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Ancient Monuments Laboratory
Report 119/87

WOODLAND MANAGEMENT STUDIES FROM CARLISLE: CASTLE STREET 1981.

J P Huntley

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Summary

Non-structural wood samples from the Roman period were identified from Castle Street, Carlisle. Four species were present, predominantly oak and alder, with a little birch and hazel.

Age/diameter measurements demonstrate that wood of a particular size was chosen in preference to age or species although there is some evidence that alder may have been coppiced.

Much of the oak was branch wood whereas the alder was from both branches and stems.

Little oak was used during the early phases of occupation, more in the middle ones but very little during the later phases. Alder was abundant throughout.

It is suggested that the wood samples reflect the woodland in the area in that initially alder was used, probably from the immediate vicinity, both to produce timber and to clear the area; that oak was preferred during the more stable period of occupation (2nd Century A.D.) but that it was probably collected from several miles away; and that this supply was exhausted by the 3rd Century whilst the alder in the immediate vicinity had re-grown or been managed on a coppice cycle.

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Castle Street, Carlisle

Woodland Management

AIMS

During excavations at Castle Street, Carlisle large amounts of small wood (non-structural timbers) were uncovered and extensively sampled. Large structural timbers, principally of oak, were also recovered and upon which dendrochronological work may be possible.

The aim of this work was to gain insight into the use of this small wood during the Roman occupational phases of the site. In particular, evidence was sought for use of specific species, for particular size or aged wood perhaps indicating a scheme of woodland management, and for any changes with time - perhaps indicating exhaustion of certain types of material.

METHODS

Since it was not possible to identify all the small wood collected during excavation in the time available a randomised sequence of the sample numbers was produced and the sampled wood identified in order from this list during the time available.

Each piece of wood was frozen for approximately 24hrs at c.-12°C. Its surface was then planed smooth and a thin transverse section taken for ring counting and, potentially, ring width measurements. Tangential- and radial-longitudinal sections were also taken to aid species determination.

Where applicable, notes were made of asymmetry, evidence of working, damage etc.

Annual growth increments were measured using a calibrated eye-piece graticule on a binocular microscope. For each piece of wood thus measured the mean ring width was calculated with its standard deviation. The deviation of each ring width from the mean was divided by the standard deviation of the mean and this value plotted against ring number. This calculation allows direct comparison to be made between pieces of wood which will naturally vary in absolute ring width depending upon the environmental and other conditions under which the tree was growing.

RESULTS

All of the results were collated into a database, using DBASE III+, which was then used to manipulate the data for input and graphical representation using Microsoft CHART. Appendix 1 lists these data.

Only four species were present in the 363 samples identified, being *Quercus* (oak) and *Alnus* (alder), along with *Corylus* (hazel) and *Betula* (birch). The later, Medieval, phases yielded charcoal of a fifth species, *Pinus* (pine), as well as of alder.

Analytical Results

Ages and diameters of the species examined were extracted from the database and used to produce scatter plots for given phases, given species and given buildings. These results are shown in Figures 1-21. For each species and phase the following figures are presented:-

(i) a scatter plot of age (years) versus diameter (mm);

(ii) a histogram of frequency versus age (years);

(iii) a histogram of frequency versus diameter class with the diameter measurements smoothed by grouping into 5mm classes such that class 1 on the histograms represents stems from 0-5mm diameter, class 2 equals 6-10mm etc..

The two histograms were produced to determine whether the wood was cut at a particular size or a particular age, since the latter might indicate a coppice cycle, the former simply selection by size from the available material.

Phase results

Data were recorded principally from phases 3, 4, 5 and 8 and these phases will be discussed individually. Data were recorded from phases 1,2,7,13 and 14-16, see Appendix 1, but only from a few pieces of wood and nothing further can be said about them.

PHASE 3 - 1st Century A.D. (Figure 1)

Only oak and alder were identified from this phase. The age vs. diameter scatter plot shows a dense cluster of stems less than 10 years old and c20mm diameter with a spread of older (35-40 yr) stems. Alder produces the tightest cluster at c5 yr old and oak a 5-10 yr cluster.

PHASE 4 - late 1st - mid 2nd Century A.D. (Figure 2)

Oak, alder and hazel were identified from this phase. Again there was a dense cluster of <10 yr old stems and a spread of larger, older stems (c20 yr). Oak shows a clear linear distribution whilst alder and hazel show a strong <10 yr cluster. They both have a narrow age range but wide diameter ranges with hazel at <30mm diameter and alder up to 60mm diameter.

PHASE 5 - mid - late 2nd Century A.D. (Figure 3)

The stems identified from this phase were principally hazel wattle from one building. They form a cluster at c8 yr old and 20mm diameter. Nothing was older than 18yr.

PHASE 8 - 3rd Century A.D. (Figure 4)

Oak, alder and hazel were identified from this phase. They show a strong linear trend from 5-30 yrs and 10-90 mm diameter with the three species contributing to different areas of the line. Oak produced a cluster of <15 yr old stems, alder a cluster in the middle and hazel some large stakes as well as a scatter of smaller stems.

Linear regression analyses were performed on these age-diameter relationships to determine relative growth rates and production by the different species involved. Figure 5 shows that phases 3 and 4 exhibit similar trends, whilst phase 8 is very different. Turning to the trends for the individual species (Figure 6) rather than of all the species combined oak and alder have almost identical trends in phase 3, whereas in phase 4 alder initially produces larger stems for a given age but is 'overtaken' by oak at about 20yrs, when oak increases more in diameter per year. This is reversed in phase 8 where the oak remains very small and the alder is more than twice the diameter of oak for a given age.

Species differences:

Quercus (Oak) (Figures 7-9)

All of the tables demonstrate that oak of c5 years and c20mm was the most frequent in all three phases under consideration. Only this small diameter material was used in phase 8, although in phases 3 and 4 a small peak of 60-70mm diameter stems was also present.

Alnus (alder) (Figures 10-12)

During phases 3 and 4 alder was most commonly 5-10 years old and 15-30 mm diameter. Phase 3 produced a few larger and older stems but phase 4 remained tightly clustered. Phase 8 produced 10-14 year old stems which were quite large.

Corylus (hazel) (Figures 13-15)

Phase 4 produced hazel of a narrow age range (5-10 years) and also a narrow diameter range (15-25mm). Phase 5 produced very narrow peaks of age and diameter but this is not surprising given that the material came from wattles of one building. Phase 8 produced two peaks (4-5 years, 20mm and 25 years, 75 mm).

In some cases the wood from specific features was examined and Figures 16-18 show the age versus diameter plots of the different species for these features (the field labelled 'parts of' in the Appendix).

All of the alder results are plotted in Figure 16 which demonstrates that young, small wood was principally used in 1627 and 1249 which are both stake and wattle buildings of the late 1st Century A.D. This wood can be compared with the much larger, though similarly-aged alder from 1277 and 1302 - the edges of an oval pen (late 1st - early 2nd Century).

Figure 17 shows the results for oak with 608 and, to a certain extent, 1627 using oak of a narrow size range. 1233, a corduroy of logs, used somewhat larger oak.

Figure 18 shows the results for hazel with a narrow range of size in 1315, the wattle of phase 5, and a larger spread in size in building 683.

These results emphasise the differences between the phases which are discussed later.

Figures 19-21 show the results of the annual ring width increments of some of the pieces of oak that were measured. None of the sequences measured were very long which makes cross-matching very difficult. However, there are some similarities visible, particularly between samples 390 and 395, which might imply that these samples came from the same woodland or even the same tree. If much longer sequences, probably from structural timber, were available it might be possible to determine a floating chronology onto which some of these shorter sequences may be fitted, perhaps indicating where the small wood originated.

DISCUSSION

Before looking at the above results it is important to determine what the vegetation of the area was like prior to the arrival of the Romans. This can most conveniently be done by looking at evidence from pollen diagrams. For the Carlisle area there is a radiocarbon-dated site at Scaleby Moss (Walker, 1966). The pollen diagram from it expresses pollen values as percentages rather than absolute numbers and therefore the values are all relative, hence an increase in one pollen type does not necessarily mean an increase in the amount of that plant in the vegetation. However, it does give an indication of the local vegetation. For the period under consideration the diagram shows that the landscape was predominantly wooded (c. 70% arboreal pollen) with *Alnus*, *Quercus* and *Betula* the most common trees and *Corylus* the most abundant shrub. *Ulmus* (elm) and *Fraxinus* (ash) were present in low amounts and *Pinus* (pine) was occasionally present. The rest of the lowland landscape was grassland with evidence of a little cereal cultivation.

Alder is a tree which favours wet, clay soils and would almost certainly have been the most abundant tree in the immediate vicinity of Carlisle. Although alder is rarely used today as a source of constructional timber it was once valued for temporary carpentry such as scaffolding (Rackham, 1980). Its wood rots easily under normal conditions but is quite resistant to decay if submerged and was therefore used for pilings at quaysides. In the Middle Ages, at least in East Anglia, small alder woods were grown on long coppice rotations to produce poles and stakes (Rackham, 1980).

The size range of alder is very similar in all phases which could mean managed woodland but could equally mean a very large, naturally occurring supply in the vicinity, as is also suggested from the pollen record. Diameters and age are obviously linked to a certain degree but a strong concentration in age, and possibly a wider span in diameter, would be expected if coppicing were taking place. The larger alder stakes are from stems (symmetrical growth) in many cases and those from phase 4 show a very narrow age range but wide diameter range. It is therefore possible that some of this was coppiced material.

Oak has for a long time been the favoured tree for production of structural timber, its wood being hard and durable. It is also likely that use would have been made of its branches and twigs where appropriate, such as in wattles. The tree will grow in the north of England today, generally on the better-drained soils, but will not produce the long, straight timber that it produces in the south of England.

Much of the oak examined in this study was in very short pieces, many of which were knobbly and exhibited the asymmetrical centre characteristic of branch wood, compared with its central nature in stems. It is therefore suggested that the small-sized pieces of oak in the present study were from branches, probably left over from trees cut down principally for structural timber.

The larger pieces of non-structural oak were all found in phases 3 or 4 whereas all of the oak from phase 8 was small and young. This might imply that the local oak had been so reduced that large stems were no longer available during phase 8.

Birch is rarely used today although it has been important in furniture making in the past, having a fine-grained, cream wood which is easily turned. It was once important in Scotland for producing structural timbers (Rackham, 1976) and could have been used similarly in northern England. Both of the two native species of tree birch grow in northern England today, one on wetter soils and the other on acid, sandy soils. They can reach 10 or more metres tall with good straight trunks.

The only birch examined in this study was from stakes.

Hazel has traditionally been a coppiced shrub producing young, straight poles for a variety of uses. It does, however, naturally coppice itself - as one mature trunk rots or falls over several shoots will develop from its base. It would have been an important component of the woods in the area during the Roman period. It is an extremely widespread shrub and, whilst in the south of Britain,it generally grows as an understorey in woodland, in the north it also grows as the canopy of low-statured woodland.

It is difficult to say whether a particular piece of wood was cut from a coppice stool unless the base of it is present. This has a characteristic bulbous shape. Another feature of a coppiced stem is its long, straight nature and often extremely rapid growth during years 1 and 2. Amongst the material examined from Castle Street no piece exhibited such a base and all the pieces were extremely short - none more than 20cm long. Some of them, particularly the hazel, did show the rapid growth cycle and therefore could have been from a coppice stool but, as stated above, hazel coppices naturally.

The main conclusion is that of the four species readily available around Carlisle at the time only oak and alder were being used to any great extent although small amounts of the others were utilised.

Looking in general at the material used in the different buildings the main conclusion has to be that, not surprisingly, wood of a particular size was chosen for a particular job, therefore larger timber was used as stakes and smaller wood for wattles, but there is no apparent selection in the species used; ie. size was important, species of wood less so. Whilst this holds true for any given building, at the level of individual phases there are indications that alder was the most commonly used wood during phase 3, the late 1st Century A.D. but that by the early 2nd Century (phase 4) oak was also used in considerable quantities. This suggests that on arrival in Carlisle the Romans cleared the woodland immediately surrounding the site both for use in building and for strategic reasons. As the garrison became a more stable feature and administrative and civilian settlement developed, sturdier buildings were required, and oak was the favoured timber. This would have been cut from a local supply, maybe some miles away, but probably not immediately surrounding the site. By the early 3rd Century this supply of oak had been exhausted but alder, being a relatively fast-growing tree, was still plentiful and therefore became more widely used again. It is also possible that some alder coppicing was being practised locally.

REFERENCES

Rackham, O. (1980) Ancient Woodland its history, vegetation and uses in England. Arnold.

Walker, D. (1966) The Late Quaternary history of the Cumberland Lowland. Philosophical Transactions of the Royal Society of London. Series B., vol. 251, 1-210.

