

MENSURATION IN EARLY MEDIEVAL BARCELONA

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In a study of two documents from the convent of Sant Pere de les Puelles published in 1947 together with J. M. Millàs Valli-crosa, Dr. Udina made an examination of the value of the *dexter* in eleventh century Barcelona¹. Although brief, this is one of the few modern contributions to the study of linear measurement in early medieval Catalonia, for, in spite of a recent resurgence of interest in the style and production of the documents which make up the bulk of our source material for this period, there has been no detailed consideration of the subject in the last few decades². The present contribution aims to pay homage to Dr. Udina both by reconsidering the range and value of

¹ J.M. MILLÀS VALLICROSA and F. UDINA MARTORELL, «Dos documentos latino-hebraicos del Archivo del monasterio de San Pedro de las Puellas» in *Sefarad* 7, 1947, pp. 123-137, esp. p. 131.

² Particularly, M. ZIMMERMAN, «Protocoles et préambules dans les documents catalans du X au XII siècle» in *Mélanges de la Casa de Velázquez* 51-79, 1975, and *idem*, «La datation des documents catalans du XX au XII siècle: un itinéraire politique» in *Annales du Midi* 93, 345-375, 1981, for document production.

A. DE BOFARRUL Y BROCA, *Historia Crítica de Cataluña*, Barcelona 1876 vol. II, p. 453 and J. BALARI JOVANY, *Orígenes históricos de Cataluña* (Sant Cugat del Vallès, 1964²) pp. 655-7, are useful introductions.

the linear measurements used in early medieval Barcelona, particularly in the city and its suburbs, and to a lesser extent its *territorium*, and by broadening the scope of his note so as to examine the reasons for the appearance or non-appearance of measurements in the sources, the size of the house-plot and other properties to be found in the early medieval city, and finally the possible origins and development of these units.

Much of Dr. Udina's 1947 discussion was devoted to calculating the value of the *dexter* mentioned in a document of 1092 referring to the sale of two plots of land in the suburbs of Barcelona at Pou de Moranta³. Udina and Millàs came to the conclusion that in this case 1 *dexter* = 1 Hebrew «qanim» = 1 «cana», and that these units were subdivided into eight palms or spans, which would suggest a total length of about 1,6 metres⁴.

Various units of length are found in use in early medieval Barcelona, but the *dexter* is by far the most common. However, the interpretation of its value is by no means straightforward, for only a small percentage of documents contain linear measurements: in the case of the city and suburbs about thirty-six out of a total of approximately one thousand in the period prior to the year 1200⁵. In addition, that the value of the *dexter* was by no means constant is indicated by the appearance of a *dexter maior* on a number of occasions, particularly in the first quarter of the eleventh century, which implies both knowledge and use of a *dexter minor*⁶. Moreover, although a few equations of values have been recorded, these cannot be automatically transferred from one locality to another for even within the confines of the *territorium* of Barcelona different standards were some-

³ Pou de Moranta was near the later church of Santa Anna, as the documentation from that church, now in the ADB, amply demonstrates.

⁴ *Op. cit.*, p. 131.

⁵ These are listed in an appendix.

⁶ The *dexter maior* is mentioned in document 10, and the following, among other, referring to the *territorium*: ACA R. Borrell 26 (996); *ibid.* 36 (998); *ibid.* 45 (1000); *ibid.* 88 (1007); ACV C6 171 (1008); ASPP 13 (1009); LAEC II 58 159, Mas 366 (1017); AM SBB 1291 (1018). A *dexter minor* is recorded in LAEC I 175, Mas 354 (1016).

times in use, as is suggested by the occurrence of a *dextro Barchinone* (1083) and a *dexter de Provinciana* (1142) referring to the area of present-day Hospitalet⁷.

The majority of modern works give the value of the Barcelona «destre» as 2.796 metres, which contradicts the figure proposed by Millás and Udina, and it would seem apposite to reconsider the available evidence⁸. In 1947 they pointed to the existence of at least eight spans in the *dexter* since one side of one of the properties undergoing sale was stated to be two «destres» and seven spans in length. Although it is true that subdivisions of more than seven spans are rarely found, a document of 1098 describes a property as having sides two «destres» less four spans in length⁹. There seems to be no logical reason for counting backwards to achieve the figure of one and a half «destres» or one «destre» and four spans, so there must have been cases when there were more than eight spans to the «destre».

This is substantiated by three eleventh century documents which give values for the *dexter* being used in each case. Unfortunately, each gives a slightly different value, and a fourth possibility can be proposed in addition, with the result that the most frequently valid length of the *dexter* can only be guessed at. The earliest, of 1031, records that *et dextro unde fuit mensurata ipsa terra abet palmos XII et palmada I*¹⁰. Even if the value of the span is taken as being approximately twenty centimetres, the uncertain value of a *palmada* leaves an element of doubt, although it might be assumed that it was somewhat larger, with the end result that the *dexter* in question measured in excess of 2.6 metres. A comparable value might be proposed as a conse-

⁷ *Dextro Barchinone* in ACA Monacales Montalegre 55 (1083); *de Provinciana* in LAEC I 324 916, Mas 1526: the latter is cited by F. Carreras Candi, *Geografía General de Catalunya: la Ciutat de Barcelona*, Barcelona, s.f., p. 327.

