(2506) report 4864

CHESTER LE STREET, Excavations 1982-83

A report on a sample of cattle horn cores from excavations in Chester-le-Street.

Introduction

Excavations in Chester-le-Street, 1982-83, produced small quantities of animal bone. A number of trenches were excavated and recorded deposits from a variety of periods from Roman onwards, but most were heavily disturbed by post-mediaeval activity. The quantity of well stratified material from these excavations was small and it is considered that its analysis, barring one feature, is not justified.

The feature whose contents have been analysed was an irregularly shaped pit (see archaeological report, Fig. 3) of late 17th-early 18th century in Trench C. Over 1300 horn cores of cattle were recovered from this single feature and it was felt that the recording and analysis of a sample of this material was important in the context of late and post-mediaeval cattle breed/types, particularly since similar collections from this period have been recovered and reported from Milburngate, Durham and Blackgate, Newcastle (Rackham, 1982; nd).

Interpretation of the feature

Collections of horn cores are not uncommon in urban archaeological excavations and many have now been recorded from the mediaeval and post-mediaeval periods (Gooder, Woodfield & Chaplin, 1966; Ryder, 1970; Armitage, 1980; Rackham, 1982; Hodgson, n.d.; Prummel, 1978; 1982). This feature contained little else besides the horn cores and one must follow other workers in interpreting it as a waste pit for a horners workshop. Similar concentrations of cattle horn cores from the same period have been found in Durham City and Newcastle (Rackham, 1982; nd.) although not in such a well defined feature. The mediaeval cores studied by Ryder (1970) were recovered from pits that Wenham (1964) interpreted as horn steeping pits.

There is no documentary evidence relating to such activities in Chester-le-Street, but it is probable that most large or market towns had someone carrying on this trade and being supplied with horns as a by-product of a more meat orientated slaughter industry.

Hornworking was until quite recently a major craft industry, but the breeding of polled cattle and the development of substitute materials has been responsible for its decline. Present day horners in England are obliged to import most of their raw material.

Materials and methods

A sample of 966 of the 1310 horn cores was catalogued and measured and a preliminary biometrical study carried out in an endeavour to answer the following questions

1. What age groups are represented in the sample.
2. What sexes are present and in what proportions.
3. Is there more than one type/breed of cattle present.

The study of animal bones has not advanced to the stage that these questions can be simply answered and it is precisely large groups such as this that permit the establishment of criteria for making such decisions or testing procedures or methods already established or generally utilised.

In contrast to many bones of cattle, horn cores have recently received a good deal of attention particularly as a result of recent finds on urban sites in London and elsewhere (Armitage, 1980; 1982; Armitage & Clutton-Brock, 1976; Prummel, 1978) . From some of these finds Armitage and Clutton-Brock (1976) and Armitage (1982) have established both a recording procedure for noting both metrical and morphological characters of cores and criteria for establishing the age at death and the sex of the animal from which the core derives. Armitage's concentration upon late mediaeval and post mediaeval samples makes his recording system (Armitage, 1982) particularly suitable for the collection from Chester-le-Street and a basis for comparison of these northern samples with those from southern England.

The recording procedure adopted for the Chester-le-Street cores therefore follows Armitage and Clutton-Brock (1976) and Armitage (1982), and the following characters were noted

1. Porosity (age character) after Armitage & Clutton-Brock.
2. Length (short, small, medium or long) " "
3. Curvature " "
4. Torsion " "
5. Rounded or pointed tip " "
6. Basal cross-sectional shape " "
7. Sex after Armitage (1982)
8. Age class "
9. Angle of attachment of core- some specimens only.
10. Anterior/posterior basal diameter (45) Von den Driesch
11. Dorso-ventral basal diameter (46) "
12. Length of outer curvature (47) "
13. Minimum length of inner curvature
14. Linear distance, dorsal base to horn tip
15. basal circumference (44) "

It is apparent that some of these categories are likely to

be somewhat subjective, scale and variation between descriptors, ie. round and oval cross-section, rely on an arbitary division in a continuous variable. Sex determination is also problematic. Of the non-metrical descriptors 'age class' (8) is probably one of the most reliable, largely due to the relative ease of recognition of the different degrees of porosity, the fairly extended range of variation and a suitable key (Armitage, 1982, Fig. 1). It is also developmentally likely to be a crude but sound estimate of age.