ACKNOWLEDGEMENTS

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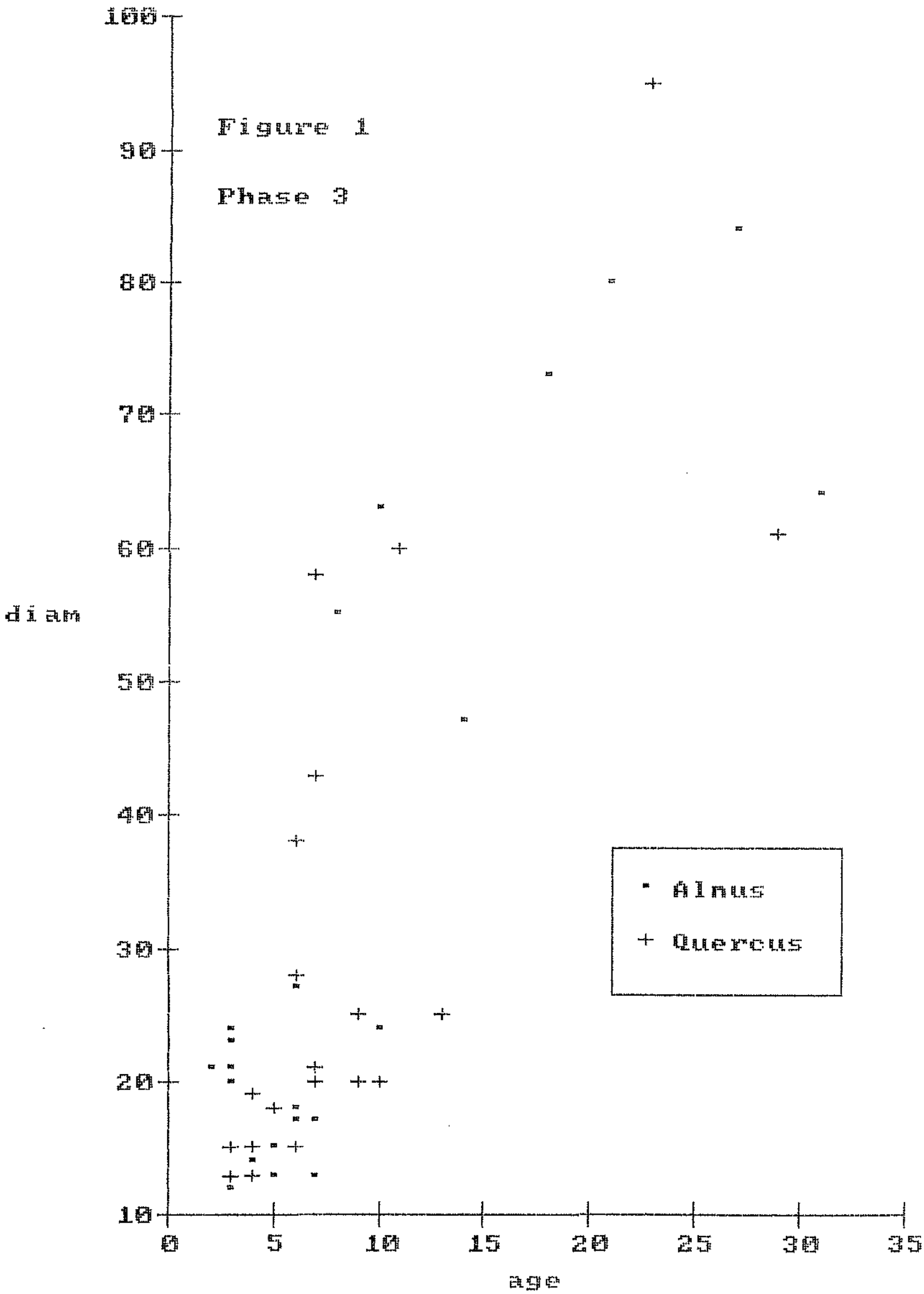
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Phase 3
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Alnus
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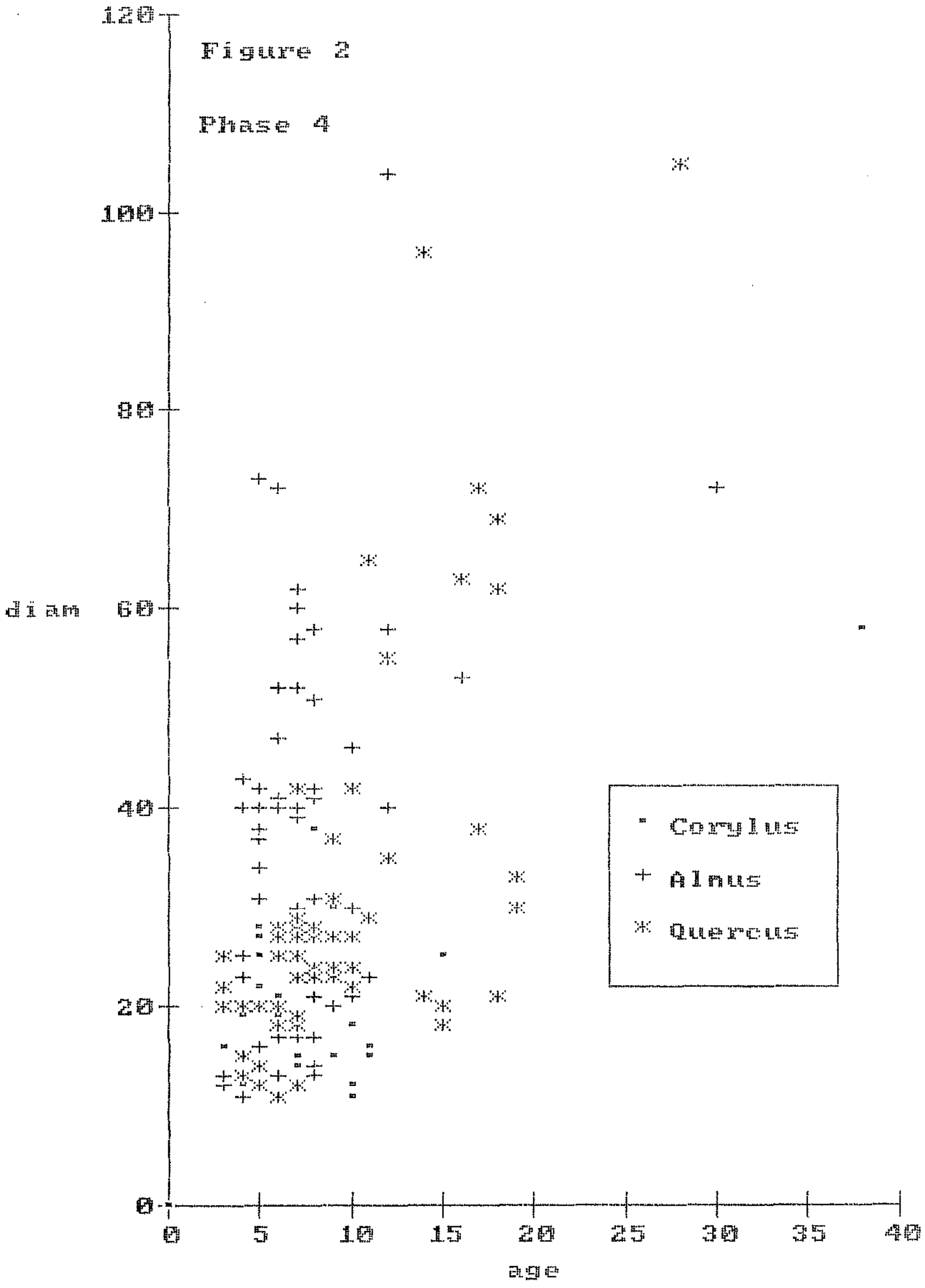
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Phase 4
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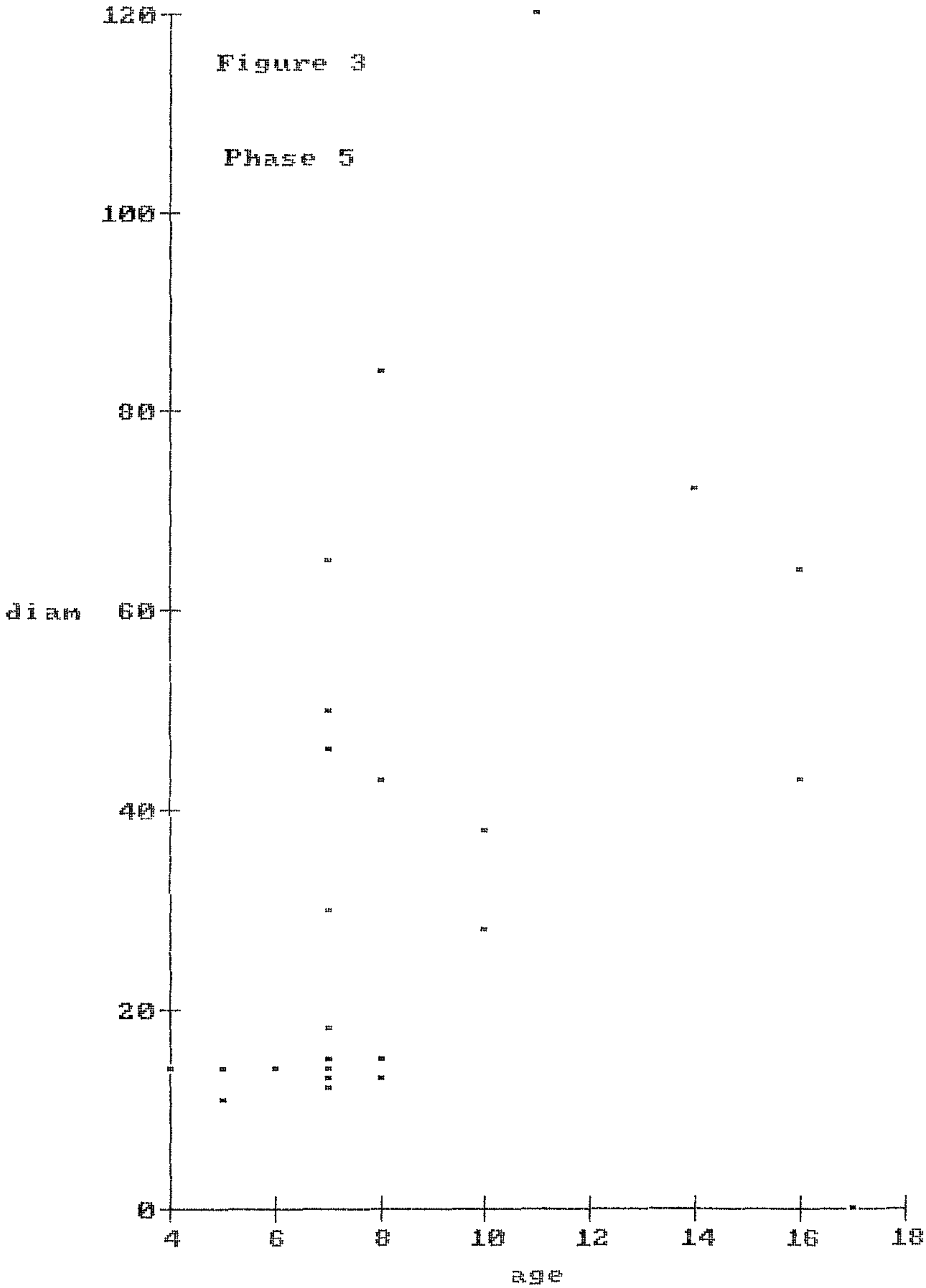
Corylus
Alnus
Quercus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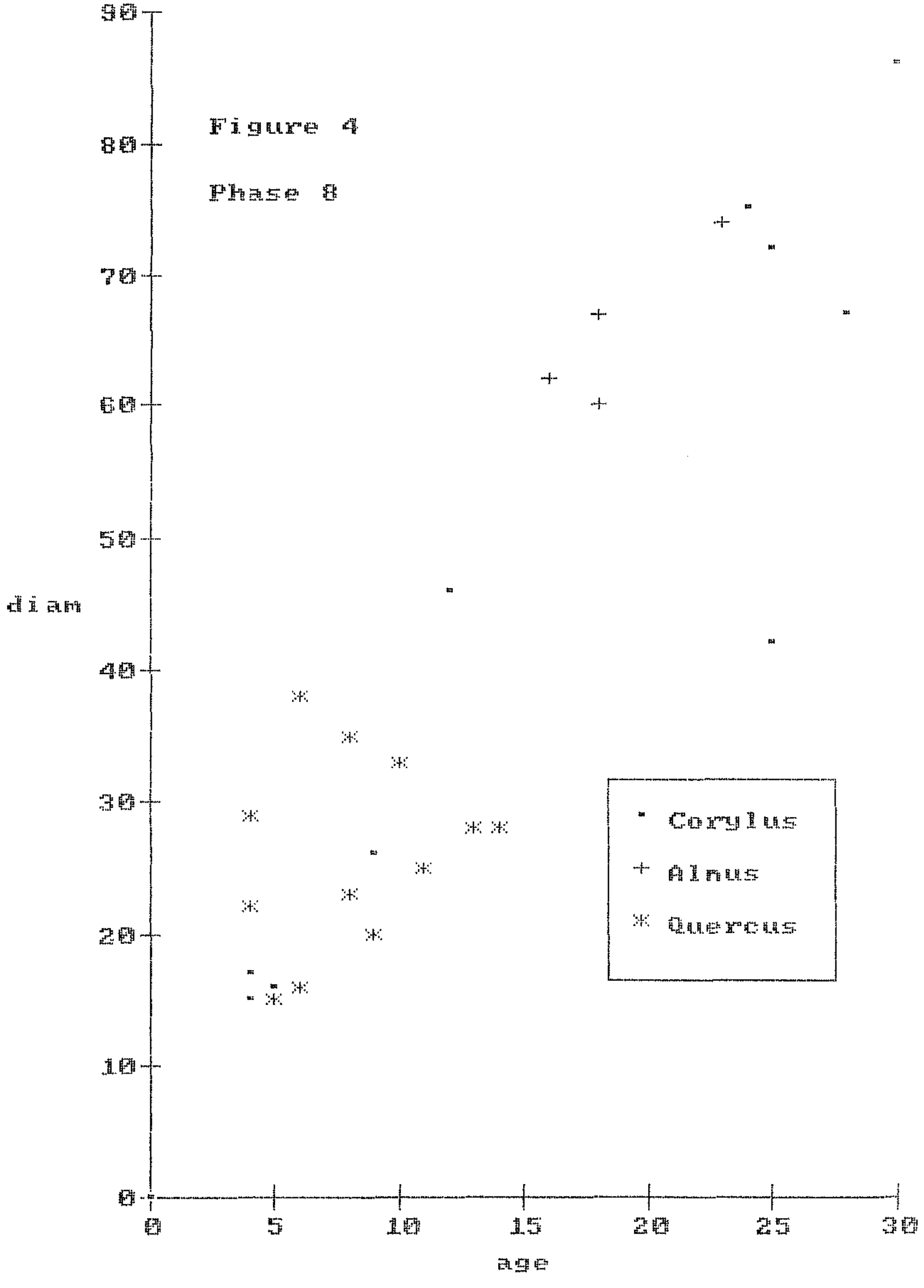
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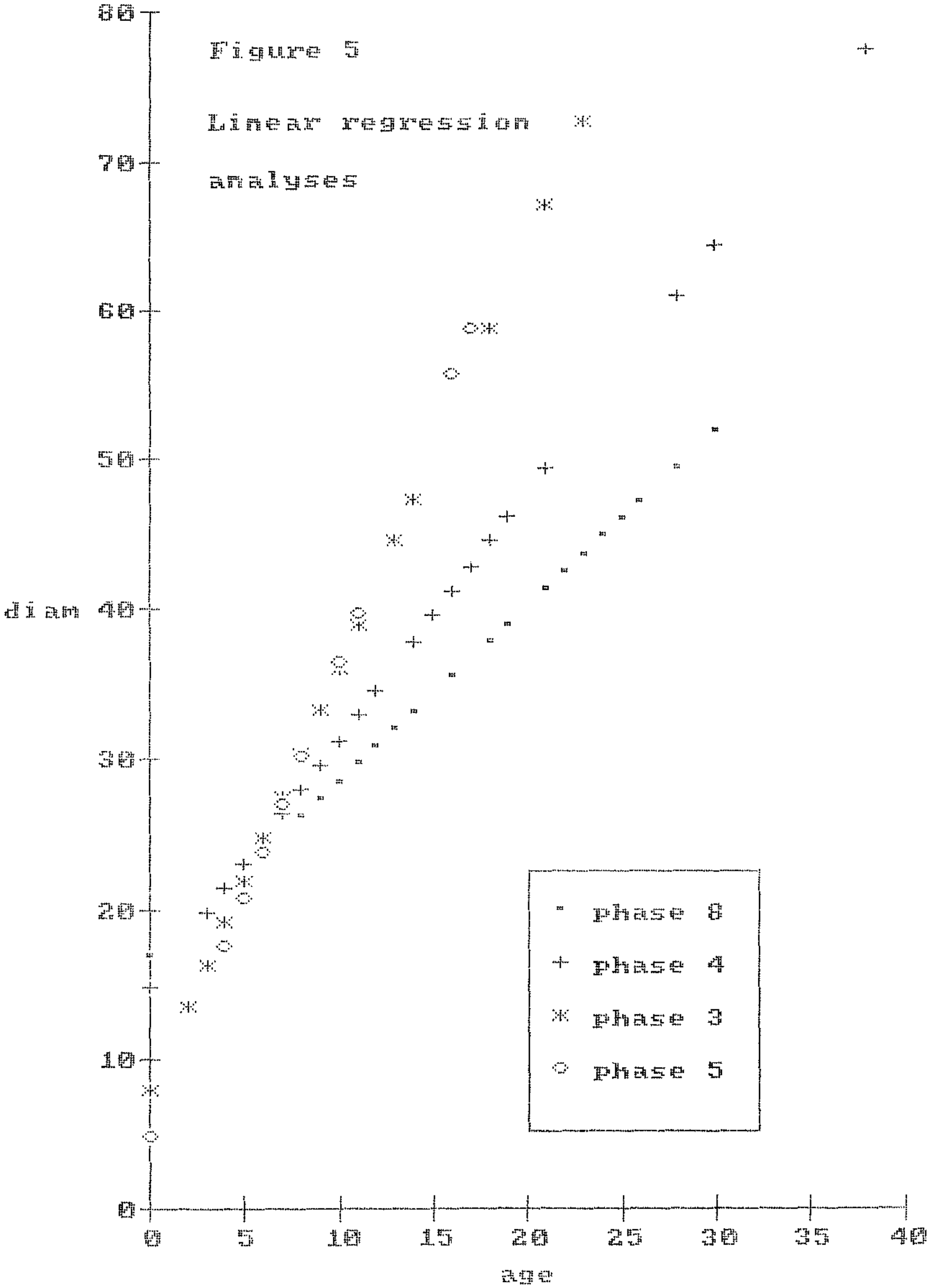
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Linear regression
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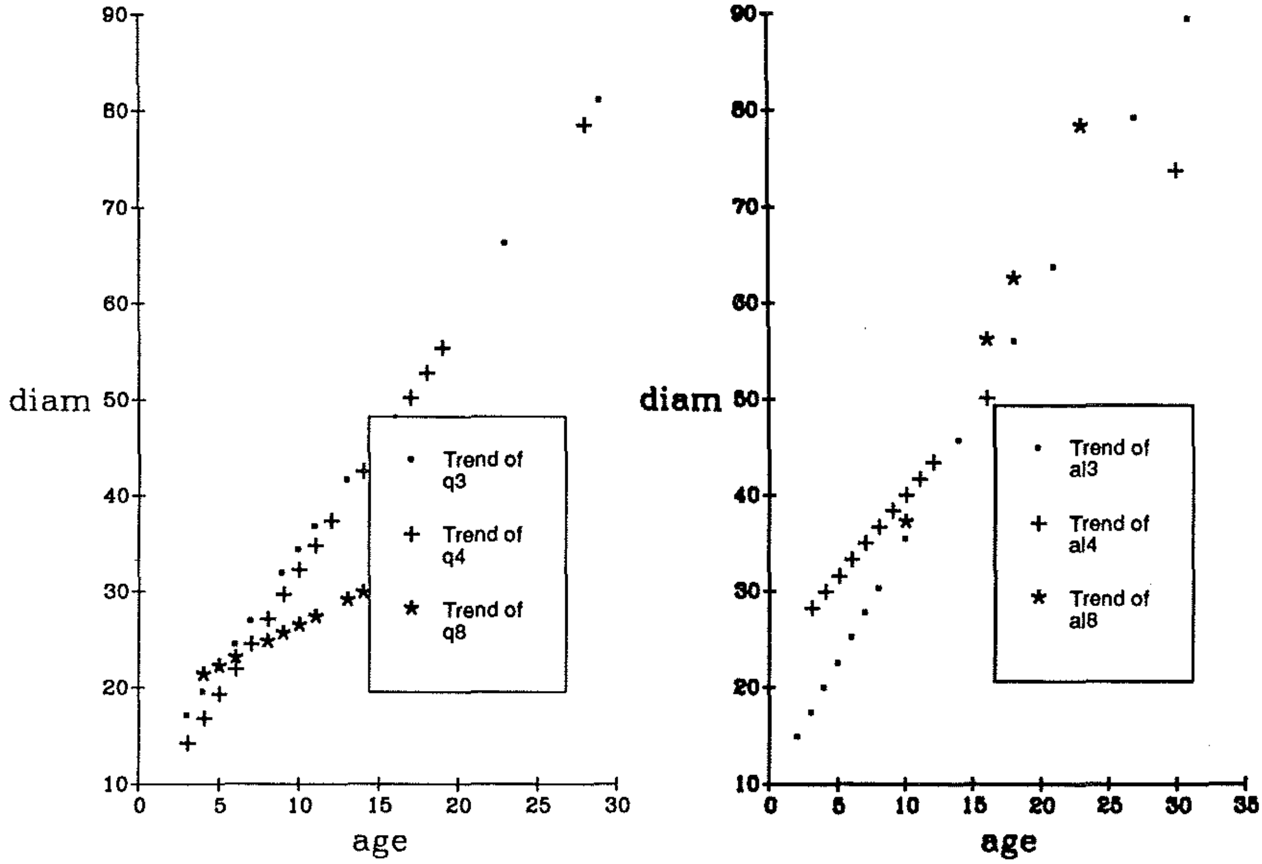
phase 8
phase 4
phase 3
phase 5



