CHAPTER 5

INTRASITE VARIATIONS IN OYSTER SHELLS FROM SITES IN THE SOUTHAMPTON REGION

The techniques outlined in Chapter 3 and put into practice in the study of shells from the Saxon Six Dials site in Southampton, described in Chapter 4, were subsequently applied to the shells from a number of sites excavated in different regions. In most cases, both intrasite and intersite comparisons on size and infestation were carried out. The results, for intrasite comparisons only, of samples from sites in four main regions will be presented in Chapters 5 - 8. This chapter deals with the Iron Age/Romano-British site at Owslebury, Hampshire; the Roman villa at Newport, Isle of Wight; and a 19th-century deposit from Romsey, Hampshire. The acquisition of samples for analysis has been on an opportunistic basis - dependent on the chance retrieval of appropriate material during excavations, and the availability of funds. Therefore, some regions or periods of occupation are better represented in this study than others. Only those methods that were specific to the site in question have been described here.

OYSTER SHELLS FROM OWSLEBURY, HAMPSHIRE

The excavations concerned a farming settlement which was founded on a hill near Winchester in the Early - Middle Iron Age and functioned for about eight hundred years during which time it adapted to new circumstances and underwent complete changes in its layout and social status. The oyster shells from this site were examined to determine their characteristics regarding size, age, relative growth rate and infestation; and to see whether there were any intrasite variations in abundance or characters. If temporal variations could be demonstrated, it was intended to see if these could be related to known climatic factors. Additionally, intersite comparisons were made between the Owslebury samples and others from Wessex to find out how similar or dissimilar they were. It was also hoped that it might be possible to suggest from which coastal location the Owslebury shells may have been collected. (The results of the intersite comparisons, and the conclusions drawn from them, are given in Chapter 9.)

Numbers

Shells of the European flat oyster (Ostrea edulis L.), mussel (Mytilus edulis L.), saddle oyster (Anomia ephippium L.), cockle (Cerastoderma edule (L.)) and carpet shell (Venerupis decussata (L.)) were recovered from 131 contexts during the excavations at Owslebury, together with a few fragments of sea urchin (probable Psammechinus miliaris). Almost without exception these shells were poorly preserved. Many looked as if they had been etched with acid, or were worn and flakey. Many were too badly broken to be measured or aged. Table 5.1 shows the abundance of oyster shells arranged according to the type of context in which they were found. There were eleven categories; ditches, gullies, quarries, trackways, pits, hollow way, ovens, track gullies, post holes, cobbles and unidentified.

The measurable shells are shown (LV = left valve; RV = right valve) separately from the unmeasurable shells (UMLV = unmeasurable left valves; UMRV = unmeasurable right valves). The two categories of left or right valves were then totalled (TOT LV; TOT RV) and the percentage of damaged shells calculated (%UMLV: %UMRV). The total number of left valves plus right valves is given and the minimum number of individuals (MNI) is presented. The MNI figure is the sum of the MNIs found in each individual context that constitutes the context type category. Whichever has the greatest number - total left or total right valves - gives the MNI. The MNIs shown in the column of Table 5.1 are therefore greater than would be deduced from the total left and right valves shown in that table.

The considerable degree of damage in oyster shells can be seen. The lowest level of damage is 41.2% and the highest 100%. The average level of damage in left valves is 60.9% and in right valves 48.2%. The left valves, being cupped and ornamented, are more susceptible to damage than the right, flat, relatively smooth valves. The numbers of right and left valves are approximately equal (1783 LV; 1814 RV) but with a slight bias to better survival in the right valves.

Ditches yielded the most oyster shells (1312 MNI or 67% of all shells from the site). Gullies were next in importance (with 265 MNI or 13.5%) and quarries third with 166 MNI or 8.5%. The eight other context types each contained less than 4% of the total number (11% in all).

Table 5.2 shows the abundance of the oyster shells according to the phase of the site occupation. Oyster shells were found in contexts belonging to 18 phases of the site from the 3rd century B.C. to the 4th century A.D., with a few modern shells and shells not allocated to phase. The arrangement of the table is identical to that of Table 5.1. It must be noted that some of the phases represent more precise divisions of time than others, and there is a certain amount of overlap. The table shows that oyster shells are unevenly distributed through the different phases. Only 180 shells (110 MNI) were recovered from all the contexts dated B.C. The first significant appearance of oysters occurred in the 1st century A.D. with 767 shells (MNI 429) 24.79% being found. The peak of oyster consumption was not reached until the 3rd-4th centuries A.D. - 2035 shells (MNI 1098, 55.4%). The relative abundance of oysters through time is shown in the bar chart form in Figures 5.1 and 5.2. Figure 5.1 shows the percentage frequency of oysters (based on MNI) for each phase of the site. Figure 5.2 shows percentage frequency of oysters (from MNI) for grouped phase according to the grouping used for computer analysis of size later on.