The measurement data by comparison with the non-metrical descriptors is less affected by such problems.

Analysis

The analysis of the data was conducted on NUMAC (Northumbrian Universities Multiple Access Computer) using SPSSx (Statistical Packages for the Social Sciences) and MIDAS (Michigan Interactive Data Analysis System). One of the problems with this type of analysis is the expectation that all sex groups of all age classes may be represented. The data therefore represents a poly normal sample with a potential maximum of fifteen normally distributed sub-populations:

Sex / Age Class	1	2	3
1	1/1	1/2	1/3
2	2/1	2/2	2/3
3	3/1	3/2	3/3
4	4/1	4/2	4/3
5	5/1	5/2	5/3

and this number would be extended if more age classes were recorded or more than one type/breed of cattle is present.

Age assessment

The age classes assessed on the basis of the criteria given by Armitage (1982, Fig. 1 & 2, Table 1) are fairly readily determined using this key and although some individuals are borderline between age classes for the majority of cases it has been possible to assign each to one of these classes.

According to these criteria the following categories were recognised:

Age Class	Age estimate	N	%
0 infant	Less than 1	0	0
1 juvenile	1-2 yrs	4	0.5
2 sub-adult	2-3 yrs	47	5.4
3 young adult	3-7 yrs	279	32.3
4 adult	7-10 yrs	481	55.7
5 old adult	Over 10 yrs	53	6.1

Not unexpectedly considering the nature of the deposit no specimens of the infant class were found. The four specimens classified into category 1 were very porous, slightly curved but showing no twist and comparatively short, not exceeding 172 mm in length of outer curvature(MAXL).

The sub-adult class comprises 5.4% of the aged sample (47 cores) exhibiting a predominantly round basal cross-section (see Fig. 1), curved core and approximately one third showing some torsion of the core. The sample includes a wide range of size extending up to nearly 350 mm MAXL.

Age class 3 is represented by 279 cores (32.3% of the sample). All these specimens were curved. This group contained a considerably larger proportion having an essentially oval cross-section although the index of maximum basal diameter(MAXBD)/minimum basal diameter(MINBD) is approximately normally distributed indicating a homogeneous rather than mixed sample (see Fig. 1). This suggests that increasing ovality may relate to age independent of other variables. This is tested below. 53% of the cores in this age class show torsion and the length range is very large (Table 1) with one core attaining a length of 568 mm.

Age category 4 (adult) is the largest class within the sample with 481 cores (55.7%). All specimens are more or less strongly curved with 80.8% showing torsion. There is a further increase in the proportion of ovate basal cross-sections although again the distribution of the index of MAXBD/MINBD is normal (Fig. 1).

Considerably fewer cores have been assigned to age class 5 (53, 6.1% of the sample) or aged adult. All specimens are curved and 83.3% of complete specimens show torsion. There is a further increase in the proportion of specimens with ovate basal cross-sections (see below).

Determination of sex and breed/type

Armitage (1982) has outlined a basis for determining the sex of the animal from which a core derives. The criteria used are largely robustness of core, proportion of length to basal circumference, basal cross-section and direction of curvature of the core with reference to the frontal profile (Armitage, 1982, p43). He asserts that the criteria for distinguishing sex in short and medium horned cattle are different to those used for longhorns, and it is therefore necessary to establish the 'breed type', ie longhorn or other, before attempting to sex individual cores. Furthermore he indicates that since the potential length of the core cannot be assessed in the younger age categories,

that only cores in age categories 3-5 can be sexed. With these requirements in mind the cores in age categories 3,4 and 5 are studied in terms of their length/type.