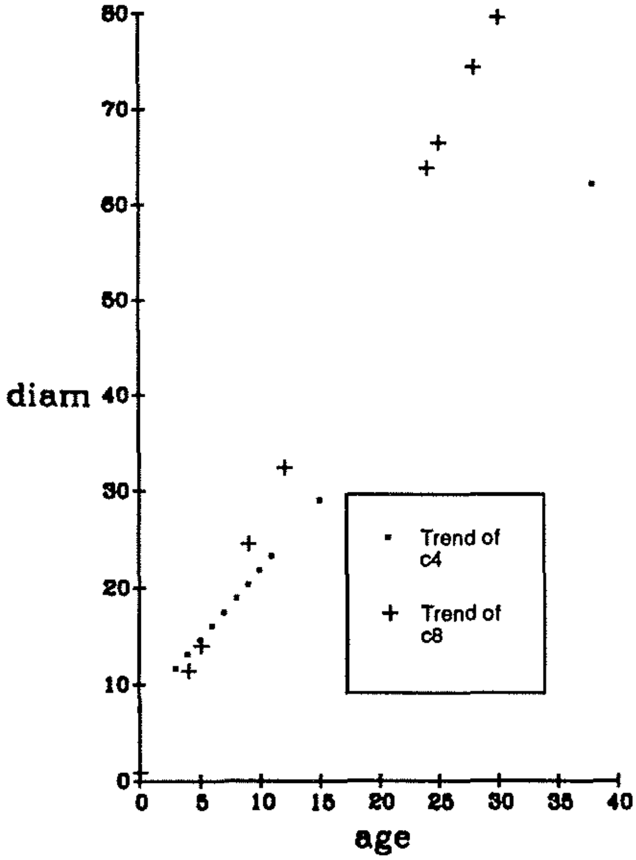


Figure 6

Linear regression analyses

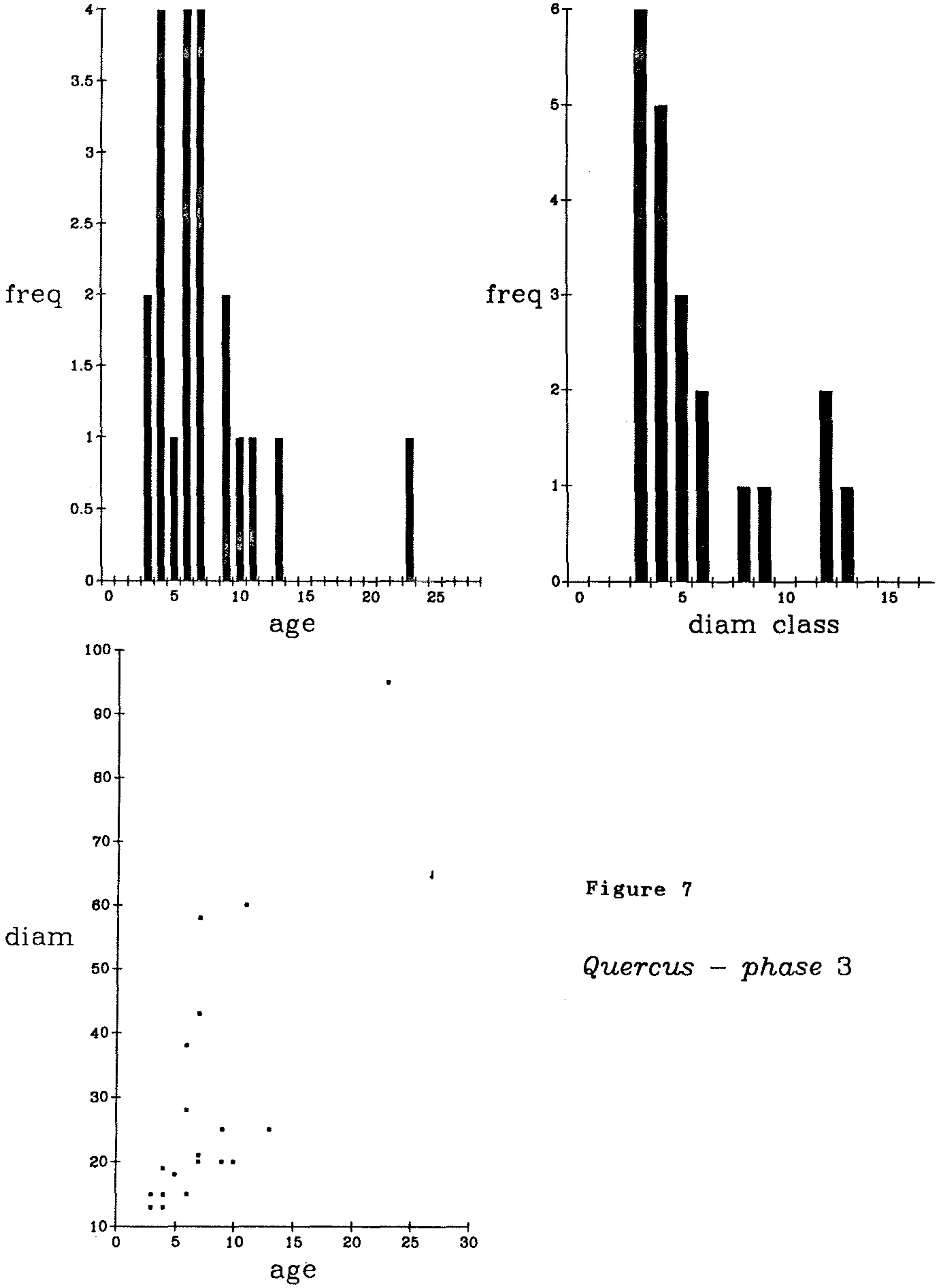
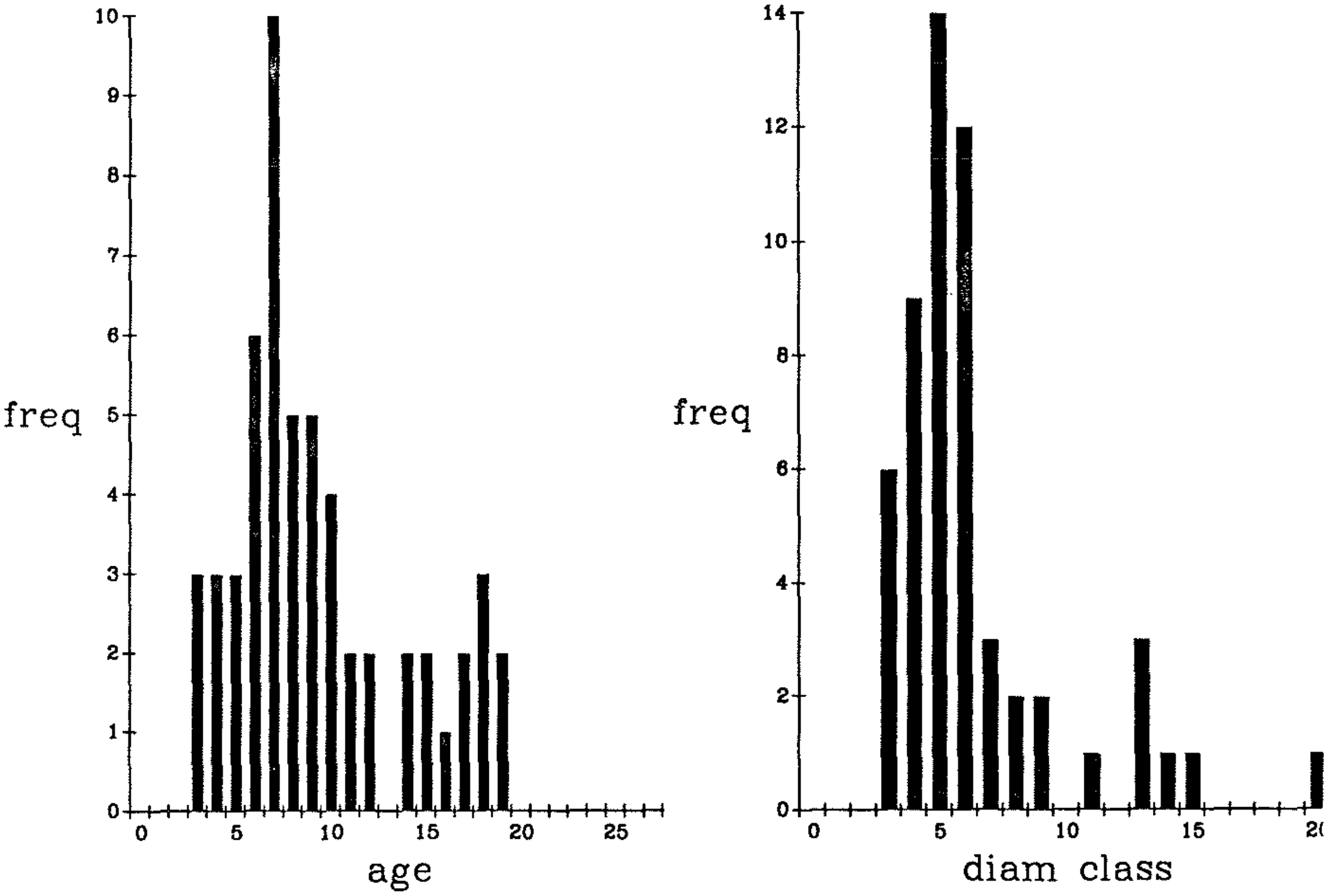


