To what extent did Anglo-Saxon coins circulate within the Northern Lands?

Evidence from the numerical analysis and interpretation of pecking

By D. M. Metcalf

As the CNS advances from volume to volume under Professor Brita Malmer's leadership, the rich opportunities for numismatic analysis directed towards discoveries in the field of monetary history become more nearly practicable. Professor Malmer herself has initiated a debate on one aspect of the evidence, namely the pecking of the coins found in the Northern Lands and in the West Slav countries. Until she drew attention to the possibilities (having herself begun their meticulous recording) it is doubtful whether anyone suspected that such apparently trivial and uninteresting evidence could yield such solid and important results.

She began from the broad perspective of two contrasting zones, one in which coins were minted, and where they were accepted in exchange without testing, the other in which coins were imported and in which they were bent or pecked in order to test their quality. The zone of bending and pecking retreated geographically during the eleventh century, as minting began in the Northern Lands. She demonstrated by the analysis of hoards that the older coins in a hoard tended to be more heavily pecked. This can be proved more exactly with English than with German coins, because the former can be dated more precisely; but it applies to both. Her preliminary study of the German coins suggested that those from the historic

duchy of lower Lotharingia were somewhat less pecked than those from Saxony, and she wondered whether this might not allow us to determine the routes by which German coins were (most frequently) imported into Scandinavia (1).

These trenchant observations served to introduce a novel method of analysis, which may prove to be of considerable importance in quantifying our view of monetary circulation within the Northern Lands in the eleventh century. As more data are incorporated the conclusions will become more secure. At this stage in the debate, however, it is even more important that the underlying ideas should be explained and the analytical procedures subjected to scrutiny.

The Anglo-Saxon coins may carry as many as 20 or 30 pecks, and the newer coins in a hoard tend to be less pecked. If we ask whether each coin was tested each time that it changed hands, we are implying the further question, whether a coin changed hands only up to 20 or 30 times in as many years – on average, less often that once a year. If that were so, the character of the monetary economy in the Northern Lands would have to be judged to be very different from its Anglo-Saxon counterpart, where coins demonstrably became mingled in circulation extremely rapidly. In fact, the quite rapid diffusion of local issues such as those of Olaf Skötkonung is a sufficient basis from

which to argue that coins changed hands more often than they were pecked (2). One would be disposed to think that it was many times more often, but that is perhaps to beg the question.

An existing peck-mark on a coin is, after all, some sort of guarantee that the coin is not a plated forgery on a base-metal core: in subsequent transactions the seller could look at the peck to make sure that it had not revealed base metal. Why, then, 20 or 30 pecks? Perhaps the test was not to detect plating, but simply to assess the quality or fineness of the silver. One could imagine that with practice merchants were able to judge the hardness of the alloy from the minute difference in the size of the peck or the feel of the blow. But we really do not know why people sometimes tested the coins, or tested some of the coins, or why some people (e.g. men, but not women?) always tested some or all of their coins. We do not even know that the pecks were applied one at a time: perhaps two or
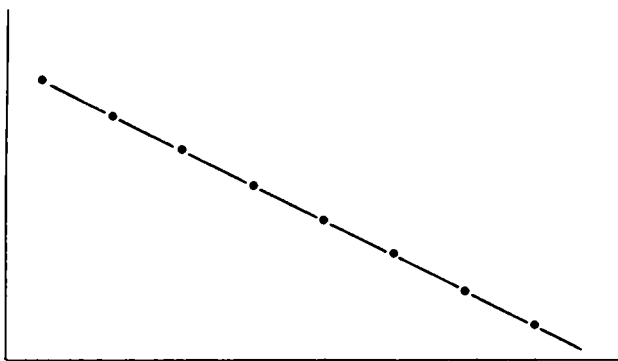
three were sometimes applied in a single inspection. We are guessing. The only facts we have are the numbers of pecks on individual coins, and the occurrence of these in the (dateable) contexts of hoards.