⁸ E. g. LLENSA DE GELCÉN, *Breve historia de las medidas agrarias de la antigüedad y estudio particular de aquellas cuyo uso es tradicional en Cataluña*, Barcelona 1952, p. 47; A. M. ALCOVER *et al.*, *Diccionari català-valencià-balear*, Palma de Mallorca 1976, vol. 4 p. 238 s.v. «destre».

⁹ Appendix document 23.

¹⁰ ACA Berenguer Ramon I 89.

quence of a *dextrum que habet tredecim palmos legitimos* (1090)¹¹, while the third document (1045) indicates *et habet ipso dextro palmos XIII legitimos*, which suggests a slightly larger figure, close to the 2.796 metres suggested by later sources¹². These same sources indicate that two measurements of the span were in common usage from the later Middle Ages onwards: the smaller at slightly under twenty centimetres, while the latter was equivalent to 23,3 centimetres¹³. That the latter unit was also in usage in the eleventh century is suggested by a re-examination of the document studied by Millàs and Udina. The east side of the first plot sold is stated to be two «destres» and seven spans in the Latin version, while the Hebrew text is translated as «dos canas y media y un palmo». This would indicate that half a «qanim» or «destre» contained six spans, and a complete unit would therefore consist of twelve. Since twelve of the longer «pams de destre» constituted a standard «destre» of 2.796 metres, it is probably fairly safe to conclude that these units were in use in this document.

The subject is evidently confused, but in most cases one is probably justified in accepting the *dexter* as having the traditional value, although it seems clear that other standards were sometimes used, particularly in the first part of the eleventh century, and there is some evidence to suggest that the *dexter* may originally have been slightly longer, a point to which we must return at a later moment. The use of the word *legitimos* in the documents of 1045 and 1090, and others of the same period, is perhaps significant for it hints at the existence of some official yardstick by which the measurement could be checked. That measures of volume were exhibited in the market from an early date is well known¹⁴. The same was also true at a later date of linear

¹¹ ADB SA Carpetà 3A, 6.

¹² ACB 1-1-2259.

¹³ Llena de Gelcén, *op. cit.*, p. 47.

¹⁴ ACA Monacales Sant Cugat 92: Rius II 371 (1002); ADB DC(b) 21 (1010); both cited by P. Bonnassie, *La Catalogne du milieu du X^e à la fin du XI^e siècle: croissance et mutations d'une société*, Toulouse 1975, p. 429, n. 211. In 987 we find the *mensura legitima de civitate Barchinona* (ACB 1-2-1502).

measurements since there are a number of references to the *legitimus dexter porte urbis Barchinome*¹⁵, and the appearance of *ipsum dextrum que videtur esse mensuratum ad orientales portam iamdicte civitatis* in a document of 1092 leaves little doubt that the gate in question was the one under the Castell Vell adjoining the market¹⁶. None of these references, however, are earlier than the later eleventh century and the date of standardization is vague, although it is possible to put forward a hypothesis derived from the evidence for the measurements of volume.

In this case, measurements were apparently standardized by the early eleventh century, if not beforehand. However, the upheavals of the second quarter of the century probably led to fluctuations, for the measures of individuals are recorded as being used to calculate, for example, the amount of grain being loaned, a clear indication of the absence of public authority and a practice obviously open to abuse¹⁷. Nevertheless, from 1058 onwards there are frequent references to «new measures» of volume, suggesting either the alteration of the old standards, or, and perhaps more probably, the reinstatement of public authority by Count Ramon Berenguer I, which would be just one more aspect of the now well-known mid-eleventh century recovery of comital power. One may legitimately wonder whether the measures of length were exhibited in the market at the same time. Certainly, the variations visible beforehand disappear thereafter, for the last reference to the *dexter maior* is significantly of 1032¹⁸.

¹⁵ e.g. ASPP 60 (1102).

¹⁶ LAEC I 61 130, Mas 1104. The standards exhibited at the Portaferriassa and the chapel of Santa Llúcia (CARRERAS CANDI, *op. cit.*, pp. 352-3) must have been of later date, in both cases after c. 1260.

¹⁷ e.g. ACA RBI 66 (1029); ACA Monacales Sant Llorenç del Munt 120 (1038).

¹⁸ *ad mensura nova de Barchinova*: ACA RBI 229 (1058); AM SBB 1465 (1060); BC 2159 (1061); the old measure is mentioned in ACB DC(d) 120 (1062), while AM SBB, 1500 (1065) has *ad mensuram grandem de mercato* and LAEC IV 160 376, Mas 817, of the same year, suggests that this large measure was used beyond Barcelona. The last reference to the *dexter maior* is in document 10 of the appendix.