Two criteria should assist us. 1. Armitage (op cit) indicates the length range for cores in the shorthorn, medium horned and longhorn groups and further notes that since these groups are likely to overlap a second criteria may be necessary. 2. This is the ratio of (MAXL/BCIRC) x 100. The value for this index in all longhorn cows and oxen is greater than 180 whereas in the medium horned cattle it is less and 'usually nearer to 100' (Armitage, 1982, p43). On the criteria of length some 24 cores exceed 360 mm and therefore fall into the longhorn group. However further analysis suggests that this would be an incorrect designation. Fig. 2 plots the scatter of BCIRC against MAXL for age classes 3 and 4. These two measures show a high degree of linear correlation and the data indicates that the increase in the ratio of these two measures is allometric. The figure shows the slope of the 100 index and that for an index of 180. A number of medium horned animals fall below the latter line (ie have a higher index) and a few of the longhorns lie above (ie an index of less than 180) the 180 line. The linearity (Pearson corr.coef. =0.82) of this data rising from a ratio of 1.07 to 2.2 in the largest cores (ie 'longhorn' in Armitage's parlance) does little to suggest that horn length alone is a useful discriminatory factor in this sample. Apart from eight cores which appreciably extend the upward range (Fig. 3) of MAXL any division into short, medium or longhorned would be largely arbitrary. The absence from this figure of all but two cores where the index falls below 100 (ie occurs above this line on the scattergram) strongly suggests that the samples are lacking bulls if Armitage's criteria are to be relied upon.

A cluster analysis utilising variables MAXBD, MAXL, BT and BCIRC isolates within age classes 3 and 4 a group of smaller horned animals (see Fig 4 for age class 3) as well as the small group of longhorns. This division into three groups is observable in most of the scatterplots and the apparent absence of bulls suggests that although similar in general conformation more than one group/type of cattle may be present in the sample, the distinguishing character being largely one of size.

The problematic aspect of this conclusion is that the very large medium sized horn group may include cows and castrates from two different groups which are inseperable on this data.

During cataloguing sex was assigned on the criteria given by Armitage. It was found however that decisions made during the cataloguing were unreliable and although many cores were originally assigned to a bull class subsequent analysis of the data and re-appraisal of the material suggests that few

if any intact males were present, that is on the basis of Armitage's criteria.

While it is possible to suggest that no bulls are present and the collection is composed largely of cows and castrates of possibly more than one (two) group or population, the identification of which of these categories each of the cores falls into has not been possible. This is unfortunate since whether cows or oxen were more common would give some clue as to the relative importance of beef as opposed to dairy for the local farmers.

In the absence of groupings of the cores into sex categories the mean dimensions of the cores are given for each age class in Table 1.

Comparison of these figures with the sample from Milburngate, Durham indicates a mean for MAXBD very close to that of the 17th century sample from Durham, but a mean for MAXL somewhat shorter at the Durham site although with a similar range.. Since the Durham material was not assigned to age classes these samples are not directly comparable and variation may be due to the age composition of the Durham sample.

Further analysis of these groups may permit some refinement and allow a conclusion on the morphometric characters for distinguishing breed/type and sex.

Interpretation

The sample comprises largely young adults and adults and presumably reflects both the slaughter pattern for meat supply and a certain amount of selection by the horner. Since this material is likely to be a by-product of the meat market, the results can in part be used to discuss this slaughter pattern. By far the largest proportion are adults, this suggests that little stock is being culled until its fourth year or later and about 32% is killed off at an age consistent with fattened bullocks and heifers for the meat market. There would however be little point in the horner obtaining core of juvenile beasts in which they were not well deveoloped. However a considerable number of animals, 55%, are killed off rather later and must represent animals that have had some other primary function. This section of the cull must derive from animals that had previously been used as draught stock, breeding or dairy cows and the few individuals slaughtered at an even greater age (6%) are probably also cows no longer suitable for breeding or milk. These results are consistent with the contemporary accounts on stock management and would suggest that oxen and cows were a higher priority at this time than beef cattle.

