Ancient Monuments Laboratory
Report 102/89

POLLEN ANALYSIS OF THE MILDENHALL, SUFFOLK, BRONZE AGE SETTLEMENT AND ADJACENT FEN.

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Summary

Three pollen sequences have been examined from the Bronze Age settlement site of Mildenhall, Suffolk. Two on-site sequences obtained from waterlogged pit features are examined and compared with the pollen obtained from adjacent fen peat accumulations. The latter has illustrated the regional changes in the vegetation from the Neolithic through to the Bronze Age. The initial lime dominated woodland (with oak and hazel) declines due to anthropogenic causes and is replaced by secondary woodland of ash and possibly beech. During this period of change, changes in the water table occurred which resulted in waterlogging at least in the local area. Pollen spectra obtained from pit features illustrate a great diversity of ruderals, segetals and crop plants. The latter include high values of cereal pollen and sporadic grains of cultivated flax.

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POLLEN ANALYSIS OF THE MILDENHALL BRONZE AGE SETTLEMENT AND ADJACENT WEST ROW FEN.

Robert G Scaife

1. INTRODUCTION

The Bronze Age settlement site (MNL 165) at Mildenhall was excavated in Summer 1982 under the direction of Edward Martin of the Suffolk Archaeological Unit. The settlement is situated on a sandy ridge (TL 654769) which forms an island within a larger expanse of peat deposits. The extensive peat area is West Row Fen. The settlement evidence comprises an occupation layer which has produced substantial quantities of pottery and flint artefacts. Other features excavated include the post holes of a small round house, numerous other post holes and several large pits which extend down into the local water table thus providing on-site waterlogged conditions.

Samples for plant macrofossil and pollen analyses were taken from the pits by Peter Murphy (Centre for East Anglian Studies) and from the adjacent West Row Fen by P Murphy and R G Scaife. Three pollen profiles have been analysed and the results of these are presented in this report. These pollen sequences are as follows:

a) West Row Fen; a fen peat sequence taken away from the edge of settlement activity and in the fringe peat of West Row Fen.

b) Pit 0921; one of the on-site waterlogged pit features which may have been a flax retting pit (for site plan see figure 1).

c) Pit 0912; the second of the two on-site pits analysed. It has been suggested that this was a watering hole.

These sites and more detailed descriptions are discussed individually below.

2. AIMS OF THE STUDY

Pollen analytical investigation was undertaken in order to provide a background 'picture' of the vegetation of the region during the period of Bronze Age occupation of the Mildenhall site and to assess the impact of this settlement on the local environment. It was expected that analyses of the fen peats adjacent to the settlement might provide this evidence. The pits 0921 and 0926 were analysed in order to compare with the plant macrofossils and other environmental data (diatoms, mollusca etc). Comparisons might also be made between the pollen spectra obtained from the pits and the long pollen sequence from the adjacent fen.

3. POLLEN ANALYTICAL TECHNIQUES

Samples for pollen analysis were taken from the open archaeological cuts, in the caae of the pits 0921 and 0912, and from a trench dug into the fen mire peats. The sub-fossil pollen was extracted and concentrated using standard techniques outlined in Faegri and Iversen 1975 and Moore and Webb 1978. These included use of sodium hydroxide for deflocculation of organic matter; sieving at 150μ; hydrofluoric digestion of silica and Erdtman's acetolysis for removal of cellulose. The concentrated pollen was stained with safranin and mounted on microscope slides in glycerol jelly. A basic pollen sum of 500 grains was counted from more than 2 slides. Critical identifications were made at high power (x1000) and using phase contrast illumination (Zeiss).

The results of these analyses are given in diagram form (figures 1,4,6). Calculations are based on a percentage of the arboreal pollen sum to facilitate easier comparison with existing earlier analyses from other sites within this region (eg Godwin in Clarke 1936). The raw pollen counts on which the percentage calculations are based are given in Appendix I.

4. THE MILDENHALL PEAT SEQUENCE

In order to study the chronological changes in vegetation and environment of this region, peat samples were obtained from the peat deposits which surround the sand island. A trench was dug *** metres to the south of the Bronze Age site. Samples for pollen analysis were taken and analysed at 4cm intervals and in conjunction with sampling for plant macrofossils and molluscs (P Murphy). The stratigraphy of this section is described in detail in Murphy (AML and this volume).

4.a. POLLEN ANALYSIS

Three broad pollen zones have been recognised in the pollen diagram (Figure 1) and which based on the inherent variation in the dry land taxa present. These zones are briefly characterised from the base of the section at 104 cm as follows:

Pollen zone WR:1 104 - 82 cm. This basal zone is characterised by relatively high arboreal pollen values. The dominant taxa are Tilia, Quercus and Alnus. Lesser representations of Betula, Pinus, Ulmus and Fraxinus are also noted. Shrubs are dominated by Corylus type (which includes Myrica although critical inspection of pollen grains suggests Corylus is the taxon represented here) with some Salix. Pollen of herbs are relatively few compared with those in the zones above (WR:2 and WR:3). Minor, broad peaks in Gramineae and Cyperaceae are noted.

Pollen zone WR:2 81 - 65 cm. This zone is characterised by a substantial decrease in Tilia at 50 cm and subsequently by a minor expansion and second decline at the top of the zone. Herb pollen becomes more abundant and exhibits greater diversity. These taxa include Ranunculaceae, Cruciferae, Chenopodiaceae, Umbelliferae, Polygonaceae and Plantaginaceae. Gramineae and Cyperaceae pollen start to increase in percentage in this zone. The zone is also typified by sharply increasing values of wetland taxa which are dominated by Typha angustifolia type (which inclued Sparganium) and Typha latifolia. Spores of Filicales similarly become increasingly important with Pteridium aquilinum and Dryopteris type (monolete fern spores) being dominant.

Pollen zone WR:3 65-56cm. Subsequent to the second decline of Tilia at the base of this zone, Betula further expands but also with the marked expansion of Fagus and Fraxinus. Herb diversity continues with the taxa noted in WR:2 remaining. Gramineae and Cyperaceae become the dominant elements in the pollen spectra of this zone. Wetland taxa and Pteridium aquilinum noted in WR:2 decline while Dryopteris type spores (monolete ferns) are abundant.

4.b. DISCUSSION

Because of the calcareous nature of the marls underlying the peat sequence and the character of the peat (which comprises large quantities of monocot rootlets), no C14 dating was attempted. It is, however, possible to interpolate dates by comparison with the archaeology and other pollen sequences. The peat accumulation is thought to have started during the Neolithic and the Bronze Age activity of the nearby sand island is represented in pollen zone WR:2 (see below). No Ulmus decline is seen in this pollen sequence and it is therefore reasonable to suggest a post Ulmus decline date for the initiation of this peat sequence. Some evidence of initial waterlogging is also given by the basal peaks of Cyperaceae and Typha angustifolia/Sparganium type. This zone therefore provides data on the vegetation and environment prior to the Bronze Age occupation.

As noted above, it appears that the landscape was largelv wooded. This comprised areas of dominant alder carr which is in evidence throughout the pollen profile. Salix (willow) is also noted. This taxon produces small amounts of pollen and as such is likely to be under-represented in pollen spectra relative to other tree and shrub taxa. It can be postulated that Alnetum (containing other fen wood plants) was the dominant community of the wetter peat-forming areas and along the fringes of the sand island. Its local importance is attested by the large pollen percentages both in this peat sequence and from pit profiles where Murphy has recovered alder cones and seeds. On drier, better drained areas of land, Tilia (T. cordata) woodland was probably dominant and/or growing with Quercus (oak) and Corylus (hazel). This is comparable with pollen data obtained from other southern and eastern English sites where many pollen profiles illustrate similar dominance of lime. This importance has been noted in recent pollen spectra from the East Anglian Fens (Waller 198?and forthcoming Fenland Survey Volume; Scaife AML and in French forthcoming). *Fraxinus* is present and because its pollen, as with *Tilia* is largely under-represented in pollen spectra (Andersen 1970,1973), it also possibly formed part of this woodland community. However, it has been noted on a number of occasions that it becomes relatively more important as a secondary woodland constituent subsequent to forest clearance and regeneration. This has been noted elsewhere in pollen sequences which span phases of Neolithic forest clearance and subsequent secondary woodland regeneration (Scaife 1980,1985).

Between 56-50 cm, *Tilia* pollen percentages decline. This is the widely recognised *Tilia* decline which is now regarded as occurring asynchronously and resulting from anthropogenic causes (Turner 1962; Baker, Moxey and Oxford 1979; Scaife 1980). The decline is frequently associated with evidence of forest clearance in the form of ruderals, segetals weeds and cereal cultivation. This is the case in pollen zone WR:2 where the diversity of herb taxa noted above increases markedly. Peaks of Cruciferae (*Hornungia* type and *Sinapis* type), Polygonaceae (*Polygonum convolvulus*, *P. aviculare* tytpe, *P. persicaria* type and *Rumex* spp.), *Plantago lanceolata*, *Artemisia* and Cereal pollen are indicative of increased agricultural activity at this *Tilia* decline. Comparisons of this zone with those spectra from pit 0921 (see below) show a degree of conformity and it is clear that the phase of activity in WR:2 can be correlated with the local Bronze Age settlement activity.

Furthermore, environmental changes also started to take place in the fen mire. Increased wetness is evidenced by the increase in aquatic/marginal aquatic taxa which include Caltha type, Nyphaea, Menyanthes, Alisma type, Potamogeton and the substantial values of Typha angustifolia/Sparganium type and Typha latifolia. This water-logging of the fen sequence may be attributed to more regional hydrological changes or to a local rise in the water table. The latter may be a consequence of forest clearance resulting in reduced evapotranspiration and greater run-off, thereby increasing the height of water tables in the local area. Such cause and effect has been noted in other lowland peat formations (Moore and Willmott 1978; Scaife 1980; Scaife and Burrin 1984).

To summarise pollen zone WR:2, it appears that much alder/willow carr (Alnetae glutinosae) woodland remained in damp places. Areas of drier land which supported Tilia and Fraxinus woodland were cleared for settlement and arable (and possibly pastoral) agriculture. These cleared patches are likely to be those adjacent, drier, sandy areas which were occupied during the middle Bronze Age.

Anthropogenic changes initiated in pollen zone WR:2 are continued in zone WR:3 where a further and final decline in Tilia occurs. This is accompanied by additional increases in the ruderal and segetal floras noted above in zone WR:2. There is, however,a reduction in wetland taxa with the exception of Cyperaceae and Gramineae which are dominant. This implies some drying out of the fen mire community and a change to a drier sedge fen at least in the area immediately around the point sampled. High percentages of monolete (Dryopteris type) spores are likely to have been produced by mersh fern taxa (eg. Thelypteris palustris).

