

**Aspects of the Palaeoecology of Large Predators,
including Man, during the British Upper Pleistocene,
with particular emphasis on Predator-Prey Relationships**

VOLUME II

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Thesis submitted for the degree of Doctor of Philosophy in
the University of Sheffield, Department of Prehistory and
Archaeology

May 1981

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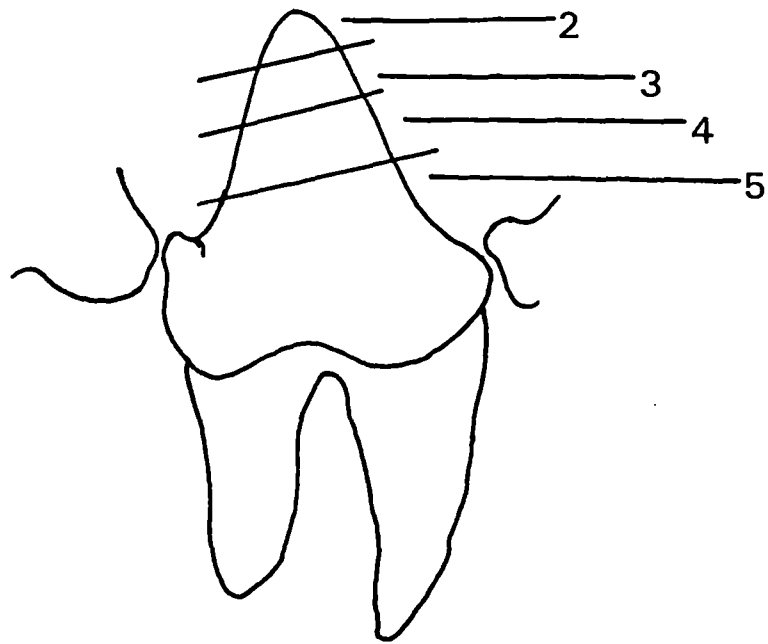


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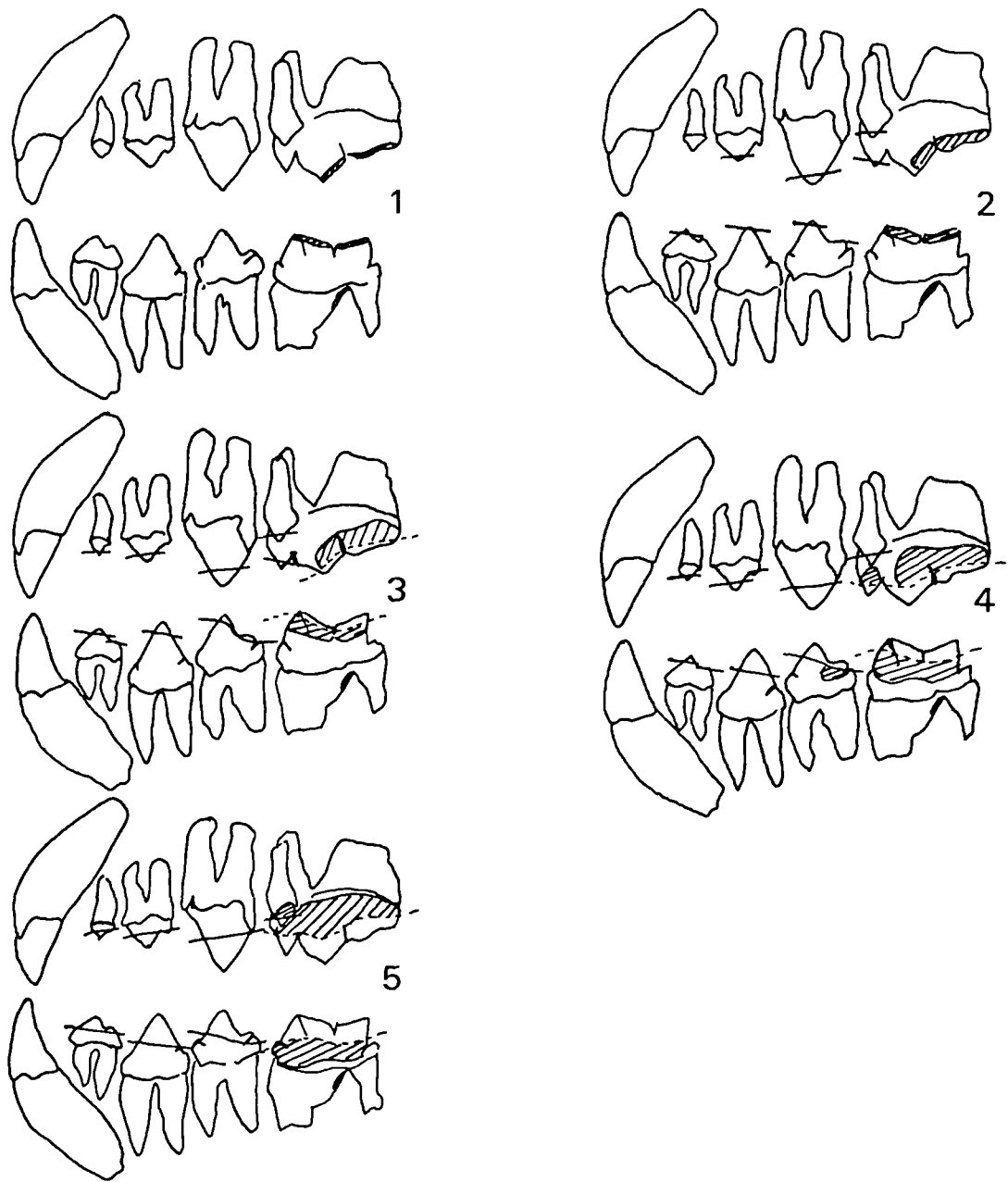


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 x ca. $\frac{1}{2}$

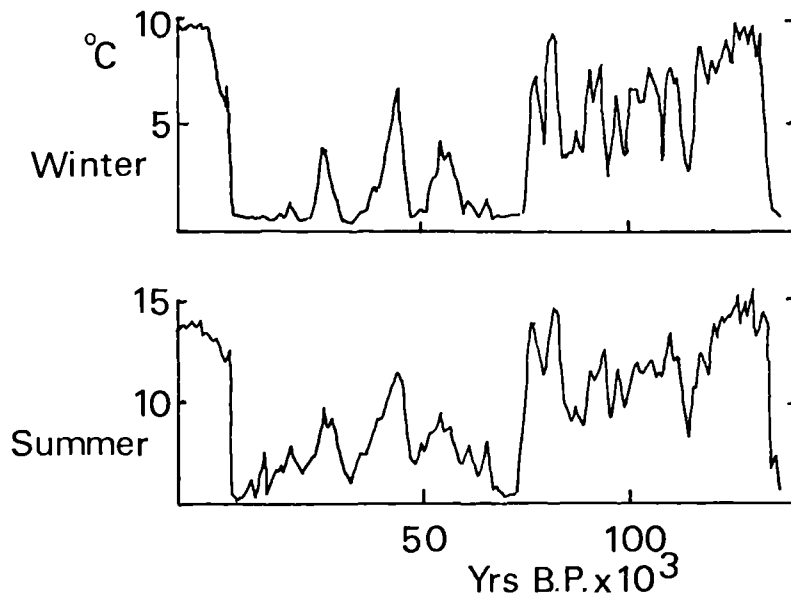


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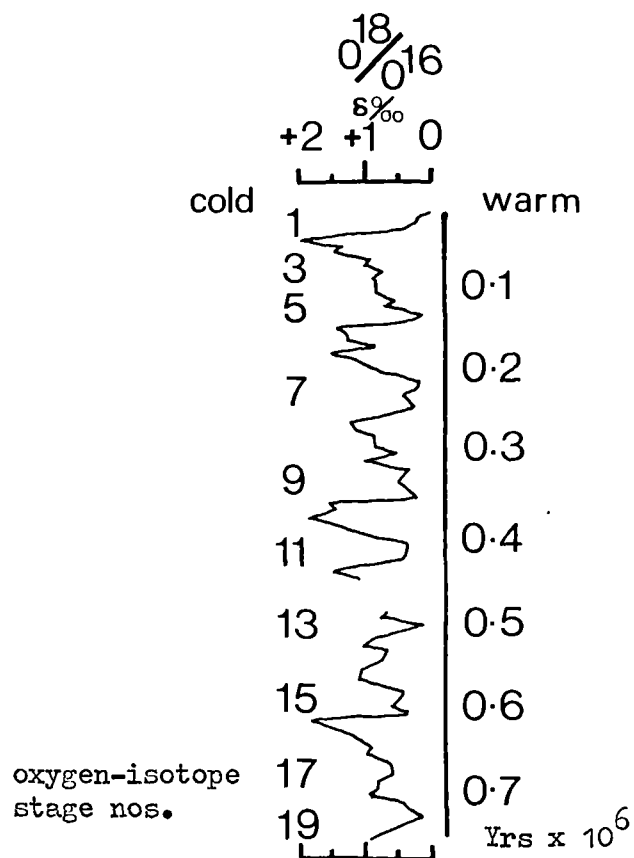
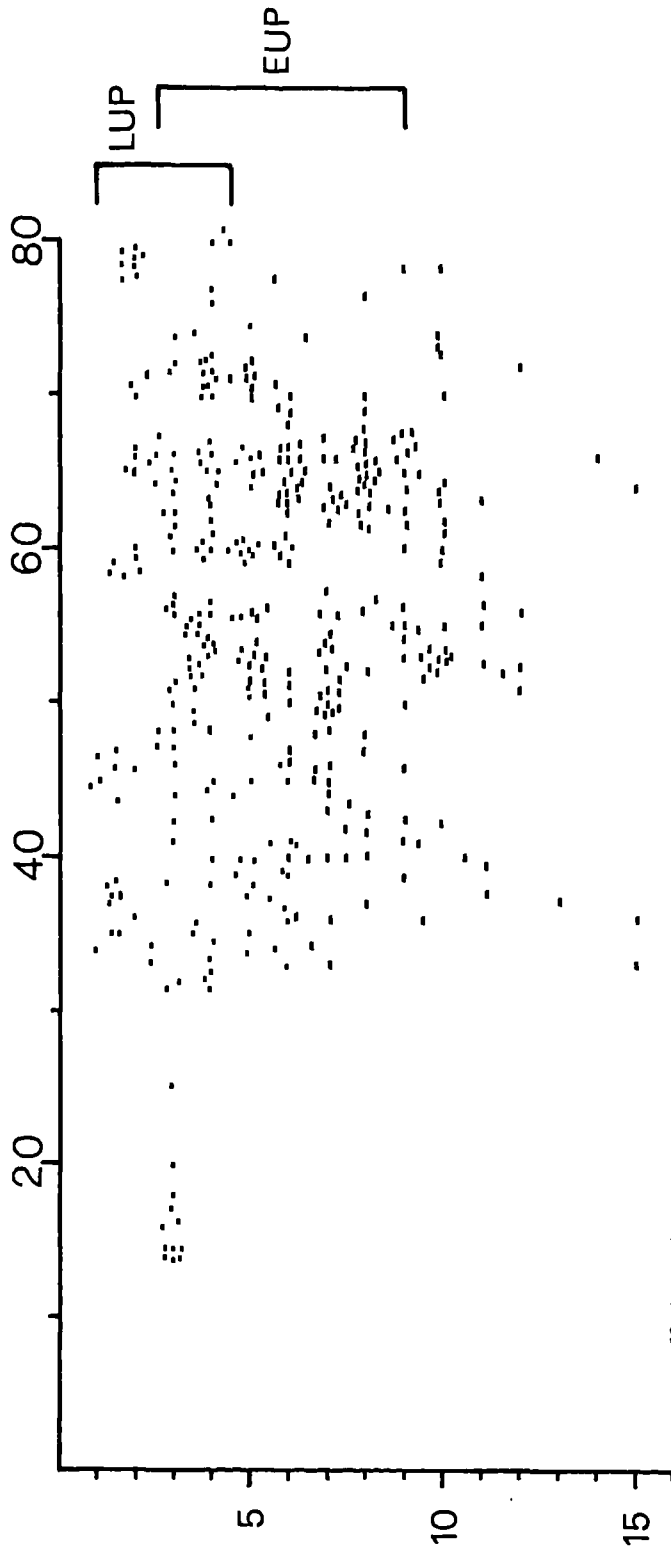


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In this figure and Figs. 6-13 the vertical and horizontal scales are in feet below an assumed horizontal datum and into the cave respectively. Specimens are positioned according to the information written on them by Armstrong (1929), the excavator.



Note: the sections produced in Figs. 5-13 are purely schematic, since no horizontal datum was actually used during excavation (R.D.S. Jenkinson, pers comm.), but serve to indicate the relative positionings of species

The sections are given purely for estimation of relative species position and concentration, and do not attempt, at this scale, to display finer details of association which the coarseness of recording would in any event render difficult

Fig. 6. Position of bear remains in Pin Hole deposits

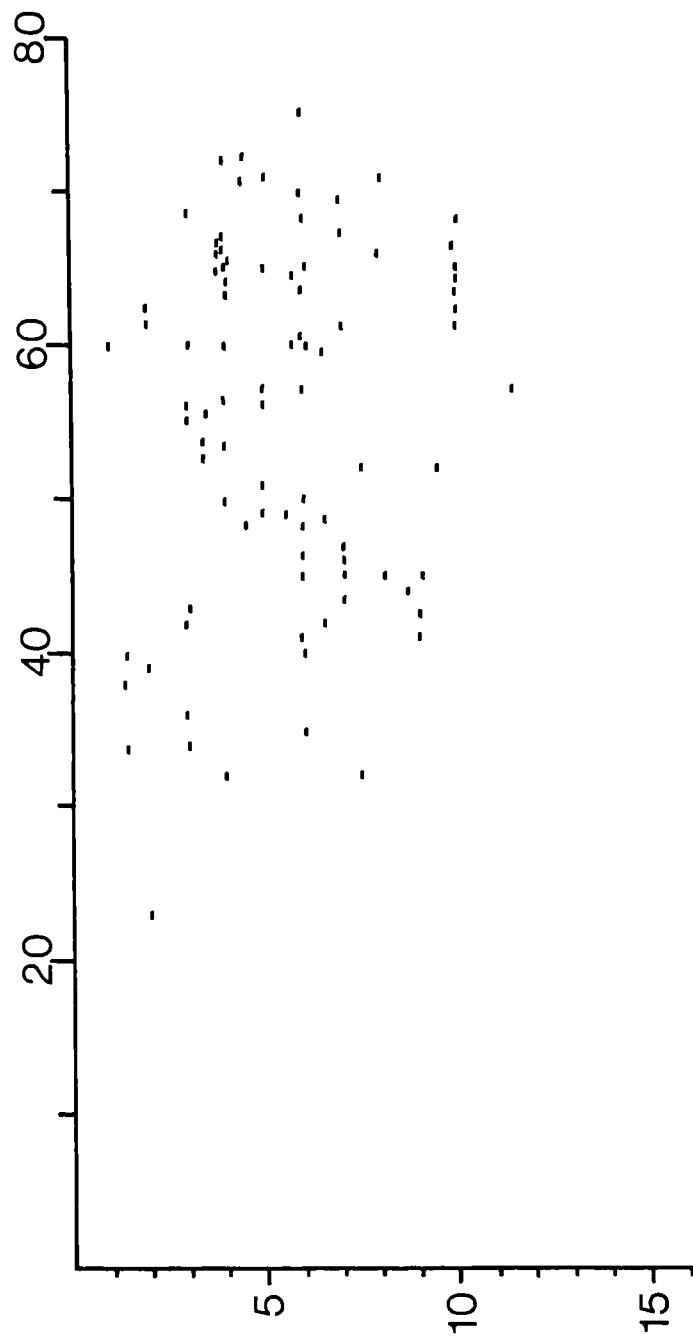


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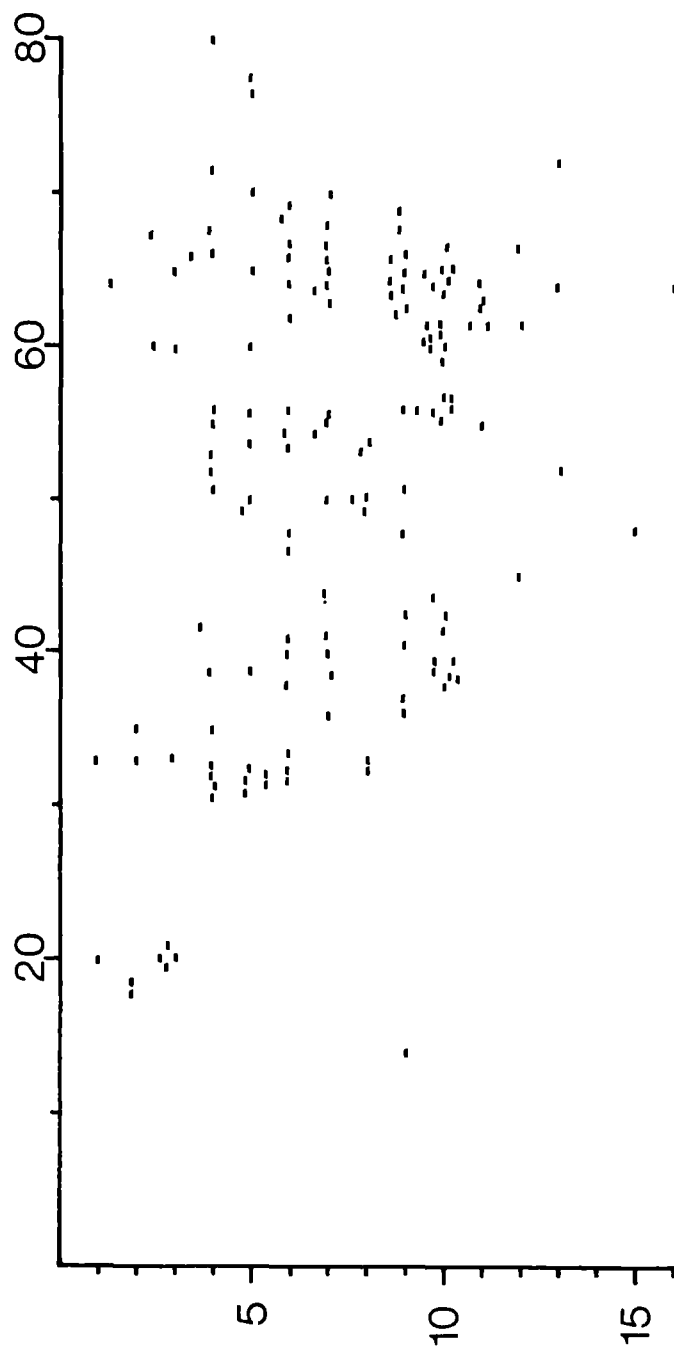


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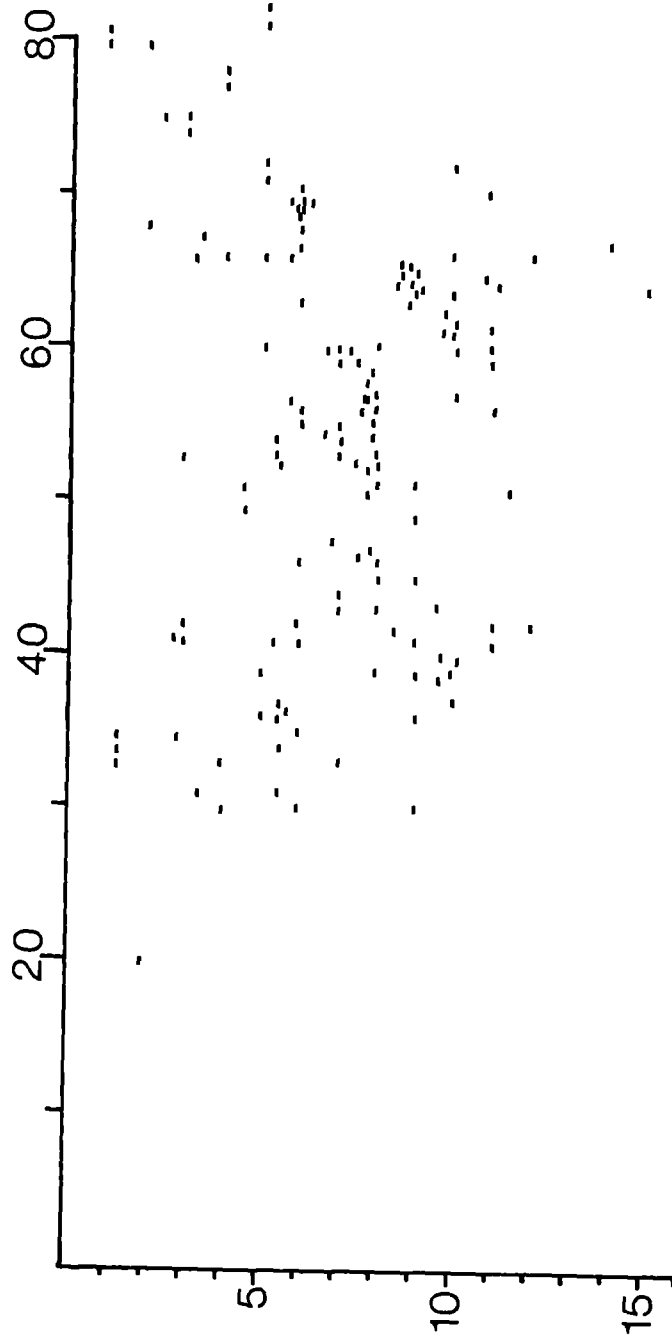


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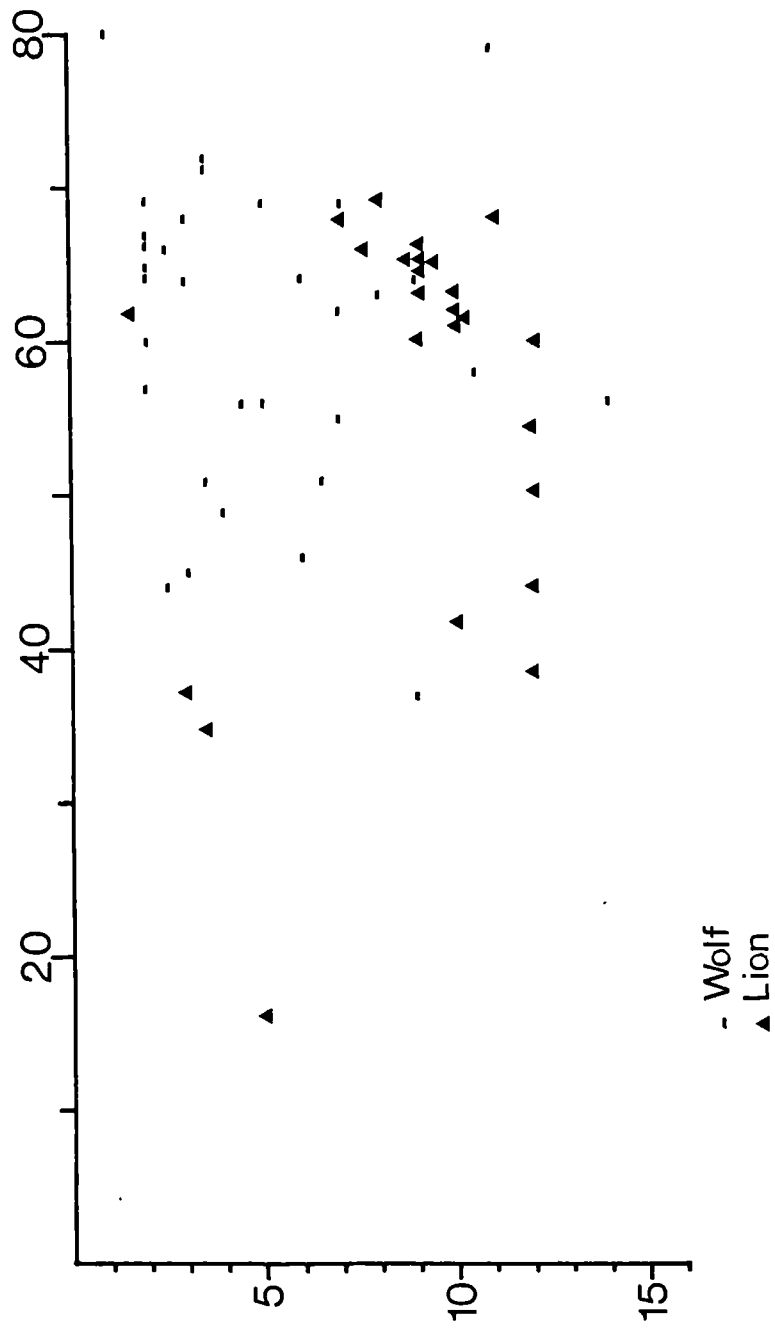


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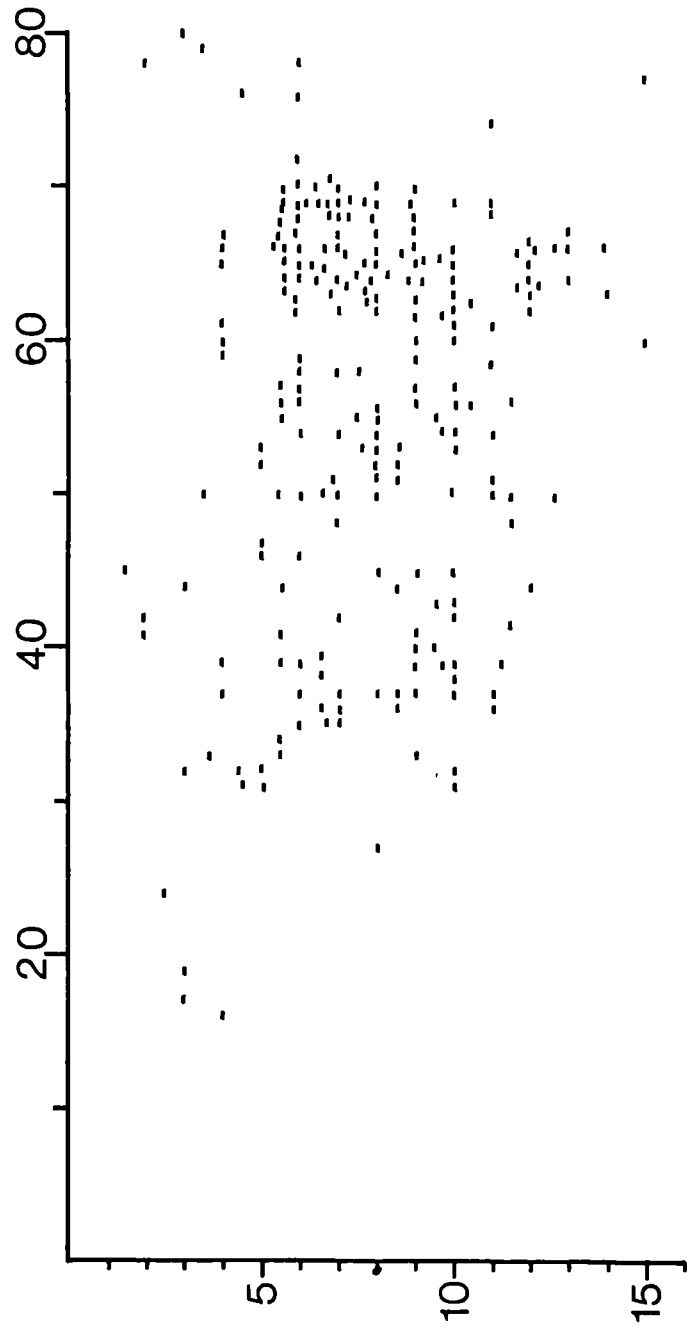


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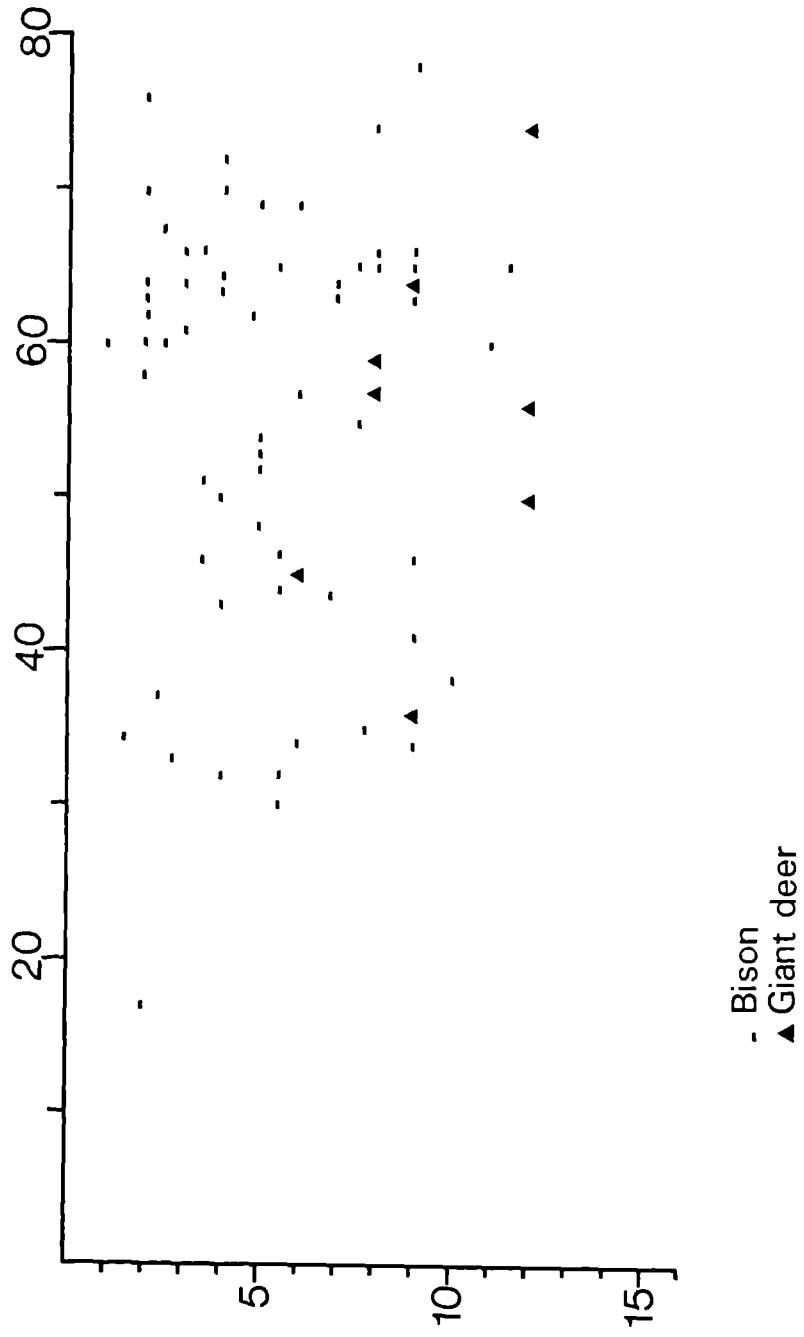


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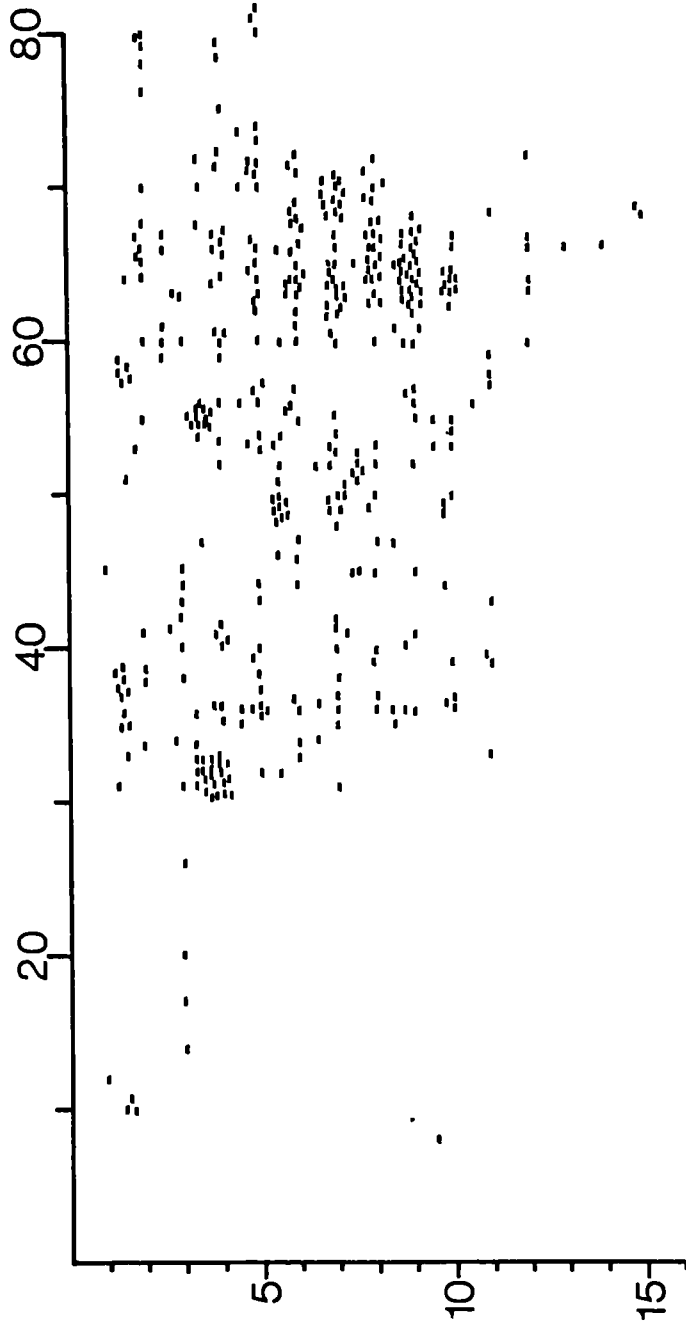
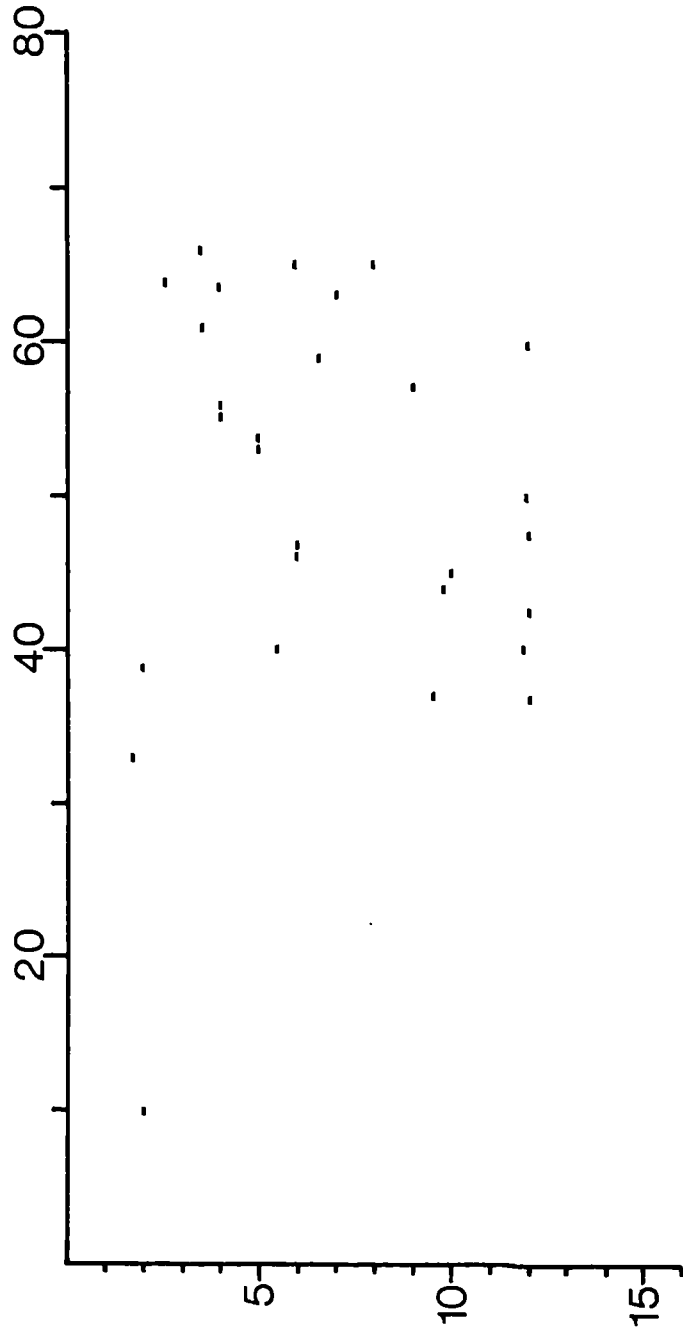


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Continental C14 years Late Devensian
 Late Weichselian b.p. Mitchell et al (1973)

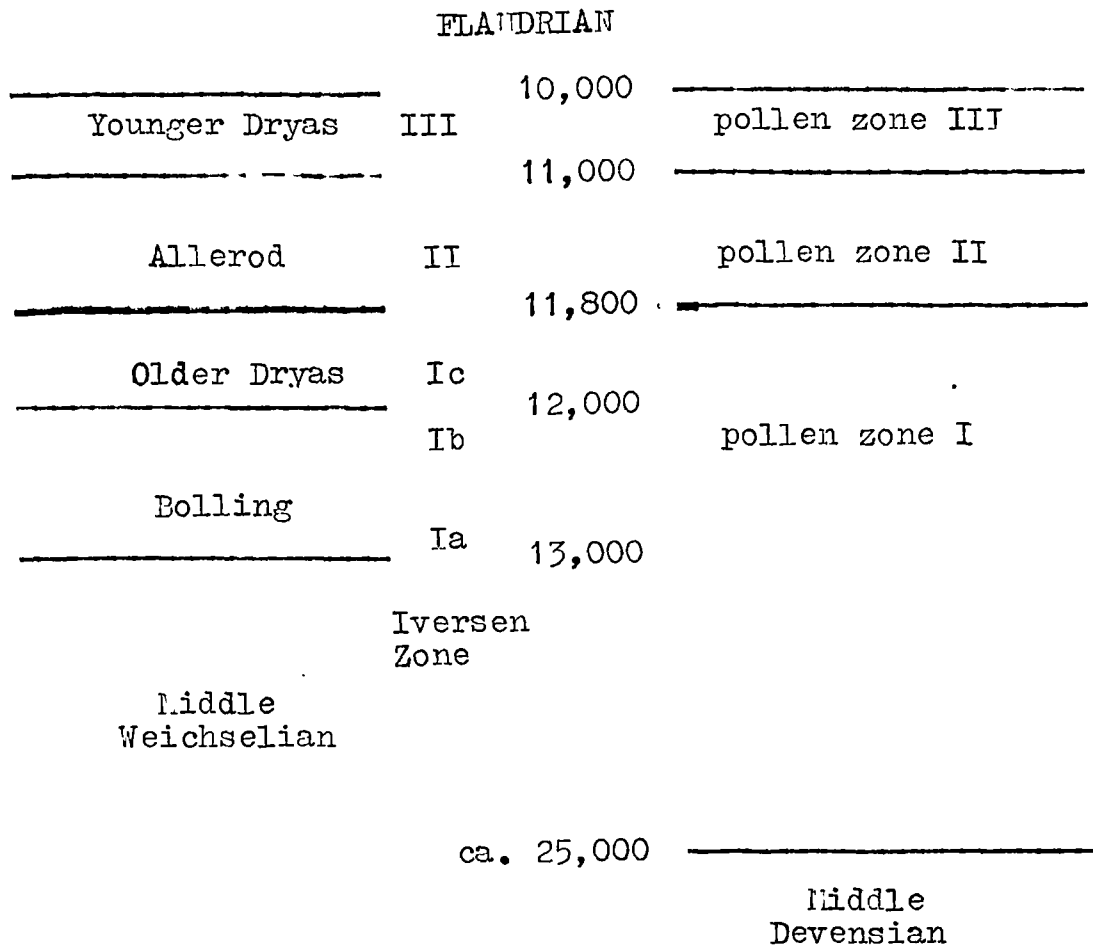


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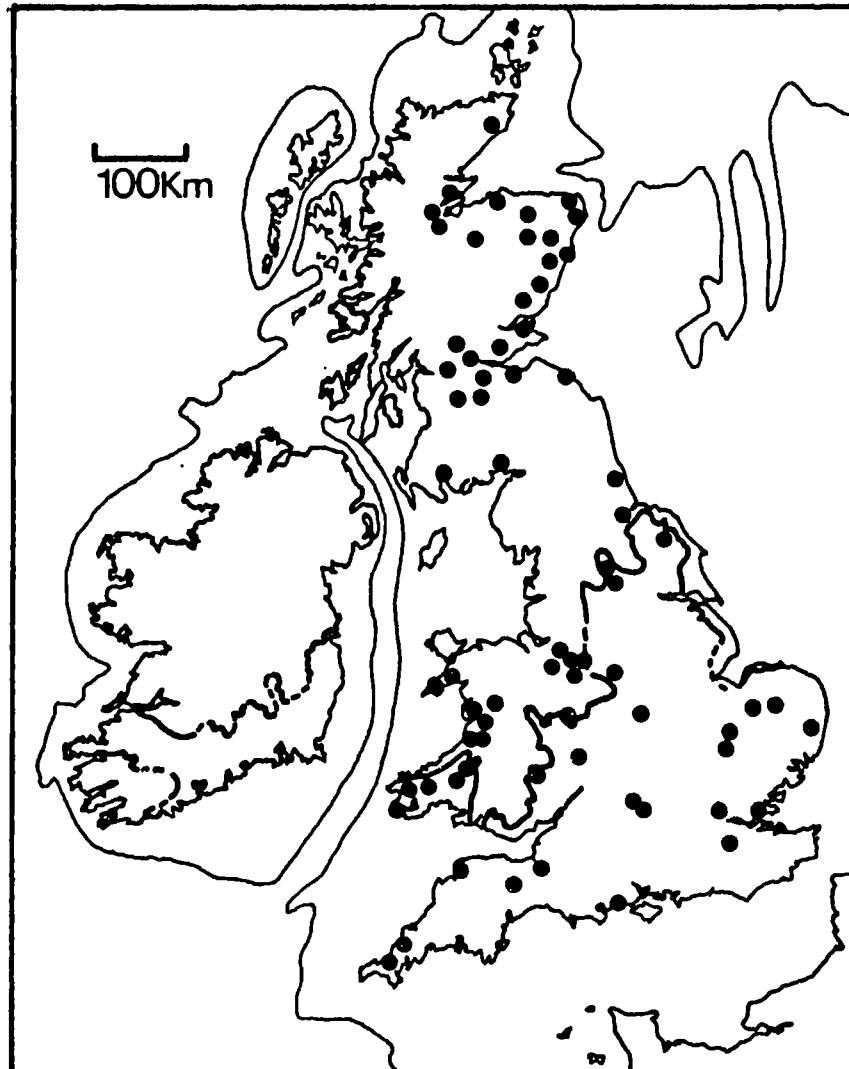
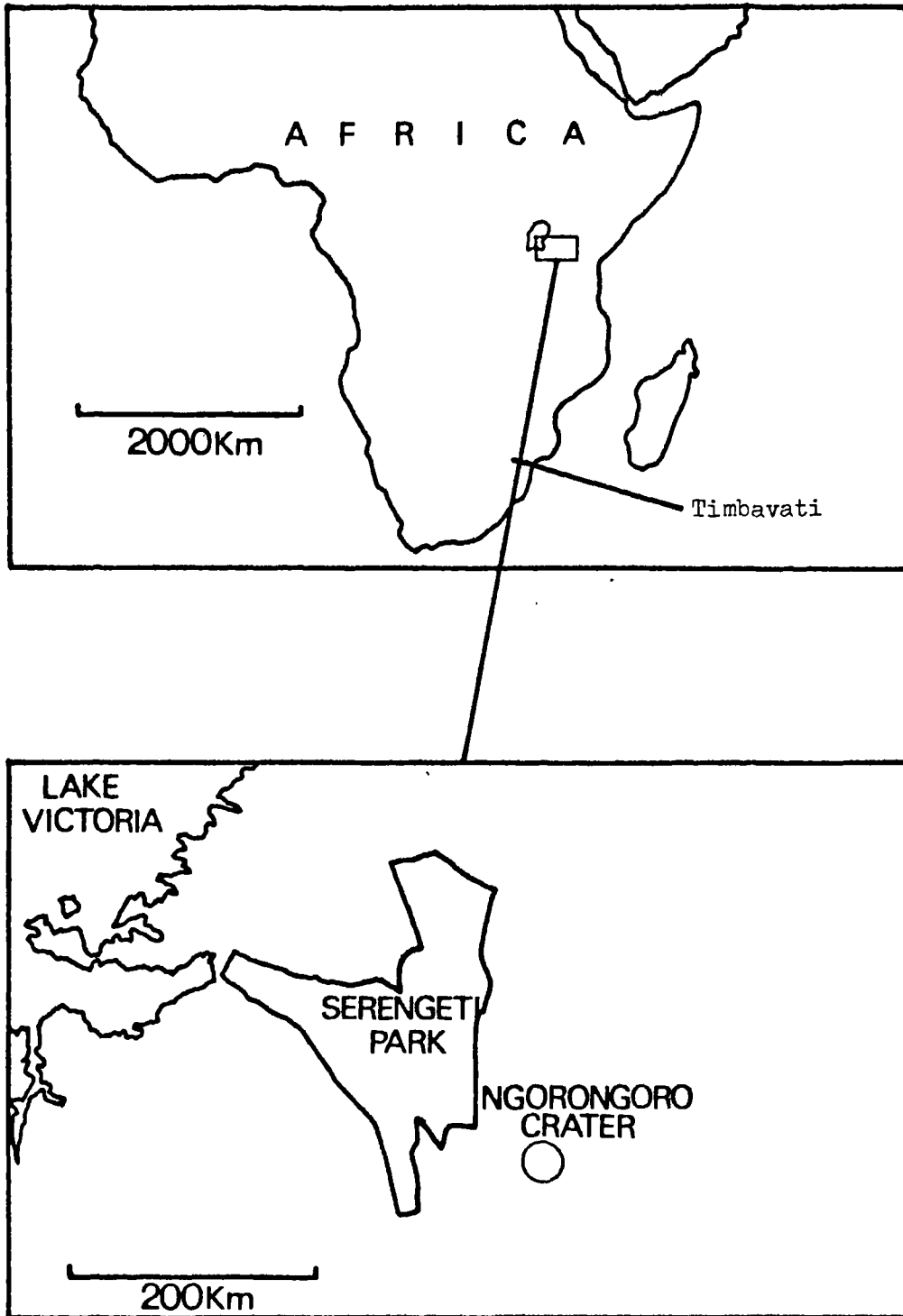