Figure 7

Quercus – phase 3



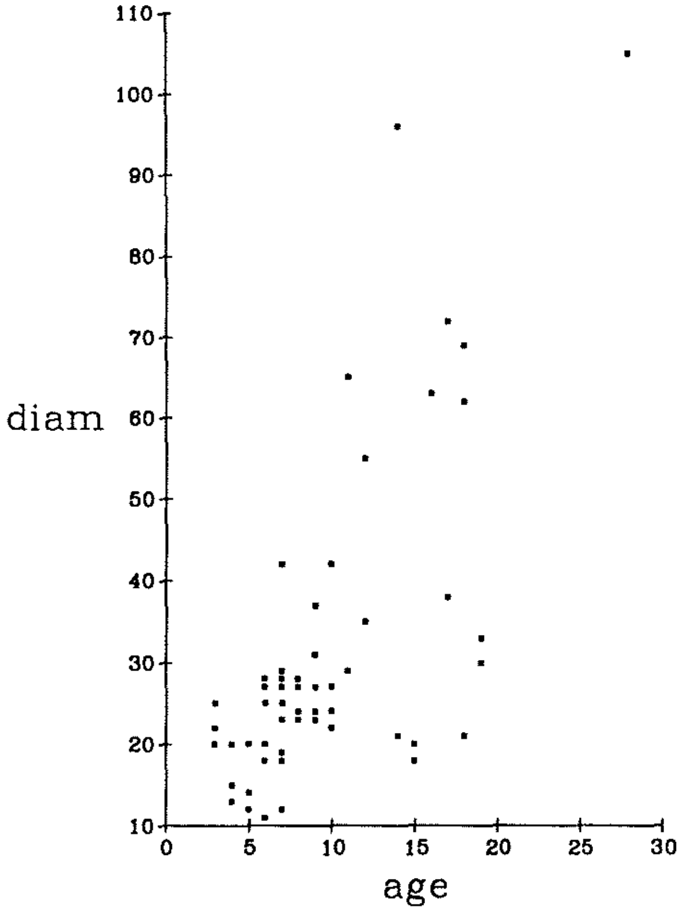
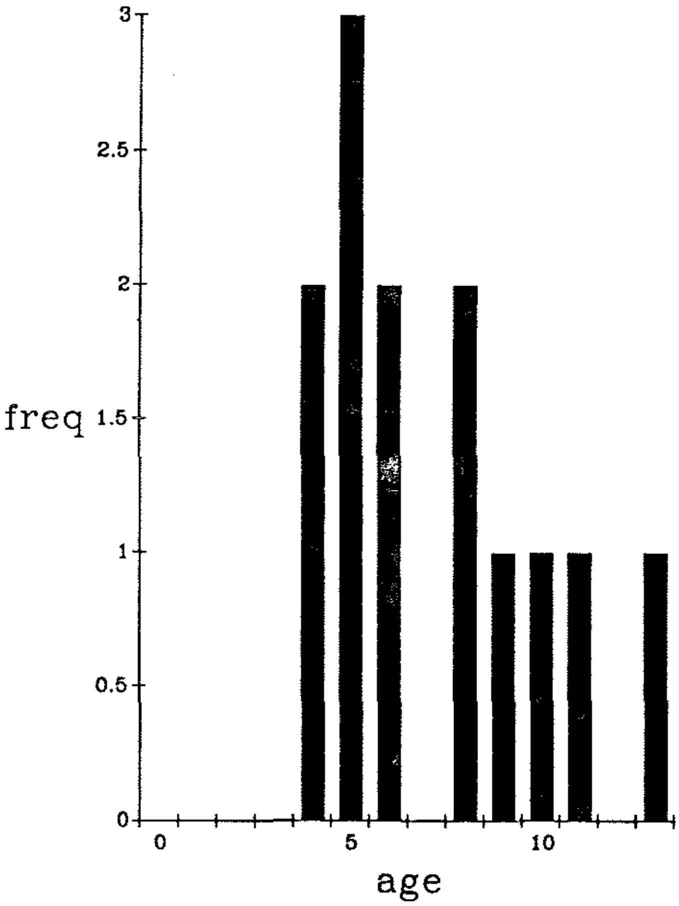
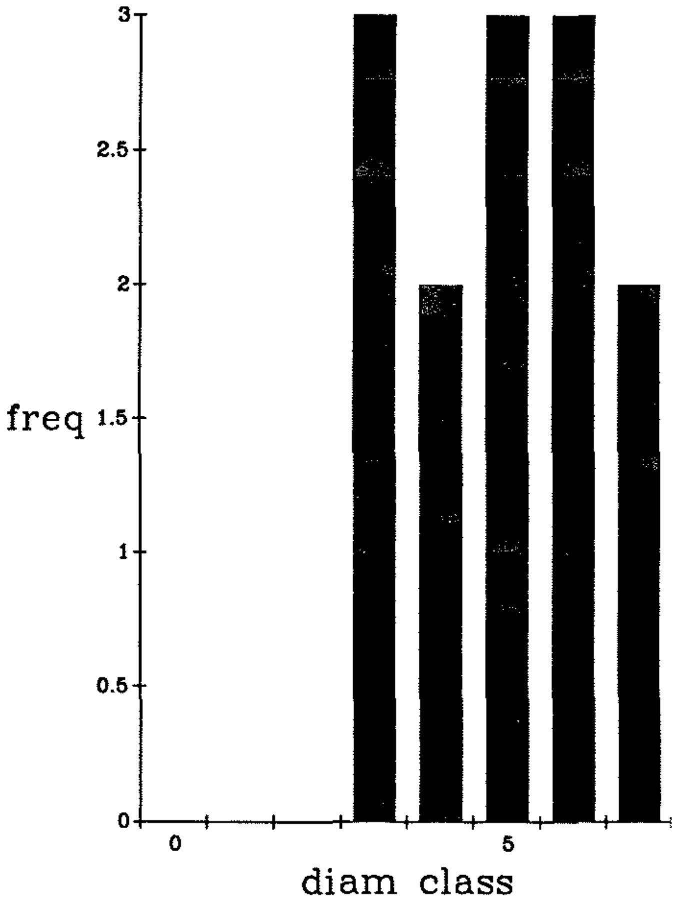
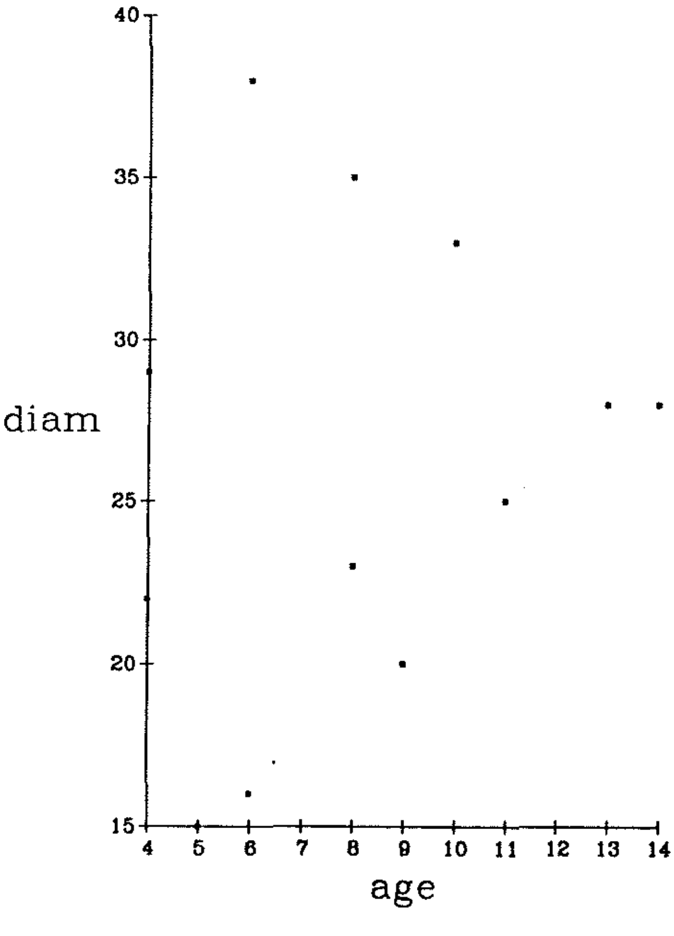


Figure 8

Quercus – phase 4







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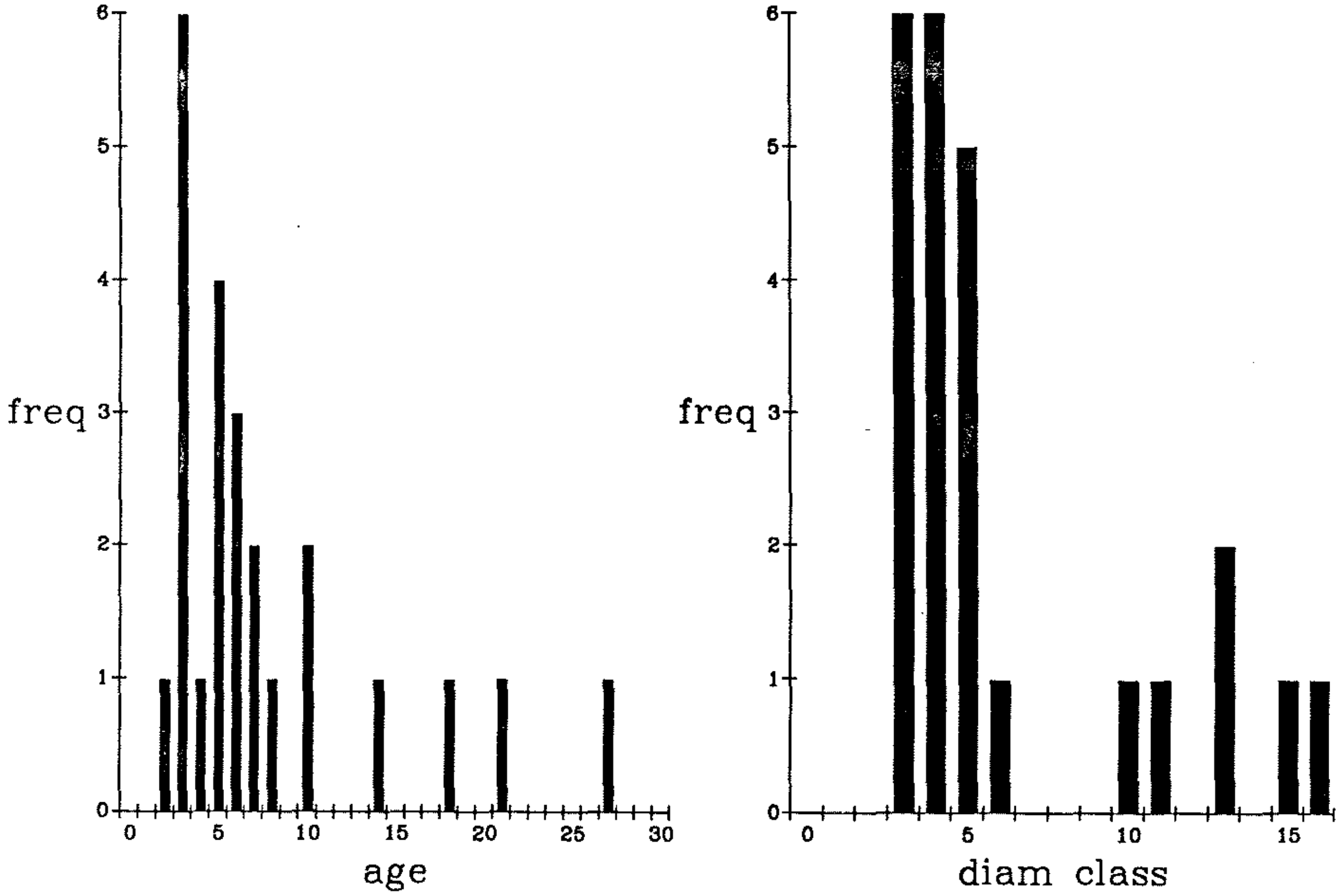
Quercus – phase 8



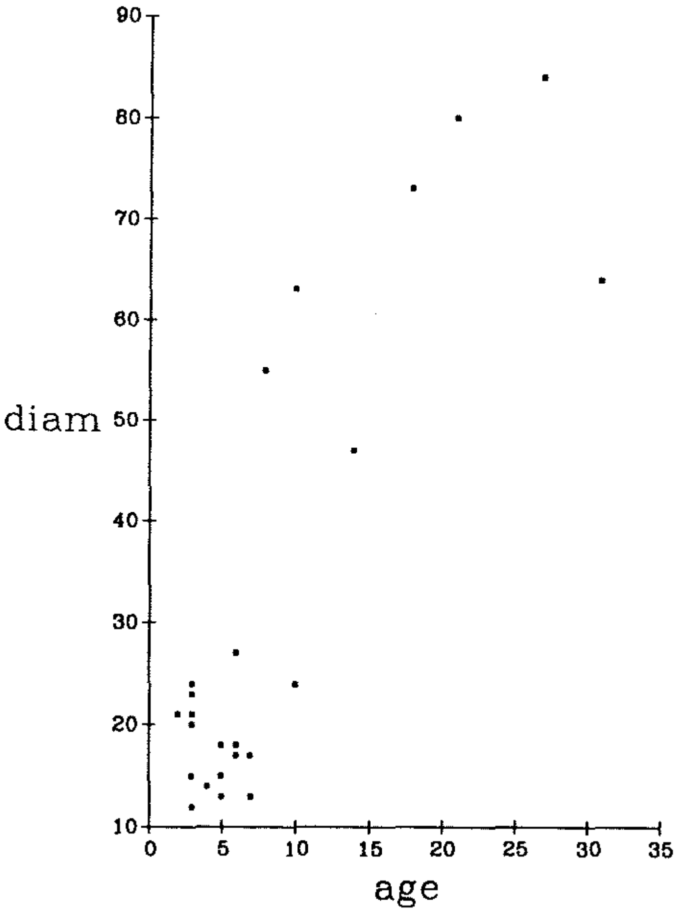
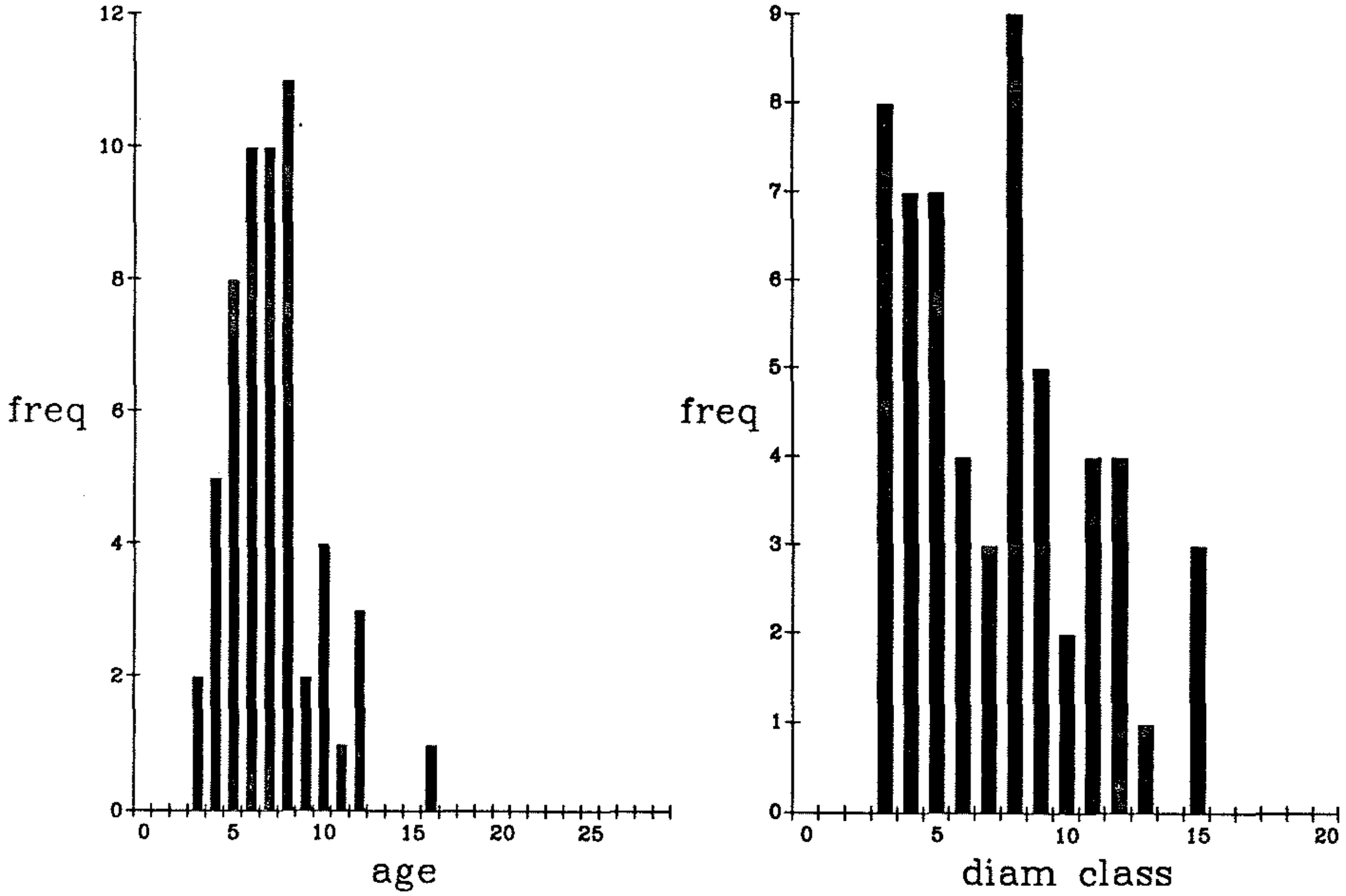
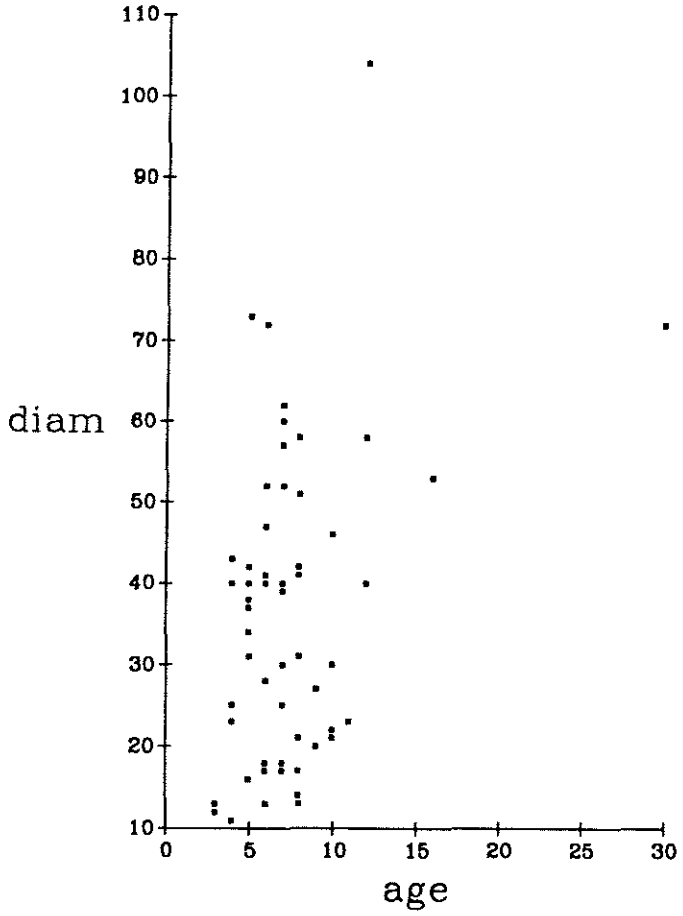


