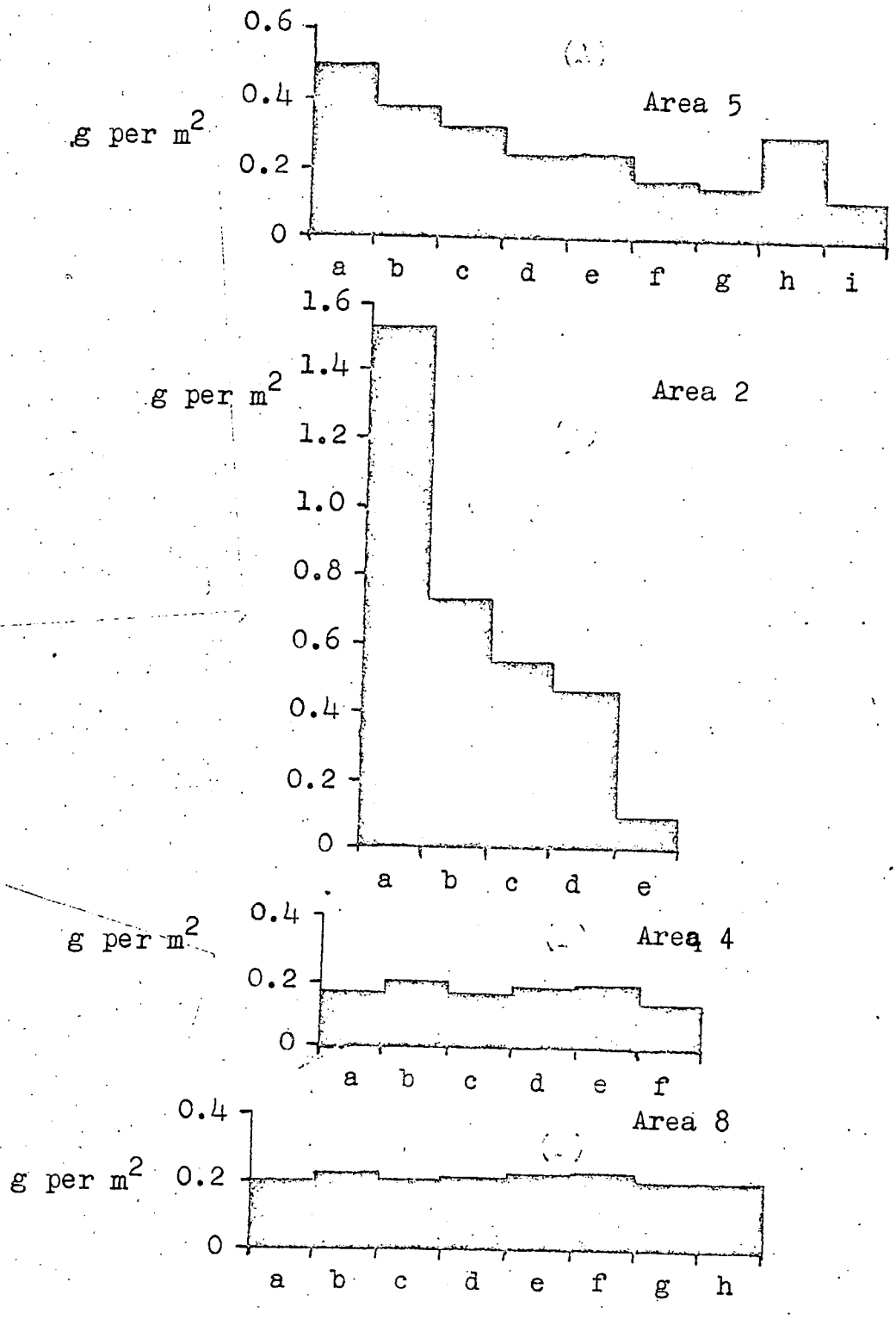


FIGURE 1.8 Percentage Water Content of soil samples from the six study areas.

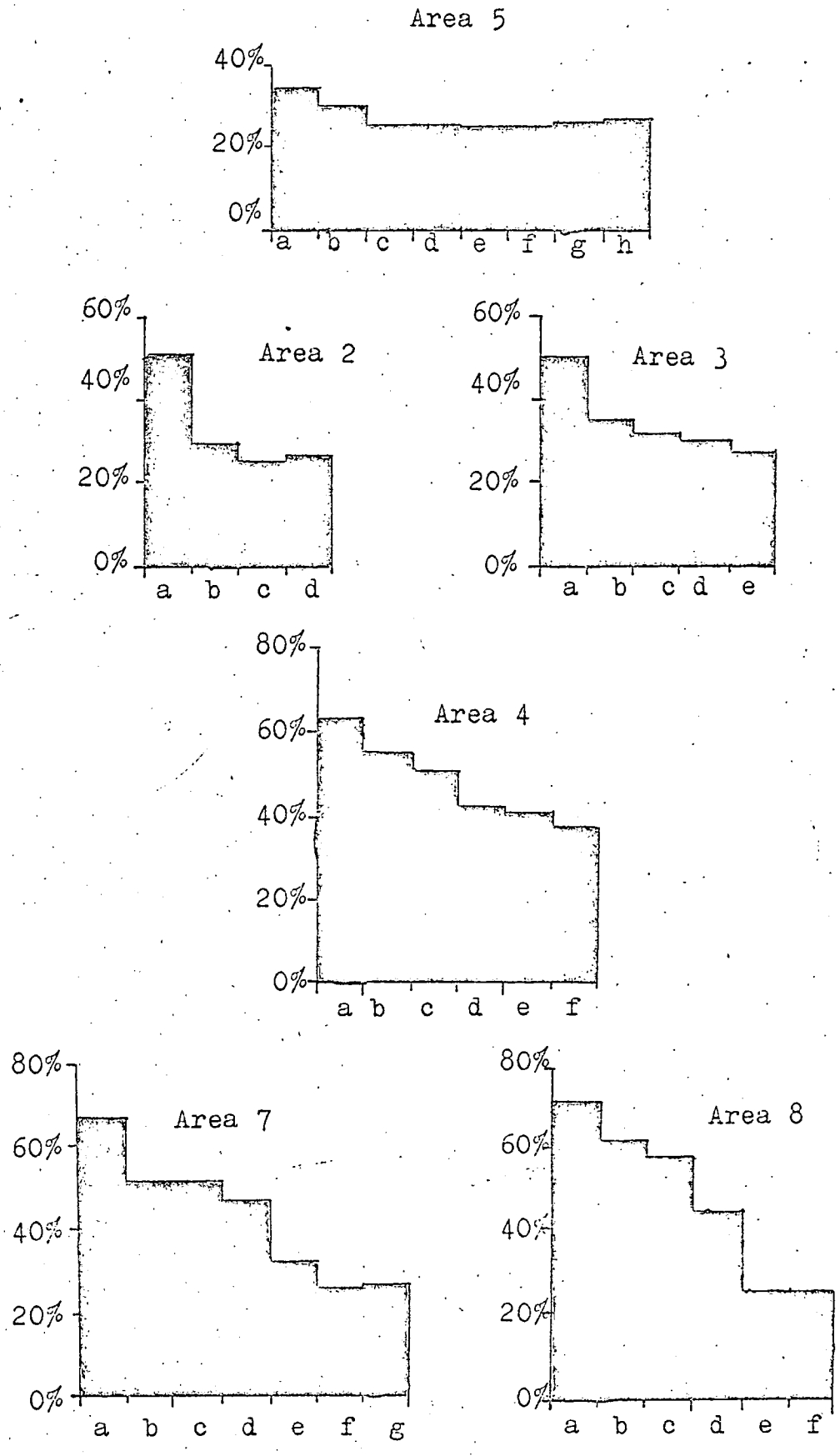


FIGURE 1.9 Percentage Organic Matter in soil samples from the six study areas.

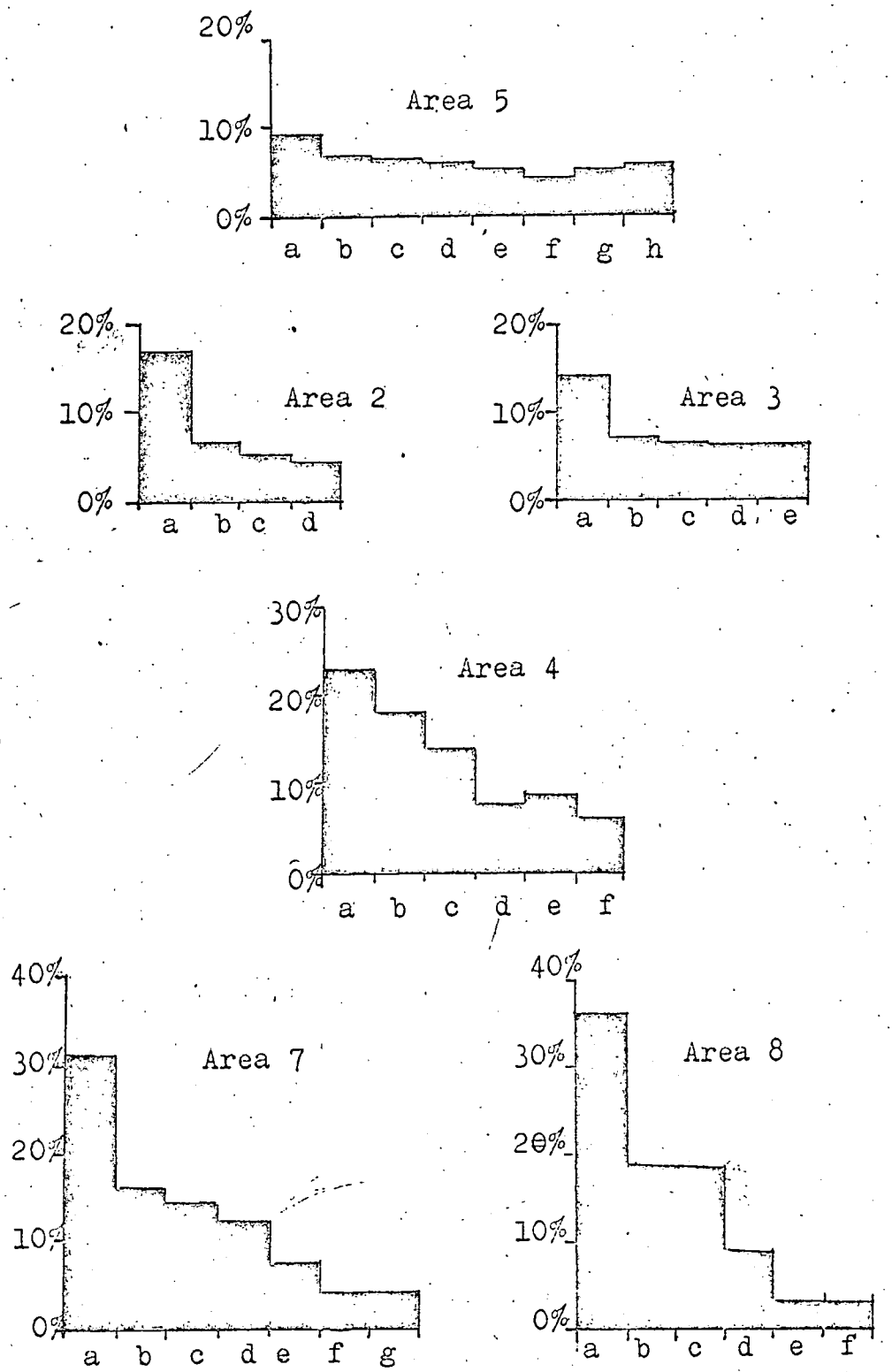


FIGURE 2.1 Dry weight (g per $m^2$) of each component group of plants at each sample date. (see Table 2)

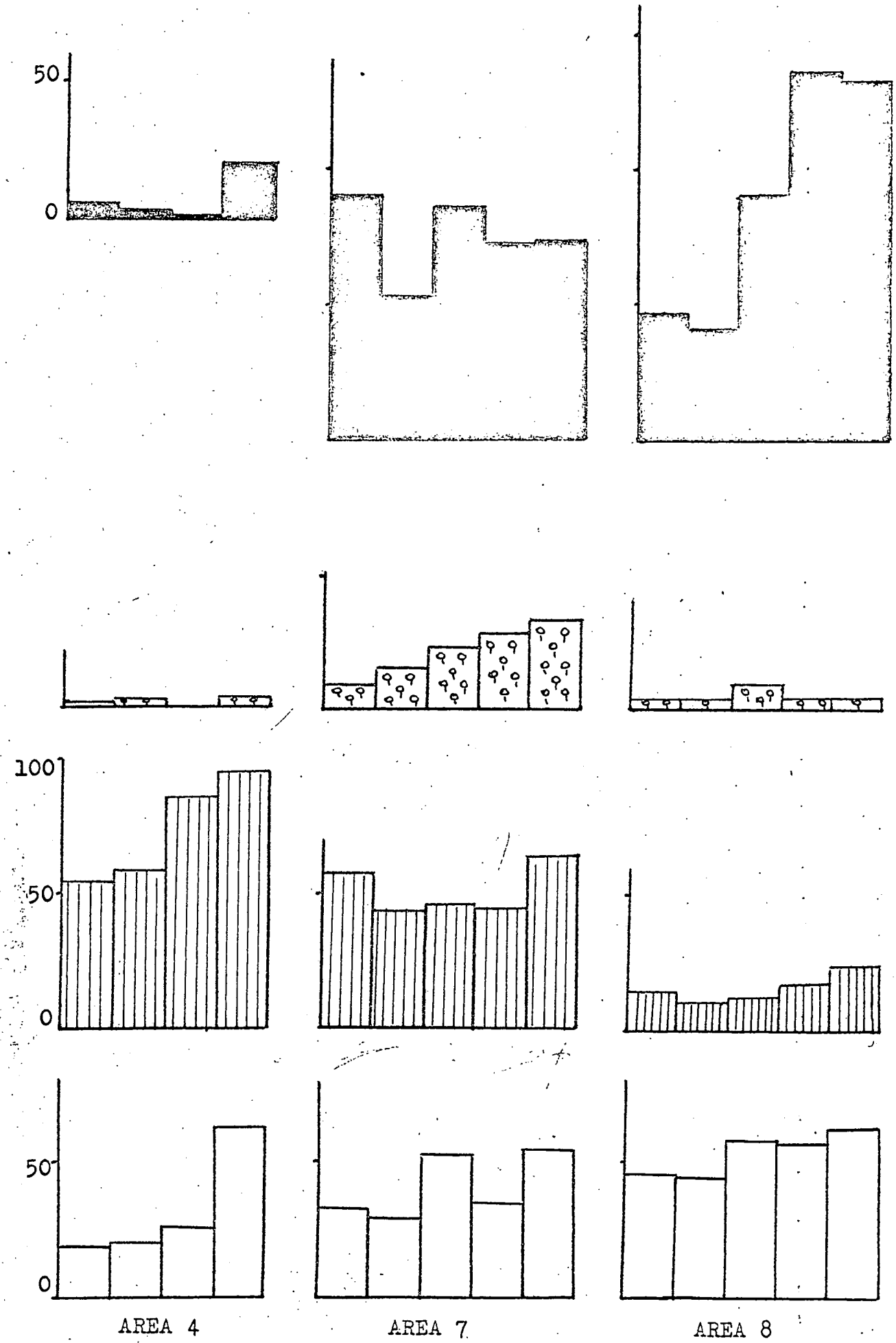


FIGURE 2.1 contd.

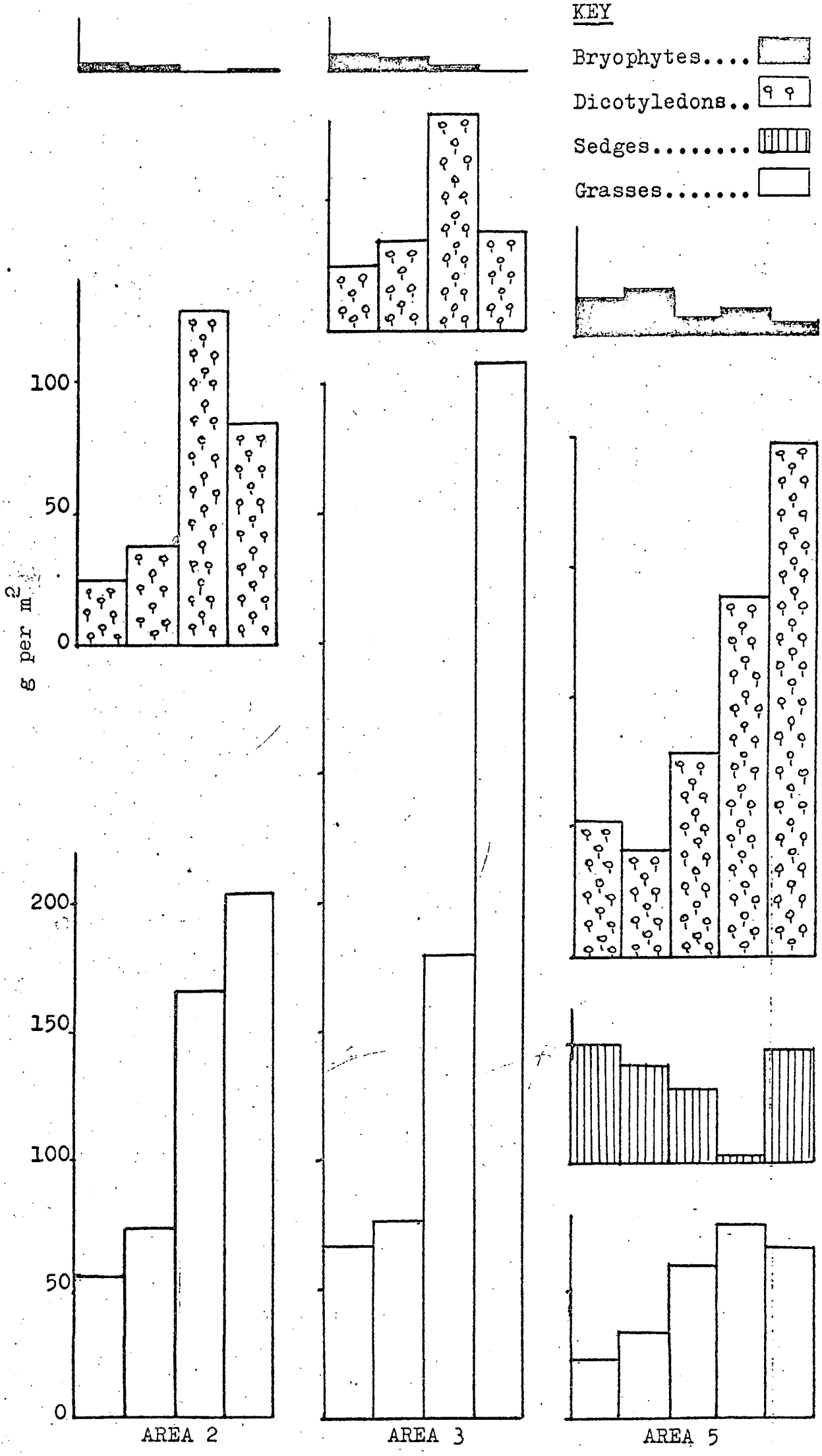


FIGURE 2.2 Total dry weight (g per $m^2$) of living and dead plant material at each sample date. (see Table 2)

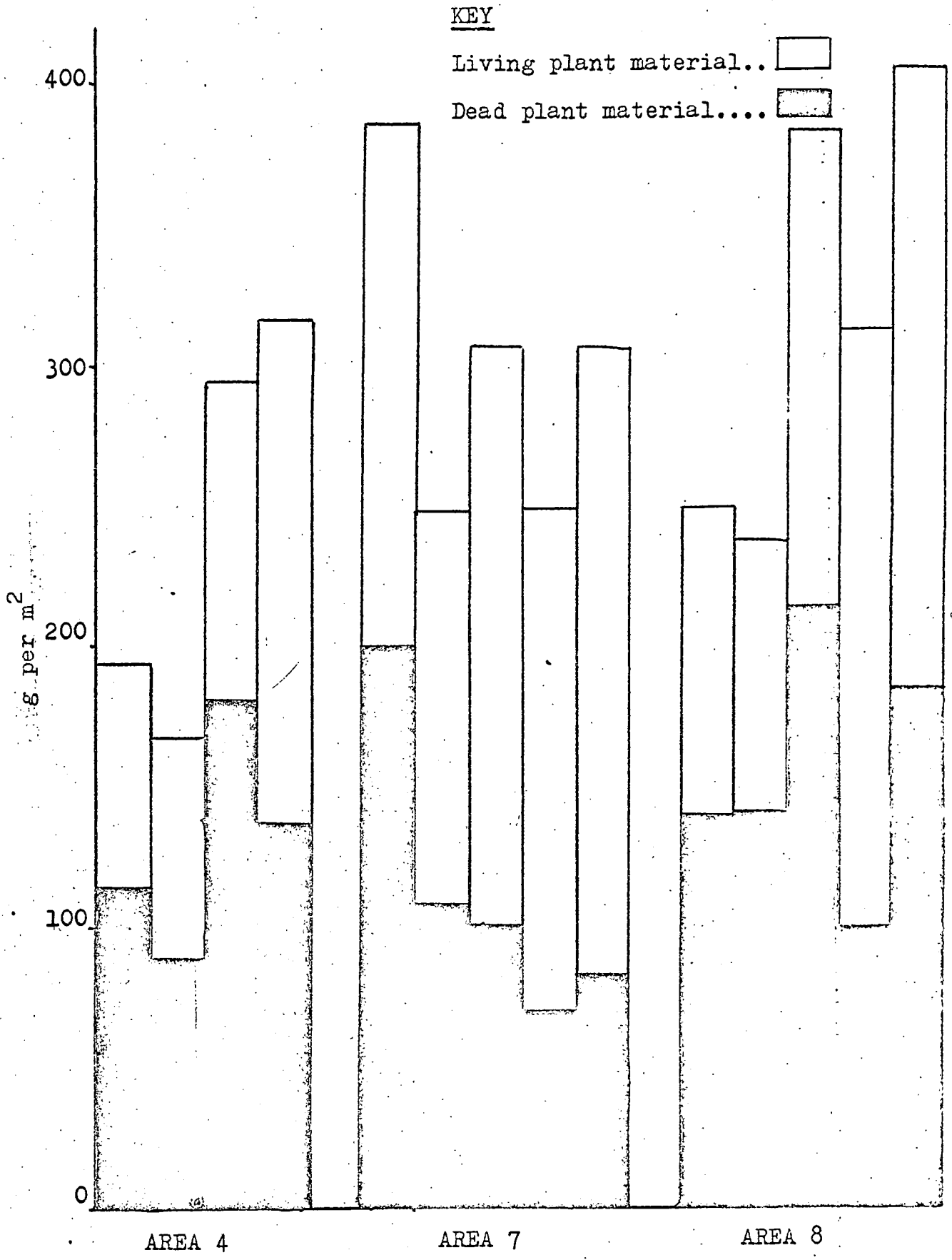
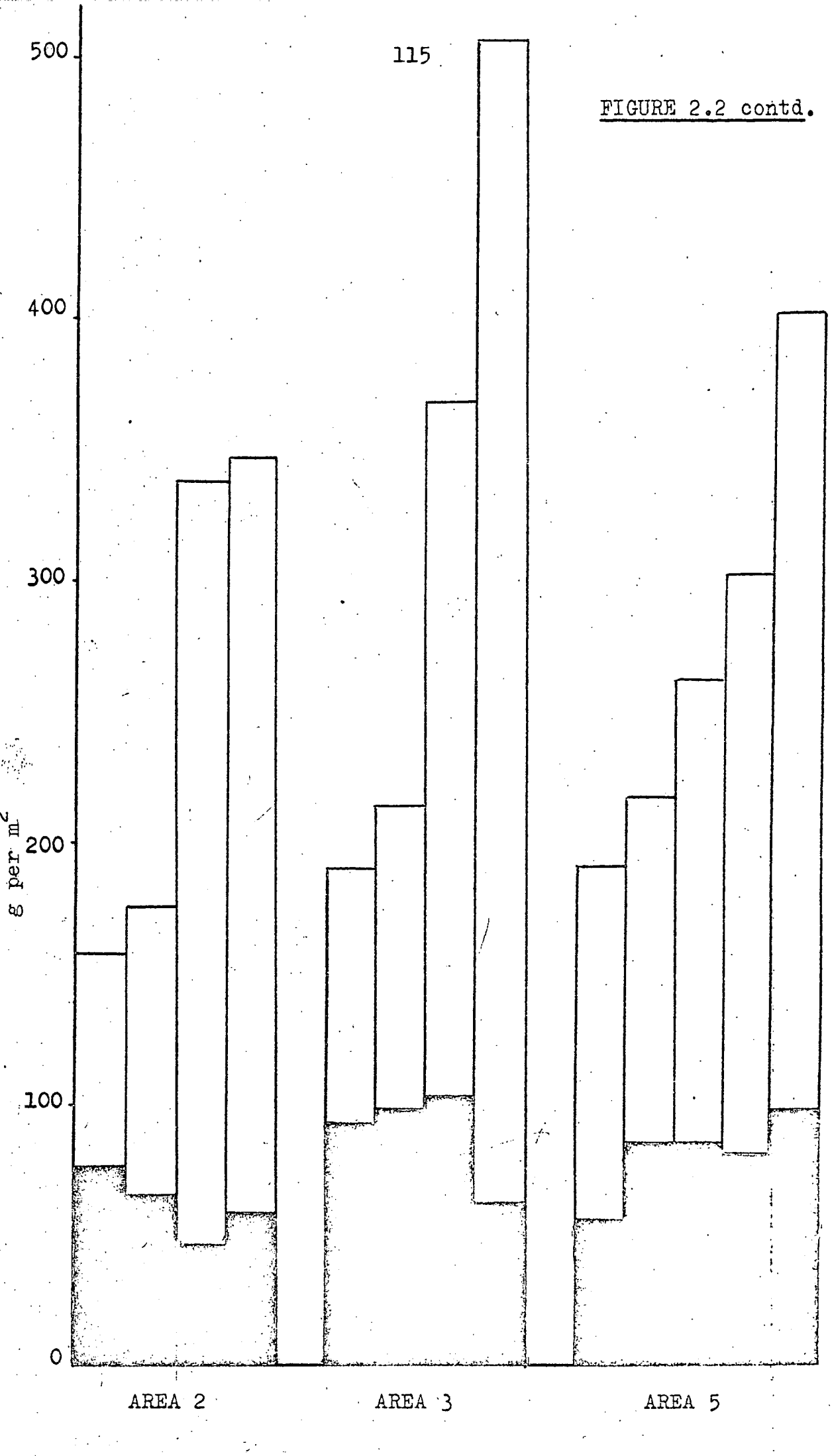


FIGURE 2.2 contd.



APPENDIX 3 Table 3.1

Number of Individuals of each Species per Square Metre.

| SPECIES | AREA 2 | AREA 3 | AREA 4 | AREA 5 | AREA 7 | AREA8 |
|---|---|---|---|---|---|---|
| Anthoxanthum odoratum | 108 | | | 404 | 317 | 249 |
| Holcus lanatus | 1309 | 338 | | 825 | 779 | 124 |
| Poa trivialis | 2208 | 1736 | | 853 | 174 | |
| Alopecurus pratensis | 706 | 805 | | | | |
| Agrostis tenuis | 965 | | | | | 182 |
| Festuca rubra | 1316 | 6146 | | 2931 | 1082 | 353 |
| Bromus mollis | 504 | 1242 | | | | |
| Helictotrichon pubescens | | 346 | | 70 | | |
| Agrostis canina | | | 32 | [illegible] | [illegible] | [illegible] |
| Molinia caerulea | | | 1814 | | 115 | 210 |
| Poa pratensis | | | | 116 | 38 | |
| Festuca ovina | | | | | 1106 | 806 |
| Briza media | | | | | 55 | 255 |
| Nardus stricta | | | | | 671 | 2732 |
| Cynosurus cristatus | | | | 925 | | |
| Carex pilulifera | | | 53 | | | |
| Carex pulicaris | | | 292 | | 347 | 304 |
| Carex panicea | | | 350 | | 237 | 247 |
| Carex caryophyllea | | | | 115 | | |
| Carex lepidocarpa | | | | | 23 | |
| Eriophorum angustifolium | | | 407 | | 58 | |
| Juncus squarrosus | | | | | 353 | |
| Juncus articulatus | | | | | 41 | |
| Luzula campestris | | | | 59 | 33 | 34 |
| Cerastium holosteodes | 334 | 267 | | 178 | 16 | |
| Ranunculus bulbosus | 88 | 66 | | 332 | 112 | |
| Conopodium majus | 191 | 90 | | | | |
| Rumex acetosa | 136 | 143 | | 57 | | |
| Trifolium repens | 257 | | | 177 | 318 | 61 |
| Rhinanthus minor | 43 | 64 | | 384 | | |

APPENDIX 3 Table 3.1 contd.

| SPECIES | AREA 2 | AREA 3 | AREA 4 | AREA 5 | AREA 7 | AREA 8 |
|---|---|---|---|---|---|---|
| Achillea millefolium | | 34 | | | | |
| Potentilla erecta | | | 34 | 52 | 41 | 73 |
| Cardamine flexuosa | | | | | 43 | |
| Ranunculus flammula | | | | | 26 | |
| Campanula rotundifolia | | | | | 6 | |
| Taraxacum paludosum | | | | 29 | 31 | |
| Prunella vulgaris | | | | | 69 | |
| Leontodon autumnalis | | | | 19 | 23 | |
| Succisa pratensis | | | | 7 | | |
| Anemone nemorosa | | | | 39 | | |
| Plantago lanceolata | | | | 721 | | |
| Centaurea nigra | | | | 110 | | |
| Leontodon hispidus | | | | 21 | | |
| Trollius europaeus | | | | 57 | | |
| Euphrasia sp. | | | | 161 | | |
| Galium saxatile | | | | | | 293 |
| Viola palustris | | | | | | 39 |
| other species | 382 | 741 | 569 | 1661 | 204 | 583 |

The "performance" of 5 selected species

Appendix 4

| Species | Area | Day No. | Average dry weight of dead leaves perplant mg. | Average dry weight of live parts/ plant mg. | Increase in dry weight of dead leaves between sampling times mg. | Increase in dry weight of live parts between sampling times mg. |
|---|---|---|---|---|---|---|
| HOLCUS LANATUS | Inside pen 2 | 1 | 21.1 | 7.4 | | |
| | | 5 | 14.3 | 7.8 | -6.8 | +0.4 |
| | | 28 | 14.8 | 15.9 | +0.5 | +8.1 |
| | | 72 | 11.7 | 130.1 | +13.1 | +114.1 |
| | | 82 | 13.5 | 139.7 | +1.8 | +9.6 |
| | | 97 | 20.1 | 158.9 | +6.6 | +19.2 |
| | Outside pen 2 | 1 | 13.7 | 4.9 | | |
| | | 7 | 9.5 | 5.2 | -4.2 | +0.3 |
| | | 15 | 10.2 | 8.6 | +0.7 | +3.4 |
| | | 20 | 10.2 | 10.0 | 0.0 | +1.4 |
| | | 28 | 12.5 | 12.7 | +2.3 | +2.7 |
| | | 36 | 5.0 | 14.0 | -7.5 | +1.3 |
| | | 55 | 8.7 | 59.7 | +3.7 | +45.7 |
| | | 72 | 6.5 | 62.4 | -2.2 | +1.7 |
| | 3 | 1 | 10.8 | 3.3 | | |
| | | 7 | 10.9 | 5.0 | +0.1 | +1.7 |
| | | 15 | 12.7 | 6.4 | +1.8 | +1.4 |
| | | 20 | 13.0 | 7.4 | +0.3 | +1.0 |
| | | 28 | 4.4 | 10.9 | -8.6 | +3.5 |
| | | 36 | 5.6 | 10.2 | +1.2 | -0.7 |
| | | 55 | 4.0 | 45.2 | -1.2 | +35.0 |
| | | 72 | 5.8 | 38.6 | +1.8 | -6.6 |
| | Inside pen 5 | 1 | 26.3 | 9.3 | | |
| | | 15 | 23.7 | 10.7 | -2.6 | +1.4 |
| | | 28 | 7.9 | 16.6 | -15.8 | +5.9 |
| | | 72 | 9.7 | 76.0 | +1.8 | +59.4 |
| | | 82 | 15.6 | 118.0 | +5.9 | +42.0 |
| | | 97 | 13.1 | 101.1 | -2.5 | -16.9 |
| | Outside pen 5 | 1 | 22.0 | 4.3 | | |
| | | 7 | 6.6 | 7.7 | -15.4 | +3.4 |
| | | 15 | 12.0 | 8.4 | +5.4 | +0.7 |
| | | 20 | 15.4 | 12.0 | +3.4 | +4.6 |
| | | 28 | 10.4 | 16.3 | -5.0 | +4.3 |
| | | 36 | 14.4 | 19.2 | +4.0 | +2.9 |
| | | 55 | 16.2 | 37.3 | +1.8 | +18.1 |
| | | 72 | 9.1 | 54.4 | -7.1 | +17.1 |
| | | 82 | 8.5 | 44.8 | -0.6 | -19.6 |
| | | 91 | 16.2 | 138.2 | +7.7 | +93.4 |
| | | 97 | 10.7 | 65.4 | -6.5 | -72.8 |

| | | | | | |
|---|---|---|---|---|---|
| Inside pen 6 | 1 | 38.8 | 10.5 | | |
| | 15 | 19.9 | 15.2 | -18.9 | +4.7 |
| | 36 | 16.0 | 30.0 | -3.9 | +14.8 |
| | 72 | 11.0 | 102.9 | -5.0 | +72.9 |
| | 82 | 11.1 | 121.3 | +0.1 | +18.4 |
| | 97 | 31.8 | 234.9 | +20.7 | +113.6 |
| Outside pen 6 | 1 | 25.6 | 4.9 | | |
| | 7 | 9.2 | 8.2 | -14.4 | +3.3 |
| | 15 | 7.4 | 8.7 | -1.8 | +0.5 |
| | 20 | 13.1 | 13.0 | +5.7 | +4.3 |
| | 28 | 12.0 | 17.0 | -1.1 | +4.0 |
| | 36 | 10.3 | 19.8 | -1.7 | +2.8 |
| | 55 | 9.5 | 52.3 | -0.8 | +32.5 |
| | 72 | 6.5 | 77.1 | -3.0 | +24.8 |
| | 82 | 11.6 | 88.7 | +5.1 | +11.6 |
| | 91 | 14.8 | 109.2 | +3.2 | +20.5 |
| | 97 | 13.0 | 111.0 | -1.8 | +1.8 |
| Inside pen 7 | 1 | 11.2 | 5.6 | | |
| | 5 | 8.3 | 7.2 | +7.1 | +1.6 |
| | 36 | 11.6 | 10.0 | +3.3 | +2.8 |
| | 72 | 10.6 | 77.6 | -1.0 | +67.6 |
| | 82 | 13.7 | 101.1 | +3.1 | +23.5 |
| | 97 | 16.8 | 88.1 | +3.1 | -13.0 |
| Outside pen 7 | 1 | 18.2 | 6.6 | | |
| | 9 | 10.5 | 4.4 | -7.7 | -2.2 |
| | 15 | 7.2 | 8.0 | -3.3 | +3.6 |
| | 20 | 8.7 | 6.9 | +1.5 | -1.1 |
| | 34 | 5.9 | 6.5 | -2.8 | -0.4 |
| | 55 | 9.3 | 22.1 | +3.4 | +15.6 |
| | 72 | 8.5 | 60.3 | -0.8 | +48.2 |
| | 82 | 11.4 | 81.5 | +2.9 | +21.2 |
| | 91 | 9.2 | 51.8 | -2.2 | -29.7 |
| | 97 | 10.6 | 74.8 | +1.4 | +23.0 |
| Inside pen 8 | 1 | 7.8 | 7.2 | | |
| | 15 | 12.3 | 8.2 | +4.5 | +1.0 |
| | 36 | 23.5 | 27.8 | +11.2 | +19.6 |
| | 82 | 16.8 | 72.4 | -6.7 | +44.6 |
| | 97 | 21.8 | 37.9 | +5.0 | -34.5 |
| Outside pen 8 | 1 | 14.5 | 3.5 | | |
| | 20 | 11.9 | 11.7 | -3.4 | +8.2 |
| | 36 | 7.7 | 11.1 | -4.2 | -0.6 |
| | 55 | 8.8 | 23.5 | +1.1 | +13.4 |
| | 72 | 7.9 | 26.4 | -0.9 | +2.9 |
| | 91 | 12.1 | 70.3 | +4.2 | +43.9 |
| | 97 | 19.2 | 44.4 | +7.1 | -25.9 |

| | | | | | | |
|---|---|---|---|---|---|---|
| FESTUCA RUBRA | Inside pen | 1 | 3.8 | 6.8 | | |
| | | 15 | 5.7 | 7.1 | +1.9 | +1.7 |
| | | 28 | 4.3 | 8.0 | -1.4 | +0.9 |
| | | 72 | 4.6 | 21.4 | +0.3 | +13.4 |
| | | 82 | 3.4 | 20.3 | -1.2 | -1.1 |
| | | 97 | 6.9 | 25.1 | +3.5 | +4.8 |
| | Outside pen 2 | 1 | 3.9 | 4.1 | | |
| | | 7 | 4.7 | 4.7 | +0.8 | +0.6 |
| | | 15 | 6.4 | 5.9 | +1.7 | +1.2 |
| | | 20 | 4.5 | 4.8 | -0.9 | -1.1 |
| | | 28 | 4.8 | 9.0 | +0.3 | +4.2 |
| | | 36 | 5.9 | 12.5 | +1.1 | +3.5 |
| | | 55 | 2.4 | 10.0 | -3.5 | -2.5 |
| | | 72 | 5.1 | 17.9 | +2.7 | +7.9 |
| FESTUCA RUBRA AREA 3 | | 1 | 3.3 | 3.2 | | |
| | | 7 | 4.2 | 4.4 | +1.2 | +0.1 |
| | | 15 | 3.4 | 3.7 | -0.7 | -0.1 |
| | | 20 | 6.5 | 7.6 | +3.9 | +0.6 |
| | | 28 | 1.2 | 3.2 | -4.4 | -0.7 |
| | | 36 | 3.2 | 5.2 | +2.0 | +0.2 |
| | | 55 | 5.9 | 10.9 | +5.7 | +0.1 |
| | | 72 | 3.3 | 7.7 | -3.2 | -0.2 |
| | Inside pen 5 | 1 | 4.2 | 6.0 | | |
| | | 15 | 7.2 | 8.3 | +3.0 | +2.3 |
| | | 28 | 2.4 | 7.0 | -4.8 | -1.3 |
| | | 72 | 6.5 | 15.0 | +4.1 | +8.0 |
| | | 82 | 4.6 | 14.5 | -1.9 | -0.5 |
| | | 97 | 4.9 | 20.5 | +0.3 | +6.0 |
| | Outside pen 5 | 1 | 6.3 | 5.5 | | |
| | | 7 | 5.9 | 6.2 | -0.4 | +0.7 |
| | | 15 | 4.5 | 8.1 | -1.4 | +1.9 |
| | | 20 | 5.9 | 11.0 | +1.4 | +2.9 |
| | | 28 | 4.7 | 8.8 | -1.2 | -2.2 |
| | | 36 | 5.0 | 7.5 | +0.3 | -1.3 |
| | | 55 | 6.7 | 9.8 | +1.7 | +2.3 |
| | | 72 | 9.2 | 10.6 | +2.5 | +0.8 |
| | | 82 | 3.8 | 13.2 | -5.4 | +2.6 |
| | | 91 | 11.8 | 28.8 | +8.0 | +15.6 |
| | | 97 | 4.7 | 14.2 | -7.1 | -14.6 |
| | Outside pen 6 | 1 | 7.7 | 9.3 | | |
| | | 15 | 10.9 | 12.1 | +3.2 | +2.8 |
| | | 36 | 6.2 | 18.8 | -4.7 | +6.7 |
| | | 72 | 6.8 | 16.8 | +0.6 | -2.0 |
| | | 82 | 4.2 | 24.6 | -2.6 | +7.8 |
| | | 97 | 5.3 | 22.4 | +1.1 | -2.2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Outside pen 6 | 910 | 9.0 | 7.7 | | |
| | | 7 | 6.2 | 7.5 | -2.8 | -0.2 |
| | | 15 | 6.4 | 7.6 | +0.4 | +0.1 |
| | | 20 | 4.7 | 7.1 | -1.7 | -0.5 |
| | | 28 | 5.2 | 12.9 | +0.5 | +5.8 |
| | | 36 | 12.5 | 18.4 | +7.3 | +5.5 |
| | | 55 | 3.1 | 9.3 | -9.4 | -9.1 |
| | | 72 | 10.6 | 24.3 | +7.5 | +15.0 |
| | | 82 | 3.1 | 17.4 | -7.5 | -6.9 |
| | | 91 | 8.2 | 28.1 | +5.1 | +10.7 |
| | | 97 | 4.6 | 18.0 | -3.6 | -10.o |
| | Inside pen 7 | 1 | 6.5 | 8.1 | | |
| | | 15 | 8.6 | 9.7 | +2.1 | +1.6 |
| | | 36 | 15.4 | 14.3 | +6.8 | +4.6 |
| | | 72 | 9.7 | 24.6 | -5.7 | +10.3 |
| | | 82 | 6.8 | 24.4 | -2.9 | -0.2 |
| | | 97 | 7.5 | 32.4 | +0.7 | +8.0 |
| | Outside pen 7 | 1 | 6.8 | 5.0 | | |
| | | 9 | 5.8 | 4.3 | -1.0 | -0.7 |
| | | 15 | 5.9 | 9.8 | +0.1 | +5.5 |
| | | 20 | 5.7 | 7.1 | -0.2 | -2.7 |
| | | 34 | 4.6 | 6.9 | -1.1 | -0.2 |
| | | 55 | 9.4 | 18.1 | +4.8 | +11.2 |
| | | 72 | 3.3 | 12.9 | -6.1 | -5.2 |
| | | 82 | 5.2 | 15.6 | +1.9 | +2.7 |
| | | 91 | 3.2 | 27.2 | -2.0 | +11.6 |
| | | 97 | 8.4 | 24.2 | +5.2 | -3.0 |
| | Outside pen 8 | 9 | 6.2 | 6.7 | | |
| | | 36 | 22.7 | 19.2 | +16.5 | +12.5 |
| | | 82 | 9.0 | 23.3 | -13.7 | +4.1 |
| ANTHOXANTHUM ODORATUM | Outside pen 2 | 1 | 15.7 | 7.7 | | |
| | | 7 | 18.7 | 3.8 | +3.0 | -3.7 |
| | | 20 | 19.7 | 15.4 | +1.0 | +11.6 |
| | | 28 | 13.0 | 12.6 | -6.7 | -2.8 |
| | | 36 | 3.9 | 18.9 | -9.1 | +5.3 |
| | | 55 | 1.6 | 20.9 | -2.3 | +2.0 |
| | | 72 | 2.2 | 51.9 | +0.6 | +31.0 |
| | 3 | 7 | 25.2 | 9.3 | | |
| | | 20 | 9.2 | 12.7 | +3.4 | -2.0 |
| | | 36 | 2.1 | 12.2 | -0.5 | -0.5 |
| | Inside pen 5 | 1 | 11.8 | 9.1 | | |
| | | 15 | 16.4 | 12.0 | +4.6 | +2.9 |
| | | 28 | 7.5 | 18.6 | -8.9 | +6.6 |
| | | 72 | 3.2 | 68.1 | -4.3 | +49.5 |
| | | 82 | 4.3 | 40.1 | +1.1 | -28.0 |
| | | 97 | 7.5 | 71.0 | +3.2 | +30.9 |

| | | | | | |
|---|---|---|---|---|---|
| Outside pen 5 | 1 | 16.5 | 9.9 | | |
| | 7 | 14.5 | 7.3 | -2.0 | -2.7 |
| | 15 | 10.8 | 10.1 | -3.7 | +2.8 |
| | 28 | 9.5 | 15.7 | -1.3 | +5.6 |
| | 36 | 8.1 | 19.1 | -1.4 | +3.4 |
| | 55 | 5.4 | 41.8 | -2.7 | +22.7 |
| | 72 | 7.1 | 45.4 | +1.7 | +3.6 |
| | 82 | 7.6 | 48.4 | +0.5 | +3.0 |
| | 91 | 10.4 | 94.9 | +2.8 | +46.5 |
| | 97 | 7.1 | 54.8 | -3.5 | -40.1 |
| Inside pen 6 | 1 | 16.5 | 4.1 | | |
| | 15 | 14.1 | 14.3 | -2.4 | +10.2 |
| | 36 | 7.1 | 24.6 | -7.0 | +10.3 |
| | 72 | 4.7 | 55.7 | -2.4 | +31.1 |
| | 82 | 4.5 | 78.8 | -0.2 | +23.1 |
| | 97 | 11.6 | 122.4 | +7.1 | +43.6 |
| Outside pen 6 | 7 | 14.2 | 11.0 | | |
| | 15 | 12.4 | 12.6 | -1.8 | -1.6 |
| | 20 | 10.9 | 14.2 | -1.5 | +1.6 |
| | 28 | 11.2 | 20.5 | +0.3 | +6.3 |
| | 36 | 12.8 | 28.5 | +1.6 | +8.0 |
| | 55 | 9.7 | 34.7 | -3.1 | +6.2 |
| | 72 | 3.3 | 57.0 | -6.4 | +22.3 |
| | 82 | 4.0 | 80.9 | +0.7 | +23.9 |
| | 91 | 12.2 | 108.7 | +8.2 | +27.8 |
| | 97 | 7.1 | 80.4 | -5.1 | -28.3 |
| Inside pen 7 | 1 | 7.3 | 8.5 | | |
| | 15 | 8.0 | 8.8 | +0.7 | +0.3 |
| | 36 | 9.3 | 19.6 | +1.3 | +10.8 |
| | 82 | 6.8 | 46.2 | -2.5 | +26.6 |
| | 97 | 12.6 | 40.5 | +5.8 | -5.7 |
| Outside pen 7 | 1 | 10.0 | 4.0 | | |
| | 9 | 7.3 | 5.1 | -2.7 | +1.1 |
| | 15 | 6.2 | 12.0 | -1.1 | +6.9 |
| | 20 | 6.9 | 10.5 | +0.7 | -1.5 |
| | 34 | 4.4 | 7.8 | -2.5 | -2.7 |
| | 55 | 5.5 | 41.1 | +1.1 | +33.3 |
| | 82 | 9.2 | 79.5 | +3.7 | +38.4 |
| | 91 | 7.9 | 39.3 | -1.3 | -40.2 |
| | 97 | 9.4 | 56.9 | +1.5 | +17.6 |
| Inside pen 8 | 1 | 11.4 | 7.0 | | |
| | 15 | 13.7 | 9.9 | +2.3 | +2.9 |
| | 36 | 6.0 | 15.9 | -7.7 | +6.0 |
| | 72 | 7.1 | 53.7 | +1.1 | +37.8 |
| | 82 | 6.5 | 61.7 | -0.6 | +8.0 |
| | 97 | 5.4 | 55.4 | -1.1 | -6.3 |

| | | | | | |
|---|---|---|---|---|---|
| Outside pen 8 | 1 | 15.4 | 11.5 | | |
| | 9 | 12.7 | 7.3 | -2.7 | -3.2 |
| | 15 | 4.5 | 10.7 | -8.2 | +3.4 |
| | 20 | 15.1 | 12.3 | +10.6 | +1.6 |
| | 36 | 15.1 | 15.7 | - | +3.4 |
| | 55 | 15.7 | 63.6 | +0.6 | +47.9 |
| | 72 | 18.3 | 60.7 | +2.6 | -2.9 |
| | 82 | 6.7 | 55.5 | +11.6 | -5.2 |
| | 91 | 10.4 | 48.5 | +3.7 | -7.0 |
| | 97 | 7.7 | 62.2 | -2.7 | +13.7 |
| ANTHOXANTHUM ODORATUM | | | | | |
| Inside pen 2 | 1 | 20.0 | 9.7 | -5.0 | +17.7 |
| | 15 | 15.0 | 27.4 | -0.7 | + 4.4 |
| | 28 | 14.3 | 31.8 | -5.9 | +29.4 |
| | 72 | 8.4 | 61.2 | -1.5 | +40.7 |
| | 97 | 6.9 | 101.9 | | |

| SPECIES | AREA | Day No. | Dryweight per plant mgm | Increase in dry weight/ plant | Rate of increase mgm/day | Increase between day 1 and 72 | Rate of increase between day 1 and 72 mgm per day |
|---|---|---|---|---|---|---|---|
| RHINANTHUS MINOR | 2 out | 1 | 0.6 | | | | |
| | | 7 | 1.9 | +1.3 | +0.2 | | |
| | | 15 | 4.0 | +2.1 | +0.3 | | |
| | | 20 | 8.0 | +4.0 | +0.8 | | |
| | | 28 | 8.0 | | | | |
| | | 36 | 33.7 | +25.7 | +3.2 | | |
| | | 55 | 88.8 | +55.1 | +2.9 | | |
| | | 72 | 214.9 | +126.1 | +7.4 | 214.3 | 3.0 |
| | 3 | 1 | 0.4 | | | | |
| | | 7 | 1.3 | +0.9 | +0.1 | | |
| | | 15 | 3.4 | +2.1 | +0.3 | | |
| | | 20 | 5.9 | +2.5 | +0.5 | | |
| | | 28 | 7.2 | +1.3 | +0.2 | | |
| | | 36 | 19.2 | +12.0 | +1.5 | | |
| | | 55 | 120.6 | +101.4 | +5.3 | | |
| | | 72 | 147.1 | +26.5 | +1.5 | 146.7 | 2.0 |
| | Inside pen 5 | 1 | 0.4 | | | | |
| | | 15 | 1.3 | +0.9 | +0.1 | | |
| | | 28 | 2.9 | +1.6 | +0.1 | | |
| | | 72 | 71.5 | +68.6 | +1.6 | | |
| | | 82 | 106.3 | +34.8 | +3.5 | 105.9 | 1.5 |
| | Outside pen 5 | 1 | 0.5 | | | | |
| | | 7 | 1.1 | +0.6 | +0.1 | | |
| | | 15 | 1.9 | +0.8 | +0.1 | | |
| | | 20 | 1.5 | -0.4 | -0.1 | | |
| | | 28 | 2.5 | +1.0 | +0.1 | | |
| | | 36 | 6.7 | +4.2 | +0.5 | | |
| | | 55 | 36.4 | +29.7 | +1.6 | | |
| | | 72 | 59.1 | +22.7 | +1.3 | | |
| | | 82 | 78.1 | +19.0 | +1.9 | | |
| | | 91 | 137.7 | +59.6 | +6.6 | | |
| | | 97 | 133.5 | -4.2 | -0.7 | 58.6 | 0.8 |
| | Outside pen 6 | 1 | 0.5 | | | | |
| | | 7 | 1.3 | +0.8 | +0.1 | | |
| | | 15 | 2.2 | +0.9 | +0.1 | | |
| | | 20 | 3.8 | +1.6 | +0.3 | | |
| | | 28 | 3.8 | | | | |
| | | 36 | 11.2 | +7.4 | +0.9 | | |
| | | 55 | 48.3 | +37.1 | +2.6 | | |
| | | 72 | 169.4 | +121.1 | +7.2 | | |
| | | 82 | 336.3 | +166.9 | +16.7 | | |
| | | 91 | 561.4 | +225.1 | +25.0 | | |
| | | 97 | 424.1 | -137.3 | -22.9 | 168.9 | 2.3 |

| SPECIES | AREA | DAY | D.W./PLANT | INC.IN D.W. | RATE OF INC. |
|---|---|---|---|---|---|
| TROLLIUS EUROPEAUS | Outside pen 5 | 1 | 70.4 | | |
| | | 7 | 92.4 | +22.0 | +3.1 |
| | | 15 | 198.3 | +95.9 | +12.0 |
| | | 20 | 258.5 | +60.2 | +12.0 |
| | | 28 | 363.7 | +105.2 | +13.1 |
| | | 36 | 508.5 | +144.8 | +18.1 |
| | | 55 | 1191.2 | +682.7 | +36.5 |
| | | 72 | 1382.3 | +191.1 | +11.4 |
| | | 82 | 1642.0 | +259.7 | +26.0 |
| | | 91 | 1180.0 | -462.0 | -51.3 |
| | | 97 | 1174.2 | -5.8 | -0.1 |