As a result, from the mid-eleventh century onwards, virtually the only units found in the context of Barcelona are the *dexter*, with its subdivision of the span. Although it had once been equally common, particularly in the tenth century, the cubit virtually disappears¹⁹, for it is found only once in the later eleventh century²⁰. One can only assume that the traditional value of six cubits in a *dexter*, thus indicating a value of 46.6 centimetres for the cubit, which is supported by evidence from elsewhere in the country, is also acceptable in the context of the city²¹. Only towards the end of the twelfth century the other units notably the «braça» and the «cana», make their appearance²².

This confusion over the value of units is particularly unfortunate for contemporaries obviously took them seriously. Why else express a measurement down to the last inch, as occurs in a number of cases? Moreover, there are references to the presence of judges, or at a later date «prohoms», to take or verify the measurements²³, and on occasions when this could not be performed immediately blanks were left in the document to be completed at a later date. Inevitably, on some occasions this was never fulfilled and parchments with still incomplete spaces exist²⁴. On another occasion the word *dextros* is found crossed

¹⁹ Documents 1, 5, 9, 10.

²⁰ Document 22.

²¹ CSC 19 46: Rius I 293 (993), *ad dextro que habet cubitos VI*. However, marginally larger dimensions are often cited: CSC 51 187 Rius II 388, *abet ipso dextro cubitos VI et una polegada*; AD Medinaceli A.H.leg.103 (985), *et de ipso dextro qui ipsa omnia fuerit mensurata, cubitos abet VI et oso I* (cited in *Glossarium Mediae Latinitatis Cataloniae*, Barcelona 1979, fasc. 8, col. 917. In the area of Girona, six cubits and half a foot appears to have been the norm, although it is uncertain whether this cubit was of 46,6 centimetres or not: examples in *ibid.*, cols. 317-9.

²² Documents 30 and 36.

²³ Especially in LAEC IV 19 61, Mas 1525, where it is stated that the measurements were taken some time after after the original sale (1142).

²⁴ In ACB 1-2-147 (996), it is clear that the measurements were added at a later date because of the spaces left. In appendix document 3, the document was copied into the *Libri Antiquitatum* without the measurements because they had presumably never been added to the original, as was the case with ACV C6 171 (1008).

out and replaced by *cubitos*, so there was a very conscious respect of the significance of the units²⁵.

It is difficult to decide why so few documents contain measurements. Most can, however, be assigned to one of four categories, and, even though not all documents which might be placed in these categories contain measurements, they do; it seems, go some way towards explaining their appearance. In the first place, the use of measurements is a phenomenon which appears particularly in the tenth and early eleventh centuries, when the public authority of the judicial system inherited from the Visigothic period was still operative²⁶. Although the Visigothic law-code did not state any obligation to record dimensions during a property transaction, or even any obligation to draw up a written deed of sale, it did emphasize the importance of boundary markers and property limits²⁷, and it is as an extension to these concepts that one must consider the earliest measurements recorded²⁸.

Secondly, there was a substantial growth in the use of measurements in the closing years of the tenth century and the first few decades of the following one²⁹. As far as can be seen from a cursory examination of published material, this phenomenon seems to be restricted to the Barcelona area, with a possible exten-

²⁵ Document 5.

²⁶ For the judicial system, BONNASSIE, *op. cit.*, pp. 183-202. For the use of the Visigothic code, M. ZIMMERMAN, «L'usage du droit wisigothique en Catalogne du IX au XII siècle» in *Mélanges de la casa de Velázquez* 9, 1973 pp. 233-281; W. KIENAST, «La pervivencia del derecho godo en el sur de Francia y Cataluña» in *Boletín de la Real Academia de Buenas Letras de Barcelona* 35, 1973-74, pp. 265-295 and F. UDINA MARTORELL, «El sedimento visigodo en la Cataluña condal» in *Revista de Archivos, Bibliotecas y Museos* (4ª serie) 77, 1974, pp. 565-581.

²⁷ P.D. KING, *Law and society in the Visigothic Kingdom*, Cambridge 1972, p. 209.

²⁸ In the few surviving Visigothic private charters area measurements are occasionally mentioned, but not linear ones: A. CANELLAS LÓPEZ, *Diplomática Hispano-Visigoda*, Zaragoza 1979.

²⁹ Thus in the first hundred documents of the ACA Ramon Borrell series (993-1012), no fewer than twenty-one documents contain linear measurements.

sion into the Baix Llobregat and Vallès. It is tempting to relate this to a need to record limits particularly carefully in the aftermath of al-Mansur's attack, for, even though destruction of property may not have been as extensive as often claimed, written records did suffer in particular, and whereas in normal practice all deeds relating to a property were handed over to the owner on its sale or donation, in such circumstances this would have been impossible³⁰.