Figure 10

Alnus – phase 3





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Alnus – phase 4

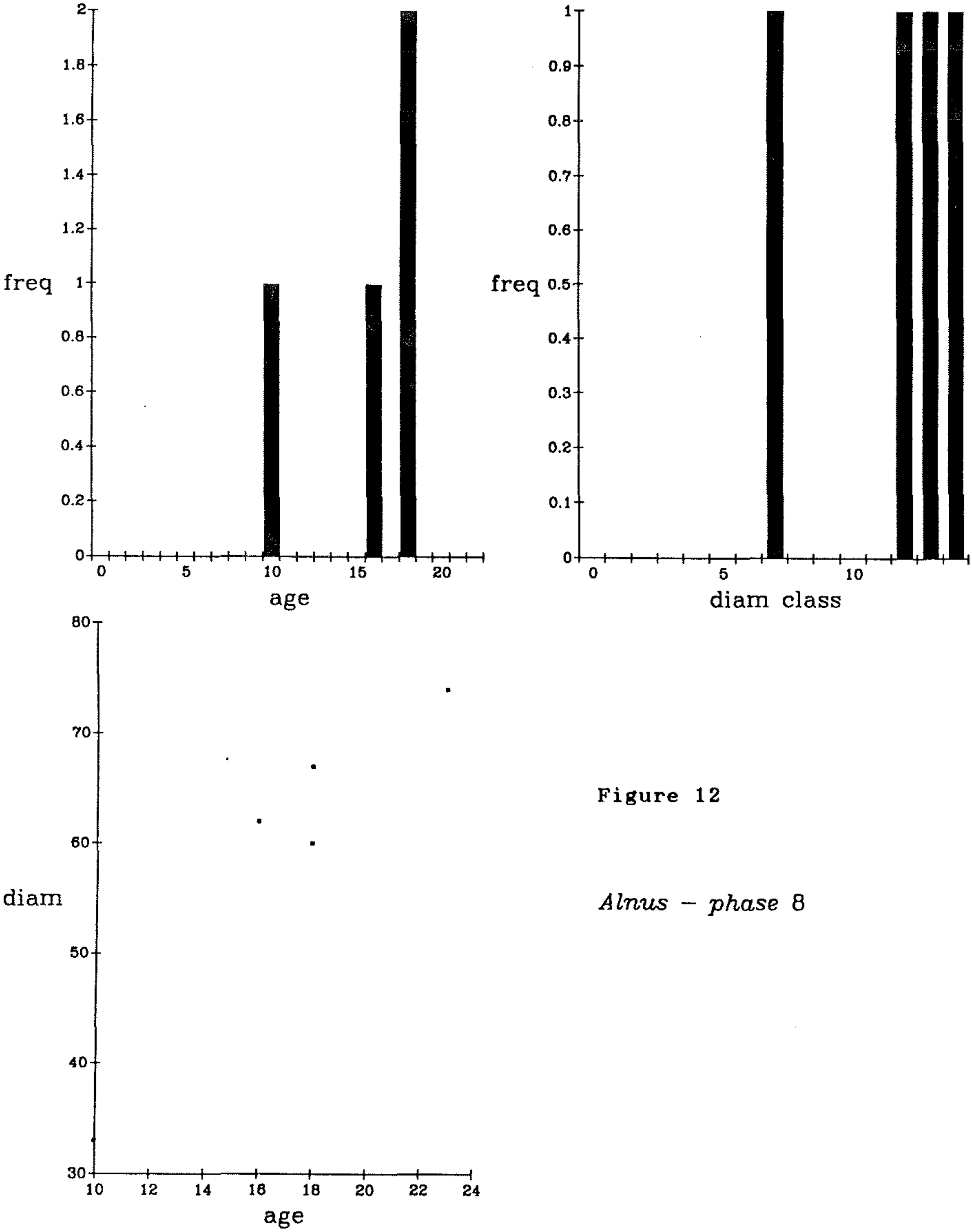


Figure 12

Alnus – phase 8

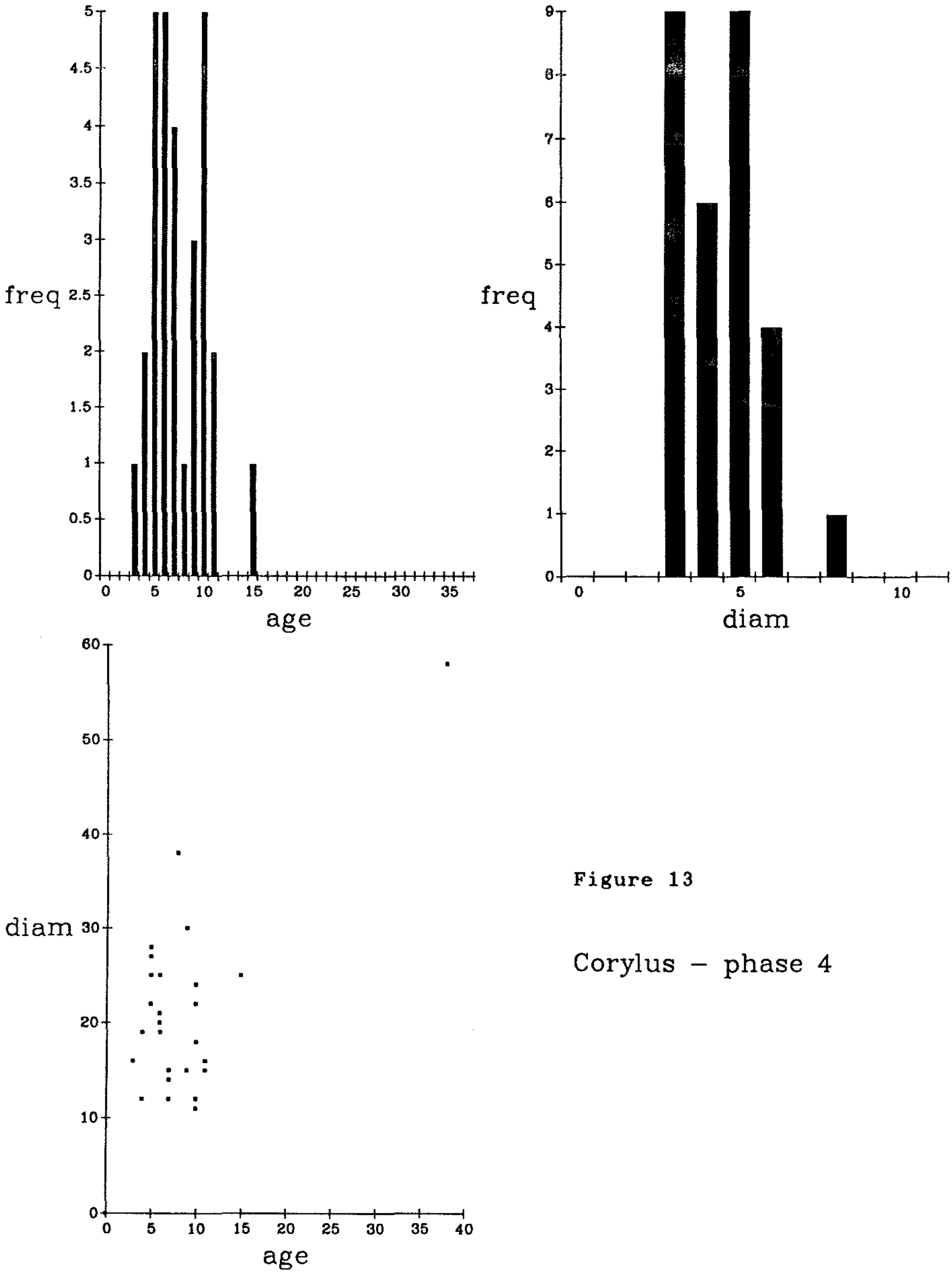
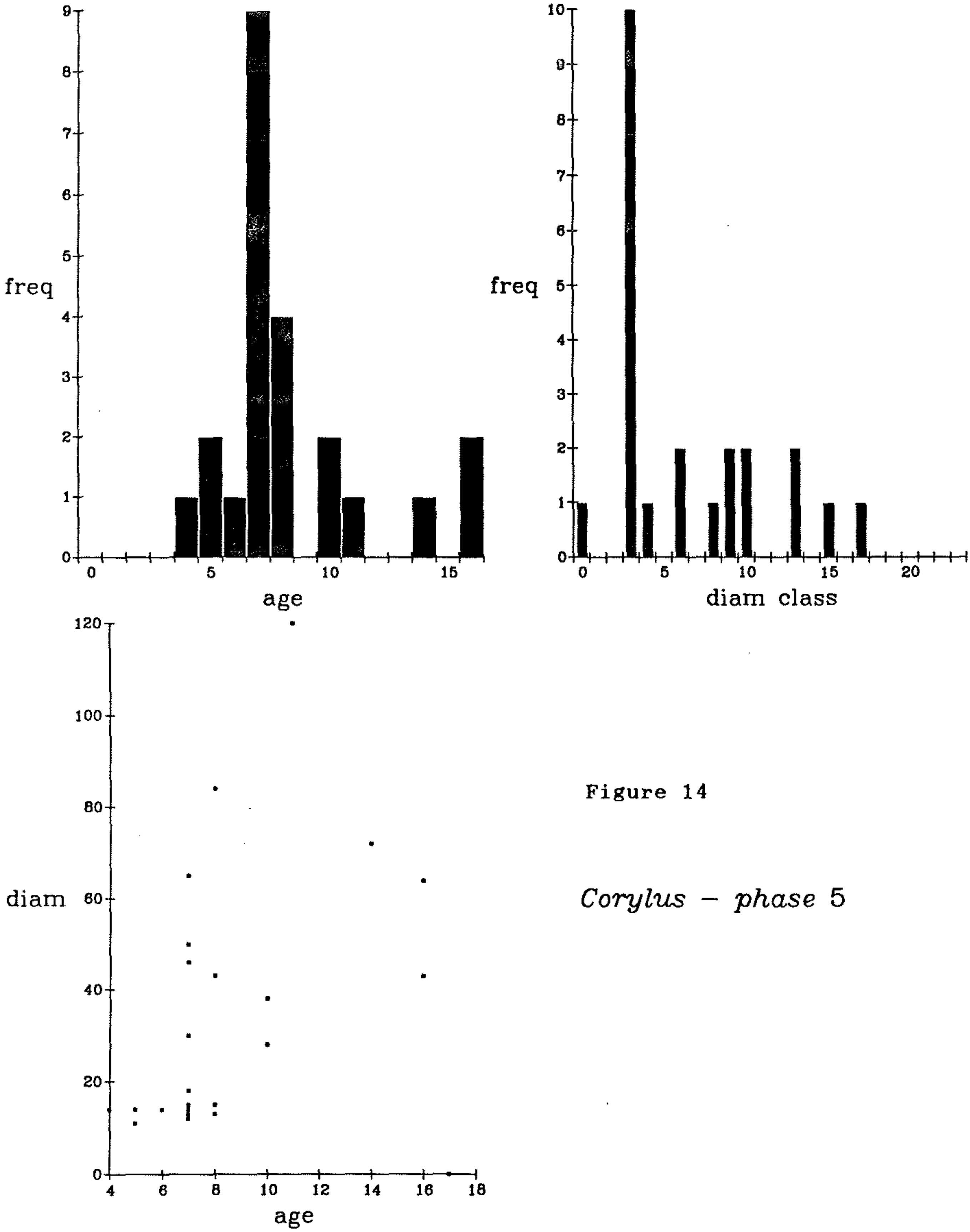