As a short contribution, this paper will use the Anglo-Saxon coins already published in *CNS* in order to examine four propositions, as examples of the way in which arguments can be developed.

1. The average amount of pecking does not increase regularly with age,

therefore the coins have not been subjected to pecking steadily and continuously since reaching the Northern Lands

Because of the thorough recoinages which took place in England at the beginning of each new validity-period (at least until the 1030s) we may be confident that English coins reached the Northern Lands in general by the end of their validity-period. They arrived thoroughly mixed as regards their mints, but unpecked: coins were never pecked in England, or virtually never (3). If they had then been subjected to a continuous process of pecking, a graph of the average number of pecks per coin, type by type, might be expected to approximate to a straight line sloping downwards to zero at the date of deposit (Fig. 1). That is very much what we find in the Digeråkra hoard, t.p.q. 1002 (Fig. 2a), except that the Reform-/First Small Cross type (*c.* 973-9) did not (on this limited evidence) suffer pecking in the same way as later types. The individual coins in the Digeråkra hoard minted from *c.* 980 onwards may be said to have acquired pecks at an average rate of one peck every two years or thereabouts. In the Ösarve hoard of about the same date, there are hardly enough Engl-

Fig. 1. Vertical: Average number of pecks; horizontal: Successive types.

ish coins to constitute a reliable sample but for what it is worth they show a similar pattern to Digeråkra (Fig. 2b).

In all the other well-documented hoards, with dates of deposit ranging from the 1020s to the 1080s, what we find is very different: somewhat erratic profiles approximating to a horizontal straight line, occasionally declining towards zero in the most recent types, but bearing little relation to what might be expected from steady and continuous pecking (Fig. 2, c-h). Moreover, the average number of pecks is certainly not directly related to the age of the coins: the same types of coins may carry 8-12 pecks in hoards from the 1020s or the 1080s, that is to say, whether the coins are perhaps twenty or eighty years old. According to the theory of continuous pecking, the latter would be expected to have four times as many pecks. If the average figures plotted in Fig. 2 were each derived from a normal distribution, one could imagine a simple explanation that would fit these facts fairly well, namely that as soon as coins arrived in the Northern Lands they rapidly underwent pecking, but that when (within five or ten years) they had received about 8-12 pecks, people could see at a glance that they had been well tested, and ceased to test them any further. One could illustrate this idea by pointing out that in the Stora Sojdeby hoard (deposit 1089 –, average numbers of pecks 9-15) two coins of William II, 1087-1100, which are almost the latest in the hoard, have received 24 and 29 pecks respectively. Perhaps in that instance people were suspicious of an unfamiliar design.

Another theory which should be mentioned is that the coins which arrived on Gotland were very little used, but were simply buried in the ground (4). This would explain why the average numbers of pecks did not increase markedly with age, but it might involve rather complicated hypotheses about the digging up of family treasures in order to add a small proportion of later coins. It might apply to some hoards but not others – for example those in which Æthelred's Long Cross coins still form a high proportion in comparison with coins of Cnut. But if these contrasting proportions tell us something about the circulation-history of the coins, should we not expect to find matching differences in the average numbers of pecks?

The average figures are in any case not derived from normal distributions. In the Digeråkra hoard the 18 Long Cross coins which are the latest issue represented are mostly unpecked, 2 coins having one peck – but one coin already has 6-10 pecks. The Crux coins in the same hoard have acquired, within eight or ten years, a roughly exponential distribution as regards their pecking (Fig. 3a). The evidence of the later hoards is best judged from those published from CNS 1.4 onwards, where the numbers of pecks are counted as exactly as possible, rather than merely as 'up to 10', 'up to 20', 'up to 30', and so on. Thus, the Long Cross coins in the Stora Sojdeby hoard (average number of pecks 13.7) carry from 0 to 50 pecks, and there are, in particular, numerous coins with 0-15 pecks (Fig. 3b). One can see that a distribution like this might have evolved from one like Fig. 3a. Later types in the same hoard show a distribution approximating rather more closely to a normal distribution with some positive skewness (i.e. most values are concentrated in the range 0-15 pecks, but there are a few higher values – as in Fig. 3c). But an even more extended or multimodal distribution is common elsewhere.