This leads one to relate measurements with a third context. A noticeable proportion of documents containing them seem to refer to «now» states, that is properties carved out of an exiting block or the result fractioning an originally larger estate³¹. Once again, since the boundaries were not otherwise recorded in writing, and on some occasions may not have been clear on the ground, the inclusion of dimensions gave an additional degree of security for both parties.

The fourth and final grouping may also contain an element of security, for it involves the Jewish community. A substantial proportion of the documents containing measurements of the period after c. 1075 involve Jews. Although anti-Semitism was not a feature of the period, there may have been an element of distrust which encouraged Jews to insist on the inclusion of dimensions to make sure that their rights were doubly protected³².

Other examples do not easily fall into any of these categories to judge by the evidence available and we can only assume that the boundaries were not immediately clear or there was a possibility of a future dispute³³. With the increasing urbanisation of the city in the twelfth century and the consequent lack of oppor-

³⁰ For the effects of al-Mansur's raid, M. ROVIRA i SOLÀ, «Notes documentals sobre alguns efectes de la presa de Barcelona per al-Mansur (985)» in *Acta Historica et Archaeologica Mediaevalia* 1, 1960, pp. 31-53, although the criticisms of G. Feliu, «Al-Mansur, Barcelona i Sant Cugat» in *ibid.*, 3, 1982, pp. 49-54, are largely valid.

³¹ e.g. documents 11, 12, 15, 25, 26, 29, 35, 36.

³² e.g. documents 16 to 18, 21.

³³ e.g. documents 1 to 10.

tunities to alter established property boundaries, however, measurements became increasingly rare, except in the case of newly urbanised estates on the fringes of the city or the conveyance of narrow strips of property to facilitate wall construction or access³⁴.

We must turn our attention to consider briefly the information that these measurements give us about the size of urban properties. Within the old Roman defences, the extent of our evidence is remarkably limited: one of the earliest documents from the city records a plot containing a House and yard adjoining the Comital Palace in 924³⁵. In spite of the lack of pressure on building space at that date, it seems to have been remarkably small, measuring approximately eight by seven and a half metres. A second document with measurements refers to the projecting *castellum* on the south side of the Roman defences by the Regomir Gate: this property stood at the south-east angle and appears to have occupied one quarter of the *castellum*, if the *dexter* is correctly calculated at 2.796 metres³⁶. The dimensions of a small piece of an orchard sold by the monks of Ripoll in 1054 indicate a trapezoidal terrain, some 15 metres long by 4.2 m tapering to 2.8 m³⁷. Two documents referring to the Miracle area, around the remains of the Roman temple, are of little interest, for they concern narrow strips for the construction of dividing walls, rather than true properties, although a third document from the same area is more informative, since

³⁴ e.g. documents 16, 20, 22, 24, 27, 31, 32, 33. Especially interesting is n° 22 in which it is specifically stated that street construction might be a potential aim of the canons. Moreover, this plot was immediately outside the Bishop's Gate, which is not mentioned in the sources until 1108 (ACA Real Patrimonio, Subsección de la Bailía, Clase 2ª, A^c8, fol. 49r.-v.), although the other three gates are frequently mentioned from the later tenth century onwards. Could it be that access through the gate was impeded until this street was cut in c. 1093? Other evidence suggests that the main north-south street, running from this gate towards Sant Jaume, was in fact partially blocked until a much later date.

³⁵ Document 1.

³⁶ Document 10.

³⁷ Document 11.

it cites a house with a street frontage of one and three quarter «destres»³⁸. The most remarkable point about this is that all the available information leads one to identify it as the property now known as Carrer de la Freneria, 1³⁹. A final document from the walled area tends to confirm the impression the previous document gives of long, relatively narrow plots, which can still be traced fronting onto the modern Carrer de la Llibreteria, for it describes an estate 3.9 metres wide but no less than 20.8 metres long⁴⁰.

In the suburbs there is a small body of evidence which may have some bearing on house sizes: in 1028 a *casalicium* at the foot of the defences measured approximately eleven by nine metres. A second document, of 1082, is more significant: it describes an irregular quadrilateral with sides measuring approximately 20, 30, 26 and 25 metres. Although it is not directly linked to the *villanova*, the fact the document is a lease by Bishop Umbert and the canons of land *ad faciendum ortos vel ad faciendum domos* suggests that this property should be connected with this area of planned growth which was developed under the auspices of the cathedral community from c. 1080 onwards. Although irregular, the size of the plot certainly fits comfortably between two of the north-south streets of this area, such as Carrer dels Banys Vells and Carrer de Montcada, and the regular east-west property divisions still traceable today⁴¹. A similar case of measurements being provided zone is found in the early thirteenth in a newly urbanized zone in the Ribera district between

³⁸ Document 34.