Outside pen 5

Rate of growth between day 1 and day with maximum dry weight (82)= $\frac{(1642.0 - 70.4)}{82}$ mgm per day = 19.2 mgm per day.

| | | | | | |
|---|---|---|---|---|---|
| | Outside pen 6 | 1 | 52.4 | | |
| | | 7 | 101.0 | +48.6 | +6.9 |
| | | 15 | 183.2 | +82.2 | +10.3 |
| | | 20 | 180.2 | -3.0 | -0.6 |
| | | 28 | 456.9 | +276.7 | +34.6 |
| | | 36 | 640.0 | +183.0 | +22.9 |
| | | 55 | 857.3 | +217.3 | +12.1 |
| | | 72 | 1769.9 | +892.6 | +52.5 |
| | | 82 | 1775.6 | +5.7 | +0.6 |
| | | 91 | 1823.3 | +47.7 | +5.5 |
| | | 97 | 1812.9 | +10.4 | -1.7 |

Outside pen 6

Rate of growth between dayland day with maximum dry weight (91)= $\frac{(1823.3 - 52.4)}{91}$ mgm per day = 19.5 mgm per day.

| | SODIUM | | | | | POTASSIUM | | | | | MAGNESIUM | | | | | CALCIUM | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 |
| AREA 2 | | | | | | | | | | | | | | | | | | | | |
| Holcus lanatus | 1.0 | 4.1 | 3.0 | 3.1 | | 27.8 | 34.6 | 13.6 | 18.3 | | 2.4 | 3.0 | 2.1 | 1.8 | | 4.2 | 5.0 | 4.9 | 2.2 | |
| Poa trivialis | 0.6 | 1.6 | 1.4 | 1.3 | | 25.2 | 23.4 | 22.4 | 21.3 | | 2.1 | 2.6 | 2.8 | 3.4 | | 3.7 | 4.4 | 7.6 | 4.5 | |
| Alopecurus pratensis | 3.1 | 1.7 | 1.3 | 1.3 | | 30.4 | 29.3 | 21.8 | 19.3 | | 2.3 | 1.9 | 1.7 | 2.5 | | 3.7 | 2.8 | 2.3 | 2.9 | |
| Agrostis tenuis | 2.3 | 5.9 | 2.7 | 1.8 | | 20.3 | 21.8 | 21.0 | 14.7 | | 3.6 | 3.3 | 3.2 | 2.0 | | 4.9 | 3.0 | 4.9 | 2.1 | |
| Festuca rubra | 0.7 | | 0.9 | 0.5 | | 23.0 | [illegible] | 26.8 | 15.8 | | 1.5 | | 2.2 | 1.6 | | 2.8 | | 4.5 | 2.3 | |
| Bromus mollis | | 3.1 | 1.9 | 2.4 | | | 14.8 | 12.9 | 8.7 | | | 2.9 | 2.1 | 2.3 | | | 3.4 | 2.9 | 2.7 | |
| Ranunculus bulbosus | 0.6 | 5.2 | 5.2 | 6.8 | | 9.3 | 15.8 | 12.2 | 12.5 | | 1.6 | 4.7 | 4.3 | 5.1 | | 2.4 | 4.8 | 8.6 | 10.3 | |
| Rumex acetosa | 9.2 | 5.6 | 2.3 | 2.2 | .7 | 43.7 | 22.2 | 20.1 | 15.3 | | 8.1 | 5.3 | 4.8 | 4.2 | | 13.7 | 6.4 | 5.4 | 4.6 | |
| Trifolium repens | 1.7 | 4.1 | | 6.4 | | 28.4 | 20.8 | | 16.4 | | 4.4 | 4.1 | | 4.1 | | 11.3 | 11.0 | | 8.5 | |
| Rhinanthus minor | | 4.0 | 1.2 | 3.4 | | | 30.8 | 22.4 | 15.0 | | | 4.3 | 3.5 | 4.5 | | | 10.0 | 7.4 | 7.5 | |
| Debris | 0.7 | 1.0 | 1.6 | 1.7 | | 5.4 | 6.8 | 8.8 | 6.2 | | 2.2 | 2.3 | 2.8 | 3.1 | | 3.9 | 5.8 | 11.3 | 6.8 | |
| AREA 3 | | | | | | | | | | | | | | | | | | | | |
| Holcus lanatus | 3.6 | | 3.1 | 2.5 | | 18.6 | 2 | | 20.2 | 17.0 | | 3.3 | | 2.7 | 2.6 | | 18.1 | | 7.2 | 6.9 |
| Poa trivialis | 1.0 | 1.3 | 1.0 | 0.5 | | 21.3 | 25.3 | 19.2 | 19.0 | | | 3.2 | 4.2 | 3.2 | 3.0 | | 21.3 | 20.6 | 12.4 | 6.5 |
| Alopecurus pratensis | 2.2 | 0.7 | 2.4 | 1.0 | 14.7 | 14.7 | 22.4 | 14.9 | 10.9 | | | 3.5 | 2.9 | 3.1 | 5.4 | | 20.7 | 11.9 | 6.7 | 12.7 |
| Festuca rubra | 0.8 | 0.5 | 0.6 | 0.4 | | 22.9 | 17.4 | 30.7 | 20.2 | | | 2.3 | 1.9 | 2.5 | 1.9 | | 16.6 | 9.9 | 5.9 | 3.9 |
| Bromus mollis | | 2.3 | 1.3 | 1.2 | | | 9.4 | 9.4 | 5.0 | | | | 5.3 | 6.8 | 2.2 | | | 9.8 | 7.8 | 4.8 |
| Helictotrichon pubescens | 0.5 | | 0.5 | 0.2 | | 22.8 | | 17.1 | 10.3 | | | 2.7 | | 2.1 | 1.1 | | 12.9 | | 9.8 | 3.1 |
| Ranunculus bulbosus | 5.0 | 8.0 | 2.2 | 5.2 | | 14.1 | 17.6 | 8.2 | 10.1 | | | 3.1 | 12.4 | 2.0 | 5.8 | | 12.1 | 22.9 | 17.4 | 18.1 |
| Rhinanthus minor | | 1.5 | 1.7 | 0.7 | | | 23.5 | 15.3 | 17.2 | | | | 5.7 | 6.0 | 3.7 | | | 31.3 | 26.6 | 6.1 |
| Cerastium holosteodes | | 3.0 | 3.1 | 1.2 | | | 27.2 | 24.1 | 21.5 | | | | 5.7 | 5.2 | 3.4 | | | 26.2 | 22.9 | 7.9 |
| Debris | 0.9 | 1.7 | 1.6 | 0.3 | | 3.5 | 7.1 | 4.0 | 4.7 | | | 2.1 | 2.7 | 8.8 | 2.0 | | 15.8 | 10.3 | 20.9 | 11.0 |
| AREA 4 | | | | | | | | | | | | | | | | | | | | |
| Molinia caerulea | 1.0 | 0.9 | | 0.3 | | 19.4 | 14.9 | | 9.5 | | | 1.7 | 2.2 | | 2.8 | | 13.4 | 10.2 | | 1.8 | |
| Eriophorum angustifolium | 1.1 | 0.8 | | 1.7 | | 18.9 | 15.3 | | 8.5 | | | 2.8 | 3.0 | | 3.0 | | 7.1 | 7.9 | | 3.5 | |
| Carex panicea | 1.0 | 1.0 | | 0.4 | | 18.5 | 21.5 | | 12.4 | | | 3.8 | 4.1 | | 3.7 | | 11.7 | 14.7 | | 4.7 | |
| Debris | 0.6 | 0.7 | | 0.6 | | 1.9 | 1.5 | | 1.4 | | | 1.6 | 2.7 | | 2.4 | | 9.3 | 12.8 | | 5.5 | |

Table 5.1 contd.

| | SODIUM | | | | | POTASSIUM | | | | | MAGNESIUM | | | | | CALCIUM | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 2415 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 |
| AREA 5 | | | | | | | | | | | | | | | | | | | | |
| Anthoxanthum odoratum | | 1.5 | 1.1 | 2.4 | 0.9 | | 19.0 | 11.0 | 13.9 | 14.7 | | 3.7 | 2.6 | 4.0 | 2.9 | | 14.9 | 6.4 | 9.9 | 4.9 |
| Holcus lanatus | | | 3.3 | 3.4 | 2.3 | | | 16.3 | 10.8 | 17.1 | | | 4.6 | 3.8 | 3.7 | | | 17.8 | 11.1 | 6.7 |
| Poa trivialis | | | 1.7 | 1.4 | 0.9 | | | 13.1 | 17.5 | 17.4 | | | 4.0 | 4.4 | 4.1 | | | 7.1 | 11.5 | 6.2 |
| Festuca rubra | 0.4 | 1.1 | 0.5 | 0.8 | 0.5 | 11.5 | 19.2 | 15.3 | 14.7 | 17.1 | 1.8 | 3.6 | 2.4 | 3.4 | 3.1 | 1.7 | 11.2 | 6.6 | 17.3 | 5.1 |
| Ranunculus bulbosus | 2.0 | 1.3 | 2.2 | 4.2 | 7.9 | 21.0 | 21.3 | 14.2 | 12.9 | 6.3 | 2.3 | 2.5 | 4.0 | 7.2 | 6.1 | 6.1 | 19.0 | 24.1 | 18.7 | 11.7 |
| Cynosurus cristatus | | 2.5 | 3.0 | 3.6 | 2.4 | | 13.0 | 14.2 | 17.4 | 13.1 | | 2.1 | 2.3 | 2.5 | 3.0 | | 3.1 | 5.4 | 8.4 | 4.6 |
| Rumex acetosa | | | 1.9 | 2.0 | 2.3 | | | 14.7 | 9.6 | 14.0 | | | 7.6 | 5.8 | 9.2 | | | 18.0 | 14.4 | 11.8 |
| Trifolium repens | | | 2.1 | 3.2 | 3.4 | | | 9.2 | 11.6 | 10.9 | | | 6.0 | 7.2 | 5.1 | | | 28.4 | 19.5 | 9.7 |
| Plantago lanceolata | 3.1 | 4.3 | 7.4 | 6.6 | 5.0 | 8.0 | 16.4 | 7.3 | 6.3 | 5.0 | 13.8 | 8.3 | 13.4 | 7.1 | 5.0 | 6.7 | 15.2 | 24.0 | 11.1 | 9.0 |
| Debris | 0.5 | 0.8 | 1.5 | 1.2 | 0.8 | 6.1 | 4.4 | 3.7 | 2.9 | 3.2 | 3.1 | 2.8 | 3.6 | 3.4 | 4.8 | 8.7 | 5.0 | 19.2 | 14.1 | 11.1 |
| AREA 7 | | | | | | | | | | | | | | | | | | | | |
| Anthoxanthum odoratum | | | 0.7 | 0.9 | 1.0 | | | 20.5 | 18.8 | 19.6 | | | 3.5 | 4.0 | 2.1 | | | 6.9 | 7.7 | 7.0 |
| Holcus lanatus | | | 1.0 | 1.6 | 1.3 | | | 28.5 | 19.9 | 21.5 | | | 3.9 | 3.5 | 2.1 | | | 7.4 | 3.1 | 9.7 |
| Festuca rubra | | | 0.4 | 0.7 | 0.7 | | | 14.8 | 15.5 | 18.5 | | | 2.4 | 2.7 | 4.1 | | | 3.3 | 2.3 | 9.8 |
| Nardus stricta | 1.1 | 0.8 | 0.3 | 0.5 | 0.6 | 10.6 | 7.7 | 15.9 | 10.5 | 8.6 | 3.4 | 1.7 | 1.8 | 2.0 | 1.7 | 14.9 | 2.5 | 2.2 | 2.1 | 3.2 |
| Carex pulicaris | | 0.9 | 0.6 | 0.6 | | | 10.4 | 15.9 | 18.1 | | | 3.8 | 3.6 | 3.2 | | | 3.5 | 6.4 | 5.9 | |
| Carex panicea | 1.2 | 1.0 | 0.5 | 0.6 | 1.1 | 18.7 | 17.7 | 20.2 | 21.2 | 15.3 | 4.8 | 3.8 | 3.0 | 3.5 | 3.4 | 21.1 | 5.1 | 2.8 | 5.3 | 10.2 |
| Juncus squarrosus | 4.3 | 4.0 | 1.1 | 2.5 | 1.1 | 5.9 | 9.3 | 14.2 | 13.3 | 9.2 | 2.9 | 2.5 | 2.2 | 1.8 | 1.0 | 1.6 | 1.3 | 3.8 | 1.0 | 2.6 |
| Ranunculus bulbosus | 9.9 | | 4.0 | | 1.8 | 12.1 | | 26.0 | | 15.8 | 8.0 | | 6.7 | | 6.5 | 9.4 | | 18.3 | | 25.5 |
| Trifolium repens | | 3.2 | 1.9 | 3.1 | 1.7 | | 12.8 | 17.0 | 12.7 | 16.9 | | 7.2 | 10.9 | 6.9 | 13.3 | | 9.2 | 19.0 | 6.7 | 23.5 |
| Rhytidiadelphus squarrosus | | | 0.7 | 0.7 | 0.6 | | | 5.6 | 4.2 | 5.9 | | | 2.9 | 2.8 | 3.2 | | | 8.7 | 2.8 | 11.5 |
| Acrocladium cuspidatum | 0.8 | 1.0 | 0.8 | 0.7 | 0.8 | 5.1 | 5.2 | 6.6 | 5.7 | 7.7 | 3.8 | 3.7 | 3.2 | 3.2 | 5.3 | 17.1 | 6.3 | 10.6 | 6.1 | 24.3 |
| Debris | 1.5 | 0.7 | 0.7 | 0.6 | 0.6 | 2.8 | 2.1 | 5.0 | 2.8 | 4.5 | 2.4 | 2.4 | 3.4 | 2.0 | 1.8 | 4.5 | 3.6 | 3.2 | 6.0 | 9.3 |
| AREA 8 | | | | | | | | | | | | | | | | | | | | |
| Festuca ovina | 1.4 | 0.7 | | 1.2 | | 11.3 | 11.5 | | 6.5 | | 2.1 | 1.3 | | 2.1 | | 17.8 | 1.7 | | 4.0 | |
| Nardus stricta | 0.8 | 1.1 | 0.6 | 1.9 | 2.0 | 10.9 | 10.3 | 11.8 | 7.6 | 6.1 | 1.5 | 1.6 | 1.4 | 1.4 | 1.0 | 0.9 | 0.8 | 3.5 | 2.4 | 1.9 |
| Agrostis canina | 1.9 | 2.1 | 1.1 | 0.7 | 1.9 | 13.6 | 14.6 | 12.0 | 11.3 | 10.4 | 3.2 | 2.3 | 2.5 | 2.0 | 2.8 | 7.9 | 2.4 | 8.0 | 4.7 | 8.7 |
| Carex panicea | 2.0 | 0.5 | 0.7 | 0.6 | 0.6 | 19.7 | 17.3 | 10.7 | 13.7 | 9.5 | 3.3 | 2.8 | 2.2 | 3.4 | 3.2 | 8.7 | 2.1 | 8.0 | 3.0 | 9.5 |
| Thuidium tamariscinum | 0.9 | 1.0 | 0.8 | | 0.8 | 5.9 | 4.4 | 3.9 | | 5.4 | 2.8 | 1.9 | 2.5 | | 2.8 | 13.3 | 3.0 | 15.6 | | 12.4 |
| Hypnum cupressiforme | 0.6 | 0.7 | 1.1 | | 0.5 | 2.8 | 4.8 | 4.8 | | 3.8 | 1.2 | 2.1 | 3.1 | | 2.0 | 9.6 | 2.6 | 23.0 | | 9.5 |
| Rhytidiadelphus squarrosus | 1.1 | 0.4 | 0.6 | 1.0 | 0.9 | 3.3 | 3.5 | 4.6 | 4.3 | 5.3 | 2.3 | 1.5 | 2.2 | 2.5 | 2.3 | 14.0 | 2.3 | 10.6 | 8.3 | 11.0 |

SODIUM

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AREA 2 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 |
| Holcus lanatus | 6.3 | 36.1 | 105.7 | 195.2 | | 174.8 | 226.4 | 141.0 | 1163.6 | | 15.0 | 25.0 | 73.6 | 112.5 | | 26.4 | 44.1 | 175.0 | 141.2 |
| Poa trivialis | 3.8 | 9.6 | 15.3 | 7.7 | 161.8 | 161.8 | 139.4 | 244.8 | 122.2 | | 13.4 | 15.3 | 30.3 | 19.9 | | 23.9 | 26.1 | 82.4 | 25.9 |
| Alopecurus pratensis | 35.8 | 38.7 | 72.4 | 87.0 | | 346.6 | 651.1 | 1194.8 | 1292.4 | | 26.8 | 41.4 | 90.5 | 168.0 | | 42.1 | 62.0 | 126.6 | 192.8 |
| Agrostis tenuis | 14.8 | 82.2 | 43.0 | 45.6 | | 131.5 | 305.2 | 331.9 | 384.2 | | 23.1 | 46.6 | 50.8 | 52.1 | | 31.5 | 69.8 | 76.8 | 54.4 |
| Festuca rubra | 5.2 | | 6.0 | 3.6 | | 170.0 | | 184.6 | 109.3 | | 10.9 | | 15.3 | 11.3 | | 20.7 | | 30.8 | 16.0 |
| Bromus mollis | | 63.2 | 92.5 | 54.6 | | | 301.5 | 631.0 | 196.3 | | | 58.1 | 101.8 | 51.0 | | | 68.8 | 142.1 | 61.9 |
| Ranunculus bulbosus | 55.7 | 583.0 | 626.1 | 1302.3 | | 836.4 | 1694.3 | 1473.9 | 2380.1 | | 146.6 | 527.2 | 518.2 | 967.0 | | 215.9 | 546.6 | 1037.5 | 1961.4 |
| Rumex acetosa | 256.6 | 89.0 | 674.3 | 300.0 | | 1220.6 | 768.4 | 5883.4 | 2044.1 | | 225.0 | 280.7 | 2175.0 | 858.0 | | 589.8 | 342.0 | 2447.7 | 946.6 |
| Trifolium repens | 40.9 | 109.7 | | 385.6 | | 704.3 | 552.1 | | 987.9 | | 108.6 | 114.0 | | 245.5 | | 279.8 | 292.2 | | 514.4 |
| Rhinanthus minor | | 176.7 | 667.4 | 946.5 | | | 1369.8 | 12044.2 | 4204.7 | | | 190.7 | 1886.0 | 1265.1 | | | 441.9 | 3976.7 | 2090.7 |
| AREA 3 | | | | | | | | | | | | | | | | | | | |
| Holcus lanatus | 33.7 | | 110.1 | 923.11 | | 174.6 | | 717.5 | 6189.6 | | 31.4 | | 97.0 | 926.9 | | 170.1 | | 256.8 | 2508.0 |
| Poa trivialis | 4.7 | 7.5 | 12.4 | 3.8 | | 101.7 | 144.9 | 239.4 | 113.9 | | 15.1 | 24.1 | 40.0 | 20.9 | | 101.7 | 118.1 | 154.0 | 45.4 |
| Alopecurus pratensis | 16.5 | 11.6 | 105.0 | 155.7 | | 111.3 | 398.8 | 644.0 | 2109.9 | | 26.8 | 51.1 | 135.7 | 882.4 | | 156.6 | 211.3 | 289.6 | 2462.9 |
| Festuca rubra | 3.5 | 2.1 | 5.2 | 5.3 | | 99.7 | 75.0 | 253.2 | 253.5 | | 9.8 | 8.1 | 20.8 | 24.3 | | 72.5 | 42.6 | 48.8 | 48.7 |
| Bromus mollis | | 48.2 | 30.8 | 15.9 | | | 195.2 | 221.8 | 67.2 | | | 112.2 | 159.1 | 29.9 | | | 204.3 | 183.3 | 64.3 |
| Helictotrichon pubescens | 10.1 | | 27.5 | 7.5 | | 430.9 | | 992.8 | 414.7 | | 51.2 | | 120.2 | 43.3 | | 244.2 | | 571.4 | 123.1 |
| Ranunculus bulbosus | 1189.4 | 2137.9 | 345.5 | 256.1 | | 3377.3 | 4704.5 | 1304.5 | 498.5 | | 739.4 | 3313.6 | 310.6 | 284.8 | | 2897.0 | 6131.8 | 2777.3 | 898.5 |
| Rhinanthus minor | | 93.8 | 309.4 | 205.0 | | | 1454.7 | 2834.3 | 5048.4 | | | 351.6 | 1103.1 | 1071.9 | | | 1939.1 | 4917.2 | 1798.4 |
| Cerastium holosteodes | | 24.7 | 114.6 | 30.3 | | | 228.1 | 906.0 | 538.6 | | | 47.6 | 196.6 | 83.1 | | | 219.9 | 858.4 | 194.4 |
| AREA 4 | | | | | | | | | | | | | | | | | | | |
| Molinia caerulea | 9.5 | 10.2 | | 10.6 | | 177.9 | 161.3 | | 327.6 | | 15.77 | 23.4 | | 95.1 | | 123.4 | 110.4 | | 60.7 |
| Eriophorum angustifolium | 95.6 | 79.9 | | 171.5 | | 1582.8 | 1466.3 | | 858.2 | | 234.9 | 289.2 | | 300.5 | | 591.4 | 755.3 | | 351.9 |
| Carex panicea | 40.6 | 39.4 | | 46.3 | | 760.0 | 864.4 | | 1440.0 | | 154.9 | 163.4 | | 425.1 | | 478.6 | 591.4 | | 545.7 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Anthoxanthum odoratum | | 11.4 | 22.8 | 59.7 | 18.0 | | 146.0 | 260.1 | 341.8 | 294.0 | | 28.5 | 54.2 | 98.5 | 58.0 | | 114.4 | 135.4 | 242.1 | 98.0 |
| Holcus lanatus | | | 30.8 | 61.2 | 26.8 | | 121.2 | 151.9 | 195.4 | 203.4 | | | 42.8 | 68.6 | 44.7 | | | 166.1 | 200.6 | 79.3 |
| Poa trivialis | | | 13.1 | 5.2 | 2.9 | | 103.8 | 103.8 | 164.0 | 59.0 | | | 31.9 | 16.1 | 13.7 | | | 55.9 | 42.0 | 21.1 |
| Festuca rubra | 1.7 | 5.5 | 2.5 | 4.5 | 3.8 | 46.2 | 95.3 | 72.4 | 84.4 | 144.0 | 7.4 | 17.9 | 11.5 | 19.7 | 26.4 | 6.9 | 55.3 | 31.4 | 99.2 | 43.4 |
| Cynosurus cristatus | | 19.1 | 58.6 | 83.1 | 45.7 | | 99.0 | 277.1 | 404.6 | 253.2 | | 16.0 | 44.8 | 58.9 | 57.6 | | 23.4 | 104.6 | 196.6 | 88.5 |
| Ranunculus bulbosus | 28.0 | 25.9 | 75.6 | 243.4 | 170.8 | 290.1 | 416.9 | 491.0 | 753.9 | 136.1 | 31.3 | 47.9 | 139.5 | 422.0 | 78.3 | 83.7 | 372.0 | 831.0 | 1096.7 | 254.2 |
| Rumex acetosa | | | 59.7 | 35.1 | 129.9 | | | 462.3 | 163.6 | 776.6 | | | 237.7 | 100.0 | 510.4 | | | 563.6 | 246.8 | 653.2 |
| Trifolium repens | | | 73.4 | 153.7 | 110.2 | | | 317.5 | 558.8 | 349.2 | | | 205.1 | 344.6 | 163.8 | | | 979.7 | 937,9 | 310,2 |
| Plantago lanceolata | 74.7 | 105.8 | 387.8 | 379.5 | 470.5 | 192.8 | 403.4 | 8382.5 | 362.2 | 470.5 | 332.6 | 204.2 | 702.2 | 408.2 | 470.5 | 161.5 | 393.9 | 1257.5 | 638.2 | 846.9 |
| AREA 7 | | | | | | | | | | | | | | | | | | | | |
| Anthoxanthum odoratum | | | 6.0 | 8.2 | 12.6 | | | 167.8 | 172.9 | 249.2 | | | 28.4 | 36.6 | 26.8 | | | 56.8 | 70.7 | 89.0 |
| Holcus lanatus | | | 22.1 | 16.2 | 9.4 | | | 629.4 | 287.2 | 152.2 | | | 86.5 | 36.5 | 14.8 | | | 162.5 | 32.5 | 68.8 |
| Festuca rubra | | | 3.3 | 2.4 | 5.4 | | | 123.5 | 56.3 | 53.2 | | | 19.7 | 9.7 | 33.8 | | | 27.4 | 8.3 | 81.1 |
| Nardus stricta | 9.4 | 8.6 | 5.8 | 7.6 | 6.7 | 94.9 | 80.4 | 285.0 | 156.3 | 105.4 | 30.4 | 17.7 | 31.8 | 28.9 | 21.4 | 133.2 | 25.9 | 38.8 | 31.1 | 39.0 |
| Carex pulicaris | | 11.8 | 5.5 | 4.9 | | | 145.2 | 157.9 | 136.6 | | | 52.7 | 36.0 | 23.9 | | | 49.0 | 63.4 | 44.4 | |
| Carex panicea | 33.3 | 38.4 | 19.4 | 29.1 | 67.9 | 515.2 | 717.7 | 853.2 | 1042.6 | 968.4 | 130.8 | 153.6 | 127.0 | 172.2 | 217.7 | 581.9 | 205.1 | 119.4 | 260.3 | 645.6 |
| Juncus squarrosus | 3.8 | 271.1 | 80.5 | 137.1 | 128.9 | 676.8 | 636.8 | 1052.1 | 718.7 | 1127.8 | 332.6 | 170.5 | 162.6 | 99.4 | 120.4 | 177.6 | 89.0 | 279.3 | 54.7 | 321.8 |
| Ranunculus bulbosus | .4 | | 180.4 | | 173.2 | 534.8 | | 1162.5 | | 1559.8 | 352.7 | | 297.3 | | 638.4 | 413.4 | 818.6 | 819.6 | | 2152.5 |
| Trifolium repens | | 42.5 | 50.3 | 85.3 | 60.1 | | 169.5 | 445.0 | 347.5 | 584.3 | | 94.7 | 284.9 | 189.9 | 460.7 | | 122.0 | 498.4 | 183.3 | 811.3 |
| AREA 8 | | | | | | | | | | | | | | | | | | | | |
| Festuca ovina | | 1.6 | | 3.8 | | 41.9 | 26.3 | | 21.2 | | 7.7 | 3.0 | | 6.7 | | 66.7 | 4.0 | | 13.2 | |
| Nardus stricta | | 2.2 | 9.4 | 27.9 | 26.5 | 113.0 | 113.3 | 187.6 | 112.4 | 80.6 | 15.6 | 17.6 | 23.0 | 21.3 | 13.8 | 9.3 | 8.5 | 55.0 | 35.0 | 25.1 |
| Agrostis canina | | .2 | 5.6 | 2.4 | 11.5 | 56.3 | 42.4 | 63.2 | 38.7 | 63.6 | 13.4 | 6.6 | 13.2 | 6.6 | 17.8 | 32.6 | 7.1 | 42.2 | 15.9 | 53.0 |
| Carex panicea | | | 22.3 | 21.5 | 36.8 | 517.4 | 499.2 | 341.3 | 535.6 | 553.4 | 86.2 | 81.8 | 71.7 | 132.8 | 184.6 | 230.0 | 259.5 | 256.3 | 116.2 | 553.4 |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 |
| AREA 5 | | | | | | | | | | | | | | | | | | | | |
| Anthoxanthum odoratum | | 11.4 | 22.8 | 59.7 | 18.0 | | 146.0 | 260.1 | 341.8 | 294.0 | | 28.5 | 54.2 | 98.5 | 58.0 | | 114.4 | 135.4 | 242.1 | 98.0 |
| Holcus lanatus | | | 30.8 | 61.2 | 26.8 | | 151.9 | 151.9 | 195.4 | 203.4 | | | 42.8 | 68.6 | 44.7 | | | 166.1 | 200.6 | 79.3 |
| Poa trivialis | | | 13.1 | 5.2 | 2.9 | | 103.8 | 103.8 | 164.0 | 59.0 | | | 31.9 | 16.1 | 13.7 | | | 55.9 | 42.0 | 21.1 |
| Festuca rubra | 1.7 | 5.5 | 2.5 | 4.5 | 3.8 | 46.2 | 95.3 | 72.4 | 84.4 | 144.0 | 7.4 | 17.9 | 11.5 | 19.7 | 26.4 | 6.9 | 55.3 | 31.4 | 99.2 | 43.4 |
| Cynosurus cristatus | | 19.1 | 58.6 | 83.1 | 45.7 | | 99.0 | 277.1 | 404.6 | 253.2 | | 16.0 | 44.8 | 58.9 | 57.6 | | 23.4 | 104.6 | 196.6 | 88.5 |
| Ranunculus bulbosus | 28.0 | 25.9 | 75.6 | 243.4 | 170.8 | 290.1 | 416.9 | 491.0 | 753.9 | 136.1 | 31.3 | 47.9 | 139.5 | 422.0 | 78.3 | 83.7 | 372.0 | 831.0 | 1096.7 | 254.2 |
| Rumex acetosa | | | 59.7 | 35.1 | 129.9 | | | 462.3 | 163.6 | 776.6 | | | 237.7 | 100.0 | 510.4 | | | 563.6 | 246.8 | 653.2 |
| Trifolium repens | | | 73.4 | 153.7 | 110.2 | | | 317.5 | 558.8 | 349.2 | | | 205.1 | 344.6 | 163.8 | | | 979.7 | 937,9 | 310,2 |
| Plantago lanceolata | 74.7 | 105.8 | 387.8 | 379.5 | 470.5 | 192.8 | 403.4 | 8382.5 | 362.2 | 470.5 | 332.6 | 204.2 | 702.2 | 408.2 | 470.5 | 161.5 | 393.9 | 1257.6 | 638.2 | 846.9 |
| AREA 7 | | | | | | | | | | | | | | | | | | | | |
| Anthoxanthum odoratum | | | 6.0 | 8.2 | 12.6 | | | 167.8 | 172.9 | 249.2 | | | 28.4 | 36.6 | 26.8 | | | 56.8 | 70.7 | 89.0 |
| Holcus lanatus | | | 22.1 | 16.2 | 9.4 | | | 629.4 | 287.2 | 152.2 | | | 88.5 | 36.5 | 14.8 | | | 162.5 | 32.5 | 68.8 |
| Festuca rubra | | | 3.3 | 2.4 | 5.4 | | | 123.5 | 56.3 | 53.2 | | | 19.7 | 9.7 | 33.8 | | | 27.4 | 8.3 | 81.1 |
| Nardus stricta | 9.4 | 8.6 | 5.8 | 7.6 | 6.7 | 94.9 | 80.4 | 285.0 | 156.3 | 105.4 | 30.4 | 17.7 | 31.8 | 28.9 | 21.4 | 133.2 | 25.9 | 38.8 | 31.1 | 39.0 |
| Carex pulicaris | | 11.8 | 5.5 | 4.9 | | | 145.2 | 157.9 | 136.6 | | | 52.7 | 36.0 | 23.9 | | | 49.0 | 63.4 | 44.4 | |
| Carex panicea | 33.3 | 38.4 | 19.4 | 29.1 | 67.9 | 515.2 | 717.7 | 853.2 | 1042.6 | 968.4 | 130.8 | 153.6 | 127.0 | 172.2 | 217.7 | 581.9 | 205.1 | 119.4 | 260.3 | 645.6 |
| Juncus squarrosus | 489.8 | 271.1 | 80.5 | 137.1 | 128.9 | 676.8 | 636.8 | 1052.1 | 718.7 | 1127.8 | 332.6 | 170.5 | 162.6 | 99.4 | 120.4 | 177.6 | 89.0 | 279.3 | 54.7 | 321.8 |
| Ranunculus bulbosus | 438.4 | | 180.4 | | 173.2 | 534.8 | | 1162.5 | | 1559.8 | 352.7 | | 297.3 | | 638.4 | 413.4 | 819.6 | 819.6 | | 2152.5 |
| Trifolium repens | | 42.5 | 50.3 | 85.3 | 60.1 | | 169.5 | 445.0 | 347.5 | 584.3 | | 94.7 | 284.9 | 189.9 | 460.7 | | 122.0 | 498.4 | 183.3 | 811.3 |
| AREA 8 | | | | | | | | | | | | | | | | | | | | |
| Festuca ovina | 5.3 | 1.6 | | 3.8 | | 41.9 | 26.3 | | 21.2 | | 7.7 | 3.0 | | 6.7 | | 66.7 | 4.0 | | 13.2 | |
| Nardus stricta | 8.3 | 12.2 | 9.4 | 27.9 | 26.5 | 113.0 | 113.3 | 187.6 | 112.4 | 80.6 | 15.6 | 17.6 | 23.0 | 21.3 | 13.8 | 9.3 | 8.5 | 55.0 | 35.0 | 25.1 |
| Agrostis canina | 7.7 | 6.2 | 5.6 | 2.4 | 11.5 | 56.3 | 42.4 | 63.2 | 38.7 | 63.6 | 13.4 | 6.6 | 13.2 | 6.96 | 17.8 | 32.6 | 7.1 | 42.2 | 15.9 | 53.0 |
| Carex panicea | 52.6 | 15.0 | 22.3 | 21.5 | 36.8 | 517.4 | 499.2 | 341.3 | 535.6 | 553.4 | 86.2 | 81.8 | 71.7 | 132.8 | 184.6 | 230.0 | 259.5 | 256.3 | 116.2 | 553.4 |

| | SODIUM | | | | | POTASSIUM | | | | | MAGNESIUM | | | | | CALCIUM | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 |
| AREA 2 | | | | | | | | | | | | | | | | | | | | |
| Holcus lanatus | 8.3 | 47.3 | 138.3 | 255.5 | | 228.8 | 296.3 | 184.6 | 1523.1 | | 19.6 | 34.0 | 96.4 | 147.3 | | 34.6 | 57.7 | 229.1 | 184.8 | |
| Poa trivialis | 8.4 | 21.1 | 33.7 | 17.1 | | 357.3 | 307.9 | 540.6 | 247.8 | | 29.5 | 33.7 | 67.0 | 43.9 | | 52.8 | 57.6 | 181.9 | 57.1 | |
| Alopecurus pratensis | 25.3 | 27.3 | 51.1 | 61.4 | | 244.7 | 459.7 | 843.5 | 912.4 | | 18.9 | 29.2 | 63.9 | 118.6 | | 29.7 | 43.8 | 89.4 | 136.1 | |
| Agrostis tenuis | 14.3 | 79.3 | 41.5 | 44.0 | | 126.9 | 294.5 | 320.3 | 370.8 | | 22.3 | 45.0 | 49.0 | 50.3 | | 30.4 | 67.4 | 74.1 | 52.5 | |
| Festuca rubra | 6.9 | | 7.9 | 4.7 | | 223.7 | | 242.9 | 143.9 | | 14.3 | | 20.2 | 14.9 | | 27.2 | | 40.5 | 21.1 | |
| Bromus mollis | | 31.4 | 46.6 | 27.5 | | | 151.7 | 318.0 | 98.9 | | | 29.3 | 51.3 | 25.7 | | | 34.7 | 71.6 | 31.2 | |
| Ranunculus bulbosus | 4.9 | 51.3 | 55.1 | 114.6 | | 73.6 | 149.1 | 129.7 | 209.5 | | 12.9 | 46.4 | 45.6 | 85.1 | | 19.0 | 48.1 | 91.3 | 172.6 | |
| Rumex acetosa | 34.9 | 12.1 | 91.7 | 40.8 | | 166.0 | 104.5 | 800.0 | 278.0 | | 30.6 | 24.7 | 191.4 | 75.5 | | 51.9 | 30.1 | 215.4 | 83.3 | |
| Trifolium repens | 10.5 | 28.2 | | 99.1 | | 181.0 | 141.9 | | 253.9 | | 27.9 | 29.3 | | 63.1 | | 71.9 | 75.1 | | 132.2 | |
| Rhinanthus minor | | 7.6 | 28.7 | 40.7 | | | 58.9 | 517.9 | 180.8 | | | 8.2 | 81.1 | 54.4 | | | 19.0 | 171.6 | 89.9 | |
| other species | 33.7 | 67.9 | 119.5 | 131.8 | | 418.0 | 472.5 | 1209.8 | 460.5 | | 83.9 | 83.2 | 256.1 | 112.0 | | 121.6 | 147.7 | 583.7 | 170.1 | |
| Debris | 51.4 | 63.5 | 72.3 | 101.1 | | 380.7 | 432.6 | 403.5 | 361.0 | | 165.4 | 148.7 | 129.9 | 179.9 | | 295.4 | 369.2 | 515.1 | 396.1 | |
| TOTAL | 198 | 437 | 686 | 938 | | 2401 | 2969 | 5511 | 5040 | | 425 | 512 | 1052 | 971 | | 734 | 950 | 2264 | 1527 | |
| AREA 3 | | | | | | | | | | | | | | | | | | | | |
| Holcus lanatus | 11.4 | | 37.2 | 312.0 | | 59.0 | | 242.5 | 2092.1 | | 10.6 | | 32.8 | 313.3 | | 57.5 | | 86.8 | 847.7 | |
| Poa trivialis | 8.1 | 13.1 | 21.6 | 6.6 | | 176.5 | 251.5 | 415.6 | 232.4 | | 26.3 | 41.9 | 69.4 | 36.2 | | 176.5 | 205.0 | 267.3 | 78.9 | |
| Alopecurus pratensis | 13.3 | 9.3 | 84.5 | 125.3 | | 89.6 | 321.0 | 518.4 | 1698.5 | | 21.6 | 41.1 | 109.2 | 710.3 | | 126.1 | 170.1 | 233.1 | 1982.6 | |
| Festuca rubra | 21.5 | 13.2 | 32.1 | 32.6 | | 614.3 | 462.0 | 1560.8 | 1562.7 | | 60.4 | 49.8 | 128.2 | 149.8 | | 446.7 | 262.3 | 300.8 | 300.3 | |
| Bromus mollis | | 59.9 | 38.2 | 19.7 | | | 242.4 | 275.5 | 83.5 | | | 139.4 | 197.6 | 37.1 | | | 253.8 | 227.6 | 72.8 | |
| Helictotrichon pubescens | 3.5 | | 9.5 | 2.6 | | 149.1 | | 343.5 | 143.5 | | 17.7 | | 41.6 | 15.0 | | 84.5 | | 197.7 | 42.6 | |
| Ranunculus bulbosus | 78.5 | 141.1 | 22.8 | 16.9 | | 222.9 | 310.5 | 86.1 | 32.9 | | 48.8 | 218.7 | 20.5 | 18.8 | | 191.2 | 404.7 | 183.3 | 59.3 | |
| Rhinanthus minor | | 6.0 | 19.8 | 13.1 | | | 93.1 | 181.4 | 323.1 | | | 22.5 | 70.6 | 68.6 | | | 124.1 | 314.7 | 115.1 | |
| Cerastium holosteodes | | 6.6 | 30.6 | 8.1 | | | 60.9 | 241.9 | 143.8 | | | 12.8 | 52.5 | 22.2 | | | 58.7 | 229.2 | 51.9 | |
| other species | 72.2 | 49.9 | 83.4 | 21.6 | | 425.5 | 158.9 | 914.5 | 218.9 | | 107.0 | 54.8 | 247.8 | 61.9 | | 924.3 | 197.3 | 1307.3 | 232.0 | |
| Debris | 82.1 | 164.7 | 168.6 | 32.1 | | 325.6 | 692.0 | 417.9 | 286.2 | | 195.0 | 266.6 | 909.2 | 119.8 | | 1476.8 | 1011.5 | 2162.7 | 663.8 | |
| TOTAL | 291 | 464 | 548 | 591 | | 2062 | 2592 | 5198 | 6818 | | 488 | 848 | 1879 | 1553 | | 3483 | 2687 | 5510 | 4434 | |

| | SODIUM | | | | | POTASSIUM | | | | | MAGNESIUM | | | | | CALCIUM | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DATE** | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 |
| **AREA 4** | | | | | | | | | | | | | | | | | | | | |
| **Molinia caerulea** | 17.2 | 18.5 | | 19.3 | | 322.8 | 292.6 | | 594.3 | | 28.6 | 42.4 | | 172.5 | | 223.8 | 200.3 | | 110.2 | |
| **Eriophorum angustifolium** | 38.9 | 32.5 | | 69.8 | | 644.2 | 596.8 | | 349.3 | | 95.6 | 117.7 | | 122.3 | | 240.7 | 307.4 | | 147.3 | |
| **Carex panicea** | 14.2 | 13.8 | | 16.2 | | 266.0 | 302.6 | | 504.0 | | 54.2 | 57.2 | | 148.8 | | 167.5 | 207.0 | | 191.0 | |
| **other species** | 15.2 | 8.7 | | 4.6 | | 87.5 | 102.8 | | 110.1 | | 41.4 | 28.4 | | 49.7 | | 128.5 | 98.3 | | 34.0 | |
| **Debris** | 70.3 | 59.8 | | 83.4 | | 214.3 | 127.4 | | 195.6 | | 187.8 | 261.0 | | 333.7 | | 1070.1 | 1106.7 | | 750.9 | |
| **TOTAL** | 161 | 133 | | 203 | | 1547 | 1422 | | 1830 | | 419 | 507 | | 897 | | 1925 | 1920 | | 1426 | |
| AREA 5 | | | | | | | | | | | | | | | | | | | | |
| **Anthoxanthum odoratum** | | 4.6 | 9.2 | 24.1 | 7.3 | | 59.0 | 105.1 | 138.1 | 119.0 | | 11.5 | 21.9 | 39.8 | 23.5 | | 46.2 | 54.7 | 97.8 | 39.6 |
| **Holcus lanatus** | | | 25.4 | 50.5 | 22.1 | | | 125.3 | 161.2 | 167.8 | | | 35.3 | 56.6 | 36.9 | | | 137.0 | 165.5 | 65.4 |
| **Poa trivialis** | | | 11.2 | 4.4 | 2.5 | | | 88.5 | 54.6 | 50.3 | | | 27.2 | 13.7 | 11.7 | | | 47.7 | 35.8 | 18.0 |
| **Festuca rubra** | 4.6 | 16.1 | 7.4 | 13.3 | 11.1 | 135.4 | 279.2 | 212.2 | 247.5 | 422.1 | 21.6 | 52.4 | 33.6 | 57.6 | 77.4 | 20.1 | 162.1 | 92.0 | 290.8 | 127.2 |
| **Cynosurus cristatus** | | 17.7 | 54.2 | 76.9 | 42.3 | | 91.8 | 256.3 | 374.3 | 243,3 | | 14.8 | 41.4 | 54.5 | 53.3 | | 21.6 | 96.8 | 181.9 | 81.9 |
| **Ranunculus bulbosus** | 9.3 | 8.6 | 25.1 | 80.8 | 56.7 | 96.3 | 138.4 | 163.0 | 250.3 | 45.3 | 10.4 | 15.9 | 46.3 | 140.1 | 26.0 | 27.8 | 123.5 | 275.9 | 364.1 | 84.4 |
| **Rumex acetosa** | | | 4.6 | 2.7 | 10.6 | | | 35.6 | 12.6 | 59.8 | | | 18.3 | 7.7 | 39.3 | | | 43.4 | 19.0 | 50.3 |
| **Trifolium repens** | | | 13.0 | 27.2 | 19.5 | | | 56.2 | 98.9 | 61.8 | | | 36.3 | 61.0 | 29.0 | | | 173.4 | 166.0 | 54.9 |
| **Plantago lanceolata** | 68.7 | 96.3 | 356.0 | 349.5 | 433.0 | 177.5 | 371.0 | 352.0 | 333.0 | 433.0 | 305.0 | 193.0 | 746.0 | 386.0 | 433.0 | 148.5 | 362.0 | 1159.0 | 587.0 | 777.0 |
| **other species** | 84.4 | 59.7 | 25.4 | 178.7 | 178.7 | 1767.2 | 1477.9 | 644.9 | 1127.6 | 1950.4 | 461.3 | 390.8 | 368.6 | 486.9 | 1105.4 | 1000.8 | 1109.9 | 855.0 | 1067.0 | 1454.9 |
| **Bryophytes** | 11.4 | 88.1 | 7.2 | 5.3 | 4.4 | 71.9 | 83.7 | 49.9 | 33.1 | 37.3 | 61.8 | 59.2 | 18.2 | 19.2 | 22.8 | 91.1 | 202.4 | 108.9 | 89.1 | 49.6 |
| **Debris** | 27.0 | 66.7 | 123.1 | 93.1 | 72.5 | 331.3 | 374.0 | 307.8 | 232.0 | 305.6 | 169.4 | 239.8 | 299.3 | 268.9 | 463.2 | 468.4 | 419.7 | 1619.8 | 1132.8 | 1075.4 |
| **TOTAL** | 206 | 356 | 662 | 907 | 860 | 2578 | 2875 | 2397 | 3063 | 3887 | 1030 | 978 | 1693 | 1511 | 2321 | 1730 | 2448 | 3205 | 4195 | 3268 |
| **AREA 7** | | | | | | | | | | | | | | | | | | | | |
| **Anthoxanthum odoratum** | | | 1.9 | 2.6 | 4.0 | | | 53.2 | 54.8 | 79.0 | | | 9.0 | 11.6 | 8.5 | | | 18.0 | 22.4 | 28.2 |
| **Holcus lanatus** | | | 17.2 | 12.6 | 7.3 | | | 490.3 | 161.4 | 118.6 | | | 67.4 | 28.4 | 11.5 | | | 126.6 | 25.3 | 53.6 |
| **Festuca rubra** | | | 3.3 | 2.4 | 5.4 | | | 123.5 | 56.3 | 153.2 | | | 19.7 | 9.7 | 33.8 | | | 27.4 | 8.3 | 81.1 |
| **Nardus stricta** | 6.3 | 5.8 | 3.9 | 5.1 | 4.5 | 63.8 | 54.0 | 191.5 | 105.0 | 70.8 | 20.4 | 11.9 | 21.4 | 19.4 | 14.4 | 89.5 | 17.4 | 26.1 | 20.9 | 26,2 |
| **Carex pulicaris** | | 4.1 | 1.9 | 1.7 | | | 50.4 | 54.8 | 47.4 | | | 18.3 | 12.5 | 8.3 | | | 17.0 | 22.0 | 15.4 | |
| **Carex panicea** | 7.9 | 9.1 | 4.6 | 6.9 | 16.1 | 122.1 | 170.1 | 202.2 | 247.1 | 229.5 | 31.0 | 36.4 | 30.1 | 40.8 | 51.6 | 137.9 | 48.6 | 28.3 | 61.7 | 153.0 |
| **Juncus squarrosus** | 172.9 | 95.7 | 28.4 | 48.4 | 45.5 | 238.9 | 224.8 | 371.4 | 253.7 | 398.1 | 117.4 | 60.2 | 57.4 | 35.1 | 42.5 | 62.7 | 31.4 | 98.6 | 19.3 | 113.6 |