If, in each of numerous transactions, only a small random sample of the coins had been tested, and if this had happened uniformly and steadily, the
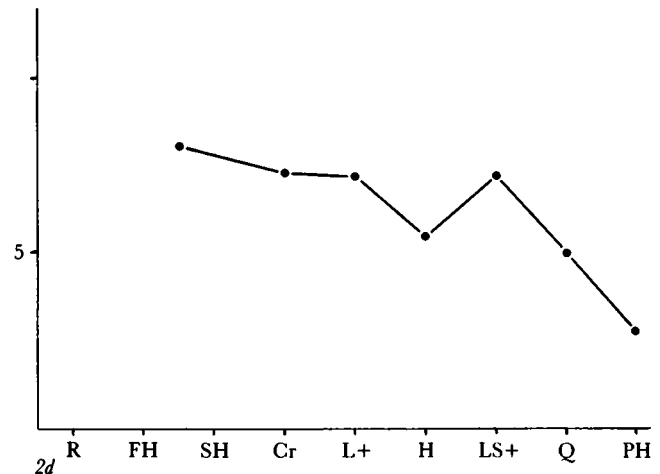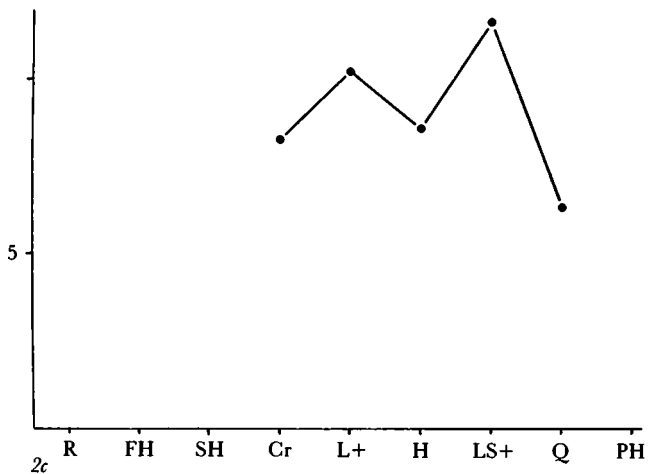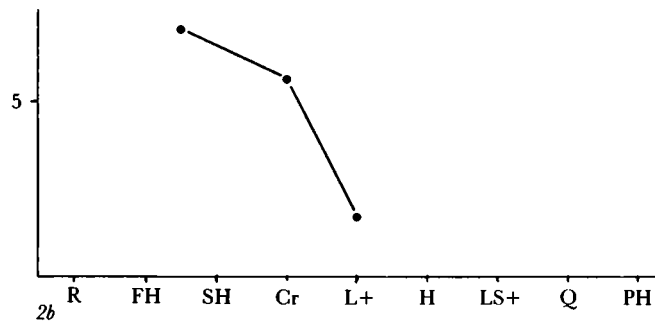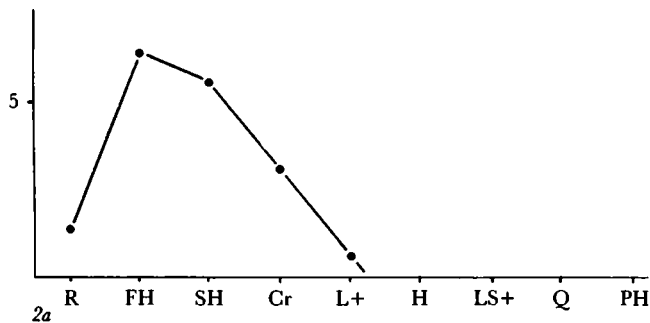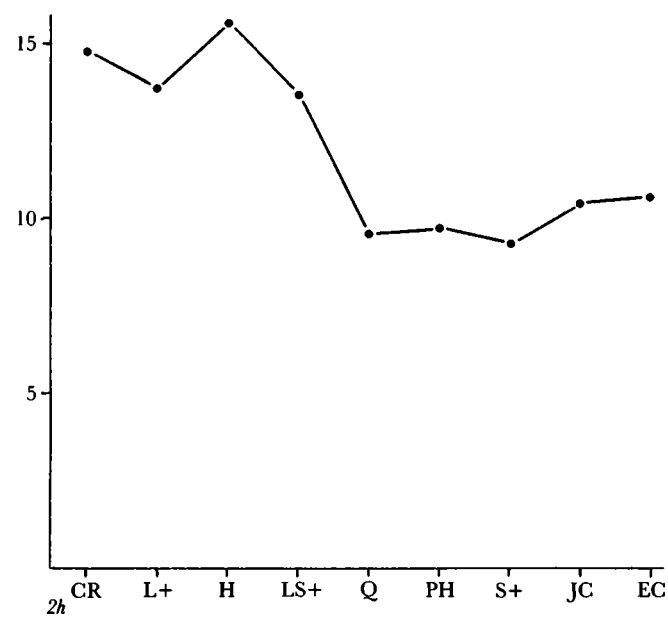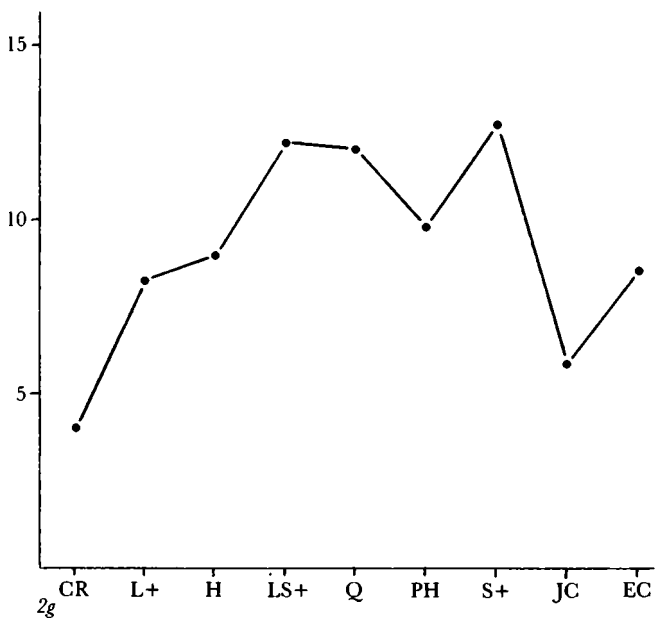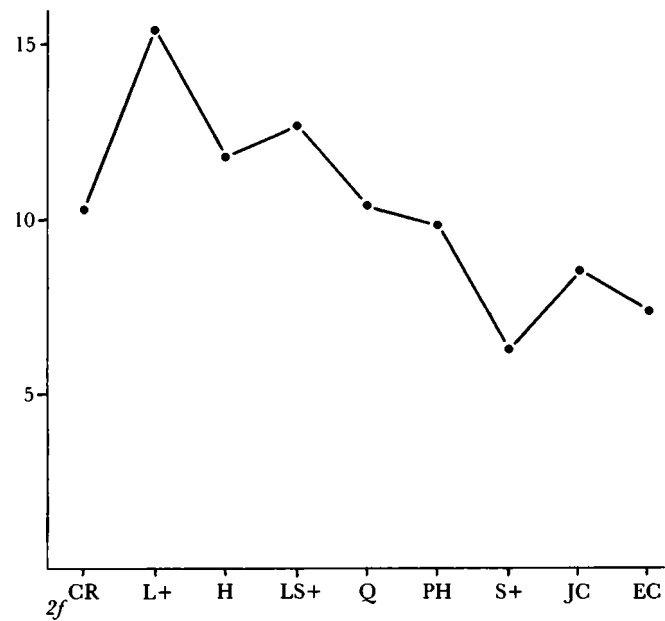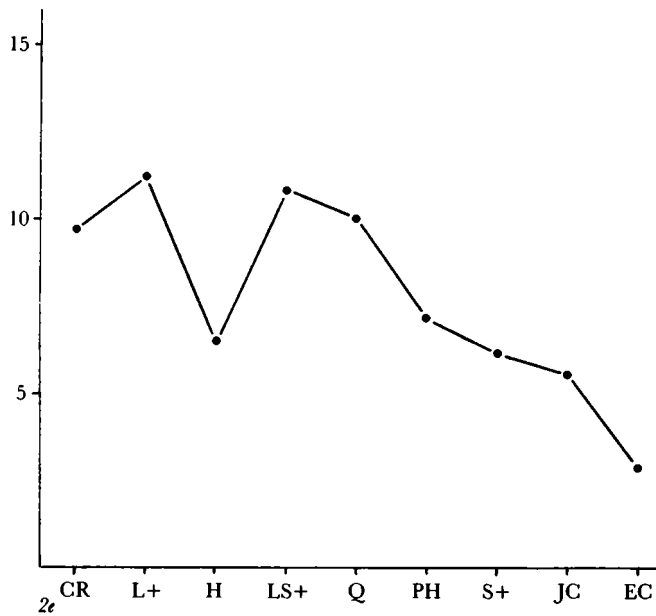
distribution that would have resulted, by the time that the currency had received even as few as 3 pecks per coin on average, would have been very different from what we observe among the Crux coins in the Digeråkra hoard. On any reasonable set of assumptions the proportion of coins with no pecks would, I think, have been less than c. 5 per cent., and the distribution would certainly already have been normal rather than exponential. To explain the positive skewness, or 'tail' of higher values, and also the essentially bimodal distributions seen, for example, among

