

A Reappraisal of Dinas Powys: Local Exchange and Specialized Livestock Production in 5th- to 7th-century Wales

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RESULTS OF THE analysis of a previously unstudied group of animal bone from Dinas Powys are tested against the original report and subsequent interpretations. Assumptions inherent in the initial sampling policy and analysis are discussed. The present interpretation explores the concept of social production in early medieval Wales.

This paper is a response to discussion stimulated by Professor L. Alcock's report of the excavations at Dinas Powys, and the subsequent debate between Alcock and Dr R. E. Chaplin over the interpretation of animal bone assemblages.¹ The main part of what follows is concerned with a sample of animal bone from Dinas Powys which has not previously been studied. An exhaustive list of data and tables can be consulted elsewhere.² The aim is to consider the significance of the findings as evidence for socio-economic interpretations of Dinas Powys alternative to Alcock's unchallenged theory of a 'princely stronghold'. In particular the following themes will be discussed:

1. The formation and meaning of the archaeological assemblage of animal bones
2. Evidence for Dinas Powys's involvement in the local exchange of livestock, with the suggestion that the site's previously defined link with long-distance exchange has been over-emphasized.

The interpretation presented here is based solely on the preferred method of archaeozoological quantification, the 'minimum number of individuals' represented in the archaeological assemblage. This account attempts to balance the very different interpretation based on quantification by fragment count which has appeared elsewhere.³

Dinas Powys yielded an unusual number of high-quality imported objects which included imported Mediterranean pottery, glass beads and fine metal-work. In addition to these the alkaline soil of the carboniferous limestone bedrock allowed

the preservation of animal bones in what Alcock termed 'embarrassing quantities'. At the time of the excavations, resources for the storage and study of the material were limited. It is only in retrospect that the character of the site's preservation, unique to date in southern Wales, can be fully appreciated. Alcock was forced to initiate what might be viewed as an early on-site sampling strategy:

Advice was taken from appropriate specialists, and questions about the animal husbandry of Dinas Powys, which the bones might serve to answer, were formulated as a basis for this selection. In particular, it seemed that we might hope to determine the order of frequency of species, the age of slaughter of the stock, and the stature of the beasts. With this in mind, we normally kept only jaws and teeth, and those long bones which retained their articular surfaces, a sample which amounted to about one-third of all the bones discovered.⁴

The analysis of one distinct group within the sample was carried out by Dr I. W. Cornwall and Mrs L. Haglund-Calley. The results of the study appeared as an appendix to the site report.⁵ Alcock detected major discrepancies between the findings of the bone report and details of animal husbandry articulated in medieval manuals. When specialists failed to respond to these anomalies Alcock challenged animal-bone methodology in the provocatively titled paper 'Dry Bones and Living Documents'.⁶ The paper alerted specialists to the unusual ratio of domestic species reported at Dinas Powys, largely pig, and to the relatively early age of slaughter of all the major species. He asked: 'Given such a drastic slaughtering policy, could the stock be maintained at all?' Alcock was also intrigued by the status of the animal bone deposit, 'the collection looks like waste from the kitchen thrown direct on to the midden never having been to table at all'.⁷

Chaplin, defending animal-bone methodology against Alcock's criticisms, cited the small sample and out-dated methods which characterized the original appendix. He suggested that 'the bones from Dinas Powys would repay further study'.⁸ The present study brings forward the results of the analysis of the previously unstudied animal bone from Dinas Powys. These fresh data can be compared to the initial report in order to clarify two main points:

1. the nature of the bone refuse
2. the animal husbandry characteristic of Dinas Powys during the period of occupation spanning the 5th to 7th centuries (Phase 4A/4B).

THE ANIMAL BONES FROM DINAS POWYS

Part I: Refuse Patterning

It should be possible to consider whether Cornwall's sample, derived from one midden, was typical of the entire site in its content of low to medium meat values.⁹ In order to make such an evaluation it is necessary to define the nature of the archaeological context from which the animal bone has been recovered. The nature of the archaeological deposit will have been determined by the refuse disposal behaviour practised during the settlement's occupation. These behavioural factors combine with subsequent taphonomic processes to fashion the character of the animal-bone assemblages.