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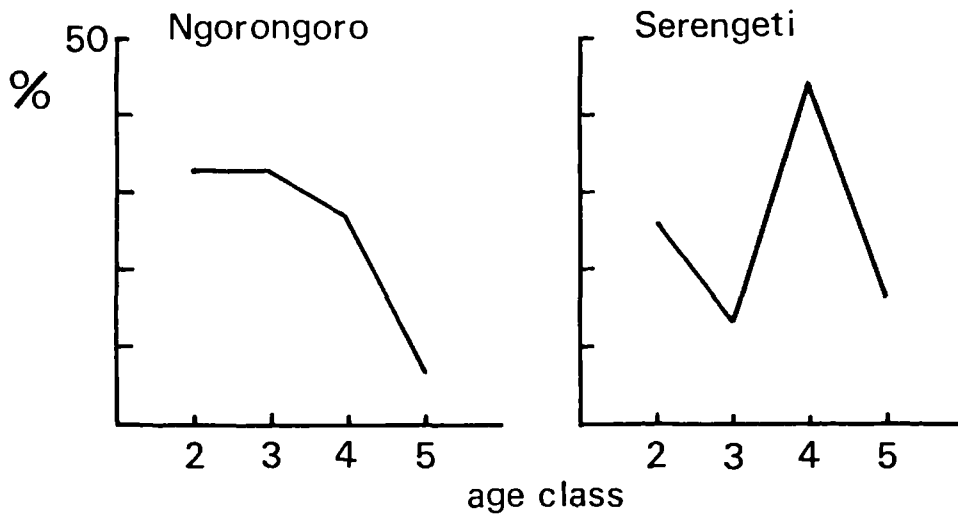


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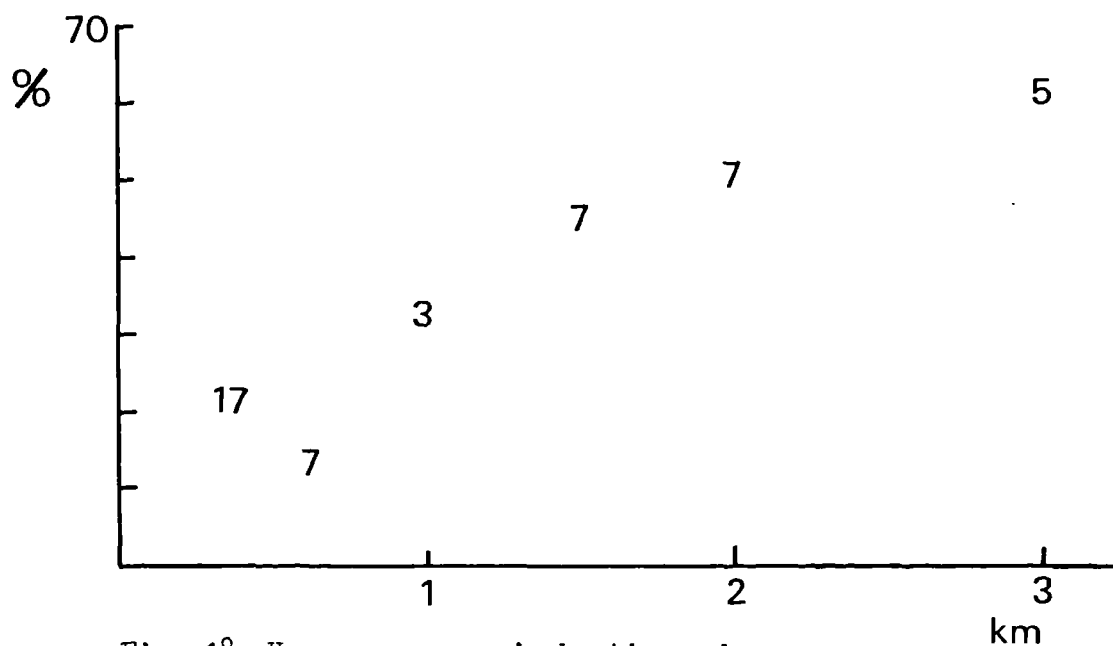


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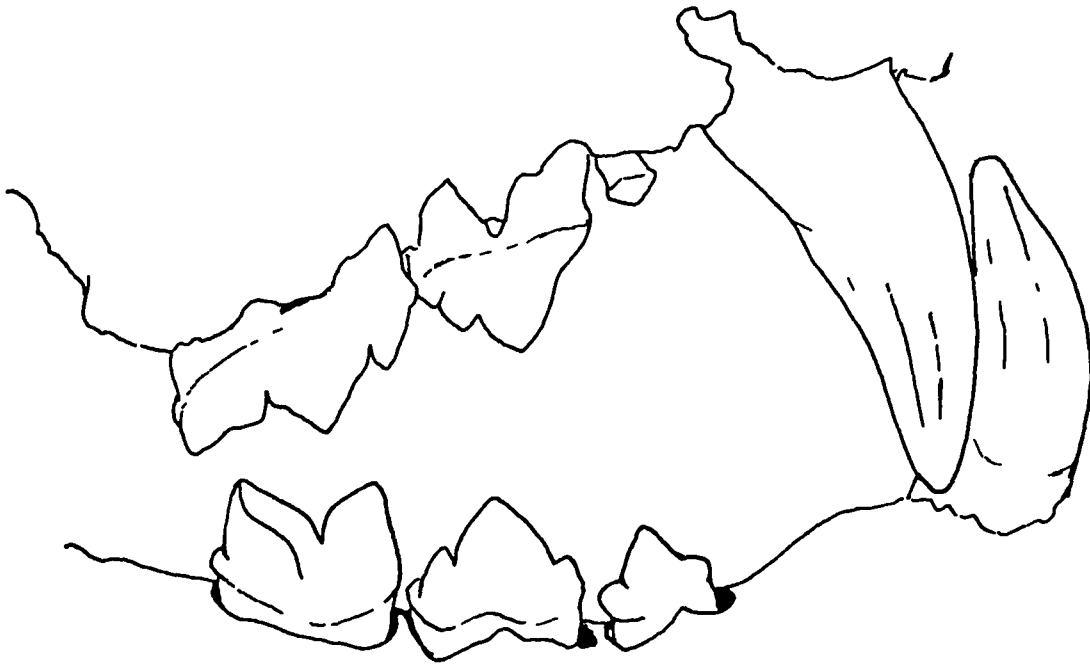


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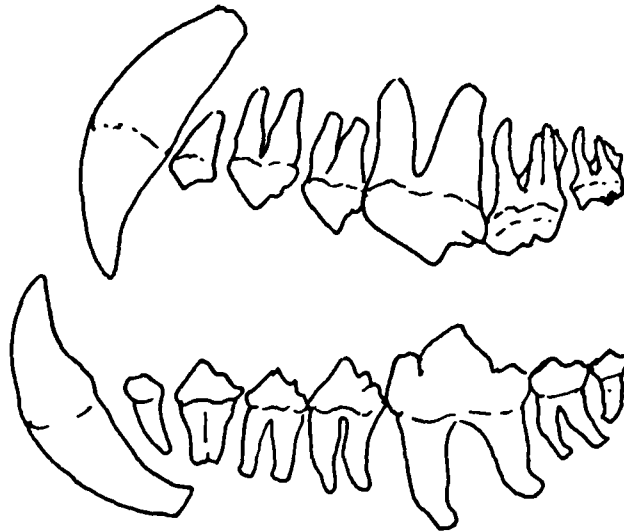


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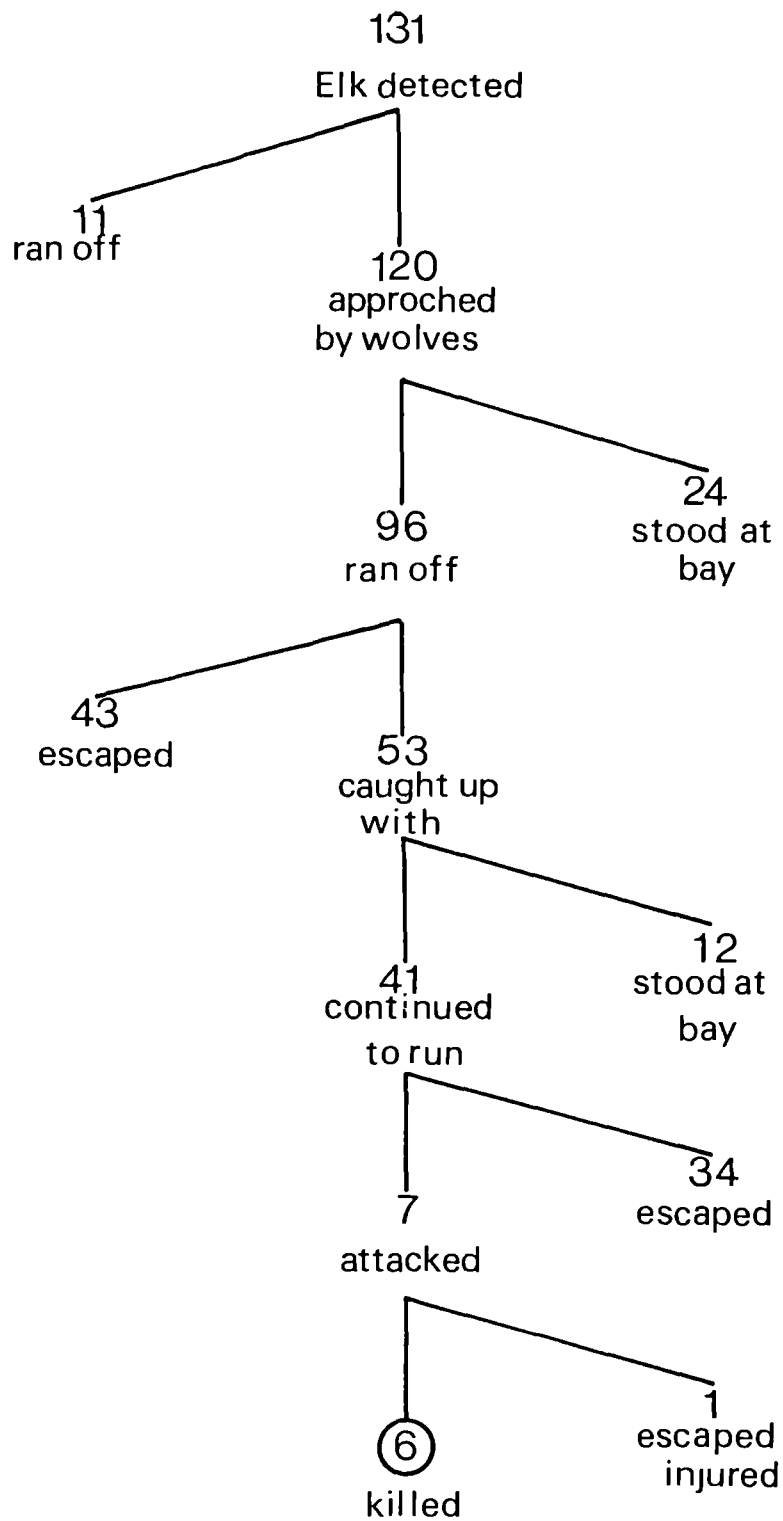


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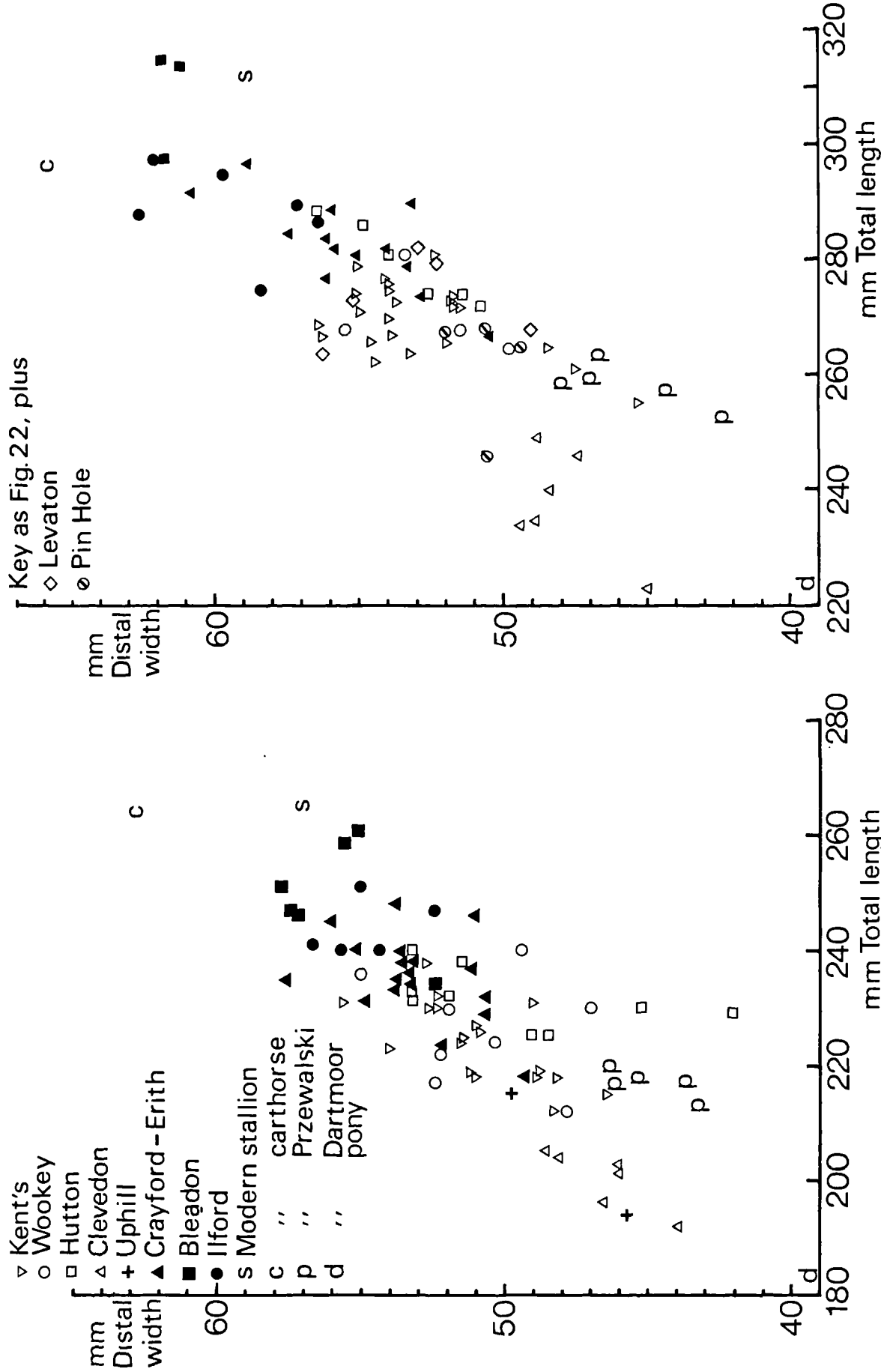


Fig. 23. Scattergram of horse metatarsal length and distal breadth

Fig. 22. Scattergram of horse metacarpal length and distal breadth

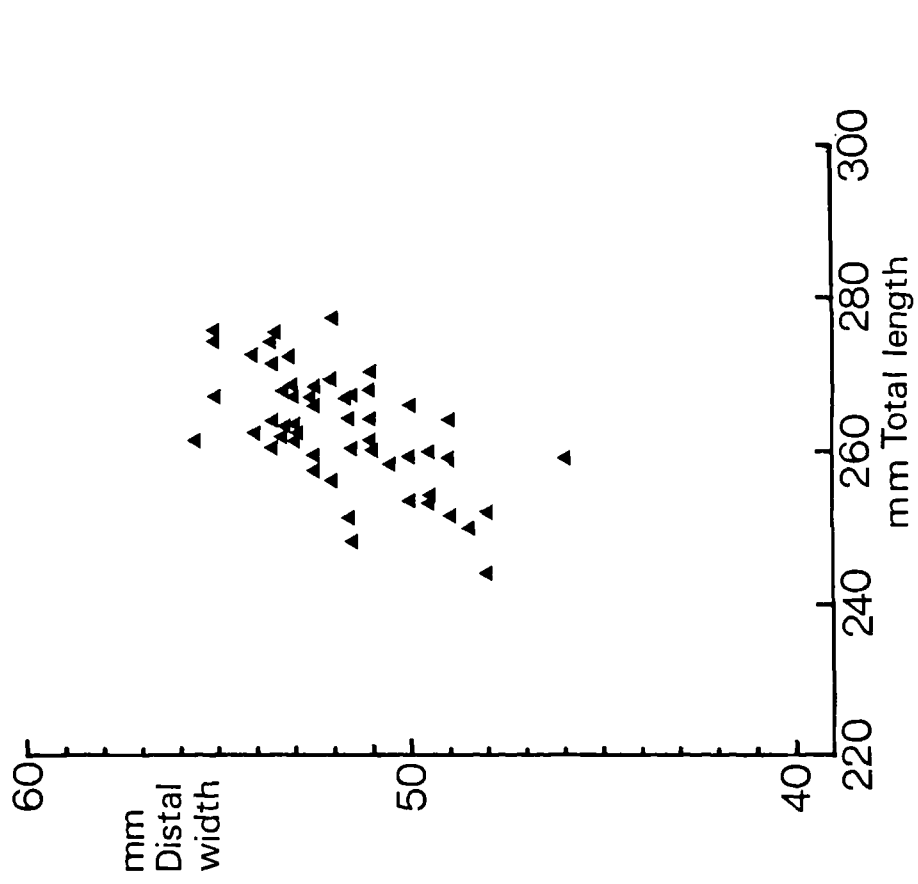


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From Nobis (1971)

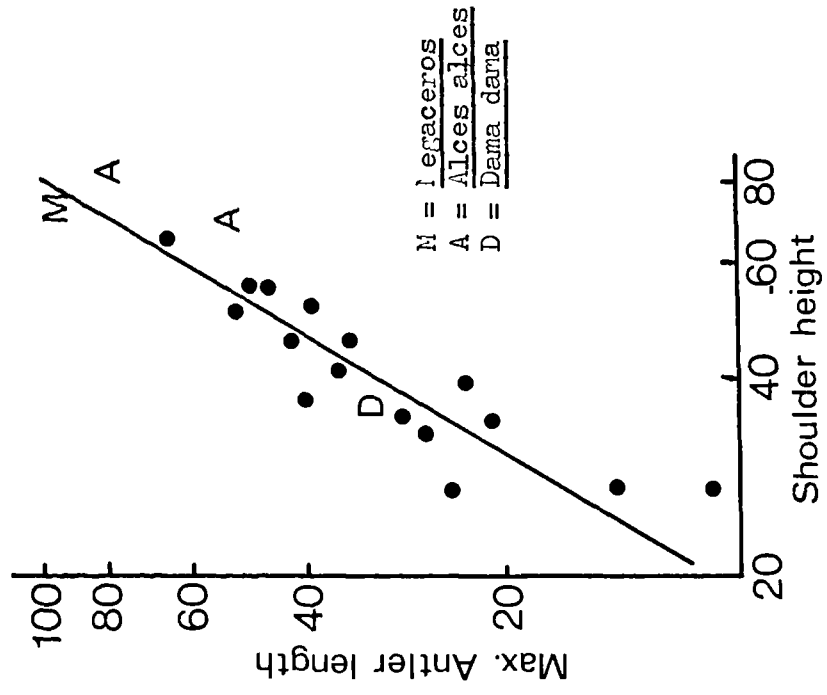


Fig. 25. Deer antler size versus shoulder height
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From Gould (1974)

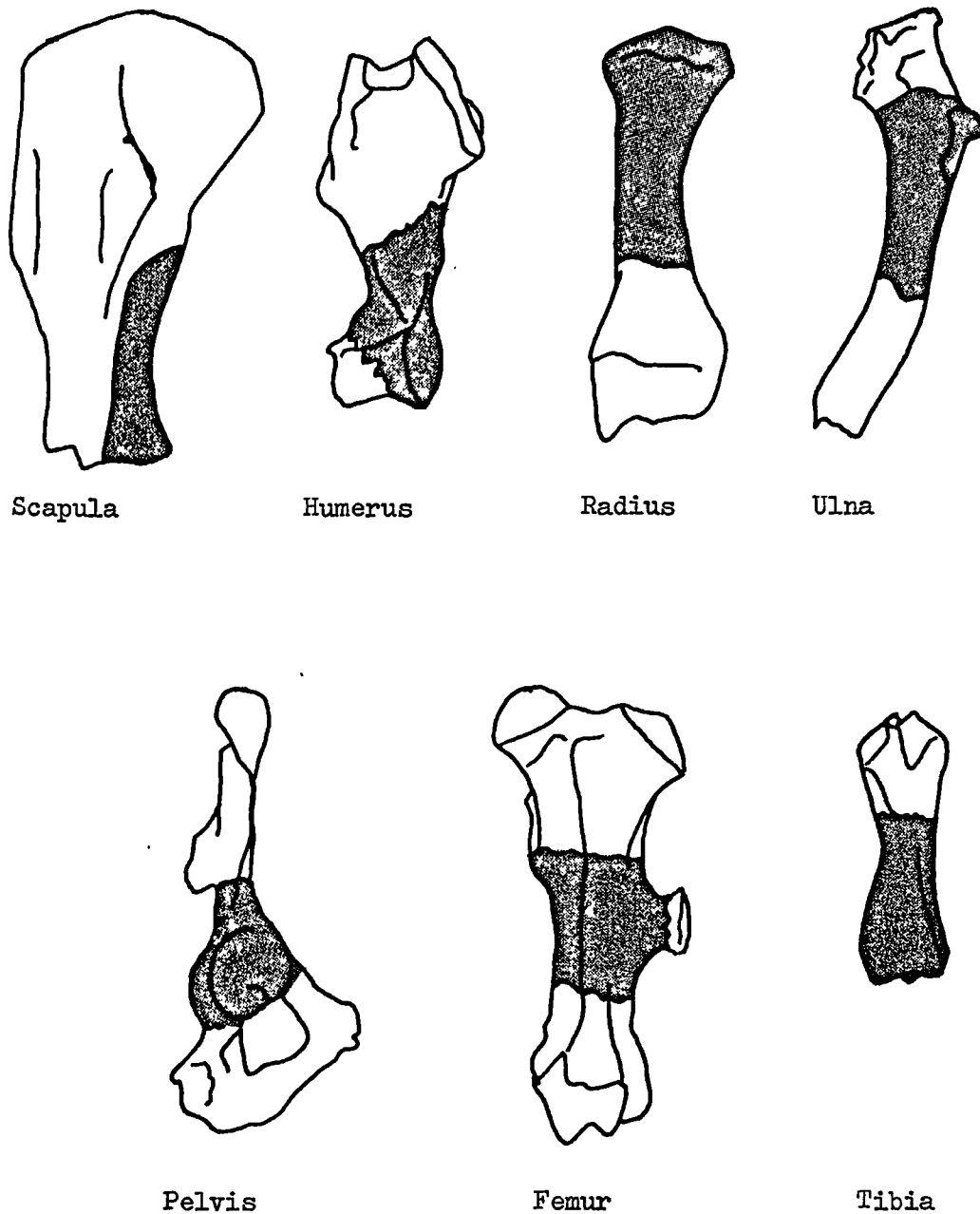
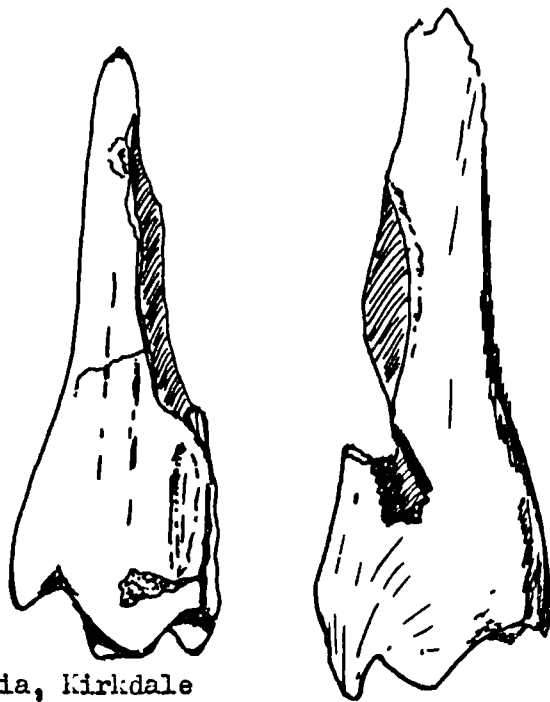


Fig. 26. Bone damage by hyaenas on rhinoceros specimens
 The shaded portions are the parts of the bones
 most commonly found in hyaena-accumulated deposits
 and are in each case the most robust with the least
 proportion of cancellous bone
 Hyaena damage identified by reference to criteria
 established by Sutcliffe (1970)

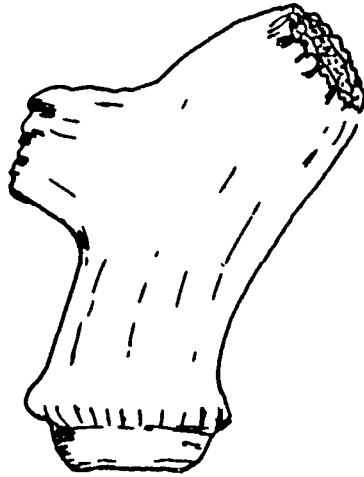


Bison tibia, Kirkdale

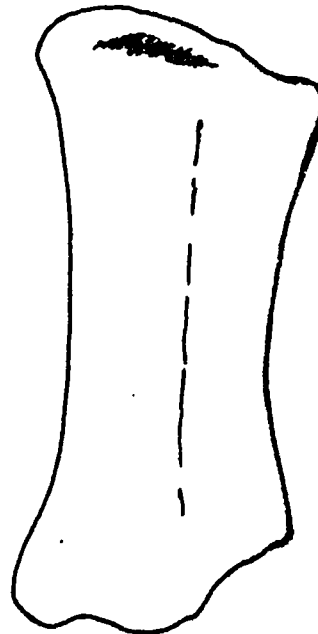
Ox tibia, Bristol Zoo

The two bones shown on the left were the subjects of an experiment by Dean Buckland to prove the bone-destroying capabilities of hyaenas. He had the right hand one fed to a captive hyaena to prove that the Kirkdale specimen was produced by similar mechanisms

Sketched from an exhibit in Oxford University Museum



Typical hyaena-gnawed fragment of reindeer antler



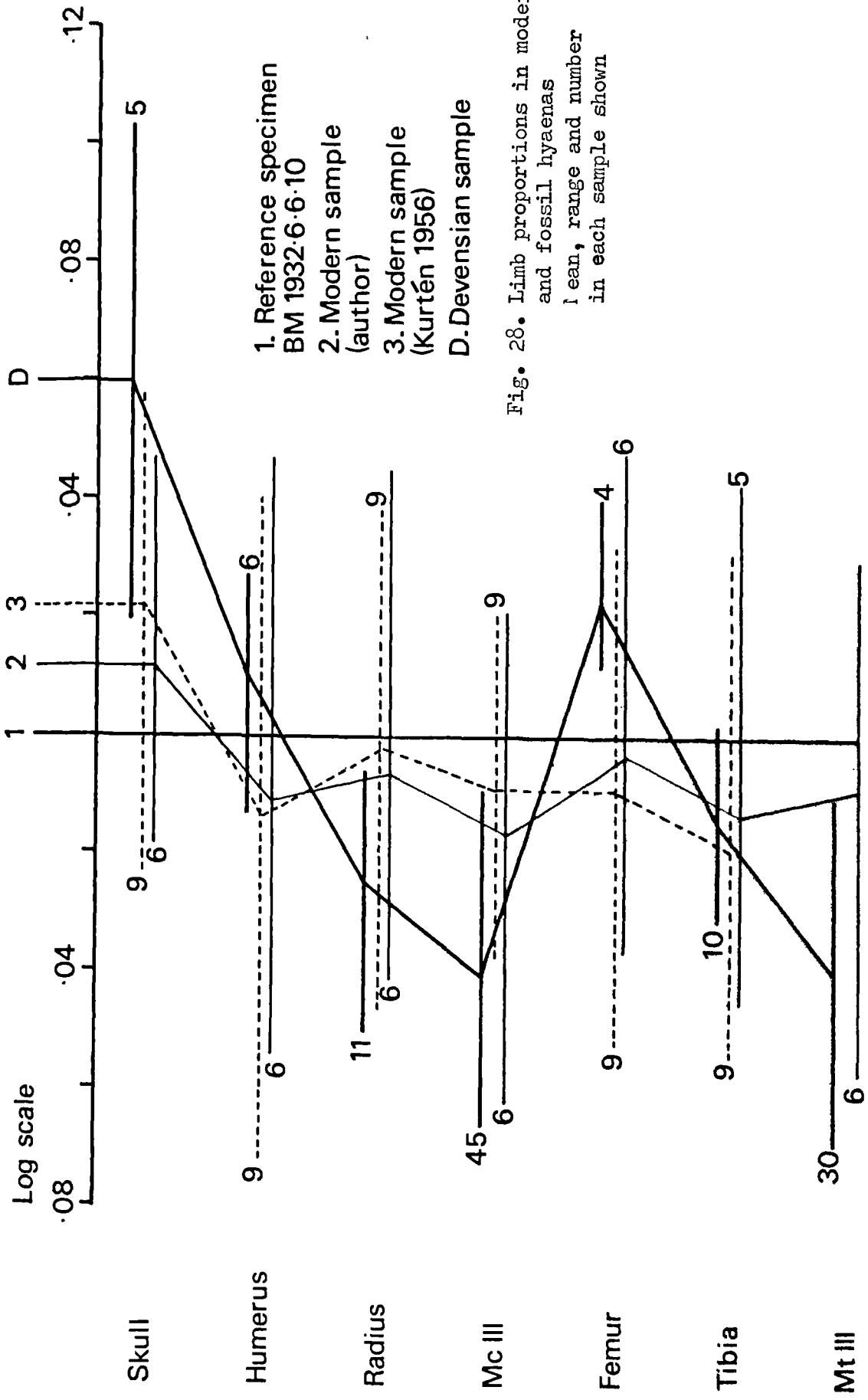
Gnawed and polished bison metacarpal, Kirkdale

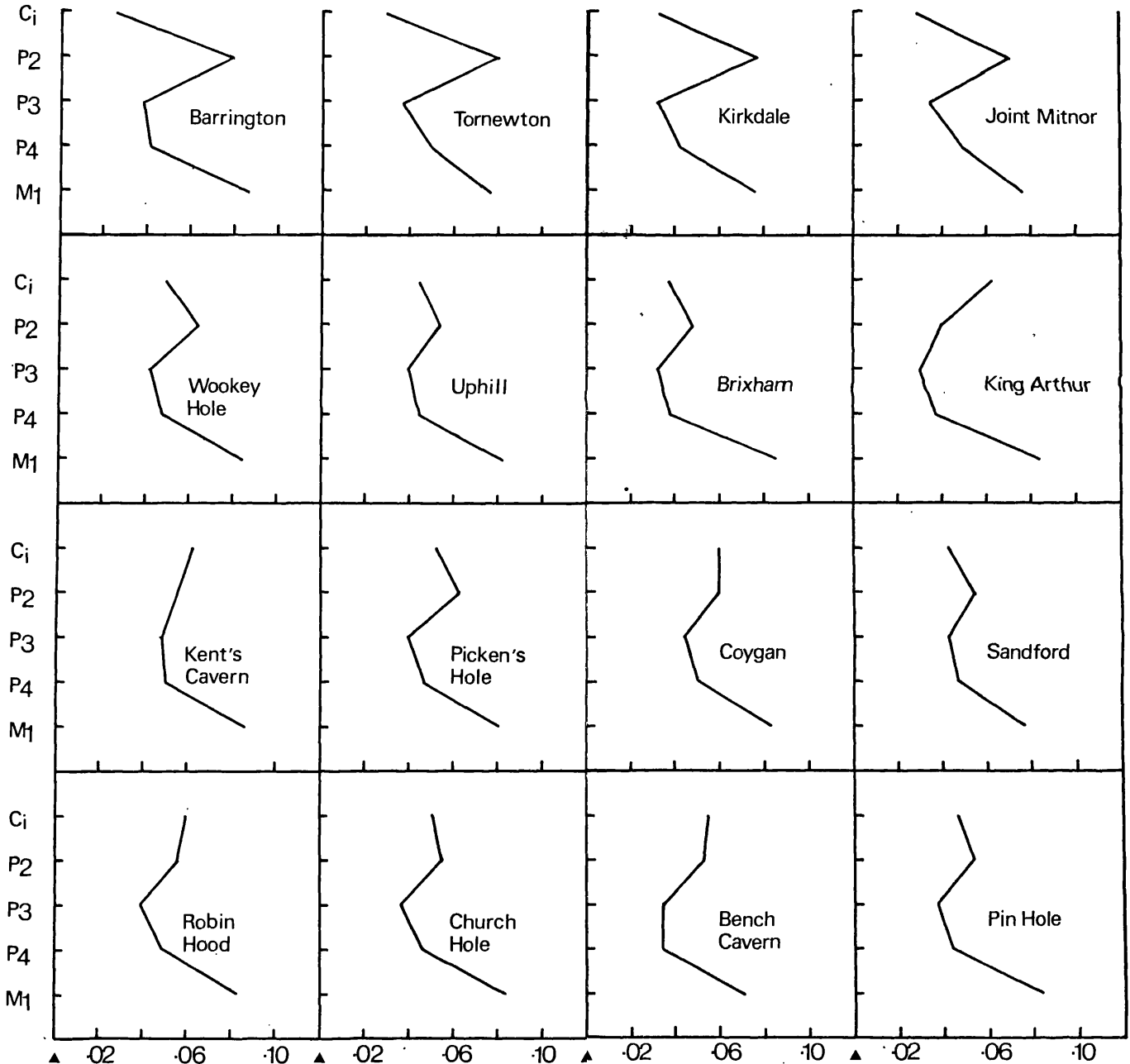
Hyaena damage identified by reference to criteria established by Sutcliffe (1970)



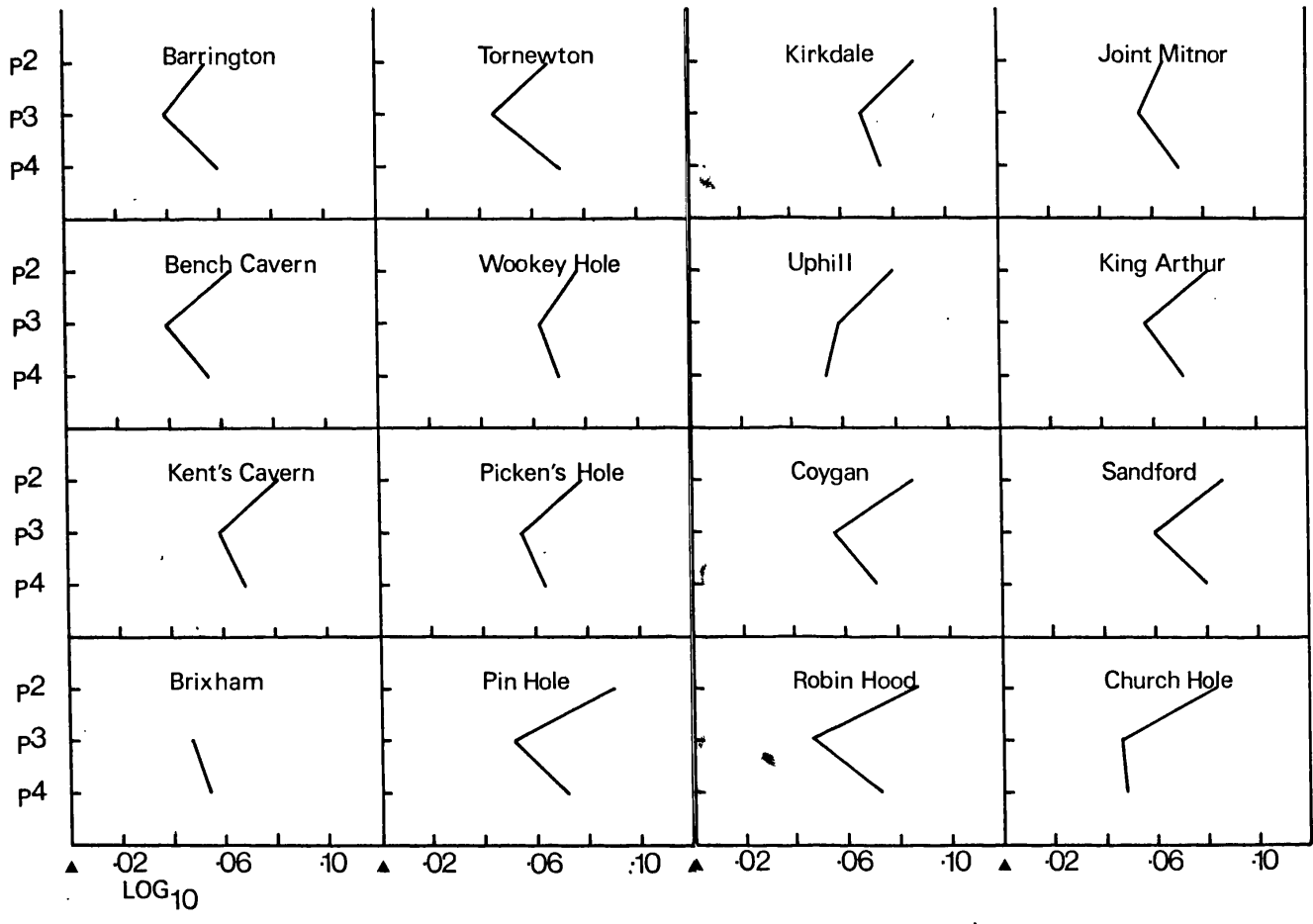
Fig. 27. Typical hyaena damage to bones of various species not to scale

Typically hyaena-gnawed humerus of a reindeer





▲ REF. **Fig. 29.** Lower dentition in modern and fossil hyaenas. Log₁₀ difference from Balbal population (Kurten 1956) which constitutes left hand scale of each small square



▲ REF.

Fig. 30. Upper dentition in modern and fossil hyaenas. Log_{10} difference from Balbal population (Kürten 1956) which constitutes left hand scale of each small square

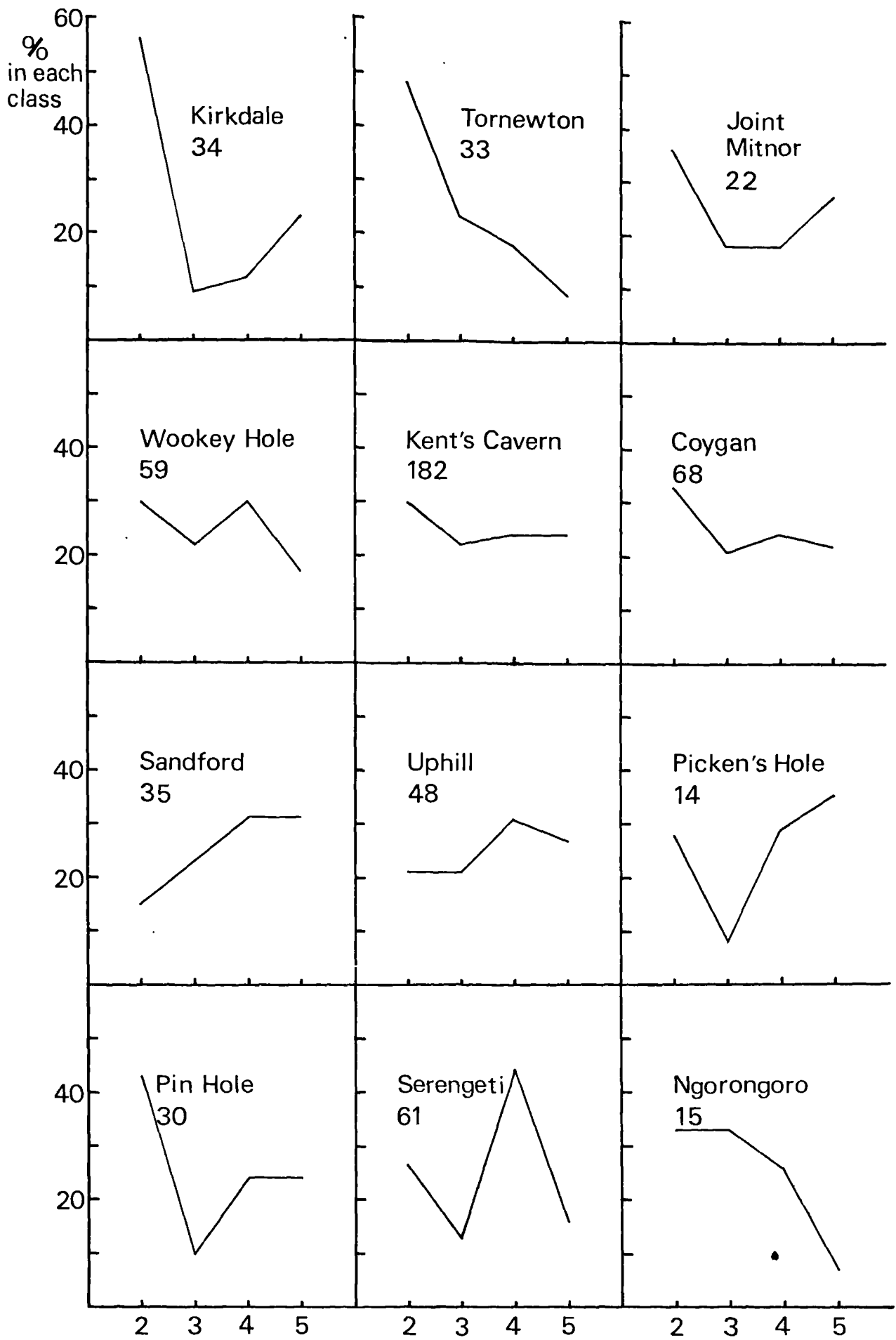


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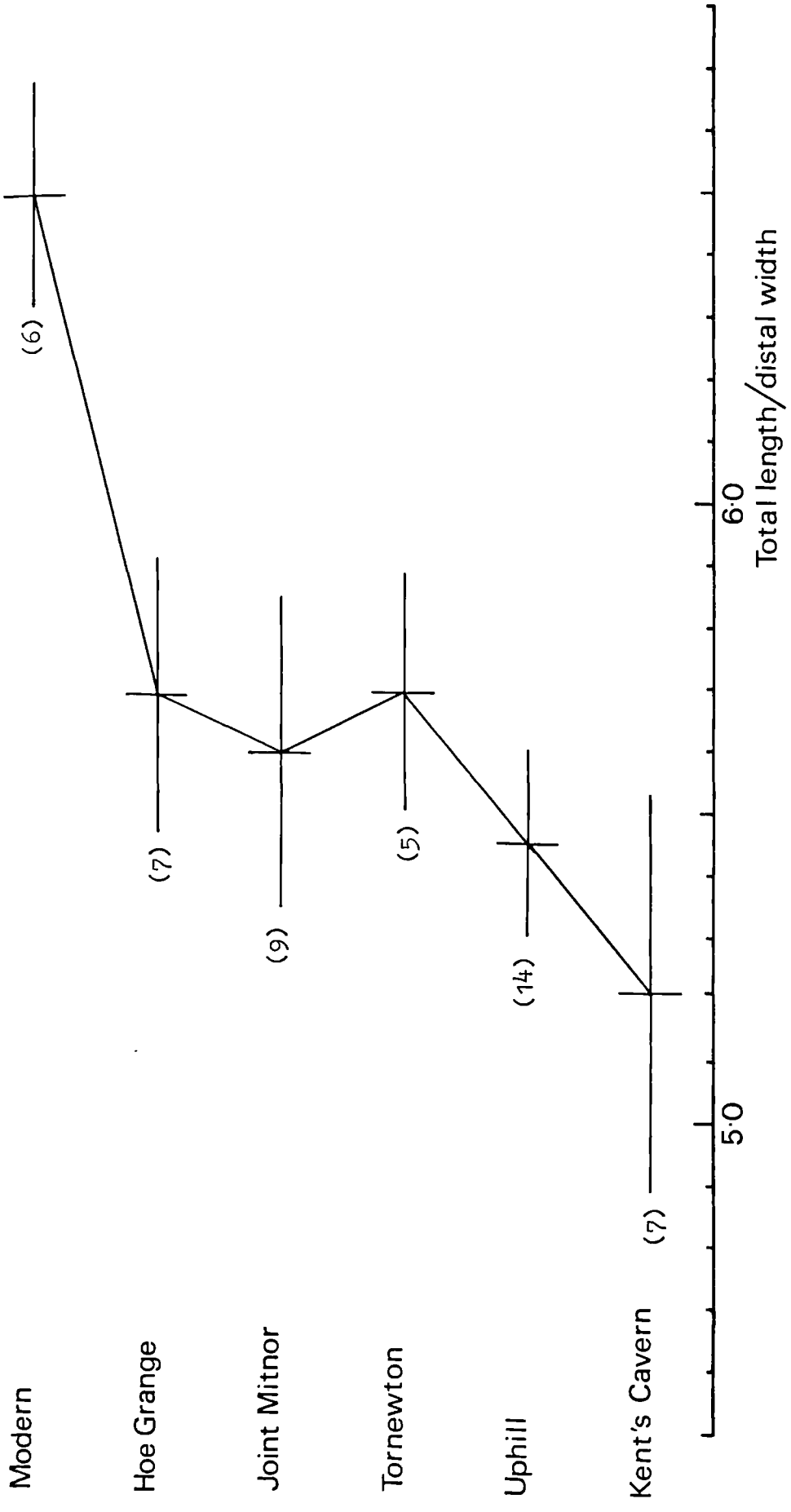


Fig. 32. Proportions of metatarsal 3 in modern and fossil hyaenas
 Mean \pm 2t expressed for each sample
 Number of specimens in brackets