Despite this corroborating evidence of increased anthropogenic pressure, there is contrary evidence for some woodland regeneration in the form of Fraxinus and scrub including Cornus and Prunus type. Considering the relatively high percentages of Fraxinus in zone WR:3 and the small pollen production of this taxon, it is likely that this regeneration occurred in close proximity to the sampled site, perhaps in areas of agricultural or settlement abandonment. A minor increase in Calluna during this zone may indicate some soil depletion, which might be tentatively used as an explanation for at least local soil depletion and agricultural abandonment. Fagus, which also occurs particularly in this zone, is interesting. Explanations for this increased pollen record may be viewed as either a real increase in its growth on local well-drained soils or due to pure pollen dispersion characteristics. Although Fagus produces copious quantities of pollen, it is on the whole poorly dispersed and consequently grossly under-represented in pollen spectra obtained away from the immediate vicinity of its canopy. Any decrease in local woodland canopy might result in its wider dissemination. This appears to be the explanation in this case. Alnus declines in the upper section of zone WR:3 which would allow greater pollen input from taxa with poorer dispersal characteristics. This purely taphonomic problem is also possibly seen in the representation of Quercus in this zone, where its values similarly increase.

4.c. SUMMARY

Prior to the Bronze Age occupation on the adjacent sand island, the local vegetation comprised alder/willow carr woodland in this area of fen. Drier areas were characterised by mixed woodland communities dominated by lime. Anthropogenic activity, which is correlated with local Bronze Age settlement, caused a reduction of the area of _Tilia_ woodland and extended agriculture. Contemporaneous with this event, there is evidence of at least local hydrological changes creating a wetter fen mire community. Alder remained important, but possibly fringing these plant communities in wetter areas. Further clearance of lime (in WR:3) is accompanied by increased percentages of weeds of cultivation and cereals. There is, however, evidence at this later stage for soil depletion (albeit tentative) and for woodland and scrub regeneration. This pollen sequence therefore appears to span the period before the local Bronze Age occupation and covers the main phase of occupation activity (see below).

5. PIT 0921/0924

5.a. INTRODUCTION

This pit was 1.6 metres in diameter, 0.68 m deep and was located in the area of occupation (see figure 2). The detailed stratigraphy and position of the pollen samples in relation to this are shown in figure 3. It can be seen that the pit contents were a heterogeneous mix of largely sandy, organic fills ranging from basal yellow sand, which contained sparse pollen, to dark highly humified peat (context 0922). These stratigraphical junctions are used to separate the pollen diagram into zones and NOT zone based upon specific pollen stratigraphical changes. This has been done because it might be expected that pollen in such deposits is largely secondary (ie. allocnthonous), being derived from a variety of sources including a fill dumped material comprising domestic and economic processing waste materials. The pollen diagrams constructed from this sequence are illustrated in Figure 4

It has been suggested that this pit may have been used as for flax retting because of the large numbers of *Linum usitatissimum* seeds and capsules which have been recovered in the plant macro analyses (Murphy 1983). Other plant macro-fossil remains recovered from this sequence by Murphy include wetland, aquatic and rudera plants, alder fruits and cones, oak twigs and remains of *Triticum dicoccum*.

5.b. POLLEN ANALYSIS

Pollen contained within the pit sequence is characterised by very substantial quantities and marked diversity of herbs representing a number of different plant communities. These include assemblages of ruderals, segetals, cultivated plants and marginal and aquatic plants.

There is also evidence of the arboreal and shrub vegetation which has also been witnessed in the long profile from the adjacent Mildenhall Fen (see above). In more detail, these plant communities are characterised as follows:

5.b.i. Arboreal pollen. These are dominated by *Quercus*, *Alnus* and *Tilia.* The latter is usually under-represented in pollen spectra because of its entomophily. Thus, the percentages of up to 10% of total pollen may be regarded as significant. *Alnus*, however, is frequently over-represented because of its high pollen productivity. In figure 4, *Quercus* percentages increase up the profile. This, however, is a function of the declining percentages of *Alnus* since both form part of the pollen sum. The decline in *Alnus* may be viewed as a real ecological change with local hydrological conditions becoming wetter giving rise to aquatic and wetland taxa (see below). Other AP types recorded include *Betula*, *Pinus*, *Ulmus* and *Fraxinus*.

5.b.ii. Shrub communities. These are dominated by *Corylus* and *Salix.* The former has been designated *Corylus* type since the pollen of *Myrica* (sweet gale) is almost indistinguishable from that of *Corylus* (hazel). Critical examination of the best preserved pollen illustrated that these were in fact *Corylus.* It is therefore thought that the 'curve' does reflect the growth of hazel. *Salix* (willow) is poorly represented in pollen spectra and its percentages recorded here suggest that it was a locally important taxon.

5.b.iii. Cultivated crops. *Linum bienne* type (*L. usitatisimum*)and cereal pollen are the only two pollen elements which can be definitely identified as deliberately cultivated crops. The former is especially important since it has been suggested that flax retting was being practised in this waterlogged pit/hollow. Cereal pollen attains very high percentages (75% of AP). This is extremely high in comparison to percentages often found in peat/organic sequences and is indicative of the strongly anthropogenically dumped character of this pit infill.

5.b.iv. Ruderals and segetals. A number of important weed types have been recorded in unusually high frequencies. Ruderals include *Plantago major* type, *P. lanceolata*, *P. coronopus* type, Chenpodiaceae, *Convolvulus* type, *Papaver*, *Spergula*, *Rumex*, *Urtica* type (which includes *Parietaria*), *Artemisia*, *Taraxacum* type (Compositae, Liguliflorae category). Some of these may also be regarded as elements of segetal communities ie associated with cereal cultivation. Pollen of Cruciferae (*Sinapis* type and *Hornungia* type) and Polygonaceae (*Polygonum aviculare* type, *P. persicaria*, *P. convolvulus*) are likely to be of segetal character. It is likely that many of the remaining herbaceous taxa recorded are similarly associated with waste-ground and/or cereal cultivation. Pollen morphology does not, however, allow differentiation to lower taxonomic levels which might allow stronger ecological interpretations to be made.

5.b.v. Wetland taxa. It is interesting that this group is strongly represented with Cyperaceae being dominant. Other taxa noted include Lythrum, Peplis, Lychnis type, Filipendula ulmaria, Caltha type, Iris, Nymphaea and the moss, Sphagnum. As with (iv), it is likely that where species or generic differentiation is not possible (due to broad pollen morphological categories), other taxa recorded may also fall into this category.

5.b.vi. Miscellaneous. It is interesting that in this and Pit 0912, a numer of plants typical of base rich soils have also been recorded (Linum catharticum).

5.c. DISCUSSION

There are marked fluctuations in the pollen record for the herbaceous taxa noted above. This is understandable due to the fact that much organic material has been thrown into the fill of the pit/pond. It is for this reason that standard pollen zonation of this pollen sequence has not been carried out. It is, however, clear that the pollen sequence can be related to, ie correlated with, the more regional changes which have been established in the Mildenhall Fen profile. The pit profile, that is, between 30 cm and 20 cm exhibits a comparable increase in pollen of Cyperaceae and with corresponding peaks of other taxa. This phase appears to be one of increasing wetness at least of the local environs. This waterlogging, due to flooding, caused a reduction in the fen carr vegetation and change to wetter sedge fen conditions. It appears that the base level changes may have had an effect on the water table associated with this pit feature.

As has been noted above, Linum bienne type is present albeit in very low percentages. Murphy (1983) has noted the abundance of flax (Linum usitatissimum) capsules. This has been interpreted as due to flax retting in this pit which contained shallow water. This cannot be confirmed from the pollen analysis, although it can be noted that flax is an extremely poor pollen producer of pollen and its presence in any pollen spectrum is unusual. Greig (pers. comm.) has similarly noted that in flax retting pits, only very small numbers of pollen grains are recorded. This paucity of record may in part be due to the harvesting of flax before it flowers.

Pollen of cereals is one of the dominant herb categories reaching 75% of AP with an overall value of around 20% of AP. Such high values are rare in normal peat forming situations and it is likely that the pit 0921 contains dumped animal faeces (and ? human) which might contain pollen and/or dumped animal feed stuffs, and bedding straw (Pteridium values are high in this sequence and this might similarly be attributed to animal bedding although it natural local growth must be considered). Crop processing activities (especially threshing and winnowing) may also release pollen trapped in the husks of the cereals. If this had occurred in close proximity to the pit/pond, it might also have resulted in high cereal pollen percentages in these sediments.

4. PIT 0912; WATERING HOLE ?

It has been suggested that pit 0912 is a watering hole. Four archaeological contexts have been sampled in this pollen sequence. The pollen diagram is given in figure 5 and are 0917, 0915, 0913, 0912 from the base upwards.

6.a. Pollen analysis.

The pollen spectra of this sequence can be divided into the following ecological categories which are broady similar to those of pit 0921 (above).

6.a.i. Arboreal pollen. In figure 6 pollen is calculated as a percentage of total pollen and not as a percentage of arboreal pollen as in figure 4 for pit 0921. Thus, percentages of tree pollen taxa are lower than shown in figure 4 because herb taxa are also included in the pollen sum. However, it is clear that the true pollen assemblage is broadly comparable with the dominant taxa from the Mildenall Fen and pit 0921 profiles, that is, dominated by Quercus, Alnus and with less consistent Tilia. There is also a small representation of Betula, Pinus, Ulmus and Fraxinus.

6.a.ii. Shrubs. Corylus type is dominant in this category. Examination of the better preserved pollen grains showed this taxon to be Corylus and not Myrica (see above). Also recorded are Frangula, Rubus type, Prunus type, Sorbus type, Cornus, Ligustrum and Salix. The latter is notably less well represented than in pit 0921.

6.a.iii. Herbs. As with pit 0921, there is a great diversity of herbs comprising ruderals, segetals and plants of wet ground. Gramineae is the most important category and attains values of 55 % of total pollen. Cereal pollen is also relatively important and may be associated with segetal taxa. These include Cruciferae, Polygonaceae (Polygonum aviculare, P. persicaria, P.convolvulus type). Ruderals predominate with notably, the presence of Plantago major type (incl. P. media), P. lanceolata, and P. coronopus type. Other taxa which may be associated with waste ground and/or arable taxa include Fumaria, Caryophyllaceae (Cerastium and Dianthus type), Papilionaceae (Medicago type, Trifolium type, Lotus type and Vicia), Chenopodiaceae, Rumex undiff., Convolvulus type and Compositae spp.

6.a.iv. Wetland taxa. These range from aquatic taxa (Nymphaea and Nuphar) to marginal aquatic taxa (Sparganium type which includes Typha angustifolia, Typha latifolia and Caltha type) to damp ground plant communities (Filipendula, Umbelliferae undiff., Hydrocotyle, Valeriana officinalis and Lythrum).

6.a.v. Miscellaneous. In pit 0921, a number of plants which are characteristic of calcareous habitats was noted. These are also in evidence in pit 0912 and include *Helianthemum*, and *Linum catharticum*.

6.b. DISCUSSION

It is again clear that many of the herb pollen taxa recorded in this pollen sequence derive from material dumped into this pit. Thus, the cereal pollen and associated segetal flora, as noted above, may derive from local crop processing activities or from animal dung, feedstuffs and/or bedding material. The autochthonous flora as evidenced by the pollen does, however, illustrate that the pit contained shallow standing water which supported rooting aquatic types (*Sparganium* type, *Iris*, and *Typha latifolia*).