Fig. 2
a) CNS. 1.2.4. Digeråkra (1002-); b) 1.2.2. Ösarve (1002-); c) 1.3.34. Hemängen (1024-); d) 1.1.19. Myrände (1036-); e) 1.1.9. Gandarve (1047-); f) 16.18. Sanda (1057-); g) 1.1.6. Snovalds (1085-); h) 1.4.18 Stora Sojdeby (1089-).

the Quatrefoil and Pointed Helmet coins in the Myrände hoard, or among Cnut's Short Cross and later coins in the Gandarve hoard, we might invoke our second proposition:

2e   CR   L+   H   LS+   Q   PH   S+   JC   EC

2f   CR   L+   H   LS+   Q   PH   S+   JC   EC

2g   CR   L+   H   LS+   Q   PH   S+   JC   EC

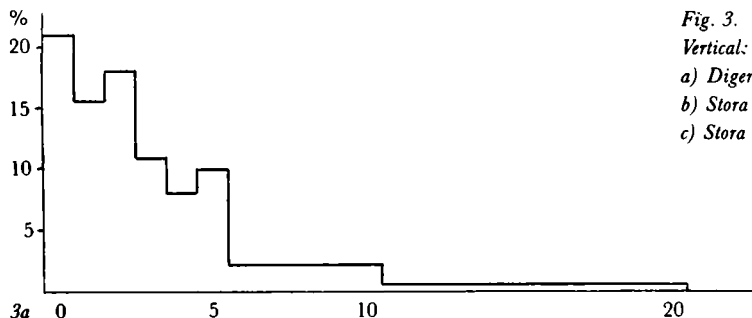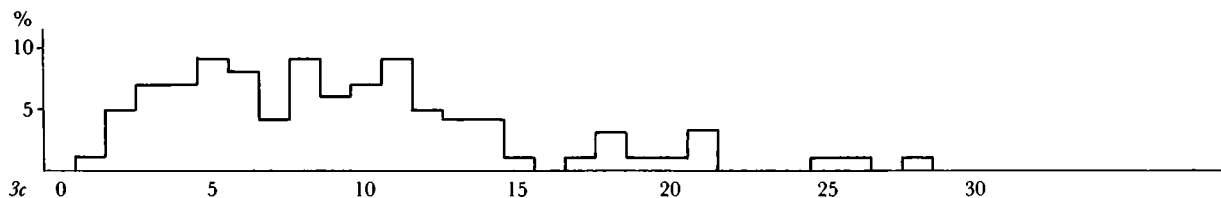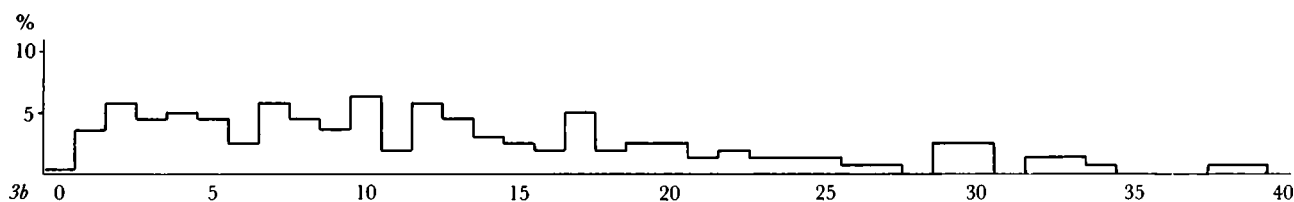2h   CR   L+   H   LS+   Q   PH   S+   JC   EC

Fig. 3.
Vertical: Number of coins in %; horizontal: Number of pecks.
a) Digeråkra: Crux.
b) Stora Sojdeby: Long Cross
c) Stora Sojdeby: Pointed Helmet.

2. The dispersion patterns of pecking within each type, hoard by hoard, are not likely to have arisen by a uniform random process,

therefore we must suppose that the hoards often bring together groups that have had different circulation histories

Bimodal distributions suggest a mingling of coins from two distinct sources, and the averages that we have been considering may in that case be misleading as evidence for the history of pecking, in the sense that graphs such as Figs. 2c-h might to some extent represent a conflation of more explicable patterns.

Coins may have stood a greater chance of receiving pecks in some regions of the Northern world than others. The available evidence is almost all from Gotland, with one mainland hoard from Dalarna, which

shows no significant differences from the Gotland material.