Table 5.3 contd.

| DATE | SODIUM | | | | | POTASSIUM | | | | | MAGNESIUM | | | | | CALCIUM | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AREA 7 contd. | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 |
| Ranunculus bulbosus | 49.1 | | 20.2 | | 19.4 | 59.9 | | 130.2 | | 174.7 | 39.5 | | 33.3 | | 71.5 | 46.3 | | 91.8 | | 281.4 |
| Trifolium repens | | 13.5 | 16.0 | 27.3 | 19.1 | | 53.9 | 141.5 | 110.5 | 185.8 | | 30.1 | 90.6 | 60.4 | 146.5 | | 38.8 | 158.5 | 58.3 | 258.0 |
| other species | 74.7 | 107.5 | 48.4 | 67.0 | 75.2 | 580.2 | 541.6 | 523.9 | 186.5 | 807.4 | 146.9 | 155.9 | 129.1 | 55.9 | 216.4 | 264.8 | 234,2 | 224.1 | 75.1 | 494.6 |
| Rhytidiadelphus squarrosus | | | 7.5 | 7.0 | 5.9 | | | 62.8 | 40.2 | 63.7 | | | 32.5 | 23.6 | 34.0 | | | 97.6 | 27.0 | 123.2 |
| Acrocladium cuspidatum | 37.7 | 45.3 | 43.2 | 4.1 | 38.8 | 255.6 | 241.2 | 377.6 | 35.3 | 399.6 | 191.8 | 169.7 | 183.0 | 19.4 | 272.3 | 859.8 | 290.1 | 611.2 | 37.9 | 1258.8 |
| other mosses | 203.5 | 7.5 | 14.4 | 51.4 | 10.2 | 223.6 | 47.4 | 132.3 | 347.1 | 65.2 | 169.6 | 25.6 | 60.1 | 194.2 | 40.6 | 244.7 | 65.3 | 103.3 | 393.0 | 168.7 |
| Debris | 298.0 | 80.3 | 74.7 | 42.4 | 47.6 | 568.1 | 225.6 | 503.8 | 200.0 | 374.6 | 488.1 | 254.9 | 340.3 | 143.0 | 153.5 | 908.1 | 393.8 | 327.1 | 426.8 | 771.6 |
| TOTAL | 850 | 369 | 286 | 279 | 318 | 2112 | 1609 | 3359 | 1944 | 3120 | 1205 | 764 | 1086 | 649 | 1097 | 2614 | 1137 | 1961 | 1191 | 3812 |
| AREA 8 | | | | | | | | | | | | | | | | | | | | |
| Festuca ovina | 4.3 | 1.3 | | 3.1 | | 33.8 | 21.2 | | 17.1 | | 6.2 | 22.4 | | 5.4 | | 53.5 | 3.2 | | 10.6 | |
| Nardus stricta | 22.7 | 33.4 | 25.7 | 76.1 | 72.3 | 308.8 | 309.5 | 512.5 | 387.1 | 2202 | 42.5 | 48.1 | 62.7 | 58.3 | 37.6 | 25.5 | 23.2 | 150.2 | 95.5 | 68.7 |
| Agrostis canina | 9.8 | 7.9 | 7.1 | 3.0 | 14.6 | 71.7 | 54.0 | 80.5 | 49.3 | 80.9 | 17.0 | 8.4 | 16.8 | 8.8 | 22.1 | 41.5 | 9.0 | 53.7 | 20.2 | 67.5 |
| Carex panicea | 13.0 | 3.7 | 5.5 | 5.3 | 9.1 | 127.8 | 123.3 | 84.3 | 132.3 | 136.7 | 21.3 | 20.2 | 17.7 | 32.8 | 45.6 | 56.8 | 14.7 | 63.3 | 28.7 | 136.7 |
| other species | 0.8 | 11.2 | 38.8 | 27.7 | 66.4 | 197.6 | 209.0 | 327.9 | 197.1 | 242.9 | 2.3 | 16.5 | 74.1 | 53.5 | 96.8 | 65.9 | 213.2 | 330.3 | 115.1 | 289.8 |
| Thuidium tamariscinum | 15.8 | 7.6 | 4.2 | | 13.6 | 106.4 | 34.8 | 20.1 | | 92.4 | 50.8 | 15.1 | 12.9 | | 47.5 | 241.7 | 24.2 | 80.1 | | 212.8 |
| Hypnum cupressiforme | 5.0 | 3.0 | 3.0 | | 42.2 | 22.1 | 20.3 | 13.5 | | 292.4 | 9.8 | 9.1 | 8.8 | | 153.1 | 75.3 | 11.2 | 64.7 | | 730.1 |
| Rhytidiadelphus squarrosus | 14.5 | 3.9 | 2.6 | 3.3 | 9.1 | 44.0 | 33.9 | 19.2 | 14.9 | 56.4 | 30.4 | 14.5 | 9.1 | 8.5 | 24.3 | 187.2 | 22.0 | 44.5 | 28.8 | 116.7 |
| Hylocomium splendens | 6.7 | 2.4 | 3.4 | | | 5.1 | 10.9 | 7.3 | | | 4.5 | 5.5 | 6.1 | | | 48.0 | 8.5 | 48.4 | | |
| other mosses | 5.4 | 18.1 | 53.8 | 86.3 | 22.5 | 27.9 | 155.3 | 271.7 | 639.3 | 136.9 | 15.6 | 40.0 | 193.9 | 363.1 | 69.0 | 43.3 | 85.6 | 1462.4 | 1240.7 | 315.9 |
| Debris | 98.0 | 81.7 | 165.3 | 54.5 | 152.0 | 392.0 | 645.3 | 478.7 | 273.5 | 381.9 | 168.0 | 119.8 | 433.6 | 173.6 | 94.6 | 994.0 | 174.7 | 2344.1 | 606.5 | 1401.6 |
| TOTAL | 196 | 190 | 309 | 259 | 402 | 1337 | 1617 | 1816 | 1631 | 1716 | 369 | 314 | 851 | 704 | 591 | 1833 | 590 | 4642 | 2146 | 3340 |

| | SODIUM | | | | | POTASSIUM | | | | | MAGNESIUM | | | | | CALCIUM | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 |
| AREA 2 | | | | | | | | | | | | | | | | | | | | |
| Holcus lanatus | 4.2 | 10.8 | 20.1 | 27.2 | | 9.5 | 10.0 | 3.4 | 30.2 | | 4.6 | 6.6 | 9.2 | 15.1 | | 4.7 | 6.1 | 10.1 | 12.1 | |
| Alopecurus pratensis | 12.8 | 6.2 | 7.4 | 6.5 | | 10.2 | 15.5 | 15.3 | 18.1 | | 5.4 | 3.7 | 6.1 | 12.2 | | 4.0 | 4.6 | 3.9 | 8.9 | |
| Poa trivialis | 4.2 | 4.8 | 4.9 | 1.8 | | 14.9 | 10.4 | 9.8 | 14.9 | | 6.9 | 6.6 | 6.4 | 14.5 | | 7.2 | 6.5 | 8.0 | 3.7 | |
| Agrostis tenuis | 7.2 | 18.1 | 6.4 | 4.7 | | 5.3 | 9.9 | 5.8 | 7.3 | | 5.2 | 8.8 | 4.7 | 5.3 | | 4.1 | 7.1 | 3.3 | 3.4 | |
| Festuca rubra | 3.5 | | 1.1 | 0.5 | | 9.3 | | 4.4 | 2.8 | | 3.4 | | 1.9 | 1.5 | | 3.7 | | 1.8 | 1.4 | |
| Bromus mollis | | 7.2 | 6.8 | 2.9 | | | 5.1 | 5.8 | 2.0 | | | 5.7 | 4.9 | 2.6 | | | 3.6 | 3.2 | 2.0 | |
| Ranunculus bulbosus | 2.5 | 11.7 | 8.0 | 12.2 | | 0.3 | 5.0 | 2.3 | 4.2 | | 3.0 | 9.1 | 4.3 | 8.8 | | 2.6 | 5.1 | 4.0 | 11.3 | |
| Rumex acetosa | 17.6 | 2.7 | 13.4 | 4.3 | | 6.9 | 3.5 | 14.5 | 5.5 | | 7.2 | 4.8 | 18.2 | 7.8 | | 7.1 | 3.2 | 9.5 | 5.5 | |
| Trifolium repens | 5.3 | 6.4 | | 10.6 | | 7.5 | 4.8 | | 5.0 | | 6.6 | 5.7 | | 6.5 | | 9.8 | 7.9 | | 8.6 | |
| Rhinanthus minor | | 1.7 | 4.2 | 4.3 | | | 2.0 | 9.4 | 3.6 | | | 1.6 | 7.7 | 5.6 | | | 2.0 | 7.6 | 5.9 | |
| other species | 17.0 | 15.5 | 17.4 | 14.0 | | 17.4 | 15.9 | 21.9 | 9.1 | | 19.7 | 16.2 | 24.3 | 11.5 | | 16.5 | 15.5 | 25.8 | 11.1 | |
| Debris | 25.9 | 14.5 | 10.5 | 10.7 | | 15.9 | 14.6 | 7.3 | 7.2 | | 38.9 | 29.0 | 12.3 | 18.5 | | 40.2 | 38.8 | 22.7 | 25.9 | |
| AREA 3 | | | | | | | | | | | | | | | | | | | | |
| Holcus lanatus | 3.9 | | 6.8 | 52.7 | | 2.9 | | 4.7 | 30.6 | | 2.2 | | 1.7 | 20.2 | | 1.6 | | 1.6 | 19.1 | |
| Poa trivialis | 2.8 | 2.8 | 4.7 | 1.1 | | 8.5 | 9.7 | 8.0 | 3.4 | | 5.4 | 4.9 | 3.7 | 2.3 | | 5.1 | 7.6 | 4.8 | 1.8 | |
| Alopecurus pratensis | 4.6 | 2.0 | 15.4 | 21.2 | | 4.3 | 12.4 | 10.0 | 24.9 | | 4.4 | 4.8 | 5.8 | 45.7 | | 3.6 | 6.3 | 4.2 | 44.7 | |
| Festuca rubra | 7.4 | 2.8 | 5.8 | 5.5 | | 29.8 | 17.8 | 30.0 | 22.9 | | 12.4 | 5.9 | 6.8 | 9.6 | | 12.8 | 9.8 | 5.4 | 6.8 | |
| Bromus mollis | | 12.9 | 7.0 | 3.3 | | | 9.3 | 5.3 | 1.2 | | | 16.4 | 10.5 | 2.4 | | | 9.4 | 4.1 | 1.8 | |
| Helictotrichon pubescens | 1.2 | | 1.7 | 0.4 | | 7.2 | | 6.6 | 2.1 | | 3.6 | | 2.2 | 0.1 | | 2.4 | | 3.6 | 1.0 | |
| Ranunculus bulbosus | 27.0 | 30.4 | 4.2 | 2.8 | | 10.8 | 12.0 | 1.7 | 0.5 | | 10.0 | 25.7 | 1.1 | 0.1 | | 5.5 | 15.1 | 3.3 | 1.3 | |
| Rhinanthus minor | | 1.3 | 3.6 | 2.2 | | 4.1 | 4.0 | 3.5 | 4.7 | | | 2.6 | 3.8 | 4.4 | | | 4.6 | 5.7 | 2.6 | |
| Cerastium holosteodes | | 1.4 | 5.6 | 1.4 | | | 2.3 | 4.6 | 2.1 | | | 1.5 | 2.8 | 1.4 | | | 2.2 | 4.1 | 1.2 | |
| other species | 24.8 | 10.7 | 15.2 | 3.6 | | 20.6 | 6.1 | 17.6 | 3.2 | | 21.9 | 6.5 | 13.2 | 4.0 | | 26.5 | 7.3 | 23.7 | 5.2 | |
| Debris | 28.2 | 35.4 | 30.7 | 5.4 | | 15.8 | 26.7 | 8.0 | 4.2 | | 39.9 | 31.4 | 48.4 | 7.7 | | 42.4 | 37.6 | 39.2 | 15.0 | |
| AREA 4 | | | | | | | | | | | | | | | | | | | | |
| Molinia caerulea | 10.7 | 13.9 | | 9.5 | | 20.9 | 20.6 | | 32.5 | | 6.8 | 8.4 | | 19.2 | | 11.6 | 10.4 | | 7.7 | |
| Eriophorum angustifolium | 24.2 | 24.4 | | 34.4 | | 41.6 | 42.0 | | 19.1 | | 22.8 | 23.2 | | 13.6 | | 12.5 | 16.0 | | 10.3 | |
| Carex panicea | 8.8 | 10.4 | | 8.0 | | 17.2 | 21.3 | | 27.5 | | 12.9 | 11.3 | | 16.5 | | 8.7 | 10.8 | | 13.4 | |
| other species | 9.4 | 6.5 | | 0.2 | | 5.7 | 7.2 | | 6.0 | | 10.0 | 5.6 | | 5.5 | | 6.7 | 5.1 | | 2.4 | |
| Debris | 43.7 | 45.0 | | 41.1 | | 13.8 | 8.9 | | 10.7 | | 44.8 | 57.4 | | 37.2 | | 55.5 | 57.6 | | 52.6 | |

Table 5.4 contd.

| | SODIUM | | | | | POTASSIUM | | | | | MAGNESIUM | | | | | CALCIUM | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 |
| AREA 5 | | | | | | | | | | | | | | | | | | | | |
| Anthoxanthum odoratum | | 1.3 | 1.4 | 2.6 | 0.8 | | 2.0 | 4.4 | 4.5 | 3.1 | | 1.2 | 1.3 | 2.6 | 1.0 | | 1.9 | 1.7 | 2.3 | 1.2 |
| Holcus lanatus | | | 3.8 | 5.6 | 2.6 | | | 5.2 | 5.3 | 4.3 | | | 2.1 | 3.7 | 1.6 | | | 4.3 | 3.9 | 2.0 |
| Poa trivialis | | | 1.7 | 0.5 | 0.5 | | | 3.7 | 1.8 | 1.3 | | | 1.6 | 0.9 | 0.5 | | | 1.5 | 0.8 | 0.5 |
| Festuca rubra | 2.2 | 4.5 | 1.1 | 1.5 | 1.3 | 5.2 | 9.7 | 8.8 | 8.1 | 10.8 | 2.1 | 5.3 | 2.0 | 3.8 | 3.3 | 1.2 | 6.6 | 2.9 | 6.9 | 3.9 |
| Cynosurus cristatus | | 5.0 | 8.2 | 8.5 | 4.9 | | 3.2 | 10.7 | 12.2 | 6.0 | | 1.5 | 2.4 | 3.6 | 2.3 | | 0.9 | 3.0 | 4.3 | 3.9 |
| Ranunculus bulbosus | 4.5 | 2.4 | 3.8 | 8.9 | 6.6 | 3.7 | 4.8 | 6.8 | 8.2 | 1.2 | 1.0 | 1.6 | 2.7 | 9.3 | 1.1 | 1.6 | 5.0 | 8.6 | 8.7 | 2.5 |
| Rumex acetosa | | | 0.7 | 0.3 | 1.2 | | | 1.5 | 4.1 | 1.5 | | | 0.4 | 0.5 | 1.7 | | | 1.3 | 0.5 | 1.5 |
| Trifolium repens | | | 2.0 | 3.0 | 2.3 | | | 2.3 | 3.2 | 1.6 | | | 2.1 | 4.0 | 1.2 | | | 5.4 | 4.0 | 1.7 |
| Plantago lanceolata | 34.3 | 27.0 | 53.7 | 30.5 | 50.3 | 6.9 | 12.9 | 14.7 | 10.9 | 11.1 | 29.6 | 19.7 | 44.1 | 25.5 | 18.6 | 8.6 | 14.8 | 36.1 | 14.0 | 23.8 |
| other species | 42.2 | 16.8 | 3.8 | 19.7 | 20.7 | 68.5 | 51.4 | 26.9 | 36.8 | 50.1 | 44.8 | 39.9 | 21.8 | 25.9 | 47.6 | 57.8 | 45.3 | 26.6 | 25.4 | 44.5 |
| Bryophytes | 5.7 | 24.7 | 1.1 | 0.6 | 0.5 | 2.8 | 2.9 | 2.1 | 1.1 | 1.0 | 6.0 | 6.0 | 0.4 | 1.3 | 1.0 | 5.3 | 8.3 | 3.4 | 2.1 | 1.5 |
| Debris | 13.0 | 18.7 | 18.5 | 10.3 | 8.4 | 12.8 | 13.0 | 12.8 | 7.6 | 7.9 | 16.4 | 24.5 | 17.7 | 17.8 | 20.0 | 27.1 | 17.1 | 5.0 | 2.7 | 3.3 |
| AREA 7 | | | | | | | | | | | | | | | | | | | | |
| Anthoxanthum odoratum | | | 0.7 | 0.9 | 1.3 | | | 1.6 | 2.8 | 2.5 | | | 0.8 | 1.8 | 0.8 | | | 0.9 | 1.9 | 0.7 |
| Holcus lanatus | | | 6.0 | 4.5 | 2.3 | | | 14.6 | 8.3 | 3.8 | | | 6.2 | 4.4 | 1.0 | | | 6.4 | 2.1 | 1.4 |
| Festuca rubra | | | 1.1 | 0.9 | 1.7 | | | 3.7 | 2.9 | 4.9 | | | 1.8 | 1.5 | 3.1 | | | 1.4 | 0.7 | 2.1 |
| Nardus stricta | 0.7 | 1.6 | 1.2 | 1.8 | 1.4 | 3.0 | 3.4 | 5.7 | 5.4 | 2.3 | 1.7 | 1.5 | 2.0 | 3.0 | 1.3 | 3.4 | 1.5 | 1.3 | 1.7 | 0.7 |
| Carex pulicaris | | 1.1 | 0.7 | 0.6 | | | 3.1 | 1.6 | 2.4 | | | 2.3 | 1.1 | 1.3 | | | 1.5 | 1.1 | 1.3 | |
| Carex panicea | 0.9 | 2.5 | 1.6 | 2.5 | 5.1 | 5.8 | 10.5 | 6.0 | 12.7 | 7.3 | 2.6 | 4.8 | 2.8 | 6.4 | 4.7 | 5.3 | 4.3 | 1.4 | 5.2 | 4.0 |
| Juncus squarrosus | 20.3 | 25.9 | 10.0 | 17.3 | 14.3 | 11.3 | 14.0 | 11.0 | 13.1 | 12.7 | 9.7 | 7.9 | 5.3 | 5.4 | 3.9 | 2.4 | 2.8 | 5.0 | 1.6 | 3.0 |
| Ranunculus bulbosus | 5.8 | | 7.1 | | 6.1 | 2.8 | | 3.9 | | 5.6 | 3.3 | | 3.1 | | 6.5 | 1.8 | | 4.7 | | 7.4 |
| Trifolium repens | | 3.6 | 5.6 | 10.0 | 6.1 | | 3.4 | 4.2 | 5.7 | 5.9 | | 3.9 | 8.3 | 9.3 | 13.3 | | 3.4 | 8.1 | 4.9 | 6.7 |
| other species | 8.8 | 29.1 | 16.9 | 24.0 | 23.6 | 27.5 | 33.7 | 15.6 | 9.6 | 25.9 | 12.2 | 20.4 | 11.9 | 8.6 | 19.7 | 10.1 | 20.6 | 11.4 | 6.3 | 13.0 |
| Rhytidiadelphus squarrosus | | | 2.6 | 2.5 | 1.8 | | | 1.9 | 2.1 | 2.0 | | | 0.3 | 3.6 | 3.1 | | | 5.0 | 2.3 | 3.2 |
| Acrocladium cuspidatum | 4.4 | 12.3 | 15.1 | 1.5 | 12.2 | 12.1 | 15.0 | 11.2 | 1.8 | 12.8 | 15.9 | 22.2 | 16.8 | 3.0 | 24.8 | 32.9 | 25.5 | 31.1 | 3.2 | 33.0 |
| other mosses | 23.9 | 2.0 | 5.1 | 18.4 | 3.2 | 10.6 | 2.9 | 3.9 | 17.8 | 2.1 | 14.1 | 3.5 | 5.5 | 29.9 | 3.7 | 9.4 | 5.7 | 5.3 | 33.0 | 44.2 |
| Debris | 35.0 | 21.8 | 26.1 | 15.2 | 15.0 | 26.9 | 14.0 | 15.0 | 10.3 | 12.0 | 40.5 | 33.3 | 31.3 | 21.8 | 14.0 | 34.7 | 34.6 | 16.7 | 35.8 | 24.7 |

Table 5.4 contd.

| | SODIUM | | | | | POTASSIUM | | | | | MAGNESIUM | | | | | CALCIUM | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 | 24.5 | 7.6 | 21.6 | 11.7 | 5.8 |
| AREA 8 | | | | | | | | | | | | | | | | | | | | |
| Festuca ovina | 2.2 | 0.7 | | 1.2 | | 2.5 | 1.3 | | 1.1 | | 1.7 | 0.8 | | 0.8 | | 2.9 | 0.5 | | 0.5 | |
| Nardus stricta | 11.6 | 17.6 | 8.3 | 29.4 | 18.0 | 23.1 | 19.1 | 28.2 | 18.8 | 12.8 | 11.5 | 15.3 | 7.4 | 8.3 | 6.4 | 1.4 | 3.9 | 3.2 | 4.4 | 2.1 |
| Agrostis canina | 5.0 | 4.2 | 2.3 | 1.2 | 3.6 | 5.4 | 3.3 | 4.4 | 3.0 | 4.7 | 4.6 | 2.7 | 2.0 | 1.2 | 3.7 | 2.3 | 1.5 | 1.2 | 0.9 | 2.0 |
| Carex panicea | 6.6 | 1.9 | 1.8 | 2.0 | 2.3 | 9.5 | 7.6 | 4.6 | 8.1 | 8.0 | 5.8 | 6.4 | 2.1 | 4.6 | 7.7 | 3.1 | 2.5 | 1.4 | 1.3 | 4.1 |
| other species | 0.4 | 5.9 | 12.6 | 10.7 | 16.5 | 14.8 | 12.9 | 18.0 | 12.1 | 14.1 | 0.7 | 5.2 | 8.7 | 7.6 | 16.4 | 3.6 | 36.1 | 7.1 | 5.4 | 8.7 |
| Thuidium tamariscinum | 8.1 | 4.0 | 1.4 | | 3.4 | 7.9 | 2.1 | 1.1 | | 5.4 | 13.8 | 4.8 | 1.5 | | 8.0 | 13.1 | 4.1 | 1.7 | | 6.4 |
| Hypnum cupressiforme | 2.5 | 1.6 | 1.0 | | 10.5 | 1.6 | 1.3 | 0.7 | | 17.0 | 2.6 | 2.9 | 1.0 | | 25.9 | 4.1 | 1.9 | 1.4 | | 21.8 |
| Rhytidiadelphus squarrosus | 7.4 | 2.0 | 0.8 | 1.3 | 2.3 | 3.3 | 2.1 | 1.0 | 0.9 | 3.3 | 8.2 | 4.6 | 1.1 | 1.2 | 4.1 | 10.2 | 3.7 | 1.0 | 1.3 | 2.8 |
| Hylocomium splendens | 3.4 | 1.3 | 1.1 | | | 0.4 | 0.8 | 0.4 | | | 1.2 | 1.7 | 0.7 | | | 2.6 | 1.4 | 1.0 | | |
| other mosses | 2.8 | 9.5 | 17.4 | 33.3 | 5.6 | 2.1 | 9.6 | 15.0 | 39.2 | 8.0 | 4.2 | 12.7 | 22.7 | 51.5 | 11.7 | 2.4 | 14.5 | 31.5 | 57.8 | 9.4 |
| Debris | 50.0 | 43.0 | 53.4 | 21.0 | 37.8 | 29.3 | 39.9 | 26.4 | 16.8 | 22.2 | 45.5 | 38.1 | 50.9 | 24.6 | 16.0 | 24.2 | 29.6 | 50.4 | 28.3 | 41.9 |

KEY FOR FIGURES 5.1-5.23

—△— Calcium
—▫— Sodium
—○— Potassium
—■— Magnesium
———— Dry weight of species (g per $m^2$)
- - - - - - Mean change in dry weight per plant (mg)

Scale A Dry weight per square metre of plant material (g per $m^2$)
B Mineral content in mg per $m^2$
C Mean change in dry weight per plant (mg)
D Mineral content in mg per g dry weight of plant material

| | |
|---|---|
| Figure 5.1 | Agrostis canina |
| 5.2 | Agrostis tenuis |
| 5.3 | Alopecurus pratensis |
| 5.4 | Anthoxanthum odoratum |
| 5.5 | Bromus mollis |
| 5.6 | Carex panicea |
| 5.7 | Carex pulicaris |
| 5.8 | Cerastium holosteodes |
| 5.9 | Cynosurus cristatus |
| 5.10 | Eriophorum angustifolium |
| 5.11 | Festuca ovina |
| 5.12 | Festuca rubra |
| 5.13 | Helictotrichon pubescens |
| 5.14 | Holcus lanatus |
| 5.15 | Juncus squarrosus |
| 5.16 | Molinia caerulea |
| 5.17 | Nardus stricta |
| 5.18 | Plantago lanceolata |
| 5.19 | Poa trivialis |

| | |
|---|---|
| 5.20 | Ranunculus bulbosus |
| 5.21 | Rhinanthus minor |
| 5.22 | Rumex acetosa |
| 5.23 | Trifolium repens |

FIGURE 5.1

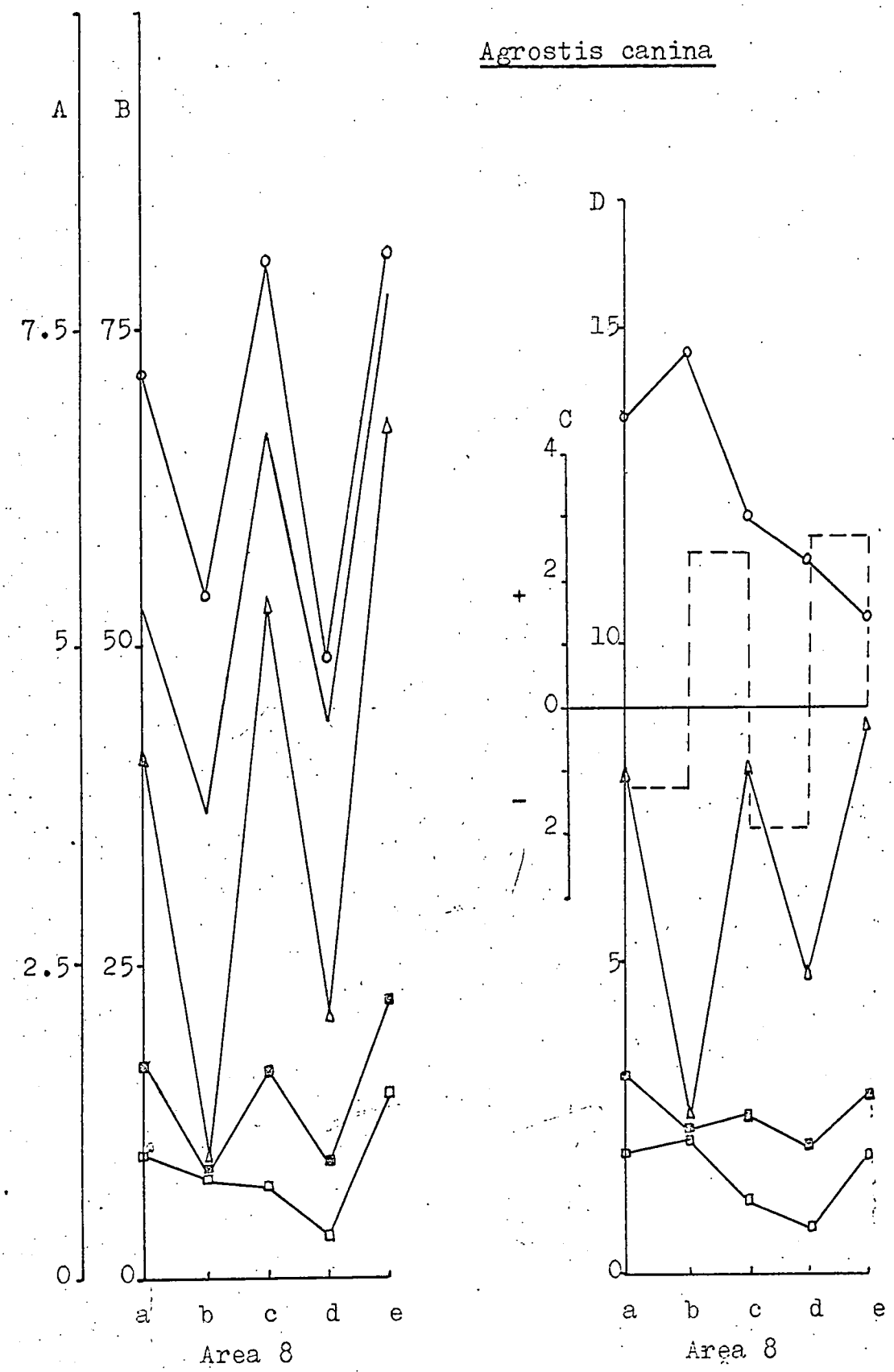

Agrostis canina
A
B
7.5
75
5
50
2.5
25
0
0
a
b
c
d
e
Area 8
D
15
C
4
2
+
10
0
2
-
5
0
a
b
c
d
e
Area 8

FIGURE 5.2

Agrostis tenuis

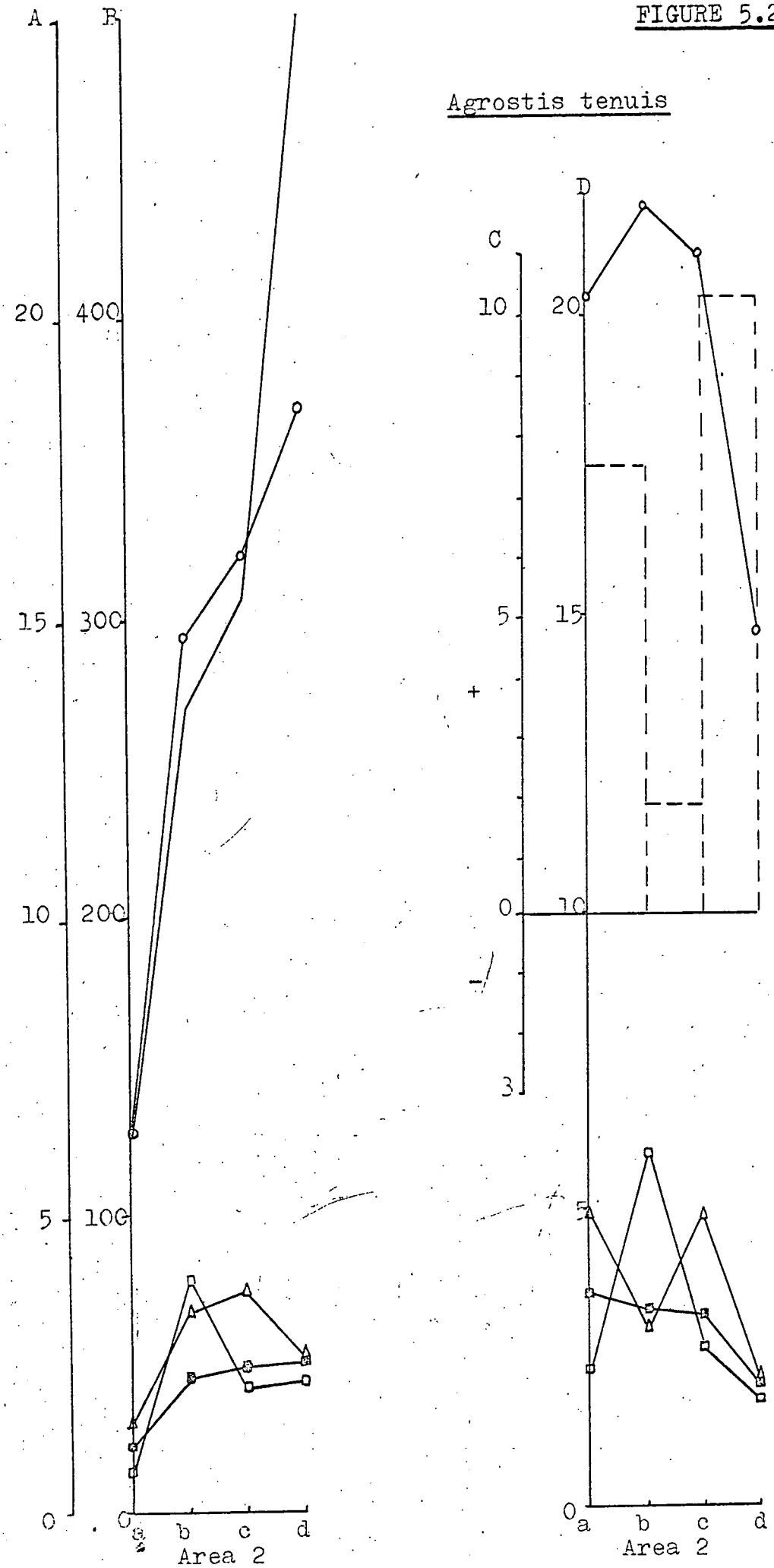


FIGURE 5.3

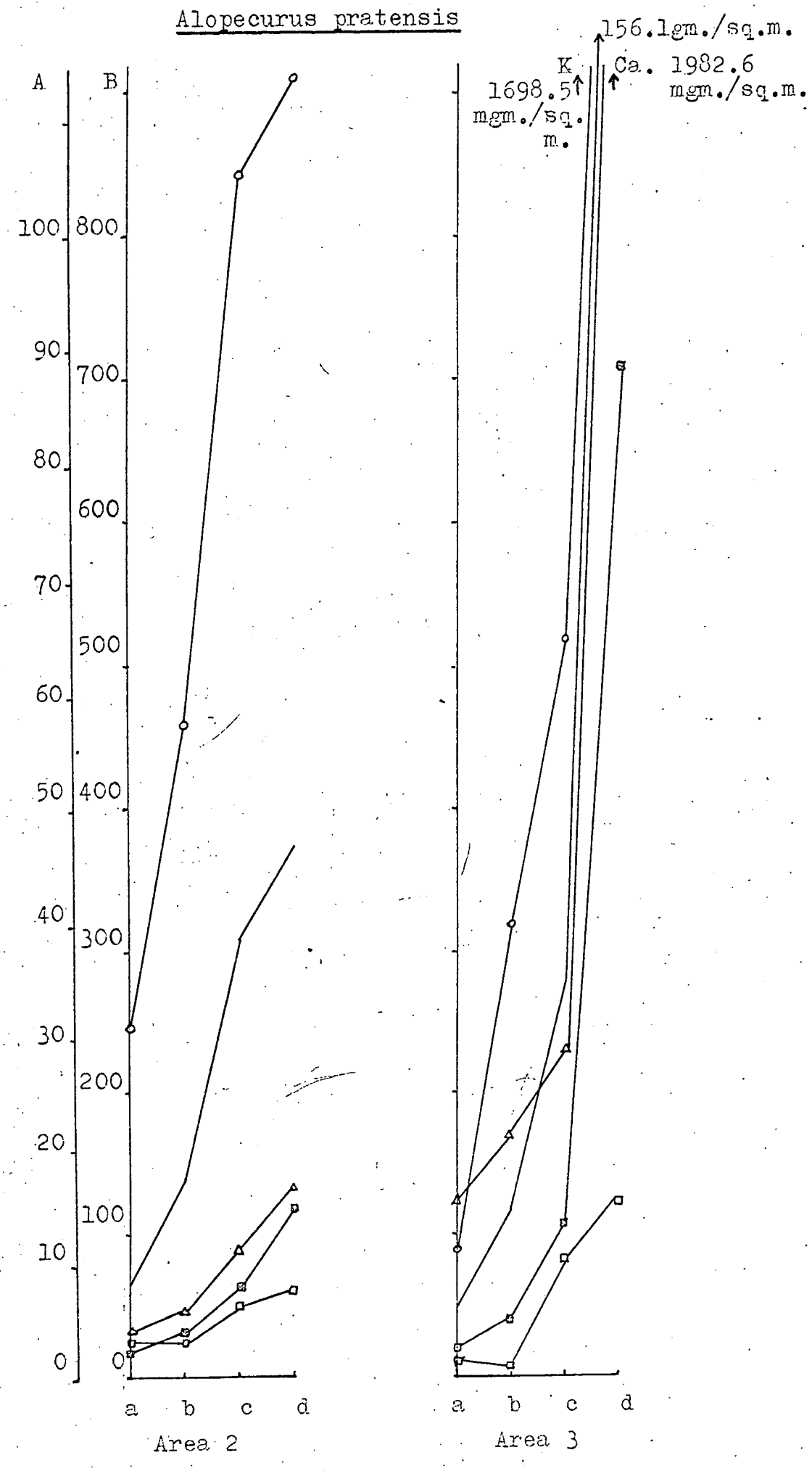
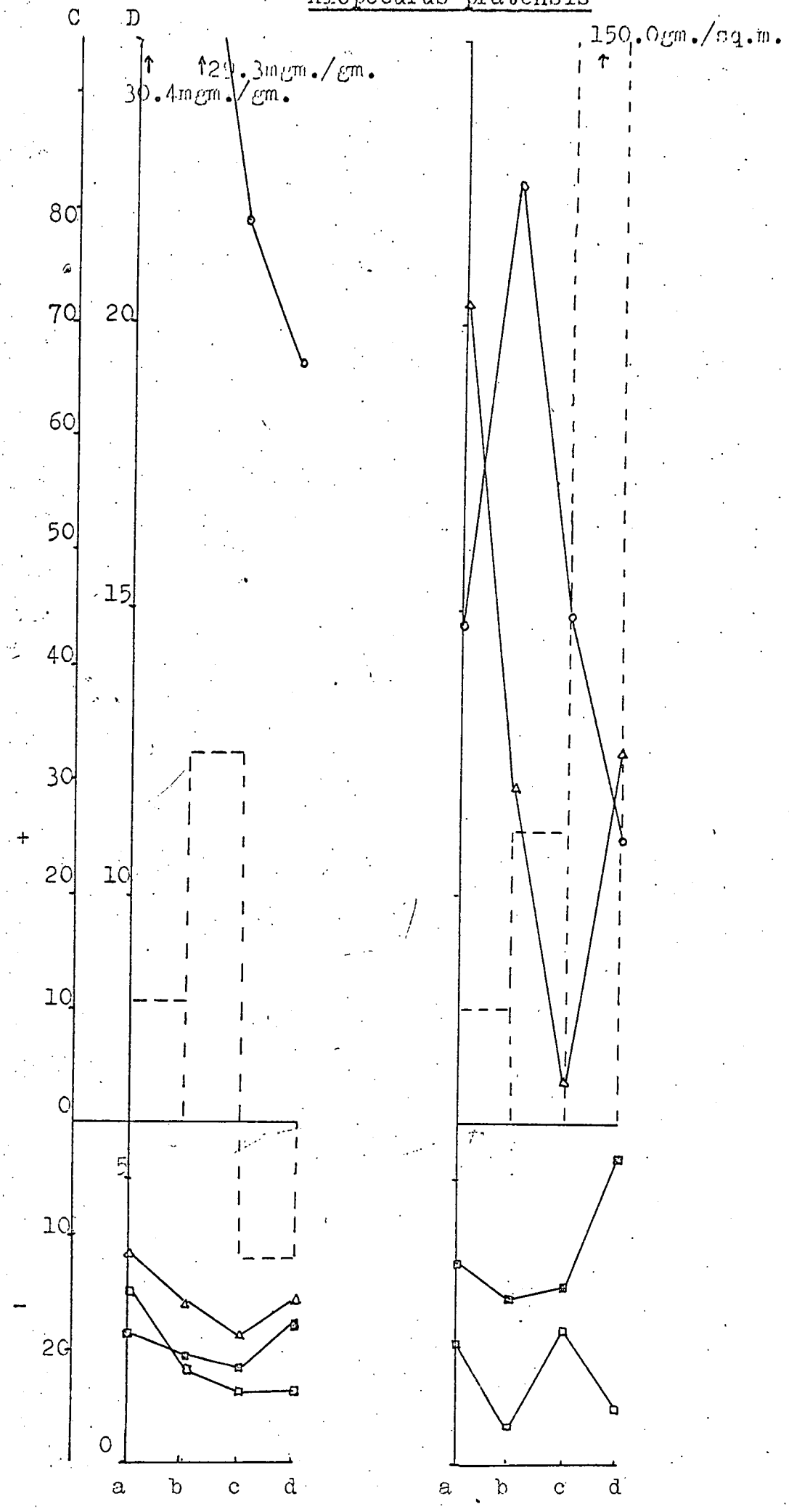

Alopecurus pratensis
156.1gm./sq.m.
K
Ca. 1982.6
mgm./sq.m.
1698.5
mgm./sq.
m.
A
B
100
90
80
70
60
50
40
30
20
10
0
800
700
600
500
400
300
200
100
0
a
b
c
d
Area 2
a
b
c
d
Area 3

FIGURE 5.3 contd.