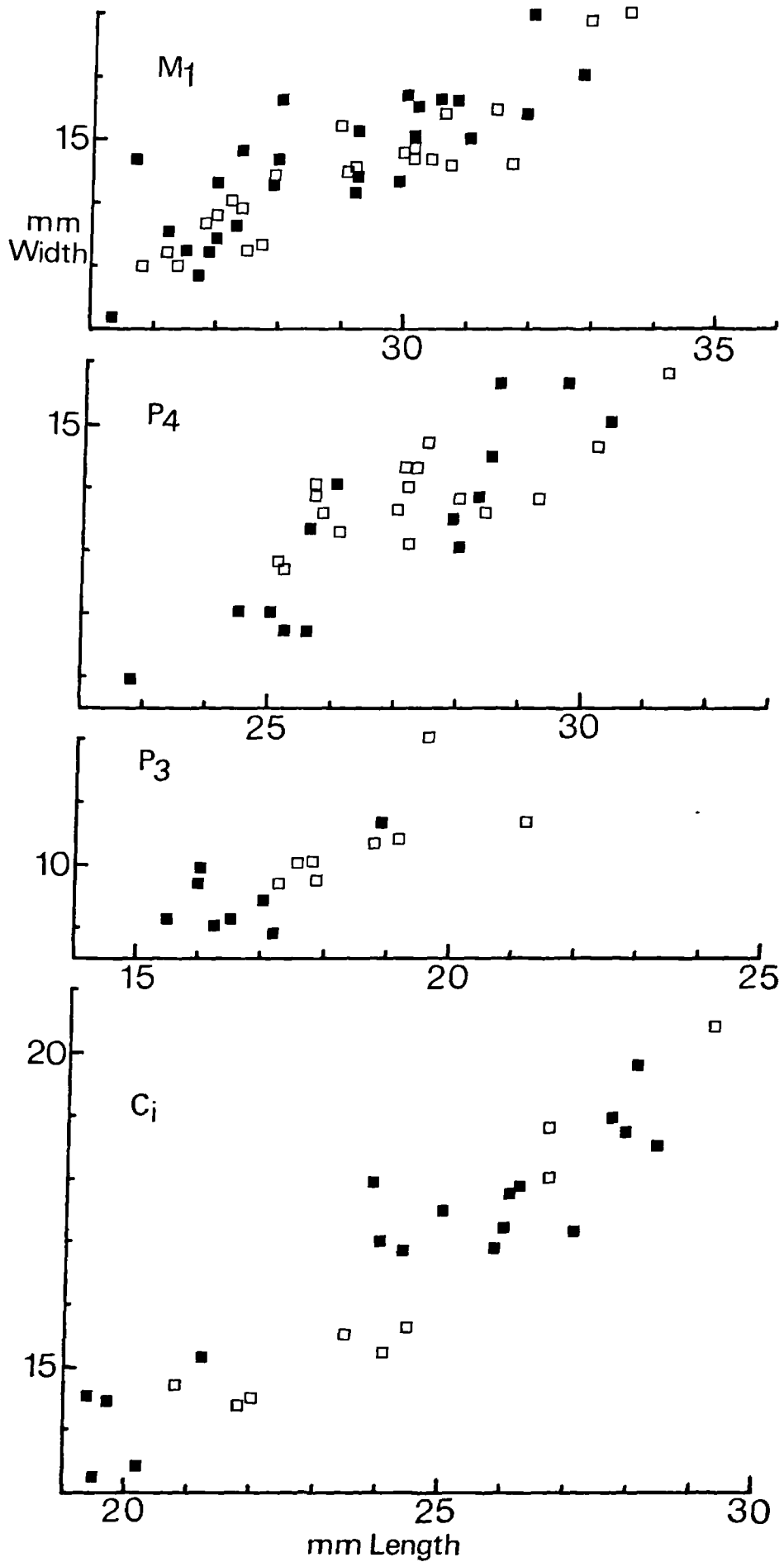


Fig. 33. Scattergram of fossil lion lower teeth

■ Devensian
 □ Ipswichian

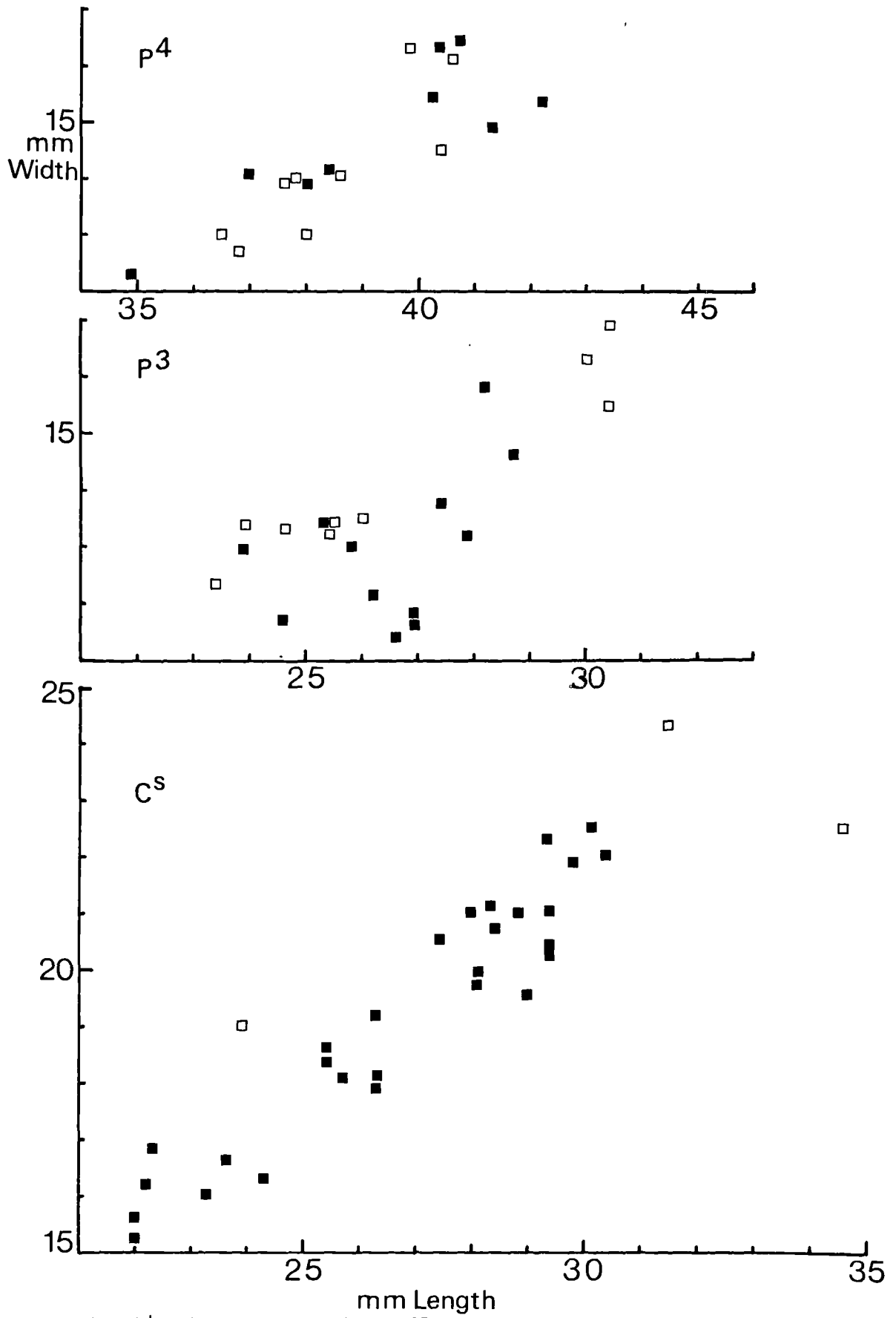


Fig. 34. Scattergram of fossil lion upper teeth

■ Devensian
□ Ipswichian

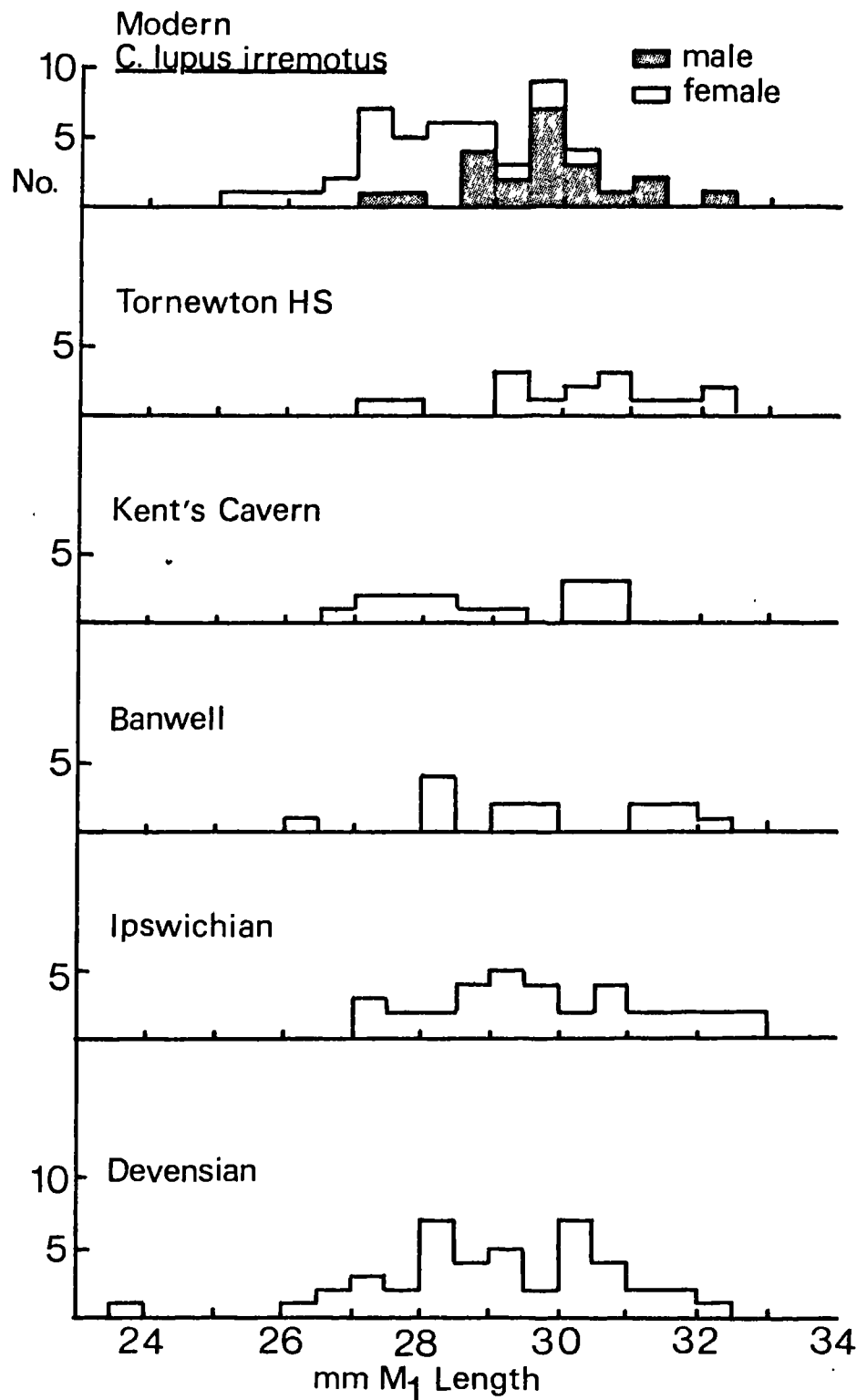


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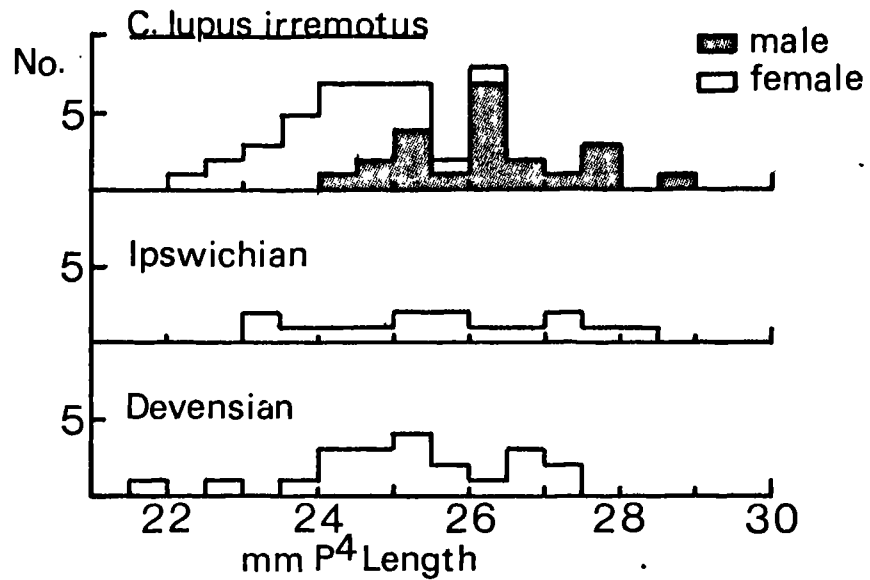


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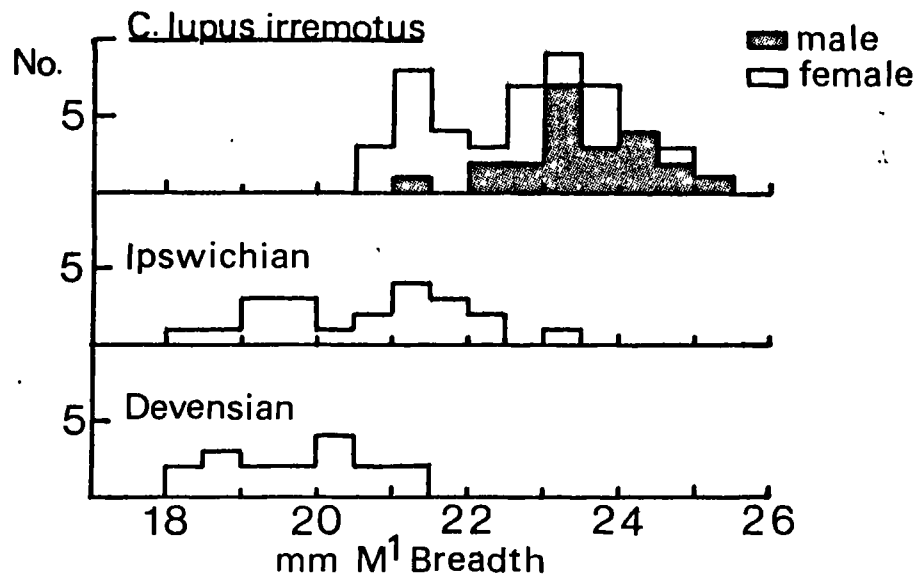


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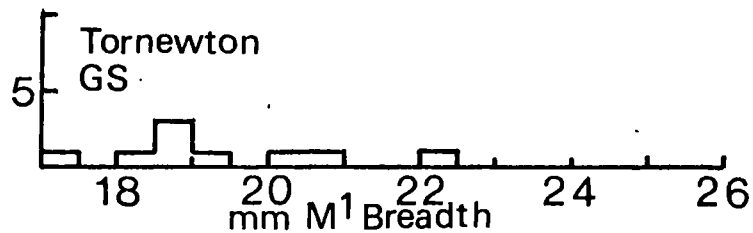


Fig. 38. Histogram of Wolstonian wolf upper molar 1 breadth

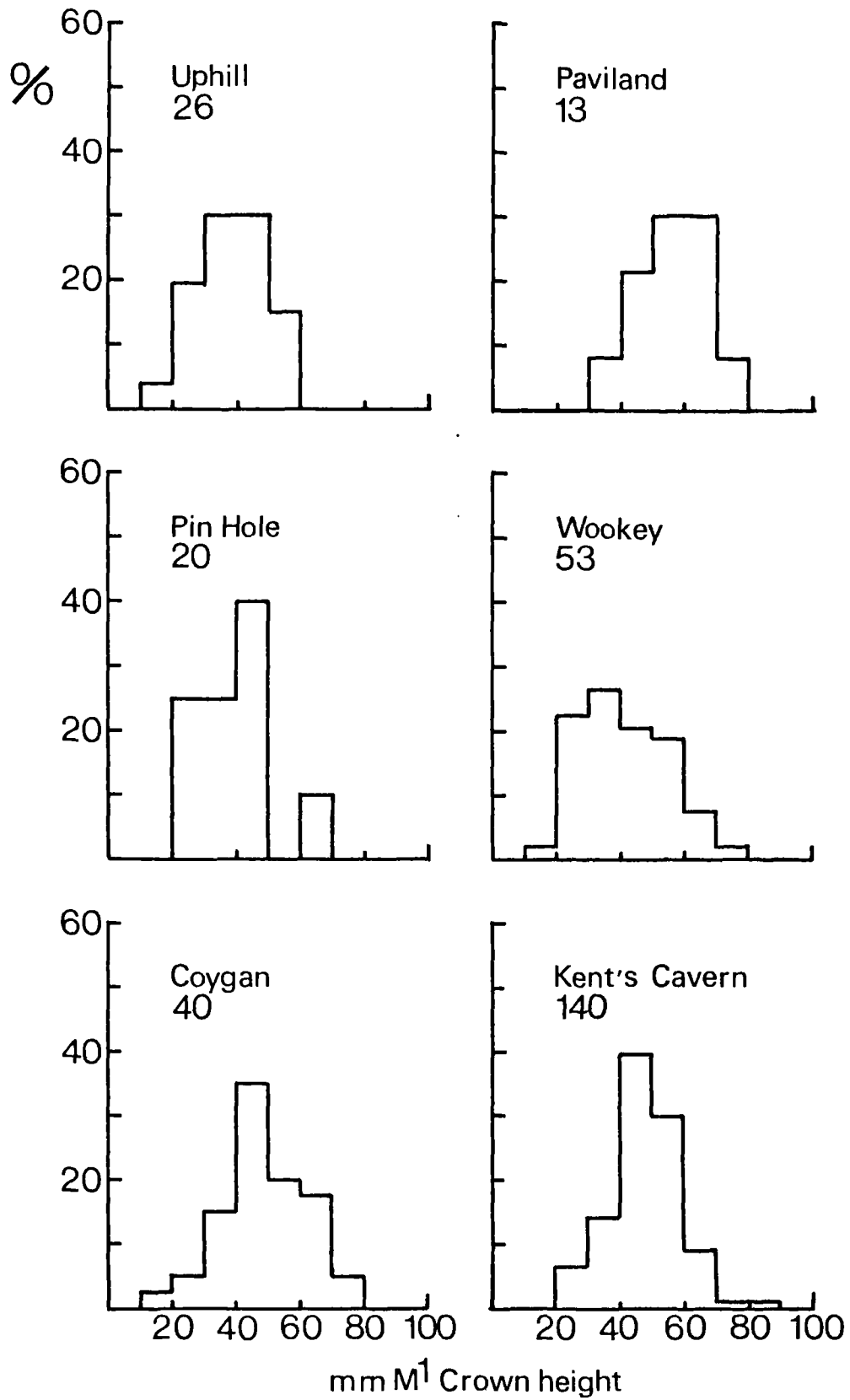


Fig. 39. Age groups of Devensian horses based on wear of upper molar 1

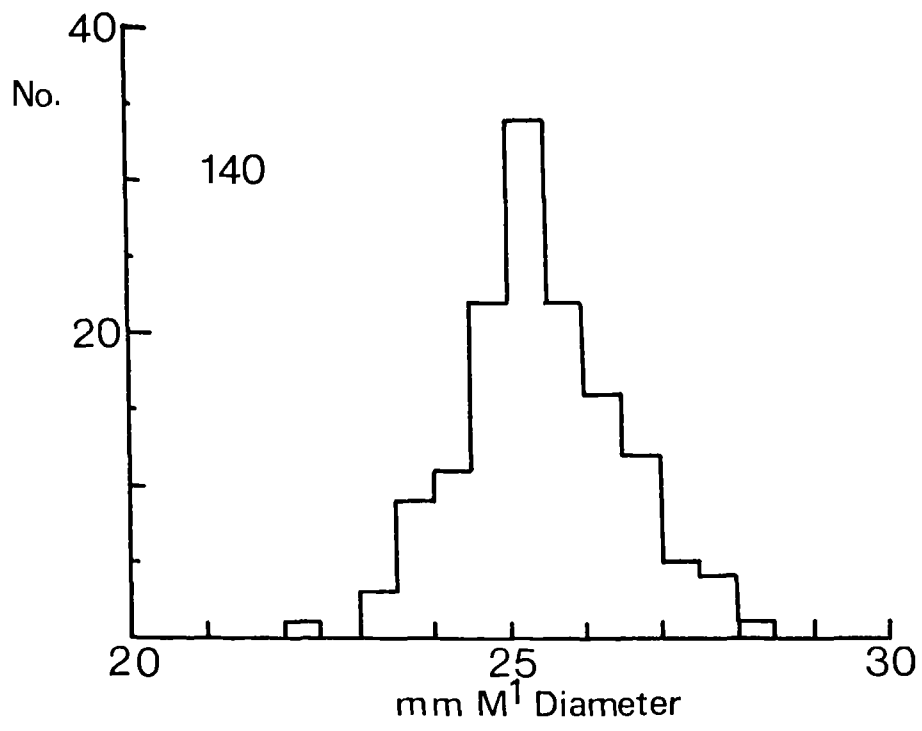
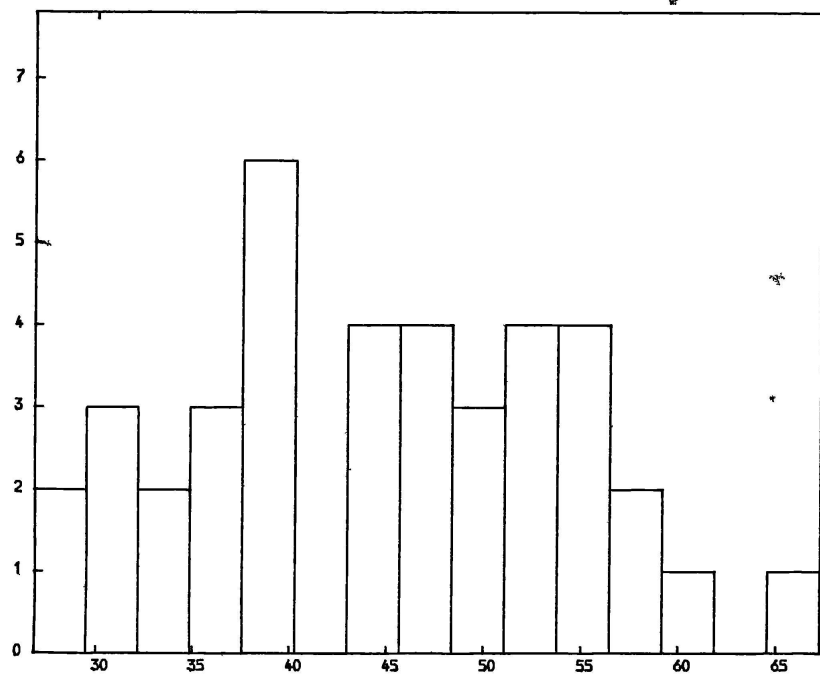


Fig. 40. Size variation in Kent's Cavern horses

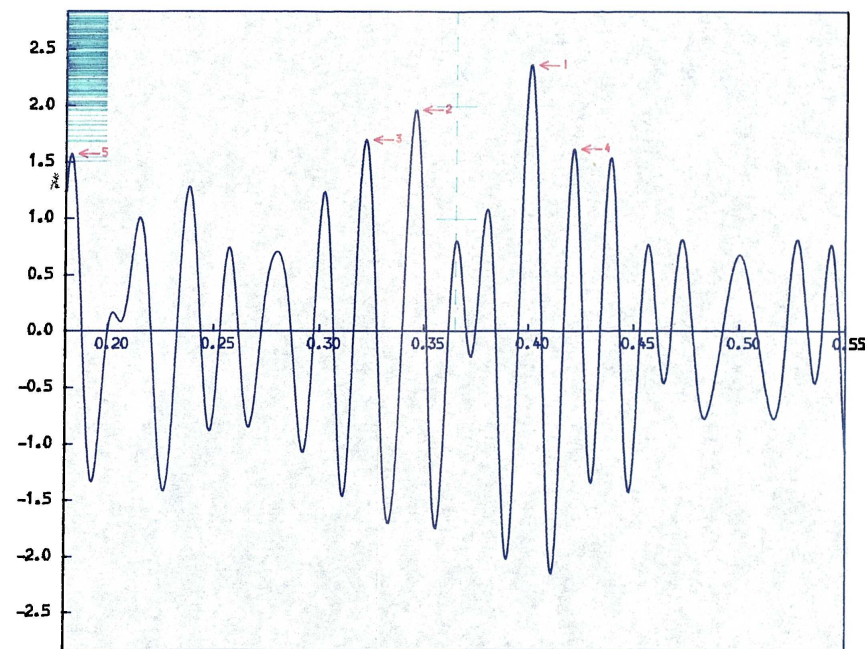
Fig. 41



HISTOGRAM (RAW DATA)

MEAN = 44.667 VARIANCE = 93.070 SKEWNESS = 0.089 KURTOSIS = -0.994
 MAXIMUM = 66.000 MINIMUM = 28.000 RANGE = 38.000
 THE SAMPLE SIZE IS 39

SITE:- KENT'S CAVERN TOOTH:- PREMOLAR 2 PARITY:- LEFT MEASUREMENT:- CROWN HEIGHT
 PRODUCED ON 11/04/80 AT 10/42/52

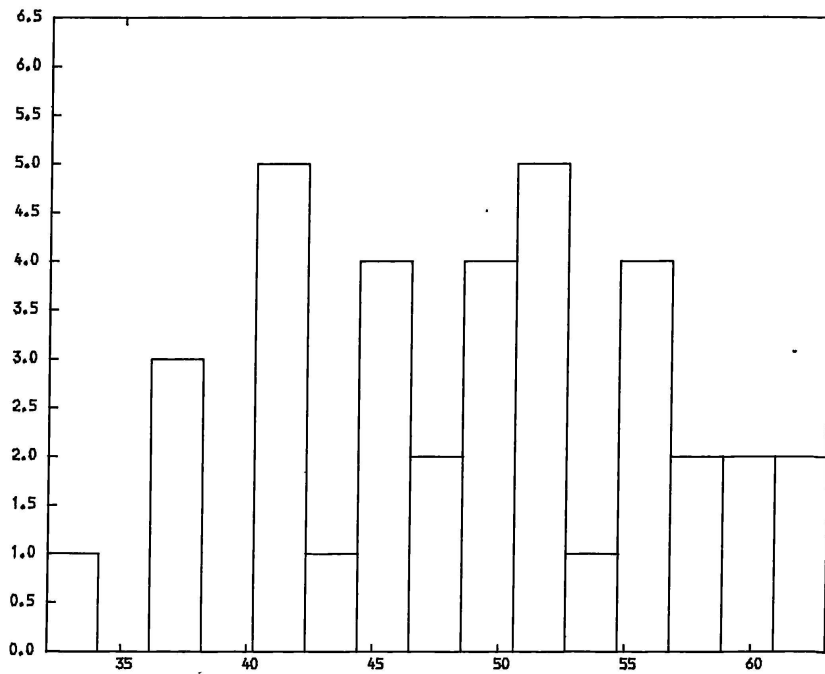


COSINE QUANTOGRAM (RAW DATA)

QUANTUM INDICATED OF 2.496, WITH ALTITUDE 2.365
 SECONDARY INDICATIONS OF QUANTA OF 2.895, 3.113, 2.374, 5.488, WITH ALTITUDES 1.967, 1.700, 1.619, 1.576,
 THE SAMPLE SIZE IS 39. THE MONTE CARLO TEST IS BASED UPON 250 SIMULATIONS.
 THE HYPOTHESIS OF NO QUANTUM IS REJECTED AT LEVEL 0.701

SITE:- KENT'S CAVERN TOOTH:- PREMOLAR 2 PARITY:- LEFT MEASUREMENT:- CROWN HEIGHT
 PRODUCED ON 11/04/80 AT 10/42/52, 543.306 SECONDS OF CPU TIME USED.

Fig. 42

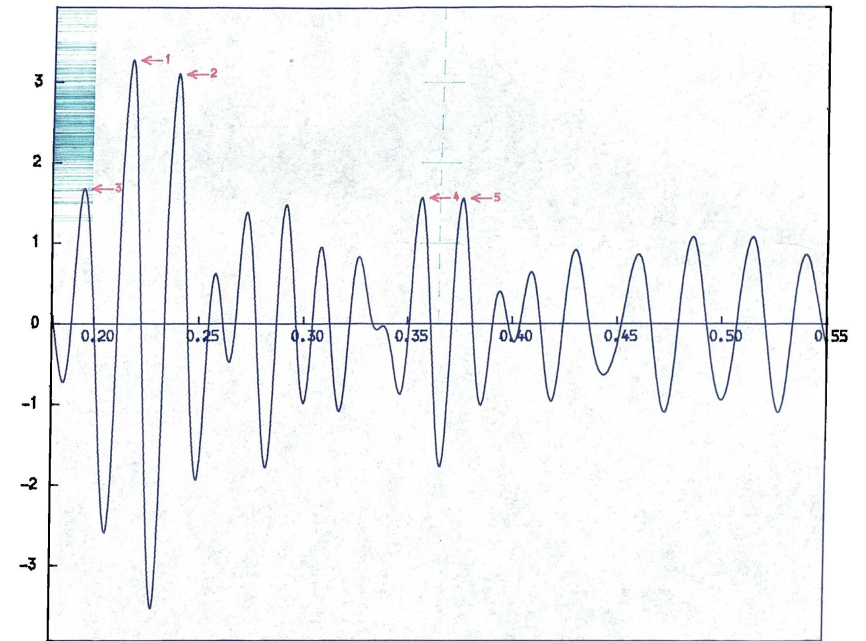


HISTOGRAM (RAW DATA)

MEAN = 48.889 VARIANCE = 55.759 SKEWNESS = -0.160 KURTOSIS = -0.905
 MAXIMUM = 62.000 MINIMUM = 33.000 RANGE = 29.000
 THE SAMPLE SIZE IS 36

SITE-- KENT'S CAVERN TOOTH-- PREMOLAR 2 PARITY-- RIGHT MEASUREMENT-- CROWN HEIGHT

PRODUCED ON 11/04/80 AT 00/40/19



COSINE QUANTOGRAM (RAW DATA)

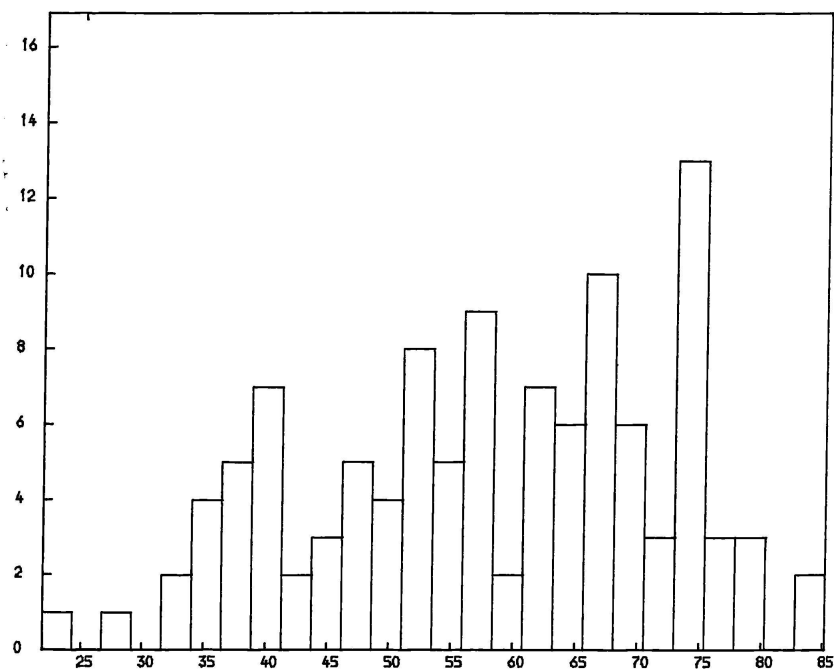
QUANTUM INDICATED OF 4.603, WITH ALTITUDE 3.272
 SECONDARY INDICATIONS OF QUANTA OF 4.184, 5.120, 2.805, 2.660, WITH ALTITUDES 3.102, 1.671, 1.555, 1.548,
 THE SAMPLE SIZE IS 36. THE MONTE CARLO TEST IS BASED UPON 250 SIMULATIONS.

THE HYPOTHESIS OF NO QUANTUM IS REJECTED AT LEVEL 0.074

SITE-- KENT'S CAVERN TOOTH-- PREMOLAR 2 PARITY-- RIGHT MEASUREMENT-- CROWN HEIGHT

PRODUCED ON 11/04/80 AT 00/40/19, 501.878 SECONDS OF CPU TIME USED.

Fig. 43



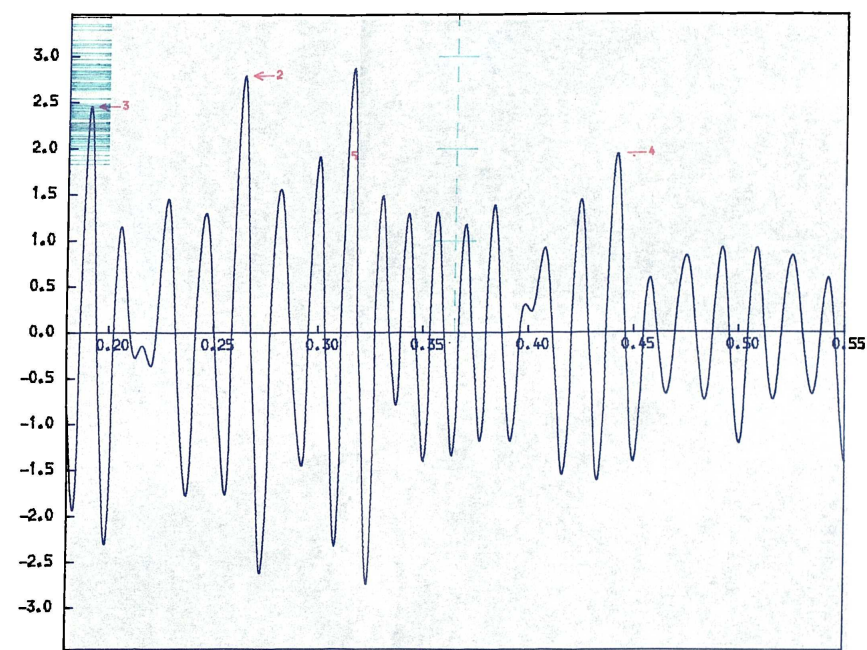
HISTOGRAM (RAW DATA)

MEAN = 57.802 VARIANCE = 194.324 SKEWNESS = -0.302 KURTOSIS = -0.872
 MAXIMUM = 84.000 MINIMUM = 23.000 RANGE = 61.000
 THE SAMPLE SIZE IS 111

SITE:- KENT'S CAVERN TOOTH:- PREMOLARS 3,4 PARITY:- LEFT

MEASUREMENT:- CROWN HEIGHT

PRODUCED ON 16/04/80 AT 19/39/54



COSINE QUANTOGRAM (RAW DATA)

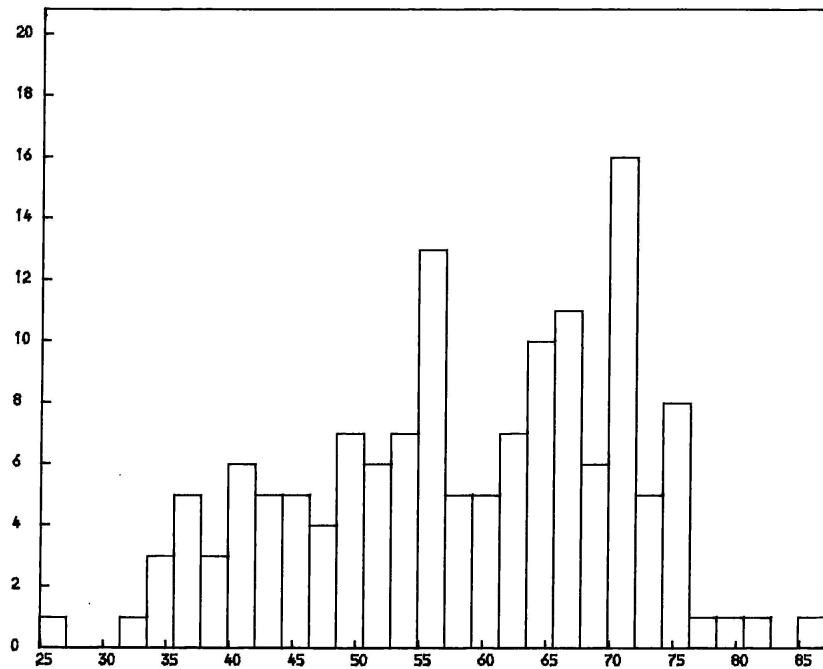
QUANTUM INDICATED OF 3.174, WITH ALTITUDE 2.877
 SECONDARY INDICATIONS OF QUANTA OF 3.796, 5.253, 2.266, 3.339, WITH ALTITUDES 2.793, 2.457, 1.943, 1.912,
 THE SAMPLE SIZE IS 111. THE MONTE CARLO TEST IS BASED UPON 100 SIMULATIONS.

THE HYPOTHESIS OF NO QUANTUM IS REJECTED AT LEVEL 0.257

SITE:- KENT'S CAVERN TOOTH:- PREMOLARS 3,4 PARITY:- LEFT MEASUREMENT:- CROWN HEIGHT

PRODUCED ON 16/04/80 AT 19/39/54, 622.829 SECONDS OF CPU TIME USED.

Fig. 44

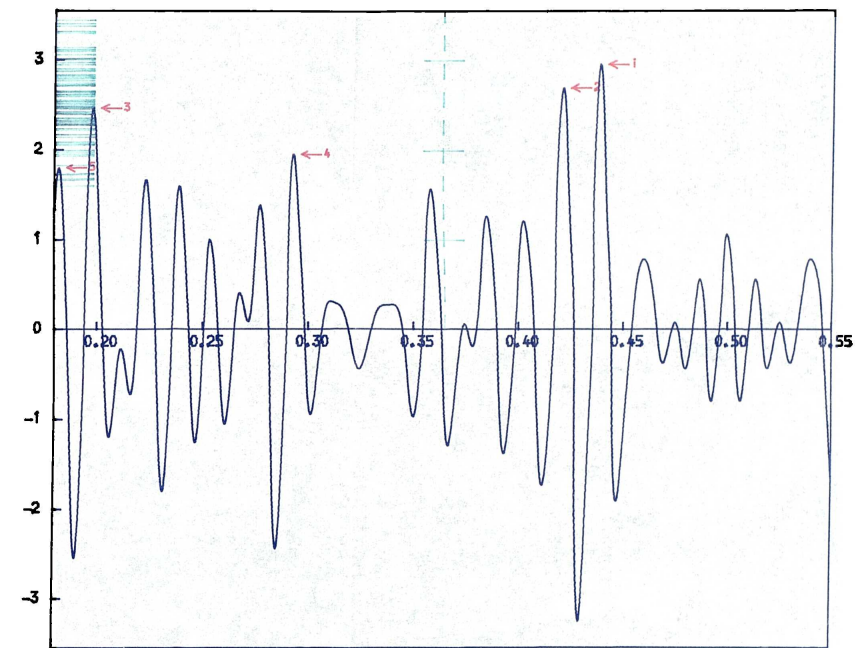


HISTOGRAM (RAW DATA)

MEAN = 58.413 VARIANCE = 157.568 SKEWNESS = -0.308 KURTOSIS = -0.752
 MAXIMUM = 86.000 MINIMUM = 26.000 RANGE = 60.000
 THE SAMPLE SIZE IS 143

SITE:- KENTS CAVERN TOOTH:- PREMOLARS 3,4 PARITY:- RIGHT MEASUREMENT:- CROWN HEIGHT

PRODUCED ON 18/04/80 AT 10/09/08



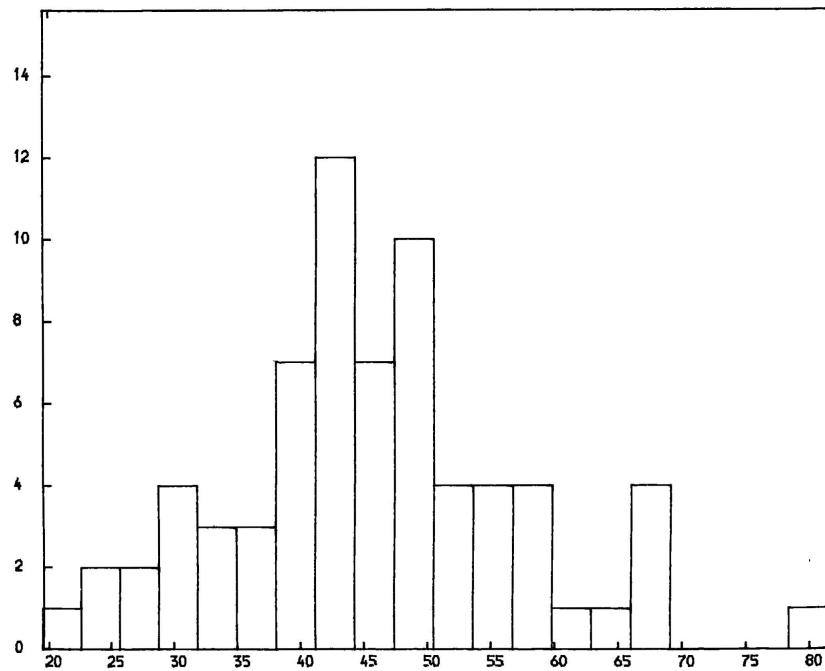
COSINE QUANTOGRAM (RAW DATA)

QUANTUM INDICATED OF 2.274, WITH ALTITUDE 2.953
 SECONDARY INDICATIONS OF QUANTA OF 2.369, 5.044, 3.407, 5.495, WITH ALTITUDES 2.694, 2.467, 1.960, 1.604,
 THE SAMPLE SIZE IS 143. THE MONTE CARLO TEST IS BASED UPON 100 SIMULATIONS.
 THE HYPOTHESIS OF NO QUANTUM IS REJECTED AT LEVEL 0.188

SITE:- KENTS CAVERN TOOTH:- PREMOLARS 3,4 PARITY:- RIGHT MEASUREMENT:- CROWN HEIGHT

PRODUCED ON 18/04/80 AT 10/09/08, 601.580 SECONDS OF CPU TIME USED.

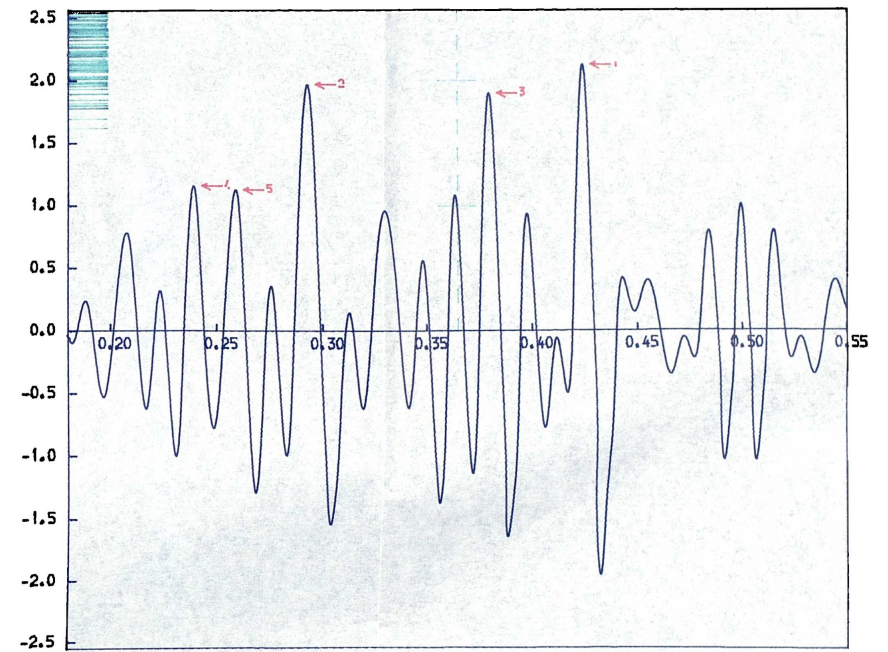
Fig. 45



HISTOGRAM (RAW DATA)

MEAN = 45.657 VARIANCE = 127.243 SKEWNESS = 0.296 KURTOSIS = 0.380
MAXIMUM = 80.000 MINIMUM = 21.000 RANGE = 59.000
THE SAMPLE SIZE IS 70

SITE:- KENT'S CAVERN TOOTH:- MOLAR I PARITY:- LEFT MEASUREMENT:- CROWN HEIGHT
PRODUCED ON 01/04/80 AT 13/13/16



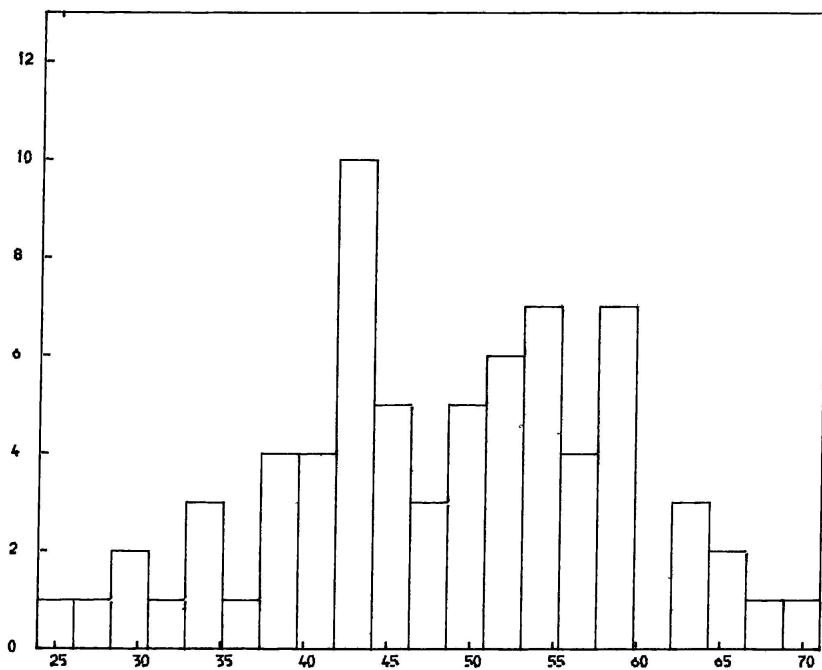
COSINE QUANTOGRAM (RAW DATA)

QUANTUM INDICATED OF 2.354, WITH ALTITUDE 2.129
SECONDARY INDICATIONS OF QUANTA OF 3.415, 2.630, 4.180, 3.861, WITH ALTITUDES 1.971, 1.903, 1.161, 1.130,
THE SAMPLE SIZE IS 70. THE MONTE CARLO TEST IS BASED UPON 250 SIMULATIONS.