Acknowledgements

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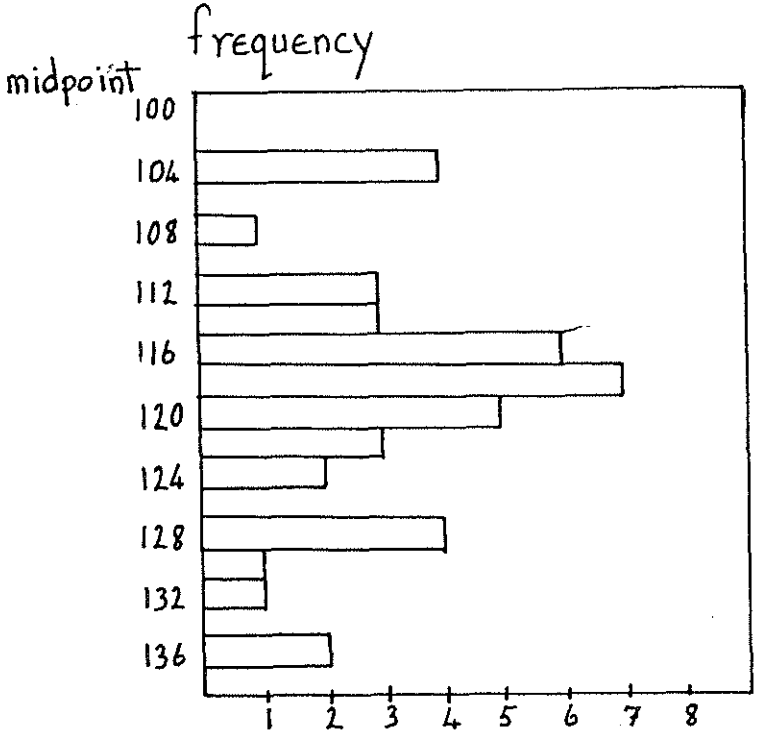
Table 1
Descriptive measures arranged by age class. Measurements in mm.

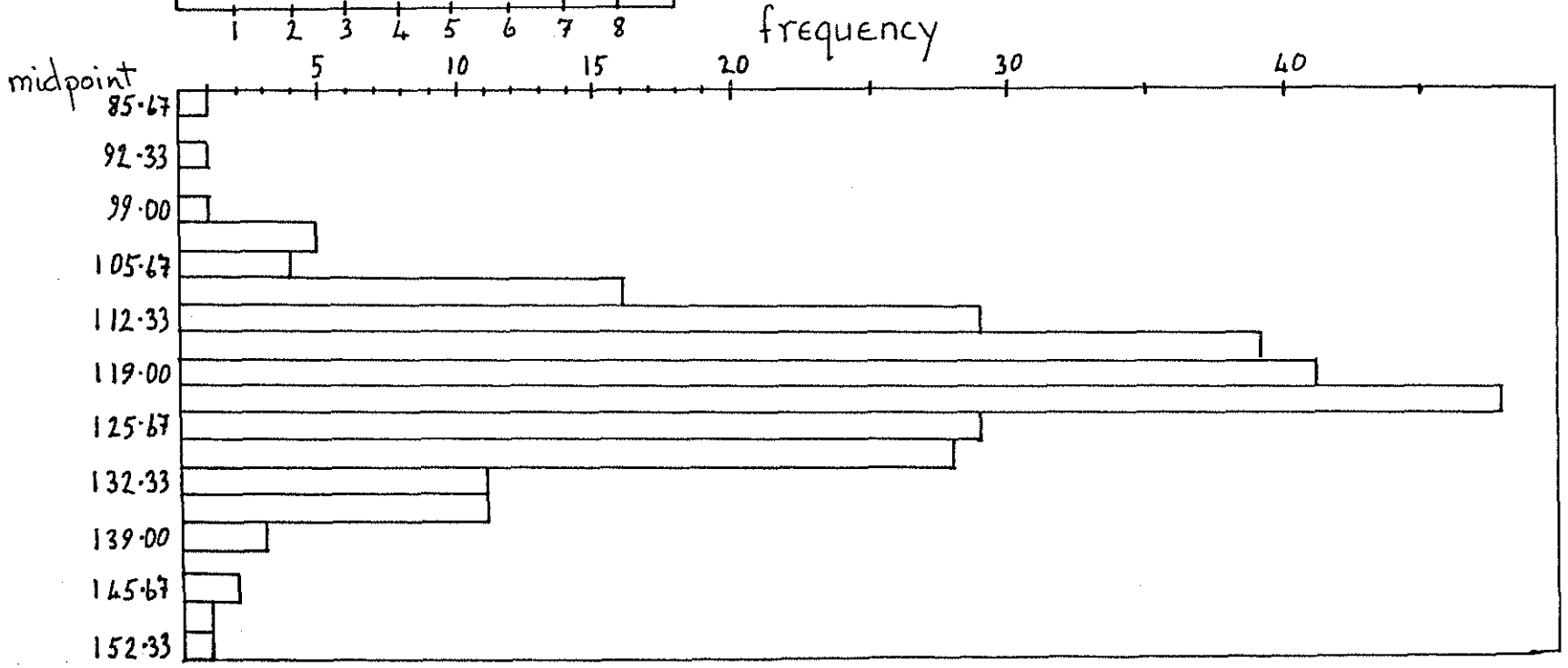
	Age class	2	3	4	5
MAXBD	N	43	272	461	51
	Min.	372	346	354	437
	Max.	778	970	942	798
	Mean	552.8	584.9	592.5	603.3
	STDev	81.9	111.3	101.7	76.0
MINBD	N	43	271	459	52
	Min.	297	288	282	363
	Max.	663	795	913	654
	Mean	493.3	488.5	486.3	486.2
	STDev	82.6	106.8	95.2	58.6
MAXL	N	23	132	245	24
	Min.	1220	1090	1030	1520
	Max.	3470	5680	5280	3630
	Mean	2186.5	2364.5	2653.6	2908.3
	STDev	670.3	889.1	670.6	545.2
MINL	N	23	132	242	23
	Min.	970	830	810	1100
	Max.	2800	4570	4100	3060
	Mean	1774.3	1888.2	2120.1	2397.4
	STDev	561.0	733.3	551.1	515.5
BCIRC	N	43	269	458	51
	Min.	1140	1060	950	1280
	Max.	2310	2780	2840	2370
	Mean	1649.5	1717.9	1711.3	1727.1
	STDev	254.5	339.9	308.1	211.7