³⁹ This subject is considered along with the topography of the Cathedral quarter in the eleventh and twelfth centuries in a forthcoming article of mine, «L'entorn de la catedral romànica de Barcelona».

⁴⁰ Document 35: it is difficult to locate this property because of the variable position of north in the area around the Castell Vell. However, it was most probably ant the angle of Baixada de la Presó and Carrer del Veguer.

⁴¹ The development of this *villanova* is discussed in BANKS, *The topography of the city of Barcelona and its urban context in eastern Catalonia from the third to the twelfth centuries* (Unpublished Ph.D. thesis, University of Nottingham, 1980) vol. II, pp. 612-623.

Santa Maria del Mar and the sea, where a primary division is declared to be eleven by seven «destres», and a secondary one three «destres» in width⁴². The former set of dimensions might be identified as delimiting the block now surround by Carrer de l'Esparteria, Carrer de la Vidreria, Plaça de les Olles and Carrer Damas or one of the adjoining blocks.

There are two sets of measurements for yards alone, one of about 6.5 metres square and the other about 16.5 by 11 metres⁴³. The bulk of the rest of the recorded measurements refer to orchards: these vary widely in size, from a minimum of about 120 square metres to a maximum of over 800 square metres, with a median of around 200 square metres⁴⁴. Later examples appear to be smaller than those of the late tenth century or early eleventh century, although the size of the sample must leave any conclusion open to doubt. Undefined plots of land could be of similar size or much larger, over a hectare on occasions. Once again, the measurements in this last category occasionally enable us to demonstrate that modern day street lines were in existence as property boundaries nearly a thousand years ago⁴⁵.

In the *territorium*, three main groupings of properties can be proposed on the basis of the evidence of measurements. First of all, long strips, found particularly on slopes⁴⁶. Secondly, irregular quadrilaterals of varying size⁴⁷, and thirdly, plots which can be defined as being more or less rectangular in shape. This last category, which comprises about seventy percent of the total,

⁴² ACA Diversos Sentmenat Indice 8 no. 20 and Indice 1, nos. 2 and 3 (1209-10).

⁴³ Documents 5 and 28.

⁴⁴ Documents 2, 3, 6, 8, 17, 18, 19, 21, 23, 26.

⁴⁵ Documents 4, 12, 13, 15, 29. No. 13 is the most interesting because its preambulations and strange shape make it easy to identify as the area now to the north-east of the Capilla d'en Marcus.

⁴⁶ e.g. ACA Monacales Sant Llorenç del Munt nos. 56 and 58 (1010-11) referring to 100½ «destres» of vineyard at Monterols, or ACA Berenguer Ramon I, 118 (1035) describing a strip of land 75 «destres» by 9 «destres» and 4 spans at Provençals.

⁴⁷ e.g. ACA R. BORRELL 45 (1000) measuring 133, 152, 55 and 88 «destres», or *ibid.* 63 (1002) with sides of 85 d.lc., 110d., 99d.lc., and 85d..

can be divided into two sub-groups: those which were relatively small in size, under eight «destres» square, and thus comparable to large «horts»; and those which were larger, but still basically rectangular in plan. These might be anything from five hundred square metres to five hectares in area, although an average would appear to be about half a hectare, in other words the *modiata* (= 4896 square metres) of the contemporary sources⁴⁸.

This is of some importance for the *modiata*, which, together with its fractions, was the principal unit of area measurement, can be defined as a square with sides twenty five «destres» in length⁴⁹. Moreover, of thirty-three rectangular plots documented with measurements in the Pla de Barcelona in the period prior to 1055, two thirds have at least one figure, and almost as often two, which can be considered a fraction or multiple of twenty-five, allowing for a variation of four percent in either direction⁵⁰. Although there is no known example of a strictly regular twenty-five *dexter* square in this area, one can point to an example recorded in Cervelló in 976⁵¹.

Both the *dexter* and the *modiata* would appear to be units of early medieval origins, largely connected with the north-west Mediterranean littoral⁵²: they certainly have no direct classical counterparts. However, given that it is unlikely that any extensi-

⁴⁸ This is based on the evidence of forty-six pre-1055 documents with measurements referring to the *territorium* of Barcelona. Far more charters, of course, describe the property undergoing transaction in terms of area measurements, although in most cases one must assume that these were at best approximations.

⁴⁹ LLENSA DE GELCÉN, *op. cit.*, p. 61; ALCOVER *et al.*, *op. cit.*, vol. 7 p. 640, s.v. «mujada».

⁵⁰ i.e. 12-13, 24-26, 36-39, 48-52 «destres».

⁵¹ ACA Monacales, Sant Cugat 45, Rius I 118, 976.