Size analysis

An analysis of size (using the right valve maximum width measurement - RVMW) was carried out. Since only two contexts, 642 and 133, yielded an adequate number of shells for analysis (514 and 79 right valves respectively), the smaller samples were grouped according to phase. These groupings were given the notation OWSLE 1 - OWSLE 14:

OWSLE 1 all contexts dating from B.C.
OWSLE 2 all contexts dated to 1st century A.D.
OWSLE 3 all contexts from the mid-1st century A.D.
OWSLE 4 all contexts from late-1st century A.D.
OWSLE 5 all contexts dated simply 1st A.D.
OWSLE 6 all contexts dated 2nd A.D.
OWSLE 7 all contexts dated 2nd/3rd century A.D.
OWSLE 8 all contexts from 3rd/4th century A.D.
OWSLE 9 all contexts dated to the 4th century A.D.
OWSLE 10 layers 1-3 of context 642 dating to mid-1st century A.D.
OWSLE 11 layer 4 of context 642 - late 1st century A.D.
OWSLE 12 layers 5-6 of context 642 - 2nd century A.D.
OWSLE 13 layer 7 of context 642 - 3rd century A.D.
OWSLE 14 layers 8-14 of context 642-3rd/4th century A.D.

The right valve maximum width measurements were used to plot size-frequency distributions for the fourteen samples. The RVMW measurements were then put on computer and analysed with the MINITAB program. A summary of the size data was drawn up. Two sample *t*-tests were carried out to compare the Owslebury samples with each other, and with samples from other sites in Wessex. The results were plotted as matrices, first showing the actual *t*-values obtained showing the magnitude of the differences observed; secondly showing only presence or absence of a significant difference in size in each two sample comparison. An analysis of variance was then executed to illustrate the degree of similarity or difference between the size characteristics of the samples from Owslebury, and then of all other samples from Wessex.

Table 5.3 gives a summary of the basic size data for the RVMW measurements of oysters shells from Owslebury. The table gives the number of shells in each sample (N), the mean measurement in millimetres (MEAN), the median or mid-point measurement (MEDIAN), the transformed mean (TRMEAN), the standard deviation (STDEV), the standard error of the mean (SEMEAN), and the minimum (MIN) and maximum (MAX) measurements.

The sizes of the samples vary a great deal - from 30 to 316 shells. The mean sizes of shells show little variation - 69.4mm in OWSLE 9 to 72.0mm in OWSLE 14. The smallest recorded shell measured 31mm and the largest 110mm. The standard deviations of the samples are fairly constant - from 9.97 to 12.93.

Histograms of the distribution of sizes within each sample can be seen in Figures 5.4 - 5.17. In these, the horizontal axis represents the maximum width in millimetres. The numbers of shells with each measurement have been grouped into 5mm bars for clarity. The vertical axis represents the percentage of the samples found in each 5mm group. Percentages have been used to aid comparability between the samples since the sample numbers vary so much.

Figures 5.18, 5.19 and 5.20 show these histograms on a reduced scale to assist in making visual comparisons. Some of the samples show a good approximation to a normal curve, e.g. OWSLE 13 (n=258), but others have an irregular distribution of sizes. In some cases this is probably due to the small sample size, e.g. OWSLE 9 (n=35) and OWSLE 11 (n=30) but in others the reason is not obvious. It can be seen that the range of sizes and the optimum size group are fairly constant from sample to sample.

To test whether there are, in fact, statistically significant differences between the samples, two sample _t_-tests were applied. The results obtained in this way for comparisons of Owslebury samples with each other can be seen in Figures 5.21 and 5.22. Figure 5.21 gives a matrix showing the actual _t_-values. Where the _t_-value is 2 or less there is probably no significant difference between the two samples as far as size is concerned. Values above 2 indicate that there probably is a significant difference in the size distribution of the two samples. Figure 5.22 shows a matrix of the same comparisons as in Figure 5.21 but here the symbol "+" has been used to denote a significant difference and the symbol "-" no significant difference. The samples from Owslebury, regardless of the phase to which they belong, show a remarkable degree of similarity. Only OWSLE

5 shows a significant difference in the comparisons but even here the *t*-values are only just over the arbitrary limit of 2.

Owslebury oyster shells were found to be consistent in their size characteristics throughout all the phases of occupation of the site in the intra-site comparisons. Figure 5.23 is an analysis of variance of the sizes of the Owslebury oyster shells showing how closely the samples are grouped.

Age and growth rate

The percentage frequency of oysters in each age group was plotted as a histogram. The mean maximum width of each year group in each sample could then be calculated and used to plot a curve of absolute growth rate.