Chester Le Street Horncores



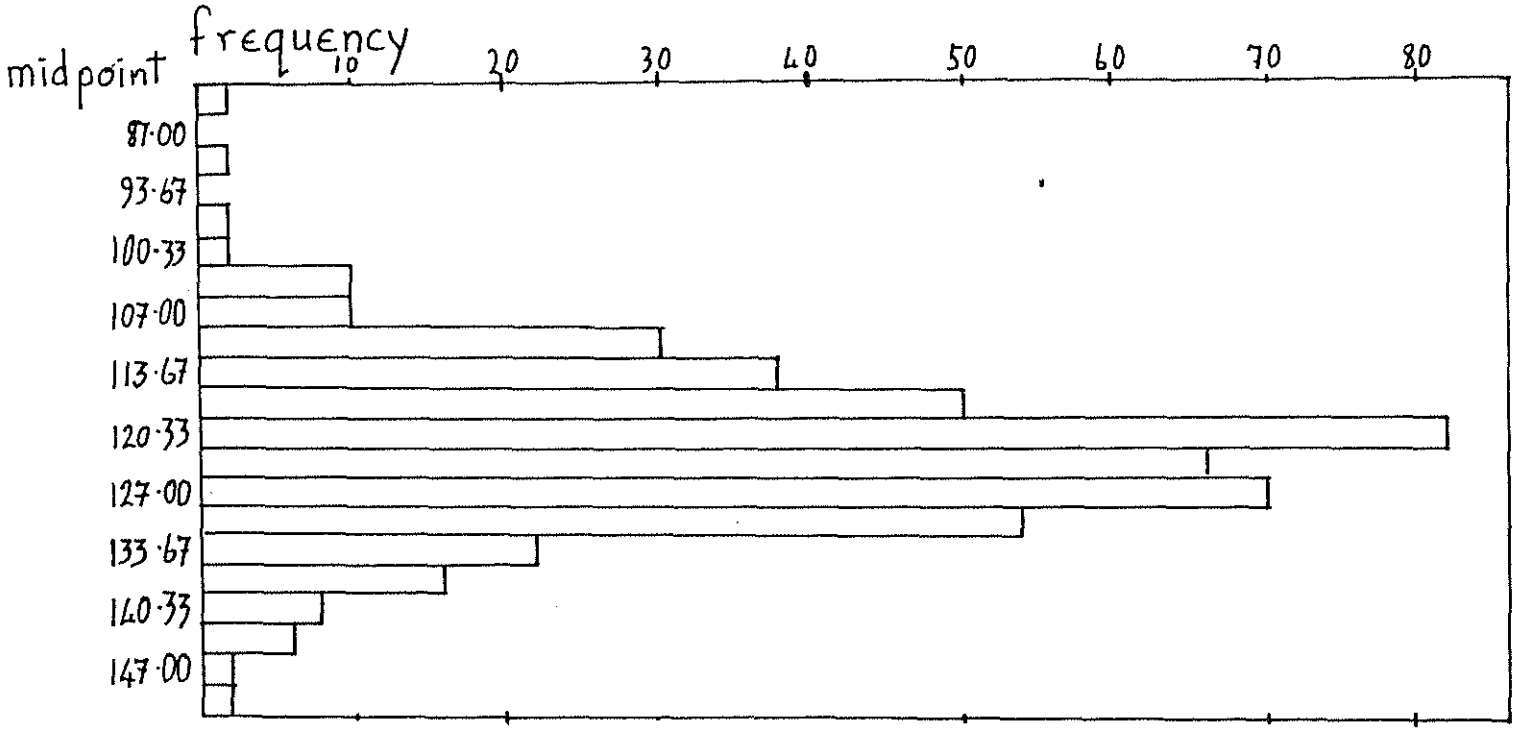
Age Class 2
subadult

Vertical axes $\frac{\text{Anterior/Posterior Diameter (MAXBD)}}{\text{Dorso/Ventral Diameter (MINBD)}} \times 100$

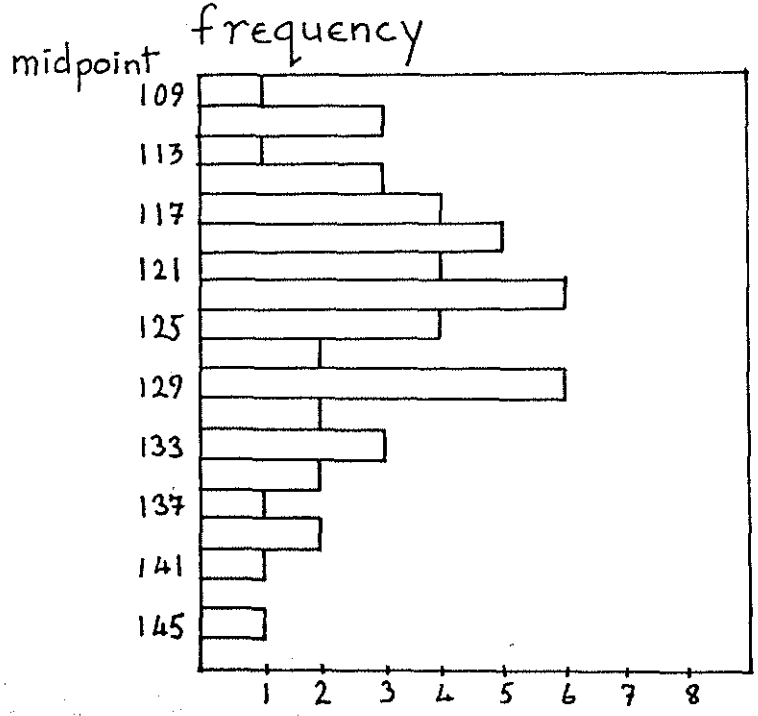


Age Class 3

Fig 1.



Age Class 4



Age Class 5 (Aged Adult)

Vertical axes $\frac{\text{Anterior/Posterior (MAXBD)}}{\text{Dorso/Ventral (MINBD)}} \times 100$