THE HYPOTHESIS OF NO QUANTUM IS REJECTED AT LEVEL 0.641

SITE:- KENT'S CAVERN TOOTH:- MOLAR I PARITY:- LEFT MEASUREMENT:- CROWN HEIGHT
PRODUCED ON 01/04/80 AT 13/13/16, 971.095 SECONDS OF CPU TIME USED.

Fig. 46



HISTOGRAM (RAW DATA)

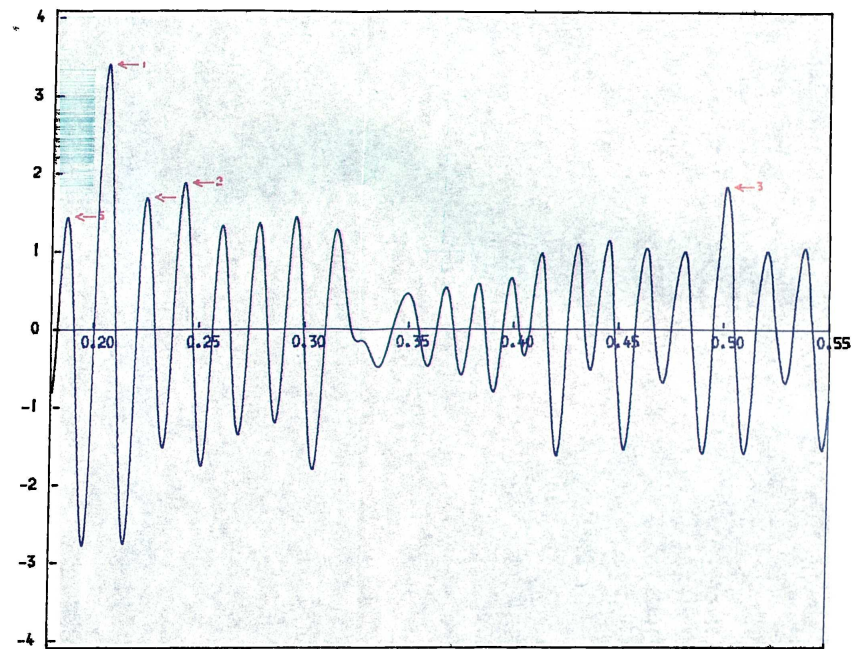
MEAN = 48.394 VARIANCE = 99.757 SKEWNESS = -0.128 KURTOSIS = -0.509

MAXIMUM = 70.000 MINIMUM = 25.000 RANGE = 45.000

THE SAMPLE SIZE IS 71

SITE:- KENT'S CAVERN TOOTH:- MOLAR I PARITY:- RIGHT MEASUREMENT:- CROWN HEIGHT

PRODUCED ON 02/04/80 AT 00/18/44



COSINE QUANTOGRAM (RAW DATA)

QUANTUM INDICATED OF 4.874, WITH ALTITUDE 3.407

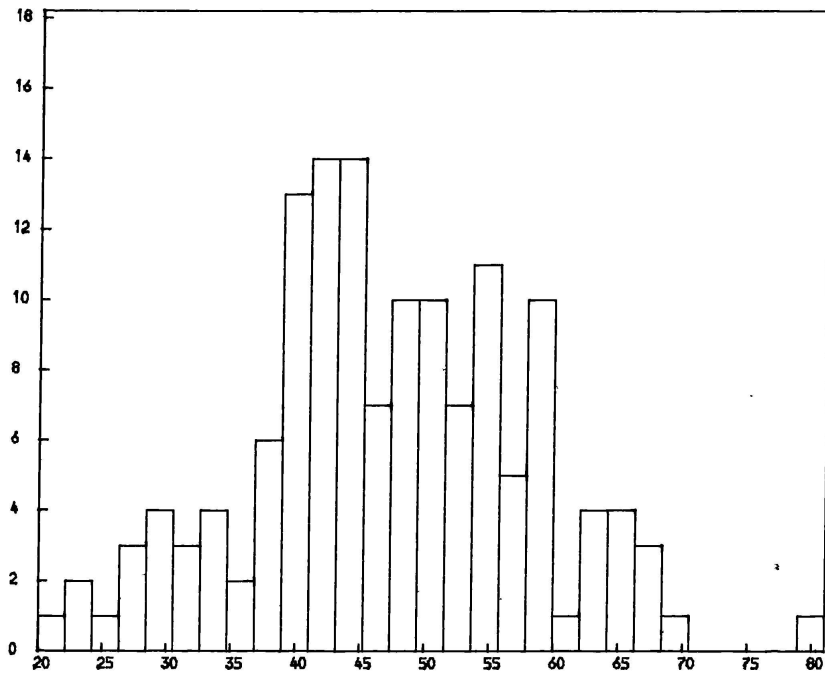
SECONDARY INDICATIONS OF QUANTA OF 4.129, 2.000, 4.456, 5.350, WITH ALTITUDES 1.886, 1.845, 1.695, 1.447, THE SAMPLE SIZE IS 71. THE MONTE CARLO TEST IS BASED UPON 250 SIMULATIONS.

THE HYPOTHESIS OF NO QUANTUM IS REJECTED AT LEVEL 0.014

SITE:- KENT'S CAVERN TOOTH:- MOLAR I PARITY:- RIGHT MEASUREMENT:- CROWN HEIGHT

PRODUCED ON 02/04/80 AT 00/18/44, 984.861 SECONDS OF CPU TIME USED.

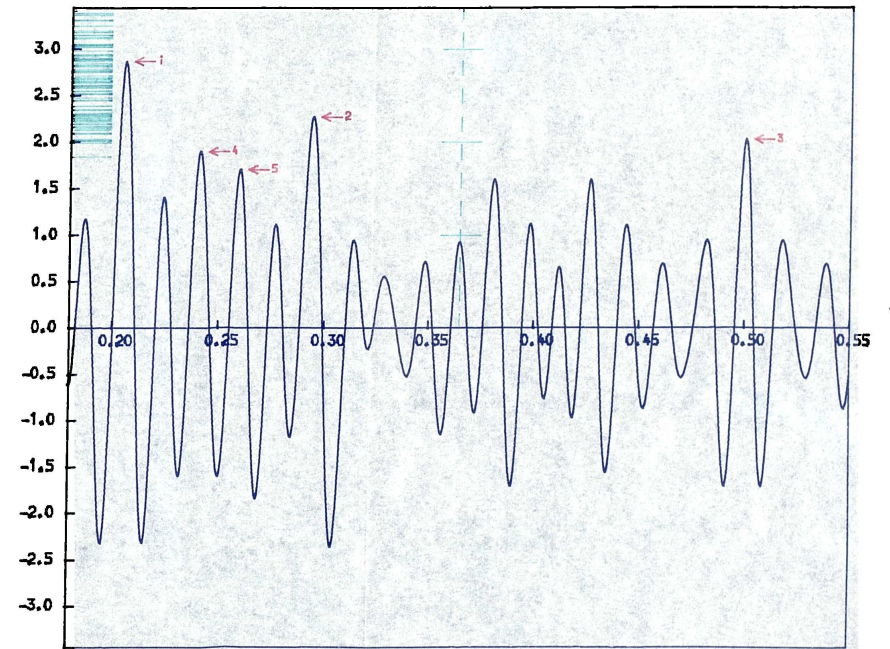
Fig. 47



HISTOGRAM (RAW DATA)

MEAN = 47.035 VARIANCE = 114.477 SKEWNESS = 0.074 KURTOSIS = 0.006
 MAXIMUM = 60.000 MINIMUM = 21.000 RANGE = 59.000
 THE SAMPLE SIZE IS 141

SITE:- KENT'S CAVERN TOOTH:- MOLAR 1 PARITY:- BOTH MEASUREMENT:- CROWN HEIGHT
 PRODUCED ON 25/04/80 AT 21/43/35

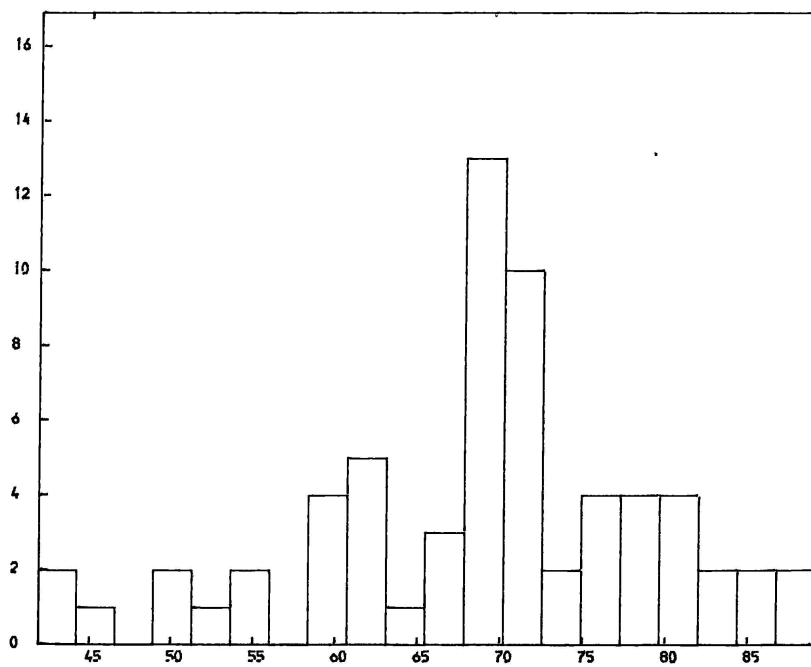


COSINE QUANTOGRAM (RAW DATA)

QUANTUM INDICATED OF 4.862, WITH ALTITUDE 2.868
 SECONDARY INDICATIONS OF QUANTA OF 3.401, 2.000, 4.146, 3.847, WITH ALTITUDES 2.272, 2.023, 1.897, 1.702,
 THE SAMPLE SIZE IS 141. THE MONTE CARLO TEST IS BASED UPON 100 SIMULATIONS.
 THE HYPOTHESIS OF NO QUANTUM IS REJECTED AT LEVEL 0.366

SITE:- KENT'S CAVERN TOOTH:- MOLAR 1 PARITY:- BOTH MEASUREMENT:- CROWN HEIGHT
 PRODUCED ON 25/04/80 AT 21/43/35, 790.417 SECONDS OF CPU TIME USED.

Fig. 48



HISTOGRAM (RAW DATA)

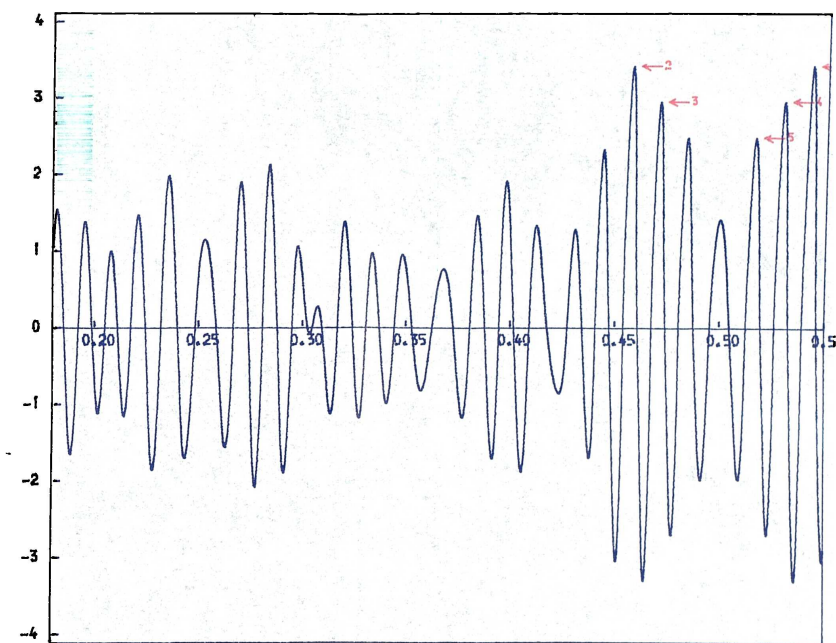
MEAN = 69.21° VARIANCE = 105.094 SKEWNESS = -0.553 KURTOSIS = 0.048

MAXIMUM = 88.000 MINIMUM = 43.000 RANGE = 45.000

THE SAMPLE SIZE IS 64

SITE = KENT'S CAVERN TOOTH = MOLAR 2 PARITY = LEFT MEASUREMENT = CROWN HEIGHT

PRODUCED ON 02/04/80 AT 01/06/18



COSINE QUANTOGRAM (RAW DATA)

QUANTUM INDICATED OF 1.843, WITH ALTITUDE 3.424

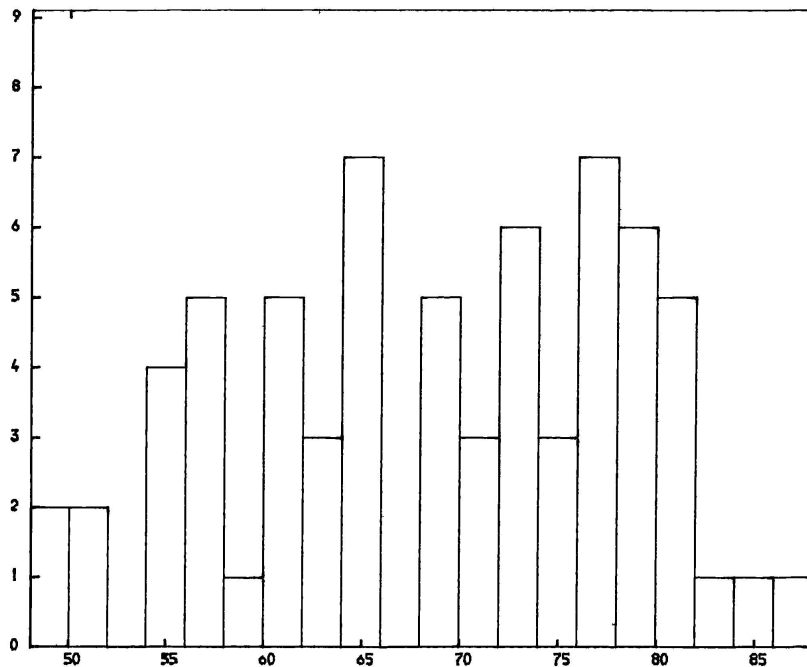
SECONDARY INDICATIONS OF QUANTA OF 2.186, 2.123, 1.889, 1.937, WITH ALTITUDES 3.423, 2.956, 2.954, 2.487, THE SAMPLE SIZE IS 64. THE MONTE CARLO TEST IS BASED UPON 250 SIMULATIONS.

THE HYPOTHESIS OF NO QUANTUM IS REJECTED AT LEVEL 0.068

SITE = KENT'S CAVERN TOOTH = MOLAR 2 PARITY = LEFT MEASUREMENT = CROWN HEIGHT

PRODUCED ON 02/04/80 AT 01/06/18, 886.188 SECONDS OF CPU TIME USED.

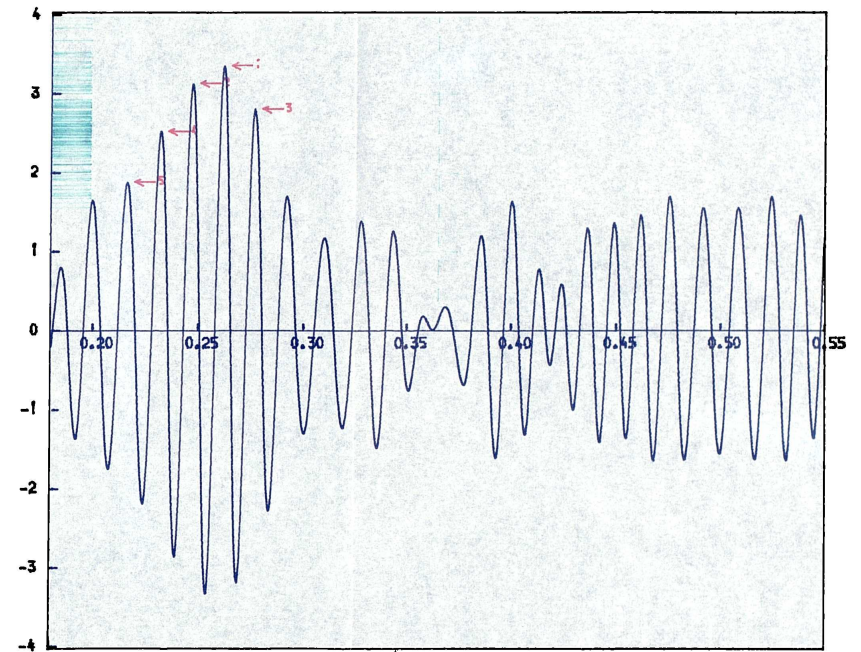
Fig. 49



HISTOGRAM (RAW DATA)

MEAN = 68.627 VARIANCE = 88.540 SKEWNESS = -0.240 KURTOSIS = -0.964
 MAXIMUM = 87.000 MINIMUM = 49.000 RANGE = 38.000
 THE SAMPLE SIZE IS 67

SITE:- KENT'S CAVERN TOOTH:- MOLAR2 PARITY:- RIGHT MEASUREMENT:- CROWN HEIGHT
 PRODUCED ON 01/04/80 AT 21/04/55



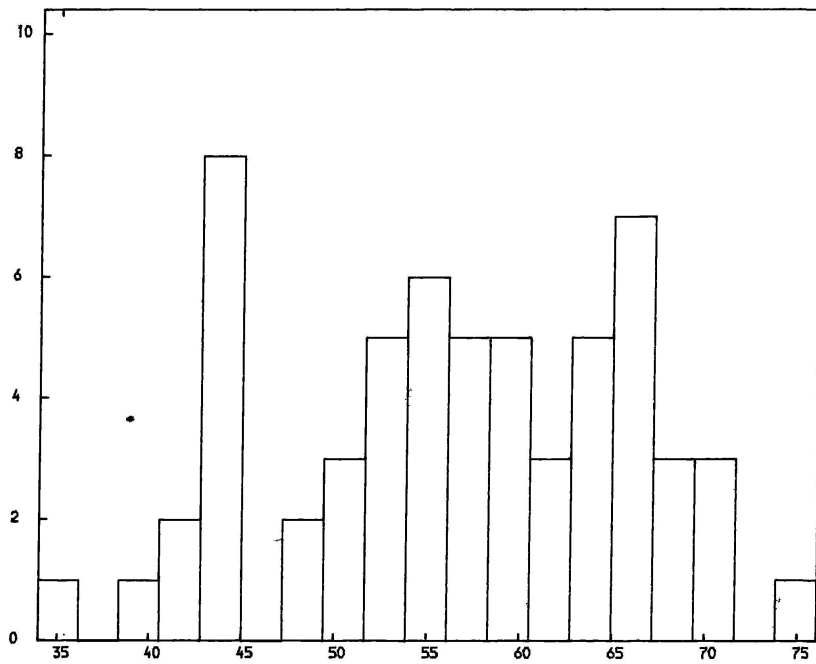
COSINE QUANTOGRAM (RAW DATA)

QUANTUM INDICATED OF 3.821, WITH ALTITUDE 3.356
 SECONDARY INDICATIONS OF QUANTA OF 4.050, 3.616, 4.313, 4.627, WITH ALTITUDES 3.133, 2.806, 2.527, 1.884,
 THE SAMPLE SIZE IS 67. THE MONTE CARLO TEST IS BASED UPON 250 SIMULATIONS.

THE HYPOTHESIS OF NO QUANTUM IS REJECTED AT LEVEL 0.072

SITE:- KENT'S CAVERN TOOTH:- MOLAR2 PARITY:- RIGHT MEASUREMENT:- CROWN HEIGHT
 PRODUCED ON 01/04/80 AT 21/04/55, 929.678 SECONDS OF CPU TIME USED.

Fig. 50



HISTOGRAM (RAW DATA)

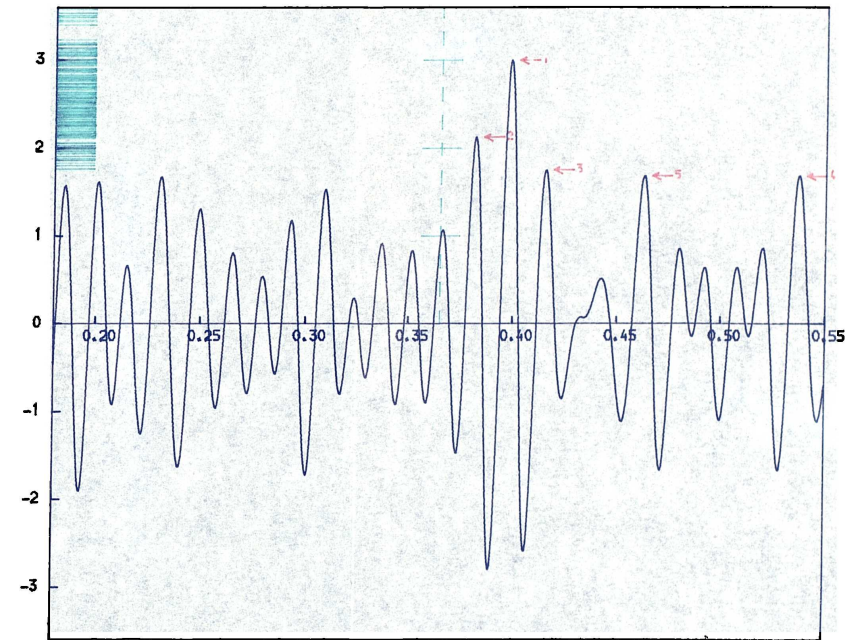
MEAN = 56.417 VARIANCE = 86.349 SKEWNESS = -0.256 KURTOSIS = -0.822

MAXIMUM = 75.000 MINIMUM = 35.000 RANGE = 40.000

THE SAMPLE SIZE IS 60

SITE:- KENT'S CAVERN TOOTH:- MOLAR 3 PARITY:- LEFT MEASUREMENT:- CROWN HEIGHT

PRODUCED ON 03/04/80 AT 13/33/14



COSINE QUANTOGRAM (RAW DATA)

QUANTUM INDICATED OF 2.510, WITH ALTITUDE 2.996

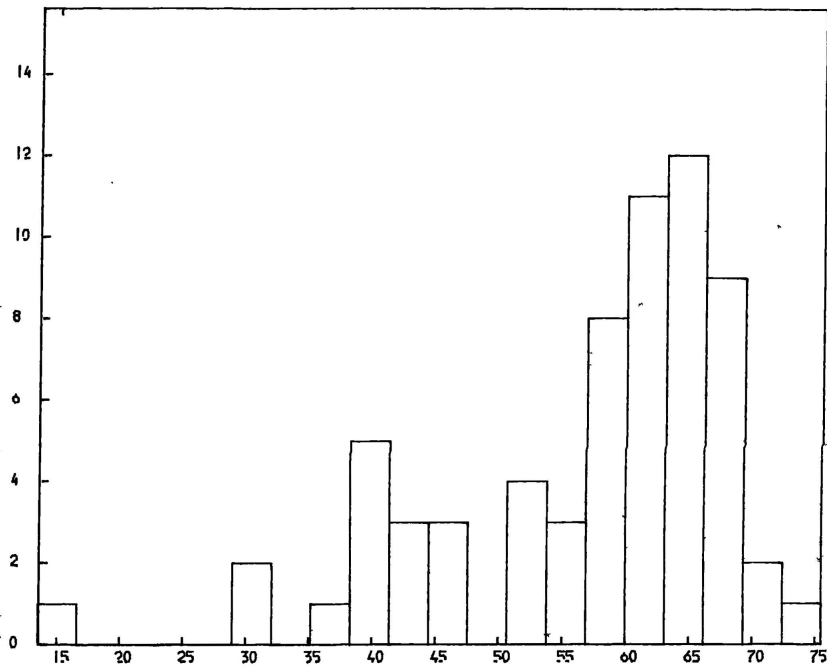
SECONDARY INDICATIONS OF QUANTA OF 2.618, 2.407, 1.862, 2.162, WITH ALTITUDES 2.128, 1.755, 1.663, 1.663, THE SAMPLE SIZE IS 60. THE MONTE CARLO TEST IS BASED UPON 250 SIMULATIONS.

THE HYPOTHESIS OF NO QUANTUM IS REJECTED AT LEVEL 0.155

SITE:- KENT'S CAVERN TOOTH:- MOLAR 3 PARITY:- LEFT MEASUREMENT:- CROWN HEIGHT

PRODUCED ON 03/04/80 AT 13/33/14, 833.090 SECONDS OF CPU TIME USED.

Fig. 51

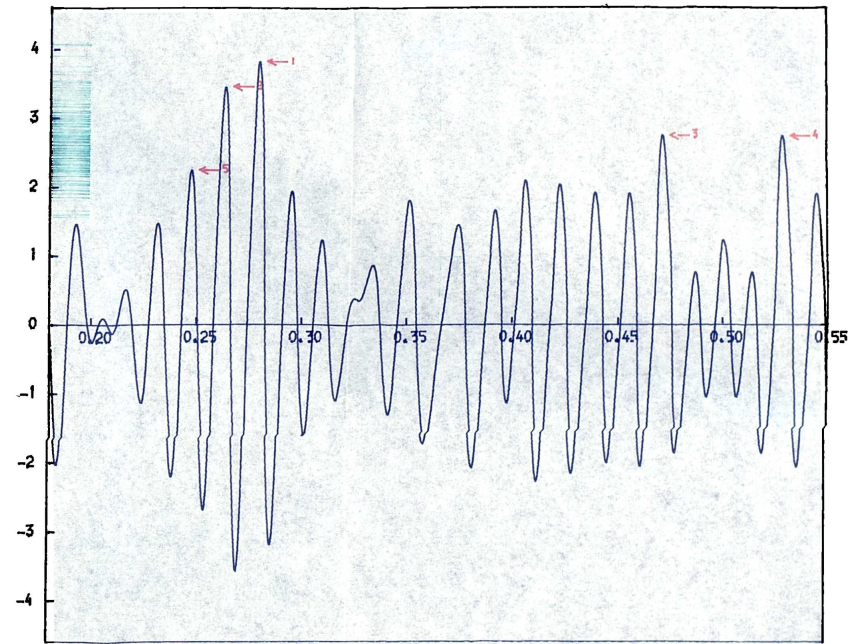


HISTOGRAM (RAW DATA)

MEAN = 56.846 VARIANCE = 139.538 SKEWNESS = -1.108 KURTOSIS = 1.017
 MAXIMUM = 74.000 MINIMUM = 15.000 RANGE = 59.000

THE SAMPLE SIZE IS 65

SITE-- KENT'S CAVERN TOOTH-- MOLAR 3 PARITY-- RIGHT MEASUREMENT-- CROWN HEIGHT
 PRODUCED ON 01/04/80 AT 23/49/17



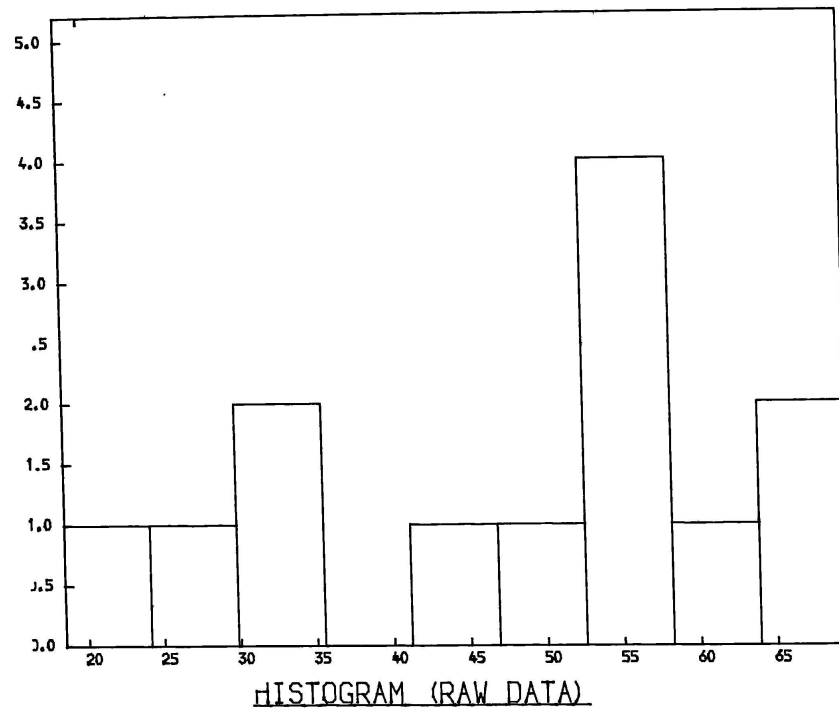
COSINE QUANTOGRAM (RAW DATA)

QUANTUM INDICATED OF 3.594, WITH ALTITUDE 3.830
 SECONDARY INDICATIONS OF QUANTA OF 3.614, 2.123, 1.890, 4.054, WITH ALTITUDES 3.465, 2.747, 2.746, 2.260,
 THE SAMPLE SIZE IS 65. THE MONTE CARLO TEST IS BASED UPON 250 SIMULATIONS.

THE HYPOTHESIS OF NO QUANTUM IS REJECTED AT LEVEL 0.014

SITE-- KENT'S CAVERN TOOTH-- MOLAR 3 PARITY-- RIGHT MEASUREMENT-- CROWN HEIGHT
 PRODUCED ON 01/04/80 AT 23/49/17, 902.006 SECONDS OF CPU TIME USED.

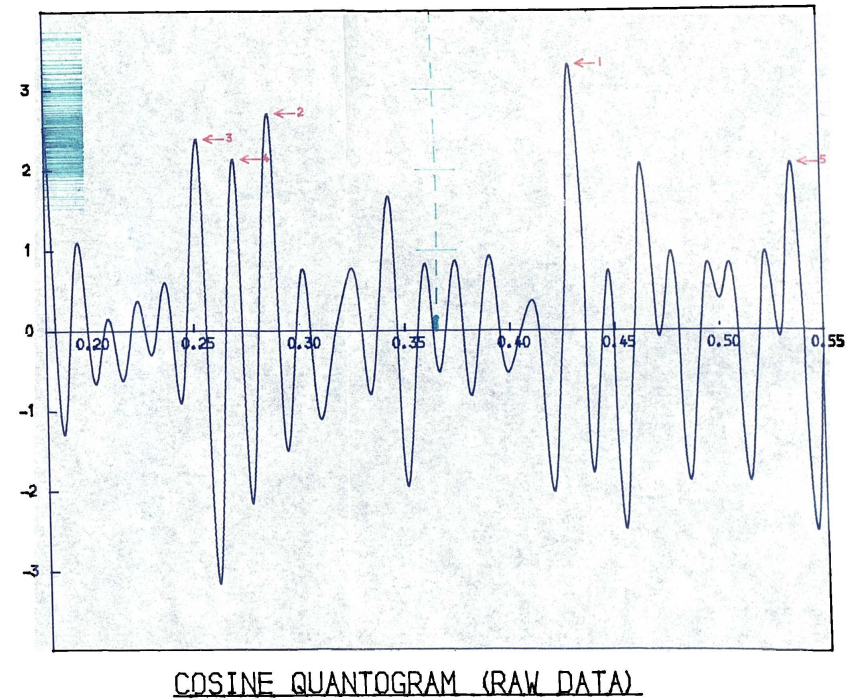
Fig. 52



MEAN = 48.000 VARIANCE = 242.633 SKEWNESS = -0.380 KURTOSIS = -1.450
 MAXIMUM = 67.000 MINIMUM = 21.000 RANGE = 46.000

THE SAMPLE SIZE IS 13

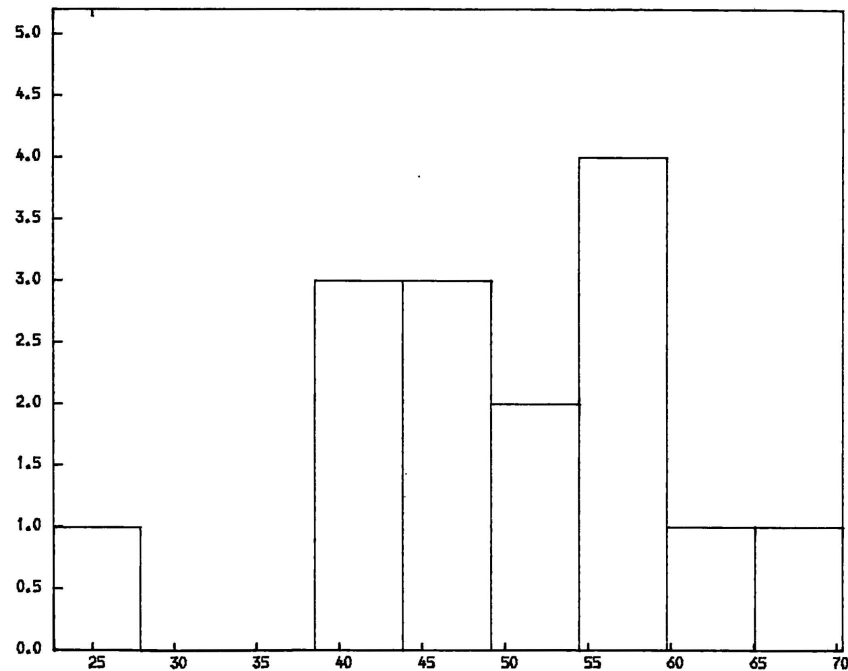
SITE:- VOOKEY HOLE TOOTH:- PREMOLAR2 PARITY:- LEFT MEASUREMENT:- CROWN HEIGHT
 PRODUCED ON 24/04/80 AT 08/51/10



QUANTUM INDICATED OF 2.321, WITH ALTITUDE 3.314
 SECONDARY INDICATIONS OF QUANTA OF 3.504, 3.971, 3.716, 1.645, WITH ALTITUDES 2.704, 2.306, 2.139, 2.072,
 THE SAMPLE SIZE IS 13. THE MONTE CARLO TEST IS BASED UPON 250 SIMULATIONS.
THE HYPOTHESIS OF NO QUANTUM IS REJECTED AT LEVEL 0.056

SITE:- VOOKEY HOLE TOOTH:- PREMOLAR2 PARITY:- LEFT MEASUREMENT:- CROWN HEIGHT
 PRODUCED ON 24/04/80 AT 08/51/10, 184.470 SECONDS OF CPU TIME USED.

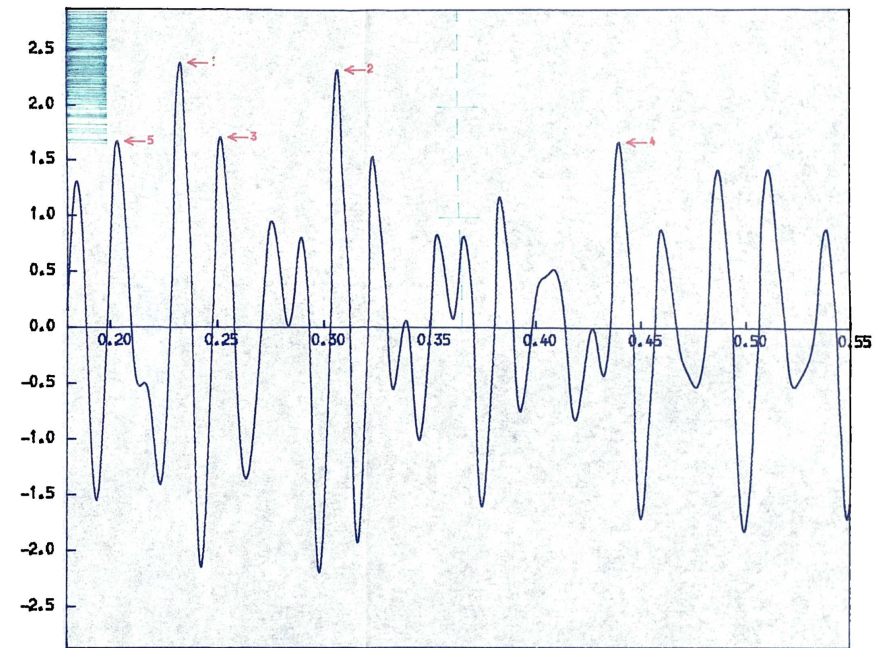
Fig. 53



HISTOGRAM (RAW DATA)

MEAN = 50.267 VARIANCE = 118.924 SKEWNESS = -0.490 KURTOSIS = -0.187
 MAXIMUM = 68.000 MINIMUM = 25.000 RANGE = 43.000
 THE SAMPLE SIZE IS 15

SITE:- VOOKEY HOLE TOOTH:- PREMOLAR 2 PARITY:- RIGHT MEASUREMENT:- CROWN HEIGHT
 PRODUCED ON 23/04/80 AT 09/06/07

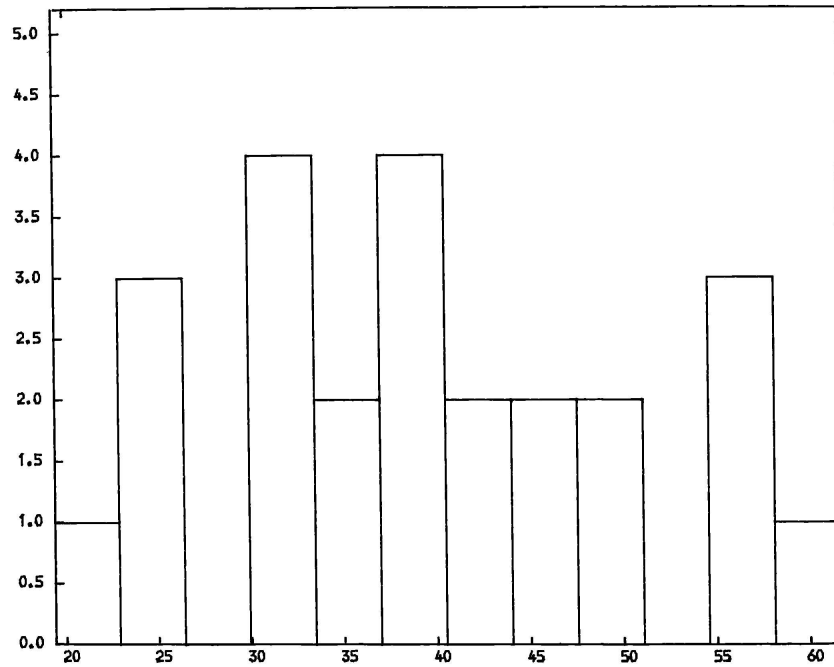


COSINE QUANTOGRAM (RAW DATA)

QUANTUM INDICATED OF 4.282, WITH ALTITUDE 2.389
 SECONDARY INDICATIONS OF QUANTA OF 3.248, 3.959, 2.264, 4.909, WITH ALTITUDES 2.335, 1.721, 1.682, 1.679,
 THE SAMPLE SIZE IS 15. THE MONTE CARLO TEST IS BASED UPON 250 SIMULATIONS.
 THE HYPOTHESIS OF NO QUANTUM IS REJECTED AT LEVEL 0.614

SITE:- VOOKEY HOLE TOOTH:- PREMOLAR 2 PARITY:- RIGHT MEASUREMENT:- CROWN HEIGHT
 PRODUCED ON 23/04/80 AT 09/06/07, 212.099 SECONDS OF CPU TIME USED.

Fig. 54



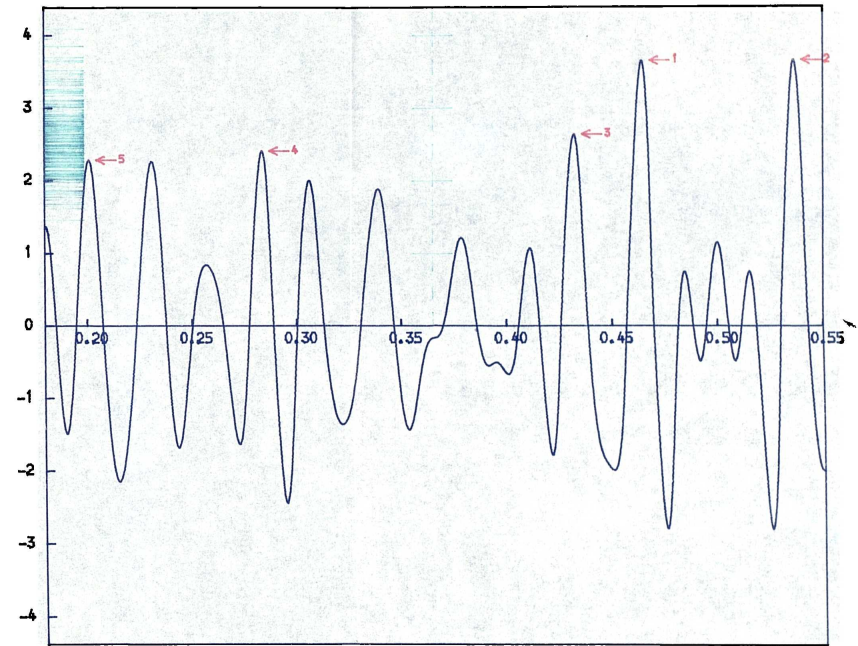
HISTOGRAM (RAW DATA)

MEAN = 39.750 VARIANCE = 125.761 SKEWNESS = 0.196 KURTOSIS = -1.096

MAXIMUM = 60.000 MINIMUM = 21.000 RANGE = 39.000

THE SAMPLE SIZE IS 24

SITE:- WOOKEY HOLE TOOTH:- MOLAR 1 PARITY:- LEFT MEASUREMENT:- CROWN HEIGHT
 PRODUCED ON 22/04/80 AT 08/58/27



COSINE QUANTOGRAM (RAW DATA)

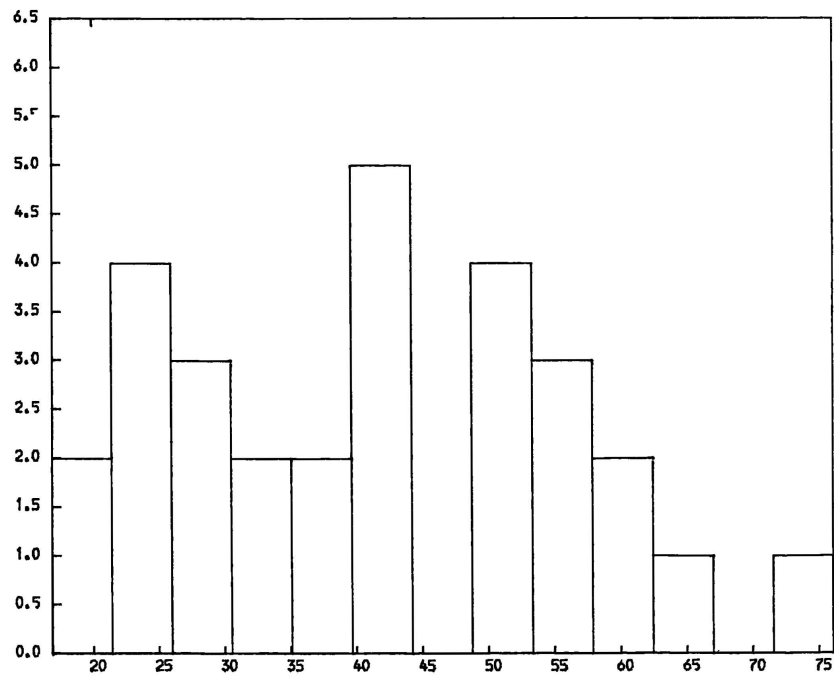
QUANTUM INDICATED OF 2.156, WITH ALTITUDE 3.653

SECONDARY INDICATIONS OF QUANTA OF 1.845, 2.315, 3.531, 4.982, WITH ALTITUDES 3.653, 2.638, 2.415, 2.288,
 THE SAMPLE SIZE IS 24. THE MONTI CARLO TEST IS BASED UPON 250 SIMULATIONS.

THE HYPOTHESIS OF NO QUANTUM IS REJECTED AT LEVEL 0.024

SITE:- WOOKEY HOLE TOOTH:- MOLAR 1 PARITY:- LEFT MEASUREMENT:- CROWN HEIGHT
 PRODUCED ON 22/04/80 AT 08/58/27, 336.268 SECONDS OF CPU TIME USED.