Cornwall's sample of 1,677 fragments represented the deeply stratified northern middens, cuts VI and VIW, whereas the present sample of 5,576 fragments was derived from the shallower rock-cut features of the interior and layers stratified beneath Bank I.¹⁰ The accumulation of domestic debris in a series of deeply stratified middens probably reflects the regular disposal of refuse. Cornwall's sample, therefore, may reflect a primary deposit of animal bones, the result of systematic refuse disposal likely to have a low incidence of residuality. For this very reason, however, the contents of the midden may have been the product of specialized activities and not an adequate representation of diet. By employing a model constructed to study behaviour and refuse patterns at Wendens Ambo it is possible to make a direct comparison between the character of the 'primary' midden deposit and the multi-context sample taken from the shallower gullies, post-holes and hearths.¹¹

The Wendens Ambo model assumes a sequential relationship between attitudes to refuse, discard stages and archaeological patterning. According to the model, one might expect the offensive waste products of slaughter and butchering to be systematically buried in deep midden-type features. The absence of 'lordly specialities' in the northern middens, then, is only to be expected in a deposit of this type. The animal bones contained in the shallower features at Dinas Powys would have been related to the activities of food preparation and consumption. The bones would have been discarded in a haphazard fashion, experiencing periods of exposure and gnawing by scavenging animals before final deposition. Following exposure and, possibly, cooking treatments the bones from the shallow deposits were in a less well-preserved state. They should, however, serve as a more accurate reflection of daily diet.

To test this hypothesis, the anatomical elements occurring in the samples were categorized according to meat values:¹²

1. Prime meat: trunk (ribs, vertebrae, pelves, scapulae); limbs.
2. Waste: skull (horns and teeth); extremities.

Figure 1 illustrates that despite the contrasting nature of the archaeological deposits from which the samples originated, their constituents are of a strikingly similar character. The butchering activities associated with deep features explain the composition of Cornwall's sample as between 89.8%–98.8% waste (skulls; extremities), depending on the species, and 1.2%–12.8% prime meat (trunk; limbs). But why should the shallow features directly related to living areas produce a similarly high proportion of waste products, 83.8%–86.7%, and an only slightly higher proportion of meat, 13.1%–16%? This high proportion of waste bones suggests that the excess of food preparation was not discarded systematically, but was instead allowed to settle in the shallow rock-cut features. The low proportion of meat bones may imply that table waste was deliberately collected and fed to domestic animals associated with the site, probably dogs or pigs.

By virtue of their density, the extremities and skulls of all species have a higher chance of survival in the archaeological record. This universal variable biases