Alopecurus pratensis




Area 2

Area 3

FIGURE 5.4

Anthoxanthum odoratum

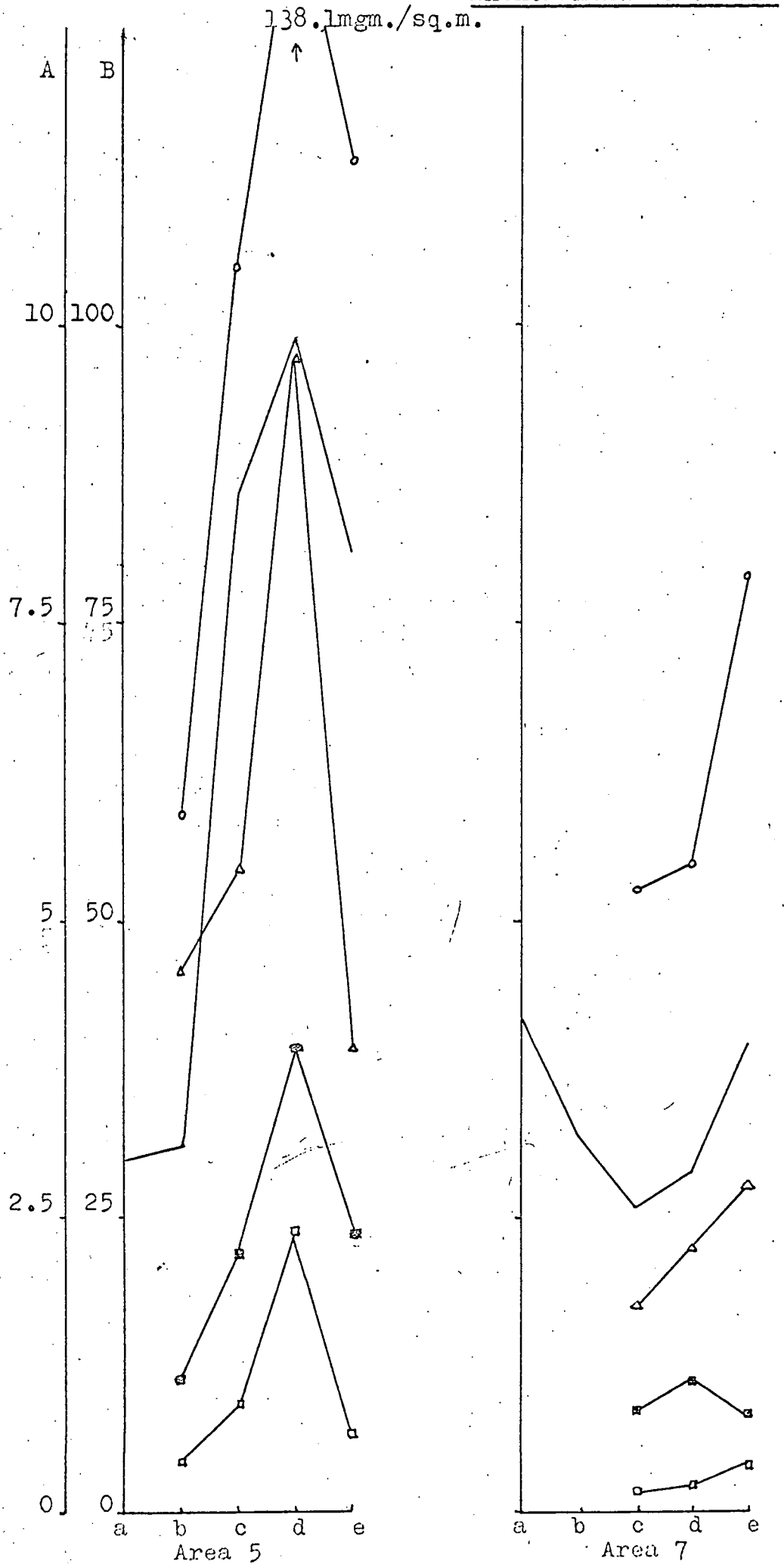
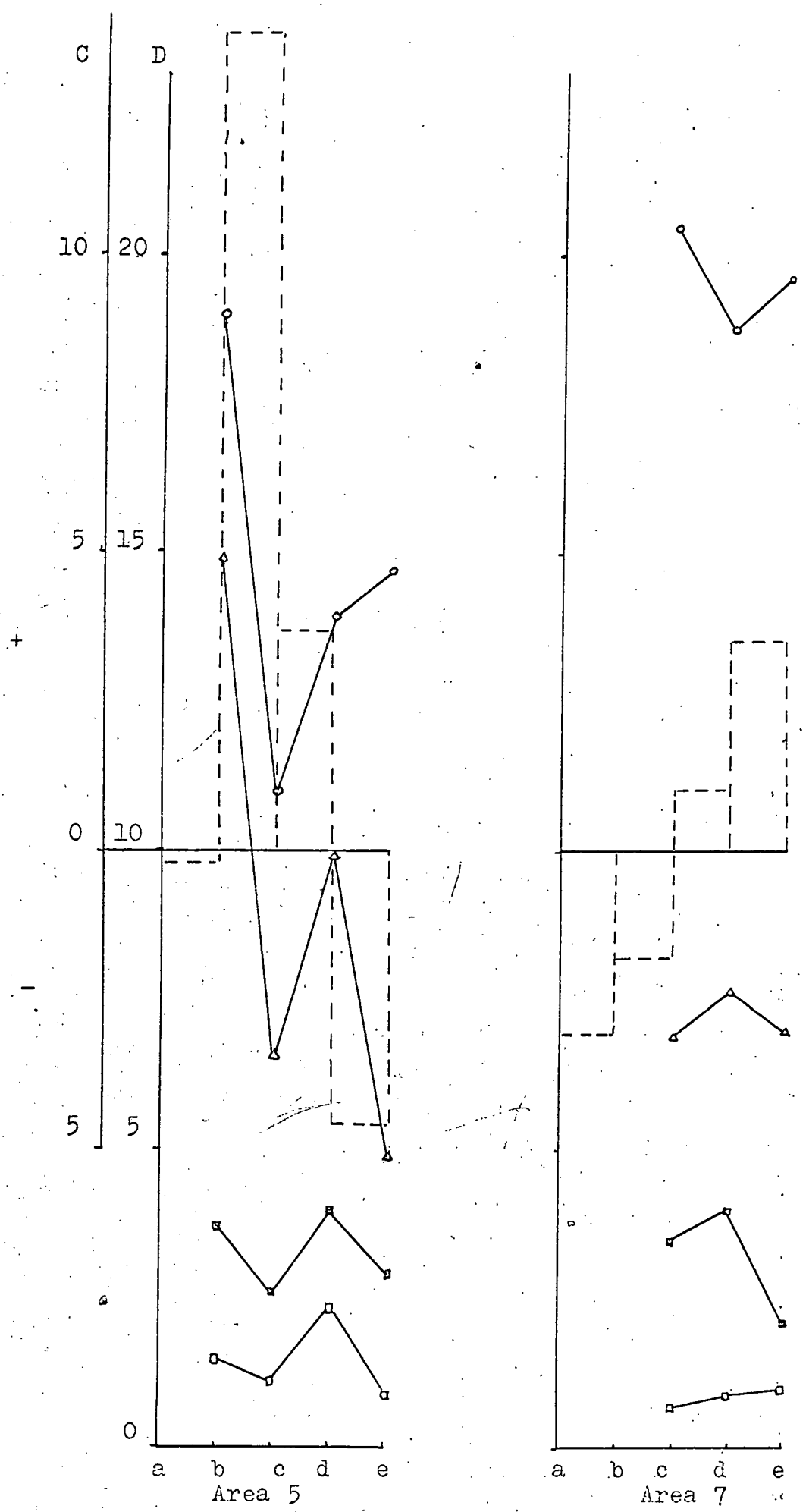


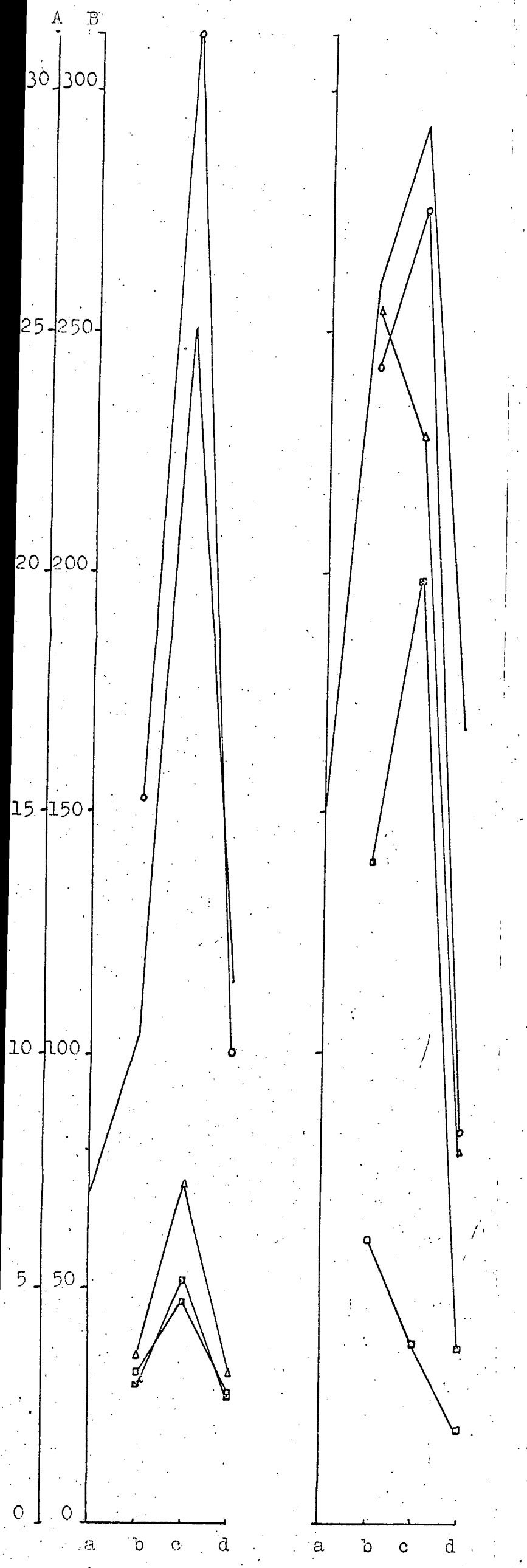
FIGURE 5.4 contd.

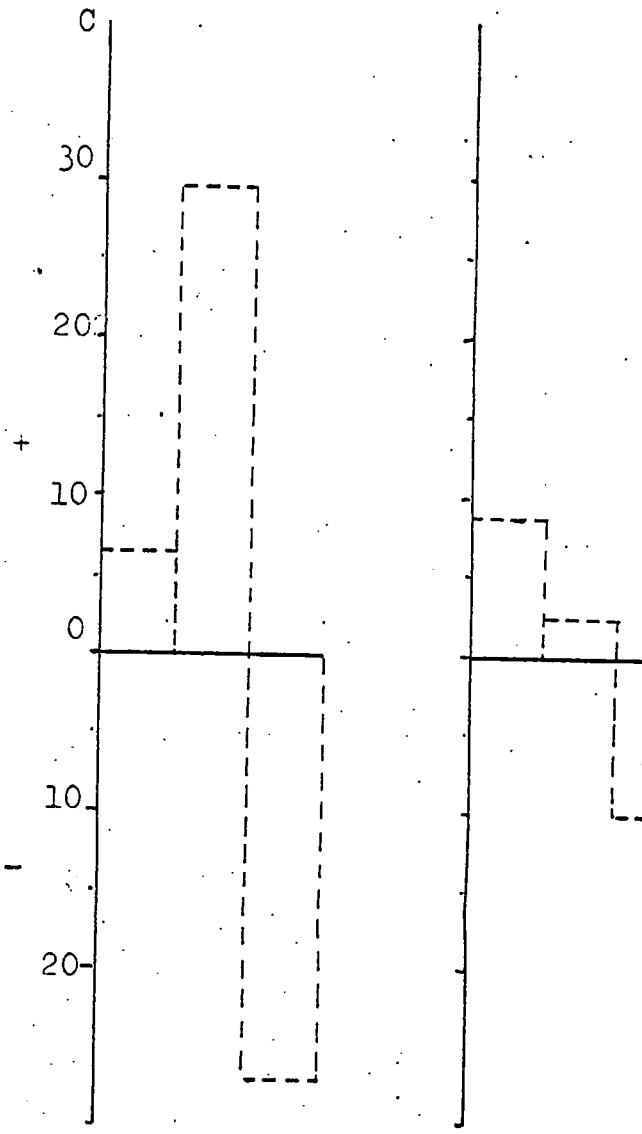
Anthoxanthum odoratum



Bromus mollis

FIGURE 5.5



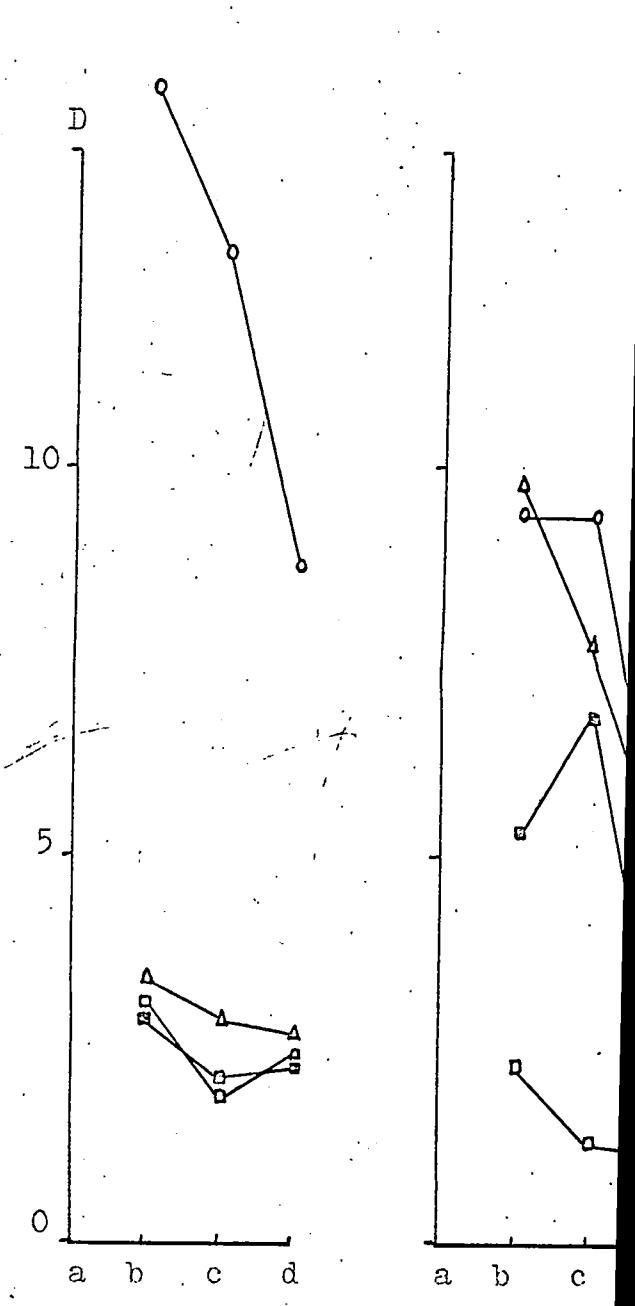



FIGURE 5.6

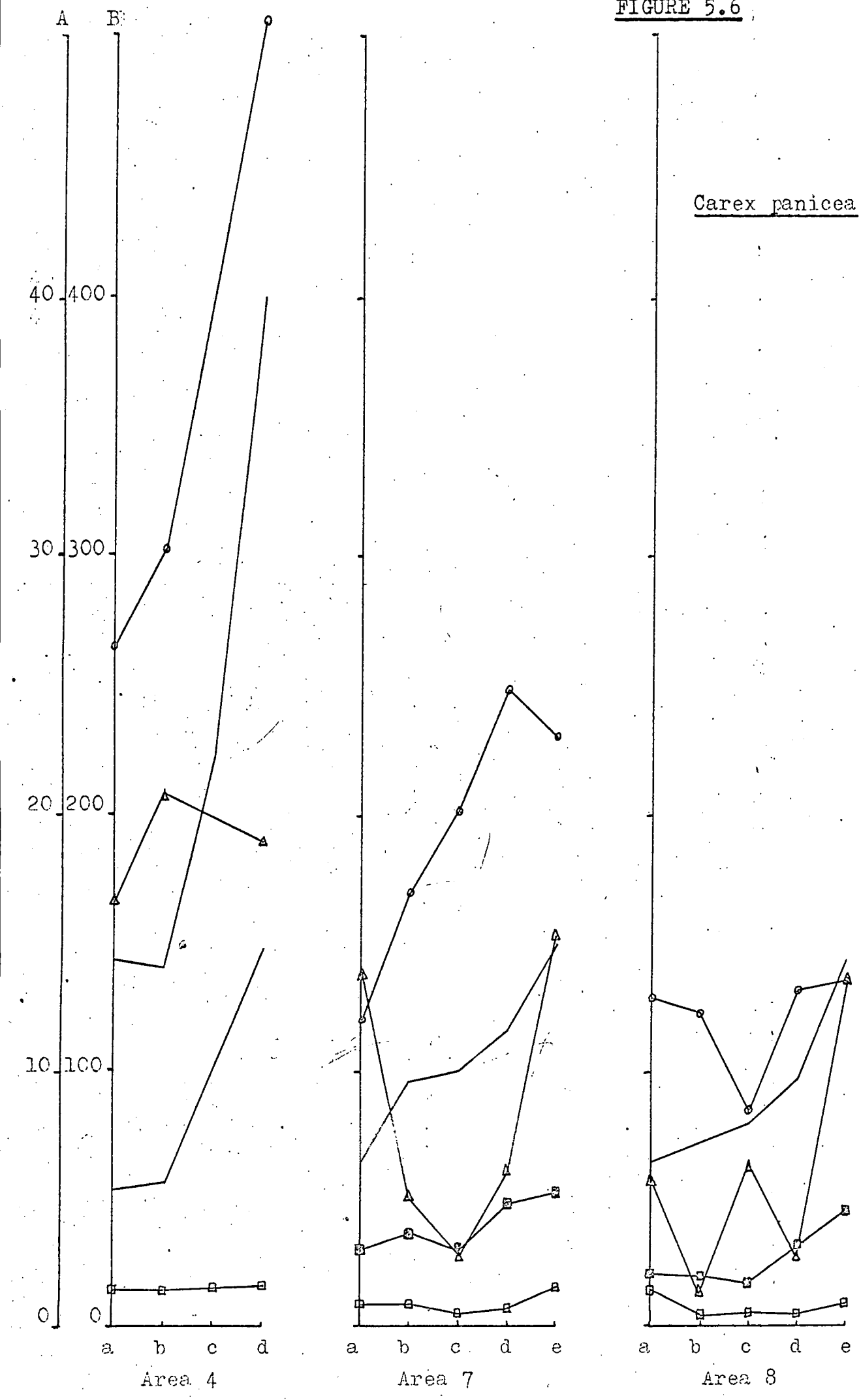

A
B
Carex panicea
40
400
30
300
20
200
10
100
0
0
a b c d
a b c d e
a b c d e
Area 4
Area 7
Area 8

FIGURE 5.6 contd.

Carex panicea

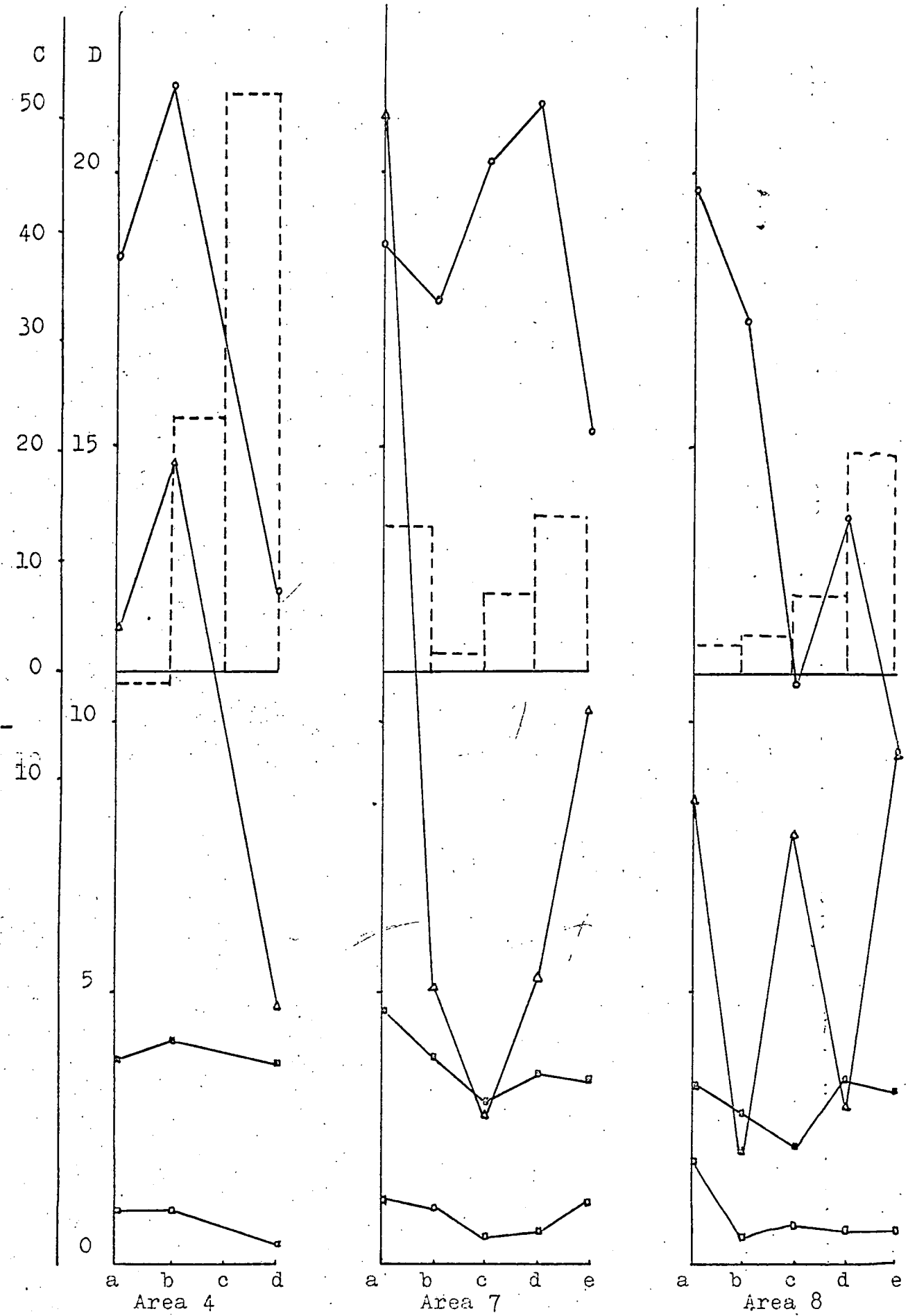


FIGURE 5.7

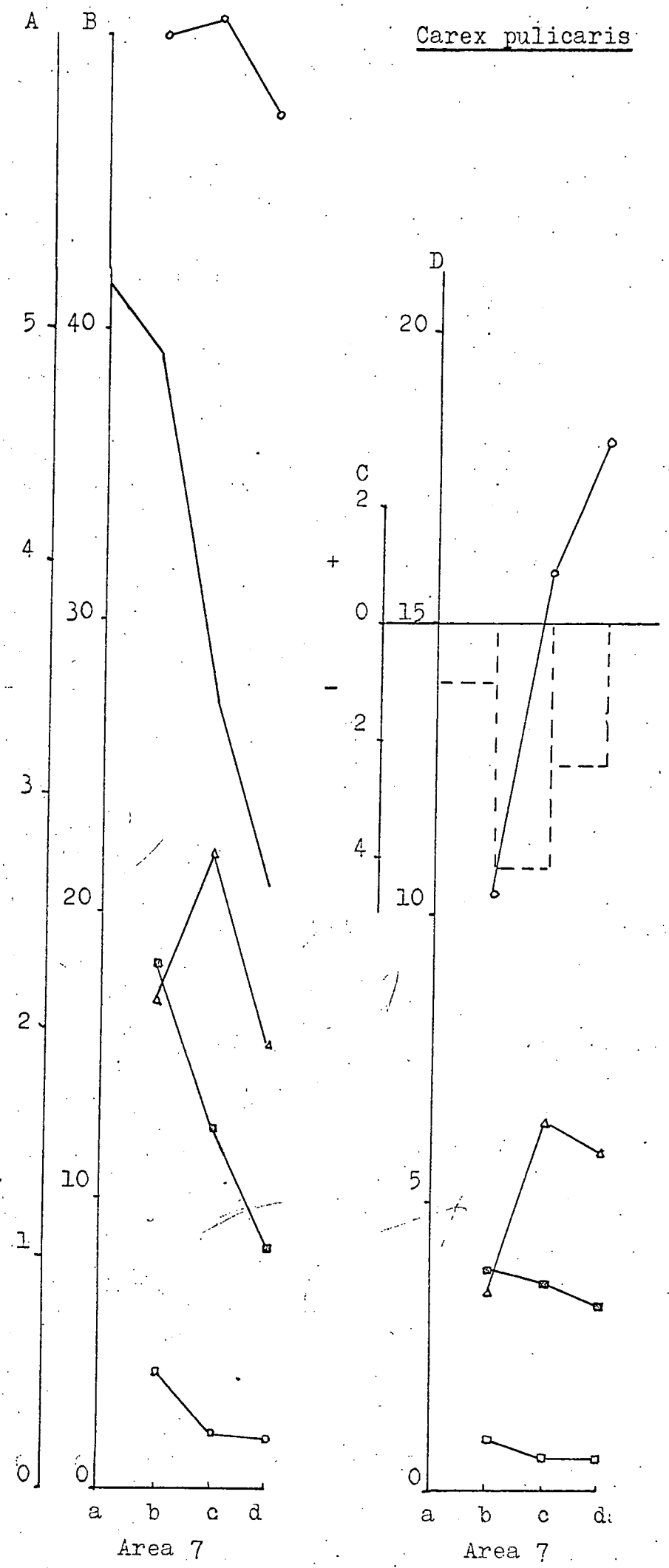

Carex pulicaris
A
B
5
40
4
30
3
20
2
10
1
0
0
a
b
c
d
Area 7
D
C
20
2
+
0
15
-
2
4
10
5
0
a
b
c
d
Area 7

FIGURE 5.8

Cerastium holosteodes

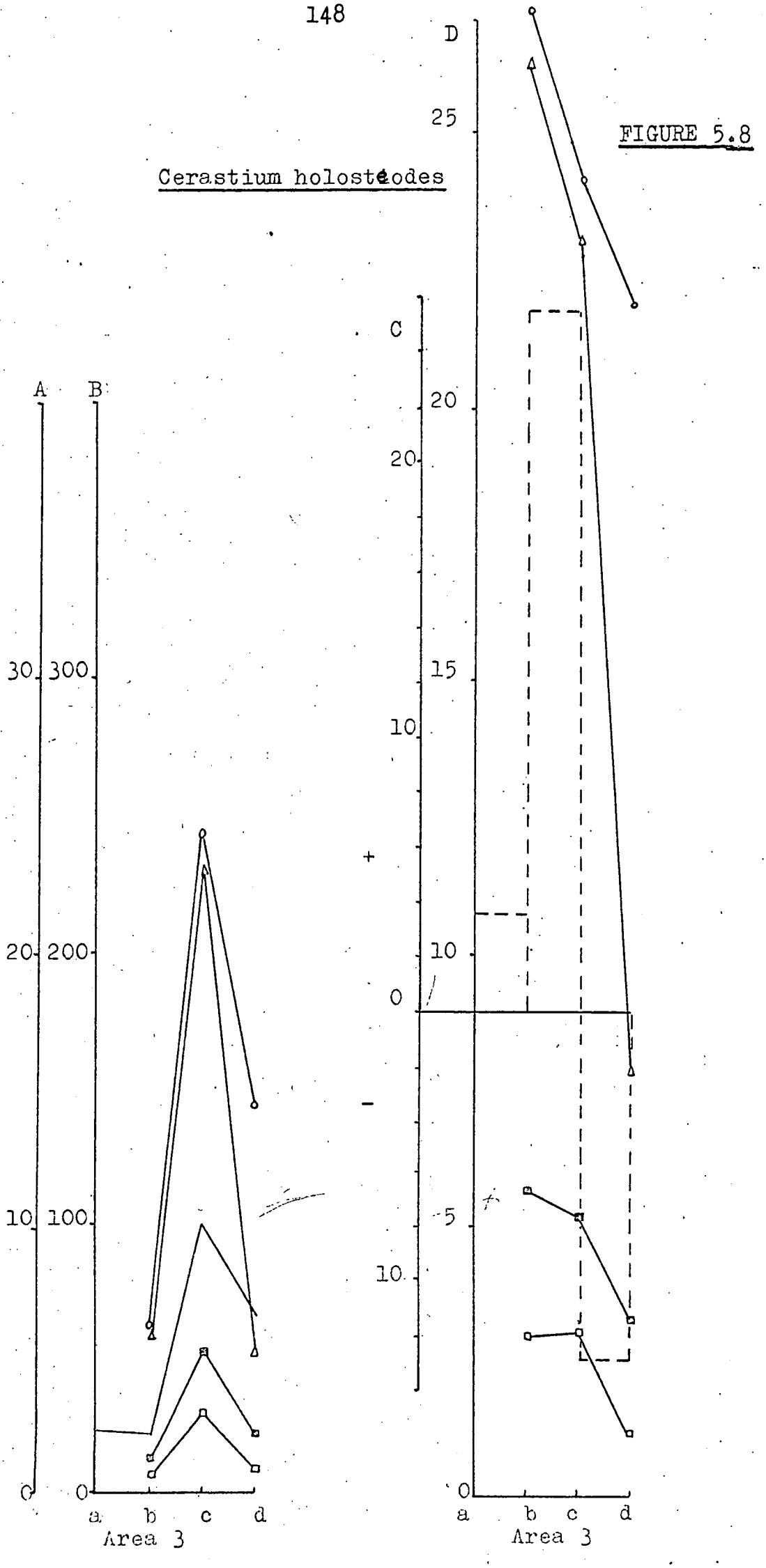


FIGURE 5.9

Cynosaurus cristatus

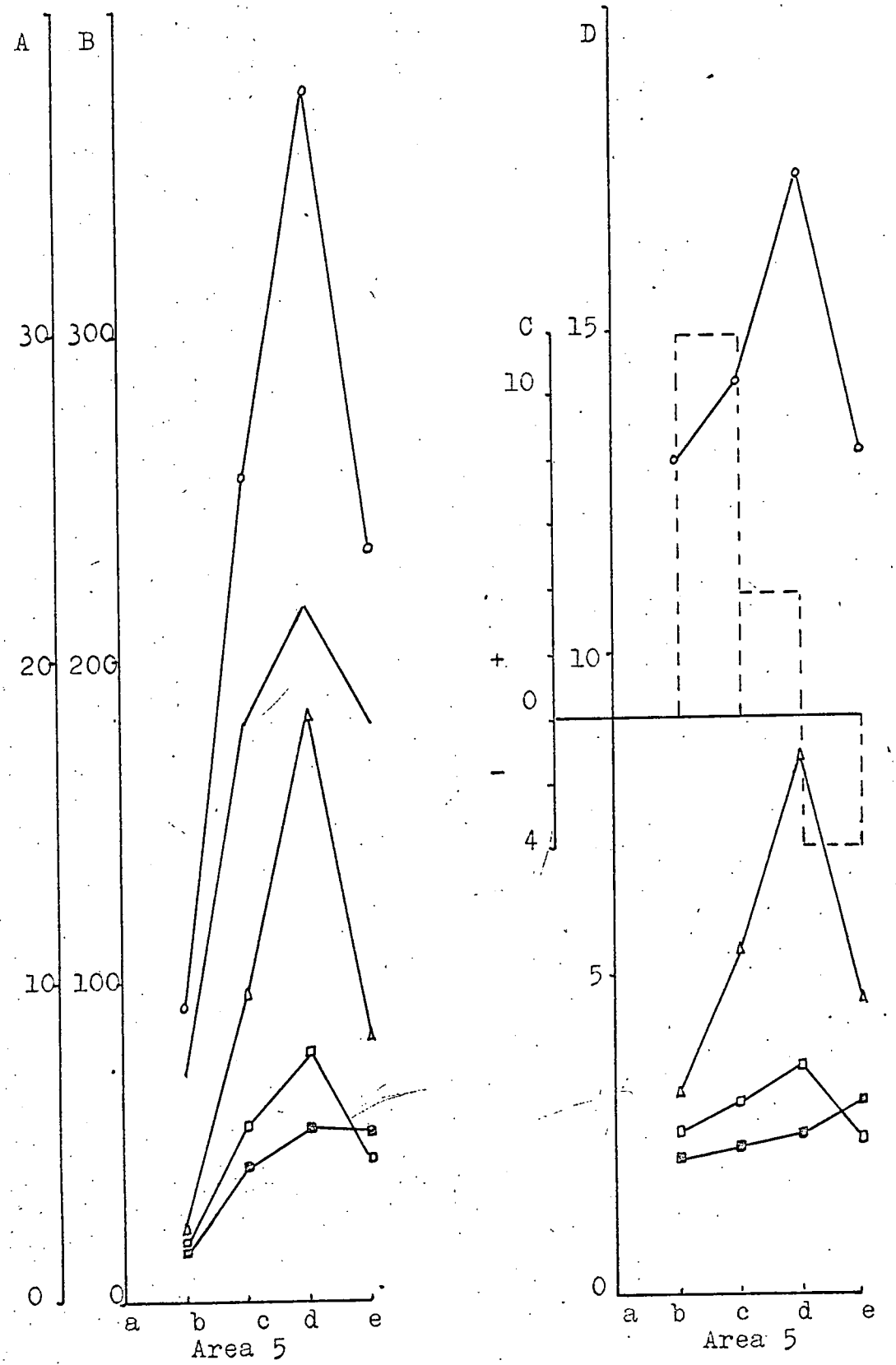


FIGURE 5.10

Eriophorum angustifolium

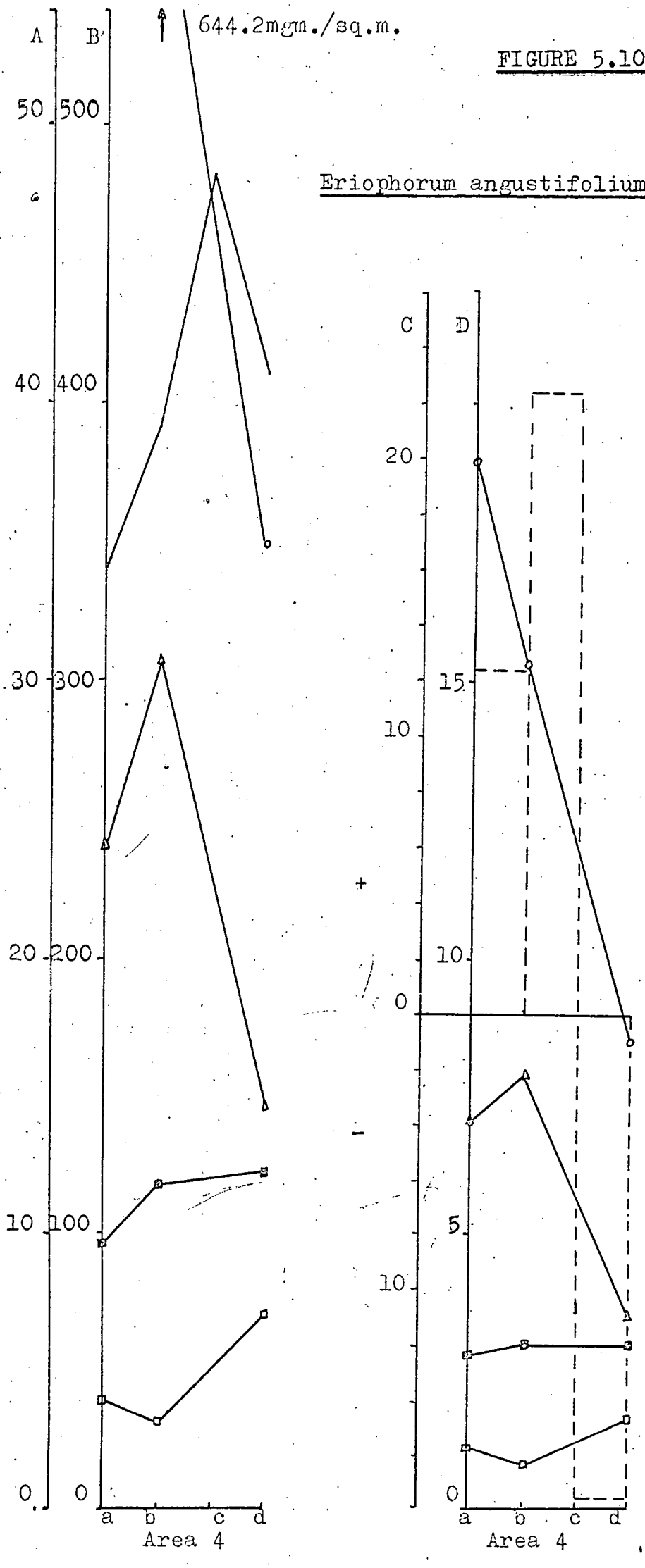
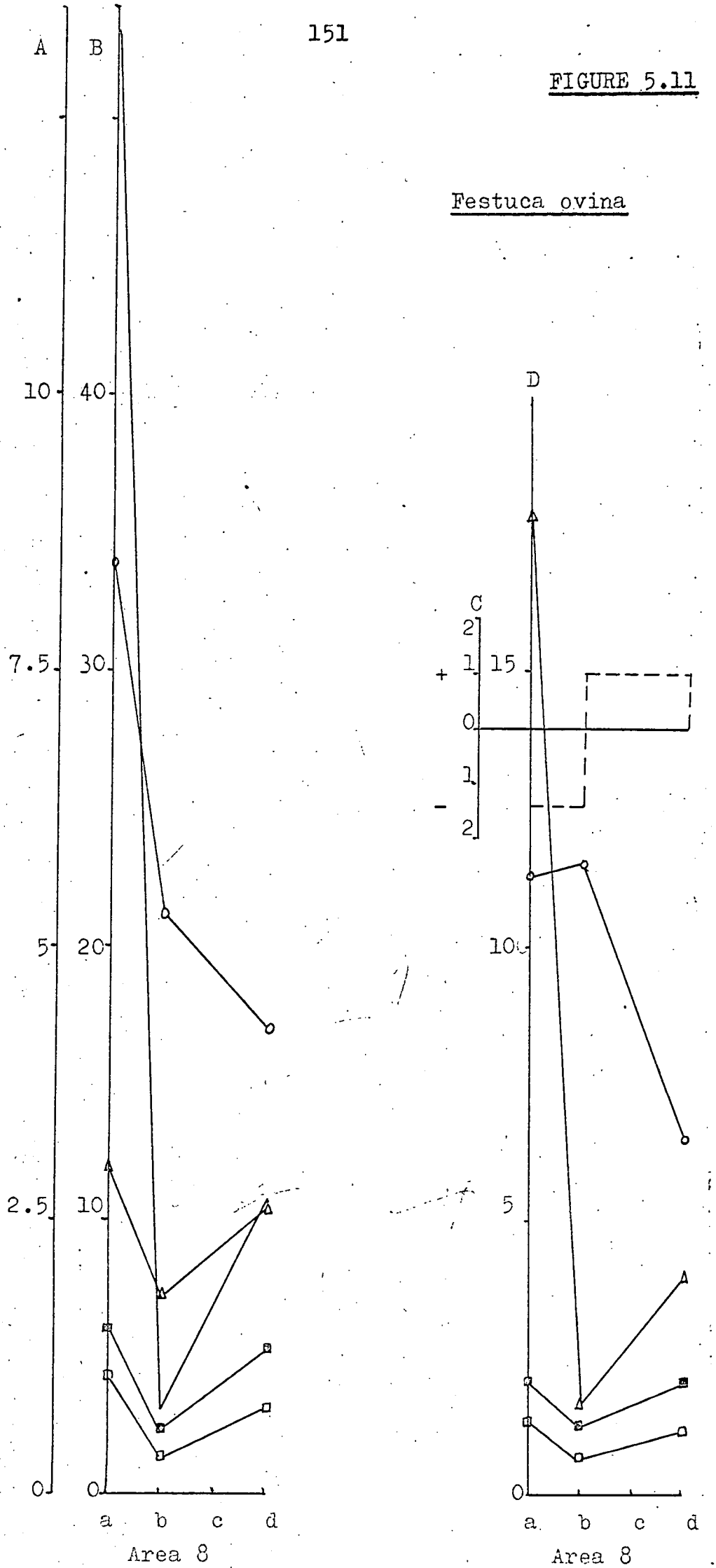


FIGURE 5.11

Festuca ovina



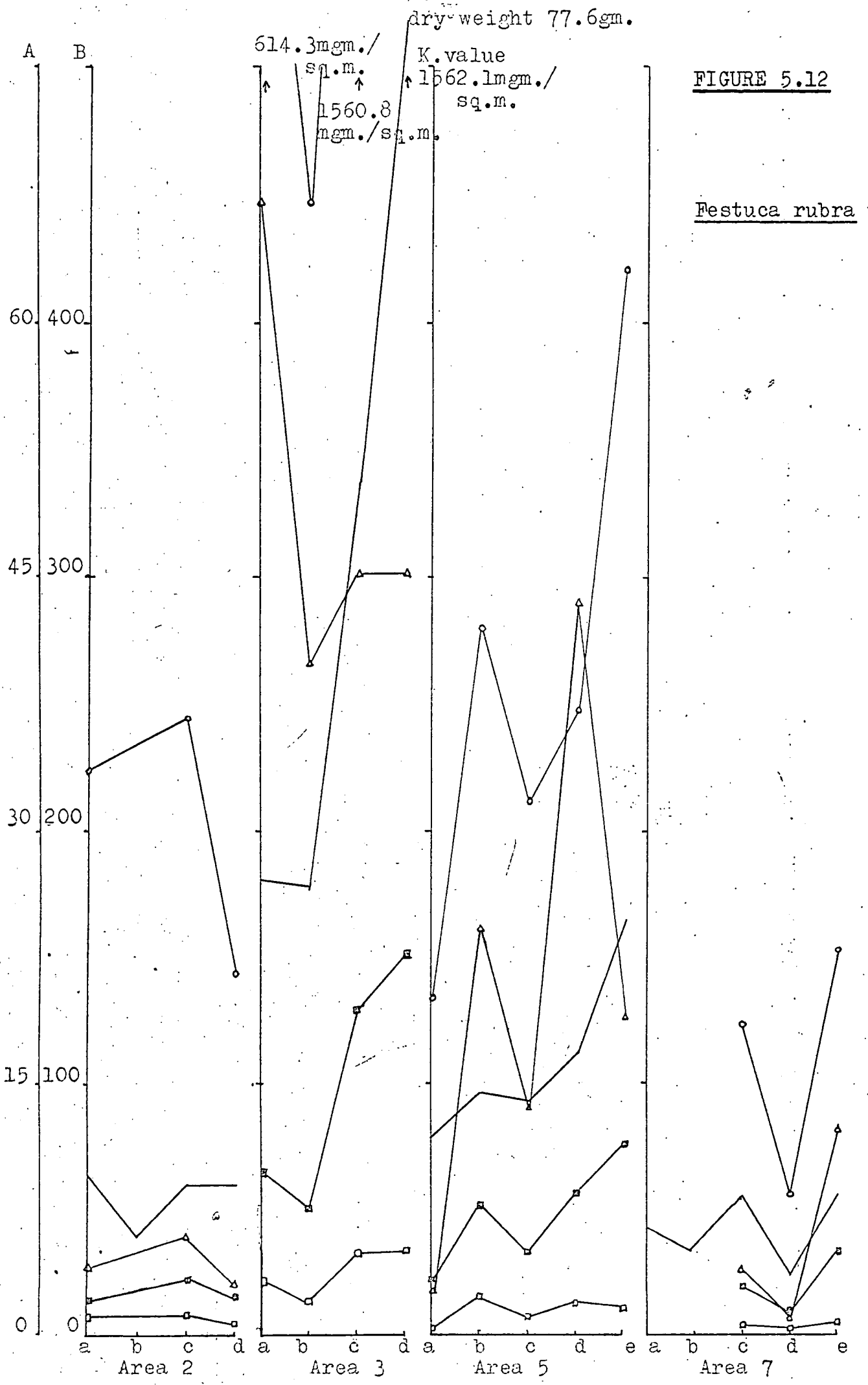



FIGURE 5.12

Festuca rubra

30.7mgm./gm.

FIGURE 5.12 contd.

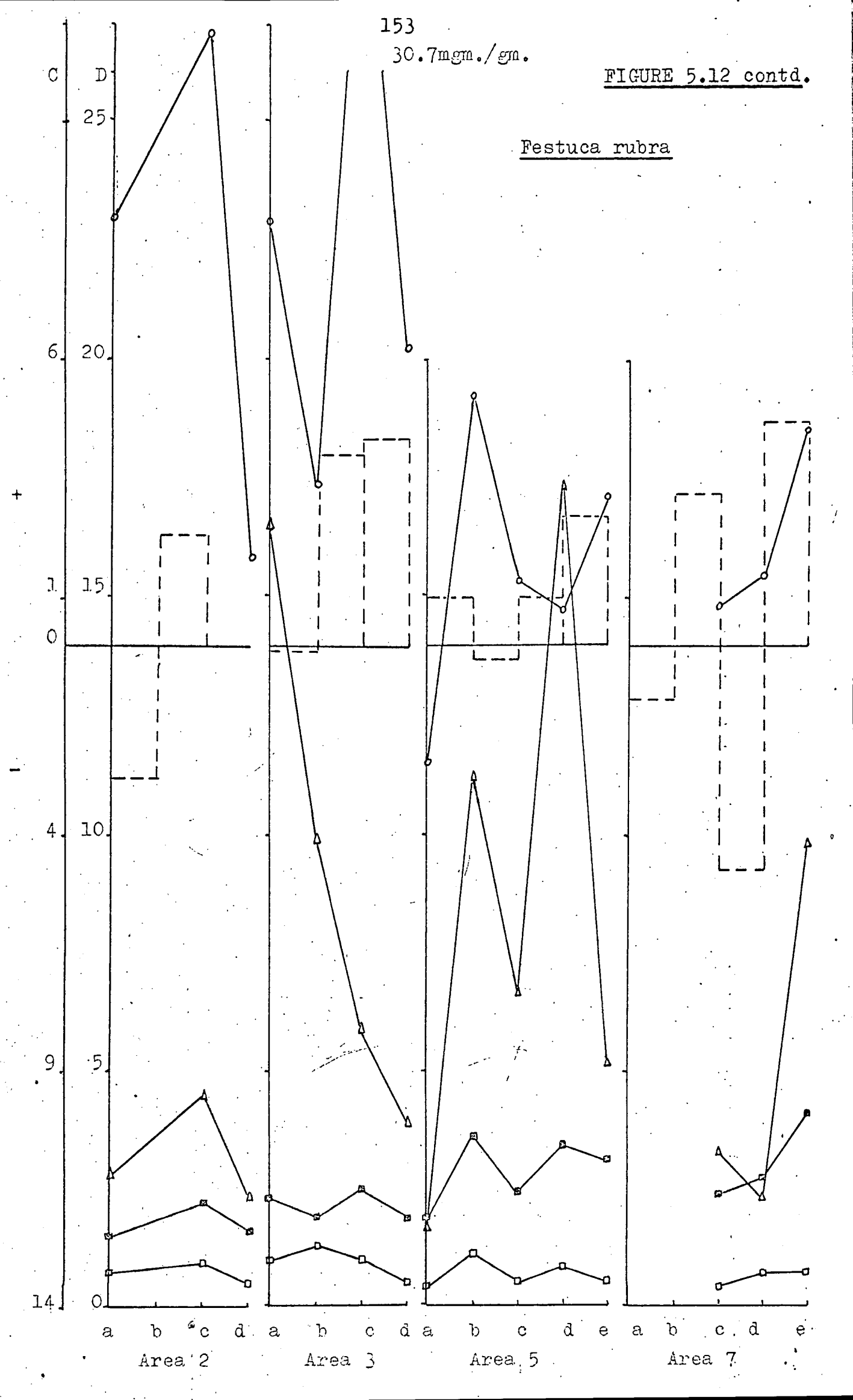
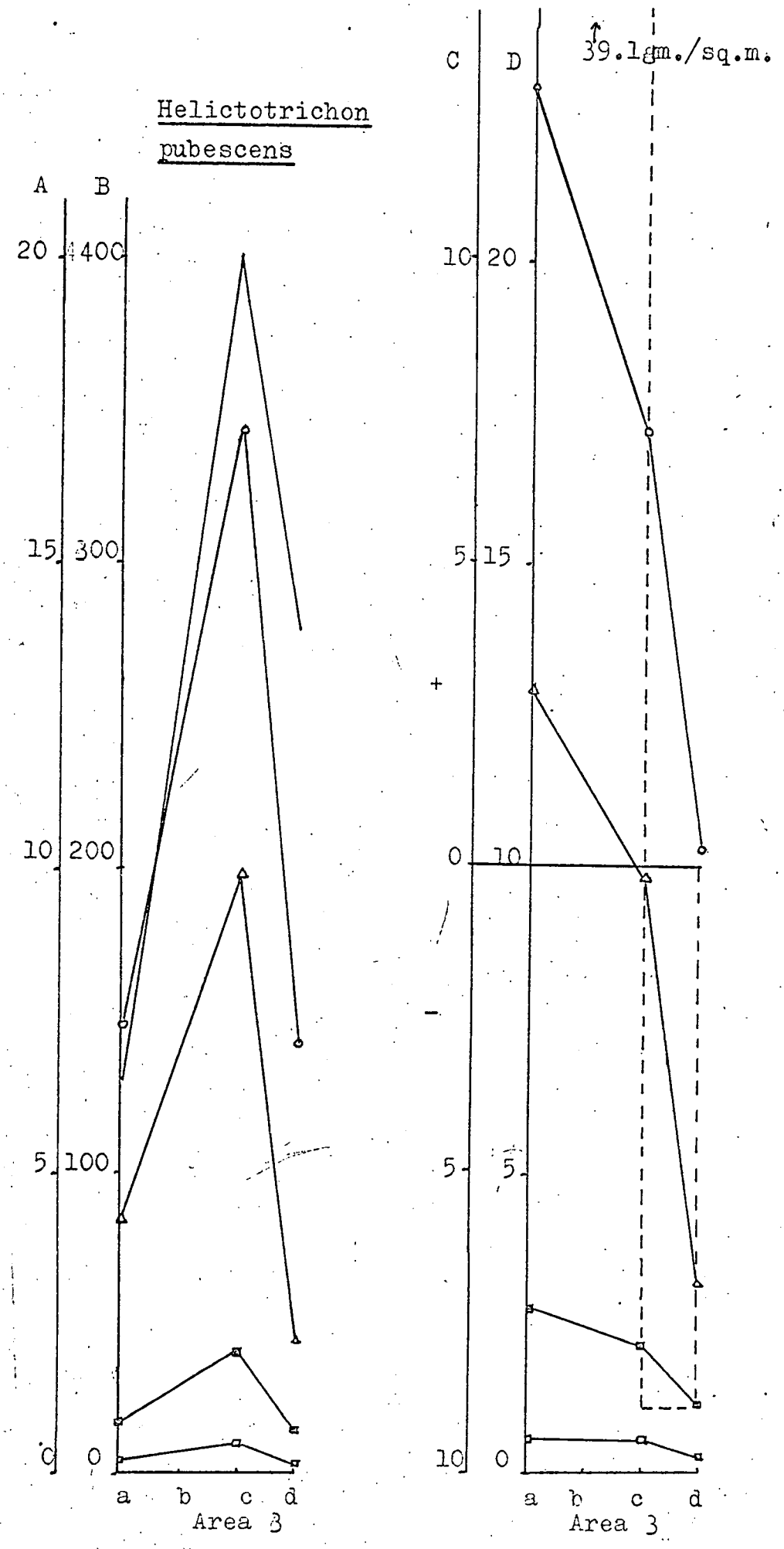


FIGURE 5.13


Helictotrichon pubescens
A
B
C
D
20
400
15
300
10
200
5
100
0
39.1gm./sq.m.
10
20
5
15
+
0
10
−
5
5
10
0
a
b
c
d
Area 3
a
b
c
d
Area 3

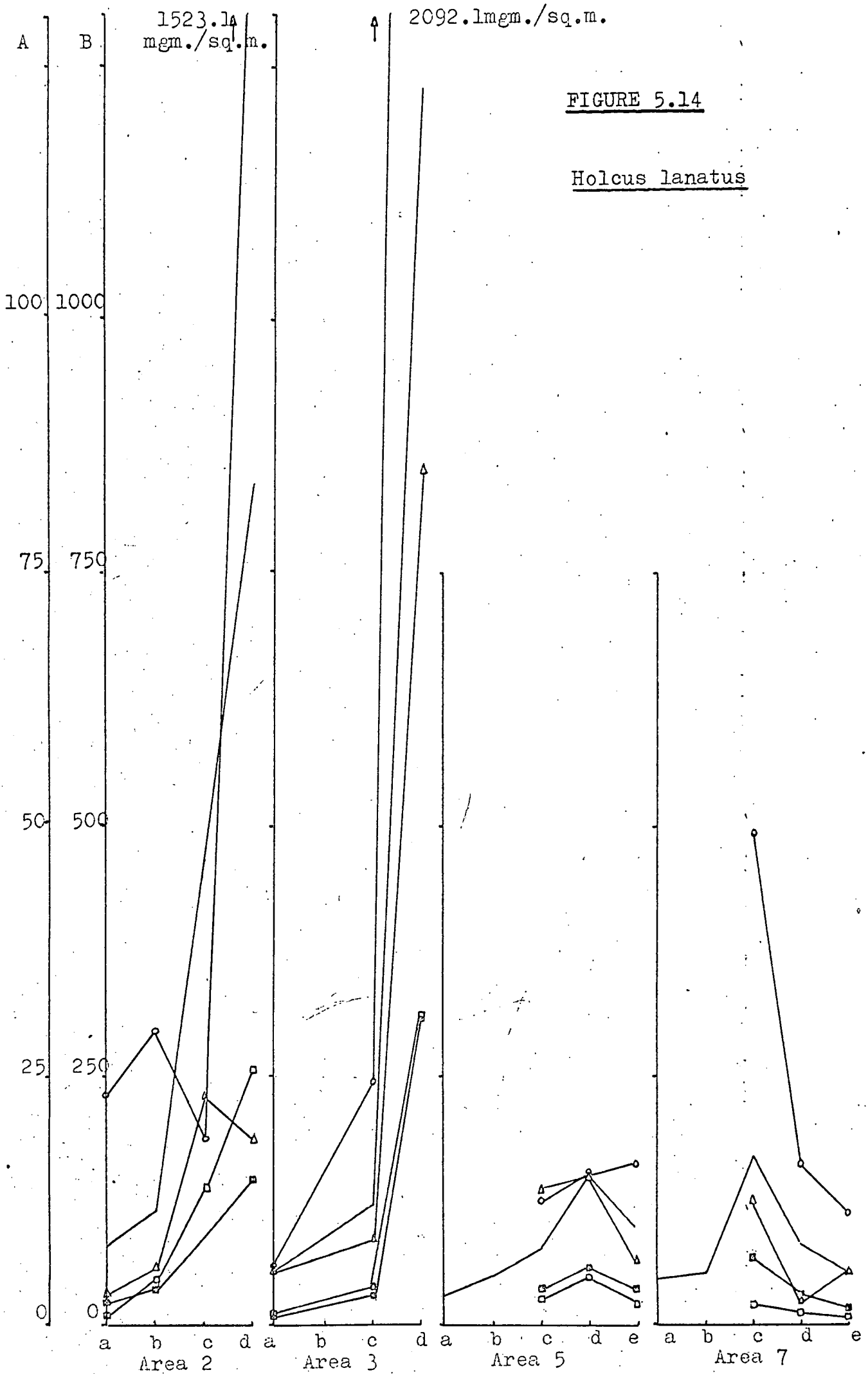



FIGURE 5.14

Holcus lanatus

FIGURE 5.14 contd.