⁵² J.F. NIERMEYER, *Mediae latinatis lexicon minus*, Leiden 1954-76, p. 328 and 699 for southern French examples. While the etymology of *dexter* is obscure, that of the *modiata* is clearly related to the area that could be sown with a *modius* of seed, even though the measurement was later used of vineyards and other non-arable land and came to be considered as the area that could be ploughed in one day. It is particularly unfortunate that the work of the monk Oliba of Ripoll entitled *De ponderibus at mensuris*, which was seen by

ve regular land division occurred in the period between the late Empire and the tenth century, one should perhaps look back to Antiquity in an attempt to trace the possible origins of these apparently recurrent lengths of approximately 35, 70, 105 and 140 metres. One of the most common units of Roman land holding, both in Spain and elsewhere was the two *iugera* or one *heredium* division, equivalent to approximately 5036 square metres, although this could vary and depended on the length of the foot used. This area could be defined as a square of sides two *actus* (= 240 Roman feet) in length, and certainly the presence of blocks of a hundred of these squares, in other words a twenty *actus* grid, constitutes to this day the clearest proof of Roman centuriation, particularly of the Augustan period⁵³. As recent research on the subject of centuriation has demonstrated, the subdivisions of these twenty *actus* blocks could be very varied, although rarely were parcels more than two *heredia* in size found⁵⁴. In view of the lack of adequate cartographical evidence for field boundaries in the Pla de Barcelona before the expansion of the city, it is difficult to envisage the day when it might be feasible to demonstrate the existence or extent of centuriation around the *colonia Barcino* through normal techniques, although it might be assumed that it existed, as in the case of

J. VILLANUEVA, (*Viaje literario a las iglesias de España*, Madrid, 1803-52, vol. VIII p. 55), was lost in the course of the nineteenth century, as it was obviously written at a crucial moment in the development of Catalan weights and measures.

⁵³ O.A.W. DILKE, *The Roman land surveyors: an introduction to the agrimensores*, Newton Abbot 1971, p. 84, Universidad Autónoma de Madrid, *Estudios sobre centuriaciones en España*, Madrid, 1974, pp. 14-15, F. FAVORY, «Propositions pour une modélisation des cadastres ruraux antiques» in M. Clavel-Lévêque (ed.), *Cadastres et espace rural*, Paris 1983, pp. 51-135, p. 80.

⁵⁴ FAVORY, *op. cit.*, pp. 132-133 for Tunisian examples.

Also of interest is M. Guy, «Existence de bornages divisionnaires dans une centuriation antique» in M. CLAVEL-LÉVÊQUE, *op. cit.*, pp. 315-317, referring to possibly ancient field boundary stones south of Ampurias set at intervals of 17/18, 35, and metres, i.e. ½, 1 and 2 *actus* (or approximately 6.25, 12.5 and 25 «drestres»).

most *coloniae*. Nevertheless, it is interesting to speculate on the possibility that the frequent twenty-five *dexter* measurements noted above might be a reflection of Roman two *actus* divisions. There are, however, a number of obstacles: in the first place there is clearly a slight difference in size between two *actus* (a minimum of 70,3 m with a standard of 70,968 m) and twenty-five «*destres*» (69,9 m), if the eleventh century standard of 2,796 m is used. Secondly, there is as yet little comparative evidence from the *Conventus Tarraconensis* for centuriation, and there is no guarantee that the units found elsewhere in *Hispania* need ever have been applied to this region. Thirdly, very few of the measurements are exactly fractions or multiples of twenty-five.

On the other hand, it might be argued that the difference between the units is in fact minimal, especially since the figures expressed in most of the charters were clearly to the nearest *dexter*, except in the case of small plots. Secondly, tenth century figures from other parts of Catalonia suggest that the «*destre*» may have once been slightly longer than the 2,796 m later accepted as standard⁵⁵. The objection concerning the rarity of absolutely regular measurements might be countered by arguing that minor changes of a few metres could easily have taken place in the preceding millenium, especially if the intensity of cultivation declined in the post-Roman period, as seems only logical⁵⁶. Moreover, allowance must be made for field boundaries and paths between plots, which may or may not have been included within the dimensions recorded. It should also be noted that in most

⁵⁵ See the references *supra* note 21. ACA R. BORRELL 5 (993) states *id est modiatas IIII ad dextro anteriore*, thereby implying a relatively recent change in the value of the *dexter*.

⁵⁶ A number of early documents from the *territorium* refer to uncultivated land: e.g. E. Junyent, *Diplomatari de la Catedral de Vic*, fasc. 1, Vic 1980, no. 44, pp. 41-2 (908). For other parallels between the late Roman period and the early medieval centuries, P.J. Bancks, «The Roman inheritance and topographical transitions in early medieval Barcelona» in T.F.C. BLAGG, R.F.J. JONES and S.J. LEAY (eds.), *Papers in Iberian Archaeology* BAR IS 193, Oxford 1984, pp. 600-634.

areas in Europe where centuriation can still be traced, relatively little of the layout can be established in detail nowadays, and it is only through the examination of extensive areas that patterns emerge more clearly. In most areas where cultivation has been more or less continuous from Antiquity onwards, it is clear that not only have changes occurred in the recent past, but also the original divisions had already undergone the sort of changes apparently visible in the Barcelona documentation by the end of the first millenium.