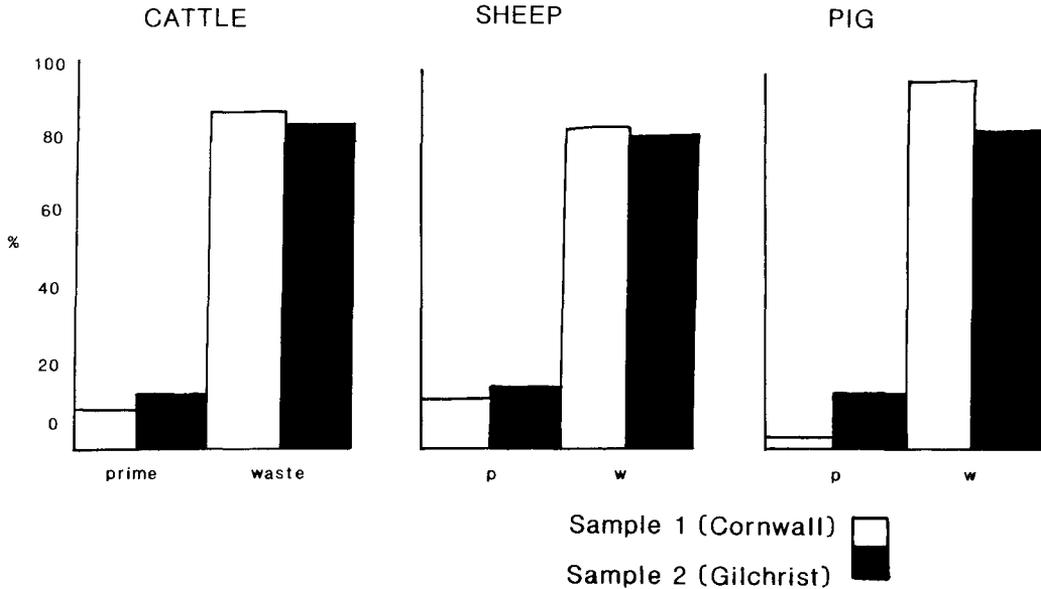


FIG. 1
Meat values

samples toward waste values and also toward mature individuals where fusion of the epiphyses is complete. Secondly, cooking treatments render the prime meat bones highly friable. Thus, post-depositional processes tend to produce fragmented material retrievable only through sieving. At Dinas Powys the bones of pig, an animal sometimes cooked intact, were of a much more highly fragmented nature than the sheep and cattle which would have been butchered before cooking.

Perhaps the constant factors of differential bone deposition and survival prevent our understanding the full range of behaviour on any excavated site. Uniformity across feature-types at Dinas Powys, however, suggests that the most significant factors in patterning the assemblages were caused by Alcock's decision to retain only jaws, teeth and complete bones. A fully representative proportion of food waste and preparation can only be recovered by sieving.

Although the sampling technique has precluded a full study of the range of refuse disposal behaviour which operated at Dinas Powys, this preliminary study has at least indicated that the distorted nature of the animal-bone refuse was determined at the stage of recovery of the data, and not at the stage of analysis. While quantification of the faunal assemblage may be feasible, the sampling strategy must be appreciated so that an appropriate methodology can be employed.

Part II: Methodology and Quantification

In recent years the method of quantification employed by Cornwall, a simple fragment count, has been criticized for not considering the biases of preservation

toward particular species and anatomical elements.¹³ The presence of large quantities of bone representing the skull and extremities of the major species indicates that animals were entering Dinas Powys intact and butchered within the settlement. While the study of anatomical elements indicated that animals were indeed entering the settlement 'on the hoof' (Fig. 1), the sampling strategy has distorted their representations. The manipulation and interpretation of any quantification based solely on fragment counts may be considered to be a potentially misleading reflection of the palaeoeconomy of Dinas Powys.¹⁴