It is also apparent that there are no broad sequential changes in this pollen sequence which can be 'tied' into the long pollen profile of the Mildenhall Fen peat sequence, such as was the case with pit 0921. The background arboreal pollen spectra are commensurate with evidence from the two other pollen profiles discussed above, with *Quercus* and *Corylus* and *Alnus* in wetter areas. It is likely, however, that this organic sequence formed over a shorter temporal span than pit 0921 and that it represents a short phase which can be placed broadly in pollen zone WR2 of the Mildenhall Fen pollen sequence (see above); that is, shortly, after the *Tilia* decline and prior to the increase in sedge flora noted in the other profiles.

7. DISCUSSION OF THE THREE POLLEN DIAGRAMS

Three pollen sequences have been presented. It was expected that the 'long profile' obtained from the fen peats adjacent to the sand island might provide evidence of longer term environmental changes of the region and that this might span the phase(s) of human occupation of the sand island. This is seen to be the case and a vegetation record spanning the middle/late Neolithic to Iron Age is present. As noted above, the vegetation of the region at least on drier areas was dominated by Tilia and/or Quercus woodland. The former declined due to anthropogenic pressure in the middle Bronze Age. This is the widely recognised Tilia decline of southern and eastern England. It appears that such woodland was replaced by Fraxinus (ash) and perhaps Fagus which subsequently appear in the pollen record.

Substantial hydrological changes occurred which caused waterlogging and consequent growth of sedge fen communities which were dominated by sedges and aquatic plants. Alder remained an important constituent of the local flora which formed carr woodland fringing the water areas noted above.

Anthropogenic activity is in evidence throughout the long profile of Mildenhall Fen. However, there is a clear expansion of activity taking place coincidentally with the Tilia decline. This is evidenced by sharply increased percentages of weeds associated with human activities. During the period of greatest anthropogenic activity which is here equated with the Bronze Age, there is evidence of an increase in the ground water table height. This phenomenon may be related to regional hydrological changes or, alternatively, anthropogenic causes may be suggested. There is substantial evidence that forest clearance may cause a decrease in evapotranspiration and consequent increase in run-off and higher water tables (Moore and Willmott 1978; Scaife 1980; Burrin and Scaife 1984). It is not yet possible to ascertain whether this rise in water tables is an anthropogenically induced change or whether it has much broader regional implications.

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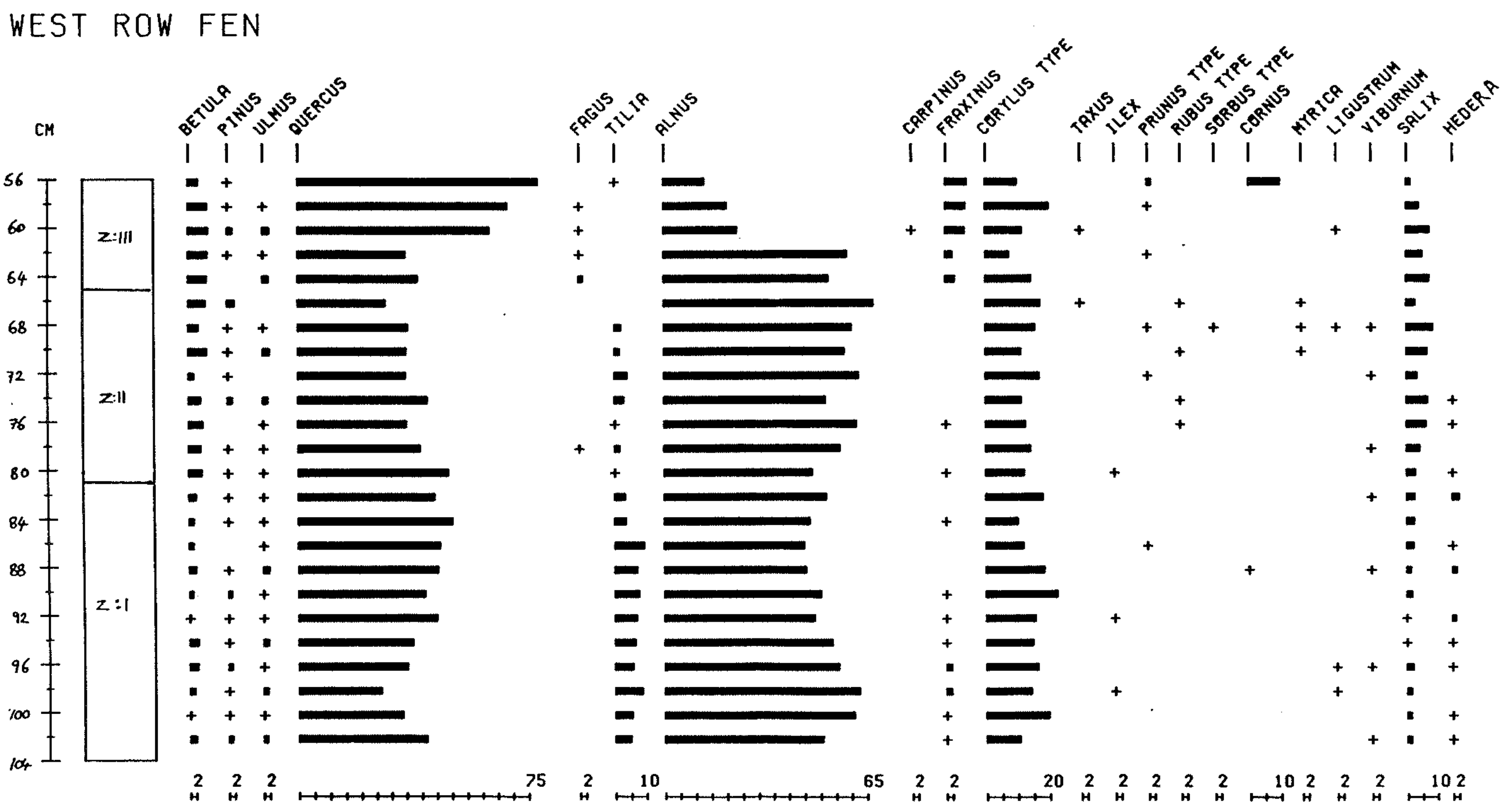
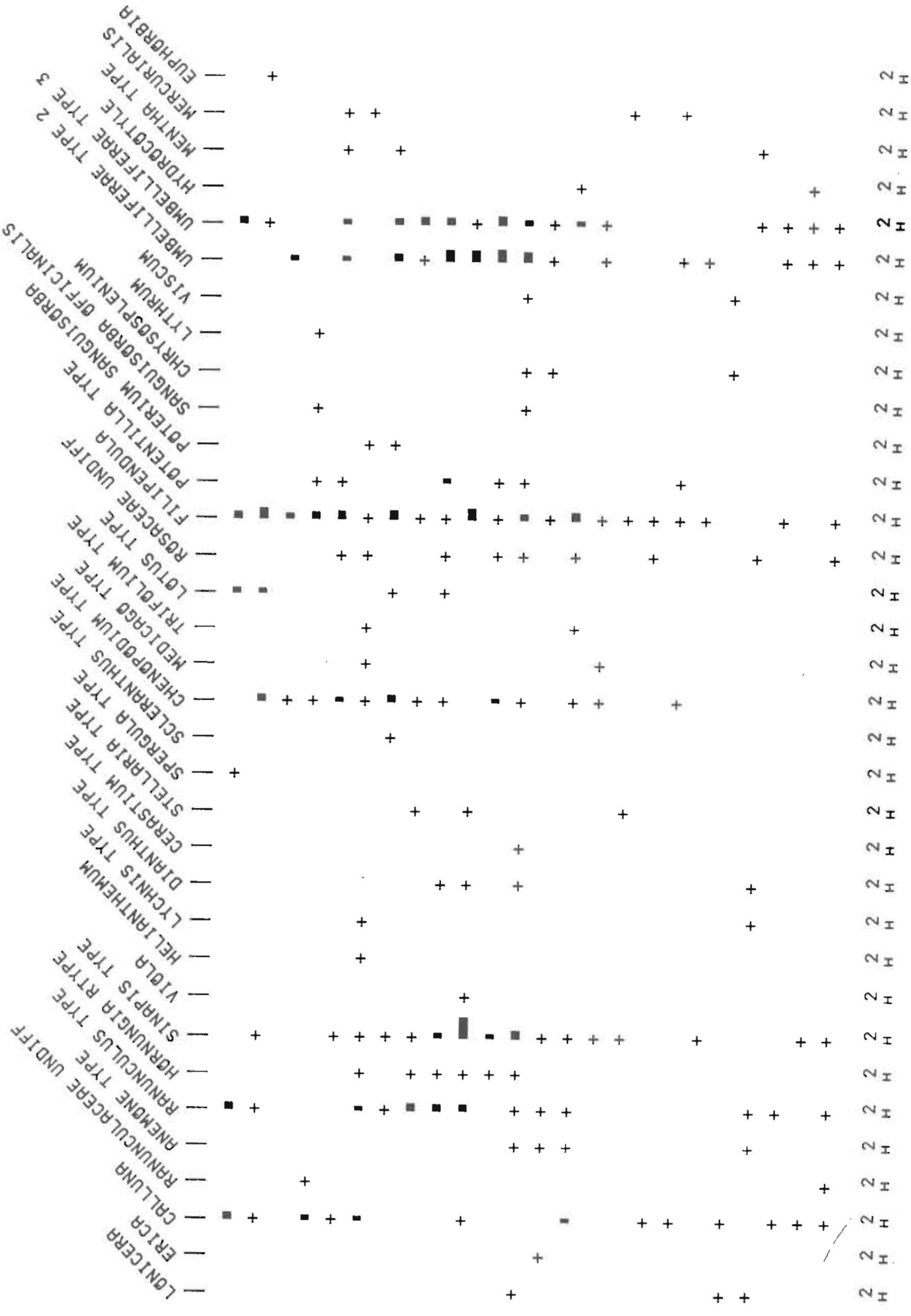

WEST ROW FEN
CM
Z:III
Z:II
Z:I
BETULA
PINUS
ULMUS
QUERCUS
FAGUS
TILIA
ALNUS
CARPINUS
FRAXINUS
CORYLUS TYPE
TAXUS
ILEX
PRUNUS TYPE
RUBUS TYPE
SORBUS TYPE
CORNUS
MYRICA
LIGUSTRUM
VIBURNUM
SALIX
HEDERA
56
60
64
68
72
76
80
84
88
92
96
100
104
2
75
10
65
20

FIG. 1 (a)

Fig 1a

Fig 1b



EUPHORBIA
MERCURIALIS
MENTHA TYPE
HYDROCOTYLE
UMBELLIFERAE TYPE 3
UMBELLIFERAE TYPE 2
VISCUM
LYTHRUM
CHRYSOSPLENIUM
SANGUISORBA OFFICINALIS
SANGUISORBA
POTERIUM TYPE
POTENTILLA TYPE
FILIPENDULA
ROSACEAE UNDIFF
LOTUS TYPE
TRIFOLIUM TYPE
MEDICAGO TYPE
CHENOPODIUM TYPE
SCLERANTHUS
SPERGULA TYPE
STELLARIA TYPE
CERASTIUM TYPE
DIANTHUS TYPE
LYCHNIS TYPE
HELIANTHEMUM
VIOLA
SINAPIS TYPE
HORNUNGIA RTYPE
RANUNCULUS TYPE
ANEMONE TYPE
RANUNCULACEAE UNDIFF
CALLUNA
ERICA
LONICERA