Figure 13

Corylus – phase 4



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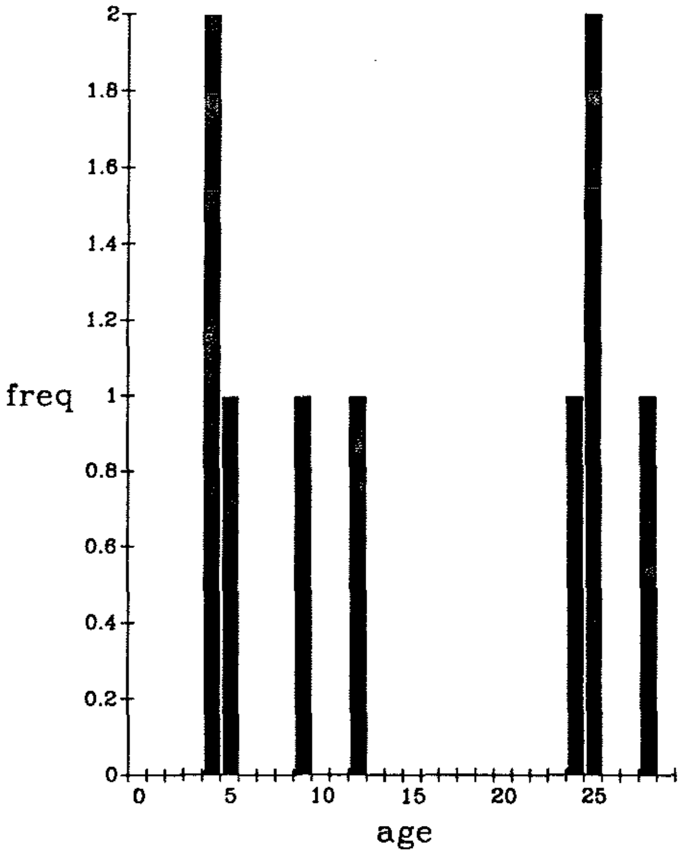
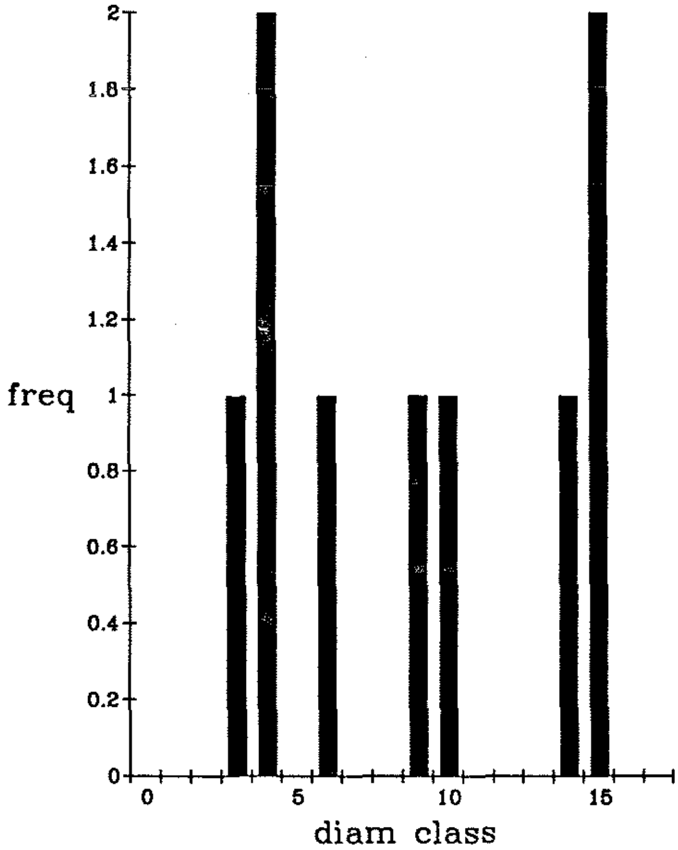
Corylus – phase 5





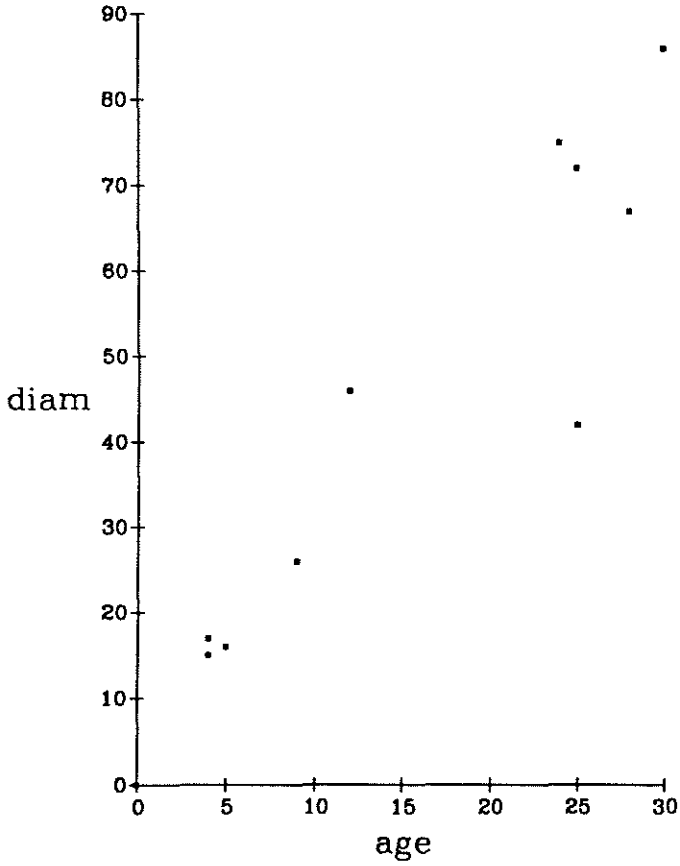
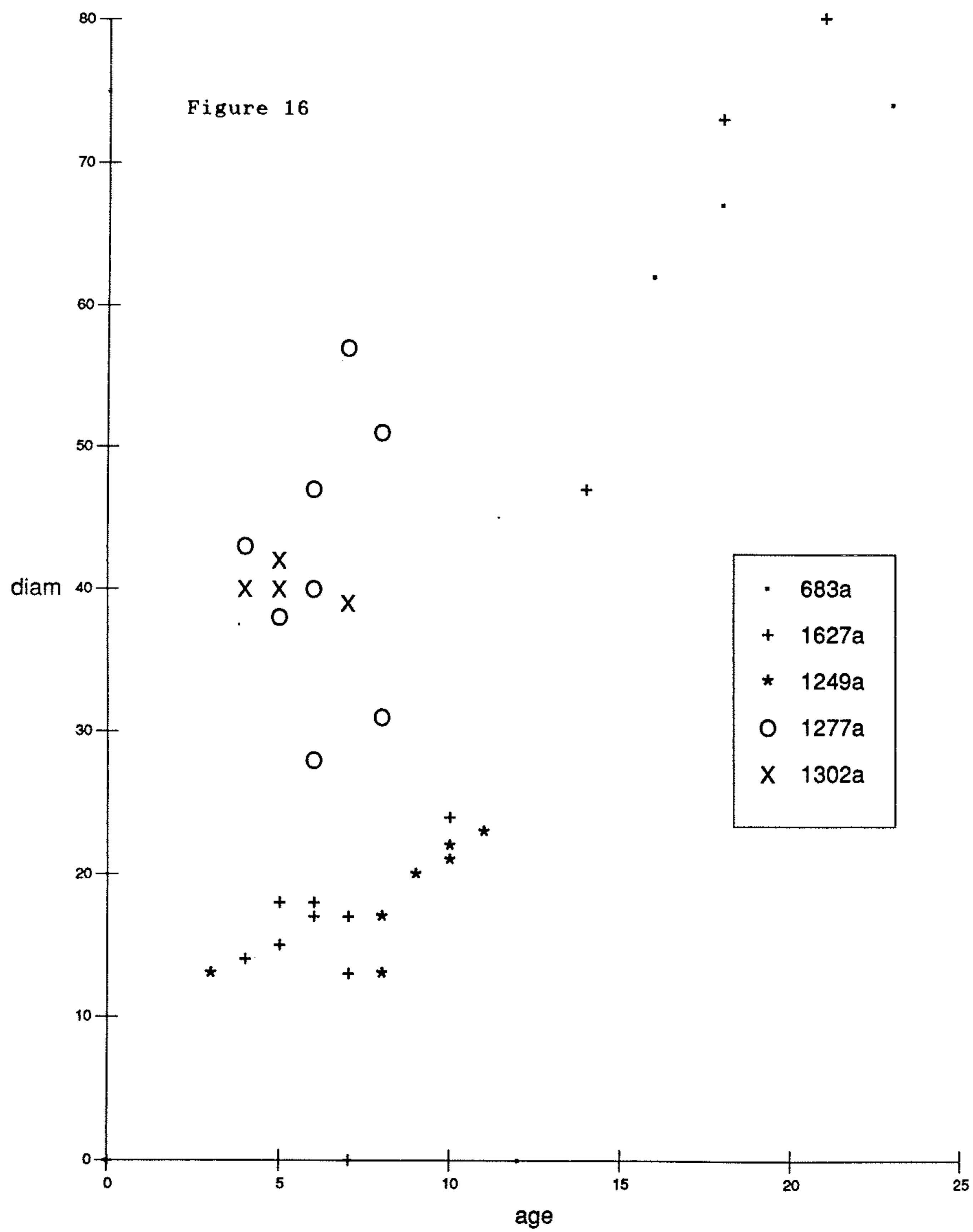


Figure 15

Corylus - phase 8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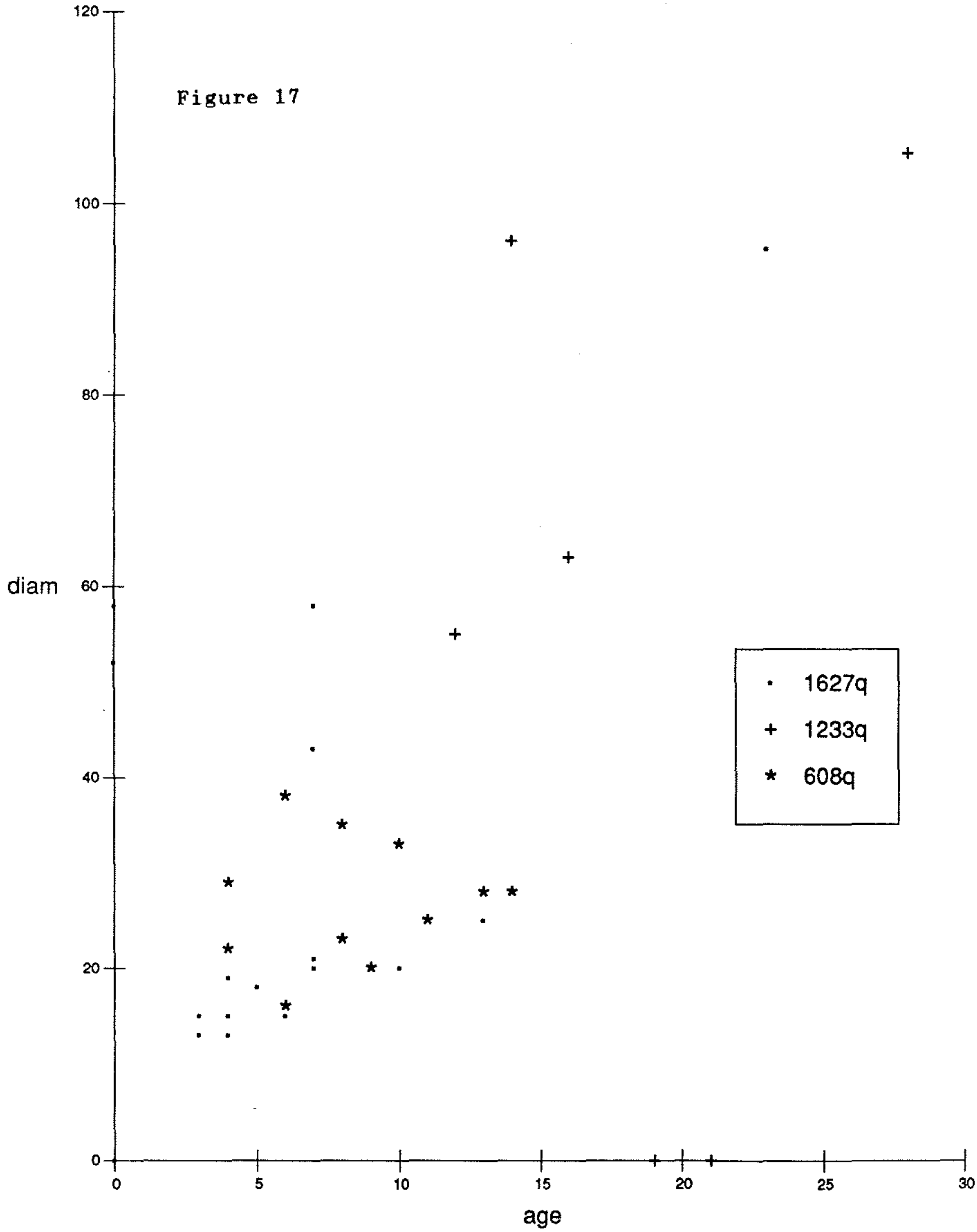
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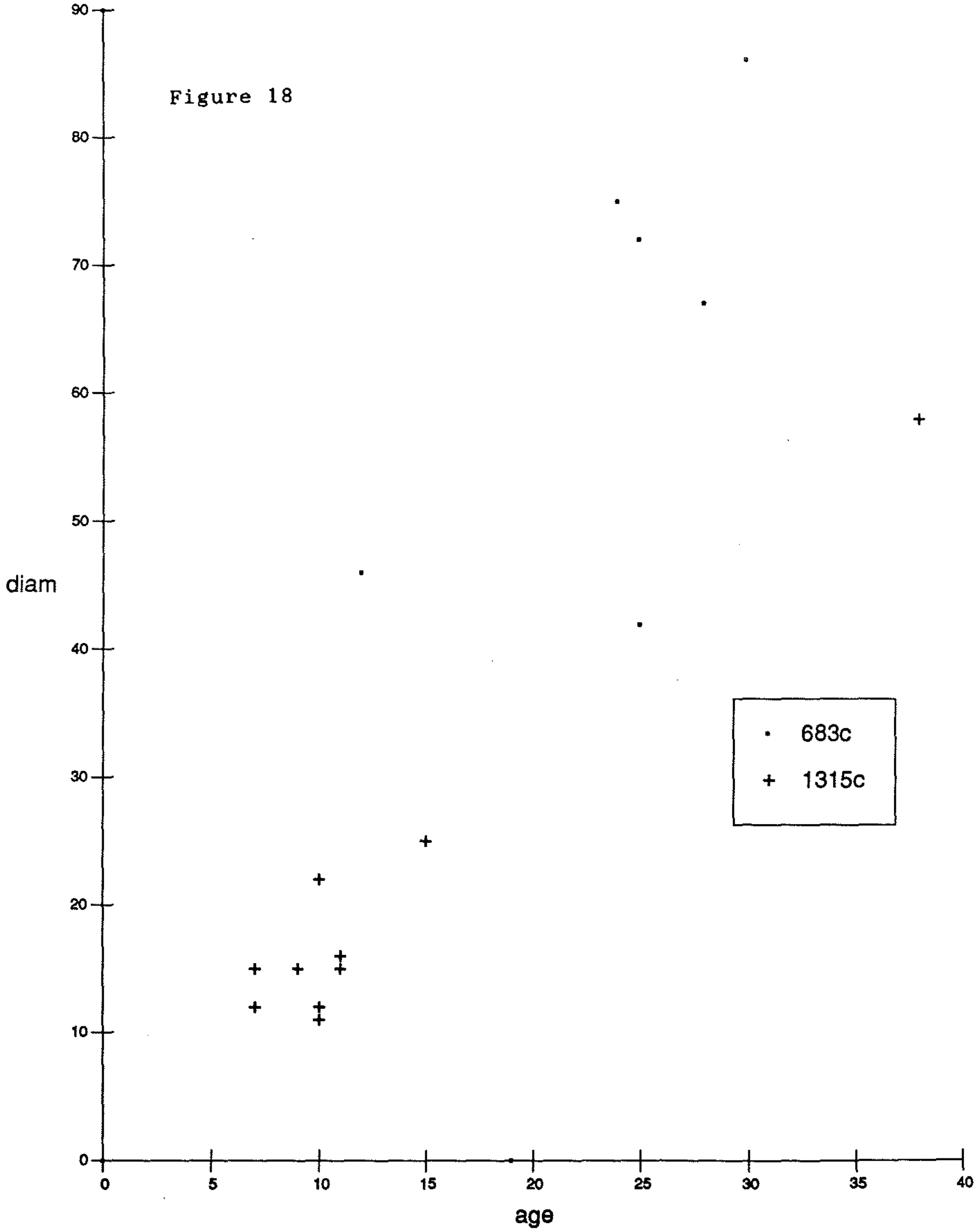
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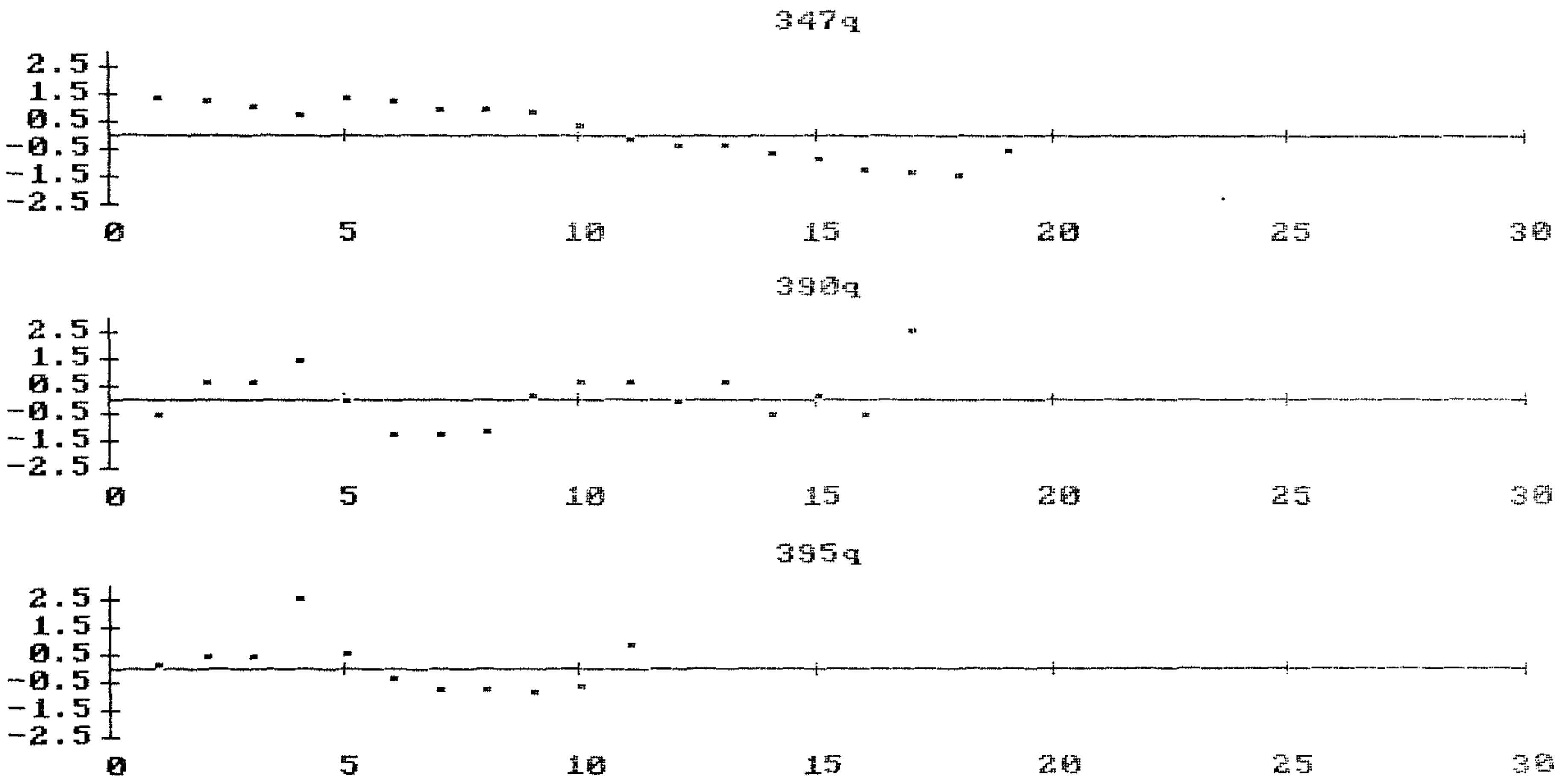