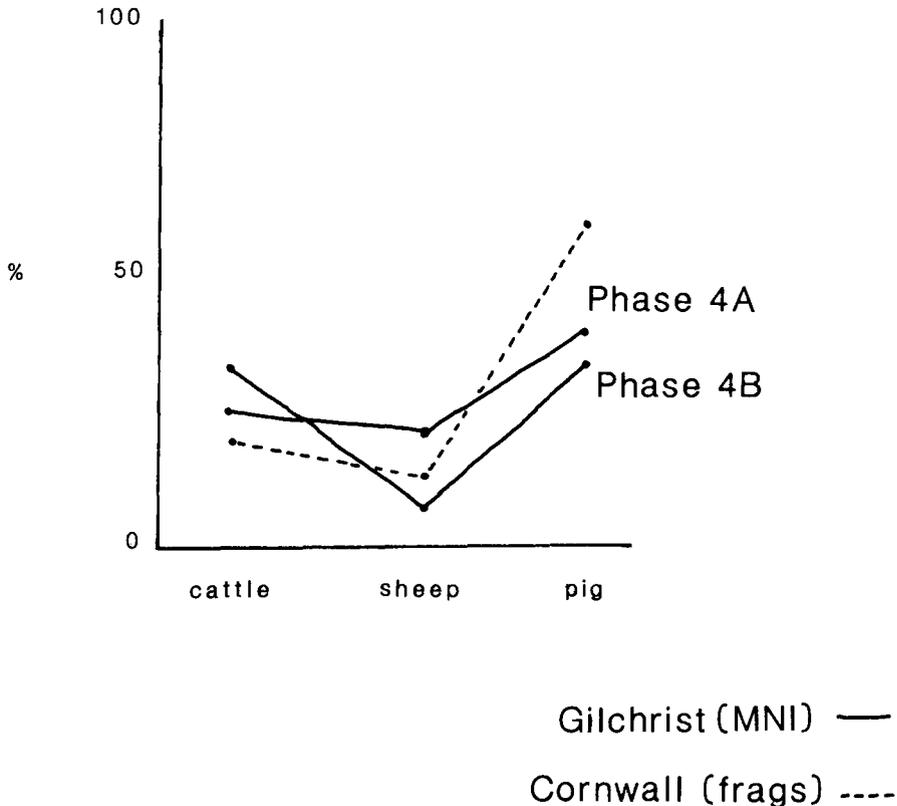


FIG. 2
Relative abundance of species

The method of quantification favoured here is the 'minimum number of individuals' (M.N.I.). An attempt has been made to count the most numerous non-reproducible skeletal components for each species (Fig. 2). By estimating the M.N.I. based only on mandibles it is possible to eliminate both the distortion produced by Alcock's sampling strategy and the natural bias imposed by the superior preservation of dense body parts. This method of quantification negates complications inherent in the fragment-count method of quantification which arise

due to the unequal proportions of some skeletal components occurring in the major domesticated species.

The large sample of intact mandibles has allowed an age-at-death estimate by tooth eruption. This method provides a smaller range of possible ages than an estimate based only on epiphyseal fusion. The stages of tooth-wear patterns are based on a method devised for the Portchester Castle material.¹⁵ Determination of sex ratios was possible for some species through metrical analysis. The sample was not sufficient to discern butchering practices adequately.