FIG 1(b)

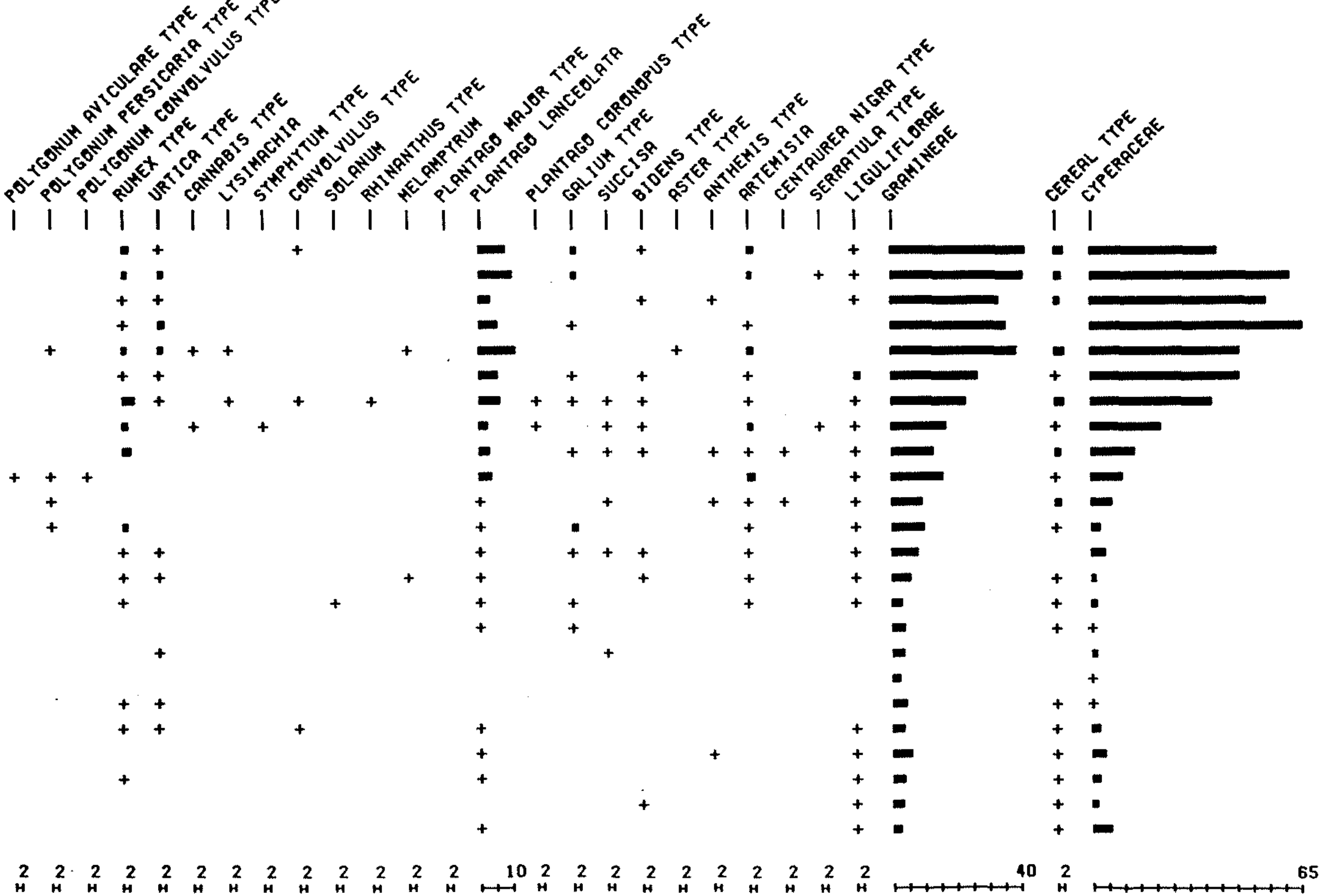

POLYGONUM AVICULARE TYPE
POLYGONUM PERSICARIA TYPE
POLYGONUM CONVOLVULUS TYPE
RUMEX TYPE
URTICA TYPE
CANNABIS TYPE
LYSIMACHIA
SYMPHYTUM TYPE
CONVOLVULUS TYPE
SOLANUM
RHINANTHUS TYPE
MELAMPYRUM
PLANTAGO MAJOR TYPE
PLANTAGO LANCEOLATA
PLANTAGO CORONOPUS TYPE
GALIUM TYPE
SUCCISA
BIDENS TYPE
ASTER TYPE
ANTHEMIS TYPE
ARTEMISIA
CENTAUREA NIGRA TYPE
SERRATULA TYPE
LIGULIFLORAE
GRAMINEAE
CEREAL TYPE
CYPERACEAE
2
10
40
65

FIG 1(c)

Fig 1d

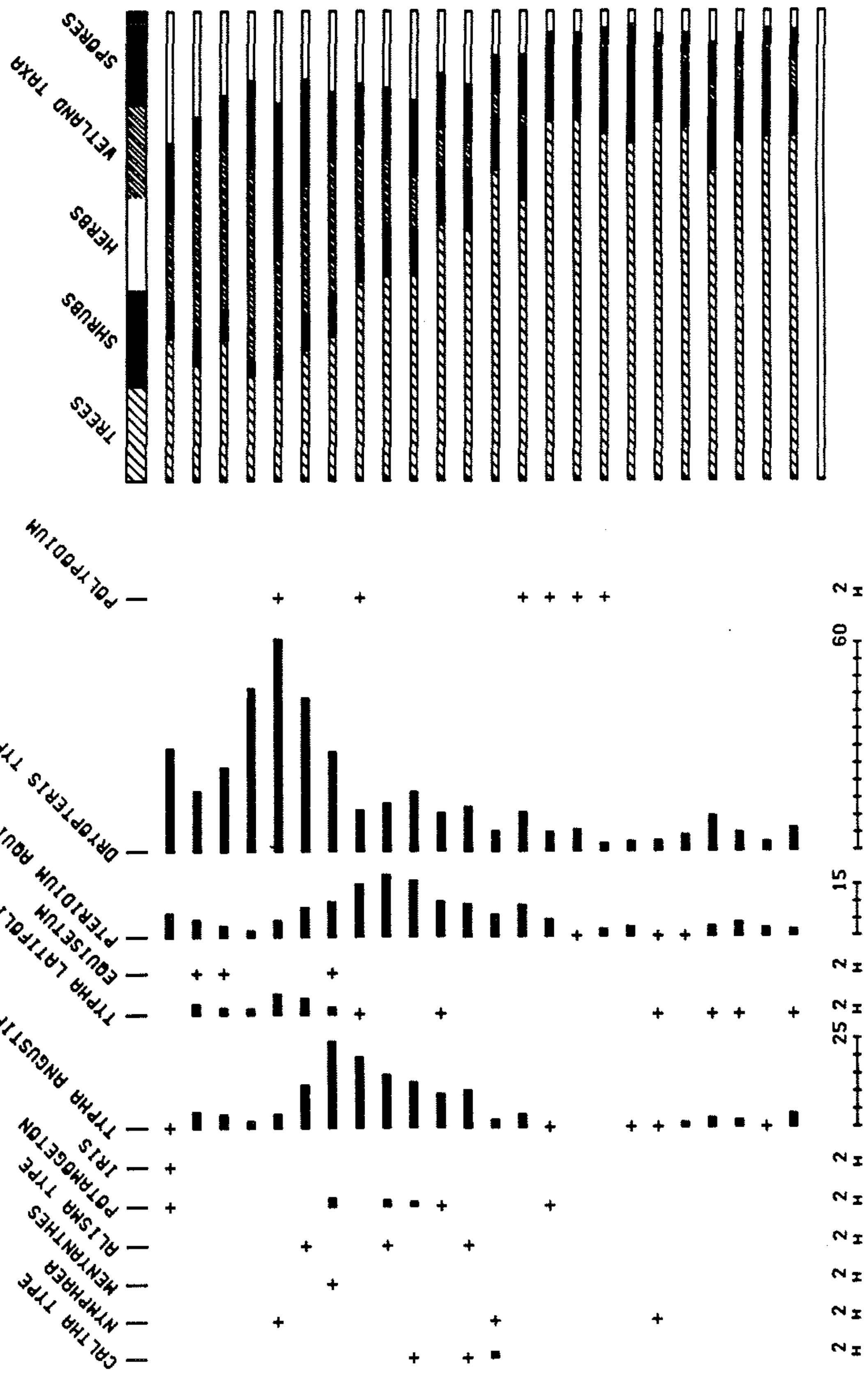

TREES
SHRUBS
HERBS
WETLAND TAXA
SPORES
POLYPODIUM
DRYOPTERIS TYPE
PTERIDIUM AQUILINUM
EQUISETUM
TYPHA LATIFOLIA TYPE
TYPHA ANGUSTIFOLIA TYPE
IRIS
POTAMOGETON
ALISMA TYPE
MENYANTHES
NYMPHAEA
CALTHA TYPE
60
15
25
2

FIG 1 (d)