The big question is what happened in Denmark (including Skåne), for it has been suggested by Blackburn and Jonsson (5) that the Crux and Long Cross pennies which reached the Danish kingdom in such large quantities were then carried to Gotland and other parts of Scandinavia only rather slowly at first. Similarly, they suggest, diffusion was gradual in the 1020s. (Note that in the Digeråkra hoard the Reform type is much less heavily pecked, perhaps because before *c.* 980 English coins which reached Denmark were not carried further east to any great extent. Note also that the Sigtuna coins in the same hoard are rather more heavily pecked than the Crux coins they imitate – average 4.3).

Excellent as the photographs in *SCBI Copenhagen* are, one cannot count pecks with complete accuracy from photographs. Certainly the coins found in Danish hoards are pecked. Provisionally, it seems that the average numbers of pecks, type by type in comparable hoards, are substantially lower in some of the hoards from Denmark than in matching material from Got-

land, but this is a conclusion which still needs, obviously, to be carefully established.

If it proved sound, it would lend support to the general idea that coins were pecked less when in use in a settled, local market economy than they were in the course of long-distance, seafaring trade around the Baltic. Allowance would then have to be made in the analysis for the possibility that the Gotland averages plotted in Fig. 2 are complex figures, influenced by what had happened to the currency in Denmark, especially perhaps in the Crux, Long Cross, and Quatrefoil types, where one might expect that the averages would be depressed.