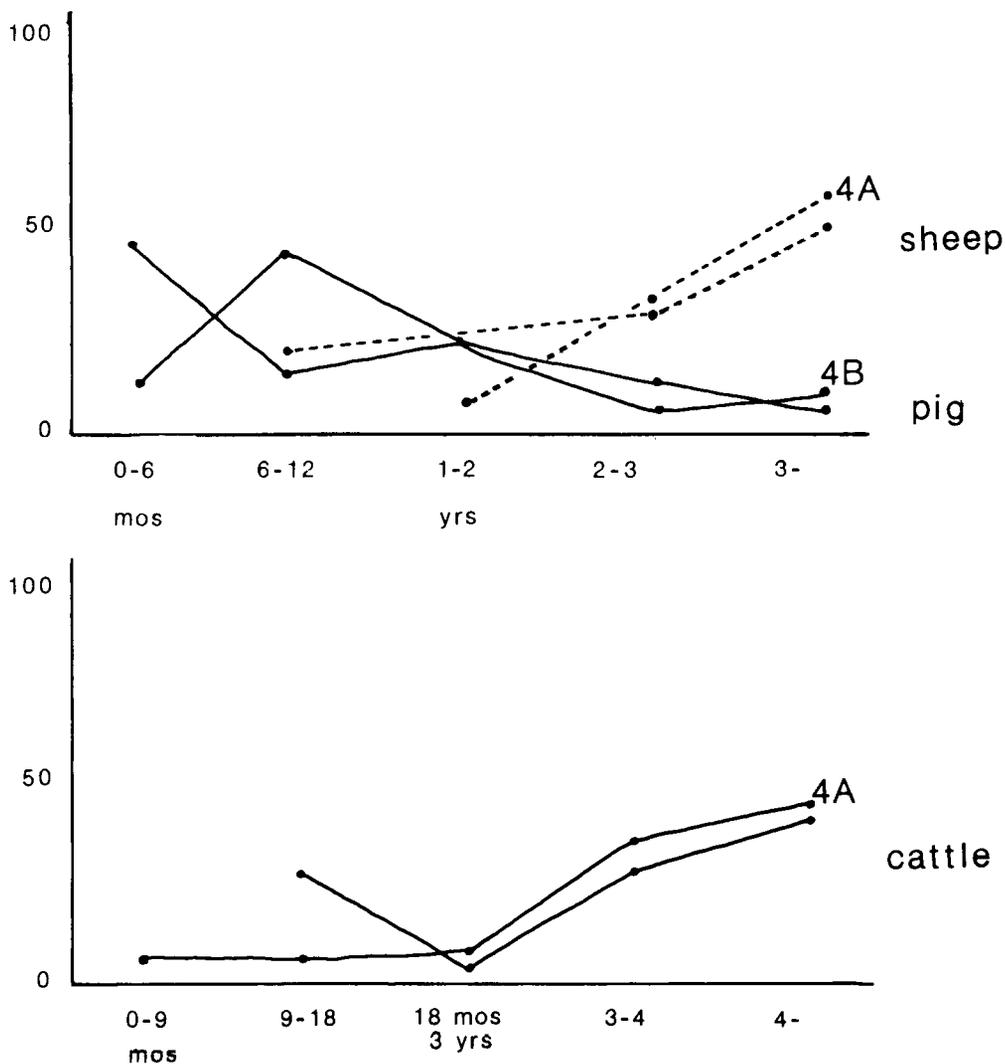


FIG. 3
Age groupings by species

CATTLE

Quantification by M.N.I. indicates that cattle represented 27.9% and 36.7% of the total sample in Phases 4A and 4B. The combined ageing evidence indicates that at least two-thirds of the sample were over three years of age at death; one-third of these were over four years old at slaughter (Fig. 3). These findings are not consistent with Cornwall's conclusion that cattle were killed between two and three years.

The cattle were sexed by calculating the 'slenderness index' of the metacarpals.¹⁶ Figure 4 depicts possible clusters of sex groupings, emphasizing a high proportion of mature females. Observation of the horn cores provided a similarly low figure for characteristically male horn cores. The sex ratio of adult animals at Dinas Powys (11 females: 3 males) does not match the expected adult cull of a meat-producing policy. This pattern of a high ratio of female mature cattle has recently been interpreted as denoting a dairying economy.¹⁷

Where a dairying policy is in operation, herders must ensure that enough calves are produced to establish lactation in the adult females. This practice leads to a surplus of calves above the number needed to sustain the herd. Archaeologically, a dairying economy can be recognized not only by the high adult female:male ratio, but by the slaughter of a large proportion of young cattle. At Grimes Graves, where the ratio of adult cattle was 6 female:1 male, it was concluded that half of the cattle in the assemblage were killed before six months of age.¹⁸ These surplus calves would have been consuming food that could have been supporting a dairy cow.

At Dinas Powys, no such dramatic cull of calves can be detected. Most cattle survive their third year. It is evident that the emphasis is on older cows, but there is an absence of the calves required to keep the cows lactating. Dinas Powys was clearly reliant on meat produced by a dairying source, but the settlement itself was not involved with the full process of dairy production. Comparable absences of a high