Fig. 55



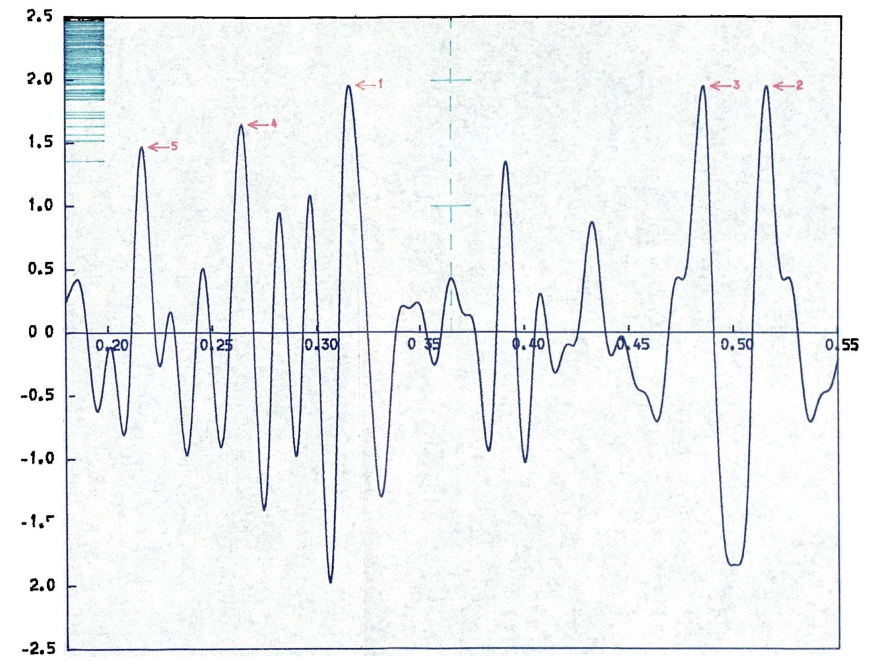
HISTOGRAM (RAW DATA)

MEAN = 41.310 VARIANCE = 223.150 SKEWNESS = 0.223 KURTOSIS = -1.053
 MAXIMUM = 74.000 MINIMUM = 19.000 RANGE = 55.000

THE SAMPLE SIZE IS 29

SITE:- WOOKEY HOLE TOOTH:- MOLAR 1 PARITY:- RIGHT MEASUREMENT:- CROWN HEIGHT

PRODUCED ON 16/04/80 AT 01/14/11



COSINE QUANTOGRAM (RAW DATA)

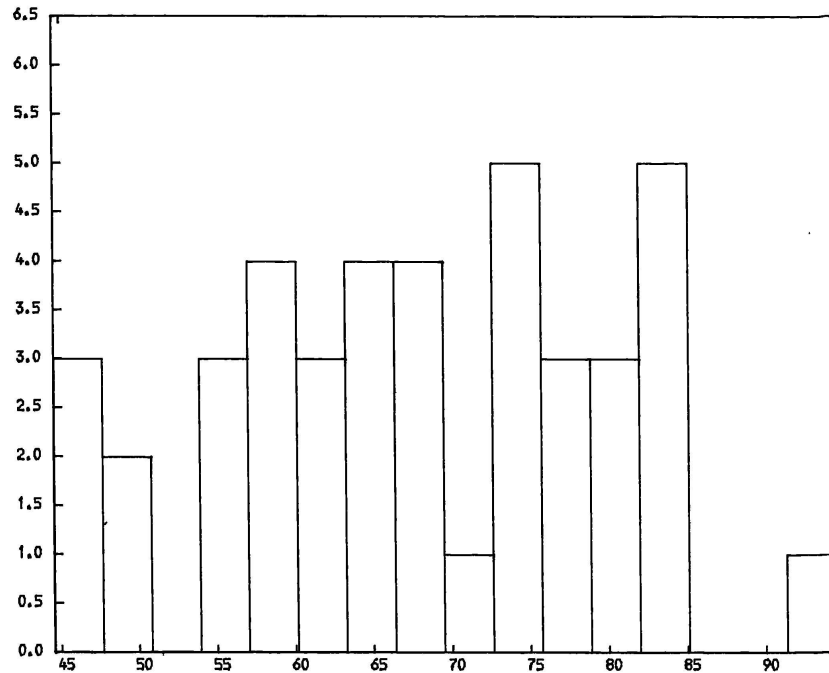
QUANTUM INDICATED OF 3.165, WITH ALTITUDE 1.960
 SECONDARY INDICATIONS OF QUANTA OF 1.942, 2.062, 3.782, 4.618, WITH ALTITUDES 1.950, 1.950, 1.449, 1.469,
 THE SAMPLE SIZE IS 29. THE MONTE CARLO TEST IS BASED UPON 250 SIMULATIONS.

THE HYPOTHESIS OF NO QUANTUM IS REJECTED AT LEVEL 0.912

SITE:- WOOKEY HOLE TOOTH:- MOLAR 1 PARITY:- RIGHT MEASUREMENT:- CROWN HEIGHT

PRODUCED ON 16/04/80 AT 01/14/11, 405.253 SECONDS OF CPU TIME USED.

Fig. 56



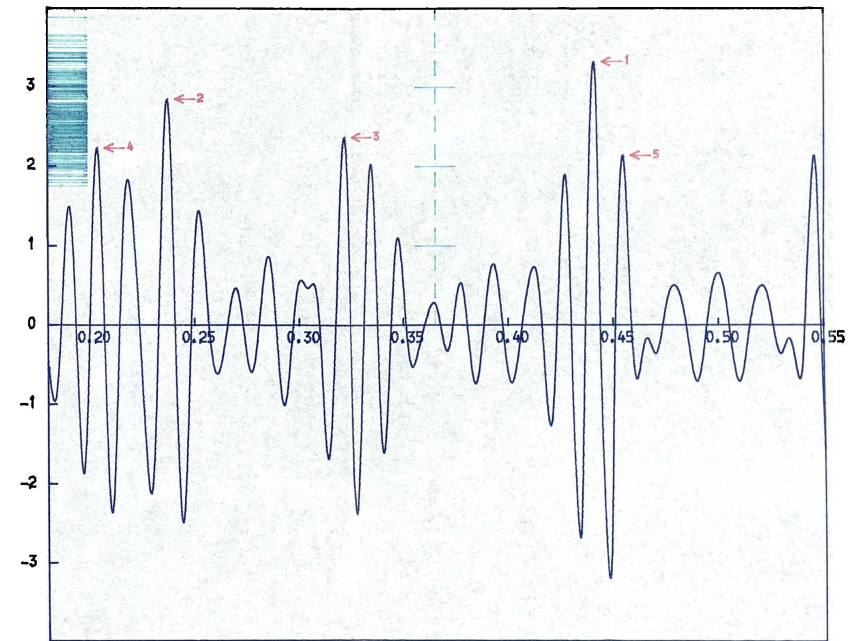
HISTOGRAM (RAW DATA)

MEAN = 67.976 VARIANCE = 144.974 SKEWNESS = -0.149 KURTOSIS = -0.895

MAXIMUM = 93.000 MINIMUM = 46.000 RANGE = 47.000

THE SAMPLE SIZE IS 41

SITE:- VOOKEY HOLE TOOTH:- MOLAR 2 PARITY:- LEFT MEASUREMENT:- CROWN HEIGHT
 PRODUCED ON 15/04/80 AT 06/05/46



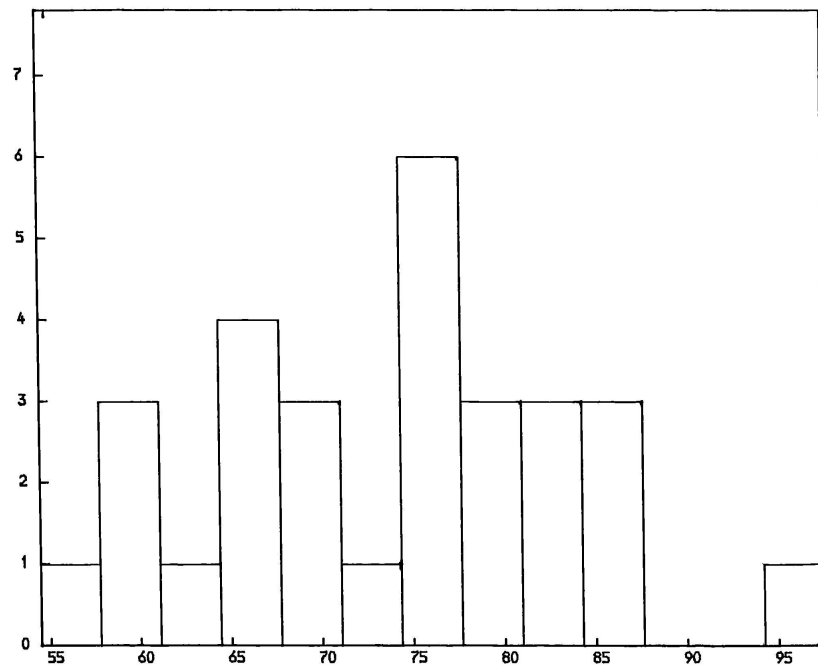
COSINE QUANTOGRAM (RAW DATA)

QUANTUM INDICATED OF 2.269, WITH ALTITUDE 3.317
 SECONDARY INDICATIONS OF QUANTA OF 4.219, 3.113, 4.915, 2.200, WITH ALTITUDES 2.844, 2.347, 2.228, 2.137,
 THE SAMPLE SIZE IS 41. THE MONTE CARLO TEST IS BASED UPON 250 SIMULATIONS.

THE HYPOTHESIS OF NO QUANTUM IS REJECTED AT LEVEL 0.092

SITE:- VOOKEY HOLE TOOTH:- MOLAR 2 PARITY:- LEFT MEASUREMENT:- CROWN HEIGHT
 PRODUCED ON 15/04/80 AT 06/05/46, 570.847 SECONDS OF CPU TIME USED.

Fig. 57

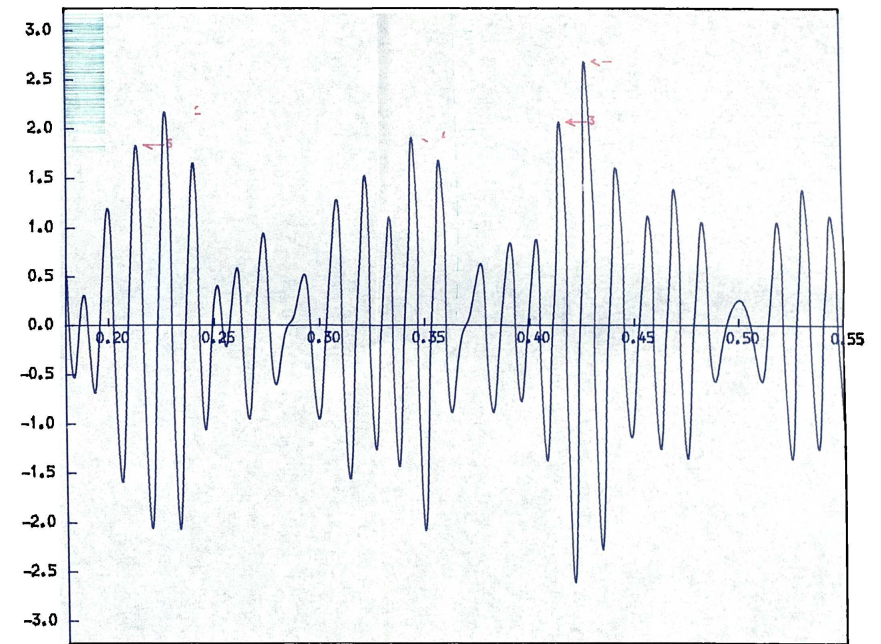


HISTOGRAM (RAW DATA)

MEAN = 73.655 VARIANCE = 97.520 SKEWNESS = 0.073 KURTOSIS = -0.773
 MAXIMUM = 96.000 MINIMUM = 56.000 RANGE = 40.000

THE SAMPLE SIZE IS 29

SITE:- WOOKEY HOLE TOOTH:- MOLAR 2 PARITY:- RIGHT MEASUREMENT:- CROWN HEIGHT
 PRODUCED ON 21/04/80 AT 17/59/50

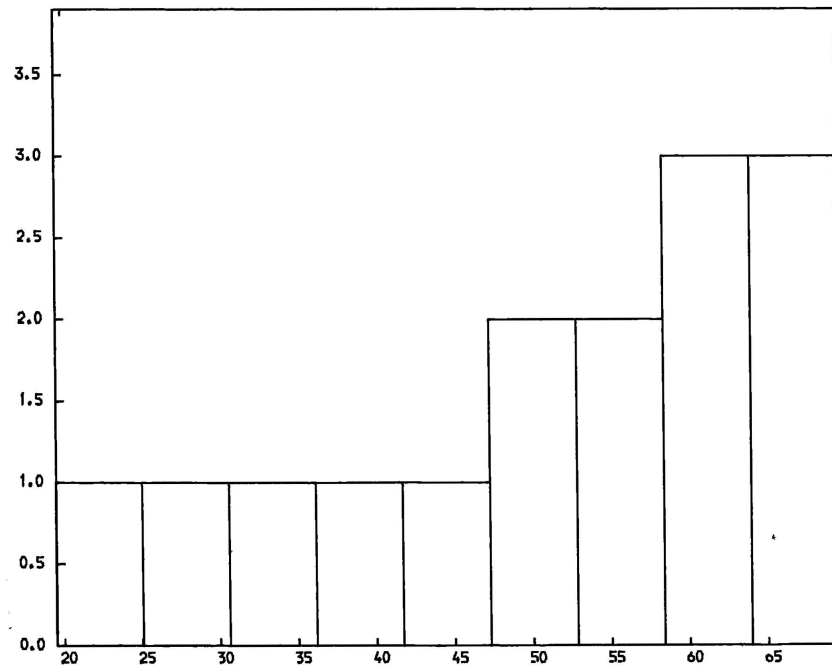


COSINE QUANTOGRAM (RAW DATA)

QUANTUM INDICATED OF 2.339, WITH ALTITUDE 2.689
 SECONDARY INDICATIONS OF QUANTA OF 4.412, 2.411, 2.908, 4.693, WITH ALTITUDES 2.175, 2.074, 1.917, 1.840,
 THE SAMPLE SIZE IS 29. THE MONTE CARLO TEST IS BASED UPON 250 SIMULATIONS.

THE HYPOTHESIS OF NO QUANTUM IS REJECTED AT LEVEL 0.494

SITE:- WOOKEY HOLE TOOTH:- MOLAR 2 PARITY:- RIGHT MEASUREMENT:- CROWN HEIGHT
 PRODUCED ON 21/04/80 AT 17/59/50, 405.315 SECONDS OF CPU TIME USED.



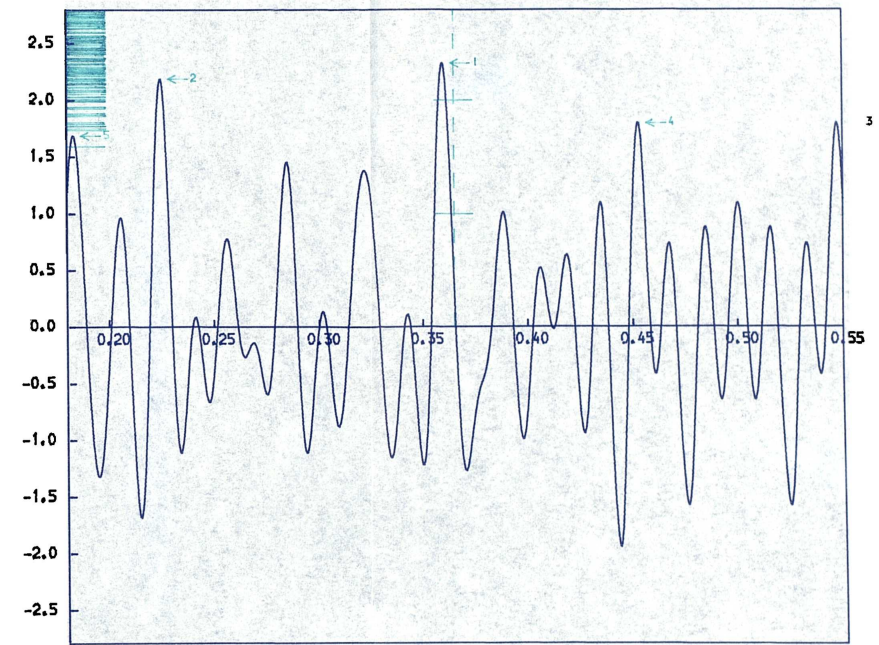
HISTOGRAM (RAW DATA)

MEAN = 50.133 VARIANCE = 208.981 SKEWNESS = -0.583 KURTOSIS = -1.110
 MAXIMUM = 67.000 MINIMUM = 22.000 RANGE = 45.000

THE SAMPLE SIZE IS 15

SITE:- WOOKEY HOLE TOOTH:- MOLAR 3 PARITY:- LEFT MEASUREMENT:- CROWN HEIGHT

PRODUCED ON 31/03/80 AT 15/03/43



COSINE QUANTOGRAM (RAW DATA)

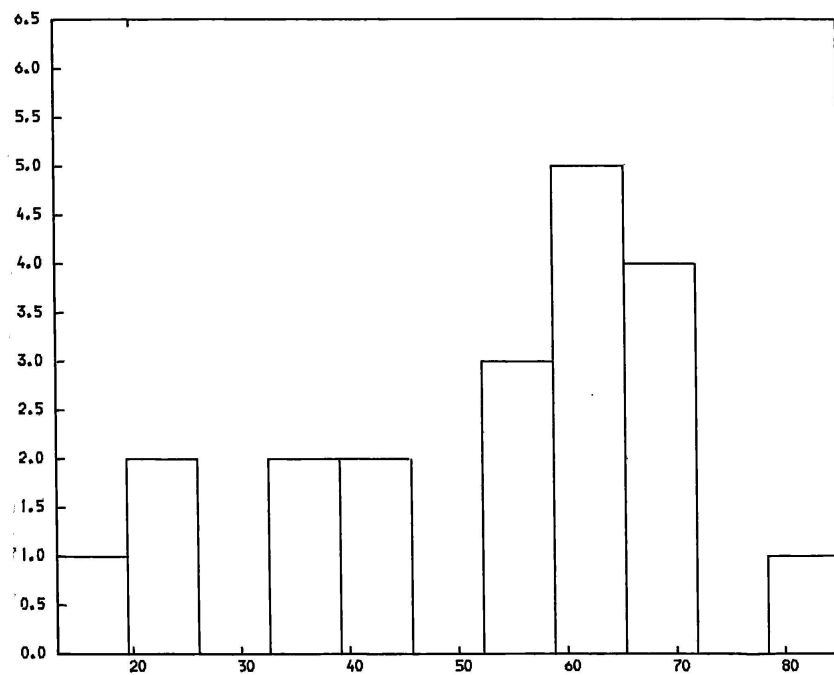
QUANTUM INDICATED OF 2.780, WITH ALTITUDE 2.327
 SECONDARY INDICATIONS OF QUANTA OF 4.456, 1.827, 2.209, 5.466, WITH ALTITUDES 2.191, 1.796, 1.795, 1.688,
 THE SAMPLE SIZE IS 15. THE MONTE CARLO TEST IS BASED UPON 250 SIMULATIONS.

THE HYPOTHESIS OF NO QUANTUM IS REJECTED AT LEVEL 0.737

SITE:- WOOKEY HOLE TOOTH:- MOLAR 3 PARITY:- LEFT MEASUREMENT:- CROWN HEIGHT

PRODUCED ON 31/03/80 AT 15/03/43, 212.115 SECONDS OF CPU TIME USED.

Fig. 59



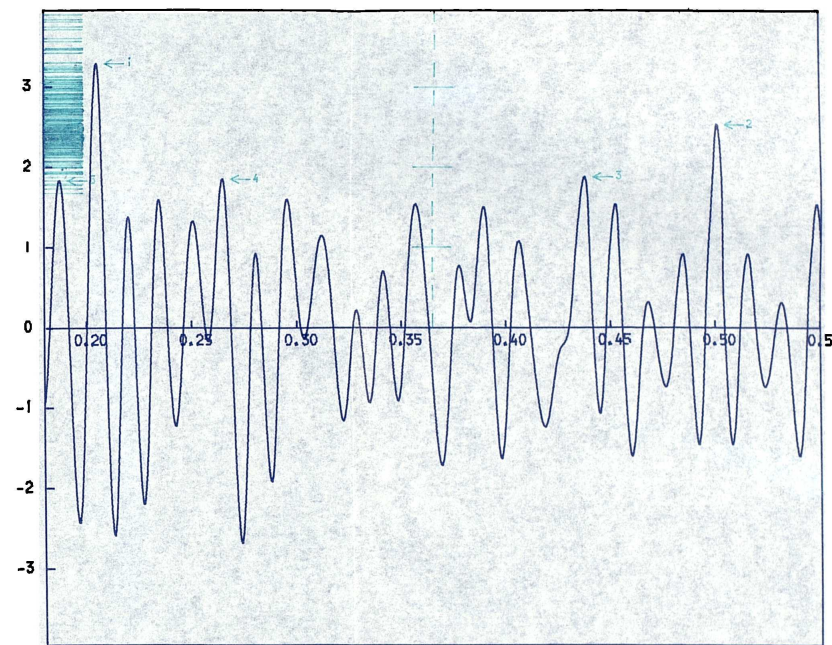
HISTOGRAM (RAW DATA)

MEAN = 52.400 VARIANCE = 332.989 SKEWNESS = -0.586 KURTOSIS = -0.819

MAXIMUM = 82.000 MINIMUM = 16.000 RANGE = 66.000

THE SAMPLE SIZE IS 20

SITE-- WOOKEY HOLE TOOTH-- MOLAR 3 PARITY-- RIGHT MEASUREMENT-- CROWN HEIGHT
 PRODUCED ON 31/03/80 AT 15/32/11



COSINE QUANTOGRAM (RAW DATA)

QUANTUM INDICATED OF 4.880, WITH ALTITUDE 3.287

SECONDARY INDICATIONS OF QUANTA OF 2.000, 2.287, 3.771, 5.336, WITH ALTITUDES 2.528, 1.884, 1.650, 1.631,
 THE SAMPLE SIZE IS 20. THE MONTE CARLO TEST IS BASED UPON 250 SIMULATIONS.

THE HYPOTHESIS OF NO QUANTUM IS REJECTED AT LEVEL 0.060

SITE-- WOOKEY HOLE TOOTH-- MOLAR 3 PARITY-- RIGHT MEASUREMENT-- CROWN HEIGHT
 PRODUCED ON 31/03/80 AT 15/32/11, 281.078 SECONDS OF CPU TIME USED.

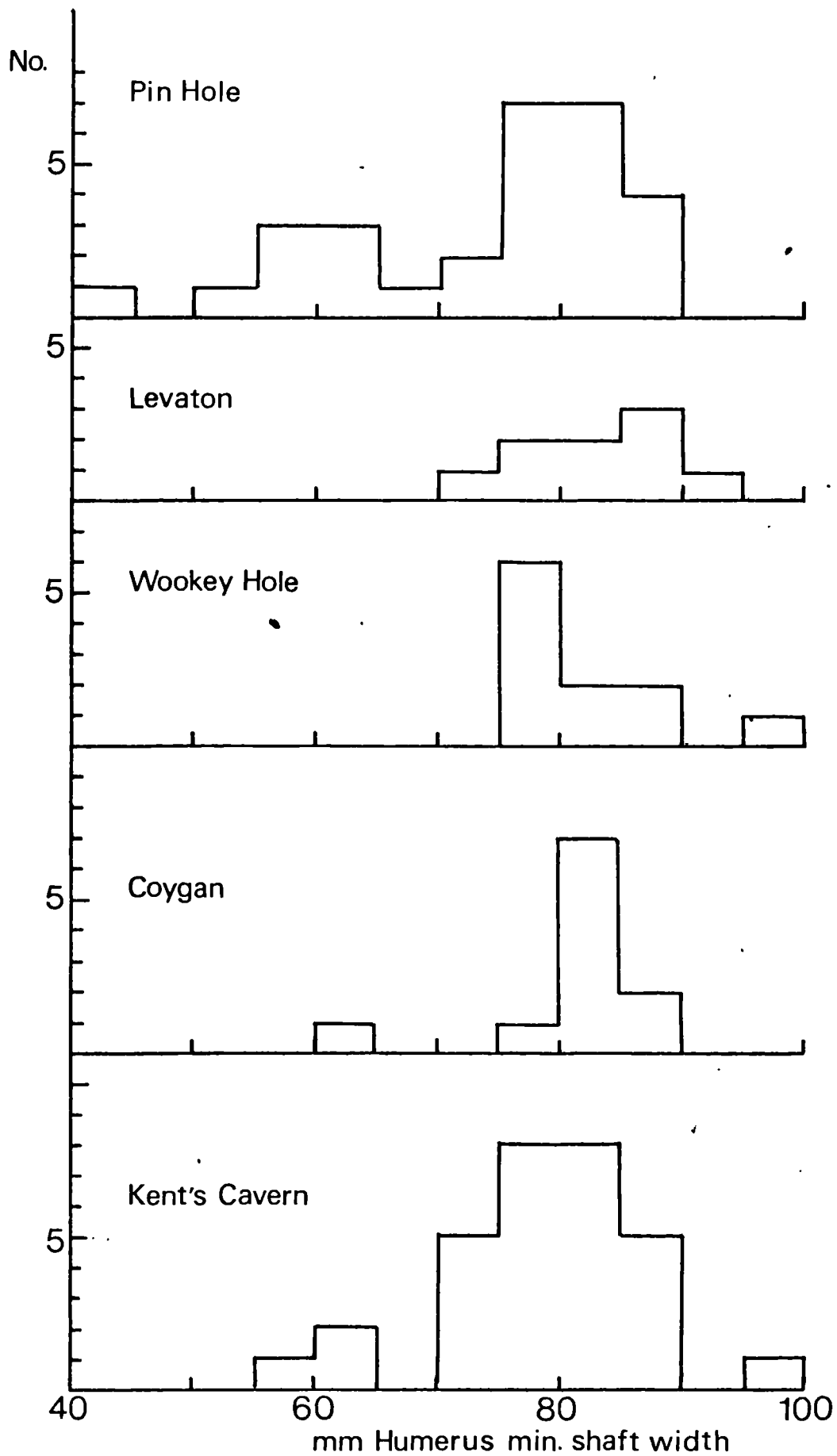


Fig. 60. Histograms of humerus shaft widths in woolly rhinoceros specimens

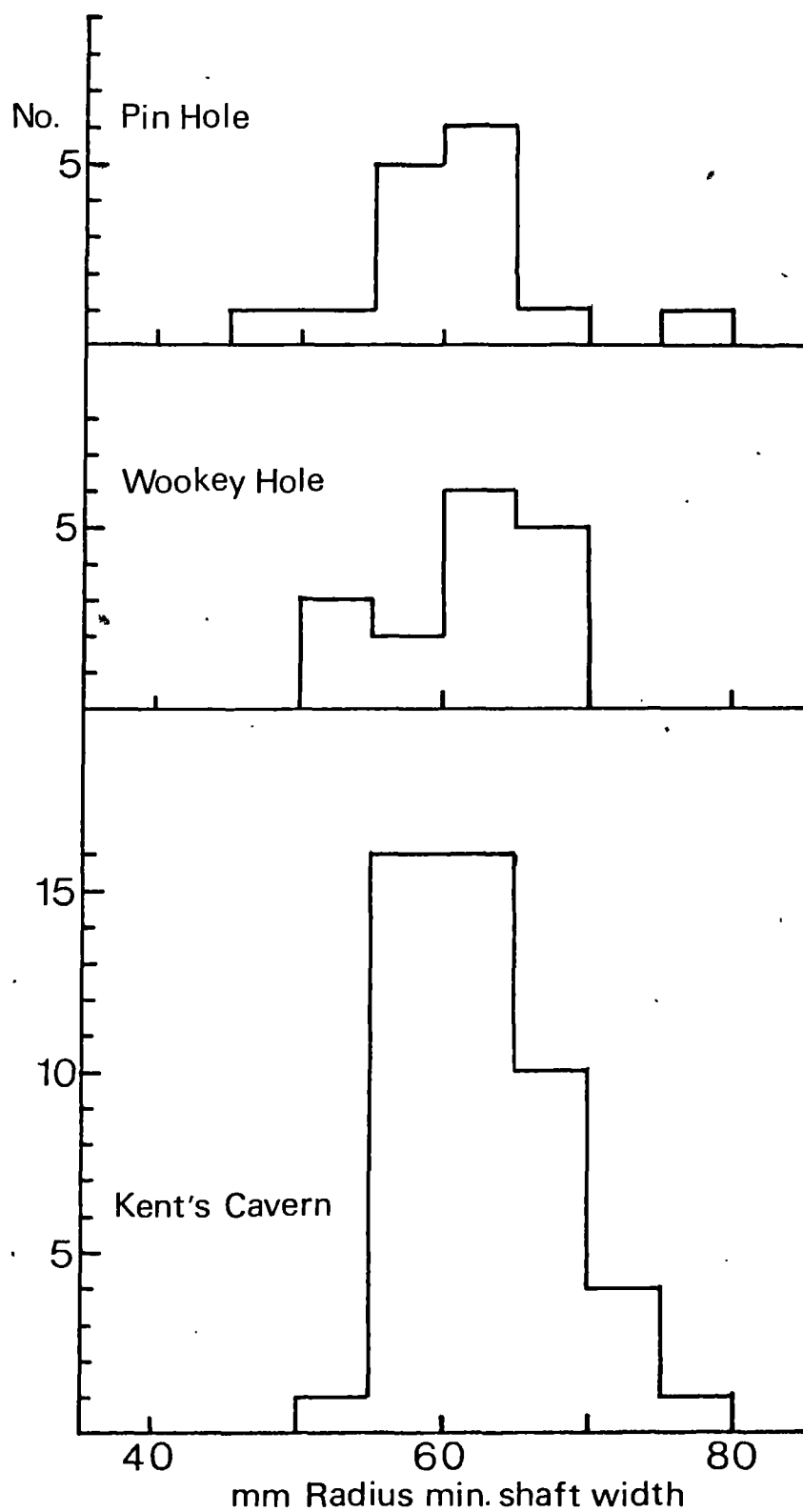


Fig. 61. Histograms of radius shaft widths in woolly rhinoceros specimens

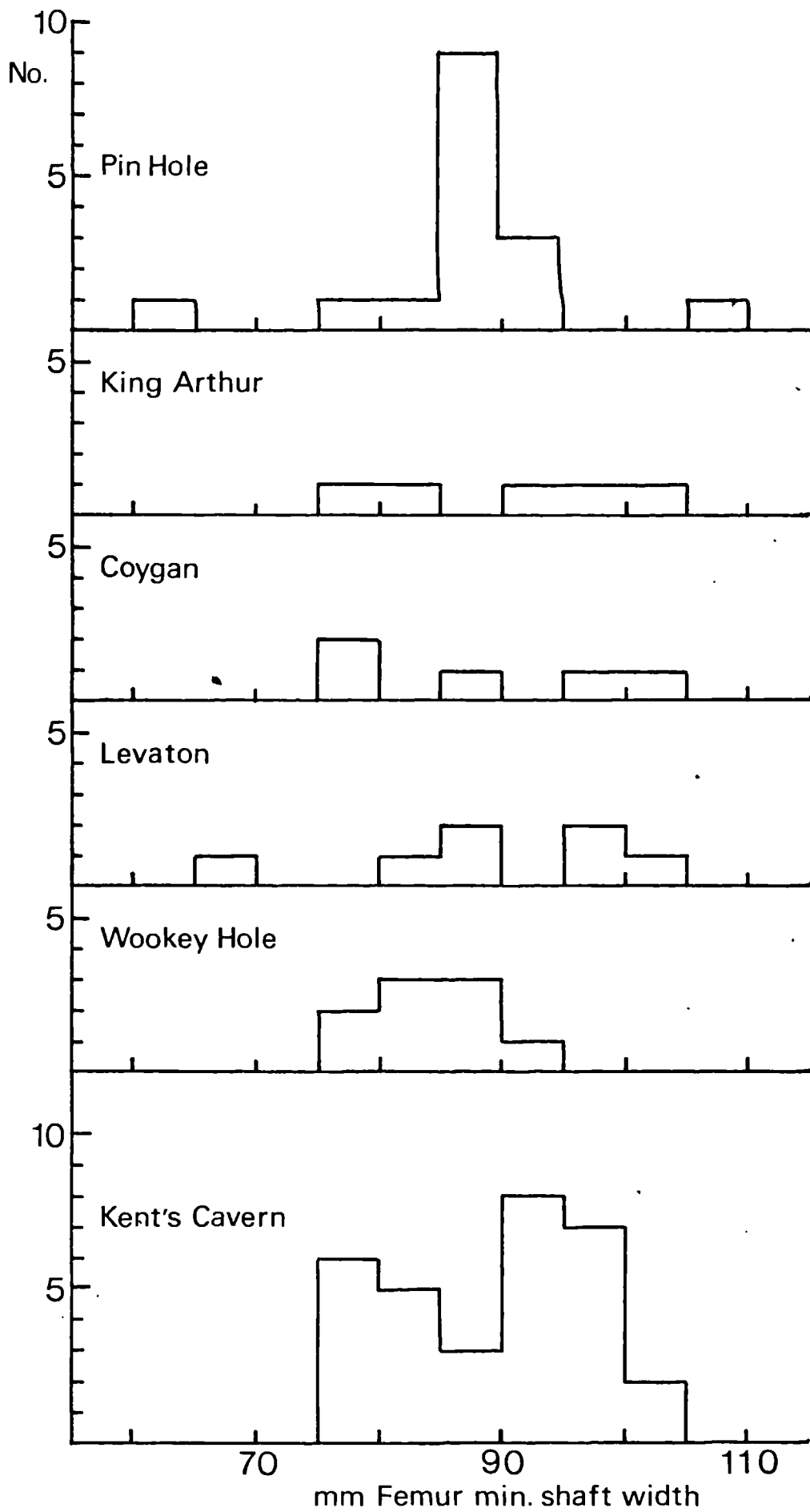


Fig. 62. Histograms of femur shaft widths in woolly rhinoceros specimens

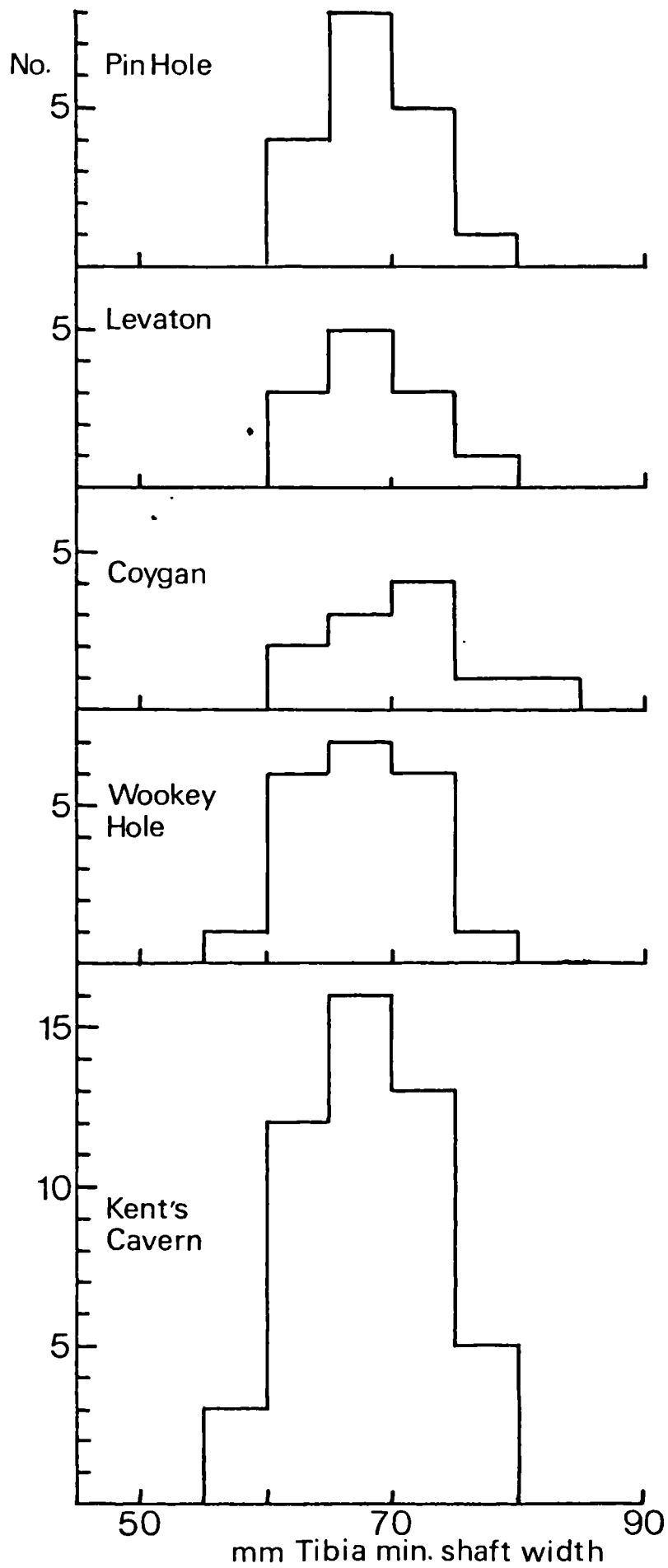


Fig. 63. Histograms of tibial shaft widths in woolly rhinoceros specimens

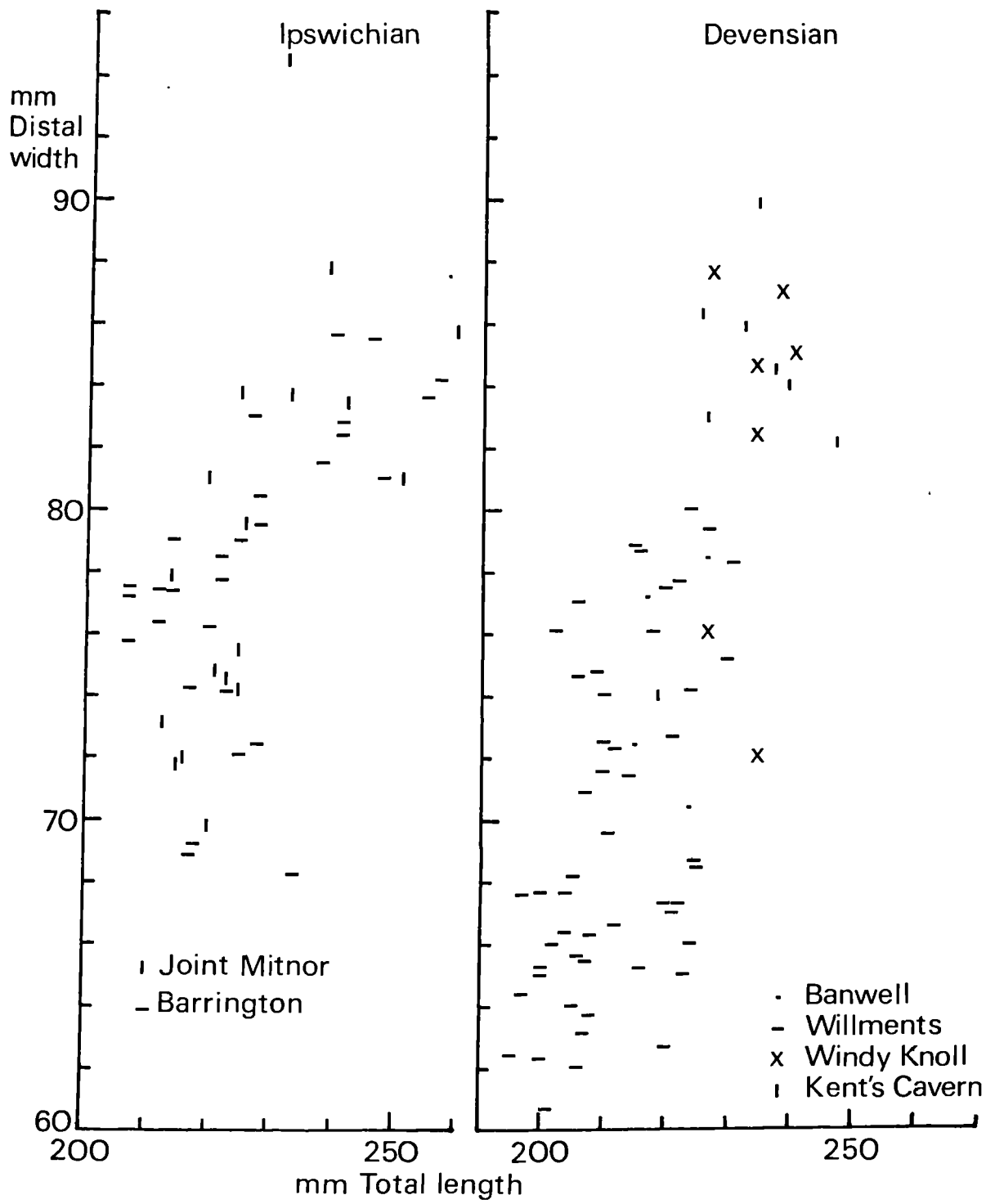


Fig. 64. Scattergram of bison metacarpal length and distal width

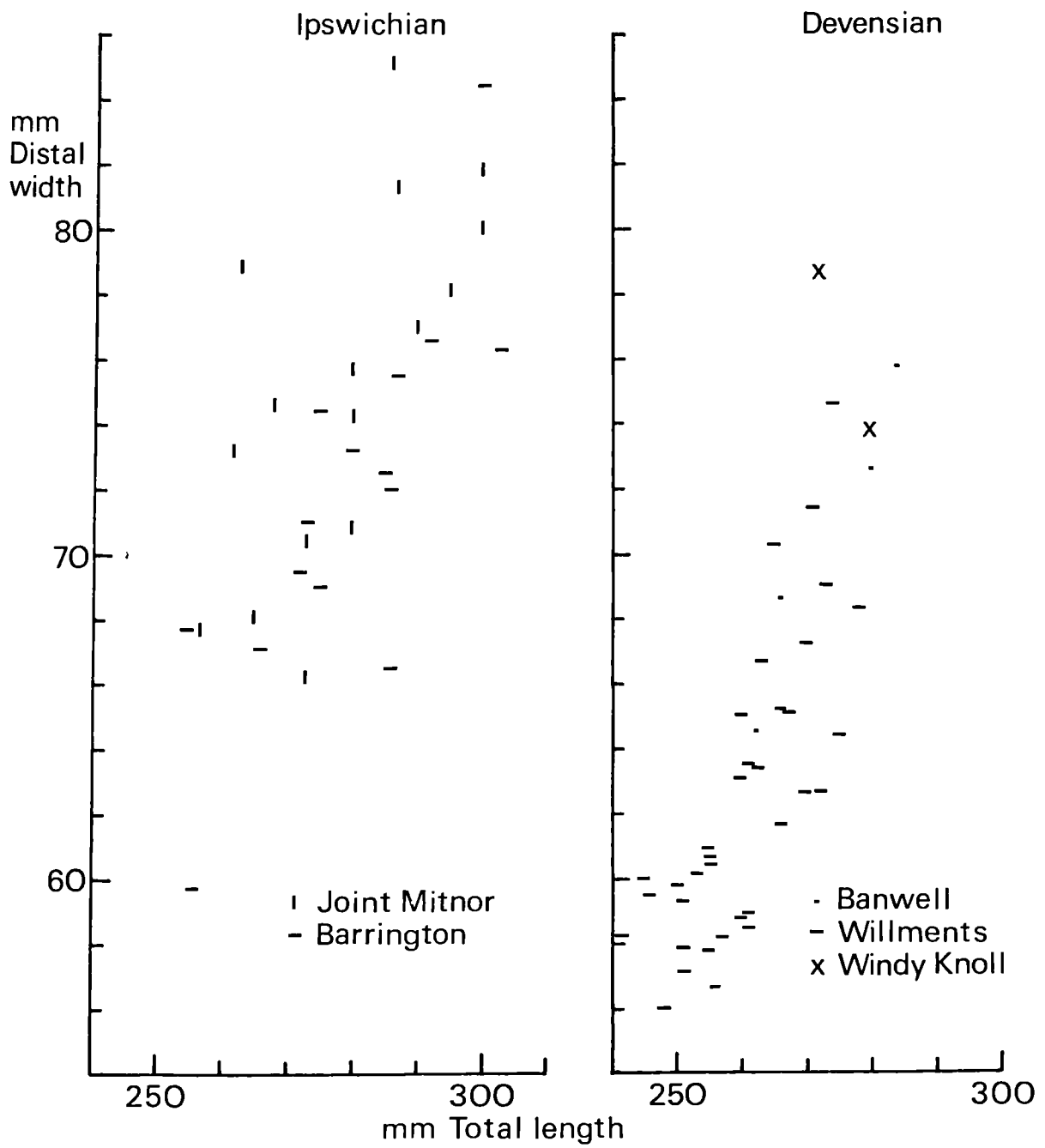


Fig. 65. Scattergram of bison metatarsal length and distal width

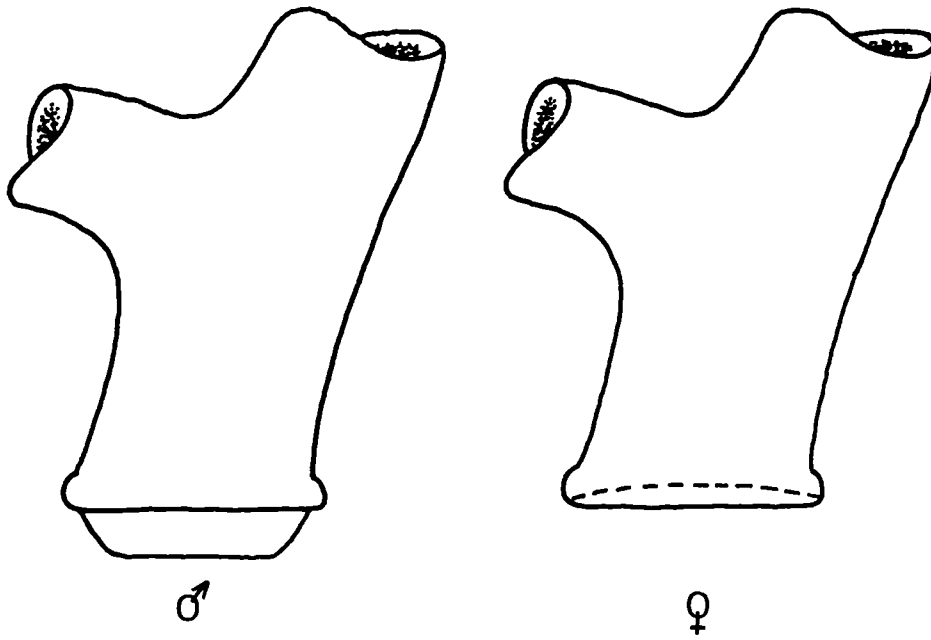


Fig. 67. Schematic separation of male and female cast antlers of reindeer. After Sturdy (1975)

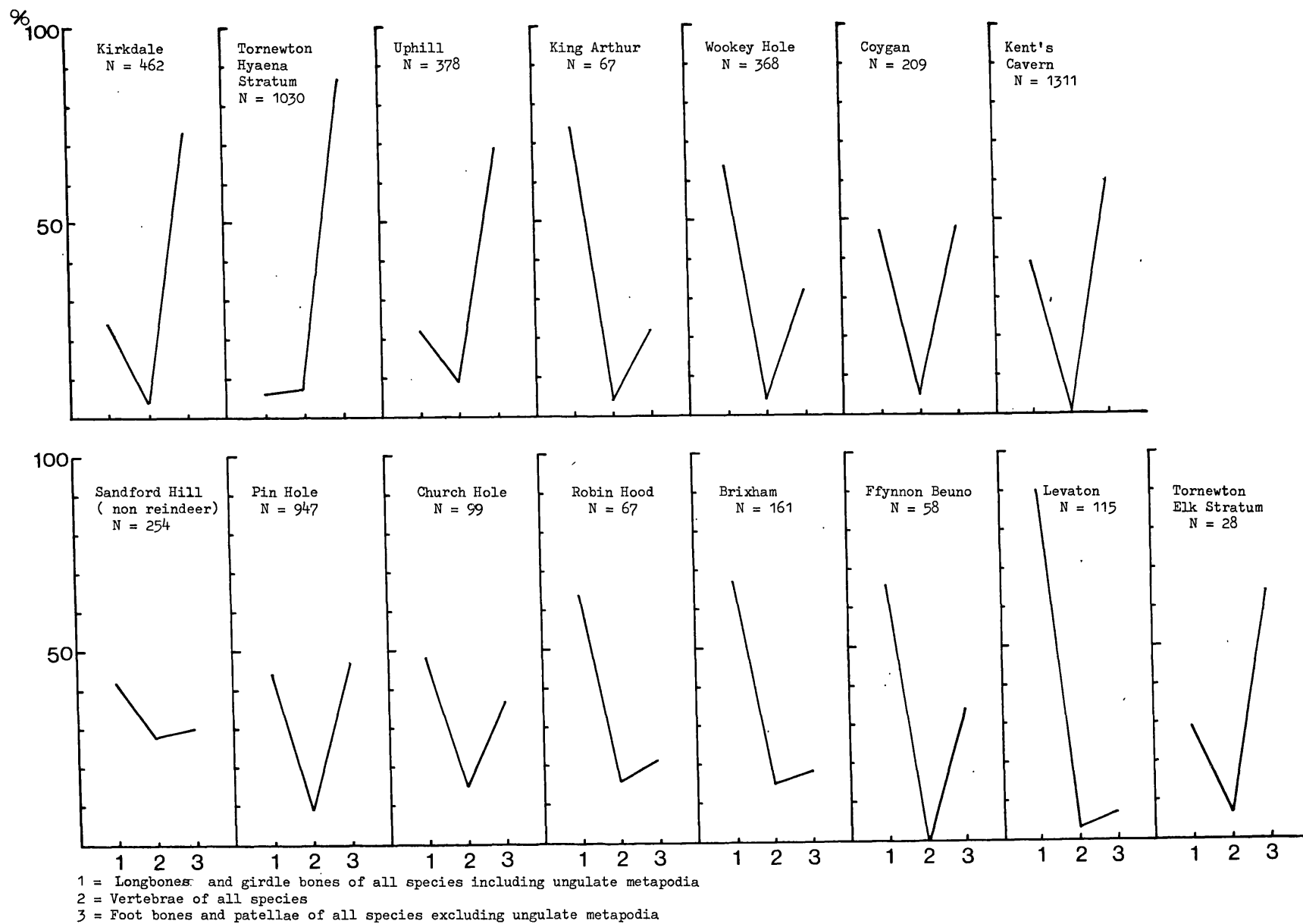


Fig. 68. Percentages of selected body parts of all large mammal species recorded from British Upper Pleistocene sites of hyaena bone-accumulation. Information from Tables 23b and 23f.