Holcus lanatus

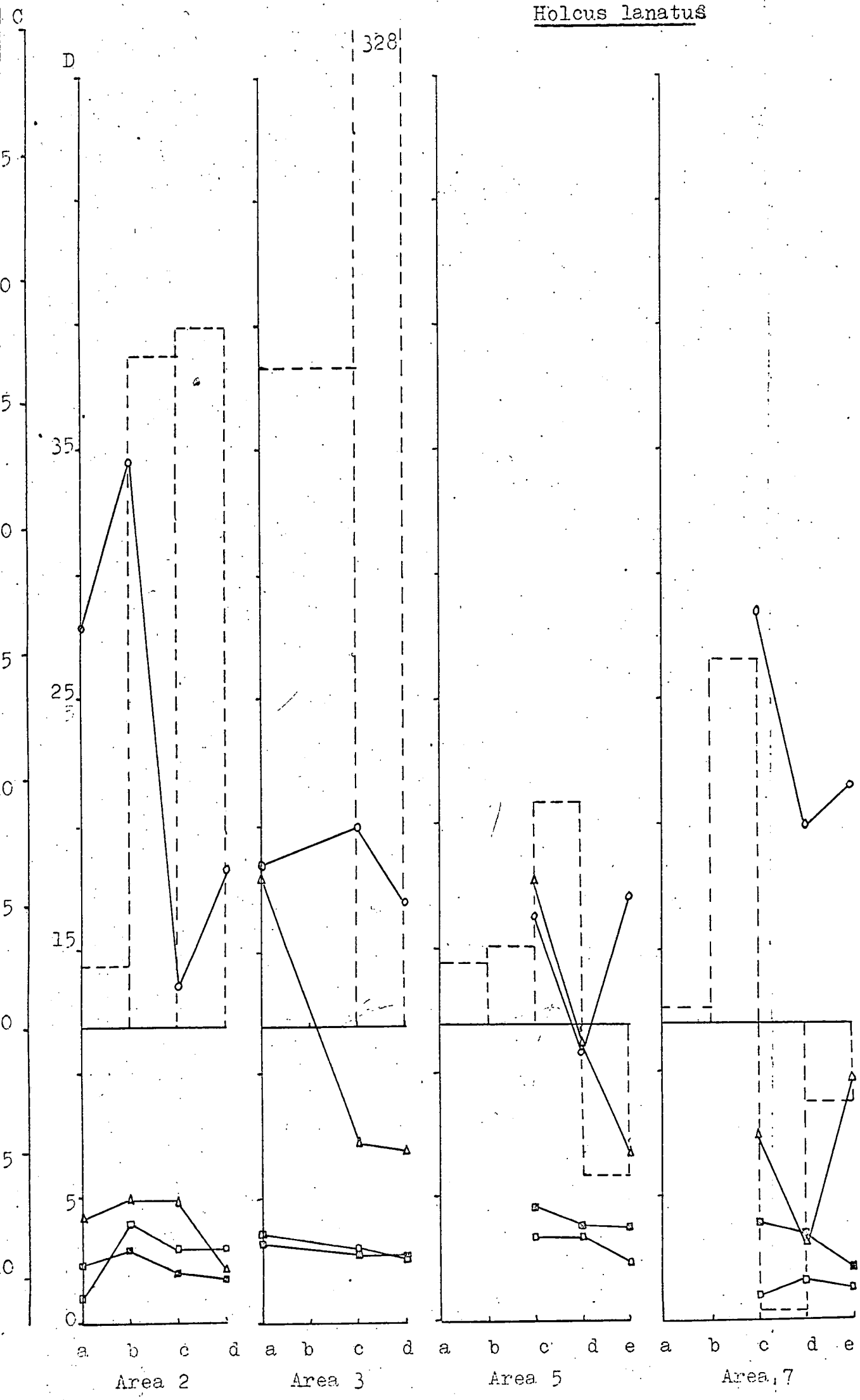


FIGURE 5.15

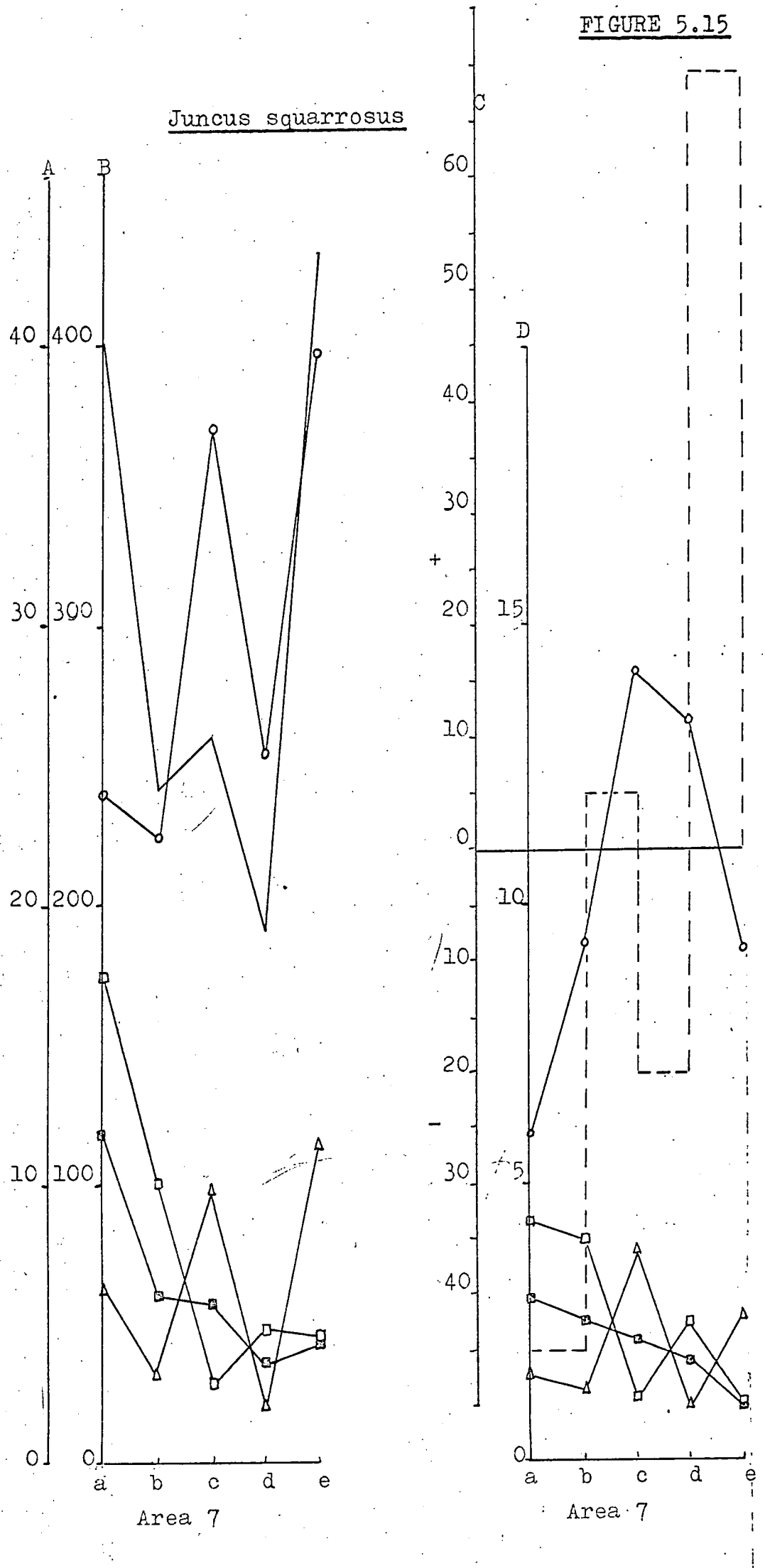

Juncus squarrosus
A
B
C
D
40
400
30
300
20
200
10
100
0
0
60
50
40
30
20
15
10
0
10
10
20
30
5
40
+
−
a
b
c
d
e
Area 7
Area 7

FIGURE 5.16

Molinia caerulea

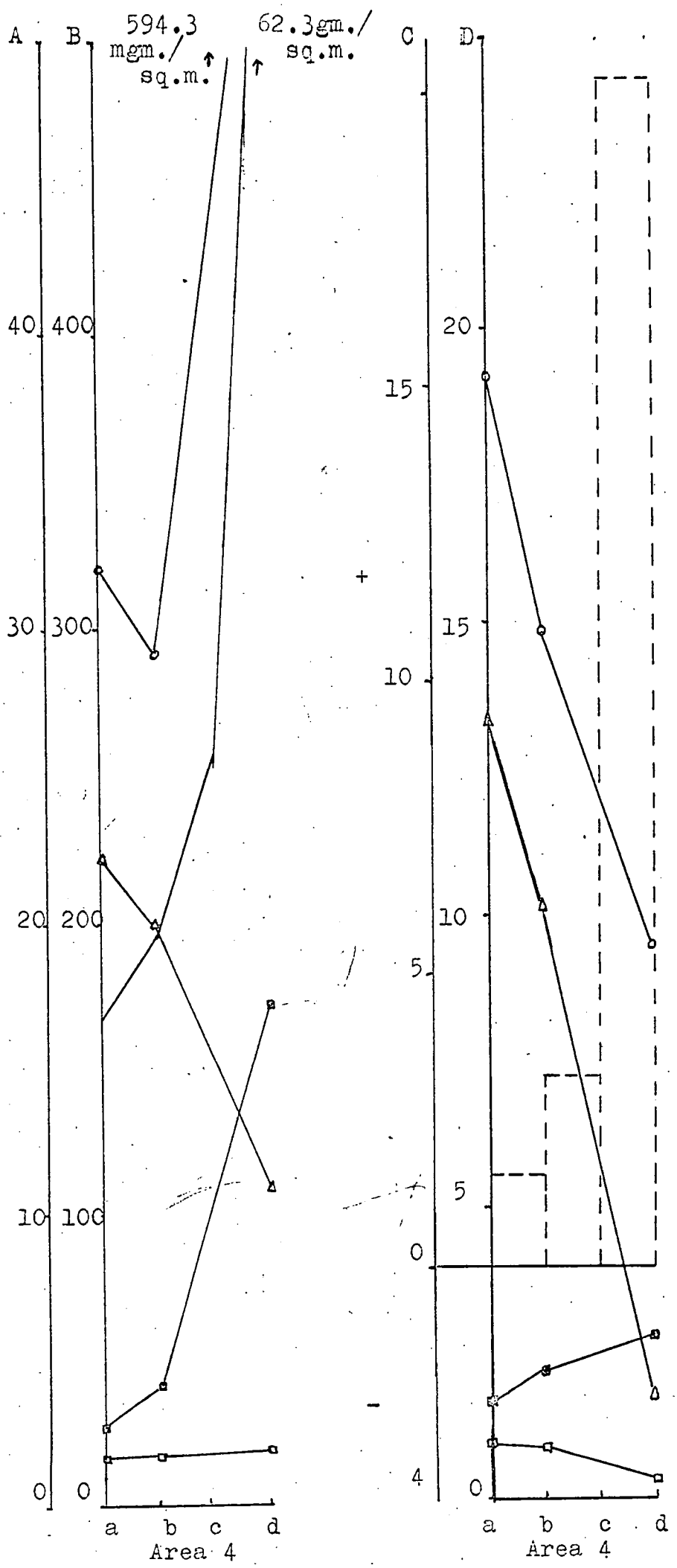


FIGURE 5.17

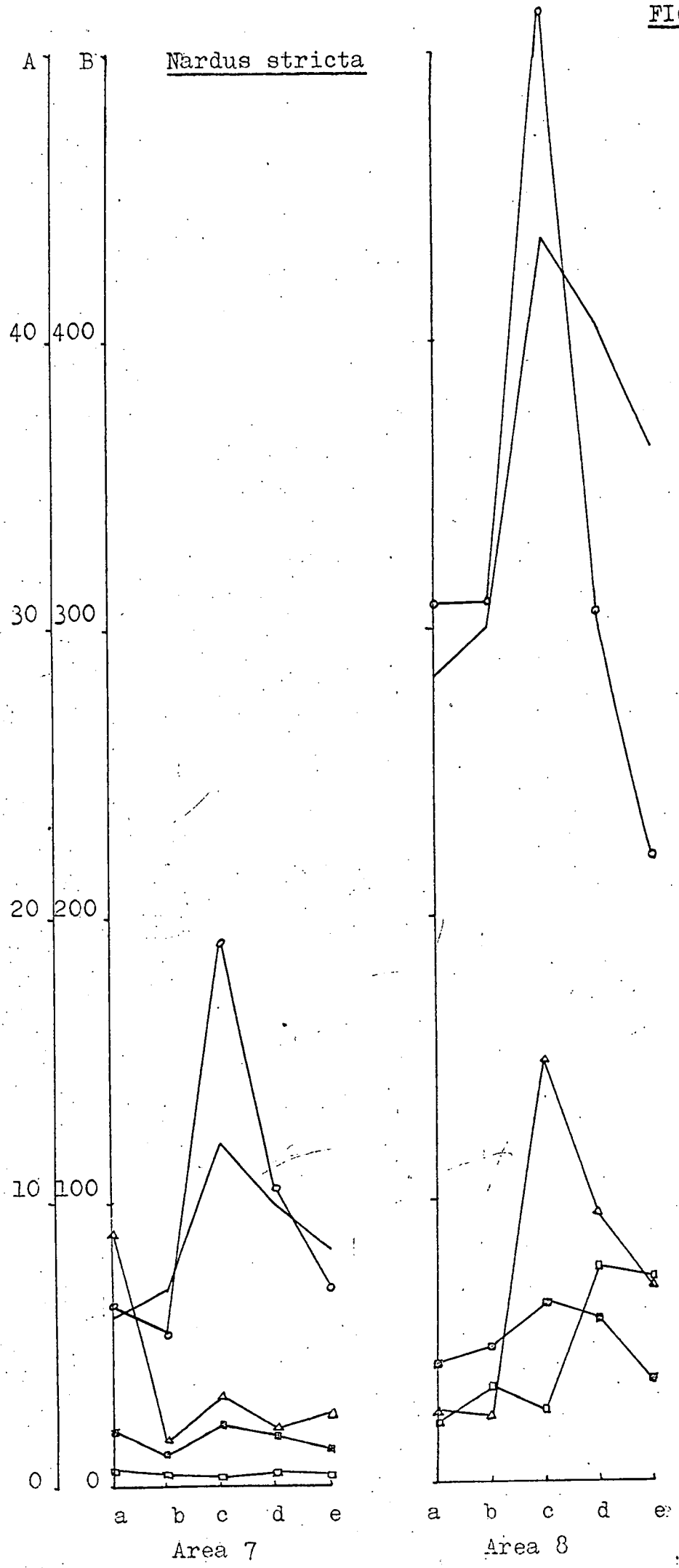

Nardus stricta
A
B
40
400
30
300
20
200
10
100
0
0
a b c d e
Area 7
a b c d e
Area 8

FIGURE 5.17 contd.

Nardus stricta

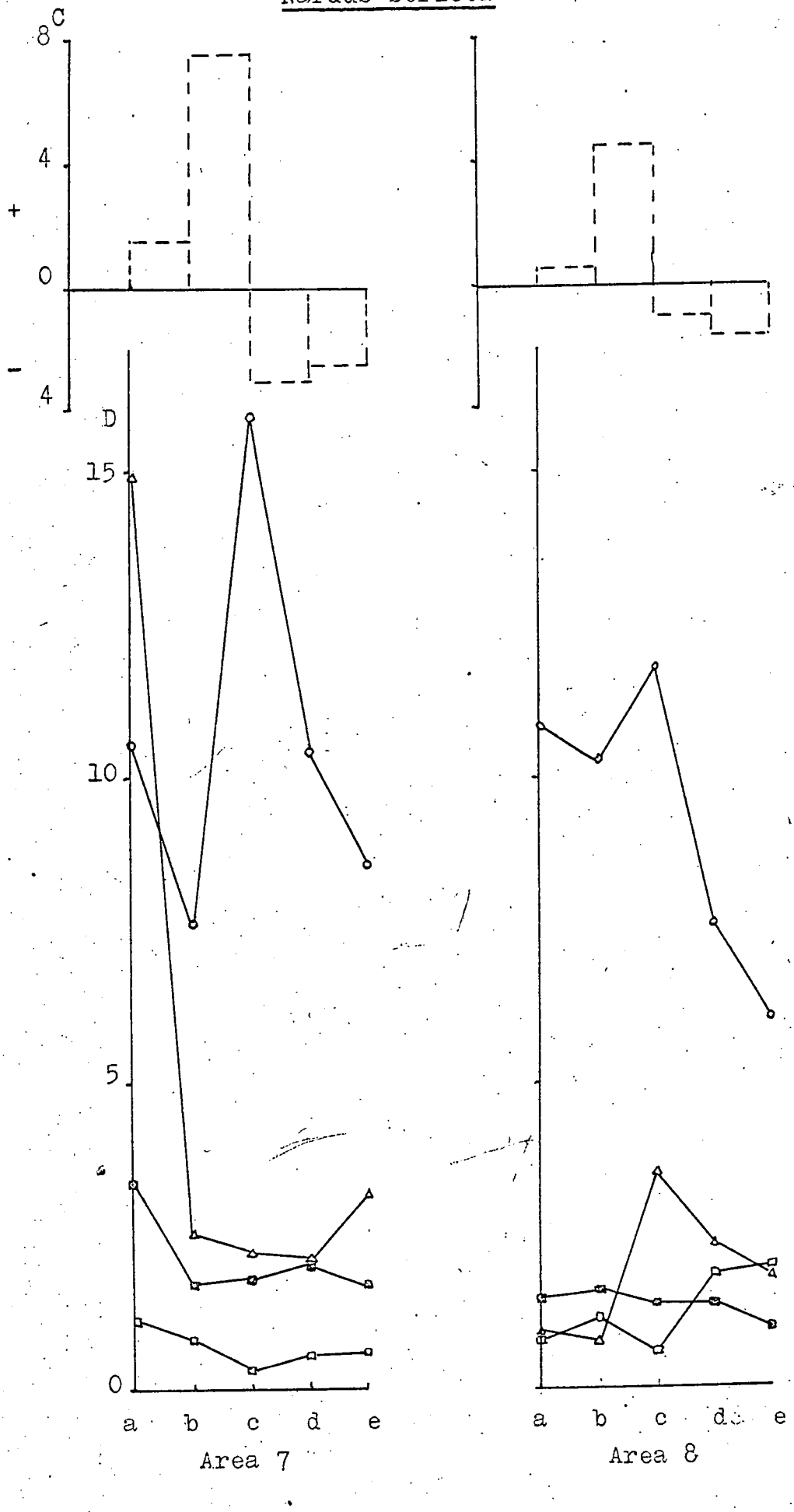
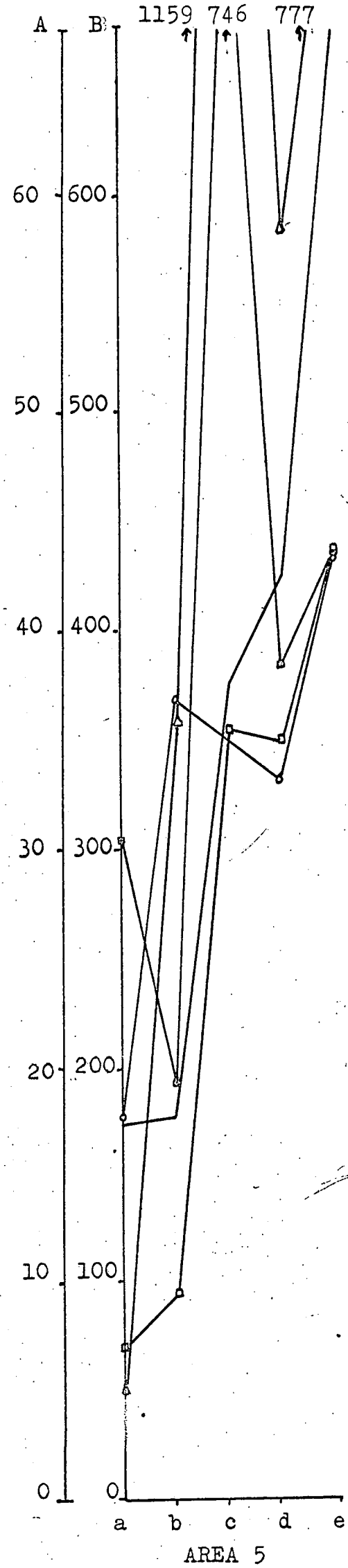


FIGURE 5.18

Plantago lanceolata



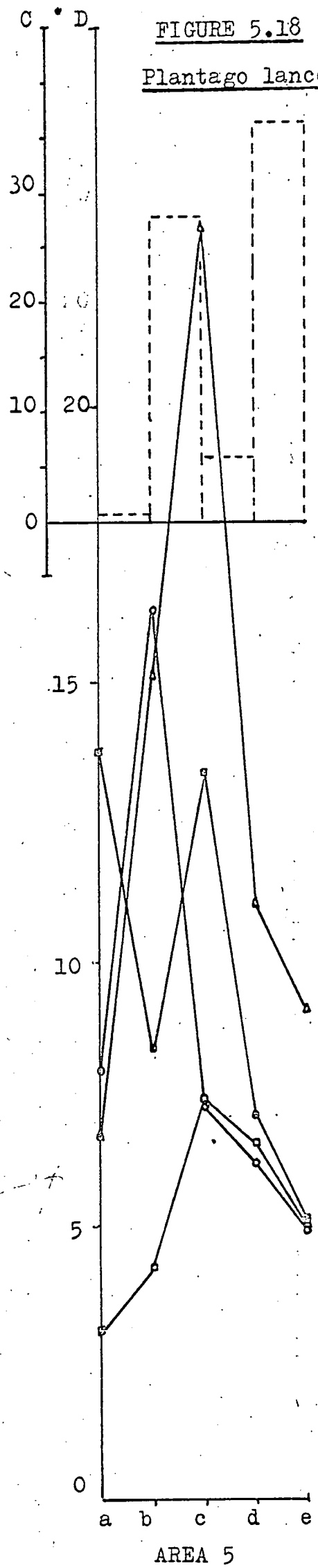



Figure 5.19

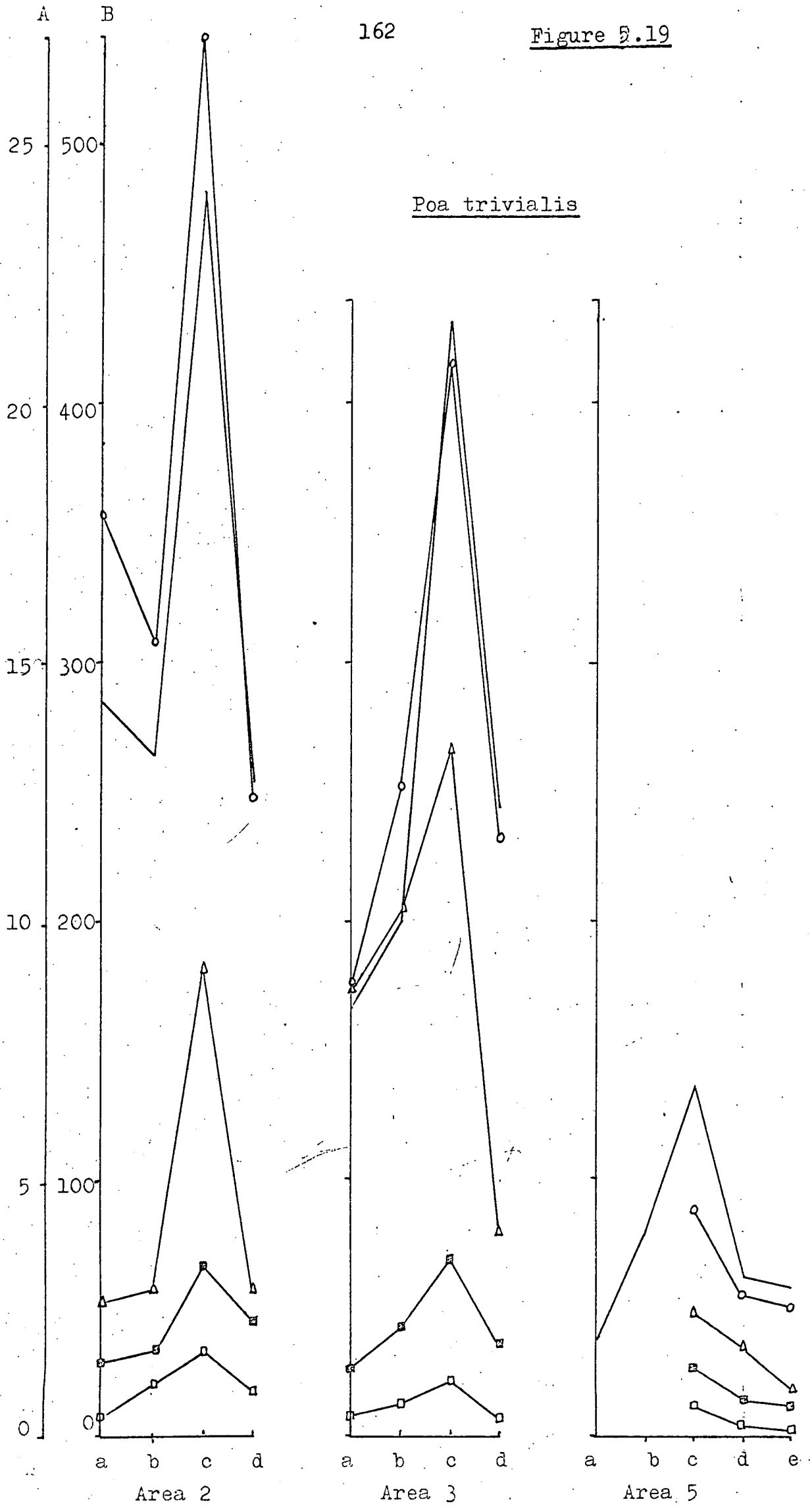

A
B
25
20
15
10
5
0
500
400
300
200
100
0
Poa trivialis
a b c d
Area 2
a b c d
Area 3
a b c d e
Area 5

Figure 5.19 contd.

Poa trivialis

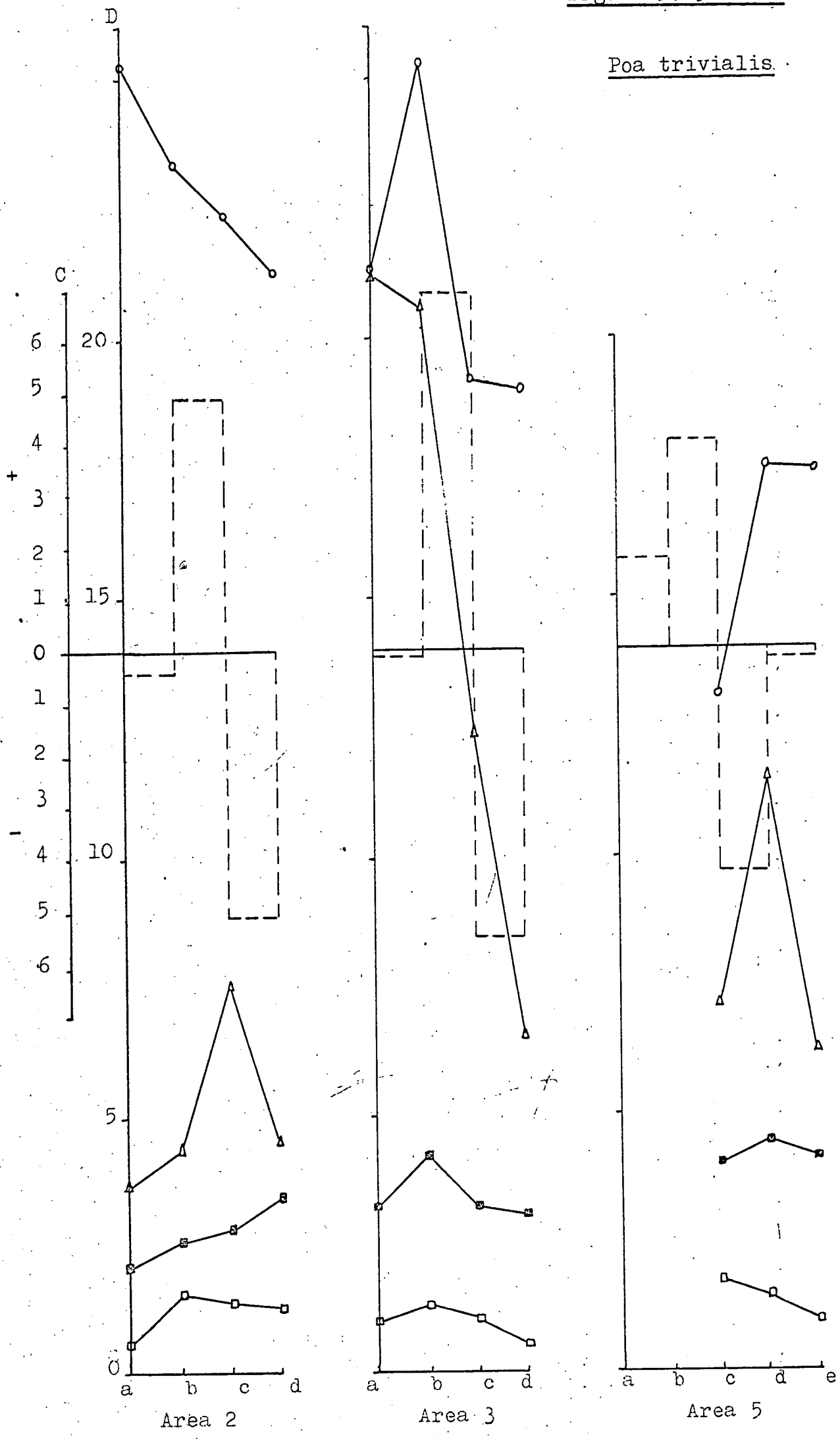


Figure 5.20 contd.

Ranunculus bulbosus

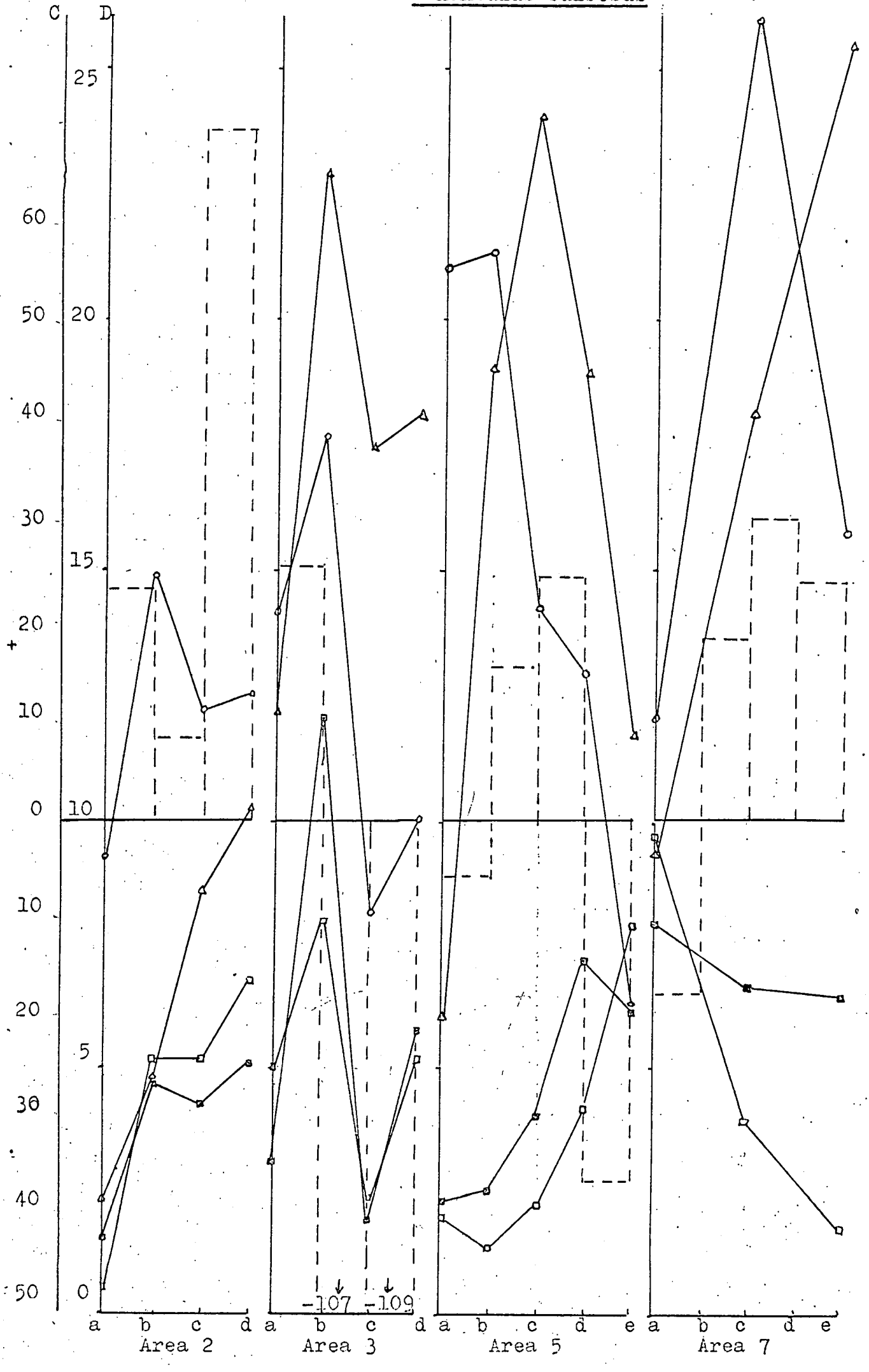


Figure 5.20

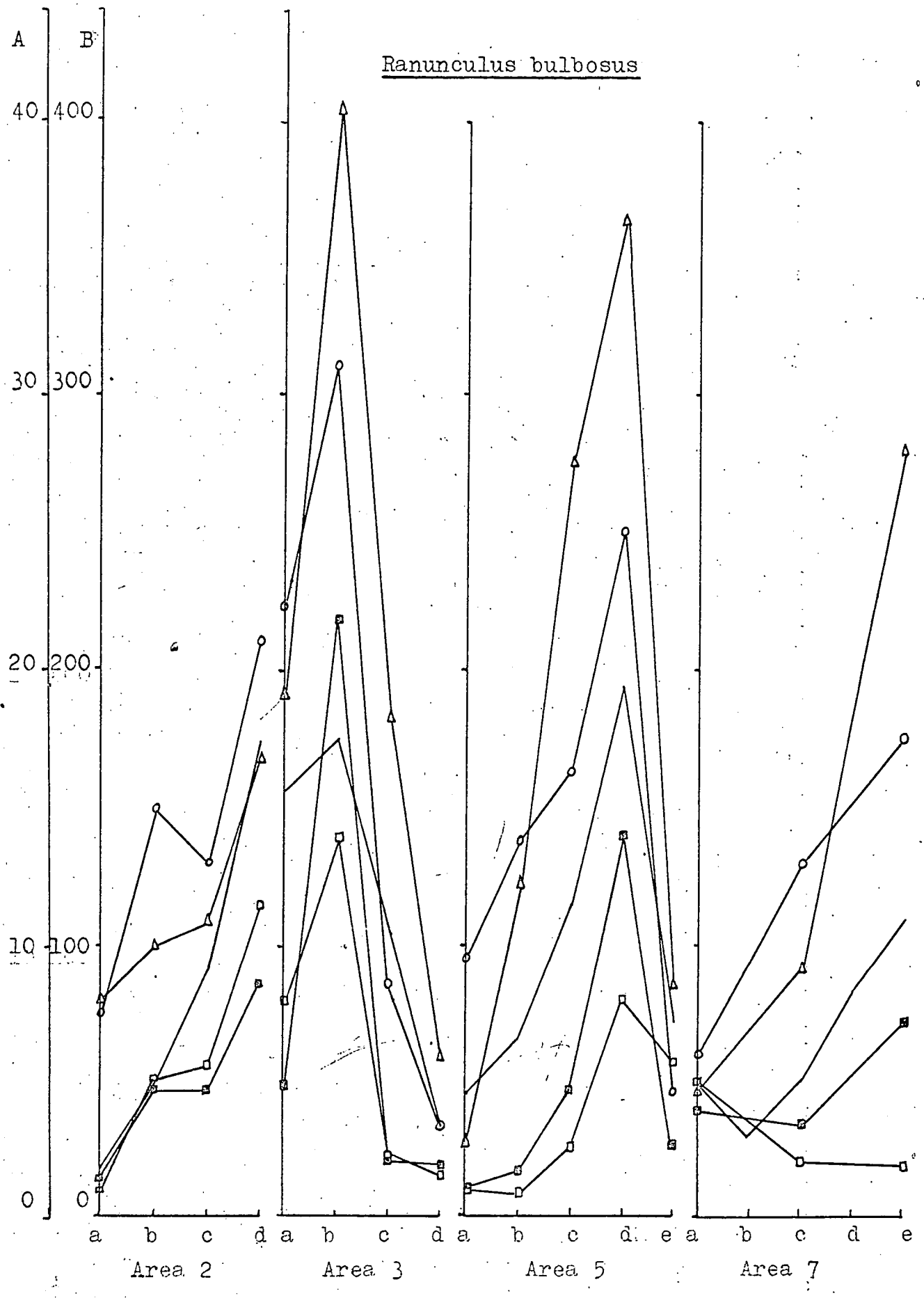
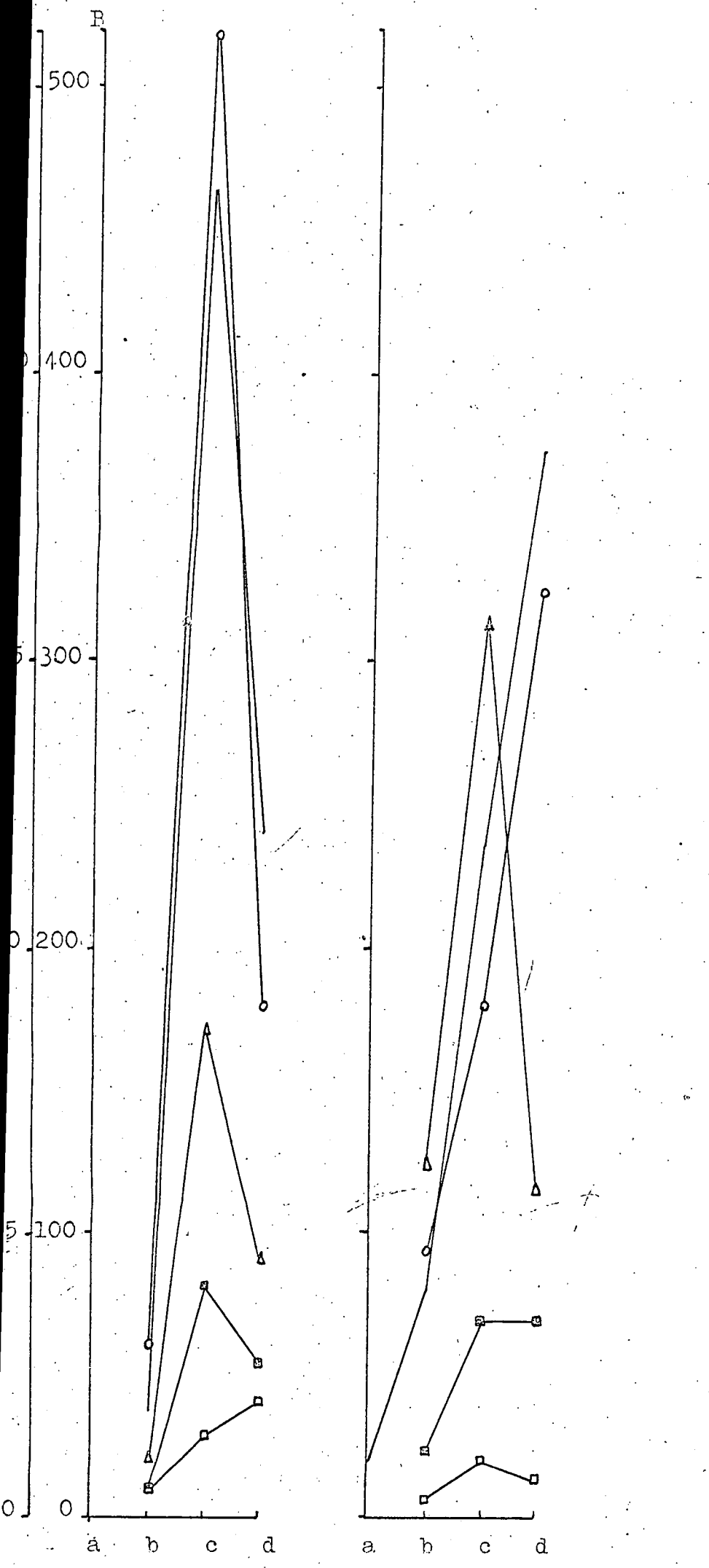

Ranunculus bulbosus
A
B
40
400
30
300
20
200
10
100
0
0
a b c d
Area 2
a b c d
Area 3
a b c d e
Area 5
a b c d e
Area 7

Figure 5.21

Rhinanthus minor



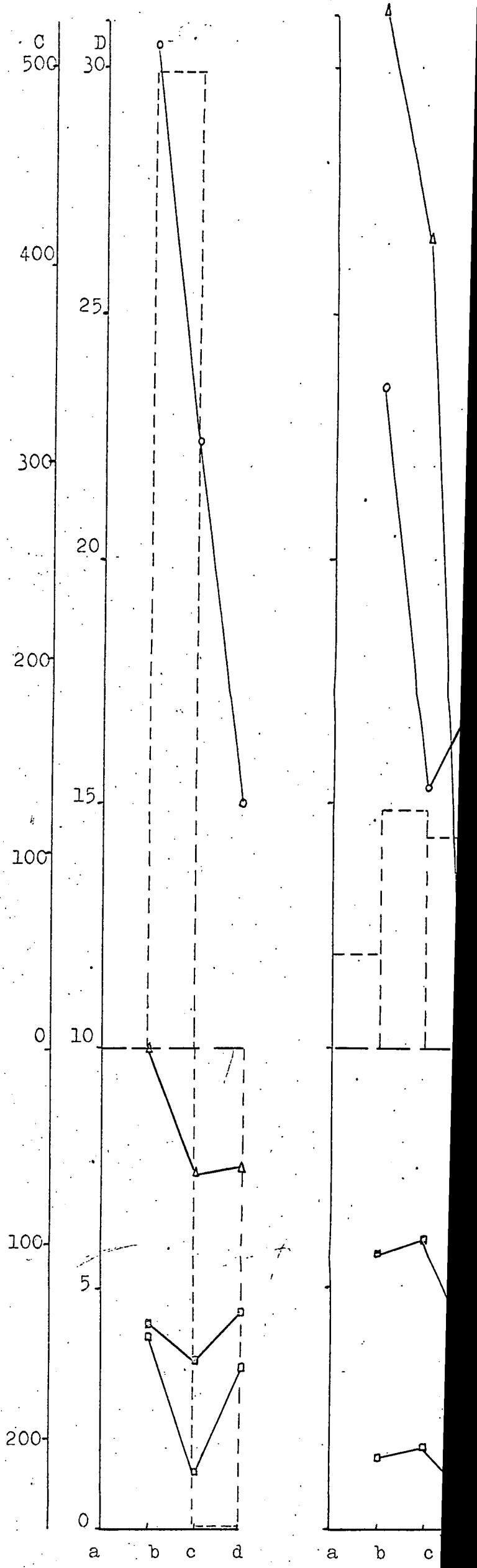



Figure 5.22

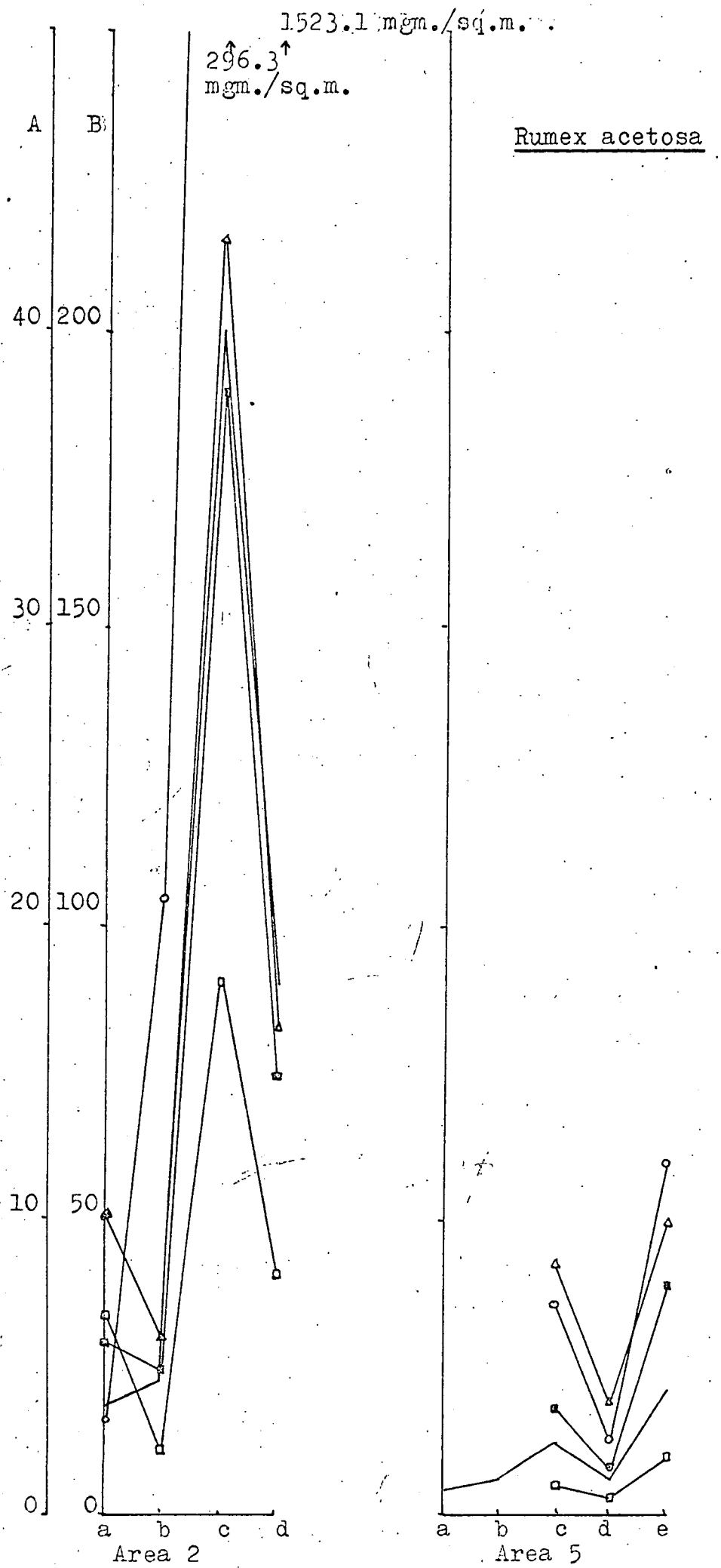

1523.1 mgm./sq.m.
296.3 mgm./sq.m.
A
B
Rumex acetosa
40
30
20
10
0
200
150
100
50
0
a b c d
Area 2
a b c d e
Area 5

Figure 5.22 contd.