Figure 19

x = ring number, 0 = bark edge

y = standard deviates of ring width from mean

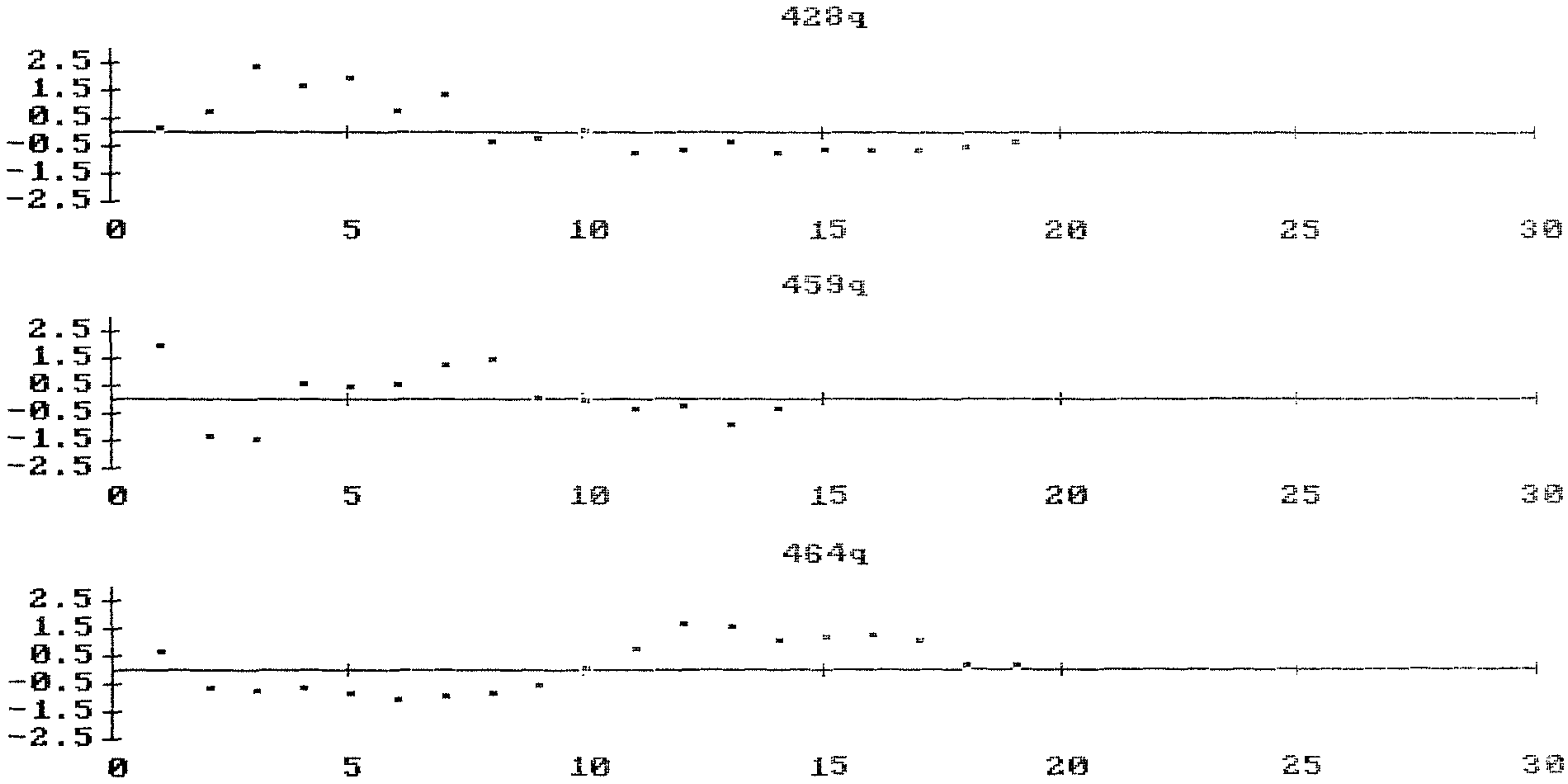

Figure 20

x = ring number, 0 = bark edge

y = standard deviates of ring width from mean

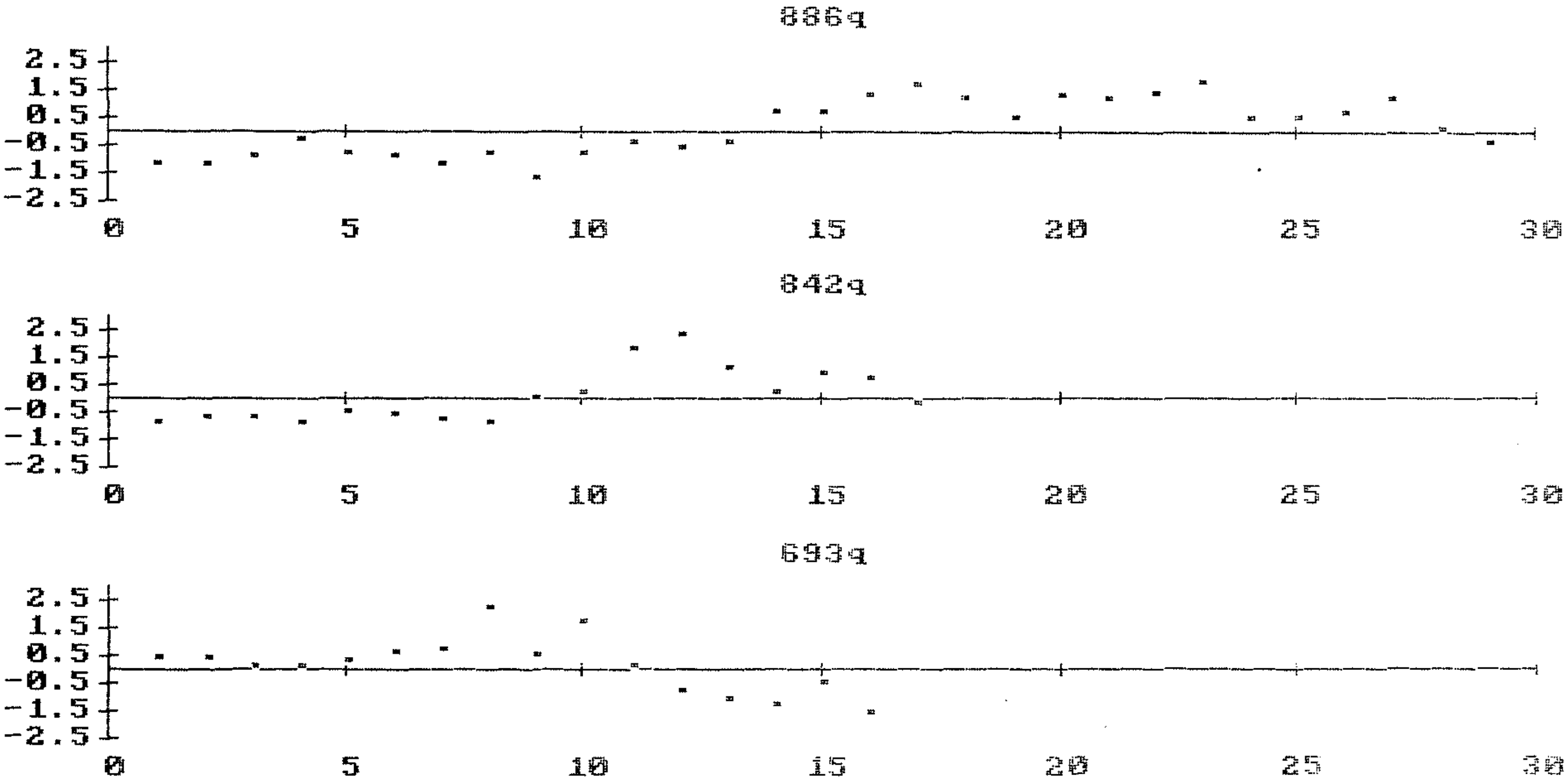

Figure 21

x = ring number, 0 = bark edge

y = standard deviates of ring width from mean

Appendix 1
Castle Street, Carlisle
Woodland Management

Sample	Context	Phase	Part of	Species	Age yrs	Diam mm	Type
0	0.00		0		0	0	
147	740.00		0	Alnus	0	0	stake
347	1038.00	-	0	Quercus	21	90	stake
896	1688.00	1	0	Quercus	0	0	misc.
8	158.20	13	0	Pinus	0	0	misc.
9	158.20	13	0	Quercus	6	32	misc.
4	24.50	14-16	0	Quercus	12	0	charcoal
842	1756.00	2-3	1601	Quercus	18	52	stake
886	1720.00	3	1632	Quercus	29	61	stake
884	1718.00	3	1632	Alnus	0	0	stake
882	1734.00	3	1632	Betula	12	74	stake
881	1733.00	3	1632	Betula	0	0	stake
877	1729.00	3	1632	Betula	16	77	stake
871	1738.00	3	1633	Alnus	31	64	stake
868	1717.00	3	1633	Corylus	44	82	stake
866	1714.00	3	1633	Alnus	0	0	stake
864	1712.00	3	1633	Corylus	24	33	stake
863	1711.00	3	1633	Alnus	27	84	stake
862	1710.00	3	1633	Alnus	0	0	stake
858	1595.00	3	0	Alnus	3	12	misc.
858	1595.00	3	0	Corylus	5	12	misc.
858	1595.00	3	0	Alnus	5	13	misc.
858	1595.00	3	0	Alnus	3	24	misc.
858	1595.00	3	0	Alnus	6	27	misc.
858	1595.00	3	0	Alnus	3	15	misc.
858	1595.00	3	0	Alnus	3	20	misc.
858	1595.00	3	0	Alnus	3	21	misc.
858	1595.00	3	0	Alnus	2	21	misc.
858	1595.00	3	0	Alnus	3	23	misc.
894	1728.00	3	1632	Alnus	10	63	stake
826	1683.00	3	1627	Quercus	0	52	stake
812	1498.30	3	1627	Alnus	4	14	wattle
812	1498.30	3	1627	Alnus	5	18	wattle
833	1658.00	3	1627	Quercus	13	25	stake
812	1498.30	3	1627	Alnus	5	18	wattle
890	1724.00	3	1632	Alnus	8	55	stake
811	1673.00	3	1627	Quercus	7	43	stake
821	1664.00	3	1627	cf. Alnus	0	0	stake
810	1672.00	3	1627	Quercus	0	0	stake
818	1498.40	3	1627	Quercus	9	20	wattle
809	1671.00	3	1627	Quercus	0	0	stake
814	1692.00	3	1627	Quercus	7	58	stake
808	1670.00	3	1627	Quercus	0	58	stake
812	1498.30	3	1627	Alnus	6	17	wattle
796	1650.00	3	1627	Quercus	0	0	stake
899	1696.00	3	0	Quercus	0	0	stake
794	1647.00	3	1627	Alnus	14	47	stake
895	1735.00	3	1632	Alnus	0	0	stake

Appendix 1
Castle Street, Carlisle
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Sample	Context	Phase	Part of	Species	Age yrs	Diam mm	Type
790	1643.00	3	1627	Quercus	23	95	stake
823	1666.00	3	1627	Alnus	0	0	stake
789	1642.00	3	1627	Alnus	7	0	stake
818	1498.40	3	1627	Quercus	10	20	wattle
788	1641.00	3	1627	Alnus	10	24	stake
812	1498.30	3	1627	Alnus	6	18	wattle
829	1687.00	3	1627	Quercus	0	0	stake
818	1498.40	3	1627	Alnus	7	17	wattle
813	1691.00	3	1627	Quercus	0	0	stake
812	1498.30	3	1627	Alnus	7	13	wattle
787	1640.00	3	1627	Alnus	21	80	stake
786	1552.00	3	1627	Quercus	5	18	wattle
786	1552.00	3	1627	Quercus	4	13	wattle
786	1552.00	3	1627	Quercus	3	13	wattle
897	1689.00	3	0	Corylus	0	0	stake
838	1709.00	3	1627	Alnus	18	73	stake
812	1498.30	3	1627	Alnus	5	15	wattle
786	1552.00	3	1627	Quercus	6	15	wattle
786	1552.00	3	1627	Quercus	7	21	wattle
709	1509.00	3	1510	Quercus	11	60	stake
720	1581.00	3	0	Alnus	0	51	stake
728	1554.10	3	1554	Quercus	6	28	stake
728	1554.10	3	1554	Quercus	6	28	stake
786	1552.00	3	1627	Quercus	4	19	wattle
786	1552.00	3	1627	Quercus	4	15	wattle
786	1552.00	3	1627	Quercus	7	20	wattle
786	1552.00	3	1627	Quercus	3	15	wattle
745	1554.20	3	1554	Quercus	8	0	stake
729	1554.20	3	1554	Quercus	9	25	stake
786	1552.00	3	1627	Quercus	4	15	wattle
780	1678.00	3	1627	Quercus	0	0	stake
753	1496.40	3	1496	Quercus	6	38	stake
345	999.00	4	999	Quercus	7	29	wattle
345	999.00	4	999	Quercus	8	28	wattle
345	999.00	4	999	Quercus	4	13	wattle
345	999.00	4	999	Quercus	8	23	wattle
345	999.00	4	999	Quercus	9	23	wattle
345	999.00	4	999	Quercus	5	12	wattle
345	999.00	4	999	Quercus	6	20	wattle
345	999.00	4	999	Quercus	7	18	wattle
345	999.00	4	999	Quercus	8	27	wattle
483	1315.00	4	1315	Corylus	10	12	wattle
610	1441.00	4	1361	Corylus	10	24	stake
613	1361.00	4	1361	Betula	8	31	stake
486	1334.00	4	1314	Alnus	10	46	stake
488	1335.00	4	1314	Alnus	7	30	stake
986	1144.00	4	0	cfAlnus charc	0	0	misc.