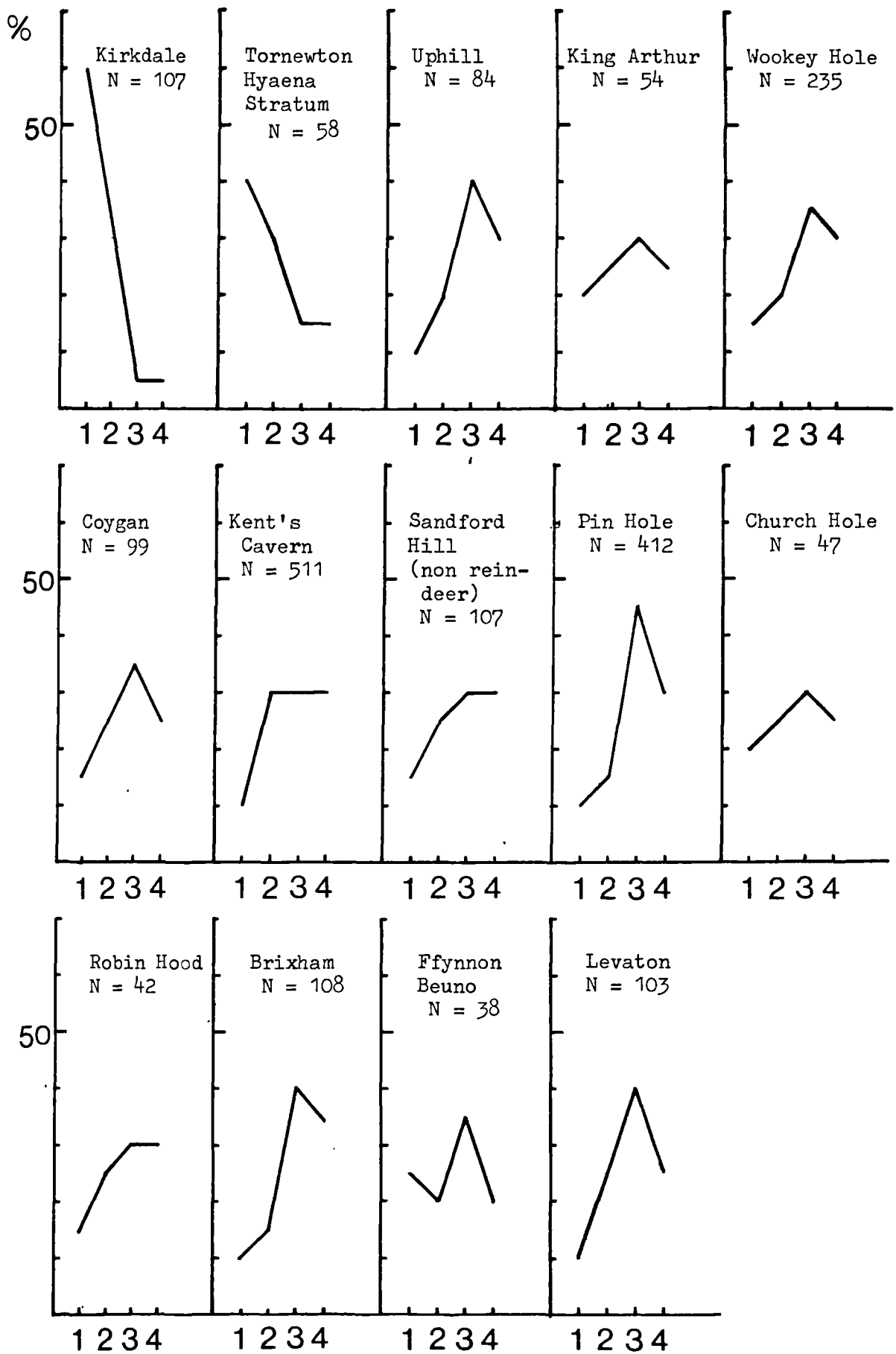


Fig. 69. Percentages of identified long bones, girdle bones and ungulate metapodia of all species in each category of hyaena-caused damage as given in Table 23b columns 1-4
 Hyaena damage assessed using criteria established by Sutcliffe (1970)

Table 1

Modern hyaena specimens used in determination of dental wear age categories.

-
1. British Museum No. 1773 1955. No location. Sex unknown
 2. British Museum No. 11.8.2.10 420. British Somaliland. Male
 3. British Museum No. 27.7.3.8. Uganda. Male
 4. British Museum No. 51.5.5.4. 1238f. South Africa. Sex unknown.
 5. British Museum No. 30.12.18.2. Laikipia Plateau, East Africa. Sex unknown.
 6. British Museum No. 35.379. Balbal. Female.
 7. British Museum No. 2.2.81. Pongola River, Zululand. Sex unknown
 8. British Museum No. 59.272. Koinadagu Dist., Sierra Leone. Female.
 9. British Museum No. 39.370. Balbal. Male
 10. British Museum No. 39.382. Balbal. Male
 11. British Museum No. 39.399. Balbal. Female
 12. British Museum No. 23.3.4.15. Rudewa, Nr. Kilosa, Tanganyika. Sex unknown
 13. British Museum No. 39.428. Balbal. Male
 14. British Museum No. 39.387. Balbal. Male
 15. British Museum No. 39.349. Balbal. Male
 16. British Museum No. 39.404. Balbal. Female
 17. British Museum No. 62.707. Tsara Park, Kenya. Sex unknown
 18. British Museum No. 66.791. Luangwa R., Fort Jameson Dist., N. Rhodesia. Male
 19. British Museum No. 70.706. Ghimbi, Ethiopia. Sex unknown
 20. British Museum No. 2.8.5.4. Kaka, White Nile. Male
 21. British Museum No. 39.380. Balbal. Male.
 22. British Museum No. 39.386. Balbal. Male
 23. British Museum No. 39.366. Balbal. Male
 24. British Museum No. 27.2.9.10. No location. Sex unknown
 25. British Museum No. 1932.6.6.10. Olduvai, Tanganyika. Sex unknown
 26. British Museum No. 1935.9.19.1. Olduvai, Tanganyika. Sex unknown
 27. National Museum of Wales. 1934. British East Africa. Sex unknown
 28. Zoology Museum, Cambridge. K4066. Malindi, between Bulawayo and Victoria Falls. Male
 29. Zoology Museum, Cambridge. K4067. E. Transvaal. Sex unknown
 30. Zoology Museum, Cambridge. K4068. purchased 1964. Sex unknown
 31. Zoology Museum, Cambridge. K4064. British East Africa. Sex unknown
 32. Zoology Museum, Cambridge. K4062. Amaswaziland, South Africa. Male
 33. Zoology Museum, Cambridge. K4065. Hargeisa, Somaliland. Sex unknown
 34. Cambridge Archaeology Department. No identification. No location. Sex unknown
 35. Creswell Crags Interpretation Centre. C119. No location (obtained from Cleethorpes Zoo). Male

Table 2

Hyaena skeletal elements from Ipswichian sites

	Kirkdale	Tornewton	Joint Mitnor	Barrington	Hoe Grange
skull					
skull frag.	4		1		
adult maxilla	9	13	4	10	
adult mandible	22	23	9	14	2
juvenile maxilla	1	10	1	-	1
juvenile mandible	10	12	-	-	
adult upper teeth	83	126	78	11	3
adult lower teeth	163	200	85	12	1
juvenile upper teeth	12	26	1	-	
juvenile lower teeth	11	72	5	-	
isolated Cs	39	92	43	7	1
isolated Ci	28	93	32	16	1
isolated I ³	13	79	31		
isolated I ₃	20	50			
isolated I	34	220	26		3
juvenile C	6	122			
scapula	2	10	1		1
humerus	4	8	9		7
radius	6	6	17		6
ulna	10	10	8		6
pelvis	1	8	1		1
femur	2	3	12		6
tibia	2	8	14		1
fibula			8		
carpal/tarsal	46	328	78		2
metcarpal	17	30	62	8	12
metatarsal	14	40	63	8	17
vertebrae	20	56	20		6
phalanges	124	429	151		5
coprolite	34	89	160		6
patella		20	7		
sternal			8		

Table 3

Wolf skeletal elements from Ipswichian sites

	Bielbeck,	Tornewton H.S.	Joint Mitnor	Durdham	Bleadon	Crayford	Kirkdale
Skull							
Skull frag.							
Adult maxilla		1		1			
Adult mandible		10	2	3	1		
Juvenile maxilla							
Juvenile mandible							
Adult upper teeth		12	9	13			
Adult lower teeth	1	5	2	7	2	1	1
Juvenile upper teeth							
Juvenile lower teeth							
Isolated Canine		11	17				
Isolated I ³							
Isolated I ₃		13					
Isolated I							
Juvenile C							
Scapula							
Humerus		2	8				
Radius			9				
Ulna			2				
Pelvis							
Femur			6		1		
Tibia			13		1		
Fibula							
Carpal/Tarsal		2	18				
Metacarpal		7	20				1
Metatarsal							
Vertebrae		12	19				1
Phalanges		30					

Table 4

Lion skeletal elements from Ipswichian sites

	Joint Mitnor	Kirkdale	Hoe Grange	Crayford	Tornewton Hyaena Stratum	Bielsbeck	Raygill Fissure	Barrington
Skull								
Skull frags								
adult maxilla						1		
adult mandible						1		
juvenile maxilla								
juvenile mandible				6				
adult upper teeth	3	1		2	6		1	
adult lower teeth	14	3			12			
upper canine	1	1		1				
lower canine	2	1		2	2			
juvenile lower teeth	3							
juvenile upper teeth								
incisors								
scapula								
humerus				1				
radius								
ulna								
pelvis								
femur								
fibia								
fibula								
Carpal/tarsal	4	1			1			
metacarpal		2	1	1				4
metatarsal	6	2						
Patella								
Phalanges	17	1			3			

Table 5

Bear skeletal elements from Ipswichian sites

	Kirkdale	Hoe Grange	Tornewton Hyaena Stratum
Skull			
skull frags.			
adult maxilla			
adult mandible			
juvenile maxilla			
juvenile mandible			
adult upper teeth	3	2	
adult lower teeth	3	2	
upper canine	1		2
lower canine			
juvenile lower teeth			
juvenile upper teeth			
incisor	1		
scapula			
humerus			
radius	1		
ulna			
pelvis			
femur			
tibia			
fibula			
carpal/tarsal	1	2	1
metacarpal	1	2	1
metatarsal			
vertebrae			
patella			
phalanges		2	

Table 6

Horse skeletal elements from Ipswichian sites

	Bleadon	Crayford	Ilford	Erith
skull				
skull frag.				
adult maxilla				
adult mandible		1	2	
juvenile maxilla				
juvenile mandible				
adult upper teeth	86	10	7	3
adult lower teeth	73	6	2	4
juvenile upper teeth	23	1		
juvenile lower teeth	21			
isolated canine	5			
isolated incisor	46			
juvenile incisor			1	
scapula				
humerus	3		1	
radius	11	4	1	2
ulna				
pelvis				
femur	8			
tibia	10	2		
carpal/tarsal	64			
metacarpal	8	14	5	6
metatarsal	3	11	6	4
vertebrae	1			
phalanges	101	21	5	3
accessory metapodia		4		
astragalus	22	9	2	
calcaneum	7	3	1	
patella	5			

Table 7

Steppe rhino skeletal elements from Ipswichian sites

	Joint Mitnor *	Kirkdale	Hoe Grange	Tornewton Hyaena Stratum
Horn base		1	1	
skull frags			1	
adult maxilla				
adult mandible				
juvenile maxilla				
juvenile mandible				
adult upper teeth		12	3	2
adult lower teeth		18	2	2
juvenile upper teeth		4		
juvenile lower teeth		1		1
scapula		1		
humerus		4		
radius		3		
ulna	1	1	1	
pelvis		2		
femur			1	
tibia	6			
carpal/tarsal	6	5	3	2
metapodial		1	2	
vertebrae				
phalanges				

* Open-air or natural trap: material only partially recorded

Table 8

Giant deer skeletal elements from Ipswichian sites

	Kirkdale	Hoe Grange
Skull		
antler cast		
antler uncast		
antler frag.		
adult maxilla		
adult mandible	1	
juvenile maxilla		
juvenile mandible		
adult upper teeth	15	
adult lower teeth	2	
juvenile upper teeth		
juvenile lower teeth		
incisor/canine		
scapula		
humerus	2	
radius/ulna		
pelvis		
femur		
tibia	2	
carpal/tarsal	8	1
metacarpal	1	
metatarsal	1	
vertebrae		
accessory metapodia		
patella		
phalanges		2

Table 9

Red deer skeletal elements from Ipswichian sites

	Kirkdale	Joint Mitnor	Tornewton Hyaena Stratum	Hoe Grange
skull				
antler cast				1
antler uncast		1		
antler frag.	3	7	3	
adult maxilla				
adult mandible		2		
juvenile maxilla				
juvenile mandible				
adult upper teeth	7	45		
adult lower teeth	7	37		
juvenile upper teeth	1			
juvenile lower teeth				
incisor/canine				
scapula		1		
humerus	1	2		
radius/ulna	1	9		
pelvis		1		
femur		3		
tibia	2	3		
carpal/tarsal	3	49	1	1
metacarpal	1	5		
metatarsal				
vertebrae		5		
accessory metapodia				
patella				
phalange		112	2	1

Table 10

Fallow deer skeletal elements from Ipswichian sites

	Joint Mitnor	Hoe Grange	Tornewton Hyaena stratum
skull			
antler cast			
antler uncast		2	
antler frag.			
adult maxilla			
adult mandible		1	1
juvenile maxilla			
juvenile mandible			
adult upper teeth	22	4	
adult lower teeth			
juvenile upper teeth			
juvenile lower teeth			
incisor/canine			
scapula		5	1
humerus	4	8	
radius/ulna	10	6	
pelvis		1	
femur	6	4	
tibia	3	6	
carpal/tarsal	27	33	2
metacarpal	9	7	
metatarsal	7	8	
vertebrae		3	
accessory metapodial			
patella			
phalanges		29	1

Table 11

Bison remains from Ipswichian sites

	Joint Mitnor *	Tornewton	Kirkdale	Crayford *	Hoe Grange	Barrington *
skull frag.			1		1	
horn core					1	
adult maxilla				1	1	
adult mandible			1	1		
juvenile maxilla						
juvenile mandible						
adult upper teeth	272	3	51		19	10
adult lower teeth	214	1	65		20	24
juvenile upper teeth			3		6	
juvenile lower teeth	271		4		3	
incisor	80	2	4			
scapula					1	
humerus			6		5	
radius/ulna			6		2	
femur					2	
tibia		1	14		3	
carpals/tarsals	115	3	91		21	
metacarpals	37		16		4	32
metatarsals	30	1	14		3	16
vertebrae		1			7	
pelvis					2	
patella						
phalanges	303		12		26	
malleolus bone			5		1	

* Open-air or natural trap: material only partially recorded

Table 12

Straight-tusked elephant skeletal elements from Ipswichian sites

	Kirkdale	Hoe Grange	
skull fragment			
tusk fragment	2		
adult tooth	1		
juvenile tooth	3	1	
mandible fragment			
scapula			
humerus			
radius			
ulna			
femur			
tibia			
carpal/tarsal			
metapodial			
phalange			
patella			
pelvis			
vertebrae.			

Table 13

Hyaena skeletal elements from Devensian sites

	Uphill	King Arthur	Wookey	Coygan	Kent's	Sandford	Pickens	Bench Cavern	Pin Hole	Church Hole	Robin Hood	Hutton	Brixham	Feynnon Beuno	Levaton	Tornewton Elk Stratum
skull			4	1	3	5			6							
skull frag.					60					2			1			
adult maxilla	17	2	17	28	46	11	4	-	15	4	-					
adult mandible	32	5	51	57	179	60	7	6	24	9	2			3	4	1
juvenile maxilla	0		5	6	2	-	1	1	4	2	-					
juvenile mandible	12	1	13	11	19	1	4	4	33	1	-					
adult upper teeth	154	48	71	164	199	13	31	59	86	13	33			5	1	2
adult lower teeth	225	80	131	299	403	53	79	76	159	15	62			5	2	7
juvenile upper teeth	2	-	-	2	-	-	4	-	30	1	4					
juvenile lower teeth	8	1	1	5	9	-	8	-	29	1	2		3			
isolated C ^s	63	9	49	94	113	26	17	9	61	11	13			1	2	
isolated Gi	70	14	57	99	131	23	19	8	43	21	15			8	1	2
isolated I ³	63	9	18	48	78		9	29	41	1	7					
isolated I ₃	1	1	3	32	22		8	2					2			
isolated I	131		6	6	1		18	30	79	16	33		2			
juvenile c	6															
scapula	6			1	1	8		7								
humerus	9		1	4	14	12		11	8	1		2	2			
radius	14		1	1	8	16		5	2	2		2	3		1	
ulna	5		6	5	14	12		5	5	1		11	2		1	
pelvis	1		2					6	2				2			
femur	10			2	4	4		8	5			2	3			
tibia	15		5	2	9	8		10	4	2		2	5			
fibula								10								
carpal/tarsal	71		8	12	12			42	10				1			
metacarpal	64	-	3	17	41	37	1	48	17	1	2	6		1		1
metatarsal	51	-	5	9	31	11	-	54	12		1	5				1
vertebrae	33		3	9	17	56		30	21	12	6	11	7			
phalanges	63			3	76			57	30							
caprolite	7			136	120				10					2		

Table 14

Wolf skeletal elements from Devensian sites

	Hutton	Sandford	Kent	Wavering	Wookey	Clevedon	Badger	Banwell	Uphill	King Arthur	Coygan	Bench	Robin Hood	Church Hole	Pin Hole	Torn Newton Elk Stratum	Brixham	Paviland
skull			1	1				2							3			
skull frag.																		
adult maxilla	3		3			3		3										2
adult mandible	2	1	4	1	2			14							8			1
juvenile maxilla																		
juvenile mandible																		
adult upper teeth	1		4		1									50				1
adult lower teeth			11		6	1	1	4						45				1
juvenile upper teeth																		
juvenile lower teeth																		
isolated canine			2						1	2	1				6			11
isolated I ³												1						
isolated I ₃																		
isolated I														27				1
juvenile C																		
scapula														1	1			
humerus	4				1			2						5				1
radius	3					1		2	1		1			5	1			
ulna	4	1	3					2						2				1
pelvis			1											3				
femur	3													3				
tibia	3													3				
fibula														2	1	1		
carp/tarsal														5	3			1
metacarpal		1			3									10	5			3
metatarsal										1				8				1
vertebrae				4										21	2			2
phalanges														48	3			1

Table 15

Lion skeletal elements from Devensian sites

	Sandford Hill	Coygan	Kent's	Wookey Hole	Pin Hole	King Arthur	Uphill	Hutton	Brixham
skull	1								
skull frags.									
adult maxilla			4						
adult mandible	2		2		4				
juvenile maxilla	2								
juvenile mandible									
adult upper teeth		1	8	1	1				3
adult lower teeth		3	7	10	7	1	1	1	
upper canine		1	6	1	2	4			4
lower canine		1	8	3	2				1
juvenile lower teeth									
juvenile upper teeth									
incisor									
scapula									
humerus	2				2				
radius	1			1					
ulna									
pelvis									
femur									
tibia	1				3				
fibula									
carpal/tarsal	1		1		4				
metacarpal	4			1					
metatarsal	7			1	5				
vertebrae					4				
patella									
phalanges		2		4	1				

Table 18

Woolly rhinoceros skeletal elements from Devensian sites

	King Arthur	Uphill	Wooley	Coygan	Kent's	Levaton	Sandford	Pin Hole	Church Hole	Robin Hood	Bench Cavern	Ffynnon Beuno	Brixham	Tornewton Elk Stratum	Paviland
Horn base			1		4			1	1						
skull			6					1							
skull frags.					4										
adult maxilla															
adult mandible			5	3	1	1		1		2					
juvenile maxilla			2		1			1	1						
juvenile mandible			1					18	1						
adult upper teeth	38	25	68	49	253	3	9	57	3	15		18	14		5
adult lower teeth	40	18	77	56	240			103	8	8		23	4	2	3
juvenile upper teeth			11	24	77	4	2	38	4	9		2		2	
juvenile lower teeth			12	23	12			32	2						
scapula	3		9	7	18	3		15	4	1		2	1		
humerus	9	3	13	15	41	12	4	33	3	6			1	1	1
radius	4		19	17	52	7	3	23	3	4		3			
ulna	4	1	18	4	27	2	4	31	4			4			
pelvis	3	3	12	3	22	7		18	2		1	4	1	1	
femur	7		12	5	33	7	5	17	4	5		4	1		
tibia	7	2	32	13	57	17	5	26	6	4		3	2		
carpal/tarsal	5	2	1	7	94	2		32	6	3		6	3		
metapodia			11	3	37	8	1	10	3	3		4			
vertebrae	1		4			3		3	1						
phalanges					5			3	2						

Table 19

Giant deer skeletal elements from Devensian sites

	Paviland	Church Hole	Pin Hole	Coygan	Kent's	Ffynnon Beuno	King Arthur	Wookey Hole	Levaton	Brixham
skull				1						
antler cast			4	1	4			4	1	3
antler uncast						1				
antler frag.							1	1		
adult maxilla					7		1	3		
adult mandible	1	1	2	2	18	1		4		
juvenile maxilla										
juvenile mandible						1				
adult upper teeth	9		2	16	68	2	11	15		
adult lower teeth	3		3	1	32	3	5	13		
juvenile upper teeth										
juvenile lower teeth										
incisor/canine										
scapula										
humerus			1					1	4	
radius/ulna					1				1	
pelvis								1		
femur										
tibia				1			1	1	1	
carpals/tarsals	4			1					1	
metacarpal		1	1	1				1	1	
metatarsal								2		
vertebrae										
accessory metapodia										
patella										
phalanges			5					1		

Table 20

Mammoth skeletal elements from Devensian sites

	Church Hole	King Arthur	Kent's	Coygan	Ffynnon Beuno	Wookey Hole	Levaton	Pin Hole	Faviland
skull fragment									
tusk fragment	1		8	4	1	20		5	2
adult tooth		7	7	4	1	7		1	3
juvenile tooth	2	5	75	37		3		15	
mandible fragment				1				3	
scapula									
humerus						1		2	
radius									
ulna									
femur						1		2	
tibia						1	1	5	
carpal/tarsal				3				14	
metapodial						1		3	
phalange									
patella				1		2			
pelvis									
vertebrae				1				1	

Table 21

Red deer skeletal elements from Devensian sites

	King Arthur	Kent's	Coygan	Wookey Hole	Brixham Cave	Levaton	Torneyton Elk Stratum	
skull								
antler cast		13	1	2	1	1	8	
antler uncast	1							
antler frag.	1							
adult maxilla								
adult mandible				1				
juvenile maxilla								
juvenile mandible								
adult upper teeth					2			1
adult lower teeth								
juvenile upper teeth								
juvenile lower teeth	1							
incisor/canine								
scapula					1			
humerus				1				
radius/ulna		2						
pelvis								
femur								
tibia		2		1				
carpal/tarsal	3	3		2				
metacarpal		3		2				
metatarsal						1	1	1
vertebrae								
accessory metapodia								
patella								
phalanges		1			1			

Sites	Hyaena		Wolf		Lion		Bear		Rhino		Giant Deer			Red Deer			Fallow Deer			Bison		Elephant		Reindeer			Horse		Hippo		Pig					
	T	B	T	B	T	B	T	B	T	B	T	B	A	T	B	A	T	B	A	T	B	T	B	T	B	A	T	B	T	B	T	B				
<u>Ipswichian</u>																																				
Kirkdale	451	248	1	2	6	6	8	3	36	17	18	14	-	15	8	3	-	-	-	129	164	6	-	-	-	-	-	-	-	4	-	5	-			
Tornewton Hyaena Stratum	1138	956	52	53	20	4	2	2	5	2	-	-	-	-	3	3	1	4	-	6	6	-	-	-	-	-	-	-	-	6	-	-	-			
<u>Devensian</u>																																				
Jphill	734	342	1	1	1	-	27	-	43	11	-	-	-	-	-	-	-	-	-	-	-	-	20	-	7	288	24	-	-	-	-	-	-			
King Arthur	170	-	2	-	5	-	3	3	78	43	13	1	-	-	3	2	-	-	-	14	10	13	-	9	5	27	103	8	-	-	-	-	-	-		
Wookey Hole	426	34	9	8	15	7	44	26	133	131	35	7	5	-	6	2	-	-	-	49	22	30	6	29	50	62	559	71	-	-	-	-	-	-		
Coygan	852	65	1	2	6	2	41	9	155	74	20	3	1	-	-	1	-	-	-	21	8	46	5	14	27	29	396	14	-	-	-	-	-	-		
Kent's Cavern	1265	227	29	5	35	1	31	162	592	386	125	1	4	-	11	3	-	-	-	117	71	90	-	267	261	55	1127	186	-	-	-	-	-	-		
Sandford Hill	192	164	1	1	5	16	-	8	11	22	-	-	-	-	-	-	-	-	-	6	40	-	-	64	830	73	4	1	-	-	-	-	-	-		
Pin Hole	610	116	149	113	16	19	95	125	252	211	7	7	4	-	-	-	-	-	-	13	102	24	27	452	174	1024	265	53	-	-	-	-	-	-		
Church Hole	97	19	-	-	-	-	-	3	20	38	1	1	-	-	-	-	-	-	-	-	1	1	3	-	3	15	87	14	22	-	-	-	-	-	-	
Robin Hood	171	9	-	-	-	-	-	7	34	23	-	-	-	-	-	-	-	-	-	1	6	-	-	38	7	6	10	15	-	-	-	-	-	-	-	
Brixham	8	25	-	1	2	4	61	52	18	9	-	-	3	2	2	1	-	-	-	5	4	-	-	10	48	3	9	21	-	-	-	-	-	-	-	
Ffynnon Beuno	22	1	-	-	-	-	-	-	43	20	7	-	1	-	-	-	-	-	-	-	4	2	-	-	6	8	18	17	-	-	-	-	-	-	-	-
Levaton	10	2	-	-	-	-	-	-	8	68	-	8	1	-	1	1	-	-	-	1	10	-	1	-	1	-	-	24	-	-	-	-	-	-	-	-
Tornewton Elk Stratum	12	2	-	16	-	-	1	1	4	2	-	-	-	-	1	8	-	-	-	5	4	-	-	-	1	12	2	1	-	-	-	-	-	-	-	-

Table 23a

Distributions of various categories of body parts from British Upper Pleistocene sites of hyaena bone-accumulation

T = Teeth and Skull Fragments

B = Postcranial Bone

A = Antler

	Percentage of identified long bones, girdle bones and ungulate metapodia in each class of completeness resulting from hyaena-caused damage						Total N	No. Vertebrae	No. foot bones and patellae of all species (except ungulate metapodia)	% Gnawed	No. teeth, jaws and skull fragments	No. antler fragments	Total No. identified fragments	No. unidentified fragments
	Completeness				No. undamaged	Total								
	1	2	3	4										
%	%	%	%											
<u>Ipswichian</u>														
Kirkdale	60	30	5	5	3	107	20	335	40	673	3	1138	118	
Tornewton Hyaena Stratum	40	30	15	15	3	58	59	903	5	1230	3	2263	-	
<u>Devensian</u>														
Uphill	10	20	40	30	4	84	33	261	10	1164	7	1549	40	
King Arthur	20	25	30	25	2	54	3	16	10	415	29	517	32	
Wookey Hole	15	20	35	30	17	235	14	119	21	1379	69	1816	225	
Coygan	15	25	35	25	3	99	10	100	10	1552	31	1792	150	
Kent's Cavern	10	30	30	30	74	511	19	781	12	3578	72	5061	1175	
Sandford Hill (reindeer)	-	-	-	-	285	285	150	395	-	64	73	967	-	
Sandford Hill (others)	15	25	30	30	13	107	71	76	10	219	-	473	-	
Fin Hole	10	15	45	30	11	412	36	449	11	1883	1028	3858	3019	
Church Hole	20	25	30	25	3	47	15	37	11	138	87	324	9	
Robin Hood	15	25	30	30	5	42	11	14	14	254	6	327	-	
Brixham	10	15	40	35	9	108	24	29	14	121	7	289	54	
Ffynnon Beuno	25	20	35	20	1	38	-	20	30	92	9	159	15	
Levaton	10	25	40	25	4	103	4	8	-	19	2	136	160	
Tornewton Elk Stratum	-	-	-	-	-	8	2	18	27	24	20	72	300	

Completeness: 1 = 0-25% complete
 2 = 25-50% complete
 3 = 50-75% complete
 4 = 75-100% complete

Assessed by visual estimation of the amount of bone missing in each case

Table 23b

Distributions of various categories of body parts from British Upper Pleistocene sites of hyaena bone-accumulation, with summary details of hyaena damage to bones.

Hyaena damage assessed with reference to criteria for recognition established by Sutcliffe (1970)

Table 23c

Numbers of long bones, girdle bones and ungulate metapodia for all species of large mammal from Ipswichian and Devensian sites of hyaena bone-accumulation

	Hyaena	Wolf	Lion	Bear	Rhinoceros	Giant Deer	Red Deer	Fallow Deer	Bison	Elephant	Reindeer	Horse	Totals
<u>Ipswichian</u>													
Kirkdale	27	-	-	1	12	6	5	-	56	-	-	-	107
Tornewton Hyaena Stratum	53	2	-	-	-	-	-	1	2	-	-	-	58
<u>Devensian</u>													
Uphill	60	1	-	-	9	-	-	-	-	-	-	14	84
King Arthur	-	-	-	1	37	1	-	-	6	-	3	6	54
Wookey Hole	15	1	1	11	126	6	4	-	12	4	15	40	235
Coygan	15	1	-	5	67	2	-	-	1	-	2	6	99
Kent's Cavern	50	4	-	15	287	1	7	-	30	-	47	70	511
Sandford Hill (Reindeer)	-	-	-	-	-	-	-	-	-	-	285	-	285
Sandford Hill (Others)	60	1	4	8	22	-	-	-	11	-	-	1	107
Pin Hole	26	21	5	34	173	2	-	-	29	12	81	29	412
Church Hole	6	-	-	-	29	1	-	-	1	-	6	4	47
Robin Hood	-	-	-	4	23	-	-	-	3	-	4	8	42
Brixham	17	1	-	37	6	-	1	-	4	-	30	12	103
Pfynnon Beuno	-	-	-	-	24	-	-	-	4	-	2	8	38
Levaton	2	-	-	-	63	7	1	-	9	1	1	19	103
Tornewton Elk Stratum	-	3	-	-	2	-	1	-	1	-	1	-	8

Table 23e

Numbers of foot bones and patella of all species from Ipswichian and Devensian sites of hyaena bone-accumulation (ungulate main metapodia excluded)

	Hyaena	Wolf	Lion	Bear	Rhinoceros	Giant Deer	Red Deer	Fallow Deer	Bison	Elephant	Reindeer	Horse	Totals
<u>Ipswichian</u>													
Kirkdale	201	2	6	2	5	8	3	-	108	-	-	-	335
Tornewton Hyaena Stratum	847	39	4	2	2	-	3	3	3	-	-	-	903
<u>Devensian</u>													
Uphill	249	-	-	-	2	-	-	-	-	-	-	10	261
King Arthur	-	-	-	1	5	-	3	-	3	-	2	2	16
Wookey Hole	16	3	6	14	1	1	2	-	9	2	35	30	119
Coygan	41	1	2	4	7	1	-	-	7	4	25	8	100
Kent's Cavern	160	1	1	145	99	-	4	-	41	-	214	116	781
Sandford Hill (Reindeer)	-	-	-	-	-	-	-	-	-	-	395	-	395
Sandford Hill (Others)	48	-	14	-	-	-	-	-	14	-	-	-	76
Pin Hole	69	71	10	77	35	5	-	-	52	14	93	23	449
Church Hole	1	-	-	2	8	-	-	-	-	-	8	18	37
Robin Hood	3	-	-	-	-	-	-	-	2	-	3	6	14
Brixham	1	-	-	4	3	-	1	-	-	-	13	7	29
Ffynnon Beuno	1	-	-	-	6	-	-	-	-	-	4	9	20
Levaton	-	-	-	-	2	1	-	-	-	-	-	5	8
Tornewton Elk Stratum	2	11	-	1	-	-	-	-	3	-	-	1	18

	Woola	Ib-early IIB	IIB										Caves ? II					III	III-IV	probably III-IV	?IV														
	Selsey	Selsey	Lundesley	Beetley	Beetley	Barrington	Trafalgar Square	Stone	Portwell	Swanton Horley	Aveley	Joint Lithor	Joe Grange	Tornewton	Hyaena Straturn	other Grundy's Parlour	Robin Hood	Kirkdale	Lilston Hill	Lastern Torrs quarry	Durham Down	Victoria Cave	Raygill Fissure	Swanton Horley	Aveley	Hilston Road	Stutton	Harkstead	Brundon	Ilford	Lexden	Crayford			
<u>Primates</u>																																			
1. <u>Homo sapiens</u> (artefacts)	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+ 1.
<u>Carnivora</u>																																			
2. <u>Canis lupus</u>	-	-	-	-	-	+	-	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+ 2.
3. <u>Ursus</u> sp.	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+ 3.
4. <u>Ursus</u> <u>meles</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+ 4.
5. <u>Crocota</u> <u>crocota</u> <u>spelaea</u>	-	-	-	-	-	+	-	-	-	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+ 5.
6. <u>Panthera</u> <u>leo</u>	-	-	-	-	-	+	+	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+ 6.
7. <u>Lynx</u> <u>lynx</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+ 7.	
<u>Proboscidea</u>																																			
8. <u>Palaeoloxodon</u> <u>antiquus</u>	-	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+ 8.
9. <u>Lanmuthus</u> <u>primigenius</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+ 9.
<u>Perissodactyla</u>																																			
10. <u>Equus</u> sp.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+10.	
11. <u>Dicerorhinus</u> <u>hemitoechus</u>	-	+	-	-	-	+	+	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+11.
12. <u>Coelodonta</u> <u>anticuitatis</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+12.	
<u>Artiodactyla</u>																																			
13. <u>Hippopotamus</u> <u>amphibius</u>	-	-	-	-	+	+	+	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+13.
14. <u>Deer</u> <u>ceros</u> <u>giganteus</u>	-	-	-	+	-	+	+	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+14.
15. <u>Dama</u> <u>dama</u>	-	-	-	-	-	+	+	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+15.
16. <u>Cervus</u> <u>elaphus</u>	-	-	-	+	-	+	+	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+16.
17. <u>Bos</u> <u>primigenius</u>	-	-	-	-	-	+	+	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+17.
18. <u>Bison</u> <u>priscus</u>	-	-	-	-	-	+	+	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+18.
19. <u>Bos</u> sp. or <u>Bison</u> sp.	-	-	-	+	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+19.
20. <u>Ovibos</u> <u>moschatu</u> s	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+20.	

Table 24.

Ipswichian sites, fauna and pollen zones

Only large mammals are shown. Information from Stuart (1976), Sutcliffe (1960), Sutcliffe and Zeuner (1962) and direct observation

Table 25

Ipswichian Vegetational Succession

Zone	Pollen assemblage Zone character	Regional vegetation
(Early Devensian)	high n.a.p.	herb-dominated
Ip IV	<u>Pinus</u>	open boreal forest
IP III	<u>Carpinus</u>	temperate forest
Ip IIb	m.o.f. <u>Pinus</u> , <u>Acer</u> , <u>Corylus</u>	mixed oak forest
Ip IIa	<u>Pinus-Quercus</u>	
Ip Ib	<u>Pinus-Betula</u>	boreal forest
Ip Ia	<u>Betula-Pinus</u>	
(Late Wolstonian)	high n.a.p.	herb-dominated

After Stuart (1976)

Table 26

Early Devensian Radiocarbon Dates

Brørup I/S	At Brørup	58740 ± 1000	GRO 1729
		59430 ± 1000	GRO 1470
	At Amersfoort	53000	GRO 1280 and 1285
		61000 at the end, 63000 at the beginning	
Amersfoort I/S	At Amersfoort	53000	GRP 1221
		63500 ± 1100	GRO 1398
		66500 at the peak, 68000 at the beginning.	

After Shotton (1977)

Table 27

Estimated Devensian Temperatures

B.P.	Mean air Temperature		Fall from Present	
	annual	July	annual	July
10500	-5	10	15	5
11500	-4	12/13	14	3
13000	-7	10	17	5
18000	-15	5	25	10
55000	-7	11	17	4

After Watson (1977)

Table 28.

A Summary of Devensian Vertebrate Fauna

Insectivora

1. Sorex cf. araneus, common shrew
2. Talpa europaea, mole

Primates

3. Homo sapiens, man

Lagomorpha

4. Lepus timidus, mountain hare

Rodentia

5. Spermophilus major, red-cheeked suslik
6. Dicrostonyx torquatus, arctic lemming
7. Lemmus lemmus, Norway lemming
8. Clethrionomys glareolus, bank vole
9. Arvicola terrestris, water vole
10. Microtus oeconomus northern vole
11. Microtus gregalis, tundra vole
12. Microtus agrestis, field vole

Carnivora

13. Lynx lynx, lynx
14. Canis lupus, wolf
15. Alopex lagopus, arctic fox
16. Vulpes vulpes, red fox
17. Ursus arctos, brown bear
18. Ursus spelaea, cave bear
19. Thalarctos maritimus, polar bear
20. Mustela erminea, stoat
21. Gulo gulo, glutton or wolverine
22. Crocota crocota spelaea, spotted (cave) hyaena
23. Panthera pardus, leopard
24. Panthera leo, lion

Proboscidea

25. Mammuthus primigenius, mammoth

Perissodactyla

26. Equus sp., horse
27. Coelodonta antiquitatus, woollyrhinoceros

Artiodactyla

28. Capra ibex, ibex
29. Megaceros giganteus, giant deer
30. Cervus elaphus, red deer
31. Cervus strongyloceros, giant red deer
32. Rangifer tarandus, reindeer
33. Bison priscus, bison
34. Saiga tartarica, saiga antelope
35. Ovibos moschatus, musk ox

After Stuart (1977) with amendments.

Table 29

Age of Zebra killed by Hyaenas

Age	Serengeti	Ngorongoro	Total
Up to 4 years old	8	14	22 (48%)
Over 4, up to 8 years	2	5	7 (15%)
Over 8, up to 12 years	5	4	9 (20%)
Over 12, up to 16 years	2	6	8 (17%)
	17	29	46 (100%)

From Kruuk (1972)

Table 30

Comparison of lower molar 3 length in red deer specimens

Location	No.	Mean	Range
Norway [@] Neolithic	13	32.1	30.0 - 34.0
Denmark [@] Neolithic	124	32.5	28.0 - 40.0
Bodensee [@] Neolithic	13	31.7	31.5 - 37.0
Joint Mitnor Ipswichian	7	34.6	31.5 - 36.2

[@] From Walvius (1961)

Table 31

Percentages of prey species taken by various Serengeti predators

Prey	Lion	Hyaena	Wild dog	Leopard	Cheetah
Wildebeest	32	53.3	38.4	6.7	1.9
Zebra	22	10.4	5.6	1.2	-
Thom. gazelle	29	28.1	42.4	53.4	91.2
Buffalo	5	-	-	-	-
Topi	trace	1.9	1.0	1.8	0.8
Warthog	"	0.5	3.0	0.6	-
Eland	"	0.5	-	-	-
Grant's gazelle	"	1.9	4.5	6.1	2.3
Hartbeest	"	0.5	0.5	1.2	0.4
Giraffe	"	-	-	-	-
Impala	"	0.5	1.0	-	1.1
Reedbuck	"	-	-	11.6	0.8
Bushbuck	"	-	0.5	-	-
Waterbuck	"	0.5	-	0.6	-
Pangolin	"	-	-	-	-
Hare	"	0.5	0.5	-	1.1
Lion	-	-	-	-	-
Hyaena	-	-	-	-	-
Leopard	-	-	-	-	-
Ostrich	-	-	2.0	-	-
Baboon	trace	-	-	0.6	-
Jackal (Golden)	"	0.5	-	0.6	-
Jackal (Black)	-	-	-	0.6	-
Fox	-	0.5	-	1.2	-
Serval	-	-	-	1.2	-
Spring hare	-	0.5	-	-	-
European stork	-	-	-	2.4	-
Total observations	887	221	198	164	261

Information derived from Schaller (1972)

Table 32

Percentages of prey taken by Kruger Park predators

Prey	Lion	Spotted Hyaena	Brown Hyaena	Wild dog	Leopard	Cheetah
Impala	19.7	60.5	20.1	87.0	71.3	67.7
Wildebeest	23.6	11.6	2.2	0.4	1.3	5.0
Zebra	15.8	0.6	3.8	0.1	1.2	1.8
Waterbuck	10.5	11.0	18.5	2.7	3.9	6.7
Kudu	10.9	9.9	39.1	4.6	2.9	6.8
Warthog	1.9	0.6	0.5	0.3	1.4	0.6
Sable antelope	1.5	-	1.1	0.2	0.1	0.4
Roan antelope	0.3	-	0.5	-	0.1	0.1
Tsessebe	0.4	-	1.1	0.1	0.2	0.7
Eland	0.5	-	0.5	0.1	0.2	0.1
Reedbuck	0.3	-	1.1	1.4	2.3	5.3
Mountain reedbuck	0.1	-	-	0.1	0.1	-
Nyala	0.1	-	-	0.3	0.4	-
Bushbuck	0.3	2.9	0.5	1.1	3.9	1.1
Duiker	0.1	-	0.5	0.9	1.3	1.7
Steenbuck	0.1	-	-	0.5	1.0	0.9
Sharp's grysbuck	0.1	0.6	-	0.3	0.6	0.2
Klip-springer	0.1	-	-	0.1	0.5	-
Ostrich	0.1	-	-	-	0.1	0.3
Ratel	0.1	-	-	0.1	-	-
Buffalo	9.2	1.2	1.1	-	0.1	0.1
Giraffe	3.9	-	-	-	-	0.2
Antbear	0.1	-	0.5	-	0.2	0.1
Porcupine	0.1	-	-	-	0.1	0.1
Hare	-	-	-	-	0.1	0.1
Cheetah	0.1	-	-	-	0.1	0.1
Oribi	-	-	-	-	0.1	0.1
Baboon	0.1	-	-	-	1.0	-
Vervet monkey	-	-	-	-	0.1	-
Cane rat	-	-	-	-	0.1	-
Leopard	0.1	-	-	-	0.1	-
Civet	0.1	-	-	-	0.1	-
Python	-	-	-	-	0.1	-
Hippopotamus	0.1	-	-	-	-	-
White rhinoceros	0.1	-	-	-	-	-
Bushpig	0.1	-	-	-	-	-
Scaly anteater	0.1	1.2	-	-	-	-
Lion	0.1	-	-	-	-	-
Hyaena	0.1	-	-	-	-	-
Jackal	0.1	-	-	-	-	-
TOTAL KILLS	12,313	172	184	2,746	5,525	1096

From Pienaar (1969)

Table 32a
Hunting success of various carnivores

Predator	Prey	No. Attempts	% Successful
Lynx	Snowshoe Hare	98	16
Lynx	Snowshoe Hare	43	42
Lynx	Ruffed Grouse	40	12.5
Puma	Deer and Wapiti	45	82
Coyote	Snowshoe Hare	40	10
Wolf	Moose (Elk)	77	8
Hyaena	Thomson's Gazelle	43	33
Hyaena	Wildebeest Calf	108	32
Hyaena	Wildebeest Adult	49	44
Hyaena	Zebra	47	34
Cheetah	Thomson's Gazelle	87	70
Lion (single)	Wildebeest and Zebra	33	15
(two)	" "	17	35
(three)	" "	16	12.5
(four-five)	" "	16	37
(five-six)	" "	21	43

Information from Schaller 1972: Tables 59, 70, 76

Note: Much clearly depends upon what is considered by the observer to be a hunting attempt, so that cross-species comparisons are difficult to make with precision and could be misleading. However, a generally low success rate is implied, pointing to the complex interaction between predator tactics and the anti-predator responses of the prey.