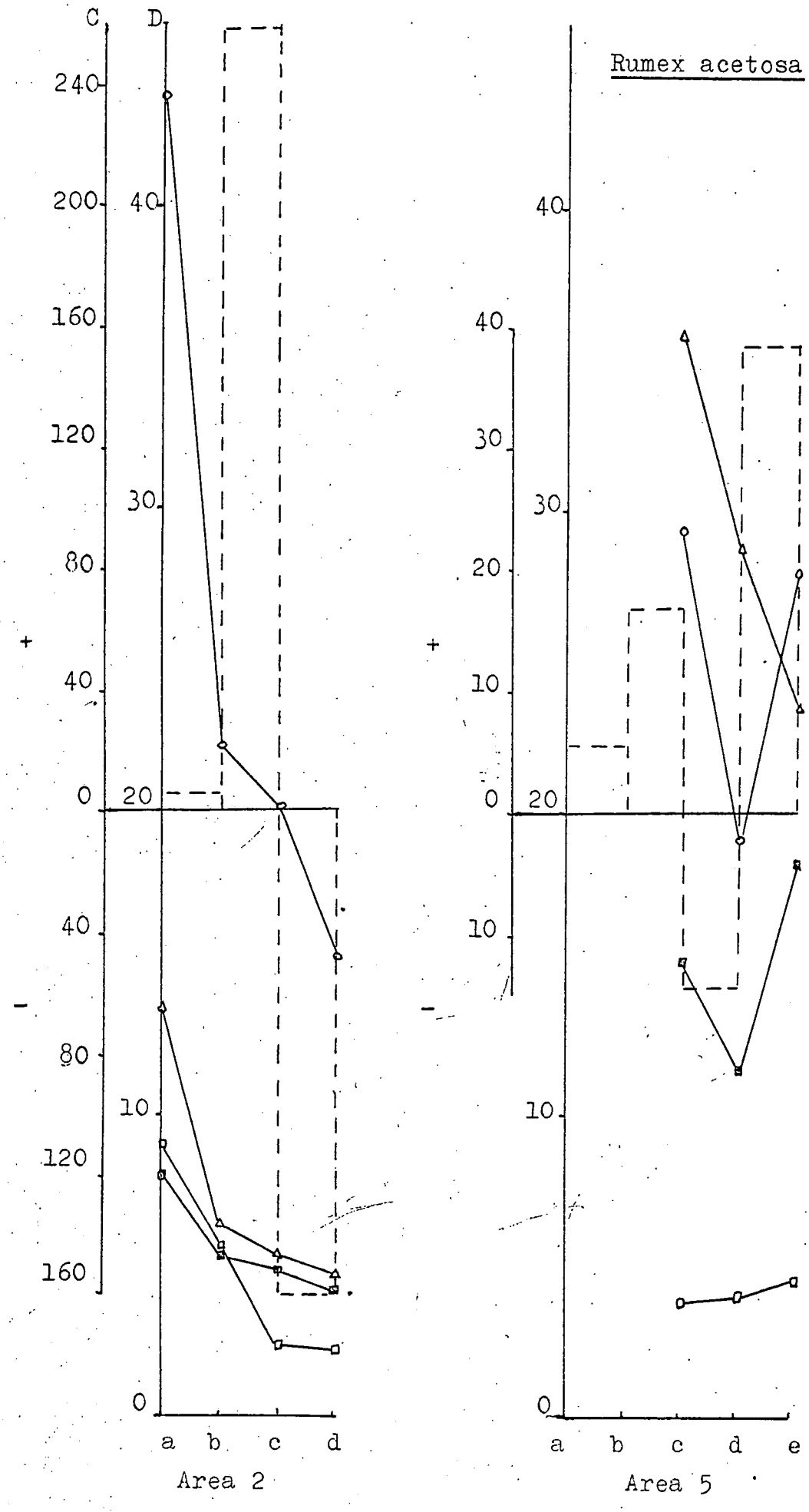


Figure 5.23

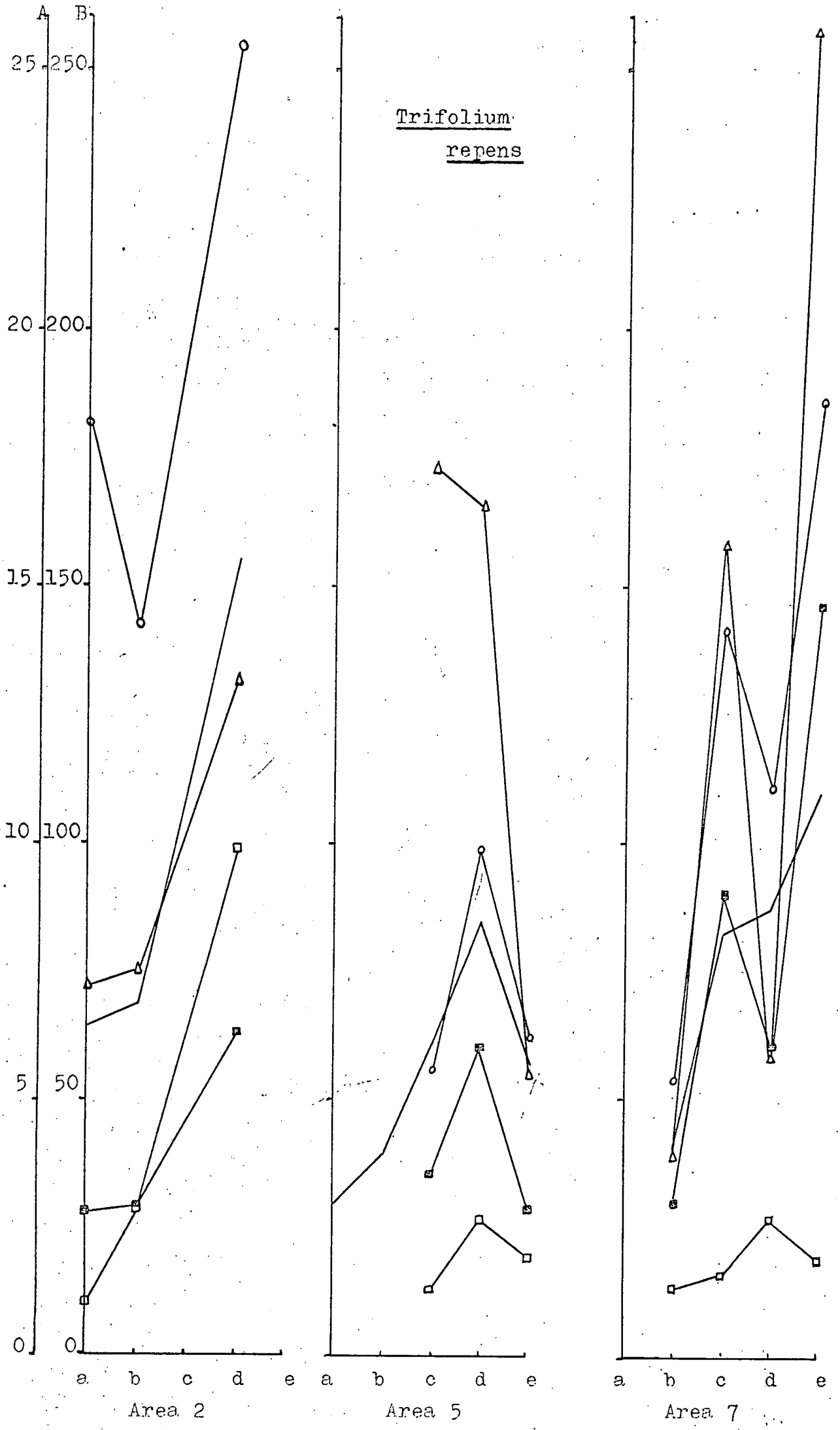
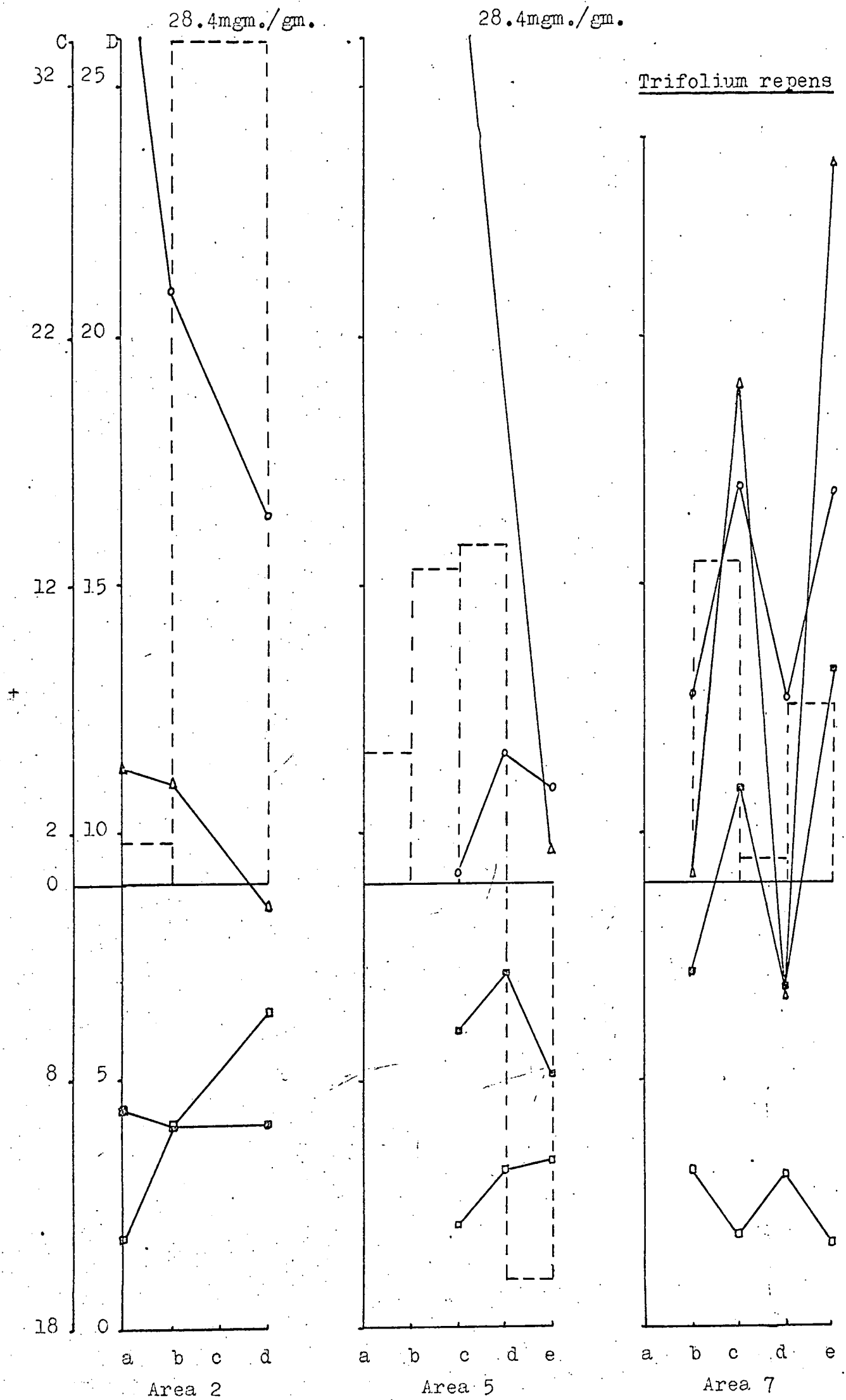

A
B
25
250
20
200
15
150
10
100
5
50
0
0
Trifolium repens
a
b
c
d
e
Area 2
Area 5
Area 7

Figure 5.23 contd.



APPENDIX 6 Table 6.1

Mineral Analysis of the Whole Community

| Date & Area | Dry weight g per $m^2$ | Total of each mineral in community mg per $m^2$ Na | K | Mg | Ca | Total weight of the 4 minerals mg per $m^2$ |
|---|---|---|---|---|---|---|
| AREA 2 | | | | | | |
| 24.5.68 | 158 | 198 | 2401 | 425 | 734 | 3758 |
| 7.6.68 | 177 | 437 | 2969 | 512 | 950 | 4868 |
| 21.6.68 | 338 | 686 | 5511 | 1052 | 2264 | 9513 |
| 11.7.68 | 346 | 938 | 5040 | 971 | 1527 | 8476 |
| Uptake | | 740 | 3110 | 627 | 1530 | 6007 |
| AREA 3 | | | | | | |
| 24.5.68 | 191 | 291 | 2062 | 488 | 3483 | 6324 |
| 7.6.68 | 213 | 464 | 2592 | 848 | 2687 | 6591 |
| 21.6.68 | 268 | 548 | 5198 | 1879 | 5510 | 13135 |
| 11.7.68 | 508 | 591 | 6818 | 1553 | 4434 | 13396 |
| Uptake | | 300 | 4756 | 1391 | 2823 | 9270 |
| AREA 4 | | | | | | |
| 24.5.68 | 193 | 161 | 1547 | 419 | 1925 | 4052 |
| 7.6.68 | 169 | 133 | 1422 | 507 | 1920 | 3982 |
| 21.6.68 | 294 | | | | | |
| 11.7.68 | 317 | 203 | 1830 | 857 | 1426 | 4316 |
| Uptake | | 92 | 408 | 438 | 499 | 1437 |
| AREA 5 | | | | | | |
| 24.5.68 | 190 | 206 | 2578 | 1030 | 1730 | 5545 |
| 7.6.68 | 215 | 356 | 2875 | 978 | 2448 | 6607 |
| 21.6.68 | 260 | 662 | 2397 | 1693 | 3205 | 7957 |
| 11.7.68 | 307 | 907 | 3063 | 1511 | 4195 | 9676 |
| 5.8.68 | 411 | 860 | 3887 | 2321 | 3268 | 10336 |
| Uptake | | 701 | 665 | 715 | 2465 | 4546 |
| AREA 7 | | | | | | |
| 24.5.68 | 386 | 850 | 2112 | 1205 | 2614 | 6781 |
| 7.6.68 | 246 | 369 | 1609 | 764 | 1147 | 3889 |
| 21.6.68 | 306 | 286 | 3359 | 1086 | 1961 | 6692 |
| 11.7.68 | 248 | 279 | 1944 | 649 | 1191 | 4063 |
| 5.8.68 | 307 | 318 | 3120 | 1097 | 3812 | 8347 |
| Uptake | | 571 | 1750 | 556 | 1467 | 4344 |
| AREA 8 | | | | | | |
| 24.5.68 | 248 | 196 | 1337 | 369 | 1833 | 3735 |
| 7.6.68 | 238 | 190 | 1617 | 314 | 590 | 2711 |
| 21.6.68 | 383 | 309 | 1816 | 851 | 4642 | 7618 |
| 11.7.68 | 311 | 259 | 1631 | 704 | 2146 | 4740 |
| 5.8.68 | 404 | 402 | 1716 | 591 | 3340 | 6049 |
| Uptake | | 119 | 479 | 537 | 4052 | 5087 |

APPENDIX 6 Table 6.2

Mineral Analysis of the Living Plant Material of the Community

| Date & Area | Dry weight g per $m^2$ | Total of each mineral in living plant material mg per $m^2$ | | | | Total weight of the 4 minerals $mg/m^2$ |
|---|---|---|---|---|---|---|
| | | Na | K | Mg | Ca | |
| AREA 2 | | | | | | |
| 24.5.68 | 84 | 147 | 2020 | 260 | 439 | 2866 |
| 7.6.68 | 113 | 374 | 2537 | 363 | 581 | 3855 |
| 21.6.68 | 294 | 614 | 5107 | 922 | 1749 | 8392 |
| 11.7.68 | 288 | 837 | 4679 | 791 | 1131 | 7438 |
| AREA 3 | | | | | | |
| 24.5.68 | 98 | 209 | 1736 | 293 | 2006 | 4244 |
| 7.6.68 | 116 | 299 | 1900 | 581 | 1676 | 4456 |
| 21.6.68 | 266 | 380 | 4780 | 970 | 3348 | 9478 |
| 11.7.68 | 446 | 559 | 6531 | 1433 | 3770 | 12293 |
| AREA 4 | | | | | | |
| 24.5.68 | 78 | 91 | 1333 | 231 | 855 | 2510 |
| 7.6.68 | 81 | 73 | 1295 | 246 | 813 | 2427 |
| 21.6.68 | 112 | | | | | |
| 11.7.68 | 180 | 120 | 1635 | 523 | 675 | 2953 |
| AREA 5 | | | | | | |
| 24.5.68 | 136 | 179 | 2247 | 861 | 1262 | 4549 |
| 7.6.68 | 131 | 289 | 2501 | 738 | 2028 | 5556 |
| 21.6.68 | 177 | 539 | 2089 | 1394 | 1585 | 5607 |
| 11.7.68 | 222 | 814 | 2831 | 1242 | 3062 | 7949 |
| 5.8.68 | 305 | 787 | 3580 | 858 | 2193 | 8418 |
| AREA 7 | | | | | | |
| 24.5.68 | 187 | 552 | 1544 | 717 | 1706 | 4519 |
| 7.6.68 | 140 | 288 | 1383 | 509 | 753 | 2933 |
| 21.6.68 | 206 | 211 | 2855 | 746 | 1633 | 5445 |
| 11.7.68 | 178 | 236 | 1744 | 506 | 765 | 3251 |
| 5.8.68 | 224 | 270 | 2745 | 943 | 3040 | 6998 |
| AREA 8 | | | | | | |
| 24.5.68 | 109 | 98 | 945 | 200 | 839 | 2082 |
| 7.6.68 | 98 | 109 | 972 | 194 | 415 | 1690 |
| 21.6.68 | 169 | 144 | 1337 | 417 | 2298 | 4196 |
| 11.7.68 | 212 | 205 | 1357 | 530 | 1540 | 3632 |
| 5.8.68 | 220 | 250 | 1334 | 496 | 1938 | 4018 |

APPENDIX 6 Table 6.2 contd.

Mineral Analysis of the Living Phanerogams and Cryptogams

| Date & Area | Dry weight of phanerogams g/m$^2$ | Total of each mineral in the living phanerogams mg per m$^2$ | | | | Total weight of the 4 minerals mg/m$^2$ |
|---|---|---|---|---|---|---|
| | | Na | K | Mg | Ca | |
| AREA 7 | | | | | | |
| 24.5.68 | 97 | 311 | 1065 | 356 | 601 | 2333 |
| 7.6.68 | 87 | 235 | 1094 | 313 | 382 | 2024 |
| 21.6.68 | 121 | 146 | 2282 | 460 | 821 | 3720 |
| 11.7.68 | 106 | 173 | 1321 | 270 | 307 | 2072 |
| 5.8.68 | 151 | 215 | 2216 | 596 | 1469 | 4497 |
| AREA 8 | | | | | | |
| 24.5.68 | 62 | 51 | 740 | 90 | 484 | 1365 |
| 7.6.68 | 57 | 74 | 717 | 110 | 263 | 1164 |
| 21.6.68 | 79 | 77 | 1005 | 186 | 598 | 1866 |
| 11.7.68 | 57 | 115 | 703 | 158 | 271 | 1247 |
| 5.8.68 | 88 | 143 | 848 | 250 | 563 | 1823 |

| Date & Area | Dry weight of cryptogams g/m$^2$ | Total of each mineral in the living cryptogams mg per m$^2$ | | | | Total weight of the 4 minerals mg/m$^2$ |
|---|---|---|---|---|---|---|
| | | Na | K | Mg | Ca | |
| AREA 7 | | | | | | |
| 24.5.68 | 90 | 241 | 479 | 361 | 1105 | 2186 |
| 7.6.68 | 53 | 53 | 289 | 196 | 355 | 893 |
| 21.6.68 | 85 | 65 | 573 | 276 | 812 | 1725 |
| 11.7.68 | 72 | 63 | 423 | 237 | 458 | 1180 |
| 5.8.68 | 73 | 55 | 529 | 347 | 1571 | 2501 |
| AREA 8 | | | | | | |
| 24.5.68 | 47 | 47 | 206 | 111 | 356 | 719 |
| 7.6.68 | 41 | 35 | 255 | 84 | 152 | 526 |
| 21.6.68 | 90 | 67 | 332 | 231 | 1700 | 2330 |
| 11.7.68 | 135 | 90 | 654 | 372 | 1270 | 2385 |
| 5.8.68 | 132 | 87 | 486 | 246 | 1376 | 2195 |

APPENDIX 6 Table 6.3

Mineral Analysis of the Dead Plant Material of the Community

| Date & Area | Dry weight g per $m^2$ | Total of each mineral in debris mg per $m^2$ Na | K | Mg | Ca | Total weight of the 4 minerals mg/$m^2$ |
|---|---|---|---|---|---|---|
| AREA 2 | | | | | | |
| 24.5.68 | 76 | 51 | 381 | 165 | 295 | 892 |
| 7.6.68 | 64 | 63 | 433 | 149 | 369 | 1014 |
| 21.6.68 | 46 | 72 | 404 | 130 | 515 | 1121 |
| 11.7.68 | 58 | 101 | 361 | 180 | 396 | 1038 |
| AREA 3 | | | | | | |
| 24.5.68 | 93 | 82 | 326 | 195 | 1477 | 2080 |
| 7.6.68 | 98 | 165 | 692 | 267 | 1011 | 2135 |
| 21.6.68 | 103 | 169 | 418 | 909 | 2163 | 3659 |
| 11.7.68 | 61 | 232 | 286 | 120 | 664 | 1102 |
| AREA 4 | | | | | | |
| 24.5.68 | 115 | 70 | 214 | 188 | 1070 | 1542 |
| 7.6.68 | 87 | 60 | 127 | 261 | 1107 | 1555 |
| 21.6.68 | 181 | | | | | |
| 11.7.68 | 137 | 83 | 196 | 334 | 751 | 1364 |
| AREA 5 | | | | | | |
| 24.5.68 | 54 | 27 | 331 | 169 | 468 | 995 |
| 7.6.68 | 84 | 67 | 374 | 240 | 420 | 1101 |
| 21.6.68 | 84 | 123 | 308 | 299 | 1620 | 2350 |
| 11.7.68 | 80 | 93 | 232 | 269 | 1133 | 1727 |
| 5.8.68 | 97 | 73 | 306 | 463 | 1075 | 1918 |
| AREA 7 | | | | | | |
| 24.5.68 | 200 | 298 | 568 | 488 | 908 | 2262 |
| 7.6.68 | 108 | 80 | 226 | 255 | 394 | 955 |
| 21.6.68 | 101 | 75 | 504 | 340 | 327 | 1246 |
| 11.7.68 | 71 | 42 | 200 | 143 | 427 | 811 |
| 5.8.68 | 83 | 48 | 375 | 153 | 772 | 1348 |
| AREA 8 | | | | | | |
| 24.5.68 | 140 | 98 | 392 | 169 | 994 | 1653 |
| 7.6.68 | 141 | 82 | 645 | 120 | 175 | 1022 |
| 21.6.68 | 215 | 165 | 479 | 434 | 2344 | 3422 |
| 11.7.68 | 101 | 55 | 273 | 174 | 607 | 1109 |
| 5.8.68 | 185 | 152 | 382 | 95 | 1402 | 2031 |

APPENDIX 7 Table 7.1

Mineral Analysis of the Whole Community-Results expressed as a Percentage of the Maximum Total

| Date & Area | Weight of all minerals as a % of total dry weight | Each mineral as a percentage of 13396 (maximum total of the 4 minerals) Na | K | Mg | Ca |
|---|---|---|---|---|---|
| AREA 2 | | | | | |
| 24.5.68 | 2.4 | 1.5 | 17.9 | 3.2 | 5.5 |
| 7.6.68 | 2.8 | 3.3 | 22.1 | 3.8 | 7.1 |
| 21.6.68 | 2.8 | 5.1 | 41.1 | 7.8 | 16.9 |
| 11.7.68 | 2.4 | 7.0 | 37.6 | 7.2 | 11.4 |
| AREA 3 | | | | | |
| 24.5.68 | 3.3 | 2.2 | 15.4 | 3.6 | 26.0 |
| 7.6.68 | 3.1 | 3.5 | 19.3 | 6.3 | 20.1 |
| 21.6.68 | 4.9 | 4.1 | 38.7 | 14.0 | 41.1 |
| 11.7.68 | 2.6 | 4.4 | 50.8 | 11.6 | 33.1 |
| AREA 4 | | | | | |
| 24.5.68 | 2.1 | 1.2 | 4.5 | 3.1 | 14.4 |
| 7.6.68 | 2.4 | 1.0 | 10.6 | 3.8 | 14.3 |
| 21.6.68 | | | | | |
| 11.7.68 | 1.4 | 1.5 | 13.6 | 6.4 | 10.6 |
| AREA 5 | | | | | |
| 24.5.68 | 2.9 | 1.5 | 19.2 | 7.7 | 12.9 |
| 7.6.68 | 3.1 | 2.7 | 21.5 | 7.3 | 18.3 |
| 21.6.68 | 3.0 | 5.0 | 17.9 | 12.6 | 23.9 |
| 11.7.68 | 3.2 | 6.8 | 22.9 | 11.2 | 31.3 |
| 5.8.68 | 2.6 | 6.4 | 29.0 | 17.3 | 24.4 |
| AREA 7 | | | | | |
| 24.5.68 | 1.7 | 6.3 | 15.7 | 9.0 | 19.5 |
| 7.6.68 | 1.6 | 2.8 | 12.0 | 5.7 | 8.6 |
| 21.6.68 | 2.2 | 2.1 | 25.0 | 8.1 | 14.6 |
| 11.7.68 | 1.6 | 2.1 | 14.5 | 4.8 | 8.9 |
| 5.8.79 | 2.7 | 2.4 | 23.3 | 8.2 | 28.4 |
| AREA 8 | | | | | |
| 24.5.68 | 1.5 | 1.5 | 10.0 | 2.7 | 13.7 |
| 7.6.68 | 1.1 | 1.4 | 12.1 | 2.3 | 4.4 |
| 21.6.68 | 2.0 | 2.3 | 13.5 | 6.3 | 34.6 |
| 11.7.68 | 1.5 | 1.9 | 12.2 | 5.2 | 16.0 |
| 5.8.68 | 1.5 | 3.0 | 12.8 | 4.4 | 24.9 |

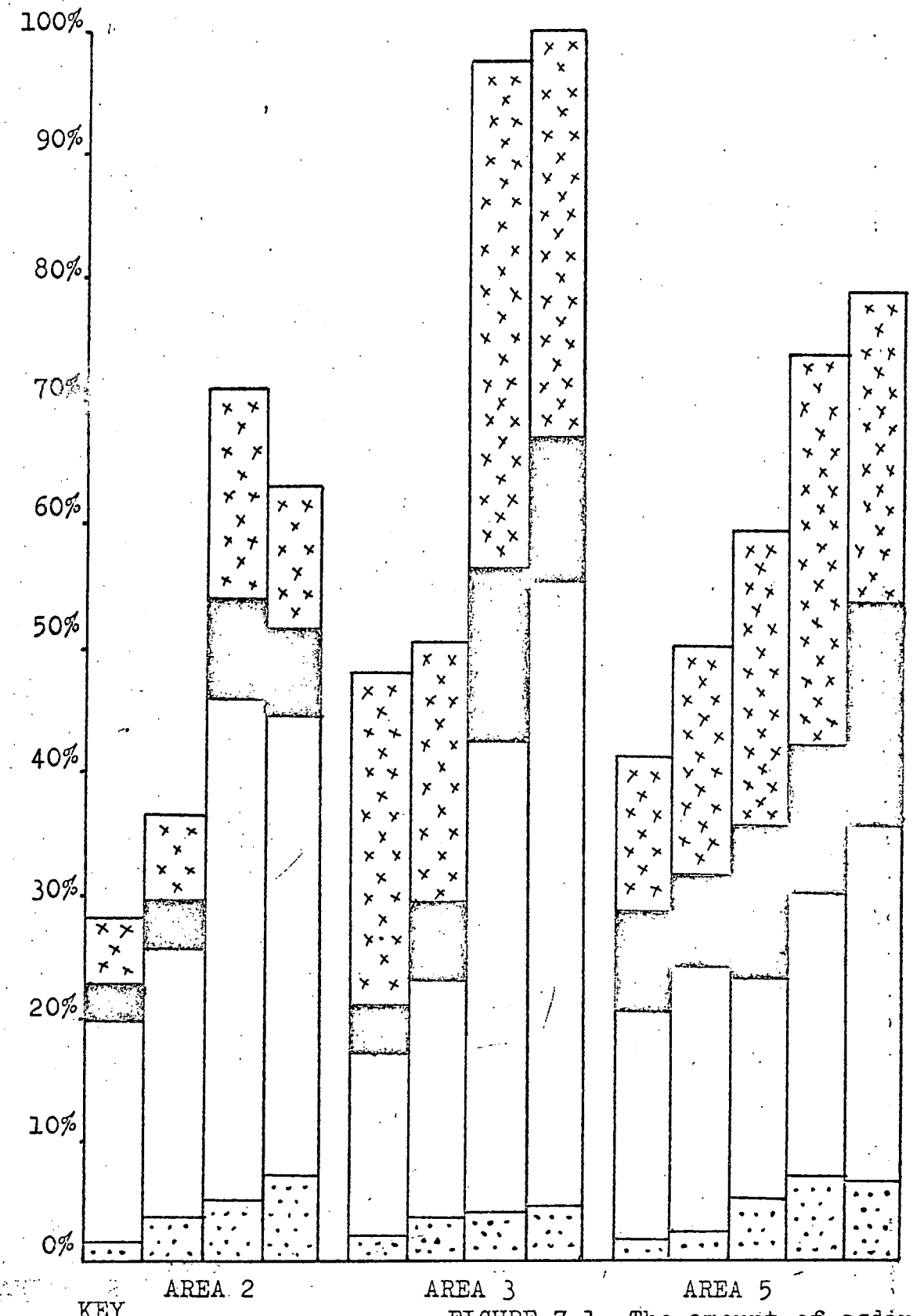
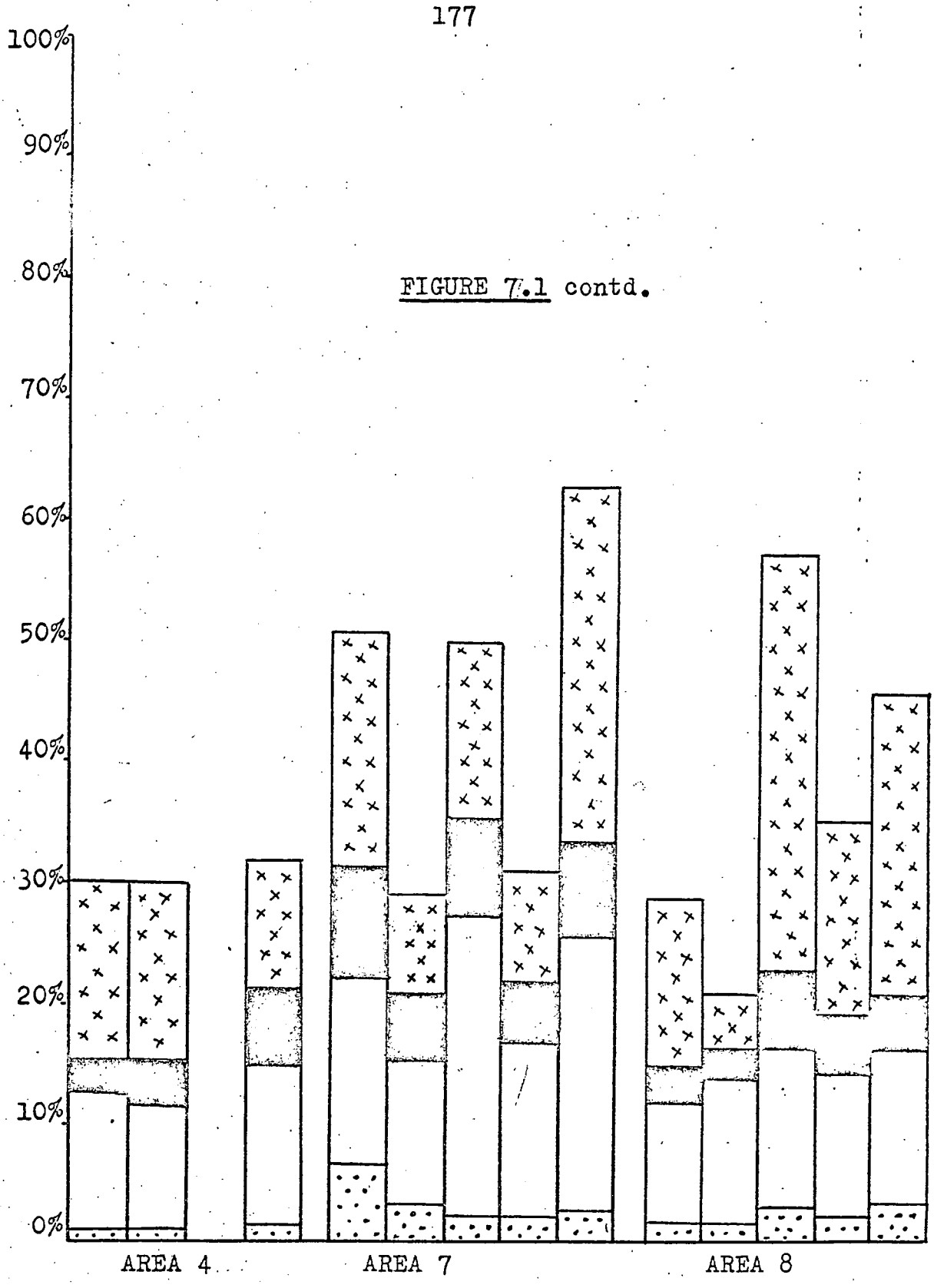



FIGURE 7.1 The amount of sodium, potassium, magnesium and calcium present in the whole community- expressed as a percentage of the maximum total found. (see Table 7.1)

FIGURE 7.1 contd.



APPENDIX 7 Table 7.2

Mineral Analysis of the Living Plant Material of the Community

| Date & Area | Weight of all minerals as a % of total dry weight | Each mineral as a percentage of 12293 (maximum total of the four minerals) Na | K | Mg | Ca |
|---|---|---|---|---|---|
| AREA 2 | | | | | |
| 24.5.68 | 3.4 | 1.2 | 16.4 | 2.1 | 3.5 |
| 7.6.68 | 3.4 | 3.0 | 20.6 | 2.9 | 4.7 |
| 21.6.68 | 2.9 | 5.0 | 41.5 | 7.5 | 14.2 |
| 11.7.68 | 2.6 | 6.8 | 38.1 | 6.4 | 9.2 |
| AREA 3 | | | | | |
| 24.5.68 | 4.3 | 1.7 | 14.1 | 2.4 | 16.3 |
| 7.6.68 | 3.8 | 2.4 | 15.5 | 4.7 | 13.6 |
| 21.6.68 | 3.6 | 3.1 | 38.9 | 7.9 | 27.2 |
| 11.7.68 | 2.8 | 4.5 | 53.1 | 11.7 | 30.7 |
| AREA 4 | | | | | |
| 24.5.68 | 3.2 | 0.7 | 10.8 | 1.9 | 6.9 |
| 7.6.68 | 3.0 | 0.6 | 10.5 | 2.0 | 6.6 |
| 21.6.68 | | | | | |
| 11.7.68 | 1.6 | 1.0 | 13.3 | 4.2 | 5.5 |
| AREA 5 | | | | | |
| 24.5.68 | 3.3 | 1.4 | 18.2 | 7.0 | 10.3 |
| 7.6.68 | 4.2 | 2.3 | 20.3 | 6.0 | 16.5 |
| 21.6.68 | 3.2 | 4.4 | 17.0 | 11.3 | 12.9 |
| 11.7.68 | 3.6 | 6.6 | 23.0 | 10.1 | 25.0 |
| 5.8.68 | 2.8 | 6.2 | 29.1 | 15.1 | 17.8 |
| AREA 7 | | | | | |
| 24.5.68 | 2.4 | 4.5 | 12.5 | 5.8 | 13.9 |
| 7.6.68 | 2.1 | 2.3 | 11.2 | 4.1 | 6.0 |
| 21.6.68 | 2.6 | 1.7 | 23.2 | 6.1 | 13.3 |
| 11.7.68 | 1.8 | 1.9 | 14.2 | 4.1 | 6.2 |
| 5.8.68 | 3.1 | 2.2 | 22.3 | 7.7 | 24.7 |
| AREA 8 | | | | | |
| 24.5.68 | 1.9 | 0.8 | 77.7 | 1.6 | 6.8 |
| 7.6.68 | 1.7 | 0.9 | 77.9 | 1.6 | 3.4 |
| 21.6.68 | 2.5 | 1.2 | 10.9 | 3.4 | 18.7 |
| 11.7.68 | 1.7 | 1.7 | 11.0 | 4.3 | 12.7 |
| 5.8.68 | 1.8 | 2.0 | 10.8 | 4.0 | 17.7 |

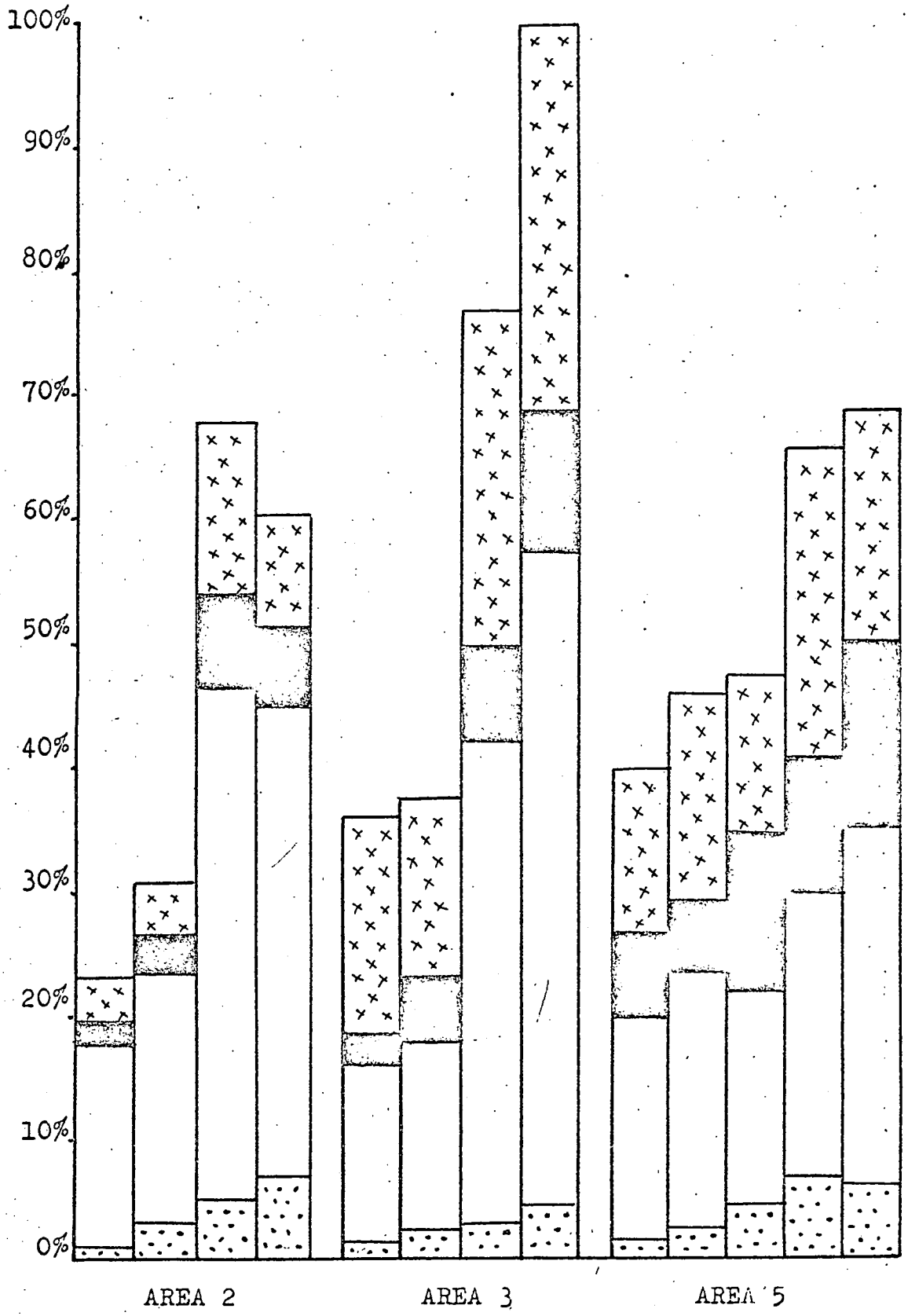



FIGURE 7.2 The amount of sodium, potassium, magnesium and calcium present in the living plant material-expressed as a percentage of the maximum total found. (see Table 7.2)

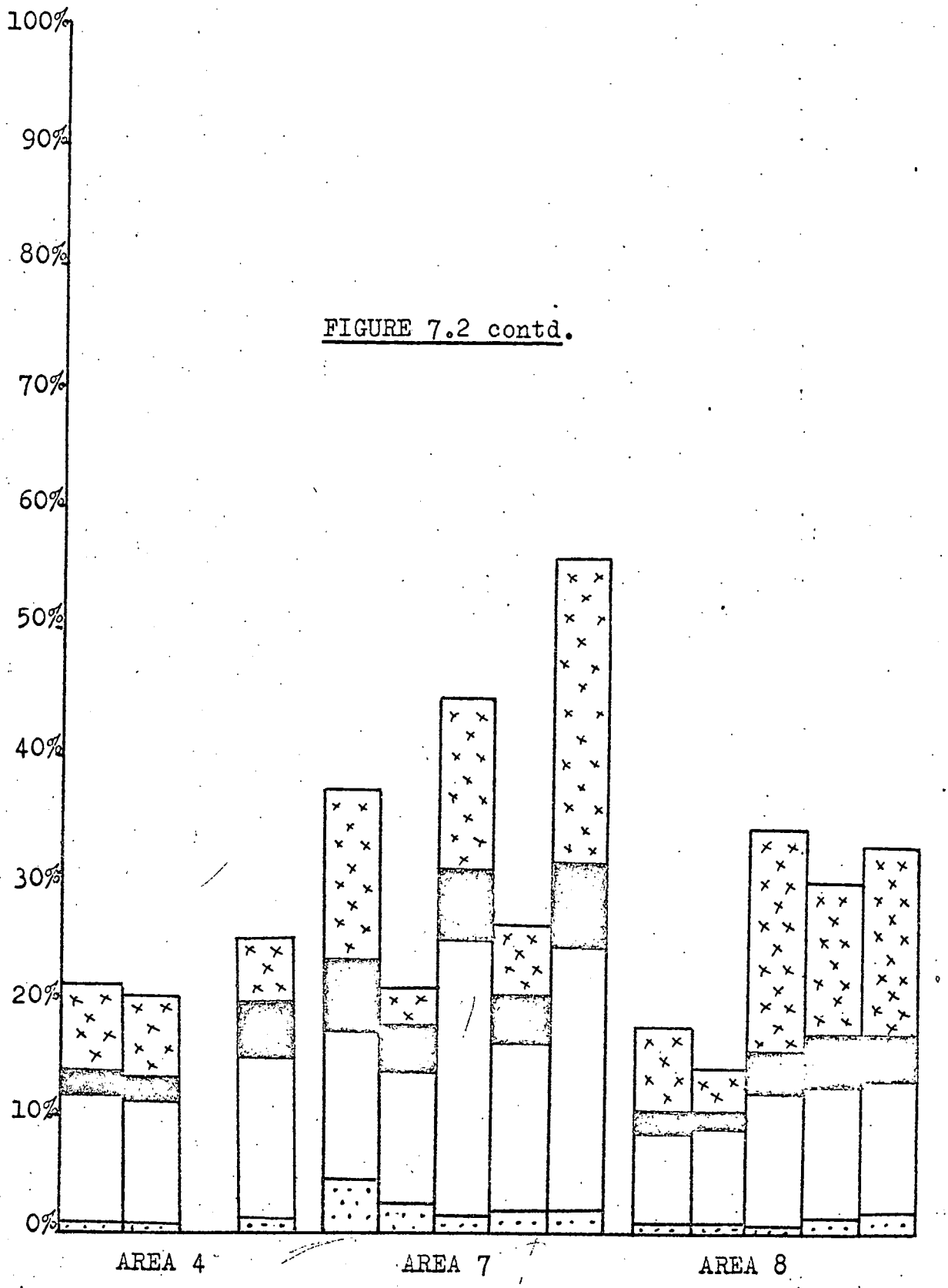



FIGURE 7.2 contd.