Chester-Le-Street Horncores

Fig. 1A

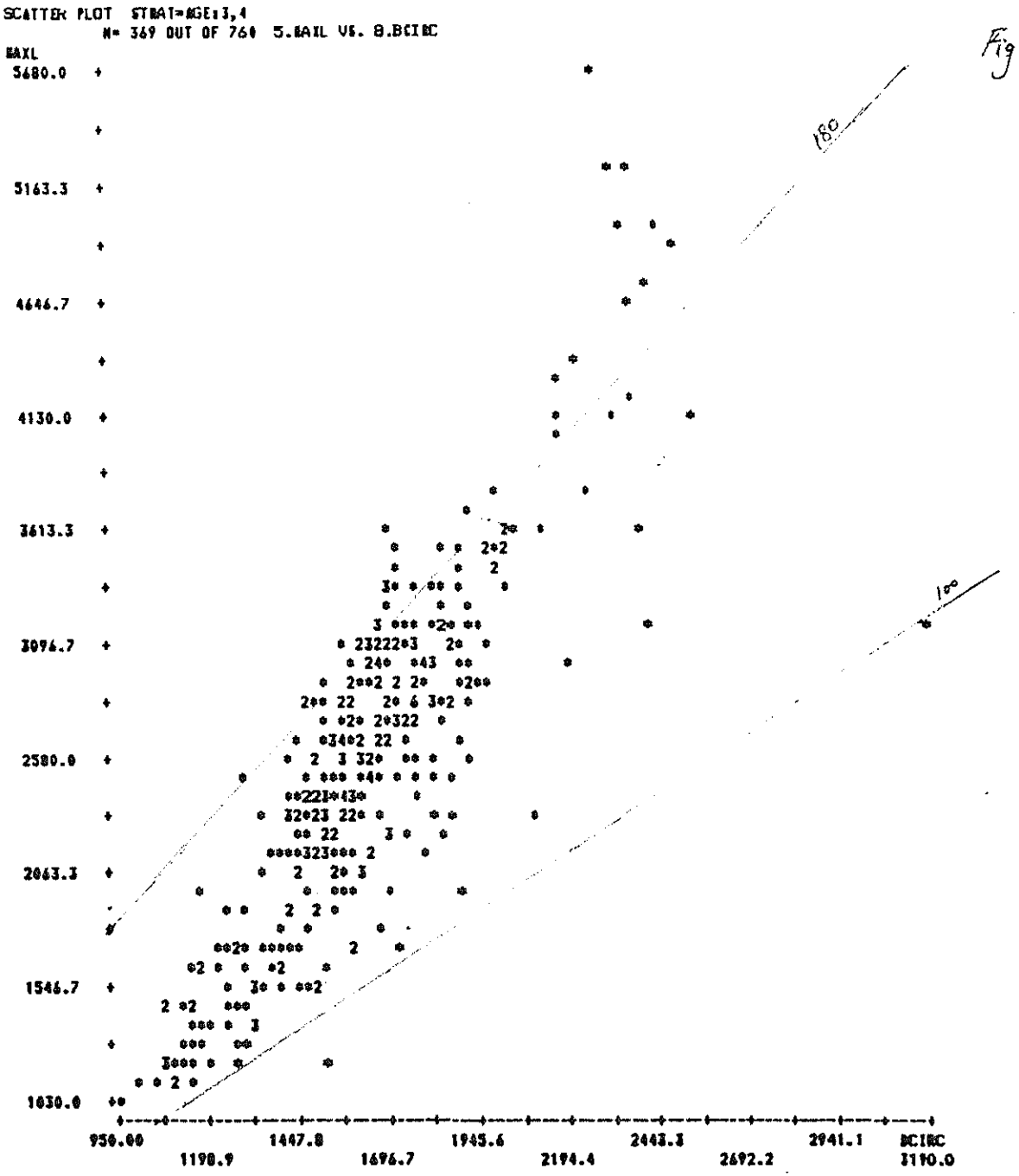

SCATTER PLOT STRAT=AGE:3,4
N= 369 OUT OF 760 5.BAXL VS. 8.BCIBC
BAXL
5680.0
5163.3
4646.7
4130.0
3613.3
3096.7
2580.0
2063.3
1546.7
1030.0
950.00
1198.9
1447.8
1696.7
1945.6
2194.4
2443.3
2692.2
2941.1
3190.0
BCIBC
180
100

Fig 2

Histogram of Maximum length of outer curvature of the calf Low cases.

Fig 3

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HISTOGRAM

MIDPOINT    COUNT FOR S.MAXL  (EACH X= 1)

 1030.0        6 +XXXXXX
 1262.5       25 +XXXXXXXXXXXXXXXXXXXXXXXXX
 1495.0       29 +XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
 1727.5       27 +XXXXXXXXXXXXXXXXXXXXXXXXXXX
 1960.0       25 +XXXXXXXXXXXXXXXXXXXXXXXXX
 2192.5       46 +XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
 2425.0       53 +XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
 2657.5       48 +XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
 2890.0       60 +XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
 3122.5       52 +XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
 3355.0       23 +XXXXXXXXXXXXXXXXXXXXXXX
 3587.5       18 +XXXXXXXXXXXXXXXXXX
 3820.0        2 +XX
 4052.5        4 +XXXX
 4285.0        3 +XXX
 4517.5        0 +
 4750.0        2 +XX
 4982.5        3 +XXX
 5215.0        2 +XX
 5447.5        0 +
 5680.0        1 +X