Fig 2

MNL 165: Site plan

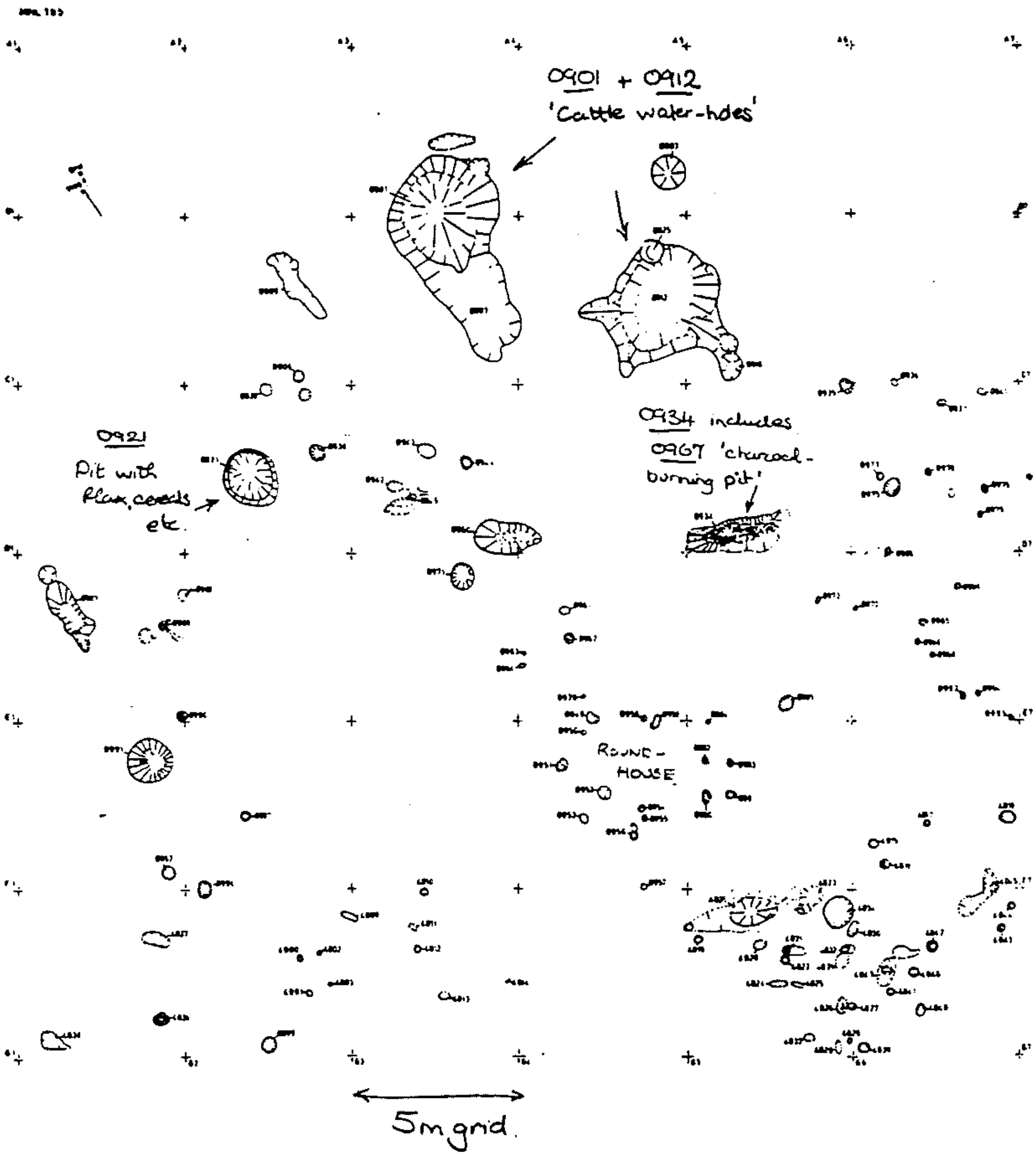
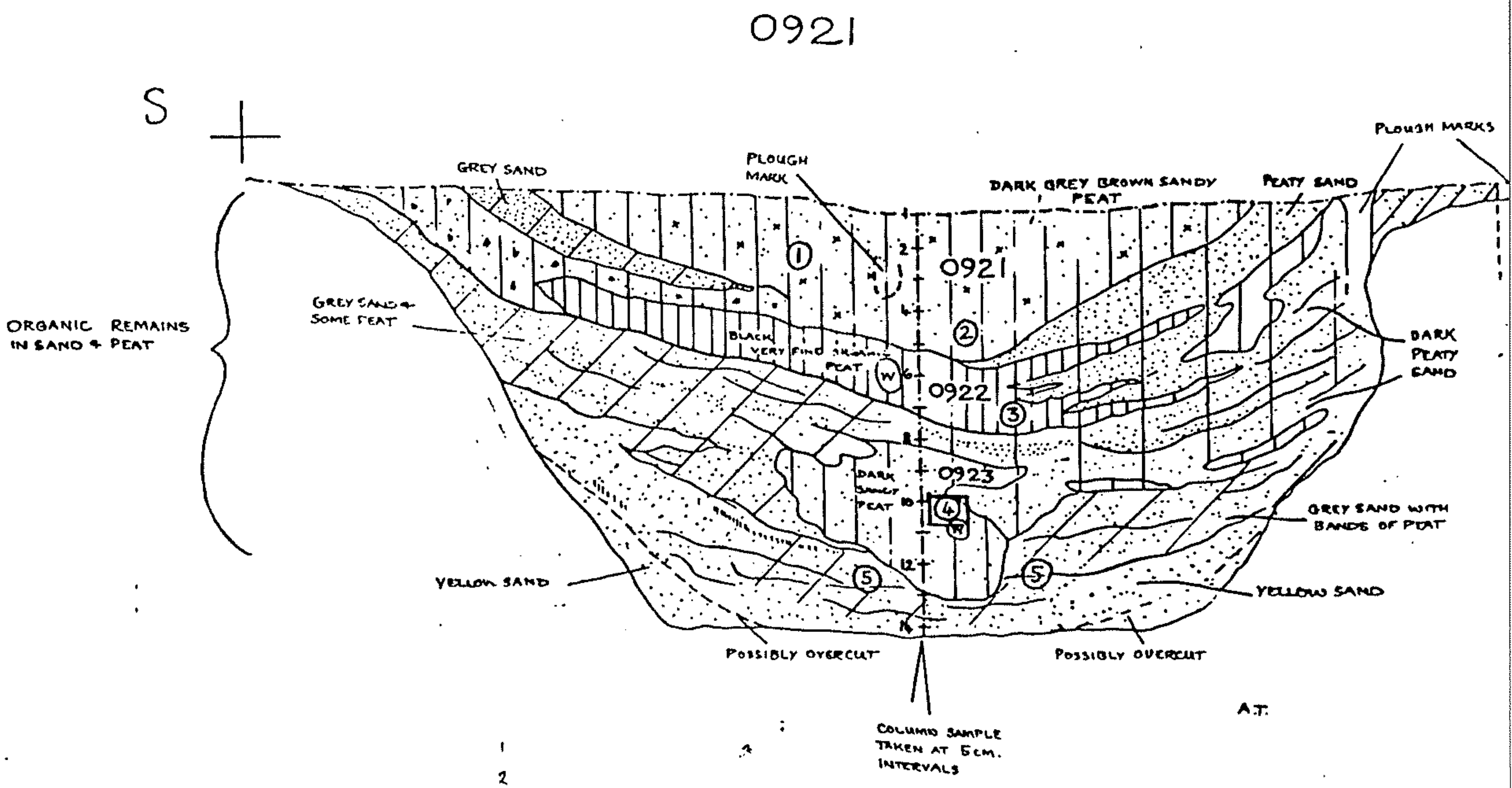


FIG 2.

Fig 3



1
2
3

BULK SAMPLES, 0927, nos. 1-5, TAKEN FROM THE POINTS INDICATED (1), (2) etc.