To provide a standard of comparison, and to demonstrate how far the observed distributions deviate from what might have been expected, Fig. 4 has been constructed to show a theoretical distribution arising from random pecking, at an average of 5 pecks per coin. The assumptions in the model are as follows. Out of 100 coins, 10 are taken at random, and pecked. They are returned to the pool, which now contains 10 coins with 1 peck and 90 with 0 pecks. Ten coins are again taken at random, and of these, the expectation

Fig. 4. A model showing a theoretical distribution arising from random pecking.
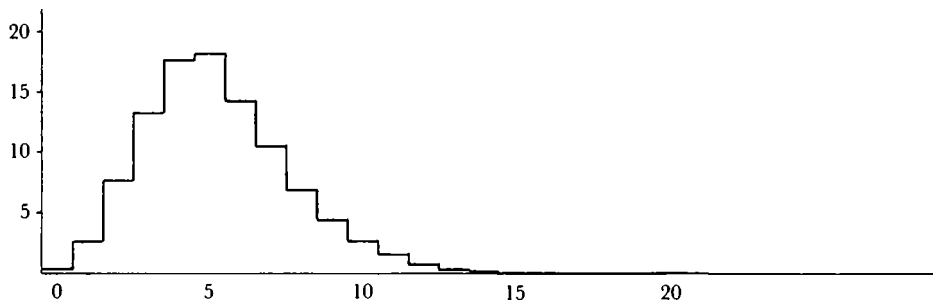
is that 1 will have 1 peck and 9 will have 0 pecks. They are pecked and returned, so that the pool now contains 1 coin with 2 pecks, 18 with 1 peck, and 81 with 0 pecks. The average number of pecks is 0.2 per coin. Other sampling procedures would give slightly different results from those shown in Fig. 4, but not essentially different. After 10 pecks per coin the curve would be further to the right and flatter.

The practical value of the model is that it serves to draw attention to dispersion patterns in which a substantial proportion of the coins have 0, 1, or 2 pecks. Note that in the model, only 0.5 per cent of the coins have 0 pecks, and under 3 per cent. have 1 peck. When we consider, for example, the Quatrefoil coins in the Myrände hoard, among which 9 per cent have 0 pecks, 6 per cent have 1 peck, and 15 per cent have 2 pecks, when the average number of pecks per coin is 5.0, the divergence from the model is such as to suggest an admixture with little-pecked coins.

There is hardly enough recorded information to show whether Long Cross and Quatrefoil characteristically include little-pecked material. If they do, we might see a link with the large quantities in which they were exported from England. More evidence will no doubt accumulate. We can, meanwhile, still venture a third proposition, although rather tentatively:

	Long Cross	Helmet	Last Small Cross
Hemängen	10.2	8.7	11.6
Myrände	7.2	5.4	7.2
Gandarve	11.2	6.5	10.9
Sanda	15.4	11.8	12.7

Inspection of the dispersion-patterns from which these averages are derived suggests that the Helmet figures are lower because they reflect fewer heavily-pecked coins.

A simple explanation might be that there was less blank space available for peck-marks on a Helmet penny than on either a Long Cross or Last Small Cross coin. If a vendor was sampling the sum of money offered to him, he might easily have been unconsciously biassed towards coins where he could better examine the pecks he made. But this idea is discounted by the later hoards of Snovalds and Store Sojdeby, where Helmet coins are just as heavily or even more heavily pecked.

Perhaps Long Cross flooded the money market in the Baltic area for a few years. It was, of course, much more widely copied than the Helmet type (which is not, incidentally, of inferior metal). This suggestion will need to be looked at again when fuller evidence about pecking is available.