 MISSING     537
 TOTAL       966  (INTERVAL WIDTH= 232.50)
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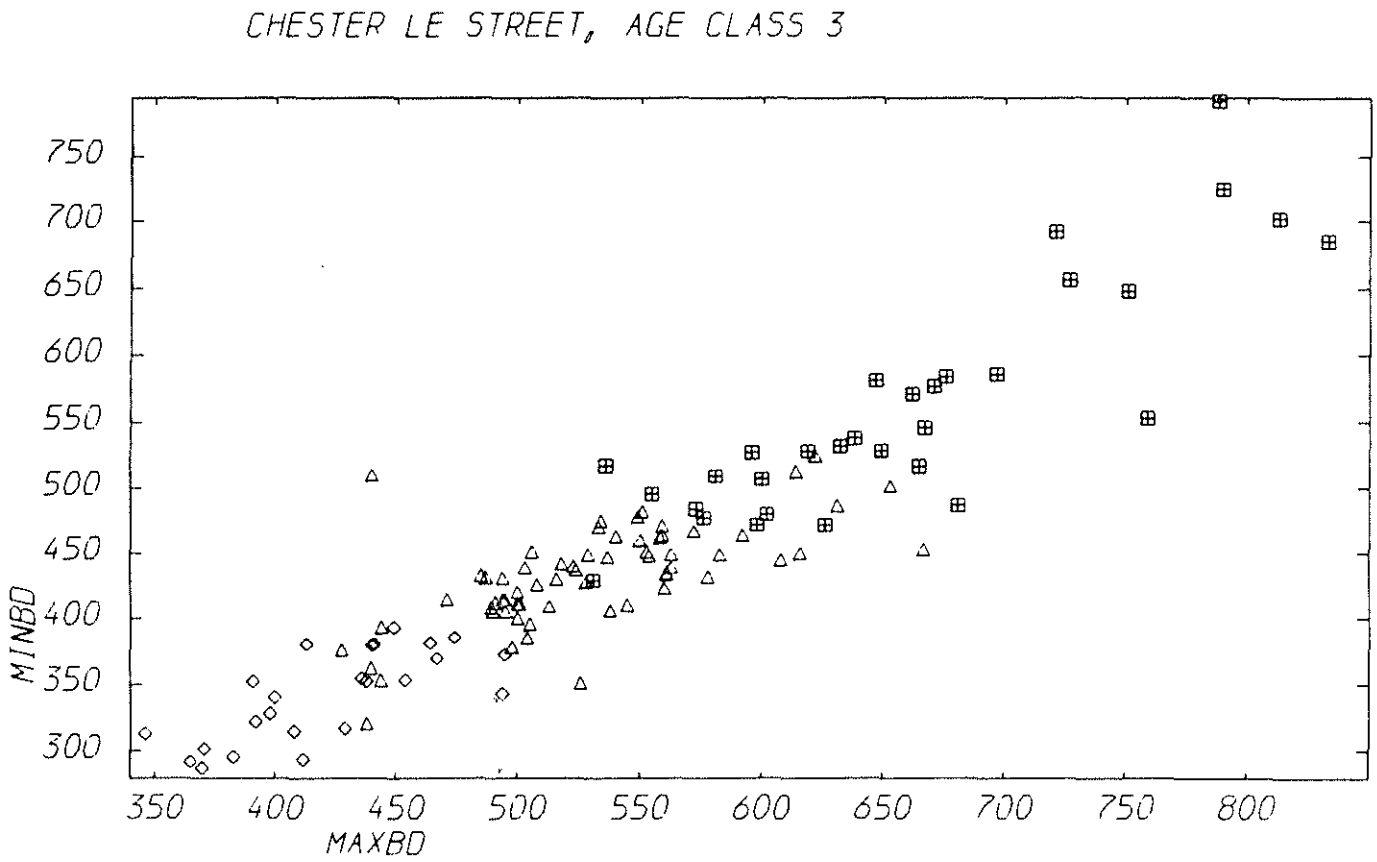
Fig 4.



scattergram of the maximum against minimum breadth of the basal diameter of cattle horns