Table 33

Devensian horse upper teeth wear quanta

<u>Kent's Cavern</u>					
Tooth	Quantum	Altitude	Level of Rejection	No. of Specimens	Quantum Accepted
P2 (L)	2.496	2.365	0.701	39	No
P2 (R)	4.603	3.272	0.076	36	Yes *
P3/4(L)	3.174	2.877	0.257	111	No
P3/4(R)	2.274	2.953	0.188	143	No
M1 (L)	2.353	2.129	0.841	70	No
M1 (R)	4.875	3.407	0.016	71	Yes *
M1 (B)	4.862	2.868	0.366	141	No
M2 (L)	1.843	3.424	0.068	64	Yes *
M2 (R)	3.821	3.356	0.072	67	Yes *
M3 (L)	2.510	2.996	0.155	60	No
M3 (R)	3.594	3.830	0.016	65	Yes *
 <u>Wookey Hole Hyaena Den</u>					
P2 (L)	2.321	3.314	0.056	13	Yes *
P2 (R)	4.282	2.389	0.614	15	No
M1 (L)	2.156	3.653	0.024	24	Yes *
M1 (R)	3.165	1.960	0.912	29	No
M2 (L)	2.269	3.317	0.092	41	Yes *
M2 (R)	2.339	2.689	0.494	29	No
M3 (L)	2.780	2.327	0.737	15	No
M3 (R)	4.880	3.287	0.060	20	Yes *

TABLE 34 Comparison of Serengeti predator behaviour (After Schaller 1972)

Characteristic	Lion	Leopard	Cheetah	Hyaena	Wild dog	Jackal
Av. adult weight (kg.)	110-180	35-55	35-55	45-60	17-20	5-9
Common habitat	Open woods	Thickets and riverine forest	Plains	Plains	Woodland and plains	Woodland and plains
Main activity time	Nocturnal	Nocturnal	Diurnal	Nocturnal	Diurnal	Nocturnal
Fastest speed (km/hr)	60	60	95	65	70	60
Max. prey size (kg.)	900	60	60	300	250	5
Usual size of hunting group	Solitary or groups of 2-15	Solitary	Usually solitary	Solitary or groups of 2-30	Groups of 2-30	Solitary or groups of 2
Average hunting success on Thompson's gazelle	26%	Not clear	70%	33%	57%	33%
Max. number of meals from one kill	Several	Several	One	Usually one	One	Usually one

Table 34a

Some predicted behavioural comparisons of British Upper Pleistocene predators based on modern ethology discussed and referenced in Chapter 4

Characteristic	Lion	Hyaena	Man	Wolf	Leopard	Bear	Lynx	Wolverine
Max. adult weight (Kg)	200 _±	60 _±	75 _±	60 _±	70 _±	800 _±	40 _±	30 _±
Habitat pref. (cover/open)	cover	open	either	open	cover	either	cover	either
Main activity period	night	night/day	day	day	night	either	either	either
Max. speed (kph)	60 _±	65 _±	35 _±	65 _±	60 _±	35 _±	60 _±	40 _±
Maintain high speed (or close to)	no	yes	no	yes	no	no	no	perhaps
Main hunting method	stalk and rush	long chase	ambush/trap/ shoot/spear	long chase	stalk and rush	opportunistic	stalk and rush	opportunistic
Usual hunting group size	solitary or groups 2-15	2-30 _±	solitary or group 2-10	2-10	solitary	solitary	solitary	solitary
Usual max. prey size (Kg)	1000 _±	350 _±	4000 _±	350 _±	60 _±	350 _±	100 _±	100 _±
Main killing method	neck bite	evisceration	spearing/ stabbing	evisceration	neck bite	mauling	neck bite	mauling
Scavenger	yes	yes	yes	yes	yes	yes	yes	yes
Ipswichian food tactics (hunt/scavenge)	hunt	scavenge/ hunt	either	scavenge/hunt	hunt	either	hunt	-
Devensian food tactics	hunt/scavenge	hunt/ scavenge	either	scavenge/hunt	hunt/ scavenge	either	hunt	hunt/ scavenge
Able to drive off	hyaena wolf leopard bear lynx ?wolverine	single lion wolf leopard ? bear lynx ? wolverine	all	?lion hyaena leopard ?bear lynx ?wolverine	single hyaena single wolf lynx	lion hyaena wolf lynx ?wolverine	none	possibly all except man
Able to hunt adult ungulates	all except elephant	horse cervids pig ovicaprids musk ox	all	cervids pig ovicaprids musk ox ?horse	reindeer fallow deer ovicaprids man pig	same range as wolf and hyaena	ovicaprids small cervids	reindeer ovicaprids anything trapped
Horse adult sex pref.	either	female	either	female	either	prob. irrel.	-	-
Birth interval Ipswichian	2 yrs	16 months	c2 yrs	1 yr	2yrs	2yrs	1yr	-
Birth interval Devensian	2 yrs	2 yrs	c2 yrs	1 yr	2yrs	2yrs	1yr	1yr
Av. male annual kill weight for food needs (Kg)	3900	800	500	800	800	variable	400	variable

Characteristic	Horse	Woolly Rhinoceros	Steppe Rhinoceros	Bison	Reindeer	Giant Deer	Red Deer	Fallow Deer	Mammoth	Straight-Tusked Elephant	Hippopotamus	Musk Ox	Saiga Antelope	Aurochs	Ibex	Pig
Max. Weight (kg)	400	3500	3500	1400	300	800	350	90	4500	5000	4500	400	70	1400	100	200
Food Preference	graze	graze	browse	browse	graze	browse	browse	browse	graze	browse	graze	graze	graze	browse	graze	browse/ root
Herding	yes	no	no	yes	yes	yes <u>seasonal</u> yes			yes	yes	no	yes	yes	yes	yes	no
Agressive to Predators	yes	yes	yes	yes	no	yes	yes	poss.	yes	yes	yes	yes	no	yes	yes	yes
Organised Group Defence	yes	no	no	yes	no	no	no	no	yes	yes	no	yes	no	yes	no	no
Usual Minimum Group Size	6-10	4-6	4-6	2+	100+	20+	20+	20+	10-20	10-20	10-20	20-30	100+	20+	20+	6-10
Major Ipswichian Predators	lion man	-	lion man	lion man	-	lion man	lion wolf hyaena	hyaena wolf leopard	-	man	?man	-	-	lion man	-	all
Major Devensian Predators	lion hyaena man	lion man	-	lion man	lion wolf hyaena man	lion wolf hyaena man	lion wolf hyaena man	-	man	-	-	man wolf hy-ena	leopard	-	?leopard wolf	-
Defend Young	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes

Table 34b

Some predicted behavioral comparisons of British Upper Pleistocene ungulates based on modern ethology discussed in Chapter 4.

Table 35

Length of upper canine in Ipswichian and Devensian hyaenas

Locality	No.	Mean and Standard Error	Standard Deviation	Range
<u>Ipswichian</u>				
Barrington	4	16.93 ± 0.46	0.93	16.0-18.2
Joint Mitnor	24	16.20 ± 0.16	0.77	14.0-17.4
Torneuton	59	16.62 ± 0.11	0.83	14.9-18.5
Kirkdale	33	16.98 ± 0.14	0.82	15.4-18.5
<u>Devensian</u>				
Wookey Hole	32	17.28 ± 0.24	1.34	14.0-19.6
Uphill	37	17.06 ± 0.15	0.92	15.5-19.8
Brixham	5	15.72 ± 0.26	0.57	15.1-16.6
Bench Fissure	9	17.11 ± 0.26	0.78	15.6-18.1
King Arthur	5	18.04 ± 0.23	0.52	17.6-18.6
Kent's Cavern	104	17.74 ± 0.09	0.90	15.4-20.0
Picken's Hole	13	17.17 ± 0.21	0.77	16.1-18.5
Coygan	81	17.54 ± 0.12	1.06	15.0-20.3
Sandford	16	17.01 ± 0.24	0.97	15.0-18.5
Pinhole	9	16.99 ± 0.36	1.07	15.5-19.4
Robin Hood	10.	17.07 ± 0.26	0.81	15.3-18.0
Church Hole	11	17.05 ± 0.26	0.86	16.0-18.8

Width of upper canine in Ipswichian and Devensian hyaenas

Locality	No.	Mean and Standard Error	Standard Deviation	Range
<u>Ipswichian</u>				
Barrington	4	12.60 ± 0.29	0.58	12.0-13.4
Joint Mitnor	24	12.04 ± 0.09	0.45	11.3-12.8
Torneuton	75	12.18 ± 0.08	0.68	10.5-14.4
Kirkdale	33	12.52 ± 0.22	0.67	11.5-14.5
<u>Devensian</u>				
Wookey Hole	39	12.52 ± 0.13	0.80	10.8-14.1
Uphill	49	12.26 ± 0.11	0.75	10.8-13.6
Brixham	8	11.44 ± 0.22	0.62	10.4-12.4
Bench Fissure	9	11.97 ± 0.23	0.69	10.8-13.0
King Arthur	10	12.69 ± 0.24	0.76	11.7-14.0
Kent's Cavern	112	13.19 ± 0.09	0.90	10.7-15.7
Picken's Hole	15	12.28 ± 0.14	0.54	11.5-13.3
Coygan	85	12.62 ± 0.08	0.76	11.1-14.2
Sandford	23	12.22 ± 0.14	0.68	11.0-13.8
Pinhole	8	12.45 ± 0.35	0.76	11.2-14.0
Robin Hood	9	12.43 ± 0.17	0.51	11.7-13.2
Church Hole	10	12.56 ± 0.30	0.95	11.4-14.0

Table 36

Length of upper premolar 2 in Ipswichian and Devensian hyaenas

<u>Locality</u>	<u>No.</u>	<u>Mean and Standard Error</u>	<u>Standard Deviation</u>	<u>Range</u>
<u>Ipswichian</u>				
Barrington	10	16.34 ± 0.23	0.73	15.4-17.5
Joint Mitnor	20	16.68 ± 0.20	0.91	15.4-18.9
Torneuton	21	16.75 ± 0.16	0.73	15.1-18.2
Kirkdale	20	17.25 ± 0.28	0.79	16.0-19.0
<u>Devensian</u>				
Wookey Hole	18	17.17 ± 0.18	0.77	15.9-18.7
Uphill	29	17.27 ± 0.15	0.82	15.6-19.3
Brixham	1	16.5		
Bench Fissure	8	16.63 ± 0.35	0.98	15.0-18.0
King Arthur	6	17.33 ± 0.41	1.01	16.2-18.6
Kent's Cavern	64	17.31 ± 0.14	1.09	13.0-19.4
Picken's Hole	8	17.21 ± 0.31	0.88	16.5-19.0
Coygan	42	17.52 ± 0.15	0.99	15.3-19.4
Sandford	12	17.54 ± 0.11	0.36	16.9-18.1
Pinhole	26	17.50 ± 0.14	0.72	16.2-19.0
Robin Hood	8	17.60 ± 0.31	0.87	16.2-18.6
Church Hole	5	17.40 ± 0.33	0.73	16.5-18.0

Width of upper premolar 2 in Ipswichian and Devensian hyaenas

<u>Locality</u>	<u>No.</u>	<u>Mean and Standard Error</u>	<u>Standard Deviation</u>	<u>Range</u>
<u>Ipswichian</u>				
Barrington	8	12.74 ± 0.32	0.89	11.6-14.1
Joint Mitnor	17	12.61 ± 0.17	0.70	11.0-13.8
Torneuton	22	12.92 ± 0.19	0.87	11.3-14.6
Kirkdale	20	12.82 ± 0.17	0.77	11.1-14.4
<u>Devensian</u>				
Wookey Hole	18	13.13 ± 0.19	0.82	11.0-14.4
Uphill	28	13.00 ± 0.17	0.87	10.9-15.1
Brixham	1	11.4		
Bench Fissure	8	12.66 ± 0.25	0.70	11.6-13.7
King Arthur	6	13.45 ± 0.53	1.29	12.3-15.3
Kent's Cavern	59	13.41 ± 0.12	0.89	11.6-15.6
Picken's Hole	9	12.91 ± 0.21	0.63	11.7-13.7
Coygan	34	13.16 ± 0.16	0.91	10.9-14.9
Sandford	9	13.12 ± 0.08	0.23	12.8-13.4
Pinhole	22	12.99 ± 0.11	0.51	12.3-13.7
Robin Hood	9	13.38 ± 0.32	0.96	11.9-15.0
Church Hole	5	12.84 ± 0.36	0.81	12.0-14.2

Table 37

Length of upper premolar 3 in Ipswichian and Devensian hyaenas

Locality	No.	Mean and Standard Error	Standard Deviation	Range
<u>Ipswichian</u>				
Barrington	16	23.09 ± 0.21	0.84	21.4-24.4
Joint Mitnor	27	23.95 ± 0.12	0.63	22.6-25.5
Tornewton	58	23.41 ± 0.12	0.88	22.0-25.5
Kirkdale	32	24.17 ± 0.17	0.97	21.9-25.9
<u>Devensian</u>				
Wookey Hole	46	24.38 ± 0.13	0.90	21.7-26.2
Uphill	44	24.34 ± 0.17	1.12	20.3-26.2
Brixham	3	23.57 ± 1.09	1.89	21.5-25.2
Bench Fissure	14	23.09 ± 0.18	0.66	21.5-24.2
King Arthur	15	24.09 ± 0.26	1.02	22.0-26.2
Kent's Cavern	122	24.19 ± 0.10	1.09	21.1-27.6
Picken's Hole	13	23.98 ± 0.23	0.81	22.1-25.0
Coygan	93	24.01 ± 0.10	1.00	21.3-26.6
Sandford	11	24.20 ± 0.28	0.94	22.6-25.9
Pinhole	18	23.80 ± 0.24	1.02	20.8-25.4
Robin Hood	12	23.51 ± 0.19	0.65	22.5-24.4
Church Hole	10	23.48 ± 0.45	1.41	20.8-25.4

Width of upper premolar 3 in Ipswichian and Devensian Hyaenas

Locality	No.	Mean and Standard Error	Standard Deviation	Range
<u>Ipswichian</u>				
Barrington	15	17.93 ± 0.28	1.08	16.3-20.4
Joint Mitnor	25	18.34 ± 0.12	0.62	17.0-19.6
Tornewton	58	18.02 ± 0.11	0.84	16.5-20.6
Kirkdale	32	18.30 ± 0.15	0.87	16.4-20.2
<u>Devensian</u>				
Wookey Hole	46	18.10 ± 0.11	0.76	16.3-19.8
Uphill	48	18.12 ± 0.14	0.94	15.7-19.8
Brixham	3	17.20 ± 0.64	1.11	16.2-18.4
Bench Fissure	15	16.96 ± 0.18	0.71	15.8-18.6
King Arthur	15	17.83 ± 0.26	1.02	16.0-19.3
Kent's Cavern	115	18.07 ± 0.08	0.87	15.4-20.6
Picken's Hole	13	17.80 ± 0.11	0.39	17.2-18.5
Coygan	89	18.03 ± 0.10	0.90	15.4-20.2
Sandford	12	18.10 ± 0.25	0.85	17.1-20.0
Pinhole	18	17.59 ± 0.25	1.07	14.3-19.0
Robin Hood	11	17.31 ± 0.20	0.68	16.0-18.3
Church Hole	10	18.16 ± 0.31	0.97	16.9-19.4

Table 38

Length of upper premolar 4 in Ipswichian and Devensian hyaenas

Locality	No.	Mean and Standard Error	Standard Deviation	Range
<u>Ipswichian</u>				
Barrington	5	40.14 \pm 0.25	0.56	29.4-40.8
Joint Mitnor	20	41.07 \pm 0.35	1.56	38.5-43.3
Torneuton	54	41.04 \pm 0.18	1.33	37.8-43.4
Kirkdale	16	41.49 \pm 0.39	1.39	38.1-44.0
<u>Devensian</u>				
Wookey Hole	33	41.11 \pm 0.25	1.46	38.2-44.0
Uphill	32	40.04 \pm 0.30	1.67	36.3-43.4
Brixham	3	39.67 \pm 0.47	0.81	38.8-40.4
Bench Fissure	6	39.78 \pm 0.45	1.11	37.8-40.8
King Arthur	8	41.20 \pm 0.54	1.54	38.9-43.3
Kent's Cavern	113	40.96 \pm 0.15	1.61	36.4-45.3
Picken's Hole	10	40.49 \pm 0.62	1.96	37.6-42.5
Coygan	66	41.29 \pm 0.17	1.38	37.1-44.8
Sandford	5	42.04 \pm 0.48	1.07	40.4-43.4
Pinhole	22	41.17 \pm 0.21	1.00	39.7-42.5
Robin Hood	4	41.40 \pm 0.41	0.83	40.2-42.1
Church Hole	6	39.03 \pm 0.34	0.83	37.9-40.0

Anterior width of upper premolar 4 in Ipswichian and Devensian hyaenas

Locality	No.	Mean and Standard Error	Standard Deviation	Range
<u>Ipswichian</u>				
Barrington	7	21.79 \pm 0.77	2.03	17.3-23.2
Joint Mitnor	20	22.19 \pm 0.23	1.03	20.5-24.0
Torneuton	50	21.76 \pm 0.15	1.09	18.6-24.1
Kirkdale	16	22.15 \pm 0.28	1.11	20.3-25.1
<u>Devensian</u>				
Wookey Hole	40	22.68 \pm 0.21	1.33	18.7-25.0
Uphill	34	22.46 \pm 0.22	1.30	19.9-26.2
Brixham	4	21.78 \pm 0.55	1.10	20.4-22.8
Bench Fissure	8	21.79 \pm 0.70	1.98	18.7-24.2
King Arthur	12	23.18 \pm 0.40	1.38	20.8-26.0
Kent's Cavern	119	22.63 \pm 0.11	1.24	19.6-26.0
Picken's Hole	11	21.92 \pm 0.38	1.27	20.2-24.0
Coygan	70	22.72 \pm 0.15	1.22	19.9-25.4
Sandford	6	22.93 \pm 0.54	1.32	21.4-25.0
Pinhole	25	21.93 \pm 0.24	1.22	19.0-24.4
Robin Hood	5	23.66 \pm 0.21	0.47	23.2-24.3
Church Hole	7	21.93 \pm 0.39	1.04	19.9-23.0

Table 39

Length of lower canine in Ipswichian and Devensian hyaenas

Locality	No.	Mean and Standard Error	Standard Deviation	Range
<u>Ipswichian</u>				
Barrington	7	15.30 ± 0.28	0.74	14.0-16.2
Joint Mitnor	25	15.39 ± 0.22	1.12	13.4-17.7
Torneuton	60	15.47 ± 0.11	0.87	13.0-17.0
Kirkdale	20	15.87 ± 0.17	0.74	14.5-17.5
<u>Devensian</u>				
Wookey Hole	48	16.19 ± 0.18	1.27	12.4-18.3
Uphill	46	16.02 ± 0.11	0.74	14.6-18.8
Brixham	8	15.76 ± 0.29	0.83	14.5-16.9
Bench Fissure	4	16.43 ± 0.41	0.81	15.8-17.6
King Arthur	8	16.68 ± 0.22	0.63	15.7-17.6
Kent's Cavern	132	16.69 ± 0.08	0.93	14.2-18.7
Picken's Hole	12	16.31 ± 0.19	0.66	15.4-17.1
Coygan	78	16.61 ± 0.12	1.03	11.5-18.7
Sandford	20	15.98 ± 0.23	1.02	14.3-18.0
Pinhole	11	16.07 ± 0.39	1.50	14.0-19.1
Robin Hood	9	16.57 ± 0.22	0.65	15.4-17.3
Church Hole	14	16.26 ± 0.23	0.87	14.6-17.7

Width of lower canine in Ipswichian and Devensian hyaenas

Locality	No.	Mean and Standard Error	Standard Deviation	Range
<u>Ipswichian</u>				
Barrington	11	12.14 ± 0.18	0.61	11.2-13.2
Joint Mitnor	26	12.37 ± 0.12	0.61	11.5-14.0
Torneuton	87	12.38 ± 0.09	0.80	10.5-14.7
Kirkdale	20	12.78 ± 0.15	0.66	11.7-14.1
<u>Devensian</u>				
Wookey Hole	58	12.79 ± 0.08	0.62	11.0-14.0
Uphill	59	12.50 ± 0.07	0.53	11.3-13.8
Brixham	12	12.38 ± 0.08	0.27	12.0-12.8
Bench Fissure	5	12.58 ± 0.24	0.53	12.2-13.5
King Arthur	12	12.86 ± 0.18	0.64	11.8-14.0
Kent's Cavern	158	13.44 ± 0.06	0.80	11.1-15.7
Picken's Hole	15	12.71 ± 0.10	0.40	11.7-13.2
Coygan	102	12.89 ± 0.07	0.71	11.1-14.7
Sandford	32	12.29 ± 0.12	0.67	11.0-13.5
Pinhole	13	12.30 ± 0.31	1.12	9.2-14.9
Robin Hood	10	12.78 ± 0.12	0.39	12.1-13.0
Church Hole	16	12.71 ± 0.16	0.62	11.5-13.9

Table 40

Length of lower premolar 2 in Ipswichian and Devensian hyaenas

Locality	No.	Mean and Standard Error	Standard Deviation	Range
<u>Ipswichian</u>				
Barrington	11	17.40 ± 0.35	1.15	15.5-18.7
Joint Mitnor	12	16.97 ± 0.23	0.81	16.0-18.1
Torneuton	23	17.38 ± 0.18	0.88	16.0-19.0
Kirkdale	29	17.33 ± 0.20	1.06	15.0-19.6
<u>Devensian</u>				
Wookey Hole	49	16.76 ± 0.13	0.90	15.1-18.9
Uphill	46	16.37 ± 0.15	1.02	13.4-19.2
Brixham	6	16.18 ± 0.43	1.06	15.0-17.8
Bench Fissure	11	16.37 ± 0.31	1.02	14.8-17.8
King Arthur	6	15.90 ± 0.23	0.55	15.0-16.5
Kent's Cavern	187	16.49 ± 0.07	0.89	14.0-19.0
Picken's Hole	15	16.70 ± 0.15	0.57	15.6-17.8
Coygan	62	16.64 ± 0.10	0.80	15.1-18.9
Sandford	50	16.41 ± 0.11	0.79	14.8-18.4
Pinhole	36	16.37 ± 0.11	0.67	15.3-17.8
Robin Hood	8	16.49 ± 0.38	1.07	14.5-18.2
Church Hole	9	16.44 ± 0.16	0.48	15.3-17.0

Width of lower premolar 2 in Ipswichian and Devensian hyaenas

Locality	No.	Mean and Standard Error	Standard Deviation	Range
<u>Ipswichian</u>				
Barrington	11	12.55 ± 0.18	0.58	11.5-13.4
Joint Mitnor	11	12.23 ± 0.27	0.90	11.0-13.7
Torneuton	26	12.51 ± 0.15	0.74	11.3-13.7
Kirkdale	29	12.52 ± 0.14	0.73	10.9-14.0
<u>Devensian</u>				
Wookey Hole	49	12.45 ± 0.12	0.83	10.6-14.1
Uphill	47	12.22 ± 0.13	0.91	10.4-14.5
Brixham	6	12.00 ± 0.24	0.59	11.5-13.0
Bench Fissure	11	12.35 ± 0.23	0.75	11.5-13.5
King Arthur	5	11.02 ± 0.18	0.41	11.2-12.2
Kent's Cavern	173	12.25 ± 0.06	0.78	10.4-16.4
Picken's Hole	16	12.59 ± 0.17	0.67	11.3-13.6
Coygan	57	12.42 ± 0.10	0.75	10.7-14.6
Sandford	48	12.17 ± 0.12	0.86	10.6-14.0
Pinhole	36	12.14 ± 0.12	0.73	10.8-14.6
Robin Hood	7	11.99 ± 0.23	0.61	11.1-12.8
Church Hole	8	11.99 ± 0.25	0.70	10.8-12.6

Table 41

Length of lower premolar 3 in Ipswichian and Devensian hyaenas

Locality	No.	Mean and Standard Error	Standard Deviation	Range
<u>Ipswichian</u>				
Barrington	16	21.66 \pm 0.24	0.95	19.4-23.1
Joint Mitnor	29	21.46 \pm 0.09	0.46	20.7-22.5
Torneuton	45	21.59 \pm 0.09	0.62	20.4-23.0
Kirkdale	46	21.46 \pm 0.11	0.71	20.0-23.2
<u>Devensian</u>				
Wookey Hill	85	21.86 \pm 0.12	1.07	19.0-24.2
Uphill	68	21.73 \pm 0.10	0.84	19.4-23.5
Brixham	6	21.42 \pm 0.40	0.99	19.8-22.5
Bench Fissure	15	21.53 \pm 0.22	0.84	20.4-23.7
King Arthur	8	21.29 \pm 0.21	0.60	20.6-22.4
Kent's Cavern	264	22.17 \pm 0.06	0.94	19.6-25.4
Picken's Hole	27	21.70 \pm 0.16	0.85	18.7-22.9
Coygan	118	22.05 \pm 0.08	0.87	20.0-24.3
Sandford	57	21.92 \pm 0.10	0.75	20.1-24.0
Pinhole	41	21.61 \pm 0.15	0.94	20.0-23.7
Robin Hood	12	21.75 \pm 0.27	0.94	19.5-22.9
Church Hole	10	21.61 \pm 0.30	0.94	20.1-23.0

Width of lower premolar 3 in Ipswichian and Devensian hyaenas

Locality	No.	Mean and Standard Error	Standard Deviation	Range
<u>Ipswichian</u>				
Barrington	16	16.29 \pm 0.18	0.70	15.1-18.0
Joint Mitnor	29	16.17 \pm 0.12	0.64	14.5-17.5
Torneuton	45	16.12 \pm 0.12	0.82	14.3-17.8
Kirkdale	46	16.20 \pm 0.13	0.85	14.0-17.8
<u>Devensian</u>				
Wookey Hole	86	16.37 \pm 0.09	0.81	14.5-18.4
Uphill	63	16.28 \pm 0.10	0.80	14.6-18.2
Brixham	6	15.45 \pm 0.35	0.86	14.2-16.5
Bench Fissure	14	15.93 \pm 0.21	0.79	14.4-17.0
King Arthur	9	15.79 \pm 0.20	0.60	15.0-16.8
Kent's Cavern	255	16.55 \pm 0.05	0.82	14.3-19.0
Picken's Hole	27	16.22 \pm 0.16	0.81	14.0-18.0
Coygan	115	16.50 \pm 0.07	0.78	14.7-18.2
Sandford	56	16.28 \pm 0.10	0.74	15.0-18.0
Pinhole	41	16.06 \pm 0.12	0.76	15.1-17.6
Robin Hood	12	16.18 \pm 0.34	1.18	15.0-17.7
Church Hole	10	15.74 \pm 0.25	0.80	14.7-17.2

Table 42.

Length of lower premolar 4 in Ipswichian and Devensian hyaenas

<u>Locality</u>	<u>No.</u>	<u>Mean and Standard Error</u>	<u>Standard Deviation</u>	<u>Range</u>
<u>Ipswichian</u>				
Barrington	15	23.82 ± 0.20	0.78	22.8-25.4
Joint Mitnor	27	24.22 ± 0.20	1.03	22.3-26.3
Torneuton	84	24.23 ± 0.09	0.85	22.0-26.4
Kirkdale	32	23.86 ± 0.25	0.83	22.0-25.2
<u>Devensian</u>				
Wookey Hole	64	24.14 ± 0.14	1.14	21.2-26.5
Uphill	57	23.96 ± 0.13	0.98	22.2-25.8
Brixham	8	23.63 ± 0.19	0.54	23.0-24.4
Bench Fissure	20	23.49 ± 0.17	0.74	22.5-25.6
King Arthur	10	23.57 ± 0.31	0.98	21.9-25.7
Kent's Cavern	255	24.29 ± 0.06	1.02	21.4-27.4
Picken's Hole	22	24.06 ± 0.19	0.90	22.7-25.7
Coygan	126	24.35 ± 0.08	0.95	22.6-27.3
Sandford	58	24.14 ± 0.13	1.01	21.0-26.1
Pinhole	57	23.96 ± 0.12	0.91	21.8-25.0
Robin Hood	13	24.25 ± 0.26	0.94	22.8-25.4
Church Hole	11	24.08 ± 0.40	1.33	22.4-26.4

Width of lower premolar 4 in Ipswichian and Devensian hyaenas

<u>Locality</u>	<u>No.</u>	<u>Mean and Standard Error</u>	<u>Standard Deviation</u>	<u>Range</u>
<u>Ipswichian</u>				
Barrington	16	14.09 ± 0.22	0.89	12.21-15.3
Joint Mitnor	28	14.16 ± 0.12	0.64	13.2-15.3
Torneuton	86	14.20 ± 0.07	0.66	12.8-15.7
Kirkdale	32	14.33 ± 0.13	0.73	12.7-15.5
<u>Devensian</u>				
Wookey Hole	61	14.76 ± 0.09	0.71	13.4-16.2
Uphill	59	14.90 ± 0.09	0.68	12.8-16.5
Brixham	8	14.60 ± 0.17	0.49	13.9-15.1
Bench Fissure	20	14.61 ± 0.14	0.63	13.7-15.8
King Arthur	10	14.50 ± 0.18	0.57	13.4-15.3
Kent's Cavern	255	15.01 ± 0.05	0.72	12.5-17.2
Picken's Hole	25	14.79 ± 0.11	0.55	13.8-15.9
Coygan	125	15.02 ± 0.06	0.66	12.9-16.2
Sandford	57	14.64 ± 0.10	0.74	13.6-17.0
Pinhole	54	14.47 ± 0.11	0.83	12.6-16.5
Robin Hood	14	14.75 ± 0.24	0.89	13.6-16.5
Church Hole	10	14.50 ± 0.21	0.66	13.3-15.2

Table 43

Length of lower carnassial in Ipswichian and Devensian hyaenas

Locality	No.	Mean and Standard Error	Standard Deviation	Range
<u>Ipswichian</u>				
Barrington	10	32.50 \pm 0.35	1.12	31.1-34.2
Joint Mitnor	23	31.73 \pm 0.32	1.55	28.6-35.9
Tornewton	93	31.80 \pm 0.13	1.24	28.8-34.7
Kirkdale	46	31.78 \pm 0.19	1.28	29.6-35.5
<u>Devensian</u>				
Wookey Hole	70	32.37 \pm 0.17	1.38	28.9-35.3
Uphill	57	32.23 \pm 0.22	1.67	28.8-36.5
Brixham	4	32.43 \pm 0.63	1.27	31.2-34.2
Bench Fissure	15	31.37 \pm 0.37	1.44	28.7-33.6
King Arthur	10	32.25 \pm 0.55	1.74	29.2-34.3
Kent's Cavern	222	32.52 \pm 0.09	1.35	27.5-36.6
Picken's Hole	22	32.09 \pm 0.27	1.25	29.9-34.8
Coygan	94	32.29 \pm 0.14	1.38	28.8-35.1
Sandford Hill	44	31.85 \pm 0.22	1.46	28.7-35.3
Pinhole	45	32.38 \pm 0.20	1.31	30.0-35.8
Robin Hood	23	32.26 \pm 0.28	1.36	29.6-34.8
Church Hole	14	32.26 \pm 0.63	2.36	29.3-36.0

Width of lower carnassial in Ipswichian and Devensian hyaenas

Locality	No.	Mean and Standard Error	Standard Deviation	Range
<u>Ipswichian</u>				
Barrington	8	13.51 \pm 0.22	0.62	12.2-14.0
Joint Mitnor	23	13.44 \pm 0.14	0.73	12.2-14.7
Tornewton	96	13.33 \pm 0.06	0.61	11.8-15.0
Kirkdale	46	13.30 \pm 0.08	0.58	12.3-14.6
<u>Devensian</u>				
Wookey Hole	72	13.82 \pm 0.08	0.70	12.1-15.3
Uphill	63	13.88 \pm 0.09	0.72	12.2-15.7
Brixham	4	13.38 \pm 0.44	0.87	12.6-14.4
Bench Fissure	19	13.65 \pm 0.14	0.59	12.7-14.6
King Arthur	12	14.22 \pm 0.24	0.82	12.7-15.5
Kent's Cavern	226	13.91 \pm 0.04	0.63	11.6-15.6
Picken's Hole	26	13.71 \pm 0.10	0.52	12.4-14.5
Coygan	105	14.07 \pm 0.07	0.72	12.4-16.0
Sandford Hill	52	13.75 \pm 0.05	0.61	12.5-15.6
Pinhole	53	13.58 \pm 0.11	0.77	12.0-15.0
Robin Hood	24	13.78 \pm 0.15	0.76	11.9-15.0
Church Hole	14	13.57 \pm 0.21	0.77	12.6-15.5

Table 44

Skull and Limb-Bone Lengths in Modern and Fossil Crocuta samples

	No.	Mean	S.D.	V	O.R
<u>Modern @</u>					
Prosthion-basion	9	228.3±3.8	11.5	5.02	206-248
Humerus	9	222.6±6.4	19.2	8.60	195-252
Radius	9	230.0±4.7	14.0	6.06	208-252
Metacarpal 3	8	96.9±1.3	3.6	3.73	91-104
Femur	9	244.7±4.5	13.3	5.45	222-269
Tibia	9	195.1±4.5	13.6	6.95	180-219
<u>Devensian</u>					
Prosthion-basion	8	249.0±4.6	13.1	5.25	228-275
Humerus	6	235.3±3.5	8.6	3.63	223-245
Radius	11	217.9±2.0	6.6	3.01	206-228
Metacarpal 3	45	90.3±0.4	3.0	3.30	85-97
Femur	4	263.5±3.7	7.4	2.81	257-274
Tibia	10	197.1±1.4	4.5	2.29	190-205
Metatarsal 3	31	81.2±0.5	2.8	3.49	76-88
<u>Ipswichian</u>					
Prosthion-basion	1	235	-	-	-
Humerus	2	227	-	-	-
Radius	6	225.7±2.1	5.2	2.29	221-234
Metacarpal 3	19	90.6±1.0	4.3	4.77	80-96
Femur	-	-	-	-	-
Tibia	6	200.3±4.2	10.3	5.16	182-212
Metatarsal 3	25	83.5±0.6	2.8	3.38	77-89

@ Data from Kurten 1956: Table 9. Other measurements author

Skull and Limb-Bone Lengths in Modern and Fossil Crocuta specimens

	1	2	3	4	5	6	7	8 @
Prosthion-basion	217	208	242	223	220	247	-	-
Humerus	230	203	256	227	209	223	238	216
Radius	231	210	256	235	214	219	219	217
Metacarpal 3	99	86	104	98	93	-	-	92
Femur	250	230	279	250	235	257	260	237
Tibia	204	184	225	202	192	201	199	189
Metatarsal 3	89	78	95	88	86	-	-	84

- @ 1. 1932 6.6.10 British Museum (Natural History)
 2. 1935 9.19.1 " " " "
 3. K4062 Cambridge Zoology Museum
 4. K4065 " " "
 5. C119 Creswell Crags Interpretation Centre
 6. Skeleton 'A' Taunton Museum Listed Reynolds (1902)
 7. Skeleton 'B' Taunton Museum Listed Reynolds (1902)
 8. R.C.S. Royal College of Surgeons Listed Reynolds (1902)

Specimens 1-5 (modern) measured by author. Specimens 6 and 7 (fossil) and 8 (modern) taken from Reynolds (1902) with addition of prosthion-basion measurement of specimen 6 measured by author.

Table 45.

Distal limb thickness in Ipswichian and Devensian hyaenas

	No.	Mean	S.D.	Range	V
<u>Humerus</u>					
Ipswichian	14	57.42±0.91	3.42	53.0-65.0	5.95
Devensian	32	57.77±0.40	2.25	53.0-64.0	3.90
<u>Tibia</u>					
Ipswichian	17	40.23±0.42	1.71	37.0-43.2	4.26
Devensian	32	40.20±0.33	1.86	36.2-43.2	4.62

Table 46

Measurements of lower cheek teeth in Ipswichian and Devensian lions

		Ci		P3		P4		M1		Wear
		L	B	L	B	L	B	L	B	
<u>Bleadon</u>										
Taunton	right	-	-	19.6	11.1	30.0	14.4	-	-	sw
Museum	left	(26.3	18.7	19.8	11.2	30.0	14.2	29.7	15.4	sw
	right	(-	19.2	20.2	11.3	29.6	14.6	30.0	15.4	
	right	-	-	-	-	27.7	13.0	-	-	mw
<u>Crayford</u>										
British	left	26.7	18.0	19.6	12.0	-	-	32.8	16.9	sw
Museum	left	-	-	-	-	27.2	13.1	-	14.4	mw
	right	24.5	15.6	-	-	-	-	-	-	sw
	right	-	-	17.6	10.0	27.0	13.6	-	-	sw
	right	21.7	-	17.9	9.8	-	-	28.9	15.2	mw
	right	-	-	18.8	10.3	28.0	13.8	30.2	14.9	mw
<u>Bielsbeck</u>										
Yorkshire	left	(29.3	20.4	21.2	10.7	30.2	14.6	31.2	14.6	
Museum	right	(28.3	19.5	-	-	30.2	13.6	31.7	14.6	
<u>Ilford</u>										
Manchester	left	26.7	18.8	-	-	27.3	14.4	-	-	vw
Museum										
<u>Sandford Hill</u>										
Taunton	left	27.1	17.1	18.9	10.6	28.5	14.4	31.0	15.0	sw
Museum	left	(-	-	16.0	8.8	22.8	10.9	25.3	12.1	sw
	right	(-	-	16.2	9.0	22.3	10.7	25.2	12.2	
<u>Kent's Cavern</u>										
Torquay	left	-	-	-	-	30.4	15.0	32.0	17.0	sw
Museum	left	28.1	19.8	-	-	-	-	-	-	sw
<u>Pin Hole</u>										
Manchester	right	26.2	17.8	-	-	28.3	13.8	29.9	14.3	vsw
Museum	right	-	-	-	-	25.1	12.0	26.8	13.2	sw
	right	-	-	-	-	24.5	12.0	28.5	-	mw
	left	25.8	16.9	-	-	27.9	13.5	-	-	sw
	left	-	-	-	-	25.2	11.7	-	-	sw

Table 47

Isolated lower canine measurements in Ipswichian and Devensian lions.

	Left		Right	
	L	B	L	B
<u>Tornewton Hyaena</u>				
<u>Stratum</u>				
British Museum	21.8	14.3	20.8	14.7
<u>Joint Mitnor</u>				
Torquay Museum			22.0	14.5
			23.5	15.5
<u>Crayford</u>				
British Museum	24.1	15.2		
<u>Kent's Cavern</u>				
Torquay Museum	24.4	16.8	19.4	14.5
			27.7	18.9
British Museum	25.0	17.4	19.7	14.4
Geological Museum			21.2	15.1
Yorkshire Museum	28.4	17.5		
<u>Coygan</u>				
Cardiff Museum	19.5	13.2		
<u>Wookey Hole</u>				
Bristol Museum	27.9	18.7		
Oxford Museum	24.0	17.0	23.9	17.9
<u>Pin Hole</u>				
Manchester Museum	26.1	17.8		
	20.2	13.4		
<u>Brixham Cave</u>				
British Museum	26.0	17.2		

Table 48

Isolated lower PM3 measurements in Ipswichian and Devensian lions

	Left	Wear	Right	Wear
	L	B	L	B
<u>Joint Mitnor</u>				
Torquay Museum	19.2	10.4 sw	17.3	9.7 sw
<u>Kirkdale</u>				
British Museum	17.8	10.0 sw		
<u>Kent's Cavern</u>				
Torquay Museum	17.0	9.4 uw		
<u>Wookey Hole</u>				
Oxford Museum	17.2	8.9 sw		
	15.5	9.1 sw		
<u>Pin Hole</u>				
Manchester Museum	16.5	9.1	16.0	9.7 vw

Table 49

Isolated lower PM4 measurements in Ipswichian and Devensian lions

	Left Wear		Right Wear	
	L	B	L	B
<u>Joint Mitnor</u>				
Torquay Museum	25.2	12.8 uw	27.2	14.0 sw
	31.3	15.8 uw	25.8	13.6 uw
	25.7	- uw		
British Museum			27.1	14.3 sw
<u>Tornewton Hyaena Stratum</u>				
British Museum	25.7	13.9 uw	25.7	14.0 uw
	26.1	13.3	25.1	12.8 sw
	28.4	13.6		
	27.5	14.7		
<u>Kirkdale</u>				
Yorkshire Museum			29.3	13.8 uw
<u>Kent's Cavern</u>				
Torquay Museum	25.6	13.3 sw	26.0	14.0 sw
			26.6	= uw
<u>Wookey Hole</u>				
Oxford Museum			29.7	15.6 uw
<u>Pin Hole</u>				
Manchester Museum	25.6	11.7 uw		

Table 50.