APPENDIX 7 Table 7.3

Mineral Analysis of the Dead Plant Material of the Community.

| Date & Area | Weight of all minerals as a % of the total dry weight | Each mineral as a percentage of 3659 (maximum total of all 4 minerals) Na | K | Mg | Ca |
|---|---|---|---|---|---|
| AREA 2 | | | | | |
| 24.5.68 | 1.2 | 1.4 | 10.4 | 4.5 | 8.1 |
| 7.6.68 | 1.6 | 1.7 | 11.8 | 4.1 | 10.1 |
| 21.6.68 | 2.4 | 2.0 | 11.0 | 3.6 | 14.1 |
| 11.7.68 | 1.8 | 2.8 | 9.9 | 4.9 | 10.8 |
| AREA 3 | | | | | |
| 24.5.68 | 2.2 | 2.2 | 8.9 | 5.3 | 40.4 |
| 7.6.68 | 2.2 | 4.5 | 18.9 | 7.3 | 27.6 |
| 21.6.68 | 3.6 | 4.6 | 11.4 | 24.8 | 59.1 |
| 11.7.68 | 1.8 | 0.9 | 7.8 | 3.3 | 18.1 |
| AREA 4 | | | | | |
| 24.5.68 | 1.3 | 1.9 | 5.8 | 5.1 | 29.2 |
| 7.6.68 | 1.8 | 1.6 | 3.5 | 7.1 | 30.3 |
| 21.6.68 | | | | | |
| 11.7.68 | 1.0 | 2.3 | 5.4 | 9.1 | 20.5 |
| AREA 5 | | | | | |
| 24.5.68 | 1.8 | 0.7 | 9.0 | 4.6 | 12.8 |
| 7.6.68 | 1.3 | 1.8 | 10.2 | 6.6 | 11.5 |
| 21.6.68 | 2.8 | 3.4 | 8.4 | 8.2 | 44.3 |
| 11.7.68 | 2.2 | 2.5 | 6.4 | 7.4 | 31.0 |
| 5.8.68 | 2.0 | 2.0 | 8.5 | 12.7 | 29.4 |
| AREA 7 | | | | | |
| 24.5.68 | 1.1 | 8.1 | 15.5 | 13.3 | 24.8 |
| 7.6.68 | 0.9 | 2.2 | 6.2 | 7.0 | 10.8 |
| 21.6.68 | 1.2 | 2.0 | 13.8 | 9.3 | 8.9 |
| 11.7.68 | 1.1 | 1.1 | 5.5 | 3.9 | 11.7 |
| 5.8.68 | 1.6 | 1.3 | 10.2 | 4.2 | 21.1 |
| AREA 8 | | | | | |
| 24.5.68 | 1.2 | 2.7 | 10.7 | 4.6 | 27.2 |
| 7.6.68 | 0.7 | 2.2 | 17.6 | 3.3 | 4.8 |
| 21.6.68 | 1.6 | 4.5 | 13.1 | 11.9 | 64.1 |
| 11.7.68 | 1.1 | 1.5 | 7.5 | 4.8 | 16.6 |
| 5.8.68 | 1.1 | 4.2 | 10.4 | 2.6 | 38.3 |

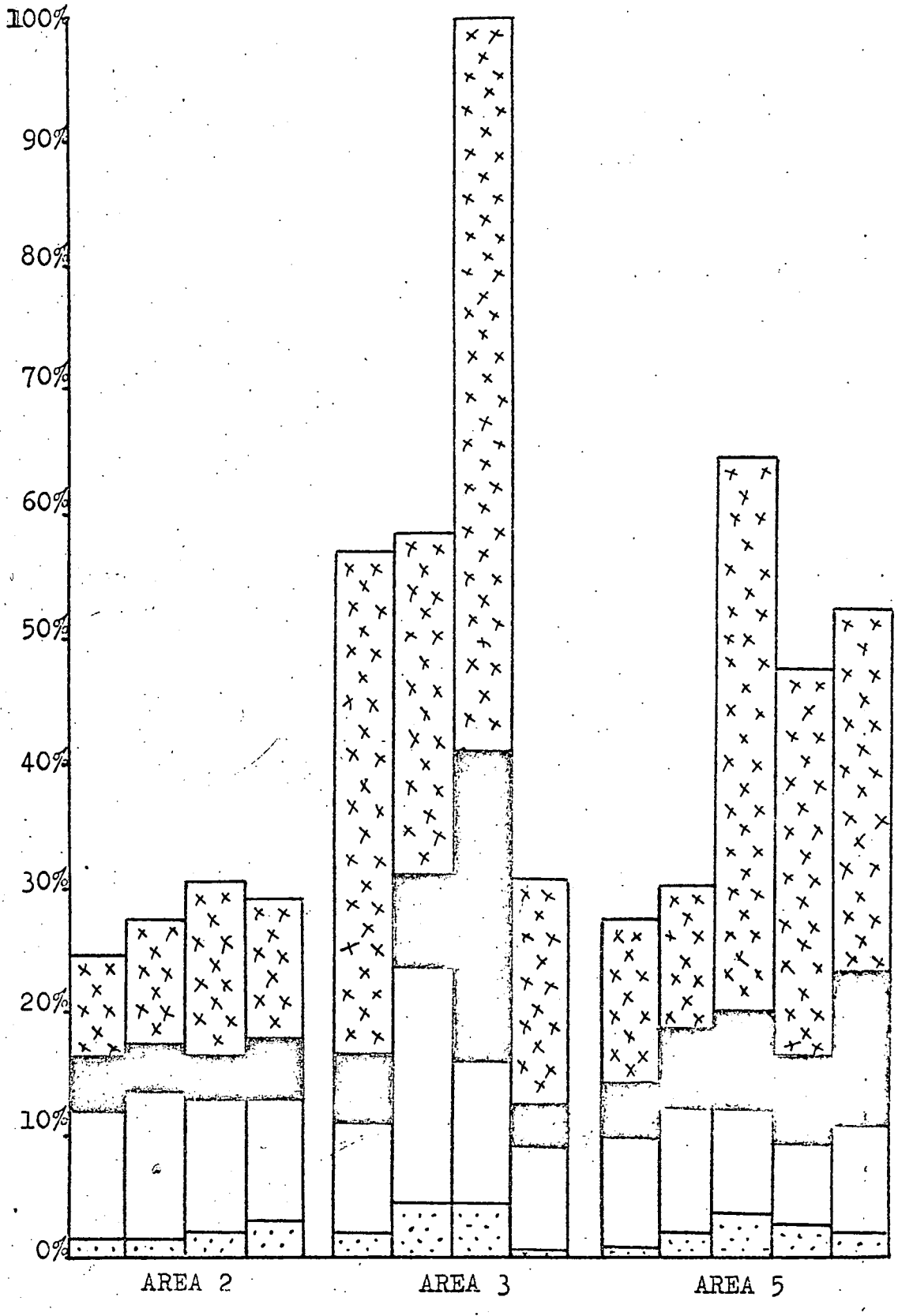



FIGURE 7.3 The amount of sodium, potassium, magnesium and calcium present in the plant debris-expressed as a percentage of the maximum total found. (see Table 7.3)

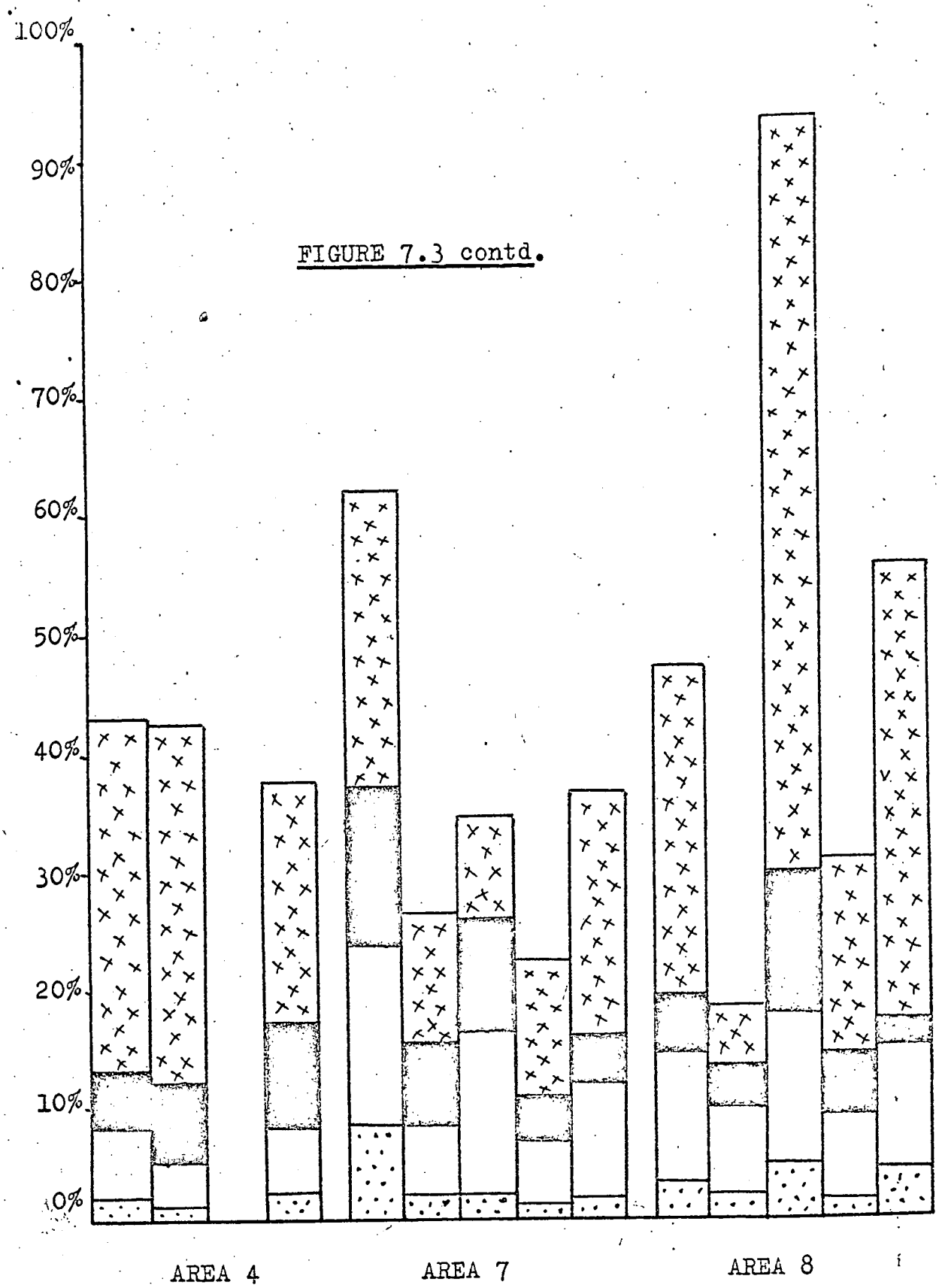



FIGURE 7.3 contd.

APPENDIX 8 Table 8.1

Ratios of Mineral Concentrations (mg per g dry weight) X 10 in the Whole community, Living and Dead Plant Material.

| DATE & AREA | Whole community | | | | Living community | | | | Plant debris | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AREA 2 | Na | K | Mg | Ca | Na | K | Mg | Ca | Na | K | Mg | Ca |
| 24.5.68 | 10 | 116 | 20 | 35 | 10 | 134 | 17 | 29 | 10 | 71 | 31 | 56 |
| 7.6.68 | 10 | 67 | 12 | 22 | 10 | 70 | 10 | 16 | 10 | 68 | 23 | 58 |
| 21.6.68 | 10 | 82 | 16 | 34 | 10 | 82 | 15 | 29 | 10 | 55 | 18 | 71 |
| 11.7.68 | 10 | 54 | 10 | 16 | 11 | 60 | 10 | 14 | 10 | 36 | 18 | 40 |
| AREA 3 | | | | | | | | | | | | |
| 24.5.68 | 10 | 71 | 17 | 123 | 10 | 83 | 14 | 96 | 10 | 39 | 23 | 175 |
| 7.6.68 | 10 | 56 | 18 | 58 | 10 | 63 | 19 | 56 | 10 | 42 | 16 | 61 |
| 21.6.68 | 10 | 94 | 34 | 99 | 10 | 129 | 20 | 90 | 10 | 25 | 55 | 131 |
| 11.7.68 | 10 | 113 | 26 | 75 | 10 | 112 | 25 | 67 | 10 | 157 | 67 | 37 |
| AREA 4 | | | | | | | | | | | | |
| 24.5.68 | 10 | 100 | 26 | 125 | 10 | 143 | 25 | 92 | 10 | 32 | 27 | 155 |
| 7.6.68 | 10 | 106 | 38 | 142 | 10 | 177 | 33 | 111 | 10 | 21 | 38 | 182 |
| 21.6.68 | | | | | | | | | | | | |
| 11.7.68 | 10 | 96 | 42 | 75 | 10 | 130 | 44 | 54 | 10 | 23 | 40 | 92 |
| AREA 5 | | | | | | | | | | | | |
| 24.5.68 | 10 | 72 | 28 | 48 | 10 | 127 | 48 | 71 | 10 | 122 | 62 | 174 |
| 7.6.68 | 10 | 83 | 28 | 71 | 10 | 87 | 25 | 70 | 10 | 55 | 35 | 63 |
| 21.6.68 | 10 | 37 | 26 | 49 | 10 | 33 | 22 | 25 | 10 | 25 | 24 | 128 |
| 11.7.68 | 10 | 34 | 16 | 46 | 10 | 34 | 15 | 37 | 10 | 24 | 28 | 117 |
| 5.8.68 | 10 | 46 | 28 | 39 | 10 | 45 | 23 | 28 | 10 | 40 | 60 | 138 |
| AREA 7 | | | | | | | | | | | | |
| 24.5.68 | 10 | 25 | 14 | 30 | 10 | 28 | 13 | 30 | 10 | 19 | 16 | 30 |
| 7.6.68 | 10 | 40 | 20 | 31 | 10 | 47 | 17 | 26 | 10 | 30 | 34 | 51 |
| 21.6.68 | 10 | 121 | 40 | 70 | 10 | 138 | 36 | 79 | 10 | 71 | 48 | 46 |
| 11.7.68 | 10 | 71 | 24 | 44 | 10 | 75 | 22 | 33 | 10 | 47 | 33 | 100 |
| 5.8.68 | 10 | 102 | 36 | 124 | 10 | 10 | 35 | 11 | 10 | 78 | 30 | 155 |
| AREA 8 | | | | | | | | | | | | |
| 24.5.68 | 10 | 69 | 19 | 93 | 10 | 96 | 20 | 86 | 10 | 40 | 17 | 101 |
| 7.6.68 | 10 | 84 | 16 | 30 | 10 | 91 | 18 | 38 | 10 | 76 | 15 | 20 |
| 21.6.68 | 10 | 59 | 28 | 15 | 10 | 88 | 28 | 151 | 10 | 27 | 25 | 136 |
| 11.7.68 | 10 | 65 | 30 | 86 | 10 | 64 | 25 | 73 | 10 | 54 | 34 | 120 |
| 5.8.68 | 10 | 42 | 15 | 82 | 10 | 55 | 21 | 80 | 10 | 42 | 10 | 152 |

APPENDIX 9

Comparison of the Standing Crop and Mineral Contents of Five Hay-Meadow Communities just prior to Mowing.

In order to compare the dry weight and mineral compostion of ecosystems mown in different hay-meadows, two other fields were also sampled. Both fields are managed in a similar way to Cronkley hay-meadow. The additional samples were collected at the end of July 1968, these two fields being mown 15 days after Cronkley, and were compared with the last samples collected from areas 2 and 3.

Two samples were collected from Force Garth Pastures, and one from Widdybank Pasture. The vegetation at the former was species-rich and very tall. The first sample (F.G.1) here being taken near the bottom edge of the field. It would be expected that it received much drainage water and minerals from higher up the slope and here were found species-Campanula rotundifolia, Cardamine flexuosa and Arrhenatherum elatius-indicative of wetter pasture(Table 9.1). The second sample (F.G.2), was from higher up the slope. At F.G.1 were numerous "shoots" or "tillers" of the "lighter" grasses, such as Poa trivialis, Agrostis tenuis, Festuca rubra and Trisetum flavescens, while "robust" species-Holcus lanatus and Dactylis glomerata-were more common at F.G.2. Also the number of dicotyledons was less at F.G.2. The third site sampled, W.P., resembled in appearance area 2. At both Holcus lanatus, Poa trivialis, Agrostis tenuis, Festuca rubra, Cerastium holosteodes, Rumex acetosa, Ranunculus bulbosus and Trifolium repens were abundant. Trollius europaeus, Veronica chamaedrys, Bellis perennis and Alchemilla glabra were present in the sample collected at W.P. but not from area 2

TABLE 9.1

NUMBER OF INDIVIDUALS PER SQ.M.

| SPECIES | F.G.1. | F.G.2. | W.P. | 2 | 3 |
|---|---|---|---|---|---|
| Anthoxanthum odoratum | 110 | | 258 | 108 | |
| Holcus lanatus | 23 | 947 | 634 | 1309 | 338 |
| Poa trivialis | 971 | | 1566 | 2208 | 1736 |
| Alopecurus pratensis | | | 39 | 706 | 805 |
| Agrostis tenuis | 1394 | 211 | 1863 | 965 | |
| Festuca rubra | 1848 | 759 | 3437 | 1316 | 6146 |
| Helictotrichon pubescens | 478 | 117 | 70 | | 346 |
| Bromus mollis | | | | 504 | 1242 |
| Poa pratensis | 94 | 8 | 227 | | |
| Cynosurus cristatus | | 31 | 23 | | |
| Dactylis glomerata | 250 | 626 | 219 | | |
| Trisetum flavescens | 665 | 180 | 219 | | |
| Arrhenatherum elatius | 211 | | | | |
| Deschampsia caespitosa | | 16 | | | |
| Luzula campestris | | 8 | 31 | | |
| Cerastium holosteodes | 117 | 16 | 47 | 334 | 267 |
| Ranunculus bulbosus | 180 | 78 | 125 | 88 | 66 |
| Rumex acetosa | 70 | 24 | 86 | 136 | 142 |
| Conopodium majus | 47 | 16 | | 191 | 90 |
| Trifolium repens | 16 | 63 | 78 | 257 | |
| Rhinanthus minor | 63 | | | 43 | 64 |
| Achillea millefolium | 16 | | | | 34 |
| Cardamine flexuosa | 8 | | | | |
| Campanula rotundifolia | 16 | | | | |
| Leontodon autumnalis | | | 8 | | |
| Plantago lanceolata | 391 | 31 | 117 | 39 | |
| Polygonum viviparum | | 23 | | | |
| Leontodon hispidus | 16 | 8 | | | |
| Trollius europaeus | | | 16 | | |
| Lathyrus pratensis | 117 | 86 | | 31 | 7 |
| Veronica chamaedrys | 55 | 63 | 55 | | 8 |
| Primula veris | 8 | | | | |
| Geum rivale | 8 | | | | |
| Vicia cracca | | | | 2 | |
| Stellaria holostea | 133 | | | | |
| Anemone nemorosa | | | | | 16 |
| Filipendula ulmaria | | 23 | | | |
| Myosotis arvensis | | | | | 24 |
| Trifolium arvense | | 8 | | | |
| Bellis perennis | | 8 | 31 | | |
| Alchemilla glabra | | 8 | 8 | | |
| Acrocladium cuspidatum | + | | | | |
| Hylocomium splendens | + | | | | |
| Lophocolea bidentata | + | | | | |
| Mnium undulatum | + | + | | | |
| Calypogeia trichomanis | | + | | | |
| Rhytidiadelphus squarrosus | | + | | | |
| Brachythecium rutabulum | | + | + | | |
| Eurynchium swartzi | | + | | | |

TABLE 9.2

DRY WEIGHT PER PLANT. MG. PER PLANT

| SPECIES | 2 | 3 | F.G.1. | F.G.2. | W.P. |
|---|---|---|---|---|---|
| Anthoxanthum odoratum | 35.9 | | 24.7 | | 45.1 |
| Holcus lanatus | 63.6 | 363.6 | 61.6 | 72.3 | 72.4 |
| Poa trivialis | 5.8 | 7.0 | 12.8 | | 13.5 |
| Alopecurus pratensis | 54.8 | 193.9 | | | 196.5 |
| Agrostis tenuis | 26.1 | | 82.4 | 61.8 | 32.2 |
| Festuca rubra | 6.9 | 12.6 | 11.7 | 13.2 | 13.3 |
| Bromus mollis | 22.6 | 13.5 | | | |
| Helictotrichon pubescens | | 40.1 | 53.3 | 50.3 | 34.2 |
| Poa pratensis | 16.6 | | 43.0 | 14.3 | 31.0 |
| Cynosurus cristatus | | 91.3 | | 44.3 | 112.9 |
| Dactylis glomerata | | | 103.2 | 314.8 | 170.1 |
| Trisetum flavescens | | | 72.8 | 129.5 | 15.9 |
| Arrhenatherum elatius | | | 76.5 | | |
| Cerastium holostoides | 23.2 | 24.6 | 4.0 | 19.8 | 41.7 |
| Ranunculus bulbosus | 190.7 | 49.3 | | 488.6 | 198.5 |
| Rumex acetosa | 133.3 | 28.8 | 571.1 | 133.7 | 125.8 |
| Conopodium majus | | | 301.2 | 343.2 | |
| Trifolium repens | 60.3 | | 68.3 | 72.2 | 45.7 |
| Rhinanthus minor | 279.3 | 294.4 | 153.3 | | |
| Achillea millefolium | | | 260.8 | | |
| Plantago lanceolata | 172.4 | | 39.1 | 517.1 | 202.6 |
| Lathyrus pratensis | 78.2 | 46.8 | 44.5 | 363.1 | |
| Leontodon hispidus | | | 261.3 | 482.2 | |
| Veronica chamaedrys | | | 66.6 | 62.9 | 26.5 |
| Stellaria holostea | | | 54.0 | | |

TABLE 9.3

COMPARISON OF DRY WEIGHT AND NUMBERS OF CERTAIN SPECIES FROM DIFFERENT AREAS

| SPECIES | Site | No per sqm. | Weight per plant mg. |
|---|---|---|---|
| HOLCUS LANATUS | 2 | 1309 | 63.6 |
| | 3 | 338 | 363.6 |
| | FG2 | 947 | 72.3 |
| | WP | 634 | 72.4 |
| POA TRIVIALIS | 2 | 2208 | 5.8 |
| | 3 | 1736 | 7.0 |
| | FG1 | 971 | 12.8 |
| | WP | 1566 | 13.5 |
| ALOPECURUS PRATENSIS | 2 | 706 | 54.8 |
| | 3 | 805 | 193.9 |
| | WP | 39 | 196.5 |
| AGROSTIS TENUIS | 2 | 965 | 26.1 |
| | FG1 | 1394 | 82.4 |
| | FG2 | 211 | 61.8 |
| | WP | 1863 | 32.2 |
| FESTUCA RUBRA | 2 | 1316 | 6.9 |
| | 3 | 6164 | 12.6 |
| | FG1 | 1848 | 11.7 |
| | FG2 | 759 | 13.2 |
| | WP | 3437 | 13.3 |
| HELICTOTRICHON PUBESCENS | 3 | 346 | 40.1 |
| | FG1 | 478 | 53.3 |
| | FG2 | 117 | 50.3 |
| | WP | 70 | 34.2 |
| DACTYLIS GLOMERATA | FG1 | 251 | 103.2 |
| | FG2 | 626 | 314.8 |
| | WP | 219 | 170.1 |
| RUMEX ACETOSA | 2 | 136 | 133.3 |
| | FG1 | 70 | 571.1 |
| | FG2 | 24 | 133.7 |
| | WP | 86 | 125.8 |

TABLE 9.3 contd.

| SPECIES | Site | No per sqm. | Weight per plant mg. |
|---|---|---|---|
| RHINANTHUS MINOR | 2 | 43 | 279.3 |
| | 3 | 64 | 294.4 |
| | FG1 | 63 | 153.3 |
| PLANTAGO LANCEOLATA | FG1 | 391 | 39.1 |
| | FG2 | 31 | 517.1 |
| | WP | 117 | 202.6 |
| RANUNCULUS BULBOSUS | 2 | 88 | 190.7 |
| | 3 | 66 | 49.3 |
| | FG2 | 78 | 488.6 |
| | WP | 125 | 198.5 |
| TRIFOLIUM REPENS | 2 | 257 | 60.3 |
| | FG2 | 63 | 72.2 |
| | WP | 78 | 45.7 |

here other herbaceous species were present. Area 3 being an open Festuca rubra turf did not resemble the three additional sites. Areas 2 and 3 seemed to have a greater number of individuals of each species, F.G.2 especially seemed to have fewer plants (Table 9.1)

The dry weight per plant of some species was similar in the different communities (Table 9.2), e.g. Holcus lanatus (area 2, F.G.2, 1, & W.P.), other species e.g. Rumex acetosa (F.G.1), grew especially well or, e.g. Ranunculus bulbosus (area 3), poorly at a particular site. Dactylis glomerata showed a higher dry weight per plant where the numbers per $m^2$ were higher, while Plantago lanceolata was the opposite (Table 9.3).

At all sites, except area 3, the dry weight of the dead and dicotyledonous plant material each comprised 20% of the total dry weight of the community (Table 9.4).

TABLE 9.4

Dry Weight of Dicotyledons, Monocotyledons and Debris expressed as a Percentage of the Total Dry Weight of the Community

| AREA | GRASSES | DICOTYLEDONS | MONOCOTYLEDONS |
|---|---|---|---|
| 2 | 58.5 | 24.2 | 17.3 |
| 3 | 79.8 | 7.5 | 11.9 |
| F.G.1 | 56.4 | 22.3 | 21.0 |
| F.G.2 | 60.9 | 21.4 | 17.7 |
| W.P. | 62.5 | 18.6 | 18.7 |

F.G.2 had the highest standing crop (Table 9.5) due to the contributions of the "robust" species-Dactylis glomerata, Holcus lanatus and Ranunculus bulbosus- the two grasses together comprised 50% of the total community dry

TABLE 9.5

Total dry weight (g per $m^2$) of each component group of plants at the 5 sites just before mowing.

| AREA | 2 | 3 | F.G.1 | F.G.2 | W.P. |
|---|---|---|---|---|---|
| Grasses | 203 | 408 | 275 | 321 | 246 |
| Dicotyledons | 84 | 38 | 109 | 113 | 73 |
| Bryophytes | 1 | 1 | 1 | 1 | 0.4 |
| Debris | 58 | 61 | 103 | 91 | 74 |
| TOTAL (debris+ living plant material) | 347 | 507 | 487 | 527 | 393 |
| TOTAL (living plant material) | 289 | 446 | 384 | 436 | 319 |

weight. 50% of the dry weight of the standing crop at F.G.1 consisted of Agrostis tenuis, Trisetum flavescens and Rumex acetosa. W.P. and area 2 were the least productive areas, Holcus lanatus, Agrostis tenuis, Festuca rubra, Dactylis glomerata, Plantago lanceolata and Ranunculus bulbosus formed 50% of the dry weight of the former site. The most important contributors at areas 2 and 3 were Alopecurus pratensis and Holcus lanatus, the latter forming 25% of the total at both. Festuca rubra was also important at area 3. The two most productive sites-or rather-the two sites with the highest standing crop at the sample time-F.G.2 and area 3-had no Anthoxanthum odoratum or Poa pratensis, little Agrostis tenuis and fewer dicotyledons (Table 9.6).

The results of analysing each species from F.G.1, F.G.2 and W.P. for sodium, potassium, magnesium and calcium are presented, with results of analysis of species from areas 2 and 3, in Table 9.7. In each section of the table the results have been expressed

TABLE 9.6

DRY WEIGHT AS PERCENTAGE OF TOTAL AT SAMPLE TIME

| | 2 | 3 | FG1 | FG2 | WP |
|---|---|---|---|---|---|
| Anthoxanthum odoratum | 1.2 | | 0.5 | | 3.0 |
| Holcus lanatus | 24.8 | 24.3 | | 13.0 | 11.7 |
| Poa trivialis | 3.8 | 2.4 | 2.5 | | 5.4 |
| Alopecurus pratensis | 14.1 | 30.8 | | | 2.0 |
| Agrostis tenuis | 7.5 | | 23.5 | 2.5 | 15.3 |
| Festuca rubra | 2.7 | 15.3 | 4.4 | 1.9 | 11.6 |
| Bromus mollis | 3.4 | 3.3 | | | |
| Helictotrichon pubescens | | 2.7 | 5.2 | 1.1 | 0.6 |
| Poa pratensis | | | 0.8 | | 1.8 |
| Cynosaurus cristatus | | | | | 0.7 |
| Dactylis glomerata | | | 5.3 | 37.3 | 9.5 |
| Trisetum flavescens | | | 9.9 | 4.4 | 0.9 |
| Arrhenatherum elatius | | | 3.3 | | |
| Cerastium holosteodes | 2.3 | 1.3 | | | |
| Ranunculus bulbosus | 5.0 | 0.6 | | 7.3 | 6.3 |
| Rumex acetosa | 5.4 | 0.8 | 8.2 | 1.0 | 2.7 |
| Conopodium majus | | | 2.9 | 1.0 | |
| Trifolium repens | 4.6 | | | 0.8 | 0.9 |
| Rhinanthus minor | 3,6 | 3,7 | 2.0 | | |
| Achillea millefolium | | | 0.8 | | |
| Plantago lanceolata | | | 3.1 | 3.1 | 6.0 |
| Lathyrus pratensis | | | 1.1 | 5.9 | |
| Leontodon hispidus | | | 0.8 | 0.7 | |
| Veronica chamaedrys | | | | 0.7 | |
| Stellaria holostea | | | 1.5 | | |
| Others | 7.3 | 2.7 | 1.7 | 1.8 | 2.8 |
| Debris | 17.3 | 11.9 | 21.0 | 17.3 | 18.7 |

Mineral Content (mg per g dry weight of plant material) of each species.

| Species | F.G.1 | | | | F.G.2 | | | | W.P. | | | | AREA 2 | | | | AREA 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Na | K | Mg | Ca | Na | K | Mg | Ca | Na | K | Mg | Ca | Na | K | Mg | Ca | Na | K | Mg | Ca |
| Anthoxanthum odoratum | 4.5 | 9.5 | 2.6 | 15.2 | | | | | 1.3 | 24.7 | 5.1 | 8.7 | | | | | | | | |
| Holcus lanatus | | | | | 1.7 | 14.7 | 1.6 | 2.0 | 3.8 | 25.9 | 6.6 | 9.5 | 3.1 | 18.3 | 1.8 | 2.2 | 2.5 | 17.0 | 2.6 | 6.9 |
| Poa trivialis | 0.7 | 17.0 | 3.2 | 14.1 | | | | | 0.8 | 19.1 | 8.3 | 12.6 | 1.3 | 21.3 | 3.4 | 4.5 | 0.5 | 19.0 | 3.0 | 6.5 |
| Alopecurus pratensis | | | | | | | | | 0.3 | 15.0 | 2.8 | 11.0 | 1.3 | 15.3 | 2.5 | 2.9 | 1.0 | 10.9 | 5.4 | 12.7 |
| Agrostis tenuis | 3.3 | 7.2 | 2.4 | 8.9 | 1.5 | 16.6 | 2.4 | 2.2 | 1.4 | 20.2 | 5.2 | 6.4 | 1.8 | 14.7 | 2.0 | 2.1 | | | | |
| Festuca rubra | 1.2 | 15.1 | 2.9 | 13.5 | 0.5 | 24.1 | 1.8 | 2.3 | 0.8 | 24.3 | 5.5 | 7.6 | 0.5 | 15.8 | 1.6 | 2.3 | 0.4 | 20.2 | 1.9 | 3.9 |
| Helictotrichon pubescens | 0.7 | 17.0 | 3.4 | 11.5 | 0.6 | 22.6 | 1.9 | 2.8 | 1.2 | 23.2 | 2.2 | 7.8 | | | | | 0.2 | 10.3 | 1.1 | 3.1 |
| Bromus mollis | | | | | | | | | | | | | 2.4 | 8.7 | 2.3 | 2.7 | 1.2 | 5.0 | 2.2 | 4.8 |
| Poa pratensis | 0.8 | 12.8 | 2.9 | 11.2 | | | | | 2.0 | 19.0 | 1.8 | 7.3 | | | | | | | | |
| Cynosurus cristatus | | | | | | | | | 1.5 | 9.1 | 4.2 | 3.5 | | | | | | | | |
| Dactylis glomerata | 5.1 | 8.9 | 4.7 | 19.1 | 4.5 | 22.5 | 2.6 | 2.5 | 2.6 | 17.7 | 8.4 | 9.1 | | | | | | | | |
| Trisetum flavescens | 0.8 | 6.4 | 2.9 | 11.3 | 0.3 | 6.4 | 1.5 | 1.7 | 0.4 | 9.1 | 2.0 | 9.1 | | | | | | | | |
| Arrhenatherum elatius | 1.1 | 12.5 | 3.3 | 11.7 | | | | | | | | | | | | | | | | |
| Cerastium holosteodes | | | | | | | | | | | | | | | | | 1.2 | 21.9 | 39.4 | 7.9 |
| Ranunculus bulbosus | | | | | 7.9 | 19.7 | 4.4 | 7.1 | 3.7 | 21.5 | 4.0 | 27.1 | 6.8 | 12.5 | 5.1 | 10.3 | 5.2 | 10.1 | 5.8 | 18.1 |
| Rumex acetosa | 2.5 | 12.4 | 4.5 | 13.0 | 1.6 | 11.5 | 5.1 | 8.1 | 2.7 | 14.1 | 12.3 | 15.8 | 2.2 | 15.3 | 4.2 | 4.4 | | | | |
| Conopodium majus | 2.5 | 2.1 | 3.5 | 24.3 | 1.0 | 10.5 | 2.8 | 10.0 | | | | | | | | | | | | |
| Trifolium repens | | | | | 4.2 | 14.5 | 4.8 | 12.1 | 2.1 | 16.7 | 15.1 | 35.8 | 6.4 | 16.4 | 4.1 | 8.5 | | | | |
| Rhinanthus minor | 3.2 | 17.3 | 4.4 | 19.9 | | | | | | | | | 3.4 | 15.0 | 4.5 | 7.5 | 0.7 | 17.2 | 3.7 | 6.1 |
| Achillea millefolium | 10.8 | 9.9 | 4.1 | 20.3 | | | | | | | | | | | | | | | | |
| Plantago lanceolata | 6.6 | 4.1 | 3.8 | 17.2 | 7.4 | 12.1 | 2.5 | 5.4 | 8.2 | 15.1 | 10.3 | 25.2 | | | | | | | | |
| Lathyrus pratensis | 0.7 | 8.5 | 4.9 | 18.2 | 0.3 | 13.6 | 4.9 | 7.8 | | | | | | | | | | | | |
| Veronica chamaedrys | | | | | 1.0 | 16.5 | 4.6 | 7.0 | | | | | | | | | | | | |
| Leontodon hispidus | 2.6 | 7.2 | 12.7 | 33.8 | 2.5 | 15.6 | 12.7 | 13.2 | | | | | | | | | | | | |
| Stellaria holostea | 10.7 | 20.4 | 4.3 | 9.8 | | | | | | | | | | | | | | | | |
| other species-mosses | 3.8 | 4.6 | 5.5 | 49.0 | | | | | | | | | | | | | | | | |
| other species-dic. | 3.2 | 28.4 | 8.5 | 11.8 | 1.4 | 13.3 | 3.5 | 4.8 | 3.4 | 25.0 | 4.2 | 19.6 | | | | | | | | |
| other species-mono. | 3.5 | 8.6 | 2.6 | 13.2 | | | | | | | | | | | | | | | | |
| Debris | 1.8 | 2.8 | 3.8 | 22.0 | 0.9 | 3.9 | 2.4 | 3.9 | 0.7 | 2.1 | 1.2 | 7.4 | 1.7 | 6.2 | 3.1 | 6.8 | 0.3 | 4.7 | 2.0 | 11.0 |

Mineral Content (mg per plant x100) of each species and Dry Weight Per Plant (mg)

| SPECIES | F.G.1 | | | | | F.G.2 | | | | | W.P. | | | | | AREA 2 | | | | | AREA 3 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | D.W. | Na | K | Mg | Ca | D.W. | Na | K | Mg | Ca | D.W. | Na | K | Mg | Ca | D.W. | Na | K | Mg | Ca | D.W. | Na | K | Mg | Ca |
| Anthoxanthum odoratum | 24.7 | 11.1 | 23.5 | 6.4 | 37.5 | | | | | | 45.1 | 5.9 | 111.4 | 23.0 | 39.2 | | | | | | | | | | |
| Holcus lanatus | | | | | | 72.3 | 12.3 | 106.3 | 11.6 | 14.5 | 72.4 | 27.5 | 187.5 | 47.8 | 68.8 | 63.6 | 19.5 | 116.4 | 11.3 | 14.1 | 363.8 | 92.3 | 619.0 | 92.7 | 250.8 |
| Poa trivialis | 12.8 | 0.9 | 21.8 | 4.1 | 18.5 | | | | | | 13.5 | 1.1 | 25.8 | 11.2 | 17.0 | 5.8 | 0.8 | 11.2 | 2.0 | 2.6 | 7.0 | 0.4 | 13.4 | 2.1 | 4.5 |
| Alopecurus pratensis | | | | | | | | | | | 196.5 | 5.9 | 29.5 | 55.0 | 216.1 | 54.8 | 8.7 | 129.2 | 16.8 | 19.3 | 193.9 | 15.6 | 211.0 | 88.2 | 246.3 |
| Agrostis tenuis | 82.4 | 27.2 | 59.3 | 19.8 | 73.3 | 61.8 | 9.3 | 102.6 | 14.6 | 13.6 | 32.2 | 4.5 | 65.0 | 16.7 | 20.6 | 26.1 | 4.6 | 38.4 | 5.2 | 5.4 | | | | | |
| Festuca rubra | 11.7 | 1.4 | 17.7 | 3.4 | 15.8 | 13.2 | 0.7 | 31.3 | 2.4 | 3.0 | 13.3 | 1.1 | 32.3 | 7.3 | 10.1 | 6.9 | 0.3 | 10.9 | 1.1 | 1.6 | 12.6 | 0.5 | 25.3 | 2.4 | 4.9 |
| Helictotrichon pubescens | 53.3 | 3.7 | 90.5 | 18.7 | 61.3 | 50.3 | 3.0 | 113.7 | 9.6 | 14.1 | 34.2 | 4.1 | 79.7 | 7.5 | 26.7 | | | | | | 40.1 | 0.7 | 41.5 | 4.3 | 12.3 |
| Bromus mollis | | | | | | | | | | | | | | | | 22.6 | 5.5 | 19.6 | 5.1 | 6.2 | 13.5 | 1.6 | 6.7 | 3.0 | 6.4 |
| Poa pratensis | 43.1 | 3.4 | 55.2 | 12.5 | 48.3 | | | | | | 31.0 | 6.2 | 58.9 | 5.6 | 22.6 | | | | | | | | | | |
| Cynosurus cristatus | | | | | | | | | | | 112.9 | 16.9 | 102.7 | 47.4 | 39.5 | | | | | | | | | | |
| Dactylis glomerata | 103.2 | 52.5 | 91.5 | 48.4 | 196.7 | 314.8 | 141.7 | 708.3 | 81.8 | 78.7 | 170.1 | 44.2 | 301.1 | 142.9 | 154.8 | | | | | | | | | | |
| Trisetum flavescens | 72.8 | 5.8 | 46.6 | 21.1 | 82.3 | 129.5 | 3.9 | 82.9 | 19.4 | 22.0 | 15.9 | 0.6 | 14.5 | 3.2 | 14.5 | | | | | | | | | | |
| Arrhenatherum elatius | 76.5 | 8.4 | 95.6 | 25.3 | 89.6 | | | | | | | | | | | | | | | | | | | | |
| Cerastium holosteodes | | | | | | | | | | | | | | | | | | | | | 24.7 | 3.0 | 53.9 | 8.3 | 19.4 |
| Ranunculus bulbosus | | | | | | 488.6 | 386.0 | 962.5 | 215.0 | 346.9 | 198.5 | 73,4 | 426.8 | 79.4 | 537.9 | 190.7 | 130.2 | 238.1 | 96.7 | 196.1 | 49.3 | 25.6 | 49.9 | 28.5 | 89.9 |
| Rumex acetosa | 571.1 | 142.8 | 708.2 | 257.0 | 742.4 | 133.7 | 21.4 | 153.8 | 68.2 | 108.3 | 125.8 | 34.0 | 177.5 | 154.7 | 198.8 | 133.3 | 30.0 | 204.4 | 85.8 | 94.7 | | | | | |
| Conopodium majus | 301.2 | 75.3 | 63.3 | 105.4 | 731.9 | 343.3 | 34.3 | 360.5 | 96.1 | 343.3 | | | | | | | | | | | | | | | |
| Trifolium repens | | | | | | 72.2 | 30.3 | 104.7 | 34.7 | 87.4 | 45.7 | 9.6 | 76.3 | 69.0 | 163.6 | 60.3 | 38.6 | 98.8 | 24.6 | 51.4 | | | | | |
| Rhinanthus minor | 153.3 | 49.1 | 265.2 | 67.5 | 305.1 | | | | | | | | | | | 279.3 | 94.6 | 420.5 | 126.5 | 209.1 | 28.8 | 20.5 | 504.8 | 107.2 | 179.8 |
| Achillea millefolium | 260.8 | 281.7 | 258.2 | 106.9 | 529.4 | | | | | | | | | | | | | | | | | | | | |
| Plantago lanceolata | 39.1 | 33.6 | 16.0 | 14.9 | 67.3 | 517.1 | 382.7 | 625.7 | 129.3 | 279.2 | 202.6 | 166.1 | 305.9 | 208.7 | 510.5 | | | | | | | | | | |
| Lathyrus pratensis | 44.5 | 3.1 | 37.8 | 21.8 | 81.0 | 363.1 | 10.9 | 493.8 | 177.9 | 283.2 | | | | | | | | | | | | | | | |
| Veronica chamaedrys | | | | | | 62.9 | 6.3 | 103.8 | 28.9 | 44.0 | | | | | | | | | | | | | | | |
| Leontodon hispidus | 261.3 | 67.9 | 188.1 | 331.9 | 883.2 | 482.2 | 120.6 | 752.2 | 612.4 | 636.5 | | | | | | | | | | | | | | | |
| Stellaria holostea | 54.0 | 3.8 | 110.2 | 23.2 | 52.9 | | | | | | | | | | | | | | | | | | | | |

| SPECIES | F.G.1 | | | | F.G.2 | | | | W.P. | | | | AREA 2 | | | | AREA 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Na | K | Mg | Ca | Na | K | Mg | Ca | Na | K | Mg | Ca | Na | K | Mg | Ca | Na | K | Mg | Ca |
| Anthoxanthum odoratum | 12.1 | 25.6 | 7.0 | 41.0 | | | | | 15.2 | 289.0 | 59.7 | 101.8 | | | | | | | | |
| Holcus lanatus | | | | | 116.5 | 1006.9 | 109.6 | 137.0 | 174.4 | 1188.8 | 302.9 | 436.0 | 255.5 | 1523.1 | 147.3 | 184.8 | 312.0 | 2092.1 | 313.3 | 847.7 |
| Poa trivialis | 8.7 | 21.1 | 39.7 | 174.8 | | | | | 16.9 | 403.0 | 175.1 | 265.9 | 17.1 | 247.8 | 43.9 | 57.1 | 6.6 | 232.4 | 36.2 | 18.9 |
| Alopecurus pratensis | | | | | | | | | 2.3 | 115.5 | 21.6 | 84.7 | 61.4 | 912.4 | 118.6 | 136.1 | 125.3 | 1698.5 | 710.3 | 1982.6 |
| Agrostis tenuis | 378.8 | 826.6 | 275.5 | 1021.7 | 19.7 | 217.5 | 31.4 | 28.8 | 84.0 | 1212.0 | 312.0 | 384.0 | 44.0 | 370.8 | 50.3 | 52.5 | | | | |
| Festuca rubra | 25.9 | 326.2 | 62.6 | 291.6 | 5.0 | 241.0 | 18.0 | 23.0 | 36.5 | 1108.1 | 250.8 | 346.6 | 4.7 | 143.9 | 14.9 | 21.1 | 32.6 | 1562.7 | 149.8 | 300.3 |
| Helictotrichon pubescens | 17.8 | 433.5 | 86.7 | 293.2 | 3.5 | 133.3 | 11.2 | 16.5 | 2.9 | 55.9 | 5.3 | 18.7 | | | | | 2.6 | 143.5 | 15.0 | 42.6 |
| Bromus mollis | | | | | | | | | | | | | 27.5 | 98.9 | 25.7 | 31.2 | 19.7 | 83.5 | 37.1 | 72.8 |
| Poa pratensis | 3.2 | 57.2 | 11.6 | 44.8 | | | | | 14.0 | 133.0 | 12.6 | 51.1 | | | | | | | | |
| Cynosurus cristatus | | | | | | | | | 4.0 | 24.6 | 11.3 | 9.4 | | | | | | | | |
| Dactylis glomerata | 132.1 | 230.5 | 121.7 | 494.7 | 887.4 | 4437.0 | 512.7 | 493.0 | 97.0 | 660.2 | 313.3 | 339.4 | | | | | | | | |
| Trisetum flavescens | 38.7 | 309.8 | 140.4 | 546.9 | 7.0 | 149.1 | 35.0 | 39.6 | 1.4 | 31.8 | 7.0 | 31.8 | | | | | | | | |
| Arrhenatherum elatius | 17.8 | 202.5 | 53.5 | 189.5 | | | | | | | | | | | | | | | | |
| Cerastium holosteodes | | | | | | | | | | | | | | | | | 8.1 | 143.8 | 22.2 | 51.9 |
| Ranunculus bulbosus | | | | | 302.6 | 754.5 | 168.5 | 271.9 | 92.1 | 535.3 | 99.6 | 674.8 | 114.6 | 209.5 | 85.1 | 172.6 | 16.9 | 32.9 | 18.8 | 55.3 |
| Rumex acetosa | 100.5 | 498.0 | 181.0 | 528.0 | 8.3 | 59.8 | 26.5 | 42.1 | 29.2 | 152.3 | 132.8 | 170.6 | 40.8 | 278.0 | 75.5 | 83.3 | | | | |
| Conopodium majus | 35.5 | 29.8 | 49.6 | 344.0 | 5.4 | 54.7 | 15.1 | 54.0 | | | | | | | | | | | | |
| Trifolium repens | | | | | 18.9 | 65.3 | 21.6 | 54.5 | 7.6 | 60.1 | 54.4 | 128.9 | 99.1 | 253.9 | 63.1 | 132.2 | | | | |
| Rhinanthus minor | 30.7 | 166.1 | 42.2 | 191.0 | | | | | | | | | 40.7 | 180.8 | 54.4 | 89.9 | 13.1 | 323.1 | 68.6 | 115.1 |
| Plantago lanceolata | 131.6 | 68.7 | 58.1 | 263.2 | 119.9 | 196.0 | 40.5 | 87.5 | 195.2 | 359.4 | 245.1 | 599.8 | | | | | | | | |
| Lathyrus pratensis | 3.6 | 44.2 | 25.5 | 94.6 | 9.4 | 925.7 | 153.4 | 244.1 | | | | | | | | | | | | |
| Veronica chamaedrys | | | | | 3.9 | 64.4 | 17.9 | 27.3 | | | | | | | | | | | | |
| Leontodon hispidus | 10.7 | 29.5 | 52.1 | 138.6 | 9.5 | 59.3 | 48.3 | 50.2 | | | | | | | | | | | | |
| Stellaria holostea | 5.0 | 146.9 | 31.0 | 70.6 | | | | | | | | | | | | | | | | |
| other species-mosses | 3.4 | 4.1 | 4.9 | 44.1 | | | | | | | | | | | | | | | | |
| other species-dic. | 29.8 | 264.1 | 79.1 | 109.7 | 13.0 | 123.7 | 32.6 | 44.6 | 37.9 | 277.3 | 45.1 | 220.4 | 131.8 | 460.5 | 112.0 | 170.1 | 21.6 | 218.9 | 61.9 | 232.0 |
| other species-mono. | 10.8 | 26.7 | 8.1 | 40.9 | | | | | | | | | | | | | | | | |
| Debris | 184.7 | 287.3 | 389.9 | 225.7 | 82.3 | 356.5 | 219.4 | 356.5 | 51 | 154 | 88 | 543 | 101.1 | 361.0 | 179.9 | 396.1 | 32.1 | 268.2 | 119.8 | 663.8 |
| TOTAL | 1226 | 4295 | 1737 | 5190 | 1612 | 8347 | 1462 | 1871 | 862 | 6763 | 2139 | 4407 | 938 | 5040 | 971 | 1527 | 591 | 6818 | 1553 | 4434 |
| Achillea millefolium | 44.3 | 40.6 | 16.8 | 83.2 | | | | | | | | | | | | | | | | |

The Percentage of the Total of each Mineral in the Community that is Contained in each Species.