FIG 3

Fig 4a

WEST RØW 0921/0924

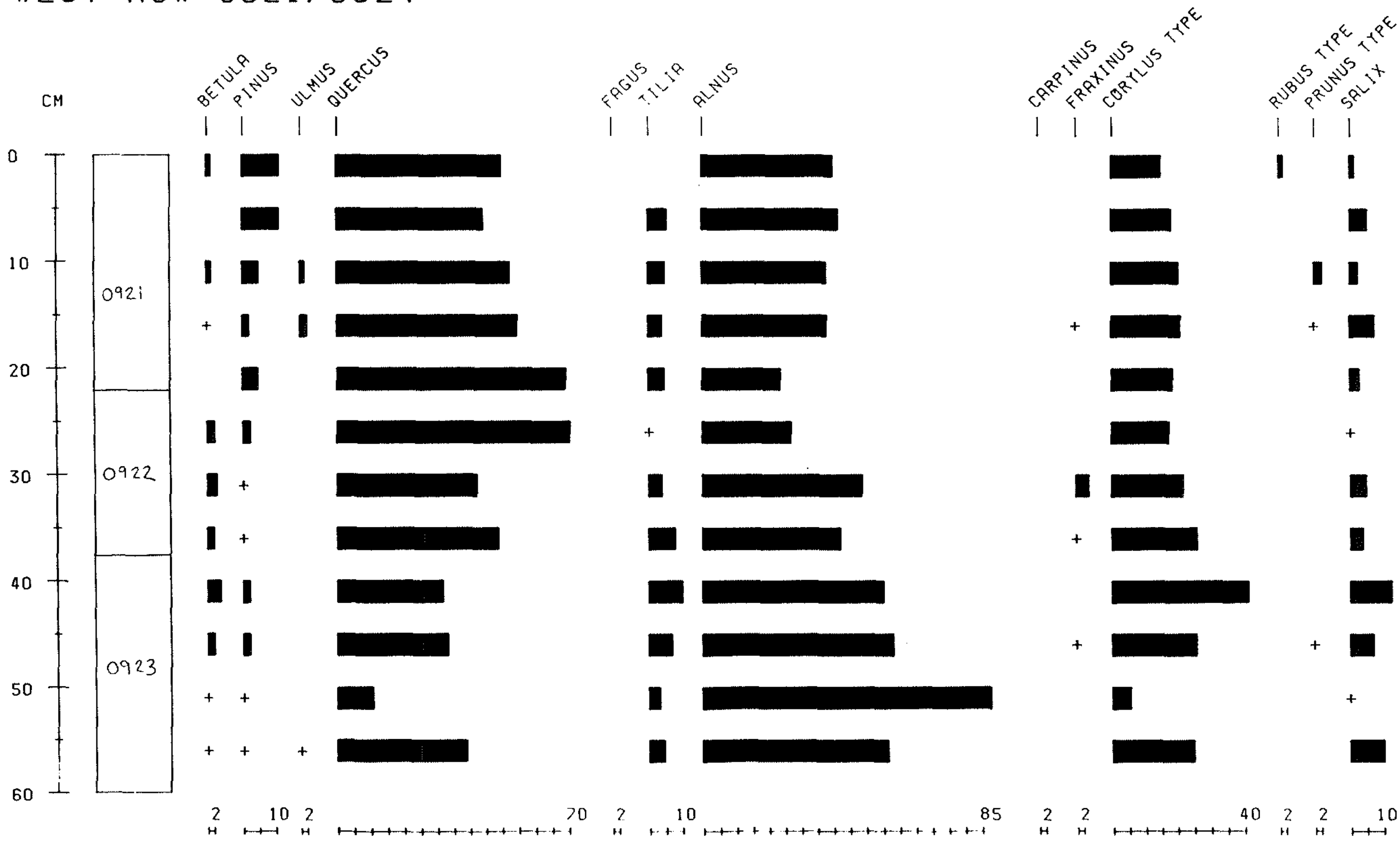


Fig 4b

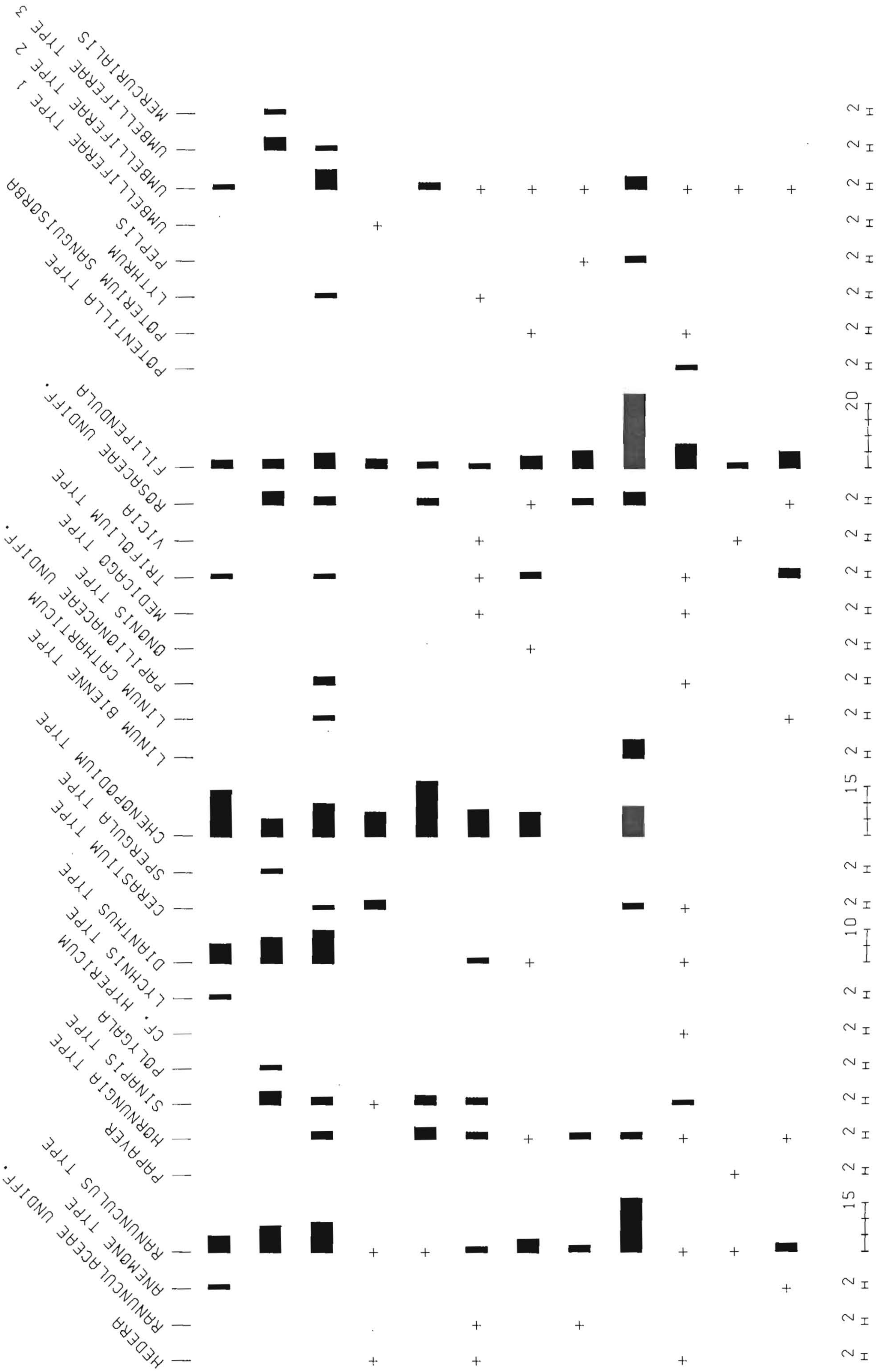

MERCURIALIS
UMBELLIFERAE TYPE 3
UMBELLIFERAE TYPE 2
UMBELLIFERAE TYPE 1
PEPLIS
LYTHRUM
POTERIUM SANGUISORBA
POTENTILLA TYPE
FILIPENDULA
ROSACEAE UNDIFF.
VICIA
TRIFOLIUM TYPE
MEDICAGO TYPE
ONONIS TYPE
PAPILIONACEAE UNDIFF.
LINUM CATHARTICUM
LINUM BIENNE TYPE
CHENOPODIUM TYPE
SPERGULA TYPE
CERASTIUM TYPE
DIANTHUS TYPE
LYCHNIS TYPE
CF. HYPERICUM
POLYGALA
SINAPIS TYPE
HORNUNGIA TYPE
PAPAVER
RANUNCULUS TYPE
ANEMONE TYPE
RANUNCULACEAE UNDIFF.
HEDERA
2
20
15
10

Fig4c

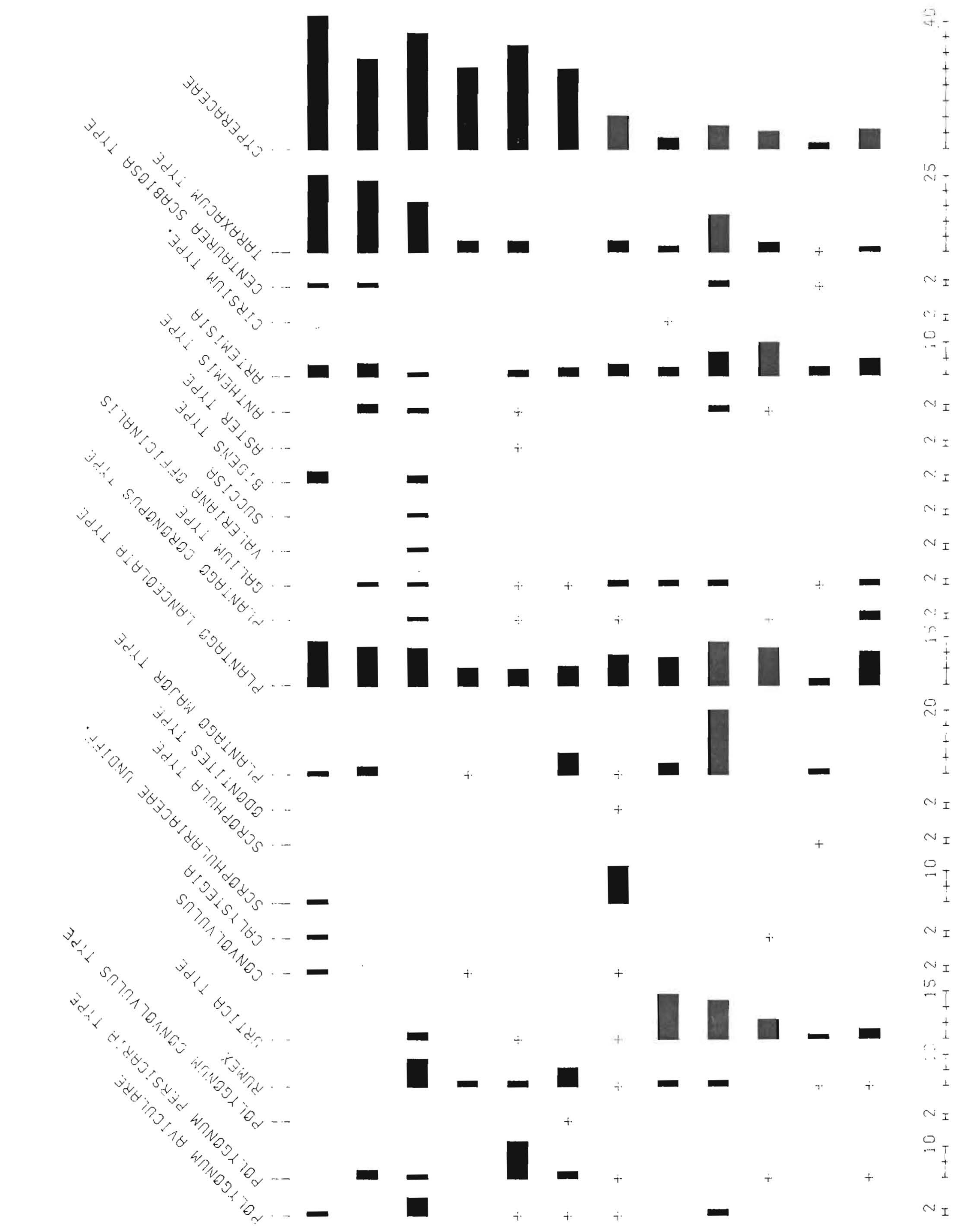

CYPERACEAE
TARAXACUM TYPE
CENTAUREA SCABIOSA TYPE
CIRSIUM TYPE,
ARTEMISIA
ANTHEMIS TYPE
ASTER TYPE
BIDENS
SUCCISA
VALERIANA OFFICINALIS
GALIUM TYPE
PLANTAGO CORONOPUS TYPE
PLANTAGO LANCEOLATA TYPE
PLANTAGO MAJOR TYPE
ODONTITES TYPE
SCROPHULARIA TYPE
SCROPHULARIACEAE UNDIFF.
CALYSTEGIA
CONVOLVULUS
URTICA TYPE
RUMEX
POLYGONUM CONVOLVULUS TYPE
POLYGONUM PERSICARIA TYPE
POLYGONUM AVICULARE