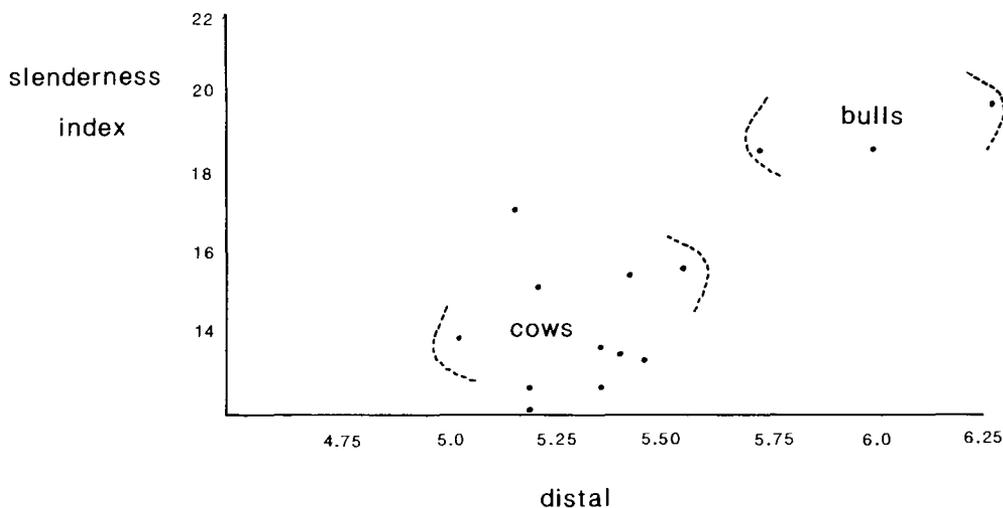


FIG. 4
Sexing of cattle metacarpals

young-male kill have been interpreted as the importing to site of adult female cattle for dairying. Ratios from Neolithic causewayed camps of 15 females: 1 male (Hambledon Hill) and 20 females: 1 male (Windmill Hill) have suggested the import of surplus dairy cows 'available from economies based at lowland (and undiscovered) Neolithic sites'.¹⁹

The medieval site of Fishamble Street, Dublin, has yielded a pattern similar to that detected at Dinas Powys.²⁰ Two conclusions have been drawn from the Fishamble Street material which can be applied to Dinas Powys. The pattern represents a modified dairying economy, with the low occurrence of calves suggesting that the settlement was not involved in cattle rearing but instead was obtaining dairy cows from outside producers.

SHEEP

Quantification by M.N.I. has shown that the total sample from Phase 4A was 20.7%, declining to 10.2% in Phase 4B. Cornwall's estimate of the sheep population at Dinas Powys was 13.4% of the total number of fragments. The proportion of sheep at Dinas Powys is slightly lower than has been recorded at contemporary Irish sites and significantly lower than the figures provided for contemporary Anglo-Saxon rural settlements.²¹

In the midden deposit examined by Cornwall it appears that all sheep were slaughtered at or before eighteen months/two years. In the present sample one-third of the sheep population was slaughtered between two and three years, and *c.* 50% were older than three years. This late peak is not in keeping with the evidence from Irish rural sites where sheep were killed at between one and two years of age. Only at Knowth, Co. Meath, is a similar pattern noted. At Knowth 50% of the sheep were killed after reaching two years of age.²² These late peaks may indicate that the exploitation of sheep for their wool and dairy by-products surpassed their value as a meat resource.

PIGS

Despite limitations imposed by differences in methodology, it is clear that in both Cornwall's midden deposit and the present sample an unusually high proportion of pig was observed. Cornwall estimated that pig made up 61.3% of the total of identified fragments, whereas the figure derived through M.N.I. is between 40–45% for the Phase 4 deposits. These figures do not support the recently proposed contention that Cornwall's 'northern midden derives from an area specializing in pig-butchery'.²³

Few parallels for the predominance of pig at Dinas Powys can be found; only the later two phases at Rathmullan, Co. Down, can be regarded as a western British analogy.²⁴ Cornwall estimated that the pigs in the sample which he examined were killed between one and two years of age. Of the pigs represented in the present sample, *c.* 60% of the Phase 4A pigs were killed before the end of their first year; 46% of the Phase 4B pigs were slaughtered before six months. Because pigs provide no economic bonus in addition to their value for meat and hides, few animals will be

permitted to reach maturity. The killing peak for pigs at Irish rural sites is significantly later than at Dinas Powys, normally between eighteen and twenty-six months. The much earlier killing peak for pigs at Dinas Powys, mainly under one year, implies either a faster maturing variety of pig or much more intensive breeding.

If the M.N.I. can be taken as indicative of intensive breeding, it is likely that the slaughtering was carried out in order to kill the pigs before they reached full size. Foraging, mature pigs begin to compete with humans for the same food. By slaughtering the pigs in this manner it is possible that a high rate of pork production was achieved while keeping the number of pigs at any one time at a manageable level.