| | F.G.1 | | | | F.G.2 | | | | W.P. | | | | AREA 2 | | | | AREA 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | Na | K | Mg | Ca | Na | K | Mg | Ca | Na | K | Mg | Ca | Na | K | Mg | Ca | Na | K | Mg | Ca |
| Anthoxanthum odoratum | 1.0 | 0.6 | 0.4 | 0.8 | | | | | 1.8 | 4.3 | 2.8 | 2.3 | | | | | | | | |
| Holcus lanatus | | | | | 7.2 | 12.0 | 7.5 | 7.3 | 20.2 | 17.5 | 14.2 | 9.9 | 27.2 | 30.2 | 15.1 | 12.1 | 52.7 | 30.6 | 20.2 | 19.1 |
| Poa trivialis | 0.7 | 0.5 | 2.3 | 3.4 | | | | | 2.0 | 6.0 | 8.2 | 6.0 | 1.8 | 4.9 | 4.5 | 3.7 | 1.1 | 3.4 | 2.3 | 1.8 |
| Alopecurus pratensis | | | | | | | | | 0.3 | 1.7 | 1.0 | 1.9 | 6.5 | 18.1 | 12.2 | 8.9 | 21.2 | 24.9 | 45.7 | 44.7 |
| Agrostis tenuis | 30.9 | 19.2 | 15.9 | 19.6 | 1.2 | 2.6 | 2.1 | 1.5 | 9.7 | 17.9 | 14.6 | 8.7 | 4.7 | 7.3 | 5.3 | 3.4 | | | | |
| Festuca rubra | 2.1 | 7.6 | 3.6 | 5.6 | 0.3 | 2.9 | 1.2 | 1.2 | 4.2 | 16.3 | 11.7 | 7.9 | 0.5 | 2.8 | 1.5 | 1.4 | 5.5 | 22.9 | 9.6 | 6.8 |
| Helictotrichon pubescens | 1.4 | 10.1 | 5.0 | 5.6 | 0.2 | 1.6 | 0.8 | 0.9 | 0.3 | 0.8 | 0.2 | 0.4 | | | | | 0.4 | 2.1 | 0.1 | 1.0 |
| Bromus mollis | | | | | | | | | | | | | 2.9 | 2.0 | 2.6 | 2.0 | 3.3 | 1.2 | 2.4 | 1.8 |
| Poa pratensis | 0.3 | 1.2 | 0.7 | 0.9 | | | | | 1.6 | 2.0 | 0.6 | 1.2 | | | | | | | | |
| Cynosurus cristatus | | | | | | | | | 0.5 | 0.4 | 0.5 | 0.2 | | | | | | | | |
| Dactylis glomerata | 10.8 | 5.4 | 7.0 | 9.5 | 55.0 | 53.1 | 35.1 | 26.3 | 11.2 | 9.8 | 14.6 | 7.7 | | | | | | | | |
| Trisetum flavescens | 3.2 | 7.2 | 8.1 | 10.5 | 0.4 | 1.8 | 2.4 | 2.1 | 0.2 | 0.5 | 0.3 | 0.7 | | | | | | | | |
| Arrhenatherum elatius | 1.4 | 4.7 | 3.1 | 3.6 | | | | | | | | | | | | | | | | |
| Cerastium holostéodes | | | | | | | | | | | | | | | | | 1.4 | 2.1 | 1.4 | 1.2 |
| Ranunculus bulbosus | | | | | 18.8 | 9.0 | 11.5 | 14.5 | 10.7 | 7.9 | 4.7 | 15.3 | 12.2 | 4.2 | 8.8 | 11.3 | 2.8 | 0.5 | 0.1 | 1.3 |
| Rumex acetosa | 8.2 | 11.6 | 10.4 | 10.1 | 0.5 | 0.7 | 1.8 | 2.2 | 3.4 | 2.3 | 6.2 | 3.9 | 4.3 | 5.5 | 7.8 | 5.5 | | | | |
| Conopodium majus | 2.9 | 6.9 | 2.9 | 6.6 | 0.3 | 0.7 | 1.0 | 2.9 | | | | | | | | | | | | |
| Trifolium repens | | | | | 1.2 | 0.8 | 1.5 | 2.9 | 0.9 | 0.9 | 2.5 | 2.9 | 10.6 | 5.0 | 6.5 | 8.6 | | | | |
| Rhinanthus minor | 2.5 | 3.9 | 2.4 | 3.7 | | | | | | | | | 4.3 | 3.6 | 5.6 | 5.9 | 2.2 | 4.7 | 4.4 | 2.6 |
| Achillea millefolium | 3.6 | 0.9 | 1.0 | 1.6 | | | | | | | | | | | | | | | | |
| Plantago lanceolata | 10.7 | 1.5 | 3.3 | 5.1 | 7.4 | 2.3 | 2.8 | 4.7 | 22.6 | 5.3 | 11.5 | 13.6 | | | | | | | | |
| Lathyrus pratensis | 0.3 | 1.0 | 1.5 | 1.8 | 0.6 | 5.1 | 10.5 | 13.0 | | | | | | | | | | | | |
| Veronica chamaedrys | | | | | 0.2 | 0.8 | 1.2 | 1.5 | | | | | | | | | | | | |
| Leontodon hispidus | 0.9 | 0.7 | 3.0 | 2.7 | 0.6 | 0.7 | 3.3 | 2.7 | | | | | | | | | | | | |
| Stellaria holostea | 0.4 | 3.4 | 1.8 | 1.4 | | | | | | | | | | | | | | | | |
| other species-mosses | 0.3 | 0.1 | 0.3 | 0.8 | | | | | | | | | | | | | | | | |
| other species-dic. | 2.4 | 6.1 | 4.5 | 2.1 | 0.8 | 1.5 | 2.2 | 2.4 | 4.4 | 4.1 | 2.2 | 5.0 | 14.0 | 9.1 | 11.5 | 11.1 | 3.6 | 3.2 | 4.0 | 5.2 |
| other species-mono. | 0.9 | 0.6 | 0.5 | 0.8 | | | | | | | | | | | | | | | | |
| Debris | 15.1 | 6.7 | 22.4 | 4.3 | 5.1 | 4.3 | 15.0 | 19.1 | 6.0 | 2.3 | 4.1 | 12.3 | 10.7 | 7.2 | 18.5 | 25.9 | 5.4 | 4.2 | 7.7 | 15.0 |

TABLE 9.7(e)

Total Mineral "Concentration" (mg per g dry weight) of each Species

| Species | FG.1 | FG.2 | W.P. | 2 | 3 |
|---|---|---|---|---|---|
| Anthoxanthum odoratum | 31.8 | | 39.8 | | |
| Holcus lanatus | | 20.0 | 45.8 | 25.4 | 29.0 |
| Poa trivialis | 35.0 | | 40.8 | 30.5 | 29.0 |
| Poa pratensis | 27.7 | | 30.1 | [illegible] | [illegible] |
| Agrostis tenuis | 21.8 | 22.7 | 33.2 | 20.6 | |
| Festuca rubra | 32.7 | 28.7 | 38.2 | 20.2 | 25.4 |
| Helictotrichon pubescens | 32.6 | 27.9 | 34.5 | | 14.7 |
| Bromus mollis | | | | 16.1 | 13.2 |
| Alopecurus pratensis | | | 29.1 | 22.0 | 19.0 |
| Cynosurus cristatus | | | 18.3 | | |
| Dactylis glomerata | 37.8 | 32.1 | 37.8 | | |
| Trisetum flavescens | 21.4 | 9.9 | 20.6 | | |
| Arrhenatherum elatius | 28.6 | | | | |
| Cerastium holostiodes | | | | | 34.4 |
| Ranunculus bulbosus | | 39.1 | 56.3 | 34.7 | 39.2 |
| Rumex acetosa | 32.4 | 26.3 | 44.9 | 26.1 | |
| Conopodium majus | 32.4 | 24.3 | | | |
| Trifolium repens | | 35.6 | 69.7 | 35.4 | |
| Rhinanthus minor | 44.8 | | | 30.4 | 27.7 |
| Achillea millefolium | 45.1 | | | | |
| Plantago lanceolata | 25.7 | 27.4 | 58.8 | | |
| Lathyrus pratensis | 32.3 | 26.6 | | | |
| Veronica chamaedrys | | 29.1 | | | |
| Leontodon hispidus | 56.3 | 44.0 | | | |
| Stellaria holostea | 35.2 | | | | |
| other species-mosses | 62.9 | | | | |
| other species-dic. | 51.9 | 23.0 | 52.2 | | |
| other species-mono. | 27.9 | | | | |
| Debris | 30.4 | 11.1 | 11.4 | 17.8 | 18.0 |

in a different way:-

(a) mg per g dry weight of plant material,

(b) mg per plant X 100,

(c) mg per $m^2$ per species, and

(d) percentage of each mineral found in the total plant material that is present in each species and

(e) total mineral concentration (mg per g dry weight) in each species.

Table 9.8 shows the total amount (mg per $m^2$), and Table 9.9 the percentage, of each mineral in

(a) the whole community,

(b) the living plant material, and

(c) the dead plant material.

TABLE 9.8

Total Amount of each Mineral in the Whole Community, the Living Plant Material and the Dead Plant Material.

| | Whole Community | | | | Living Plant Material | | | |
|---|---|---|---|---|---|---|---|---|
| AREA | Na | K | Mg | Ca | Na | K | Mg | Ca |
| 2 | 938 | 5040 | 971 | 1527 | 837 | 4679 | 791 | 1131 |
| 3 | 591 | 6818 | 1553 | 4454 | 559 | 6532 | 1433 | 3790 |
| F.G.1 | 1226 | 4295 | 1737 | 5190 | 1041 | 4008 | 1347 | 4964 |
| F.G.2 | 1612 | 8347 | 1462 | 1871 | 1530 | 7990 | 1243 | 1515 |
| W.P. | 862 | 6763 | 2139 | 4407 | 811 | 6609 | 2051 | 3864 |

| | Dead Plant Material | | | |
|---|---|---|---|---|
| AREA | Na | K | Mg | Ca |
| 2 | 101 | 361 | 180 | 396 |
| 3 | 32 | 286 | 120 | 664 |
| F.G.1 | 185 | 287 | 390 | 226 |
| F.G.2 | 82 | 357 | 219 | 356 |
| W.P. | 51 | 154 | 88 | 543 |

TABLE 9.9

Percentage of each Mineral Found in the Living and Dead Plant Material.

| | Living Plant Material | | | | Dead Plant Material | | | |
|---|---|---|---|---|---|---|---|---|
| AREA | Na | K | Mg | Ca | Na | K | Mg | Ca |
| 2 | 89.3 | 92.8 | 81.5 | 74.1 | 10.1 | 7.2 | 18.5 | 25.9 |
| 3 | 94.6 | 95.8 | 92.3 | 85.0 | 5.4 | 4.2 | 7.7 | 15.0 |
| F.G.1 | 84.9 | 93.3 | 77.6 | 95.7 | 15.1 | 6.7 | 22.4 | 4.3 |
| F.G.2 | 94.9 | 95.7 | 85.0 | 80.9 | 5.1 | 4.3 | 15.0 | 19.1 |
| W.P. | 94.0 | 97.7 | 95.9 | 87.7 | 6.0 | 2.3 | 4.1 | 12.3 |

Table 9.10 with the total weight of the four minerals studied shows that the ecosystem at W.P. contained the highest total of minerals even though (see Table 9.5) the total standing crop was low. Area 3, F.G.1

TABLE 9.10

The Total Weight of Minerals in the Living Whole Community, the Living Plant Material and the Dead Plant Material($mg/m^2$).

| AREA | Whole Community | Living Plant Material | Debris |
|---|---|---|---|
| 2 | 8476 | 7438 | 1038 |
| 3 | 13416 | 12314 | 1102 |
| F.G.1 | 12448 | 11360 | 1088 |
| F.G.2 | 13292 | 12278 | 1014 |
| W.P. | 14171 | 13335 | 836 |

and F.G.2 had similar total dry weight and total mineral content while the community at area 2 had the lowest values for both quantities.

Table 9.11 shows that the"concentration"of the four minerals in the living plant material was highest at areas 2 and 3, and that except for W.P., the "concentration" of all four minerals in the whole

[illegible] by

community and in the dead plant material was approximately the same. The higher total amount of minerals

TABLE 9.11

"Concentration" of the Total of the Four Minerals (mg per g dry weight) in the Whole Community, the Living Plant Material and the Dead Plant Material.

| AREA | Whole Community | Living Plant Material | Debris |
|---|---|---|---|
| 2 | 24.4 | 17.5 | 25.8 |
| 3 | 26.4 | 18.0 | 27.6 |
| F.G.1 | 25.5 | 10.6 | 29.5 |
| F.G.2 | 25.2 | 11.1 | 28.1 |
| W.P. | 36.0 | 10.0 | 41.8 |

present in the plant material was due to the higher mineral content of the individual species at W.P., as neither number per square metre nor dry weight per plant were greater there (Table 9.12 and Table 9.2).

TABLE 9.12

COMPARISON OF MINERAL CONTENT OF CERTAIN SPECIES FROM DIFFERENT SITES

| SPECIES | Site | Mineral mgm per gm dry weight Na. | K. | Mg. | Ca. | Total mineral mgm/gm |
|---|---|---|---|---|---|---|
| HOLCUS LANATUS | 2 | 3.1 | 18.3 | 1.8 | 2.2 | 25.4 |
| | 3 | 2.5 | 17.0 | 2.6 | 6.9 | 29.0 |
| | FG2 | 1.7 | 14.7 | 1.6 | 2.0 | 20.0 |
| | WP | 3.8 | 25.9 | 6.6 | 9.5 | 45.8 |
| POA TRIVIALIS | 2 | 1.3 | 21.3 | 3.4 | 4.5 | 30.5 |
| | 3 | 0.5 | 19.0 | 3.0 | 6.5 | 29.0 |
| | FG1 | 0.7 | 17.0 | 3.2 | 14.1 | 35.0 |
| | WP | 0.8 | 19.1 | 8.3 | 12.6 | 40.8 |
| ALOPECURUS PRATENSIS | 2 | 1.3 | 19.3 | 2.5 | 2.9 | 26.0 |
| | 3 | 1.0 | 10.9 | 5.4 | 12.7 | 10.0 |
| | W.P | 0.3 | 15.0 | 2.8 | 11.0 | 29.1 |
| AGROSTIS TENUIS | 2 | 1.8 | 14.7 | 2.0 | 2.1 | 20.6 |
| | FG1 | 3.3 | 7.2 | 2.4 | 18.9 | 21.8 |
| | FG2 | 1.5 | 16.6 | 2.4 | 2.2 | 22.7 |
| | WP | 1.4 | 20.2 | 5.2 | 6.4 | 33.2 |
| FESTUCA RUBRA | 2 | 0.5 | 15.8 | 1.6 | 2.3 | 20.2 |
| | 3 | 0.4 | 20.2 | 1.9 | 3.9 | 26.4 |
| | FG1 | 1.2 | 15.1 | 2.9 | 13.5 | 32.7 |
| | FG2 | 0.5 | 24.1 | 1.8 | 2.3 | 28.7 |
| | WP | 0.8 | 24.3 | 5.5 | 7.6 | 38.2 |
| HELICTOTRICHON PUBESCENS | 3 | 0.2 | 10.3 | 1.1 | 3.1 | 14.7 |
| | FG1 | 0.7 | 17.0 | 3.4 | 11.5 | 32.6 |
| | FG2 | 0.6 | 22.6 | 1.9 | 2.8 | 27.9 |
| | WP | 1.2 | 23.3 | 2.2 | 7.8 | 34.5 |
| DACTYLIS GLOMERATA | Fg1 | 5.1 | 8.9 | 4.7 | 19.1 | 37.8 |
| | FG2 | 4.5 | 22.5 | 2.6 | 2.5 | 32.1 |
| | WP | 2.6 | 17.7 | 8.4 | 9.1 | 37.8 |
| RUMEX ACETOSA | 2 | 2.2 | 15.3 | 4.2 | 4.6 | 26.3 |
| | FG1 | 2.5 | 12.4 | 4.5 | 13.0 | 32.5 |
| | FG2 | 1.6 | 11.5 | 5.1 | 8.1 | 26.3 |
| | WP | 2.7 | 14.1 | 12.3 | 15.8 | 44.9 |

TABLE 9.12 contd.

| SPECIES | Site | Na. | K. | Mg. | Ca. | Total mineral mgm/gm |
|---|---|---|---|---|---|---|
| RHINANTHUS MINOER | 2 | 3.4 | 15.0 | 4.5 | 7.5 | 30.4 |
| | 3 | 0.7 | 17.2 | 3.7 | 6.1 | 27.7 |
| | FG1 | 3.2 | 17.3 | 4.4 | 19.9 | 44.8 |
| PLANTAGO LANCEOLATA | FG1 | 8.6 | 4.1 | 3.8 | 17.2 | 25.7 |
| | FG2 | 7.4 | 12.1 | 2.5 | 5.4 | 27.4 |
| | WP | 8.2 | 15.1 | 10.3 | 25.2 | 58.8 |
| RANUNCULUS BULBOSUS | 2 | 6.8 | 12.5 | 5.1 | 10.3 | 34.7 |
| | 3 | 5.2 | 10.1 | 5.8 | 18.1 | 39.2 |
| | FG2 | 7.9 | 19.7 | 4.4 | 7.1 | 39.1 |
| | WP | 3.7 | 21.5 | 4.0 | 27.1 | 56.3 |
| TRIFOLIUM REPENS | 2 | 6.4 | 16.4 | 4.1 | 8.5 | 35.4 |
| | FG2 | 4.2 | 14.5 | 4.8 | 12.1 | 35.6 |
| | WP | 2.1 | 16.7 | 15.1 | 35.8 | 69.7 |

FIGURE 10.1

MAP OF EXPERIMENTAL AREA

(FROM O.S. SHEET NY 82 NE.)

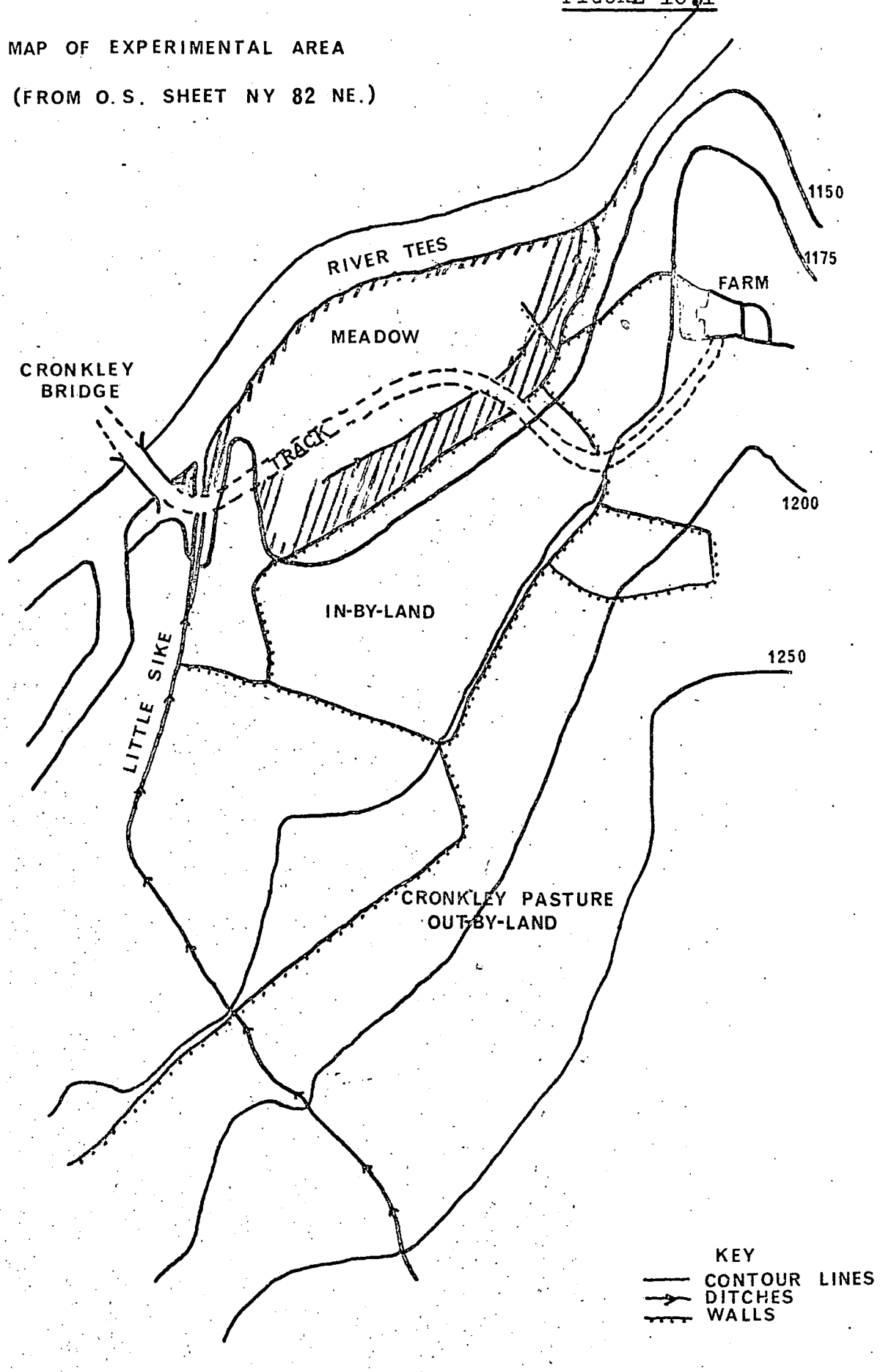



Figure to show position of quadrats-all recorded in the shaded area.

KEY TO FIGURE 10.2

1.....Molinia caerulea
2.....Achillea ptarmica
3.....Cynosurus cristatus
4.....Euphrasia sp.
5.....Eriophorum angustifolium
6.....Carex panicea
7.....Anemone nemorosa
8.....Lychnis flos-cuculi
9.....Helictotrichon pratensis
10....Juncus bulbosus
11....Conopodium majus
12....Plantago lanceolata
13....Cirsium palustre
14....Festuca rubra
15....Ranunculus acris
16....Succisa pratensis
17....Juncus squarrosus
18....Trifolium pratense
19....Brachythecium rutabulum
20....Mnium hornum
21....Galium cruciata

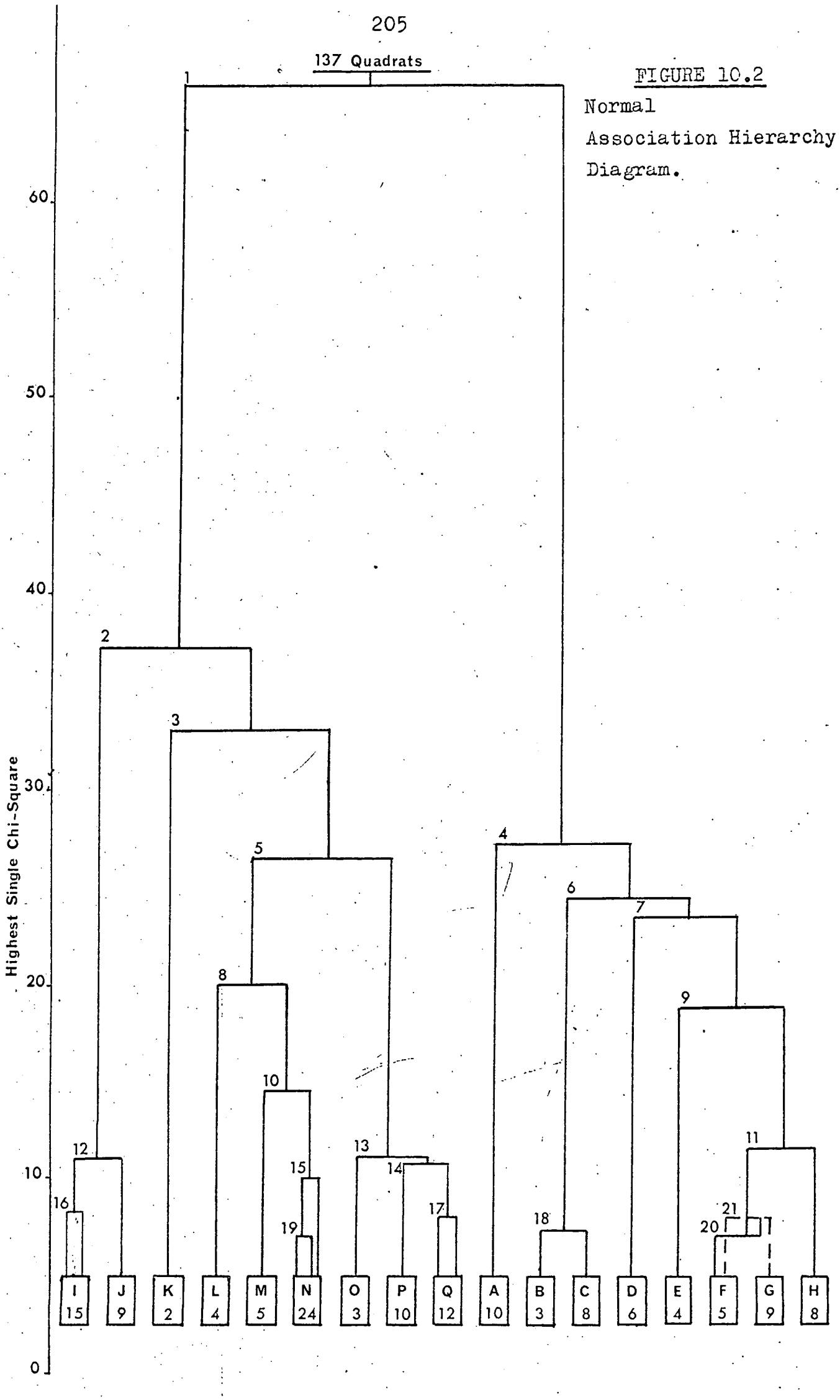



FIGURE 10.2

Normal Association Hierarchy Diagram.

TABLE 10.1

Percentage Frequency of Occurrence of each species in the Quadrat Groups.

| Group. | A | B | D | E | F | G | H | J | I | C | K | L | M | N | O | P | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average number of phanerogam species. | 33 | 29 | 22 | 24 | 22 | 10 | 21 | 22 | 30 | 25 | 30 | 30 | 20 | 19 | 25 | 17 | 12 |
| Average number of cryptogam species. | 5 | 8 | 4 | 2 | 2 | + | 2 | 3 | 6 | 5 | 7 | 4 | 6 | 4 | 4 | 3 | 5 |
| Number of stands in group. | 10 | 3 | 6 | 4 | 5 | 9 | 8 | 9 | 15 | 8 | 2 | 4 | 5 | 24 | 3 | 10 | 12 |
| Phanerogam cover % | 85 | 90 | 98 | 100 | 95 | 95 | 100 | 92 | 98 | 95 | 100 | 99 | 85 | 95 | 98 | 98 | 90 |
| Cryptogam cover % | 10 | 25 | 2-40 | + | 6-10 | + | 0-30 | 0-50 | 5-50 | 0-60 | 30 | 2-20 | 50 | 2-50 | 20-70 | 5 | 2-70 |
| Height of vegetation cm. | 5-10 | 25-40 | 15-40 | 20-30 | 10-25 | 20-50 | 30-60 | 20-70 | 15-60 | 20-60 | 15-45 | 15-45 | 20-50 | 10-50 | 15 | 20-50 | |
| Site of quadrat | R.B. | Bk. | Bk. | R.B. | R.B. | Bk. | Bk. | Bg. | Bg. | Bg. | Bg. | Bg. | Bg.8 | Bg. | Bg. | Bg. | Bg. |
| Amount of litter. | VL-L | P-S | M-P | VL | O-M | VL-P-M | VL-L | M-P | S-M | VL-M | L-S | M | M-P | M | M | L-M | M-P |
| Slope. | F-10° | 30-60° | F-40° | F-15° | F-10° | F-30° | F-20° | F-30° | F-20° | F-5° | F-5° | F-5° | F | F-10° | F | F-15° | F-5° |
| Association character and differential species. | | | | | | | | | | | | | | | | | |
| Molinia caerulea | | | | | | | | 100.0 | 100.0 | 87.5 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Rhinanthus minor | 90.0 | 100.0 | 50.0 | 75.0 | | | 25.0 | 22.2 | 46.7 | 50.0 | 50.0 | 25.0 | | | | | |
| Centaurea nigra | 100.0 | 100.0 | | 75.0 | 100.0 | 22.2 | | 22.2 | | 50.0 | | | | | | | |
| Agrostis tenuis | 60.0 | 66.7 | 83.3 | 25.0 | 20.0 | 22.2 | | 22.2 | 20.0 | | 50.0 | 25.0 | | | | 20.0 | |
| Alchemilla glabra | 40.0 | 66.7 | | 25.0 | | | 25.0 | | 40.0 | 25.0 | 100.0 | | | | | | |
| Leontodon hispidus | 90.0 | 66.7 | | 100.0 | | | | | 26.7 | | | | | | | | |
| Campanula rotundifolia | 70.0 | 33.3 | | 75.0 | 20.0 | | | | | | | | | | | | |
| Trollius europaeus | | 33.3 | | | | | | 44.4 | 46.7 | | | | 20.0 | | | | |
| Holcus mollis | | 33.3 | | 25.0 | 80.0 | 44.4 | | | | | | | | | | | |
| Carex caryophyllea | 20.0 | | | 25.0 | | | | | 26.7 | | | | | | | | |
| Conopodium majus | 30.0 | 33.3 | | 50.0 | 100.0 | 100.0 | | | | | | | | | | 30.0 | |
| Euphrasia sp. | 100.0 | | | | | | | | | | | 25.0 | | | | | |
| Galium cruciata | 70.0 | | | 25.0 | 60.0 | | | | | | | | | | | | |
| Helictotrichon pratensis | 70.0 | | | 100.0 | | | | | | | | | | | | | |
| Plantago maritima | 80.0 | | | 25.0 | 20.0 | | | | | | | | | | | | |
| Festuca ovina | 20.0 | | 66.7 | | | | | | 33.3 | | | 75.0 | 80.0 | 87.5 | 33.3 | 40.0 | 83.3 |
| Viola palustris | 40.0 | 33.3 | | | | | | 33.3 | | 25.0 | | 50.0 | 100.0 | 62.5 | 100.0 | 20.0 | |

| | A | B | D | E | F | G | H | J | I | C | K | L | M | N | O | P | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MOLINION Character species. | | | | | | | | | | | | | | | | | |
| Achillea ptarmica | 20.0 | 100.0 | 33.3 | 50.0 | 20.0 | 22.2 | 75.0 | 100.0 | 100.0 | 50.0 | | | | | | | |
| Juncus conglomeratus | | | | | 20.0 | | 37.5 | 88.9 | 33.3 | 50.0 | | | 40.0 | 29.2 | 33.3 | 20.0 | |
| Festuca arundinacea | | | | 50.0 | | | | | | | 50.0 | | | | | | |
| MOLINIETALIA Character species | | | | | | | | | | | | | | | | | |
| Succisa pratensis | 70.0 | 100.0 | 66.7 | 75.0 | | | 25.0 | 66.7 | 73.3 | 50.0 | 50.0 | 75.0 | 100.0 | 87.5 | 100.0 | 60.0 | 41.7 |
| Carex panicea | 40.0 | 100.0 | | | | | | 33.3 | 93.3 | 100.0 | 100.0 | 100.0 | 100.0 | 91.7 | 66.7 | 30.0 | 33.3 |
| Deschampsia caespitosa | | 66.7 | 66.7 | 50.0 | 60.0 | 55.6 | 50.0 | 66.7 | 60.0 | | 50.0 | 25.0 | | | | 30.0 | |
| Caltha palustris | | | | 50.0 | 20.0 | | 75.0 | 44.4 | 66.7 | 62.5 | 100.0 | 75.0 | 20.0 | | 33.3 | | |
| Equisetum palustris | 50.0 | 66.7 | | 50.0 | 40.0 | | 75.0 | 33.3 | 33.3 | 62.5 | | 75.0 | 20.0 | 29.2 | | 20.0 | |
| Filipendula ulmaria | 20.0 | 33.3 | | 50.0 | 60.0 | 33.3 | 63.5 | 33.3 | 20.0 | 37.5 | 100.0 | | | | | | |
| Sanguisorba officinalis | 70.0 | | | 100.0 | | 22.2 | | 33.3 | | 25.0 | | | | | | 30.0 | |
| Angelica sylvestris | | 33.3 | | 50.0 | 20.0 | 33.3 | 37.5 | 66.7 | 33.3 | | | | | | 66.7 | | |
| Cirsium palustre | | | | | | | | 44.4 | 46.7 | 25.0 | 50.0 | | | | 100.0 | | |
| Lychnis flos-cuculi | | | | | | | | 33.3 | 25.0 | 50.0 | 100.0 | | | | 33.3 | | |
| Geum rivulare | | | | | 20.0 | | 25.0 | | 25.0 | | | | | | | | |
| MOLINIO-ARRHENATHERETALIA Character species | | | | | | | | | | | | | | | | | |
| Anthoxanthum odoratum | 90.0 | 100.0 | 100.0 | 75.0 | 60.0 | 66.7 | 100.0 | 88.9 | 93.3 | 87.5 | 100.0 | 100.0 | 80.0 | 100.0 | 100.0 | 100.0 | 66.7 |
| Holcus lanatus | 90.0 | 100.0 | 100.0 | 100.0 | 100.0 | 77.8 | 100.0 | 100.0 | 100.0 | 87.5 | 100.0 | 100.0 | 40.0 | 75.0 | 100.0 | 80.0 | 41.7 |
| Festuca rubra | 60.0 | 100.0 | 83.3 | 50.0 | 100.0 | 55.6 | 75.0 | 88.9 | 87.5 | 100.0 | 75.0 | 20.0 | 33.3 | 33.3 | 66.7 | 100.0 | |
| Rumex acetosa | 20.0 | 100.0 | 100.0 | 75.0 | | 100.0 | 87.5 | 77.8 | 60.0 | 50.0 | 100.0 | 75.0 | | | 100.0 | 70.0 | 33.3 |
| Ranunculus acris | 60.0 | 100.0 | 33.3 | 75.0 | 60.0 | 44.4 | 37.5 | 77.8 | 93.3 | 50.0 | 100.0 | 100.0 | 20.0 | 58.3 | 66.7 | 40.0 | |
| Plantago lanceolata | 80.0 | 100.0 | 100.0 | 100.0 | 20.0 | 22.2 | 37.5 | | 100.0 | | 50.0 | 50.0 | | | | 30.0 | |
| Cerastium holosteodes | 90.0 | 66.7 | 66.7 | 75.0 | 60.0 | 22.2 | 75.0 | 44.4 | 66.7 | | 50.0 | 50.0 | 20.0 | | 33.3 | | |
| Cardamine pratensis | | | | | 40.0 | | 62.5 | 33.3 | 46.7 | 62.5 | | 75.0 | 20.0 | 25.0 | 66.7 | | |
| Briza media | 90.0 | | | | | | | | 66.7 | 25.0 | | 50.0 | | 25.0 | | 20.0 | |
| Trifolium repens | 60.0 | 66.7 | 50.0 | | | 22.2 | | | 26.7 | 37.5 | 100.0 | | | | | | |
| Cynosurus cristatus | 70.0 | 100.0 | 83.3 | 75.0 | | | 37.5 | | 33.3 | 25.0 | 100.0 | | | | | | |
| Taraxacum paludosum | 20.0 | 66.7 | 33.3 | 25.0 | | | | 22.2 | 33.3 | 37.5 | 100.0 | 50.0 | | | 33.3 | | |
| Ranunculus repens | | | | | | 66.7 | 75.0 | 33.3 | 26.7 | 37.5 | 50.0 | | | | 33.3 | | |
| Poa trivialis | | 33.3 | | | 20.0 | 44.4 | 50.0 | 44.4 | | | 50.0 | 50.0 | 20.0 | | 33.3 | | |
| Trifolium pratense | 70.0 | 100.0 | | 75.0 | | | | | 26.7 | | 50.0 | | | | | | |

| | A | B | D | E | F | G | H | J | I | C | K | L | M | N | O | P | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MOLINIO-ARRHENATHERETALIA Character species contd. | | | | | | | | | | | | | | | | | |
| Dactylis glomerata | 50.0 | | 33.3 | 100.0 | 100.0 | | 37.5 | | | | | | | | | | |
| Prunella vulgaris | 20.0 | 66.7 | | 25.0 | | | | | 60.0 | | 100.0 | | | | | | |
| Lotus corniculatus | 80.0 | 33.3 | 33.3 | 50.0 | | | | | | | | | | | | | |
| Vicia cracca | 60.0 | | | 25.0 | | | 25.0 | | | | | | | | | | |
| Poa pratensis | | | 66.7 | | | 44.4 | | | | | | | | | 33.3 | | |
| Lathyrus pratensis | 30.0 | | | 50.0 | | | | | | | | | | | | | |
| Leontodon autumnalis | | | | | | | | | 20.0 | 25.0 | | 50.0 | | | | | |
| Phleum pratense | | 33.3 | | | | | 50.0 | | | 25.0 | 50.0 | | | | | | |
| Lolium perenne | | | | 25.0 | | | | | | | | | | | | | |
| Accompanying Species of the ARRHENATHERETALIA | | | | | | | | | | | | | | | | | |
| Potentilla erecta | 50.0 | 100.0 | 100.0 | 25.0 | 20.0 | 44.4 | 50.0 | 77.8 | 86.7 | 62.5 | 50.0 | 100.0 | 80.0 | 100.0 | 66.7 | 100.0 | 100.0 |
| Agrostis gigantea | 20.0 | | 66.7 | | 100.0 | 66.7 | 50.0 | 66.7 | 20.0 | 37.5 | | 50.0 | 20.0 | | | 50.0 | |
| Galium verum | 50.0 | | | | 20.0 | | | | | | | | | | | | |
| Carex flacca | 60.0 | | | | | | | | | | | | | | | | |
| Achillea millefolium | 40.0 | | | 25.0 | 40.0 | | | | | | | | | | | | |
| Trisetum flavescens | 20.0 | | 33.3 | 25.0 | | | | | | | | | | | | | |
| Veronica chamaedrys | | 33.3 | | | | | | | | | | | | | | | |
| Pimpinella saxifraga | 30.0 | | | | | | | | | | | | | | | | |
| Galium palustre | | | | | | | 25.0 | | | | | | 20.0 | | | | |
| Listera ovata | | | | | | | | | 20.0 | | | | | | | | |
| Parnassia palustris | 20.0 | | | | | | | | | | | | | | | | |
| Gymnadenia conopsea | | | | | | | | | 20.0 | | | | | | | | |
| Arrenatherum elatius | | | | | 20.0 | | | | | | | | | | | | |
| Other accompanying species. | | | | | | | | | | | | | | | | | |
| Luzula campestris | 20.0 | 66.7 | 100.0 | | | | 25.0 | 44.4 | 93.3 | 62.5 | 100.0 | 100.0 | 100.0 | 79.2 | 66.7 | 60.0 | 58.3 |
| Carex nigra | | 66.7 | 50.0 | | | | 37.5 | 22.2 | 73.3 | 75.0 | 100.0 | 75.0 | 100.0 | 83.3 | 66.7 | 70.0 | 33.3 |
| Agrostis canina | | | | 25.0 | 20.0 | | | 22.2 | 60.0 | 37.5 | 50.0 | 75.0 | 60.0 | 100.0 | 66.7 | 60.0 | 66.7 |
| Juncus acutiflorus | 20.0 | 33.3 | 33.3 | 25.0 | | | 37.5 | 77.8 | 66.7 | 50.0 | 100.0 | 100.0 | 60.0 | 62.5 | 100.0 | 70.0 | 25.0 |
| Carex echinata | | | | | | | | 33.3 | 66.7 | 50.0 | | 75.0 | 80.0 | 83.3 | | 60.0 | |
| Eriophorum angustifolium | | | | | | | | | 53.3 | 37.5 | 50.0 | 100.0 | 100.0 | 100.0 | | | |
| Nardus stricta | 20.0 | | | | | | | 22.2 | 73.3 | 50.0 | 50.0 | 75.0 | 40.0 | 54.2 | | 20.0 | 25.0 |

TABLE 10.1 contd.

| | A | B | D | E | F | G | H | JJ | I | C | K | L | M | N | O | P | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Other accompanying species. | | | | | | | | | | | | | | | | | |
| Juncus squarrosus | | | | | | | | | 46.7 | 25.0 | 50.0 | 25.0 | 20.0 | 37.5 | | 20.0 | 41.7 |
| Pedicularis sylvatica | | | | | | | | | 46.7 | 25.0 | | 25.0 | 20.0 | 33.3 | | 40.0 | |
| Carex pulicaris | 20.0 | | | | | | | | 46.7 | | 100.0 | | 40.0 | | | | |
| Sielingia decumbens | 70.0 | | 66.7 | | | | | | 26.7 | | | 25.0 | | | | 30.0 | |
| Crepis paludosa | | | | | | | 25.0 | 33.3 | 53.3 | | | 25.0 | | 25.0 | 66.7 | | |
| Ranunculus flammula | | | | | | | | 22.2 | 33.3 | 25.0 | | 75.0 | 100.0 | | 33.3 | | |
| Anemone nemorosa | | | 100.0 | | | | | | 20.0 | | 50.0 | | | | | | |
| Carex demissa | | | | | | | | | 26.7 | | 50.0 | 75.0 | 80.0 | 25.0 | | | |
| Galium uliginosum | | | | | 40.0 | | | | 20.0 | 50.0 | 50.0 | 25.0 | 20.0 | | 33.3 | | |
| Hypochaeris radicata | 20.0 | 33.3 | 50.0 | 50.0 | | | | | | | | 25.0 | | | | | |
| Helictotrichon pubescens | 20.0 | 33.3 | 33.3 | | 60.0 | | | 44.4 | | | | | | | | | |
| Juncus effusus | | | | | 20.0 | | 37.5 | | | 25.0 | | | 20.0 | | | 20.0 | |
| Salix atrocinerea | 30.0 | | | 75.0 | | | | 44.4 | | | | | | | | | |
| Ajuga reptans | | | | | | | | | 26.7 | | | 100.0 | | | 33.3 | 20.0 | |
| Epilobium palustre | | | | | | | | | | 37.5 | | 25.0 | 20.0 | | 66.7 | 66.7 | |
| Galium saxatile | | | | | | | | 22.2 | | | | | | | | 20.0 | 33.3 |
| Carex rostrata | | | | | | | | | | | | 25.0 | 40.0 | 25.0 | | | |
| Juncus bulbosus | | | | | | | | | | | 50.0 | | 100.0 | | | | |
| Polygonum viviparum | 60.0 | | | 25.0 | 20.0 | | | | | | | | | | | | |
| Deschampsia flexuosa | | 33.3 | | | | | | | | | | | | | 33.3 | | 58.3 |
| Galium boreale | 20.0 | | | | | | | | | | | | | | | | |
| Lathyrus palustris | 20.0 | | | | 80.0 | | | | | | | | | | | | |
| Calluna vulgaris | 20.0 | | | | | | | | | | | | | | | | |
| Scabiosa columbaria | 20.0 | | | | | | | | | | | 25.0 | | | | | |
| Thymus drucei | 20.0 | | | | | | | | | | | | | | | | |
| Festuca vivipara | 50.0 | 33.3 | | | | | | | | | | | | | | | |
| Hieracium pilosella | 20.0 | 66.7 | | | | | | | | | | | | | | | |
| Dactylorchis fuchsii | | 33.3 | | | | | | | | | | | | | | | |
| Montia fontana | 20.0 | | | | | | | | | 25.0 | | | | | | | |
| Senecio jacobea | | | | | | | | | | 37.5 | 50.0 | | | | | | |
| Viola lutea | | | 33.3 | | | | | | | | | | | | | | |
| Cirsium heterophyllum | | | | 25.0 | | | | | | | | | | | | | |

| | A | B | D | E | F | G | H | J | I | C | K | L | M | N | O | P | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Other accompanying species. | | | | | | | | | | | | | | | | | |
| Tussilago farfara | | | | 25.0 | | | | | | | | | | | | | |
| Geranium sylvaticum | | | | | 60.0 | | | | | | | | | | | | |
| Glyceria fluitans | | | | | | | 25.0 | | | | | | | | | | |
| Stellaria holostea | | | | | | | | | | | 50.0 | | | | | | |
| Sagina procumbens | | | | | | | | | | | 50.0 | 25.0 | | | | | |
| Potentilla sterilis | | | | | | | | | | | | 25.0 | | | | | |
| Galium palustre | | | | | | | | | | | | | 20.0 | | | | |
| Polygala vulgaris | | | | | | | | | | | | | 20.0 | | | | |
| Potentilla palustris | | | | | | | | | | | | | 20.0 | | | | |
| Narthecium ossifragum | | | | | | | | | | | | | | | | | 25.0 |
| Scirpus cespitosus | | | | | | | | | | | | | | | 33.3 | | 41.7 |
| Taraxacum paludosum | | | | | | | | | | | | | | | 33.3 | | |
| Bryophytes and lichens. | | | | | | | | | | | | | | | | | |
| Rhytidiadelphus squarrosus | 50.0 | 100.0 | 100.0 | 25.0 | | 44.4 | | 22.2 | 73.3 | 75.0 | 100.0 | 75.0 | 100.0 | 58.3 | | 40.0 | 66.7 |
| Acrocladium cuspidatum | 80.0 | 33.3 | | | | | 51.5 | 55.6 | 66.7 | 87.5 | 100.0 | 100.0 | 80.0 | 50.0 | 33.3 | | |
| Lophocolea bidentata | | 100.0 | 66.7 | | | | 25.0 | 33.3 | 60.0 | | 100.0 | 25.0 | 60.0 | 50.0 | 66.7 | 50.0 | 75.0 |
| Thuidium tamariscinum | | 66.7 | 50.0 | | | | | 33.3 | 40.0 | 37.5 | 100.0 | 25.0 | 20.0 | 45.8 | | 20.0 | |
| Mnium undulatum | 40.0 | 66.7 | 50.0 | | | | | 22.2 | 60.0 | 37.5 | 100.0 | 25.0 | | | 33.3 | 20.0 | |
| Pseudoscleropodium purum | 20.0 | 100.0 | 50.0 | | | | | | 46.7 | 25.0 | | | 40.0 | 29.2 | | 30.0 | |
| Mnium punctatum | 20.0 | 33.3 | | 25.0 | | | | 22.2 | 40.0 | | 50.0 | 25.0 | | | 33.3 | | |
| Brachythecium rutabulum | | 33.3 | | 25.0 | | | | 22.2 | 26.7 | 25.0 | | 25.0 | 20.0 | 25.0 | 100.0 | | |
| Climacium dendroides | | | | | | | | | 66.7 | | 50.0 | 50.0 | 40.0 | | 33.3 | | |
| Hylocomium splendens | | 100.0 | | | | | | | 40.0 | | 50.0 | 25.0 | | | | 20.0 | |
| Mnium hornum | 30.0 | 100.0 | 33.3 | 25.0 | | | | | 20.0 | 25.0 | | | | | 33.3 | | |
| Sphagnum recurvum | | | | | | | | | | | | | 80.0 | | | | 33.3 |
| Hypnum cupressiforme | 40.0 | | | | | | | | | | | | | | | 20.0 | 41.7 |
| Calypogeia trichomanis | | | | | | | | | | 25.0 | | 25.0 | 20.0 | | 66.7 | 20.0 | 25.0 |
| Sphagnum palustre v. squarrosum | | | | | | | | | | | | | 40.0 | 33.3 | | | |
| Pleurozium schreberi | 20.0 | | | | | | | | | | | | | | | | |
| Dicranum scoparium | | | | | | | | | | | | | | | | | 33.3 |

TABLE 10.1 contd.

| | A | B | D | E | F | G | H | J | I | C | K | L | M | N | O | P | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bryophytes and lichens contd. | | | | | | | | | | | | | | | | | |
| Polytrichum commune | | | | | | | | | | | | | | | | | |
| Plagiochila asplenioides | | | | | | | | | 20.0 | | | | | | | | |
| Scapania undulata | 30.0 | 33.3 | | | | | | | | | | | | | | | |
| Eurhynchium swartzii | | 33.3 | | | | | | | | | | | | | 33.3 | | |
| Cladonia sp. | | 33.3 | | | | | | | | | | | | | | | |
| Bryum pallescens | 20.0 | | | | | | | | | | | | | | | | |
| Fissidens sp. | 20.0 | | | | | | | | | | | | | | | | |
| Philonotis fontana | 20.0 | | | | | | | | | | | | | | | | |
| Rhytidiadelphus triquetrus | | | | | | | | | 20.0 | | | | | | | | |
| Aulacomnium palustre | | | | | | | | | | | | | 20.0 | | | | |
| Riccardia pinguis | | | | | | | | | | | | | 20.0 | | | | |

Amount of litter:- VL ...very little
L ...little
P ...patchy
S ...medium
M ...much
O ...none

Site of quadrat:- R.B...river bank
Bk....bank at foot of fell
Bg....boggy areas.