Fig 4d

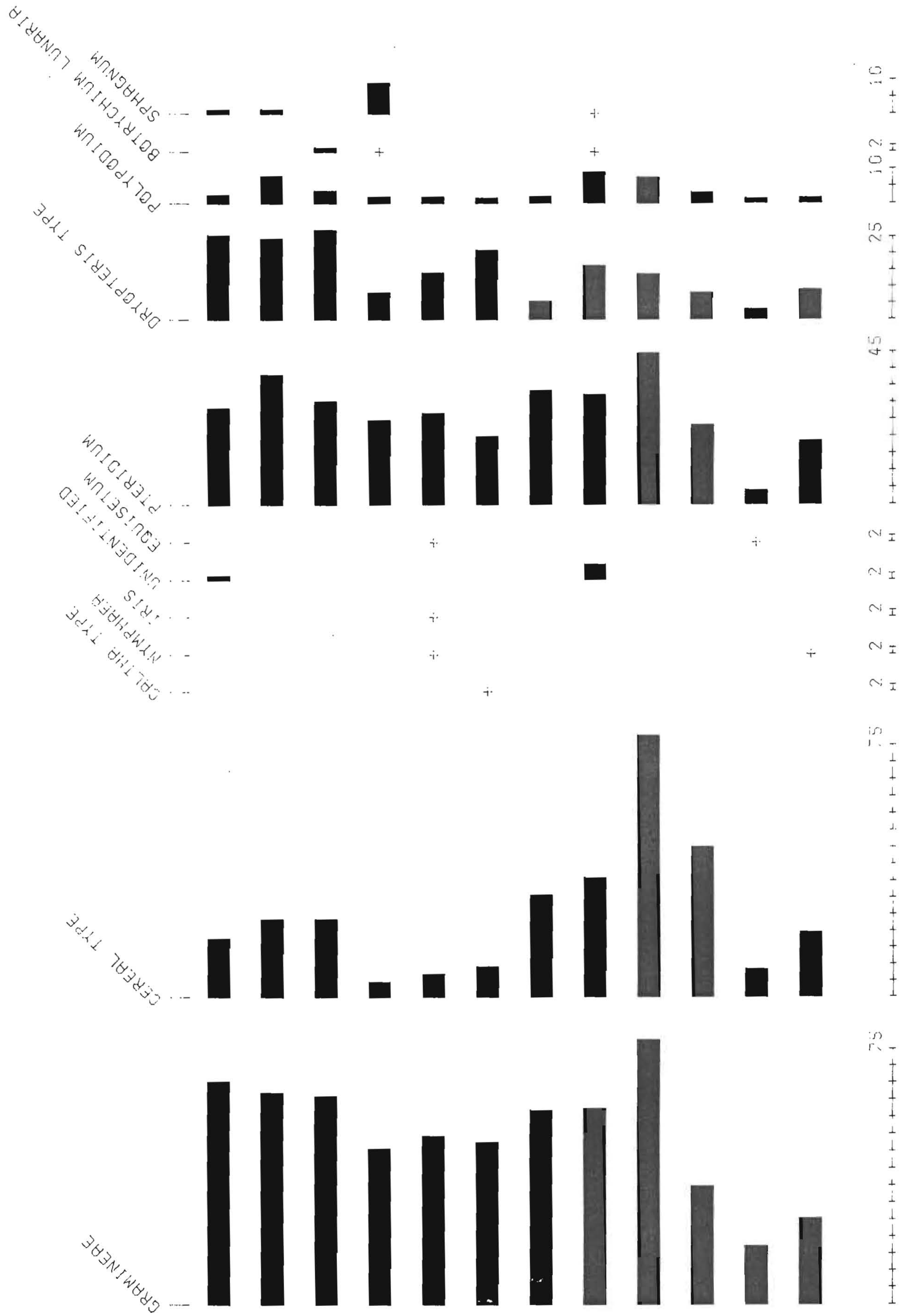
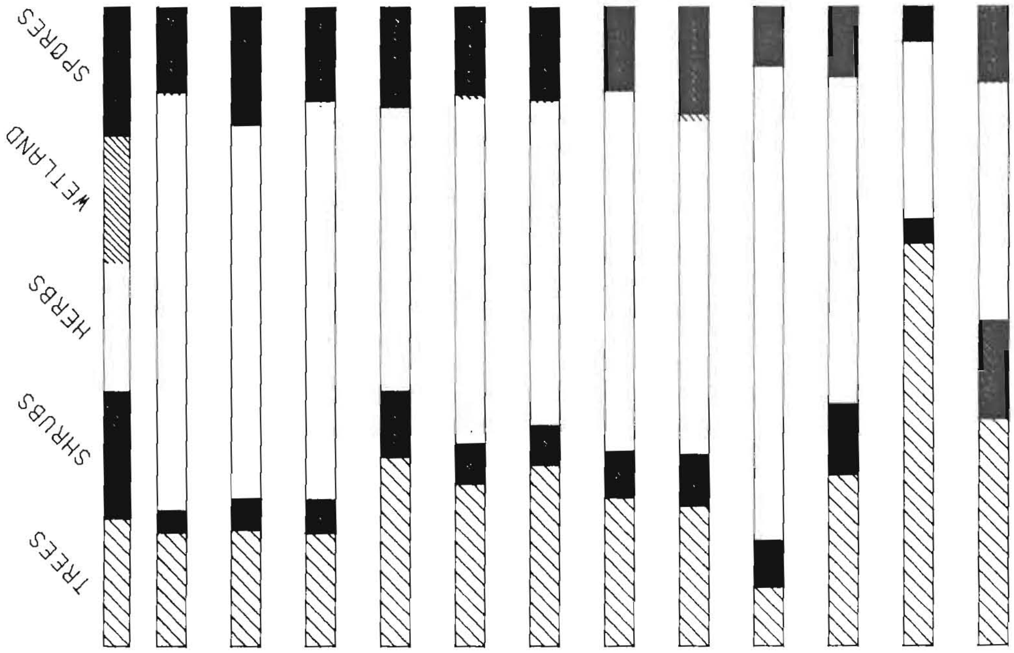
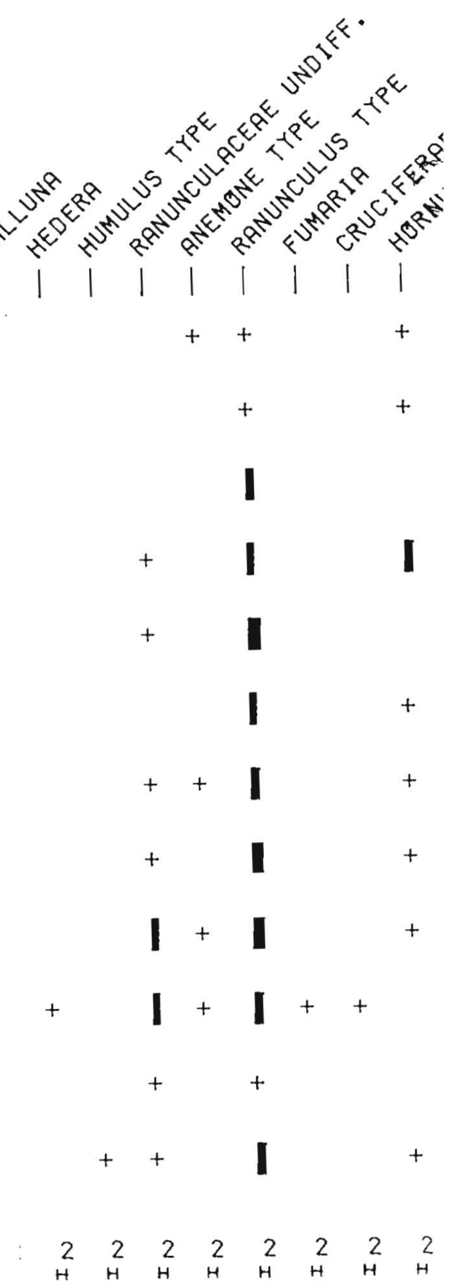

SPHAGNUM
BOTRYCHIUM LUNARIA
POLYPODIUM
DRYOPTERIS TYPE
PTERIDIUM
EQUISETUM
UNIDENTIFIED
IRIS
NYMPHAEA
CALTHA TYPE
CEREAL TYPE
GRAMINEAE