One final point might serve to associate the late tenth-early eleventh century *modiata* with a classical root and explain the diversity of units employed at that date. The monastery of Ripoll was renowned for its learning in tenth century Europe and among the works to be found in its library were copies of the Roman *agrimensores'* treatises⁵⁷. Since the vast majority of the documents recording dimensions of agricultural plots belong to the two decades after c. 990, when activity at Ripoll was at its peak, could it be that one of the side effects of this activity was the increased use of measurements in contemporary private charters? If so, this may have led to the standardization of customary measures to reflect Roman regularity rather than strict accuracy, so that one *dexter* came to be considered the same as six cubits, twelve «pams de destre» or fourteen spans. Thus while the earlier, tenth century *dexter* was perhaps a slightly larger unit, which may have in fact been exactly one twenty-fifth of a two *actus* length, although this was probably not realised by contemporaries, its eleventh century namesake may have been reduced in size (*dexter minor*) so that it no longer consisted of six cubits plus a fraction of another unit, in an attempt to present

⁵⁷ R. BEER, «Los manuscritos del Monastir de Santa María de Ripoll», *Butlletí de la Reial Academia de Bones Lletres de Barcelona* 5, 1909, 137-170, 230-280, 299-320, 329-365 and 492-520; J.M. MILLÀS VALLICROSA, *Assaig d'història de les idees físiques i matemàtiques a la Catalunya medieval*, Barcelona 1931, esp. pp. 214-9, 302-4 and 327-334, referring to ACA Ms, Ripoll.106. Most recently, with very full bibliography, L. TONEATTO, «Tradition manuscrite et éditions modernes du *Corpus Agrimensorum Romanorum*» in M. Clavel-Lévêque, *op. cit.*, pp. 21-50.

a neat mathematical equation in the classical mould. The confused terminology of the period 990 to 1030 could, therefore, have reflected the overlap of the two systems, the *dexter maior* being the previous standard and the *dexter minor* the new yardstick.

This, however, is advancing into fields of extreme conjecture: in the absence of supporting evidence, suffice it to say that there does seem to be an emphasis on twenty-five *dexter* units in this period, and that these lengths may have been the result of the regular sub-division of Roman twenty *actus* centuriation blocks, for it is difficult to envisage any other moment at which such a regular division could have taken place. Needless to say, many other fields and vineyards present other measurements, thus reflecting the multitude of changes that had taken place⁵⁸.

To conclude, six points can be made:

a) The *dexter* was in use from the early tenth century, if not before.

b) By the year 1050, the later traditional value of 2,796 metres appears to have been standard, at least in the Barcelona area, although beforehand a longer length seems feasible if not demonstrable.

c) A standard was exhibited in the market place alongside measures of volume.

d) The measurements recorded can occasionally help to demonstrate that certain blocks in the city of Barcelona have changed little in shape since the early Middle Ages.

e) Measurements were only recorded in charters when some doubt about the extent of the property was likely to arise.

⁵⁸ It should also be noted that many, if not all, the twenty-five *dexter* units come from the area of Provençals, which has on occasions been equated with the Roman *ager provincialis* (e.g. CARRERAS CANDI, *op. cit.*, pp. 62-64). However, since so much of the documentation for this period is derived from the family archive of Vivas of Provençals, for which see P. BONNASSIE, «Une famille de la campagne barcelonaise et ses activités économiques aux alentours de l'an mil» in *Annales du Midi* 76, 1964, pp. 261-303, one should perhaps exercise caution until a wider body of evidence is considered.

f) In the *territorium* a case can be made for linking the frequently found fractions and multiples of twenty-five «des-tres» to Roman centuriation patterns.

APPENDIX 1

Barcelona documents weith measurements, 924-1200.

Abbreviations

- ACA: Arxiu de la Corona d'Aragó: Cancelleria (unless otherwise stated)
R. Borrell: Parchments of Ramon Borrell
RBI: Parchments of Ramon Berenguer I
ACB: Arxiu Capítular de Barcelona: followed by parchment number
DC: Diversorum C
ACV: Arxiu Capítular de Vic
C6: Calaix 6
Lib.Dot.: Liber Dotationum
ADB: Arxiu Diocesà de Barcelona
ME: Mensa Episcopal
SA: Santa Anna
AMSBB Arxiu de Montserrat: Parchments of Sant Benet de Bages
ASPP: Arxiu de Sant Pere de les Puelles
BC: Biblioteca de Catalunya: parchments
CSC: Cartulario de Sant Cugat (in ACA) followed by reference to J. Rius Serra, *Cartulario de «Sant Cugat» del Vallès* (Barcelona, 1945-47), 3 volumes.
LAEC: *Libri Antiquitatum Ecclesie Cathedralis* (in ACB) followed by reference to J. Mas, *Notes històriques del Bisbat de Barcelona*, volumes IX-XII (Barcelona, 1900-14).
- d.: dextros
c.: cubitos
p.: palmos.