3. Æthelred's Helmet type is often less pecked than the types which preceded and followed it, therefore there were short-term fluctuations in the rate at which English coin became diffused eastwards from Denmark
The relevant averages are:

4. Cut halfpennies are much less pecked than the corresponding pennies, whereas irregular halves seem not to be, therefore cut halfpennies probably circulated differently
After treading at the limits of statistical confidence, it

is a relief to be able to make a point which is statistically beyond any doubt: cut halfpennies are much less pecked. The same is true of cut farthings. The reader of *CNS* can see it for himself at a glance. The fact is obvious, but the conclusion to be drawn from it is rather less so. One may assume that most if not all the regularly cut coins arrived from England already cut (as hoards such as List suggest) but it is impossible to demonstrate it, except by pointing out that the proportion of cut coins is lower in the regions further east than in the List hoard, and lower than in westerly hoards such as Kongsø plantage. Whereas it is tempting to suggest that halfpennies found their use in the settled, local market economy, while the merchants who sailed the Baltic dealt in larger sums of money and preferred pennies, another explanation is possible: *de minimis non curat vendor.* There might have been a tendency to disregard the odd halfpenny or farthing that made up a sum. To this it might be replied that cut halfpennies *are* pecked, if not very much; and that they differ from the corresponding pennies not just noticeably, but very markedly. In Digeråkra, for example, Crux halfpennies average 0.6 pecks, cf. 3.1 for pennies. In Hemängen, Long Cross halfpennies average 6.1, cf. 10.2 for pennies. Last Small Cross halfpennies in the same hoard average 3.8, cf. 11.6. In Myrände, Long Cross halfpennies average 2.8, cf. 7.2. In the later Stora Sojdeby hoard, Long Cross cut halfpennies average 6.3, cf. 13.7.

The clinching argument is that irregular fragments were often more heavily pecked than regular halves – sometimes more heavily, even, than whole coins. In the Snovalds hoard, the Last Small Cross coins (average, 12.1) include two irregular fragments, each with up to 30 pecks, and a cut half, with 3! The Crux coins in Hemängen show a similar discrepancy. This suggests that, in the zone where pecking was prevalent, fragments did not escape testing.

Abbreviations

The periodic types are shown in Figs. 2 and 3 with the following abbreviations (approximate dates as in CNS 1.4, page 226):

R   Reform Small Cross, 973-975; Normal Small Cross, 975-978; First Small Cross, 978-979
FH First Hand, 979-985
SH Second Hand, 985-991
Cr Crux, 991-997
L+ Long Cross, 997-1003
H   Helmet, 1003-1009
LS+ Last Small Cross, 1009-1017
Q   Quatrefoil, 1017-1023
PH Pointed Helmet, 1023-1029
S+ Short Cross, 1029-1035
JC Jewel Cross, 1035-1038; Fleur-de-lis, 1038-40; Arm and Sceptre, 1040-1042
EC Edward the Confessor, various types (mostly 1042-1050)
CNS *Corpus Nummorum Saeculorum IX-XI, qui in Suecia reperti sunt,* ed. Brita Malmer et alii, Stockholm 1975-

Notes

1. B. Malmer, Methodological problems in editing and evaluating the Swedish Viking-age coin hoards, in *Viking-Age Coinage in the Northern Lands* (ed. M.A.S. Blackburn and D.M. Metcalf), Oxford 1981, pp. 391-403.
2. For a general consideration of the evidence for monetary circulation within the Northern Lands, see D.M. Metcalf, Some twentieth-century runes. Statistical analysis of the Viking-age coin hoards and the interpretation of wastage rates, *ibid.*, pp. 329-382, especially at pp. 344-346.
3. Cf. Malmer, loc.cit., at p. 398. The phenomenon has been recognised by other numismatists.
4. On this topic, see the discussion between K. Jonsson, Myntcirkulation på Gotland under vikingatiden – för och emot, *NNUM* 1982, 62-4 and 69-72, and B. Malmer, Cirkulationen av mint och

andra betalningsmedel på Gotland under vikingatiden – ett forskningsprogram, *ibid.*, 64-69, with bibliography of earlier contributions.

5. M. Blackburn and K. Jonsson, The Anglo-Saxon and Anglo-Norman element of north European coin finds, *Viking-Age Coinage in the Northern Lands*, 147-254, at 161-4.