DISCUSSION

Discrepancies in ageing data between Cornwall's report and the present sample may simply reflect differences in methodology. Alternatively, these differences could represent an internal spatial separation of activities. The midden examined by Cornwall was situated in the extreme northern limit of the internal occupation area, whereas the present sample was derived from more central rock-cut features and material sealed by Bank I, which serves as the extreme southern boundary of the site's interior. The northern precinct of the site may have been an area specializing in the slaughter and butchering of juveniles for their meat. This would suggest the operation of a very complex division in food resources which distinguished between meat and dairy proteins, and, perhaps, the internal separation of the food consumers by status.

The interpretation of Dinas Powys as a princely stronghold was based on the quantity of high-status imported objects which excavation of the site has produced. As a result of this characterization, the site has been used to depict the type of long-distance trade aimed at 'central places and their persons'.²⁵ This model can now be tested against the animal-bone evidence.

In order to test the animal-bone evidence it is convenient to utilize models previously advanced to explain the economies of the Somerset hillforts, and which Alcock himself used in his consideration of the Dinas Powys evidence.²⁶ Dr I. Burrow identified four economic strategies in which the reoccupied hillforts may have participated: (1) subsistence activities, (2) local exchange of goods and services, (3) long-distance trade and (4) industrial complexes. The relevance of these models can be evaluated through additional comparative material drawn from excavated Irish sites and works of historical synthesis.

In his model of subsistence activities, Burrow assumed that the hillfort settlement would have achieved its basic subsistence requirements independent of external sources. Examination of the economic activities of the Irish rath, a comparable settlement form, has suggested an essentially self-sufficient nature.²⁷ Professor W. Davies interpreted the documentary and material evidence for early medieval Wales as representing a general self-sufficiency achieved by most of the population:

On the whole, men did not acquire their food by purchase or by the exchange of means which they had won by labouring at unconnected activities. They acquired food by working

to produce it or by owning lands and consuming the products. Occupations or income, therefore, were directly connected with the fundamental means of supporting life.²⁸

It may be recalled that the anatomical elements present in the animal-bone assemblage from Dinas Powys confirm that whole animals were entering the settlement and being butchered there (Fig. 1). However, these animals may not necessarily have been associated with a production centre based at Dinas Powys. The irregular dairying pattern detected in the material, similar to that of an urban assemblage, contradicts the hypothesis of subsistence activities operating at a level of self-sufficiency. The absence of a slaughter peak for surplus young male cattle suggests that the settlement was not directly involved with cattle rearing. The dairy cows at Dinas Powys must have originated from an external source.

Historical evidence provides little support for the second of Burrow's models, that of the local exchange of goods and services. Davies stressed the total absence of references to local exchange in Wales. This paucity starkly contrasts with the evidence from other areas of western Europe. While the study of local exchange has proven problematical for historians, some advance may be provided by archaeozoology. For example, the dairy cows which were central to the animal husbandry of Dinas Powys may have been obtained in return for the surplus cured pork produced by intensive pig-breeding. This exchange represents the very sort of local transaction which cannot be detected in documents.

By recognizing the local exchange of livestock we do not necessarily invalidate either Burrow's model of the hillfort as a centre for long-distance trade, or Alcock's interpretation of Dinas Powys as a princely stronghold. Indeed the pattern of incoming dairy cows has been interpreted as representing the food renders due to a medieval Welsh prince: 'In its finer detail [the animal husbandry] is consistent with the interpretation of Dinas Powys 4 as a princely stronghold receiving tribute in the form of food renders rather than as the centre of a working farm'.²⁹

Alcock made this assumption on the basis of the Welsh Laws of Hywel Dda, which survive only in 13th-century manuscript form but which may in part date to the period immediately preceding Hywel's death in *c.* 950 A.D. These 10th-century laws have been extrapolated to cover the period of Dinas Powys Phase 4 occupation. While it has been accepted that the Laws are highly stratified, their value in the interpretation of 5th- to 7th-century occupations must be questioned: 'At present there is no easily available method of disentangling the later from the earlier and this means that the law tracts as such are not useful as evidence for the pre-Conquest period'.³⁰

In addition to the problems in dating the origins of Welsh socio-economic institutions, the relevance of the Laws for reconstructing site economies must be considered. Alcock has noted that the food-gifts paid by freemen were predominantly mature, fattened animals. These food renders, therefore, were gifts of livestock that would have been immediately slaughtered and consumed. This emphasis on high-status meat consumption does not reflect the conclusions of the animal-bone analysis at Dinas Powys; cattle and sheep were kept primarily for their by-products.