Isolated lower M1 measurements in Ipswichian and Devensian lions

	Left Wear		Right Wear	
	L	B	L	B
<u>Kirkdale</u>				
Oxford Museum	27.9	14.4		
<u>Joint Mitnor</u>				
Torquay Museum	30.1	14.7 vsw	27.7	13.3 uw
	27.5	13.2 uw		
	26.2	13.2 uw		
	33.5	17.0 vsw		
<u>Torneyton Hyaena Stratum</u>				
British Museum	29.1	14.5 uw	29.2	14.5 uw
	27.2	14.0 vw	26.8	13.7 mw
	27.4	13.9 sw	26.4	13.0 uw
	25.8	13.0 uw	30.0	14.8 mw
	30.6	15.4 mw	30.7	14.6 sw
	27.0	13.8 mw		
	30.4	14.7 mw		
<u>Kent's Cavern</u>				
Torquay Museum	29.2	15.1 sw	26.2	13.5 uw
	30.0	15.7 uw		
	28.0	15.6 sw		
British Museum	28.0	14.7 sw	30.1	15.0 sw
	30.8	15.6 sw		
	26.7	12.8 vw		
Oxford Museum			27.4	14.8
<u>King Arthur</u>				
Gloucester Museum			29.2	14.4 vw
<u>Creswell Crags</u>				
British Museum	30.2	15.5 sw		
<u>Uphill</u>				
Bristol Museum	27.3	13.6		
<u>Hutton</u>				
British Museum	31.9	15.4		
<u>Coygan</u>				
Cardiff Museum			27.0	14.3 sw
			27.9	14.3 mw
Sedgwick Museum			25.7	14.7
<u>Wookey Hole</u>				
Oxford Museum			32.8	16.0 mw
<u>Pin Hole</u>				
Manchester Museum	26.5	13.2 (mw)	30.5	15.6 sw
	27.0	13.4 vw		
	29.2	14.2 mw		

Table 51

Measurements of upper cheek teeth in Ipswichian and Devensian lions

		C ^s		P ³		P ⁴		
		L	B	L	B	L	Bbl	Wear
<u>Bielsbeck</u>								
Yorkshire Museum	left	-	-	30.4	15.5	40.4	14.5	sw
<u>Ilford</u>								
Yorkshire Museum	left	(31.5	24.3	30.5	-	39.8	16.3	
	right	(30.4	24.0	30.4	16.9	-	-	
<u>Bleadon</u>								
Taunton Museum	left	24.0	18.0	24.8	13.0	-	-	sw
	right	21.3	17.7	26.0	13.5	38.3	13.9	sw
	right	-	-	25.0	13.5	-	-	sw
<u>Kent's Cavern</u>								
Torquay Museum	left	22.3	16.8	26.9	11.8	-	-	mw
	right	29.3	22.3	28.7	14.6	42.2	15.3	mw
	right	23.6	16.6	26.2	12.1	-	-	
<i>British Museum</i>	<i>right</i>	25.4	18.6	27.4	13.7	41.3	14.9	
<u>Sandford Hill</u>								
Taunton Museum	left	28.4	20.7	28.2	15.8	40.7	16.4	sw
	left	(-	-	-	-	40.4	16.5	sw
	right	(30.1	22.5	-	-	40.3	16.2	
	left	(-	-	24.2	11.4	34.9	12.3	sw
	right	(-	-	24.6	11.7	34.8	12.9	

Table 52

Isolated upper canine measurements in Ipswichian and Devensian lions

	Left		Right	
	L	B	L	B
<u>Joint Mitnor</u>				
Torquay Museum			23.9	19.0
<u>King Arthur</u>				
Gloucester Museum	26.3	18.0	29.4	20.4
	22.3	16.0		
	26.3	18.0		
<u>Kent's Cavern</u>				
Torquay Museum	28.1	19.8		
	26.3	19.2		
	24.3	16.3		
	29.0	19.5		
British Museum	28.1	19.9	27.4	20.5
	28.8	21.0	29.4	20.3
			22.0	15.2
			29.4	21.0
<u>Wookey Hole</u>				
Taunton Museum	28.0	21.0		
Oxford Museum	30.4	22.0		
<u>Pin Hole</u>				
Manchester Museum	22.2	16.2	29.8	21.9
<u>Brixham Cave</u>				
British Museum	22.0	15.6	25.4	18.6
	25.7	18.1	28.3	21.1

Table 53

Isolated upper PM3 measurements in Ipswichian and Devensian lions

	Left		Right	
	L	B	L	B
<u>Bleadon</u>				
Taunton Museum	22.5	13.4		
<u>Tornewton Hyaena Stratum</u>				
British Museum	24.6	13.3 uw	25.4	13.2 uw
	23.4	12.3 uw		
<u>Joint Mitnor</u>				
British Museum	30.0	16.3	23.9	13.4
<u>Kent's Cavern</u>				
Geological Museum	25.3	13.4		
<u>Torquay Museum</u>				
	23.9	12.9 sw	23.6	- mw
	23.0	- mw	25.8	13.0 sw
<u>Pin Hole</u>				
Manchester Museum	27.9	13.3 sw		
<u>Brixham Cave</u>				
British Museum	26.9	11.7 mw	26.6	11.4 mw

Table 54

Isolated upper PM4 measurements in Ipswichian and Devensian lions

	Left			Right		
	L	Bbl	Wear	L	Bbl	Wear
<u>Joint Mitnor</u>						
Torquay Museum	37.8	14.0	sw	36.5	13.0	sw
British Museum				37.6	13.9	
<u>Bleadon</u>						
Taunton Museum	-	14.0				
<u>Torneyton Hyaena Stratum</u>						
British Museum	38.5	-	uw	38.6	14.1	mw
				38.0	13.0	vw
<u>Raygill Fissure</u>						
Leeds Museum	36.8	12.7				
<u>Crayford</u>						
British Museum				40.6	16.1	
<u>Kent's Cavern</u>						
Torquay Museum	38.4	14.1	mw	40.2	15.4	
Geological Museum				37.0	14.0	
<u>Brixham Cave</u>						
British Museum				38.0	13.9	

Table 55

Measurements of lower cheek teeth in Ipswichian and Devensian wolves

		P2		P3		P4		M1		Wear	
		L	B	L	B	L	B	L	B		
<u>Banwell</u>											
Taunton Museum	left	13.5	6.7	15.3	7.5	16.4	8.9				
	left					15.8	7.8	28.3	11.5	ww	
	left	13.6	6.8	14.6	7.0	17.9	9.1			vw	
	right	-	-	-	-	18.4	9.4	31.0	12.4	ww	
	right	14.0	6.5	13.9	6.9	-	-	28.1	11.2	sw	
	right	-	-	-	-	14.5	7.8	26.9	11.0	ww	
	right	-	-	-	-	-	-	31.5	13.7	vw	
	right	13.3	6.7	14.6	7.5	16.5	8.7	-	-	ww	
	right	-	-	-	-	-	-	28.1	11.8	mw	
	right	-	-	-	-	18.3	9.1	32.2	13.0	ww	
	right	-	-	-	-	-	-	29.0	11.6	ww	
	British Museum	right	-	-	-	-	17.7	9.2	31.0	12.7	sw
		left	-	-	-	-	-	-	31.5	13.0	ww
left		-	-	-	-	-	-	-	-	vw	
<u>Tornewton Hyaena Stratum</u>											
British Museum	left	-	-	13.6	6.7	16.0	7.6	29.3	11.1	ww	
	left	-	-	14.7	7.2	16.8	9.2	32.2	12.7	mw	
	left	-	-	-	-	16.6	10.0	30.6	12.0	uw	
	left	-	-	-	-	15.5	8.1	27.5	11.3	sw	
	left	13.6	6.7	15.0	7.4	17.2	9.0	30.5	11.6		
	right	13.5	7.8	15.2	7.5	17.4	9.0	30.7	12.0		
	right	-	-	-	-	-	-	30.0	11.5		
	right	12.6	6.0	14.0	6.8	16.2	8.7	29.8	11.6		
	right	-	-	-	-	-	-	31.7	12.8		
	right	-	-	-	-	16.6	-	29.4	-		
<u>Joint Mitnor</u>											
Torquay Museum	right	-	-	-	-	-	-	27.0	10.5		
	right	-	-	-	-	-	-	29.5	12.0		
<u>Durdham Down</u>											
Bristol Museum	left	-	-	-	-	17.8	8.9	31.3	11.9		
	left	13.1	7.1	15.2	7.6	16.6	9.0	30.5	12.2		
	right	-	-	-	-	-	-	28.6	11.2		
<u>Bleadon</u>											
Taunton Museum	right	-	-	-	-	16.6	7.8	31.5	11.8	mw	
<u>Oreston</u>											
British Museum	right	11.3	5.8	14.3	6.7	15.7	8.7	29.3	12.2	sw	
Oxford Museum	right	-	-	-	-	-	-	29.0	11.3	mw	
<u>Hutton</u>											
British Museum	left (	-	-	-	-	-	-	28.5	11.4)	
	right(	14.2	7.1	14.4	7.5	15.2	9.0	-	-)	
Taunton Museum	left	13.5	6.1	-	-	15.9	7.4	28.7	11.3	ww	
<u>Sandford</u>											
Taunton Museum	left	-	-	-	-	16.3	8.4	30.0	11.6	uw	

Table 55 (continued)

Measurement of lower cheek teeth in Ipswichian and Devensian wolves

		P2		P3		P4		M1		Wear
		L	B	L	B	L	B	L	B	
<u>Kent's Cavern</u>										
Torquay Museum	left	12.8	5.7	14.0	6.3	16.9	7.8	27.8	11.4	sw
	left	-	-	-	-	15.9	7.4	27.2	10.7	uw
	right	-	-	-	-	15.4	8.9	27.7	11.9	sw
British Museum	right	13.3	6.7	15.2	7.2	16.4	8.6	30.9	12.2	mw
<u>Wavering Down</u>										
Wells Museum	left (	-	-	-	-	-	-	30.2	-	)sw
	right(	-	-	-	-	-	-	30.1	-)
<u>Wookey Hole</u>										
Oxford Museum	left	11.5	6.1	13.6	7.2	16.0	8.2	28.2	11.4	sw
	left	13.6	7.0	14.7	8.1	17.3	9.5	-	-	sw

Table 56

Isolated lower M1 measurements in Ipswichian and Devensian wolves *

	Left Wear			Right Wear		
	L	B		L	B	
<u>Tornewton Hyaena Stratum</u>						
British Museum	30.3	11.8	sw	31.2	12.3	ww
	29.4	11.3	uw	32.0	13.1	mw
	27.0	11.5	uw			
<u>Tornewton Glutton Stratum</u> *						
British Museum	28.0	10.9	mw	28.3	10.8	mw
				27.5	11.2	sw
				24.2	11.5	mw
<u>Tornewton Bear/Glutton Stratum</u> *						
British Museum	28.2	11.5				
<u>Bleadon</u>						
Taunton	28.5	11.7	sw	28.3	11.9	
<u>Joint Mitnor</u>						
Torquay Museum				28.3	11.9	
				27.2	10.7	
<u>Crayford</u>						
Geological Museum				28.5	11.4	
<u>Kirkdale</u>						
Yorkshire Museum				29.3	11.4	
<u>Bielbecks</u>						
Yorkshire Museum				-	10.6	
<u>Durdham Down</u>						
Bristol Museum	28.7	12.4		29.7	12.1	
	32.8	12.7		29.8	12.4	
	29.2	11.8		32.7	12.6	
				27.9	11.0	
<u>Creswell Crags</u>						
British Museum				27.2	11.9	sw
<u>Kent's Cavern</u>						
Torquay Museum	30.0	11.8	sw	30.9	12.2	sw
	28.7	11.7	mw	27.3	10.9	uw
	30.0	12.8	uw	28.4	12.0	uw
Leeds Museum	26.5	10.5				
British Museum	29.0	11.8	sw			
	28.1	11.7	mw			
	30.5	12.6				
Torquay Museum				30.0	12.2	vw
<u>Wookey Hole</u>						
Wells Museum	23.6	-		29.2	-	
	29.1	-		30.5	-	
Oxford Museum	30.2	12.6	sw	26.8	11.0	sw

* Wolstonian for comparison

Table 56 (continued)

Isolated lower M1 measurements in Ipswichian and Devensian wolves

	Left Wear		Right Wear	
	L	B	L	B
<u>Clevedon</u> Bristol Museum	28.8	11.8		
<u>Badger Hole</u> Wells Museum			30.1	-
<u>Banwell</u> British Museum	29.6 29.8	12.0 -	28.4 29.2	11.3 12.0

Table 57

Measurements of upper cheek teeth in Ipswichian and Devensian Wolves

		P2		P3		P4		M1		Wear
		L	B	L	B	L	Bb1	L	B	
<u>Durdham Down</u>										
Bristol Museum	right	-	-	-	-	27.0	10.7	16.7	22.1	.
<u>Torneuton</u>										
British Museum	left	-	-	-	-	-	-	17.0	19.9	uw
<u>Kent's Cavern</u>										
Torquay Museum	left	(16.2	6.8	17.3	7.4	26.0	11.2	16.9	20.2)	
	right	(16.0	6.9	17.2	7.4	26.0	10.8	17.2	20.4)	
	right	-	-	-	-	22.7	9.8	16.2	18.2	uw
	right	-	-	-	-	24.4	10.8	17.4	19.8	sw
	left	-	-	-	-	27.0	12.6	17.6	21.4	
<u>Banwell</u>										
Taunton Museum	left	-	-	-	-	24.0	10.4	16.2	18.8	mw
	left	-	-	16.8	8.7	24.1	10.2	16.2	19.3	ww
British Museum	left	(	-	17.3	7.3	24.8	11.2	-	-)
	right	(	-	-	-	-	-	16.8	20.6)	
	left	-	-	-	-	26.8	11.1	-	-	
	left	(	-	-	-	26.5	10.2	16.7	20.1)	
	right	(	-	-	-	25.8	10.2	16.8	20.5)	
<u>Hutton</u>										
Taunton Museum	right	-	-	-	-	25.3	9.9	-	-	
British Museum	left	14.4	6.4	17.0	7.2	23.8	-	14.4	18.5	
	right	-	-	-	-	24.8	10.5	14.2	18.8	
<u>Creswell</u>										
British Museum	left	-	-	14.5	5.7	21.9	-	14.4	18.3	
<u>Wavering Down</u>										
Wells Museum	left	(	-	-	-	26.7	10.9	17.9	20.0)	sw
	right	(	-	-	-	26.8	10.9	17.9	20.0)	
<u>Clevedon</u>										
Bristol Museum	left	-	-	-	-	25.3	10.6	16.9	21.0	
	right	-	-	-	-	25.3	10.4	16.6	20.6	
	right	-	-	-	-	25.0	9.6	16.2	19.5	

Table 58

Isolated upper PM4 measurements in Ipswichian and Devension wolves *

	Left		Wear	Right		Wear
	L	Bb1		L	Bb1	
<u>Torneyton Hyaena Stratum</u>						
British Museum	26.7	10.8	uw	25.4	10.4	uw
	26.0	11.2	uw	24.4	9.0	sw
	23.3	9.4	sw	28.4	11.4	uw
				23.3	10.0	uw
<u>Torneyton Glutton Stratum</u> *						
British Museum	27.5	11.3	sw	24.7	10.4	uw
				23.3	9.7	ww
				22.6	9.5	uw
<u>Torneyton Bear/Glutton Stratum</u> *						
British Museum	22.3	9.8	sw			
<u>Joint Mitnor</u>						
British Museum				23.8	-	
Torquay Museum	25.8	11.6	sw	26.4	10.5	sw
	24.5	9.7	sw			
<u>Durdham Down</u>						
Bristol Museum	25.5	10.4		27.7	11.5	
	25.1	11.0		27.0	11.6	
<u>Kent's Cavern</u>						
Torquay Museum	24.8	11.1	uw	27.2	11.1	uw
British Museum	26.9	10.7	mw			
<u>Wookey Hole</u>						
Oxford Museum				25.2	11.0	

*Wolstonian for comparison

Table 59

Isolated upper M1 measurements in Wolstonian, Ipswichian and Devensian wolves*

	Left		Wear	Right		Wear
	L	Bbl		L	Bbl	
<u>Tornewton Hyaena Stratum</u>						
British Museum	16.7	22.3	mw	16.5	21.7	ww
	16.3	20.7	mw	16.0	19.0	sw
				16.4	19.3	uw
<u>Tornewton Glutton Stratum*</u>						
	15.3	18.4	mw	16.4	18.6	sw
	17.9	22.3	sw	16.2	17.4	uw
	15.7	20.0	uw	16.1	18.5	uw
	15.4	19.4	uw	15.8	18.7	sw
	16.7	20.7	uw			
<u>Joint Mitnor</u>						
Torquay Museum	17.7	19.6		18.6	23.2	
	15.9	18.3		17.3	21.0	
	15.7	18.8				
<u>Durdham Down</u>						
British Museum	16.4	20.8		18.5	21.7	
	16.1	19.5		15.4	19.1	
	17.4	21.6				
	17.6	21.3				
	17.0	21.1				
	16.6	21.1				
	16.2	20.1				
<u>Kent's Cavern</u>						
British Museum	17.6	20.3	uw			
<u>Hutton</u>						
British Museum	16.0	19.0				

*Wolstonian for comparison

Table 60

Ratios of horse canine and incisor teeth

Source	Canine		Incisor	
	No.	%	No.	%
Expected	4	14.29	24	85.71
King Arthur	1	10.00	9	90.00
Uphill	5	6.41	73	93.59
Wookey Hole	10	10.42	86	89.58
Coygan	1	2.00	49	98.00
Kent's Cavern	8	10.26	70	89.74
Pin Hole	7	8.33	77	91.67
Robin Hood	1	14.29	6	85.71
Pooled fossil sample	33	8.19	370	91.81

Table 61

No. of Kent's Cavern woolly rhinoceros upper molar 3 in each wear class

	Unworn	Slight Wear	Moderate Wear	Well Worn	Very Worn
Left	8	2	3	1	1
Right	6	5	4	2	3
Total	14	7	7	3	4

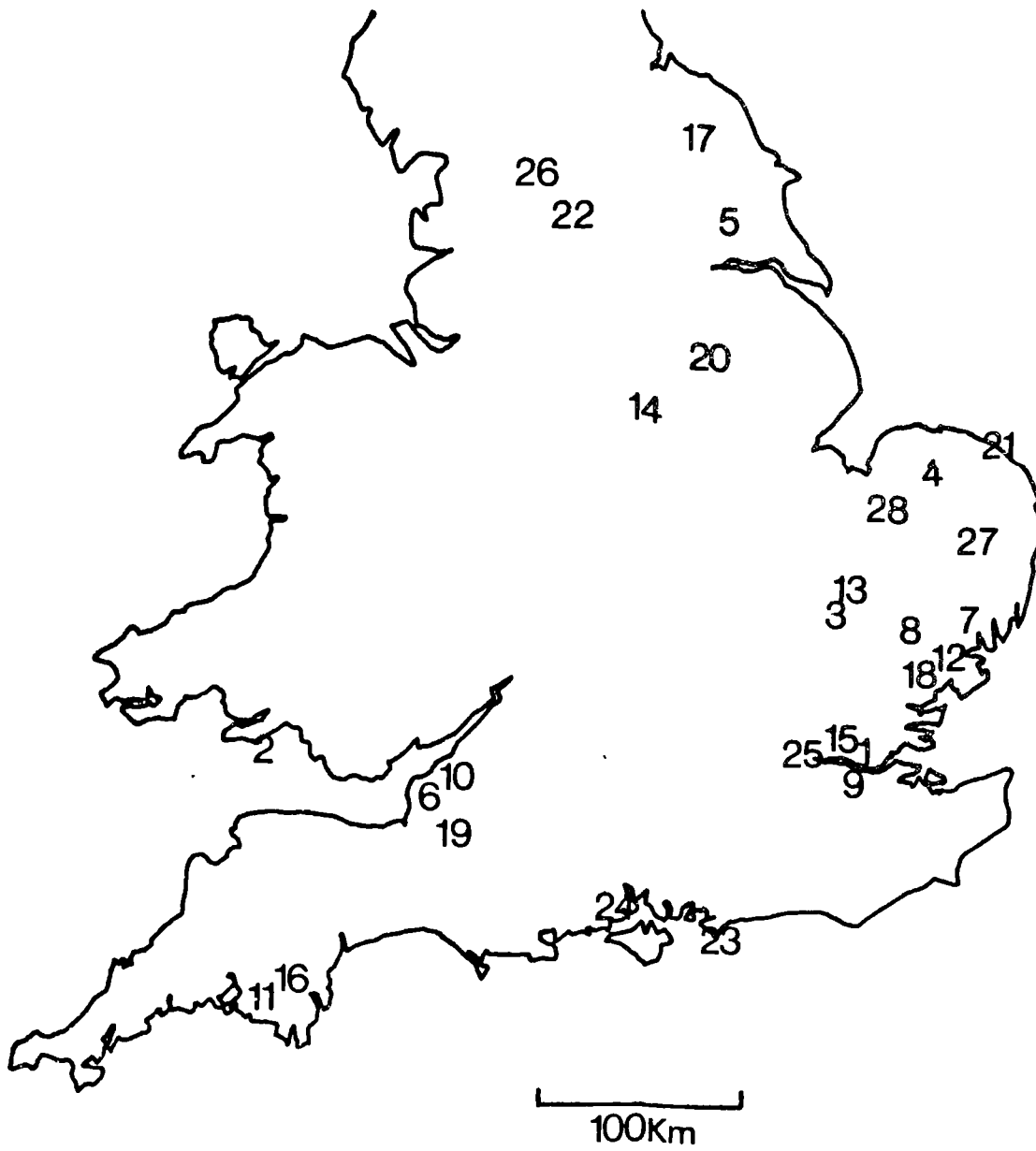
Table 62

No. of Kent's Cavern reindeer mandibles in each wear class

Juvenile Milk teeth	Unworn	Slight Wear	Moderate Wear	Well Worn	Very Worn	Total
18	-	3	11	7	7	46

Key to Map 1

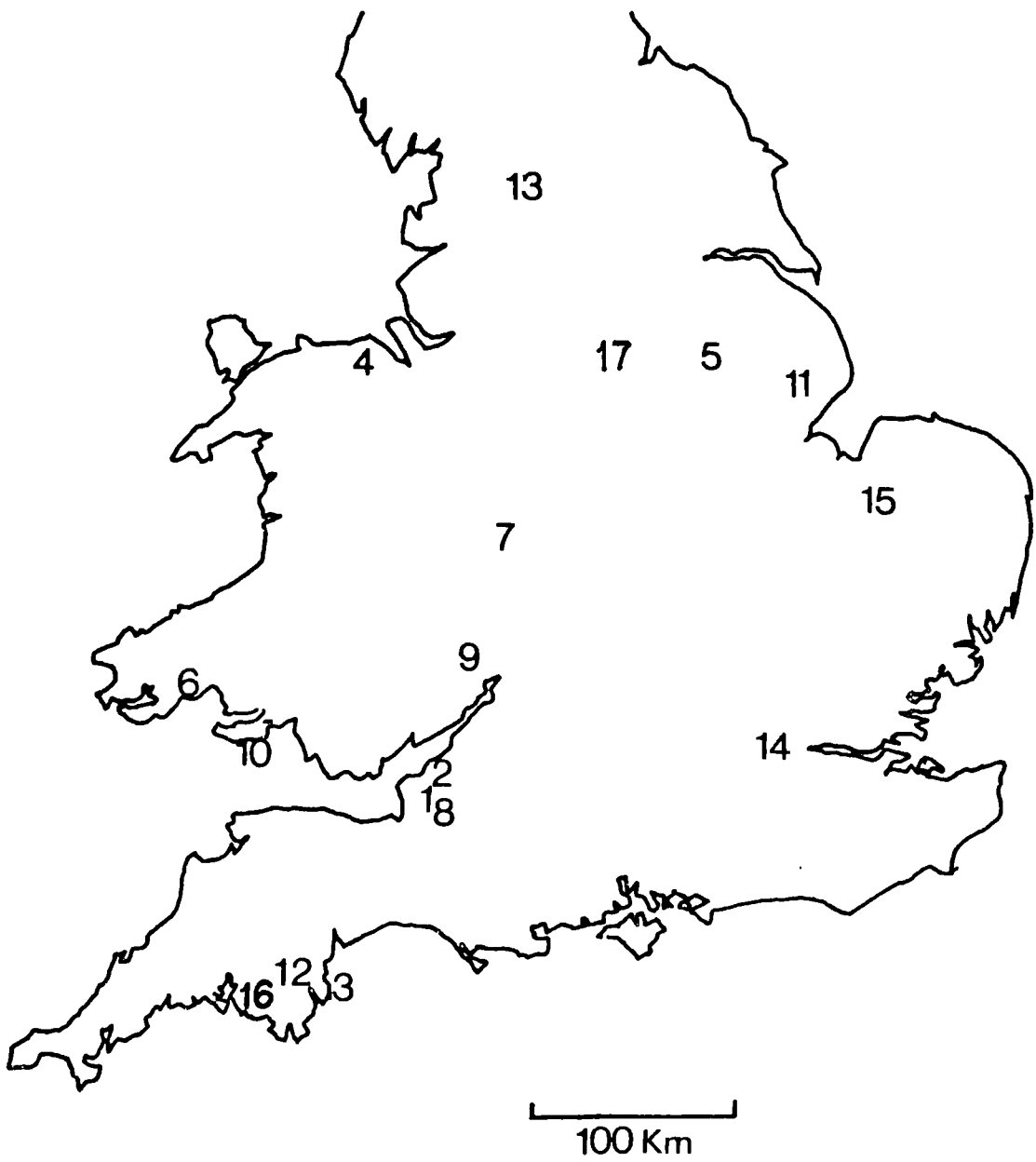
1. Aveley
2. Bacon Hole
Minchin Hole
Ravenscliff
3. Barrington
4. Beetley
Swanton Morley
5. Bielsbeck
6. Bleadon
7. Bobbitshole
8. Brundon
9. Crayford and Erith
10. Durdham Down
11. Eastern Torrs Quarry; Oreston Caves
12. Harkstead
Stutton
13. Histon Road
14. Hoe Grange
15. Ilford
16. Joint Mitnor
Tornewton
17. Kirkdale
18. Lexden
19. Milton Hill
20. Mother Grundy's Parlour
Robin Hood
21. Mundesley
22. Raygill Fissure
23. Selsey
24. Stone
25. Trafalgar Square
26. Victoria Cave
27. Wortwell
28. Wretton



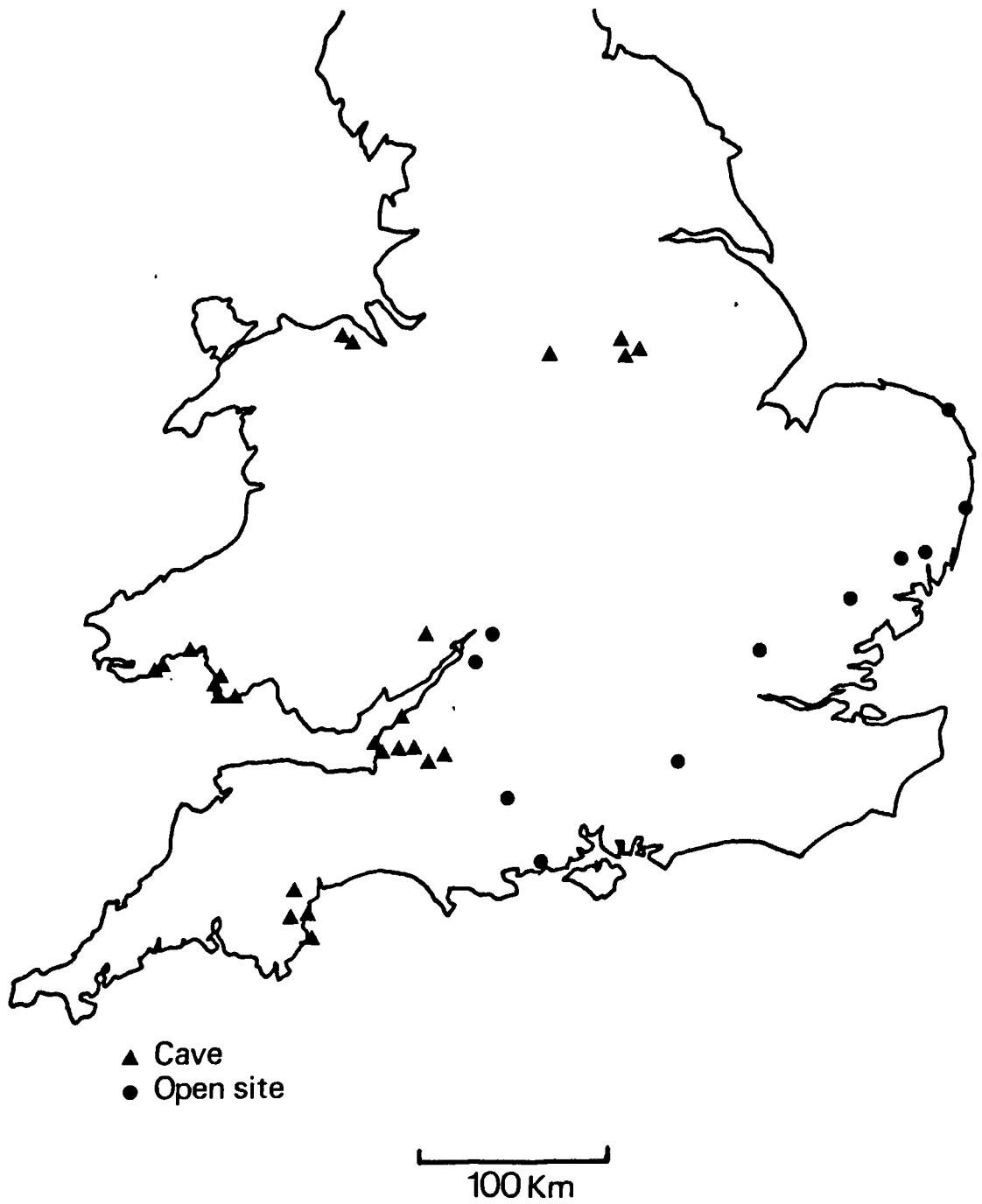
Map 1. Location of Ipswichian sites

Key to Map 2

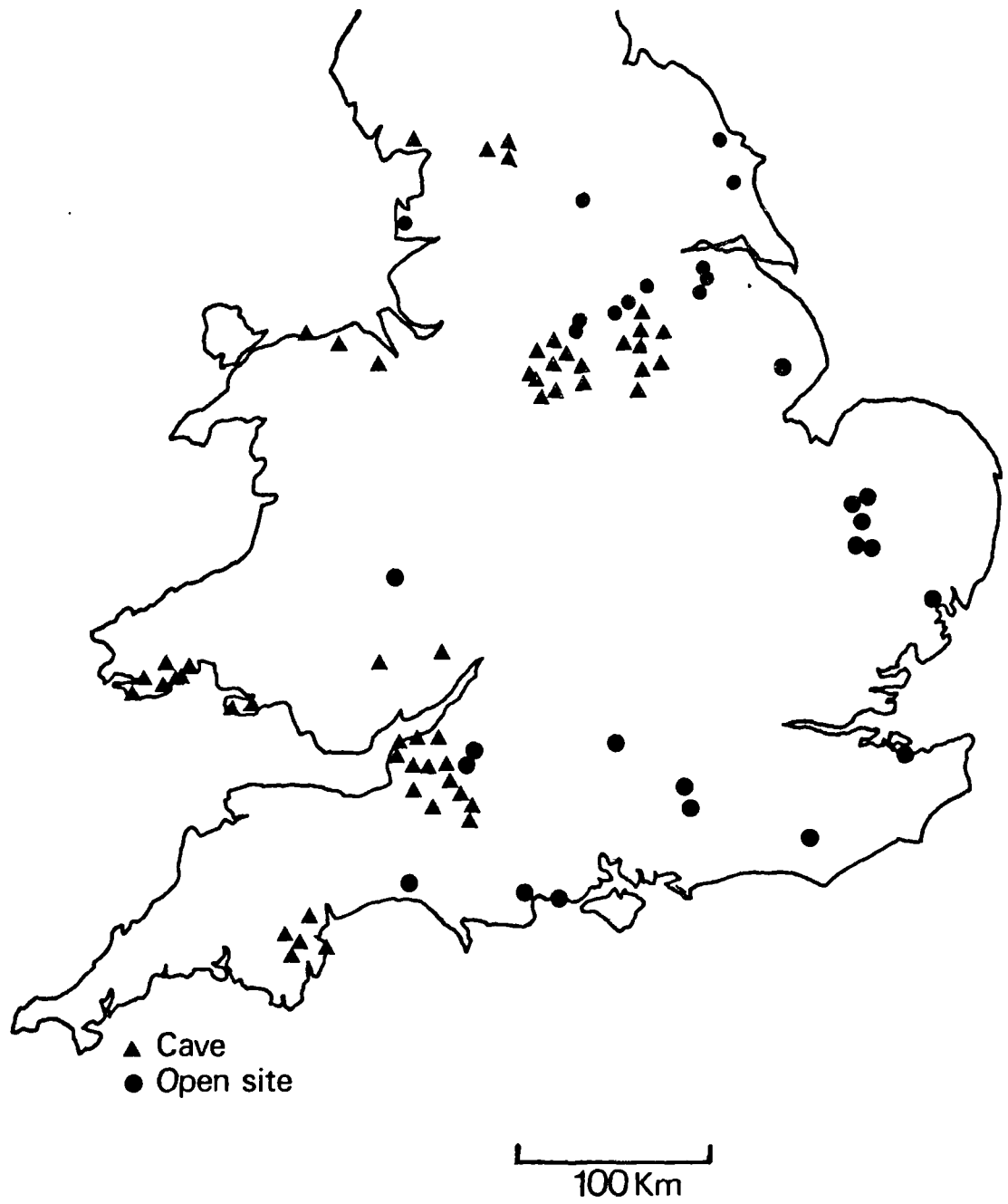
1. Banwell
Bleadon
Hutton
Picken's Hole
Sandford Hill
Uphill
2. Clevedon
3. Bench Cavern
Brixham
Kent's Cavern
4. Cae Gwyn
Ffynnon Beuno
5. Church Hole
Mother Grundy's Parlour
Pin Hole
Robin Hood
6. Coygan
7. Four Ashes
8. Badger Hole
Lough's Cave
Soldier's Hole
Wookey Hole
9. King Arthur
10. Paviland
11. Tattershall Castle
Tattershall Thorpe
12. Levaton
Tornewton
13. Victoria Cave
14. Willments Gravel Pit
15. Wretton
16. Oreston
17. Windy Knoll



Map 2. Location of Devensian sites



Map 3. Location of Early Upper Palaeolithic sites
From Campbell (1977)



Map 4. Location of Later Upper Palaeolithic sites
From Campbell (1977)

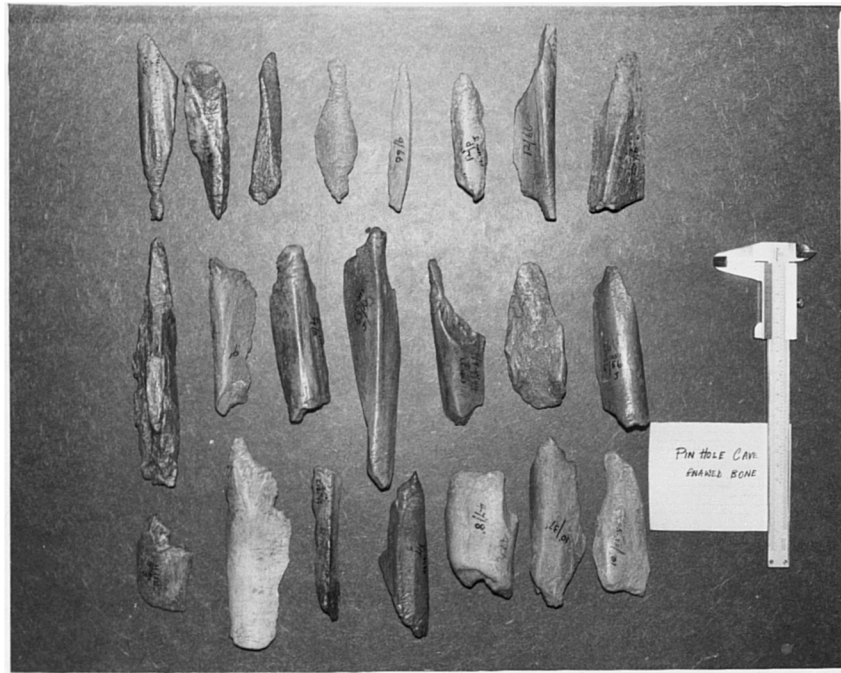


Plate 1. Bone from Pin Hole, showing splintering by adult hyaenas and gnawing by the young assessed on the basis of criteria established by Sutcliffe (1970)

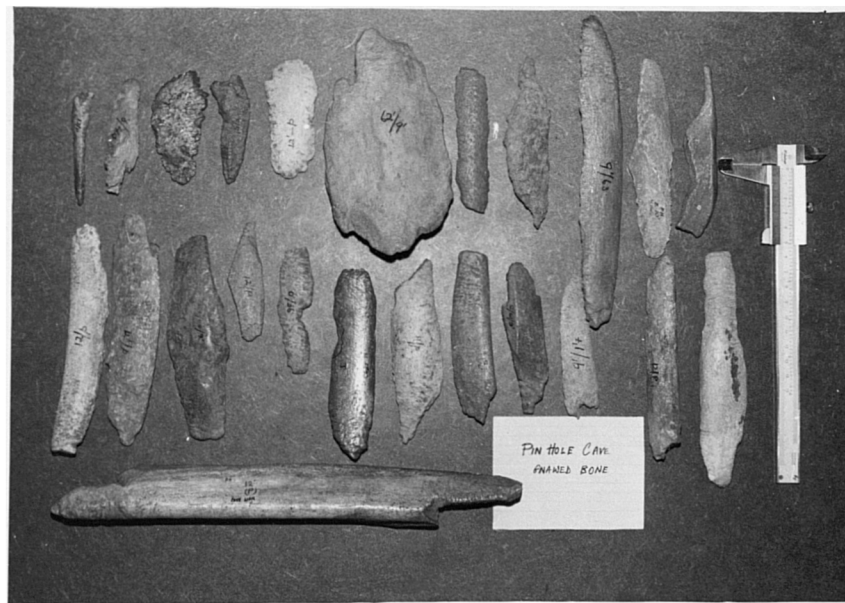


Plate 2. Bone from Pin Hole showing similar damage to that in Plate 1



Plate 3. Bone from Pin Hole showing similar damage to that in Plates 1 and 2

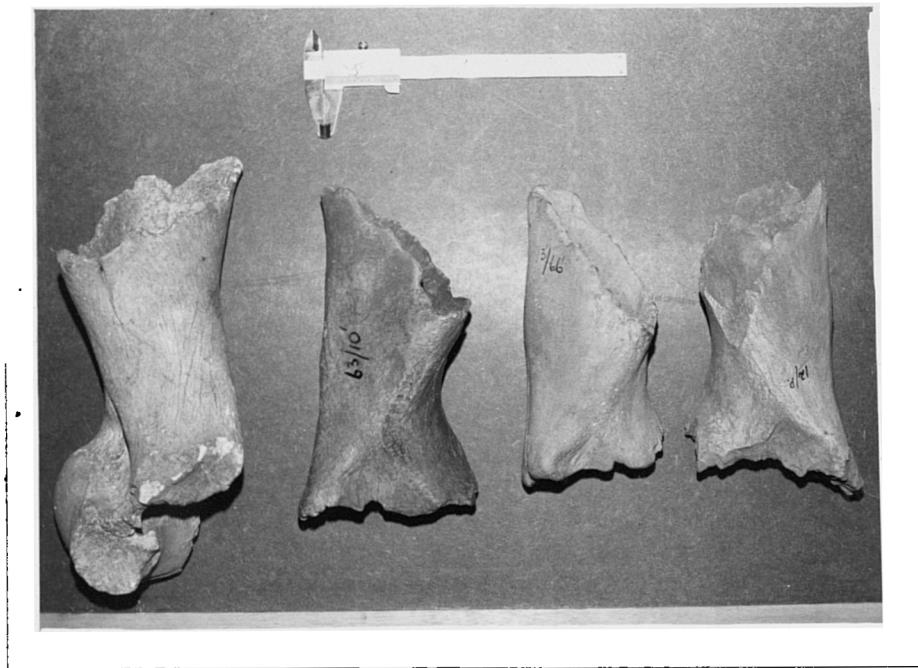


Plate 4. Rhinoceros humeri from Pin Hole showing adult-hyaena damage and scooping out of spongy bone as described by Sutcliffe (1970)

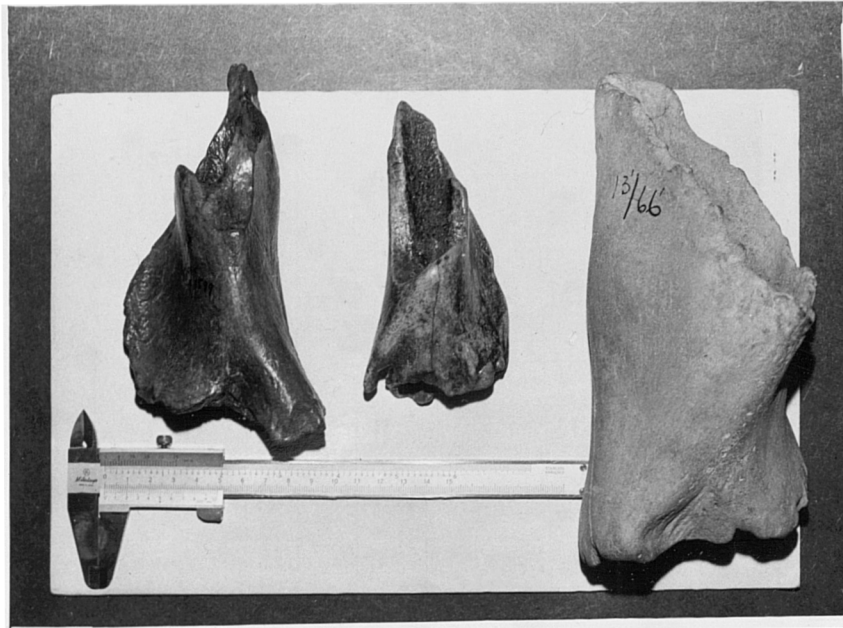


Plate 5. Humeri of (left to right) bear, lion and rhinoceros from Pin Hole showing damage similar to that in Plate 4

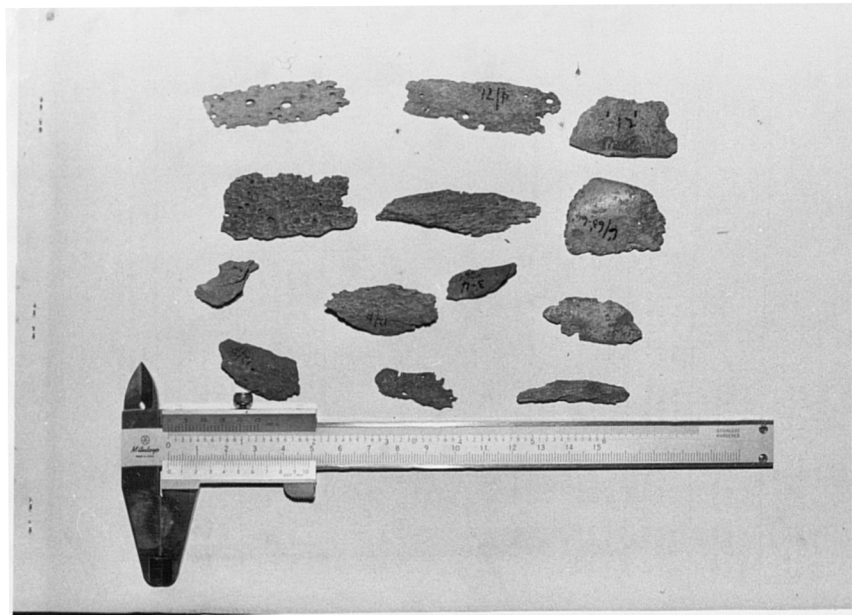


Plate 6. Bone fragments from Pin Hole showing damage by hyaena gastric juices as described by Sutcliffe*(1970)

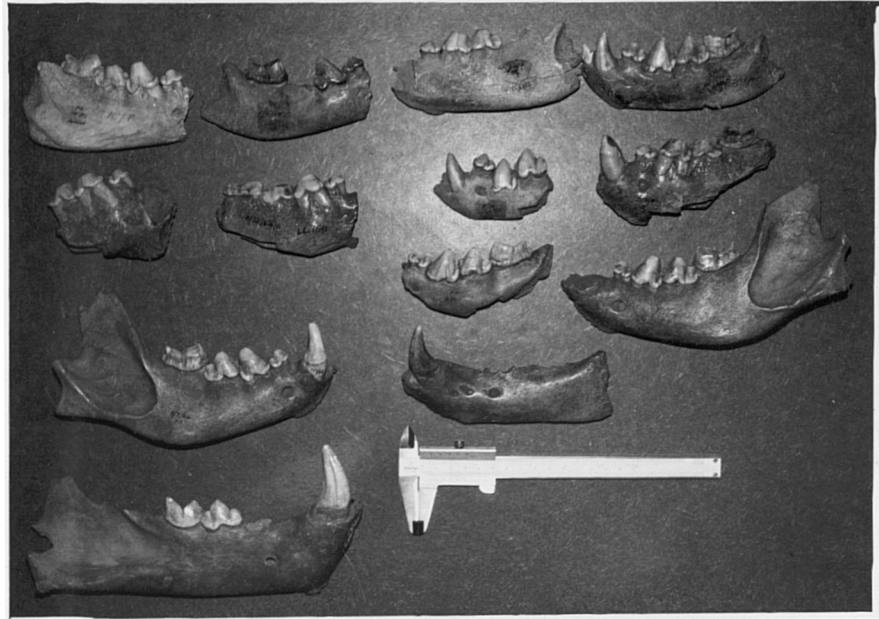


Plate 7. Mandibles from Pin Hole showing characteristic hyaena damage to ventral margins and ascending rami as described by Sutcliffe (1970). Bottom left specimen of lion, bottom centre specimen of bear. All others hyaena.

APPENDIX 1

SPECIES LIST

- African elephant, Loxodonta africana, Cuvier
African wild dog, Lycaon pictis, Brookes
American lion, Panthera atrox, Leidy
Ant bear, Orycteropus afer, Geoffroy
Arctic fox, Alopex lagopus, Linnaeus
Arctic lemming, Dicrostonyx torquatus, Pallas
Aurochs, Bos primigenius, Bojanus
Baboon, Papio anubis, Fischer
Badger, Meles meles, Linnaeus
Bank vole, Clethrionomys glareolus, Schreber
Bighorn sheep, Ovis canadensis, Shaw
Bison (American), Bison bison, Linnaeus
Bison (British Pleistocene), Bison priscus, Bojanus
Bison (European), Bison bonasus, Linnaeus
Black rhinoceros, Diceros bicornis, Linnaeus
Brown bear, Ursus arctos, Linnaeus
Brown hyaena, Hyaena brunnea, Thunberg
Buffalo, Syncerus caffer, Sparrman
Burchell's zebra, Equus burchelli, Gray
Bushbuck, Tragelaphus scriptus, Blainville
Bush pig, Potamochoerus porcus, Gray
Cane rat, Thyromys swinderianus, Fitzinger
Cave bear, Ursus spelaeus, Rosenmuller and Heinroth
Cave hyaena, Crocuta crocuta spelaea, Goldfuss
Cheetah, Acinonyx jubatus, Schreber

Civet, Civettictis civetta, Schreber
Common shrew, Sorex araneus, Linnaeus
Dall sheep, Ovis dalli, Shaw
Duiker, Cephalophus silvicultor, Abzeilius
Dire wolf, Canis dirus, Leidy
Eland, Taurotragus oryx, Pallas
Elk, Alces alces, Linnaeus
Fallow deer, Dama dama, Linnaeus
Field vole, Microtus agrestis, Linnaeus
Fox (bat eared), Otocyon megalotis, Desmarest
Giant deer, Megaceros giganteus, Azzaroli
Giant red deer, Cervus strongylocerus, Owen
Giraffe, Giraffa camelopardalis, Linnaeus
Grant's gazelle, Gazella granti, Brooke
Hare, Lepus crawshayi, De Winton
Hartbeeste, Alcephalus buselaphus, Pallas
Hippopotamus, Hippopotamus amphibius, Linnaeus
Horse (wild), Equus przewalski, Poliakoff
Ibex, Capra ibex, Linnaeus
Impala, Aepyceros melampus, Lichtenstein
Indian elephant, Elephas maximus, Linnaeus
Indian rhinoceros, Rhinoceros unicornis, Linnaeus
Javan rhinoceros, Rhinoceros sondaicus, Desmarest
Jackal, black, Canis mesomelus, Schreber
Jackal, golden, Canis aureus, Linnaeus
Klipspringer, Oreotragus oreotragus, Smith
Kudu, Tragelaphus strepsiceros, Pallas

Leopard, Panthera pardus, Linnaeus
Lion, Panthera leo, Linnaeus
Lynx, Lynx lynx, Linnaeus
Mammoth, Mammuthus primigenius, Blumenbach
Mole, Talpa europaea, Linnaeus
Mountain hare, Lepus timidus, Linnaeus
Mountain reedbuck, Redunca arundinium, Pallas
Musk ox, Ovibos moschatus, Linnaeus
Northern vole, Microtus oeconomus, Pallas
Norway lemming, Lemmus lemmus, Linnaeus
Nyala, Tragelaphus angasi, Blainville
Oribi, Ourebia ourebia, Laurillard
Ostrich, Struthio camelus, Linnaeus
Pig, Sus scrofa, Linnaeus
Polar bear, Thalarctos maritimus, Phipps
Porcupine, Hystrix africaeaustralis, Peters
Python, Python sebae, Gmelin
Ratel, Mellivora capensis, Shreber
Red deer, Cervus elaphus, Linnaeus
Red fox, Vulpes vulpes, Linnaeus
Reedbuck, Redunca redunca, Pallas
Reindeer, Rangifer tarandus, Linnaeus
Roan antelope, Hippotragus equinus, Pallas
Roe deer, Capreolus capreolus, Linnaeus
Sable antelope, Hippotragus niger, Pallas
Sabre-toothed cat (American), Smilodon spp., Leidy
Saiga antelope, Saiga tartarica, Linnaeus

Scaly anteater, Manis pentadactyla, Linnaeus
Serval, Felis serval, Schreber
Sharpe's grysbuck, Raphicerus sharpei, Smith
Spotted hyaena, Crocuta crocuta, Erxleben
Springhare, Pedetes capensis, Illiger
Steenbuck, Raphicerus campestris, Thunberg
Steppe rhinoceros, Dicerorhinus hemitoechus, Falconer
Stoat, Mustela erminea, Linnaeus
Straight-tusked elephant, Palaeoloxodon antiquus, Falconer and
Cautley
Sumatran rhinoceros, Dicerorhinus sumatrensis, Fischer
Suslik, Spermophilus major, Pallas
Tasmanian wolf, Thylacinus cynocephalus, Temminck
Thomson's gazelle, Gazella thomsoni, Gunther
Tiger, Panthera tigris, Linnaeus
Topi, Damaliscus korrigum jimela, Ogilby
Tsesseby, Damaliscus lunatus, Sclater and Thomas
Tundra vole, Microtus gregalis, Pallas
Vervet monkey, Ceropithecus aethiops, Linnaeus
Wapiti, Cervus canadensis, Linnaeus
Warthog, Phacochoerus aethiopicus, Pallas
Waterbuck, Kobus defassa, Ruppell
Water vole, Arvicola terrestris, Linnaeus
White rhinoceros, Ceratotherium simum, Burchell
Wildebeest, Connochaetes taurinus, Burchell
Wolf, Canis lupus, Linnaeus
Wolverine, Gulo gulo, Linnaeus

Woolly rhinoceros, Coelodonta antiquitatis, Blumenbach