Fig 4a





PIT 0912

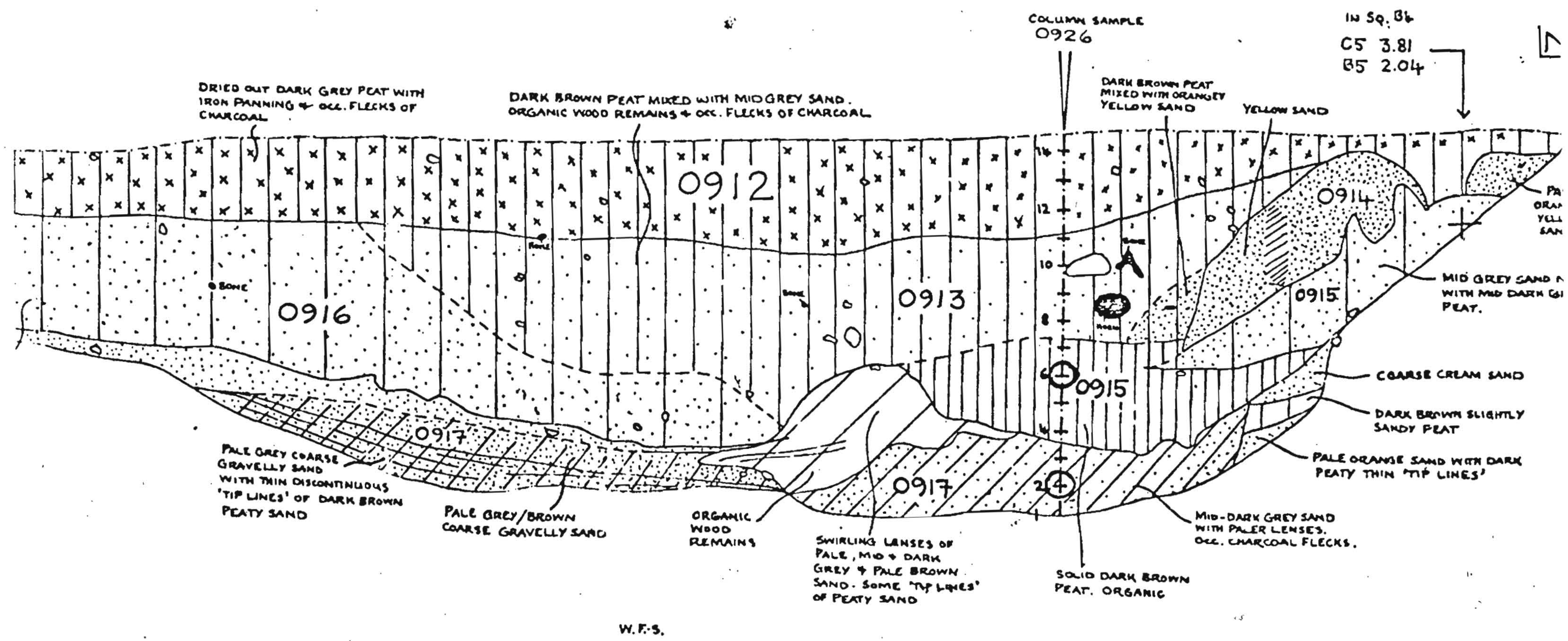


FIG. 5

Fig 5

WEST ROW 0926/0912

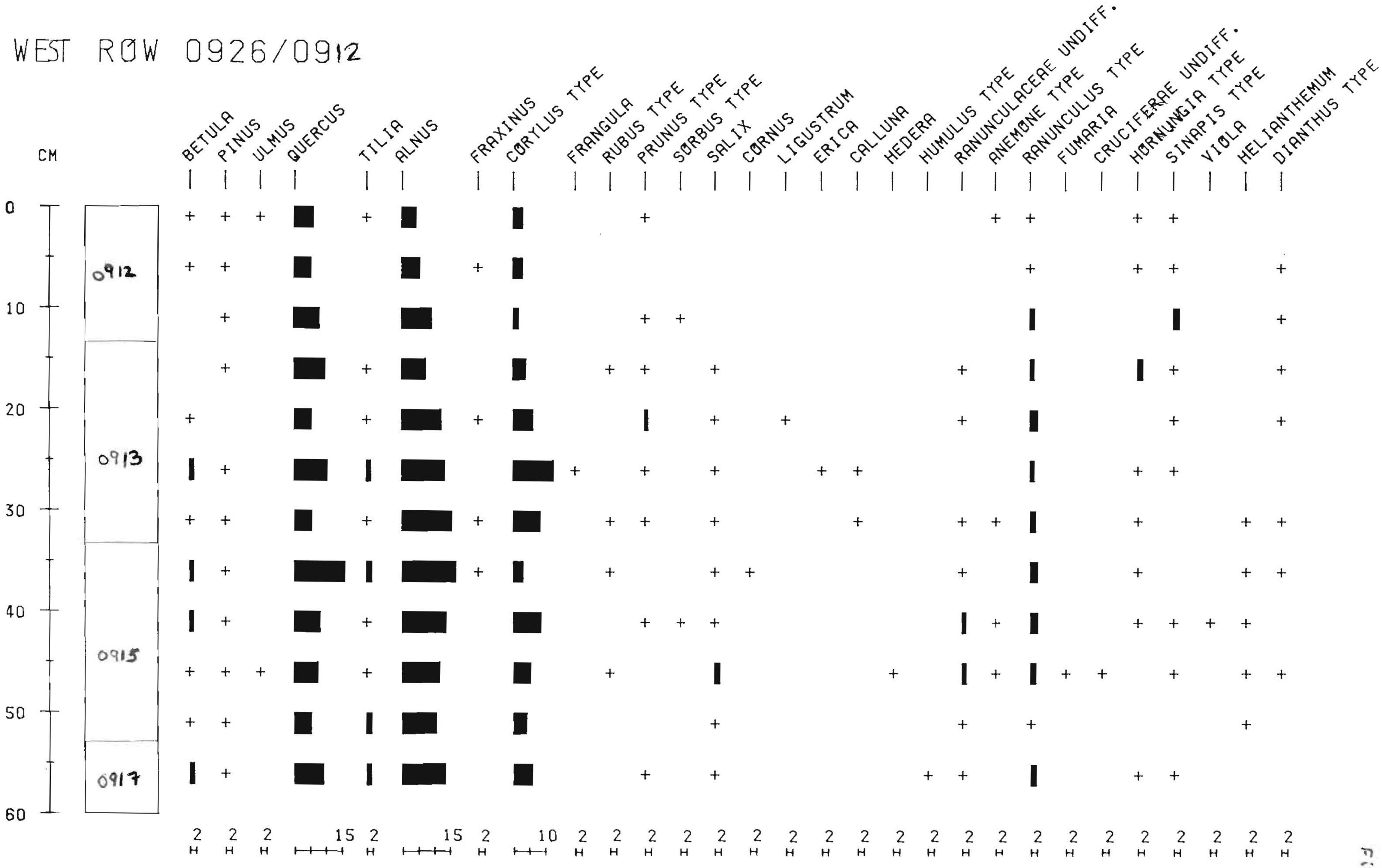


Fig 6a

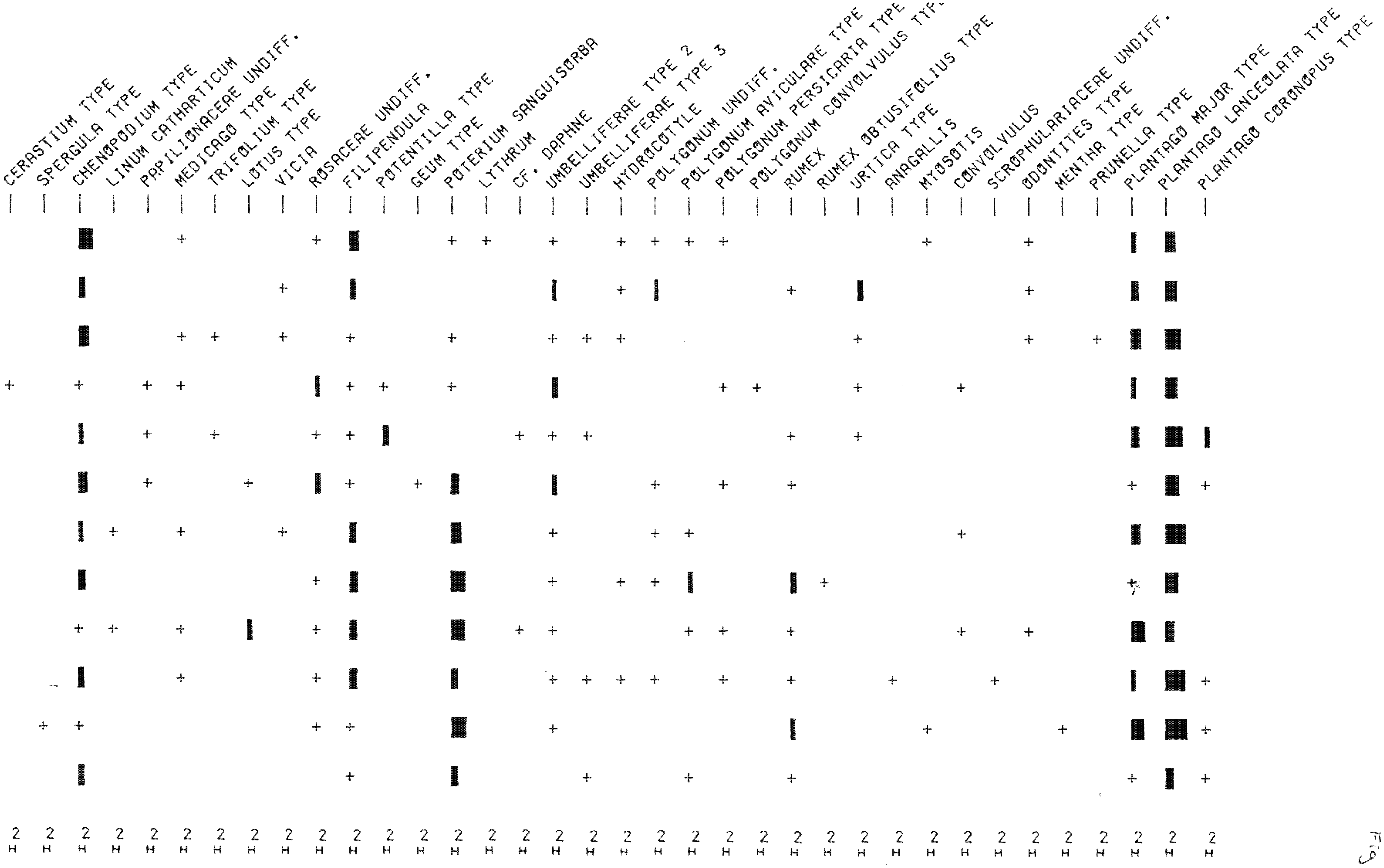

CERASTIUM TYPE
SPERGULA TYPE
CHENOPODIUM TYPE
LINUM CATHARTICUM
PAPILIONACEAE UNDIFF.
MEDICAGO TYPE
TRIFOLIUM TYPE
LOTUS TYPE
VICIA
ROSACEAE UNDIFF.
FILIPENDULA
POTENTILLA TYPE
GEUM TYPE
POTERIUM SANGUISORBA
LYTHRUM
CF. DAPHNE
UMBELLIFERAE TYPE 2
UMBELLIFERAE TYPE 3
HYDROCOTYLE
POLYGONUM UNDIFF.
POLYGONUM AVICULARE TYPE
POLYGONUM PERSICARIA TYPE
POLYGONUM CONVOLVULUS TYP
RUMEX
RUMEX OBTUSIFOLIUS TYPE
URTICA TYPE
ANAGALLIS
MYOSOTIS
CONVOLVULUS
SCROPHULARIACEAE UNDIFF.
ODONTITES TYPE
MENTHA TYPE
PRUNELLA TYPE
PLANTAGO MAJOR TYPE
PLANTAGO LANCEOLATA TYPE
PLANTAGO CORONOPUS TYPE

Fig 6b

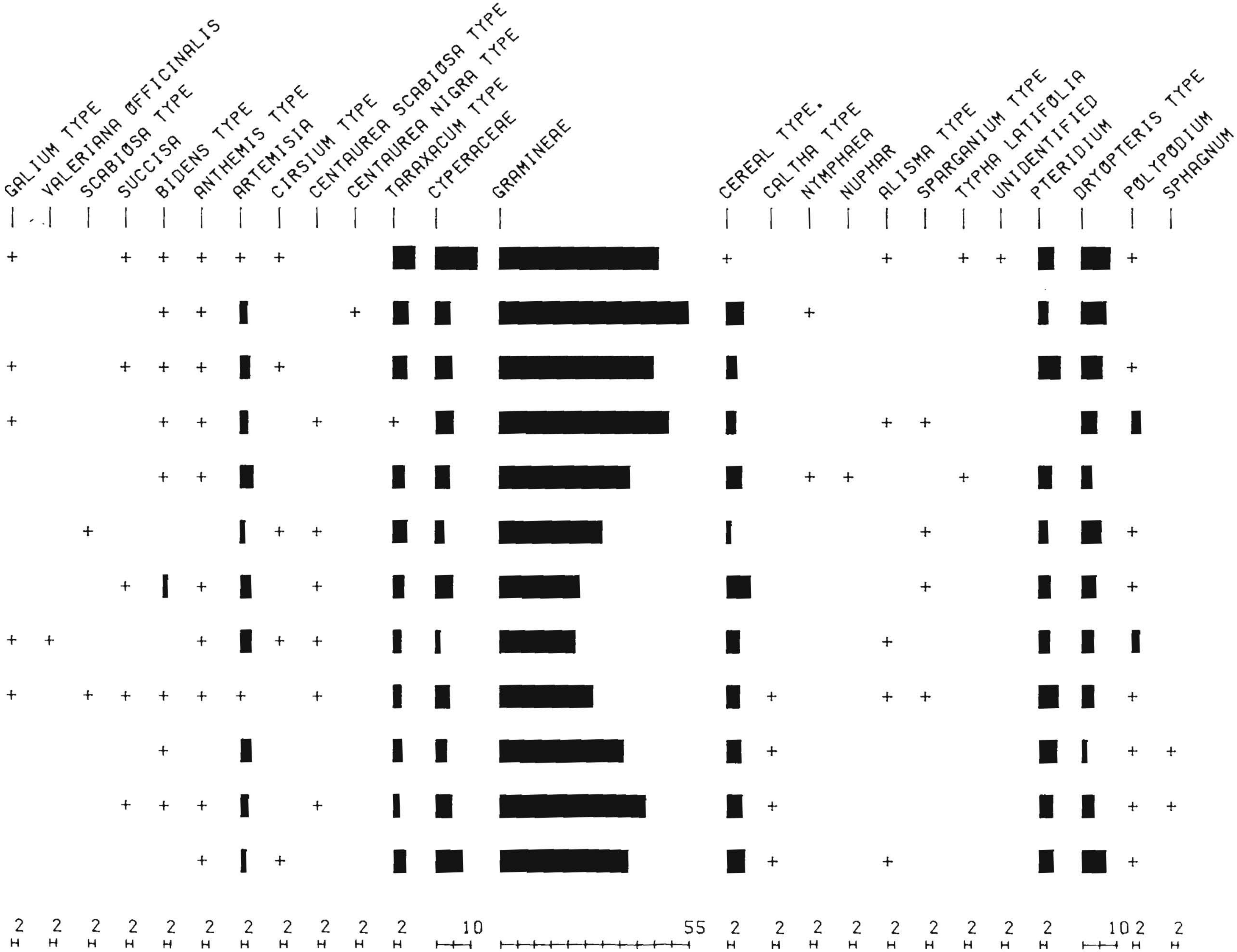

GALIUM TYPE
VALERIANA OFFICINALIS
SCABIOSA TYPE
SUCCISA
BIDENS TYPE
ANTHEMIS TYPE
ARTEMISIA
CIRSIUM TYPE
CENTAUREA SCABIOSA TYPE
CENTAUREA NIGRA TYPE
TARAXACUM TYPE
CYPERACEAE
GRAMINEAE
CEREAL TYPE.
CALTHA TYPE
NYMPHAEA
NUPHAR
ALISMA TYPE
SPARGANIUM TYPE
TYPHA LATIFOLIA
UNIDENTIFIED
PTERIDIUM
DRYOPTERIS TYPE
POLYPODIUM
SPHAGNUM
2
10
55
102

Fig 6c

Fig 6d