Alcock has himself considered Dinas Powys in the light of Burrow's proposed function of hillforts as industrial complexes. Can Dinas Powys represent a 'strongly defended industrial site'? Are craft activities a feature of princely forts? It is difficult to envisage this small fortification adequately protecting a community of specialist craftworkers. Documentary evidence suggests that specialization was largely in an agrarian context with craft specialization not apparent until the late 11th century. A lack of comparable sites makes it difficult to determine whether any particular pattern of animal husbandry would be characteristic of a Dark-Age industrial site. At the Irish site of Moynagh Crannog, which has been described as a production centre, the emphasis is on dairying with cows making up 66% of the mature cattle.³¹

Dr A. J. Legge has suggested that dairying is practised where the animal-husbandry potential is limited.³² This could be as a result of limited space for pasturage, low soil-fertility or pressure on human labour/time. Milk-production provides more protein than beef-production while remaining less labour-intensive and more productive in terms of yield per unit of land. Meat-production requires large-scale clearance of land for pasture. Because the brown earth soils (well-drained, loamy, noncalcareous) associated with Dinas Powys are very high quality, the constraints must have been on the availability of human labour, either for land clearance or animal management. It seems, therefore, that dairying would be appropriate for industrially specialized sites operating from small-holdings.

Having tested the animal-bone evidence against Burrow's models, only the model of hillforts operating within a subsistence framework can be fully discounted on the basis of the detection of an irregular dairying economy. The other functions which Burrow suggested need not have represented the exclusive economic role of the settlement. Unfortunately little Welsh documentary evidence survives to balance the evidence toward any single or combination of socio-economic roles. The very act of the refortification and reoccupation of Iron-Age hillforts during this period suggests great social change. Incidence of plagues in the 5th, 6th and 7th centuries caused severe depopulation and a subsequent shortage of labour.³³ This labour crisis may have stimulated administrative efforts directed from the hillforts which served as convenient centres. It is at this point that an organized local exchange of essential goods and services would have become necessary, an exchange which falls within the range of activities postulated in Burrow's second model.

In Ireland this form of local exchange was governed by rules of reciprocity in a society where long-distance trade was peripheral until the 8th or 9th centuries.³⁴ The development of local transactions was closely associated with secular or ecclesiastical authority motivated by the profit from taxation. In its essence, therefore, Alcock's depiction of Dinas Powys as a high-status secular site is not adverse to the model proposed here: local exchange is not incompatible with a princely stronghold. The evidence for the specialized production and exchange of livestock, however, expands our conception of Dinas Powys as an economically passive site receiving one-directional trade and food renders. At contemporary Irish sites local exchange bound by social obligation was of primary importance. The market principles fundamental to organized long-distance trade were absent in early medieval Wales until their introduction from outside.

Recently the value of animal-bone studies in the recognition of exchange patterns has been realized. With refinements in animal-bone methodology, it has become possible to reconstruct instances of complex economic production and to put forward a number of hypotheses concerning the corresponding relations of production. The type of livestock specialization detected at Dinas Powys emphasizes the local exchange of animals primarily for their by-products. The operation of a modified dairying economy must have been organized within a stratified society with some degree of labour specialization and localized settlement hierarchy. The present interpretation may not refute the site's previous characterization as a princely stronghold. It does, however, bring into question the accepted definition of Dinas Powys as a consumer site which served as the centre for long-distance trade aimed at an individual.

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NOTES

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