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Castle Street, Carlisle
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Sample	Context	Phase	Part of	Species	Age yrs	Diam mm	Type
986	1144.00	4	0	Quercus	0	0	misc.
986	1144.00	4	0	Alnus	0	0	misc.
693	1482.00	4	0	Quercus	18	21	wattle
693	1482.00	4	0	Quercus	19	30	wattle
693	1482.00	4	0	Corylus	10	18	wattle
374	1101.00	4	0	Quercus	10	24	wattle
374	1101.00	4	0	Quercus	9	27	wattle
491	1339.00	4	1314	Alnus	8	42	stake
374	1101.00	4	0	Quercus	10	27	wattle
494	1314.00	4	1314	Alnus	6	18	wattle
374	1101.00	4	0	Quercus	7	28	wattle
494	1314.00	4	1314	Alnus	8	14	wattle
374	1101.00	4	0	Quercus	8	23	wattle
494	1314.00	4	1314	Alnus	6	17	wattle
374	1101.00	4	0	Quercus	7	19	wattle
494	1314.00	4	1314	Alnus	6	13	wattle
374	1101.00	4	0	Quercus	9	31	wattle
494	1314.00	4	1314	Alnus	5	16	wattle
374	1101.00	4	0	Quercus	11	29	wattle
494	1314.00	4	1314	Alnus	4	11	wattle
374	1101.00	4	0	Quercus	7	27	wattle
494	1314.00	4	1314	Alnus	8	21	wattle
386	1102.00	4	0	Quercus	11	65	stake
494	1314.00	4	1314	Alnus	7	17	wattle
394	1219.00	4	1105	Alnus	12	58	stake
526	1461.00	4	1317	Quercus	6	27	stake
399	1225.00	4	0	Quercus	19	33	stake
527	1317.00	4	1317	Quercus	7	12	wattle
404	1096.00	4	0	Corylus	6	19	wattle
527	1317.00	4	1317	Quercus	6	11	wattle
404	1096.00	4	1096	Alnus	9	27	wattle
527	1317.00	4	1317	Alnus	3	12	wattle
428	1110.00	4	0	Quercus	18	62	stake
532	1325.00	4	1131	Alnus	6	72	stake
430	1111.00	4	0	Quercus	17	72	stake
549	1191.00	4	1090	Alnus	12	104	stake
435	1269.00	4	0	Alnus	30	72	stake
550	1192.00	4	1090	Quercus	0	0	peg
456	1233.20	4	1233	Quercus	14	96	log
551	1193.00	4	0	Alnus	0	0	
459	1233.60	4	1233	Quercus	12	55	log
555	1097.00	4	0	Corylus	0	0	
462	1233.90	4	1233	Quercus	19	0	log
558	1343.00	4	1300	Alnus	7	62	stake
469	1296.00	4	0	Alnus	6	41	stake
562	1444.00	4	1315	Alnus	7	60	stake
475	1131.00	4	1090	Corylus	5	22	wattle
563	1300.00	4	1300	Alnus	7	18	stake

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Sample	Context	Phase	Part of	Species	Age yrs	Diam mm	Type
475	1131.00	4	1090	Corylus	5	25	wattle
565	1378.00	4	1302	Alnus	5	42	stake
475	1131.00	4	1090	Corylus	5	28	wattle
567	1381.00	4	0	Alnus	0	0	
475	1131.00	4	1090	Corylus	3	16	wattle
570	1384.00	4	1302	Alnus	4	40	stake
475	1131.00	4	1090	Corylus	5	25	wattle
571	1385.00	4	1302	Alnus	5	40	stake
476	1353.00	4	1315	Alnus	10	30	stake
573	1373.00	4	1302	Alnus	7	39	stake
480	1388.00	4	1315	Corylus	38	58	stake
577	1302.00	4	0	Alnus	0	0	
481	1390.00	4	1315	Alnus	5	34	stake
580	1437.00	4	1318	Alnus	8	58	stake
483	1315.00	4	1315	Corylus	9	15	wattle
584	1431.00	4	1319	Alnus	4	23	stake
483	1315.00	4	1315	Corylus	15	25	wattle
586	1433.00	4	1319	Alnus	7	52	stake
483	1315.00	4	1315	Corylus	11	15	wattle
588	1345.00	4	1240	?Alnus	8	37	stake
483	1315.00	4	1315	Corylus	10	11	wattle
689	1339.00	4	0	Quercus	18	69	stake
590	1347.00	4	1240	Alnus	7	40	stake
485	1333.00	4	1314	Quercus	9	37	stake
591	1349.00	4	1240	Alnus	5	31	stake
374	1101.00	4	0	Quercus	8	24	wattle
592	1350.00	4	1240	Alnus	0	66	stake
374	1101.00	4	0	Quercus	7	25	wattle
595	1374.00	4	1240	Quercus	10	42	stake
374	1101.00	4	0	Quercus	10	22	wattle
598	1364.00	4	1240	Alnus	6	40	stake
374	1101.00	4	0	Quercus	9	24	wattle
605	1316.00	4	1316	Alnus	8	14	wattle
388	1212.00	4	0	Quercus	0	84	burnt
605	1316.00	4	1316	Corylus	7	14	wattle
402	906.00	4	0	Quercus	7	42	stake
608	1425.00	4	1360	Alnus	0	0	stake
404	1096.00	4	1096	Alnus	4	25	wattle
429	1109.00	4	0	Alnus	0	0	stake
432	1175.00	4	0	Alnus	0	0	stake
455	1233.20	4	1233	Betula	17	73	log
458	1233.50	4	1233	Quercus	28	105	log
461	1233.80	4	1233	Quercus	21	0	log
464	1233.11	4	1233	Quercus	16	63	log
614	1427.00	4	1370	Quercus	17	38	stake
475	1131.00	4	1090	Corylus	6	25	wattle
616	1393.00	4	1277	Alnusus	5	38	stake
475	1131.00	4	1090	Corylus	4	19	wattle

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Sample	Context	Phase	Part of	Species	Age yrs	Diam mm	Type
618	1395.00	4	1277	Alnus	4	43	stake
475	1131.00	4	1090	Corylus	6	21	wattle
634	1400.10	4	1277	Alnus	6	47	stake
481	1390.00	4	1315	Alnus	5	37	stake
639	1405.00	4	1277	Alnus	8	31	stake
483	1315.00	4	1315	Corylus	10	22	wattle
641	1407.00	4	1277	Alnus	8	51	stake
483	1315.00	4	1315	Corylus	7	12	wattle
642	1408.00	4	1277	Alnus	6	28	stake
693	1482.00	4	0	Corylus	8	38	wattle
643	1409.00	4	1277	Alnus	6	40	stake
374	1101.00	4	0	Quercus	7	23	wattle
644	1410.00	4	1277	Quercus	7	29	stake
374	1101.00	4	0	Alnus	7	25	wattle
651	1417.00	4	1277	Alnus	7	57	stake
404	1096.00	4	1096	Corylus	4	12	wattle
652	1418.00	4	0	Alnus	0	0	
688	1249.00	4	1249	Quercus	14	21	wattle
654	1420.00	4	0	Alnus	6	52	stake
475	1131.00	4	1090	Corylus	6	20	wattle
673	1477.00	4	1475	Alnus	12	40	stake
478	1355.00	4	1315	Alnus	16	53	stake
688	1249.00	4	1249	Alnus	10	22	wattle
483	1315.00	4	1315	Corylus	7	15	wattle
688	1249.00	4	1249	Alnus	8	13	wattle
374	1101.00	4	0	Quercus	6	28	wattle
688	1249.00	4	1249	Alnus	11	23	wattle
395	1220.00	4	1213	Quercus	12	35	stake
688	1249.00	4	1249	Alnus	8	13	wattle
471	1327.00	4	0	Alnus	5	73	stake
688	1249.00	4	1249	Alnus	10	21	wattle
483	1315.00	4	1315	Corylus	11	16	wattle
374	1101.00	4	0	Quercus	6	25	wattle
688	1249.00	4	1249	Corylus	7	12	wattle
475	1131.00	4	1090	Corylus	6	21	wattle
484	1332.00	4	1314	Alnus	8	41	stake
688	1249.00	4	1249	Alnus	3	13	wattle
688	1249.00	4	1249	Alnus	8	17	wattle
688	1249.00	4	1249	Alnus	9	20	wattle
688	1249.00	4	1249	Quercus	15	20	wattle
688	1249.00	4	1249	Quercus	6	18	wattle
373	1137.00	4-5	0	Quercus	15	18	wattle
373	1137.00	4-5	0	Quercus	4	15	wattle
373	1137.00	4-5	0	Corylus	5	27	wattle
373	1137.00	4-5	0	Quercus	3	25	wattle
373	1137.00	4-5	0	Quercus	4	20	wattle
373	1137.00	4-5	0	Quercus	3	22	wattle
373	1137.00	4-5	0	Quercus	3	20	wattle

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Sample	Context	Phase	Part of	Species	Age yrs	Diam mm	Type
373	1137.00	4-5	0	Corylus	9	30	wattle
373	1137.00	4-5	0	Quercus	5	14	wattle
373	1137.00	4-5	0	Quercus	5	20	wattle
373	1137.00	4-5	0	Corylus	9	30	wattle
368	1077.00	5	0	Alnus	14	72	stake
366	1072.00	5-6	0	Corylus	5	14	stake
366	1072.00	5-6	0	Corylus	7	15	stake
374	961.00	5-6	981	Alnus	16	64	stake
374	961.00	5-6	981	Alnus	8	84	stake
374	961.00	5-6	981	Alnus	10	38	stake
374	961.00	5-6	981	Quercus	7	65	stake
350	1072.00	5-6	0	Corylus	7	30	stake
374	961.00	5-6	981	Quercus	7	50	stake
350	1072.00	5-6	0	Corylus	10	28	stake
374	961.00	5-6	981	Corylus	16	43	stake
350	1072.00	5-6	0	Quercus	17	0	stake
366	1072.00	5-6	0	Corylus	7	13	stake
350	1072.00	5-6	0	Quercus	11	120	stake
366	1072.00	5-6	0	Corylus	6	14	stake
366	1072.00	5-6	0	Corylus	7	14	stake
366	1072.00	5-6	0	Corylus	7	12	stake
366	1072.00	5-6	0	Corylus	5	11	stake
374	961.00	5-6	981	Quercus	8	43	stake
366	1072.00	5-6	0	Corylus	8	13	stake
366	1072.00	5-6	0	Corylus	8	15	stake
366	1072.00	5-6	0	Corylus	4	14	stake
366	1072.00	5-6	0	Corylus	7	18	stake
374	961.00	5-6	981	Quercus	7	46	stake
245	921.00	6	0	Quercus	0	0	peg
239	788.00	6	806	Quercus	0	0	wattle
235	887.00	6	0	Quercus	0	35	stake
334	1052.00	6	981	Alnus	30	72	stake
197	682.00	6-8	0	Quercus	0	0	stake
195	617.00	6-8	0	Betula	0	0	stake
130	622.00	7-8	0	Quercus	3	28	stake
144	734.00	7-8	0	Quercus	10	33	stake
145	735.00	7-8	0	Quercus	10	39	stake
142	732.00	7-8	0	Quercus	0	0	stake
131	623.00	7-8	0	Quercus	6	39	stake
129	621.00	7_8	0	Quercus	3	18	stake
174	708.00	8	683	Alnus	23	74	stake
160	694.00	8	683	Alnus	16	62	stake
170	704.00	8	683	Corylus	28	67	stake
159	693.00	8	683	Betula	12	0	stake
168	702.00	8	683	Betula	0	94	stake
180	716.00	8	683	Alnus	0	75	stake
189	725.00	8	683	Quercus	0	47	stake
157	691.00	8	683	Alnus	18	67	stake

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Sample	Context	Phase	Part of	Species	Age yrs	Diam mm	Type
173	707.00	8	683	Corylus	0	90	stake
169	703.00	8	683	Betula	23	0	stake
69	512.00	8	0	Alnus	18	60	stake
175	709.00	8	683	Alnus	12	0	stake
161	695.00	8	683	Corylus	12	46	stake
156	690.00	8	683	Corylus	0	0	stake
155	689.00	8	683	Corylus	0	0	stake
154	688.00	8	683	Betula	26	0	stake
152	686.00	8	683	Corylus	25	42	stake
149	684.00	8	683	Betula	0	0	stake
198	741.00	8	0	Quercus	0	0	stake
287	983.00	8	0	Quercus	0	0	misc.
158	692.00	8	683	Corylus	24	75	stake
139	680.00	8	608	Quercus	13	28	stake
138	669.00	8	608	Quercus	6	16	stake
136	642.00	8	608	Quercus	4	22	stake
135	627.00	8	608	Quercus	8	35	stake
134	626.00	8	608	Quercus	9	20	stake
133	625.00	8	608	Quercus	4	29	stake
132	624.00	8	608	Quercus	14	28	stake
172	706.00	8	683	Corylus	25	72	stake
171	705.00	8	683	?Betula	21	60	stake
163	697.00	8	683	Alnus	0	0	stake
100	561.20	8	0	Quercus	22	0	misc.
128	605.00	8	608	Corylus	9	26	stake
88	545.00	8	0	Quercus	5	15	wattle
125	602.00	8	608	Quercus	6	38	stake
123	600.00	8	608	Quercus	8	23	stake
122	599.00	8	608	Alnus	10	33	stake
126	603.00	8	608	Quercus	10	33	stake
124	601.00	8	608	Quercus	11	25	stake
88	545.00	8	0	Quercus	5	15	wattle
88	545.00	8	0	Quercus	5	15	wattle
88	545.00	8	0	Corylus	4	15	wattle
88	545.00	8	0	Corylus	4	17	wattle
88	545.00	8	0	Corylus	5	16	wattle
164	698.00	8	683	Corylus	19	0	stake
167	701.00	8	683	Alnus	0	0	stake
166	700.00	8	683	Corylus	30	86	stake