No.	Date	Reference	Property	Dimensions
1	24.IX.924	ACB 1-2-499	domus et curte	17c. <i>et osso</i> , 16c. <i>et serco</i> (?), 17c. <i>et osso</i> , 17c. and 4 <i>digita</i> . 6d.1p., 12d.5p., 7d., 14d.2p. blank spaces
2	5.XII.980	ACB 1-2-1358	«hort»	
3	15.VI.997	LAEC I 157 412 Mas 179	«hort»	
4	25.IV.1000	ACA R. Borrell 48	terra	48d., 22d., 49d., 33d.
5	19.X.1000	ACA R. Borrell 56	curte	14c., 14½c., 13½c., 12½c.
6	25.VI.1003	ACV Lib.Dot.fol.IV	«hort»	14d., 3½d. and 1p., 14d., 4d.
7	7.IV.1014	LAEC I 127 321 Mas 336	ferreginal	7d., 10½d., 5¼d., 10d.4p.
8	5.XIII.1017	LAEC I 128 325 Mas 367	«hort»	6d.6p., 12d.4p., 6d.2p., 5d.
9	19.VI.1028	ACB DC(b) 81	casalicium	4d.less 2c., 3d.1c.1p., 4d., 3d.1c.1p.
10	1.XI.1032	ACB DC(b) 99	turres, muros, terra	7d.2c., 7d.2c., 7½d., 7½d.
11	5.XII.1053	ACB DC(b) 187	curtis	5d.5p., 1½d., 5d.5p., 1d.
12	26.VI.1059	LAEC Tit.III,2 Mas 757	terra	6d., 10d., 8½d., 9d.
13	29.VI.1059	ADB ME Tit.III,2	terra	26d., 22d., 29d., 9d.
14	12.VII.1066	LAEC I 129 327 Mas 827	clausus	10½d., 3½d.

No.	Date	Reference	Property	Dimensions
15	8.III.1082	LAEC I 135 347 Mas 1010	terra	8d., 11d.1p., 9d.5½p., 9d.
16	7.XI.1082	LAEC I 41 84 Mas 121	terra	1p. and half a foot in width
17	7.V.1085	LAEC I 41 83 Mas 1046	«Hort»	4d.½ foot, 7d.½ foot, 4d.½ foot, 7d.½ foot.
18	29.X.1087	LAEC I 42 87 Mas 1053	«hort»	width only: 5d.less 3p. and 4d.1p.
19	9.II.1088	ACB 1-2-1385	«hort»	width only: 1d.3p.
20	18.VIII.1088	AM SBB 1590	«hort»	9d.less 2p. 13d.5p., 7d.2p. 13d.5p. 3d.1p., 2p. and 1 palmata
21	6.I.1092	ASPP 48	solum	2d.7p., 6d.1p., 2d.4p., 6d.1p.
22	2.I.1093	LAEC I 141 365 Mas 1105	«hort»	6p., 5d.1p., 4½p., 5d.1p. 1d., 22c.
23	V.1098	LAEC I 77 174 Mas 1160	terra	2d.less 4p., 2d.less 4p.
24	23.X.1105	ACB 1-2-982	access	4p. wide
25	9.I.1146	ADB SA Carp.2,359	terra	5d.less 1p., 5d.less 2p., 5d.less 3p., 6d.less 2p.

No.	Date	Reference	Property	Dimensions
26	22.VI.1146	LAEC I 36 71 Mas 1607	½ «hort»	5d.4p., 4d.6p., 5d.1p., 4d.5p.
27	4.IX.1154	LAEC I 95 227 Mas 1703	solarium	4p. in width
28	4.III.1160	ACB DC(c) 171	curialis	6d.less 2p., 4d.less 1p.
29	21.VIII.1160	ACB DC(c) 173	terra	28d.2p., 20d., 28d., 8d.less 2p.
30	15.I.1171	ADB SA Unnumbered	terra	10 brasses long
31	1.VII.1174	ADB SA Carp.2.399	access	9p.
32	3.VII.1174	ADB SA Carp.2.397	access	8p.
33	30.XIII.1183	LAEC I 97 232 Mas 2137	access	4p.
34	15.VI.1184	LAEC I 96 233 Mas 2146	domos	width only: 1 ¹ / ₄ d.
35	29.VI.1190	LAEC I 60 124	domos et operatios	7d.6p., 1d.5 ¹ / ₂ p., -, 1d.5 ¹ / ₂ p.
36	26.VII.1197	Mas 2209 ACB 1-1-2506b.	terra	1 ¹ / ₄ canas <i>ad cannam de draperiam</i>