Figures 5.24 to 5.27 show the age distribution of the shells in the fourteen Owslebury samples. In each histogram the horizontal axis is marked in years and the vertical axis as percentage. The bars represent the percentage of oyster shells of the sample in each age group. The samples are characterised by a wide age range, usually from 2 or 3 years up to 11 years. In some cases 1 year to 13 years (OWSLE 8). The most frequently occurring sizes are in the 4 to 5 year groups. It is important to examine the ages of oysters to eliminate the possibility that it is the age of the oysters that has influenced the sizes in the sample. Oysters of young age only might account for a sample of small sized oysters. The ages found in the sample might also reflect the degree of selectivity used in their collection.

Using the data collected for age and size of oyster shells, growth rate curves could be drawn. The curves for the 14 samples are seen in Figures 5.28 to 5.41. The horizontal axis of the graph is marked in years. The vertical axis represents mean maximum width in millimetres. The encircled points represent the mean measurement for each age group. The vertical bars extending from the points are the 95% confidence intervals. Where the latter are absent, the point represents only one measurement. Points which represent the mean measurement of an age group comprising less than 5% of the sample are not connected to other points because the mean may not be truly representative of the age group.

The growth-rate curves obtained show a marked similarity to each other, despite the fact that the small numbers of specimens in some samples have resulted in somewhat erratic curves. When the Owslebury curves are compared with those for samples from other sites they appear middle of the range. Other sites have produced oyster shells which have developed at faster or slower rates.

Infestation

Encrusting organisms leaving hard parts on the oyster shells recorded from Owslebury material include the calcareous tube made by the worm Pomatoceros triqueter, barnacles on the Balanus group and Polyzoa which are lace or moss-like encrustations belonging to minute colonial animals.

Table 5.4 shows the numbers and percentage of shells within each sample that have been affected by various types of infesting or encrusting organisms. The most obvious evidence of infestation is the boreholes left by Polydora ciliata. All samples were affected in percentages varying from 21.7% to 49.3%. The holes made by Polydora hoplura were also common to all samples but they were less frequent - 7.6% to 16.7%.

Boreholes, probably made by the sting winkle, were also recorded in all samples but the frequency was low - 1.3% in OWSLE 1 to 5.6% in OWSLE 14. Cliona sponge affected small numbers of shells in ten of the samples. Encrusting calcareous tubes, barnacles and sea mats were uncommon.

The infestation data is also presented in bar chart form in Figures 5.42 to 5.45. Here it is easier to see how the two Polydora species were predominant. Evidence of organisms that burrowed into the shell was more common than that of attached animals.

Conclusions and discussion

Considering the length of occupation at Owslebury, there were not many oyster or other marine mollusc shells. The surviving shells were poorly preserved and a high proportion of them were damaged to such an extent that measuring and aging them was not possible. Moreover the condition of the shells may have been worsened by post-excavation washing.

The majority of contexts yielded only a few shells with the exception of contexts 642 and 133. To make the analysis more manageable, details of oysters were amalgamated in two types of groupings. First according to the phase of occupation and then the type of context. Most oyster shells were recovered from ditches, followed by gullies and quarries. Other context types had few shells. The considerable damage in all types of context makes it seem likely that the shells were redeposited after lying around on the surface for some time. Oysters first appeared in significant numbers in the 1st century A.D. which coincided with the first finds of imported Gallo-Belgic wares. The peak of oyster consumption was reached in the 3rd and 4th centuries A.D. The relative scarcity of oyster shells on the site, the inland rural position, and the relatively high status of the community may be an indication that oysters were a luxury item of food.

The analyses of the sizes of shells in the grouped samples from each phase showed that with the possible exception of OWSLE 5 the size characteristics of all the samples were alike.

OYSTER SHELLS FROM NEWPORT ROMAN VILLA, ISLE OF WIGHT

A large number of oyster shells (Ostrea edulis L.) with a few other marine molluscs such as carpet shells (Venerupis decussata (L.)), cockles (Cerastoderma edule (L.)), limpets (Patella sp.), mussels (Mytilus edulis L.), whelks (Buccinum undatum L.) and winkles (Littorina littorea (L.)) were recovered from the excavations of the

Newport Roman Villa on the Isle of Wight. Most of the shells came from a midden context 37.

Abundance

There was a total of 2,159 oyster shells. Of these 1,124 were right valves and 1035 left valves - roughly equal proportions (52% RV: 48% LV). The proportions of each type of valve that were too badly damaged to measure were different. One hundred and ninety-three (17.2%) of right valves were unmeasurable compared with 335 (31.4%) of left valves. This left a total of 1631 shells which could be used for analysis. 931 right valves and 700 left valves.

Size

The size distribution of the oyster shells was plotted as a histogram for the Newport context 37 sample. This can be seen in Figure 5.46. Initially the right valve maximum width measurements were used to study size variations of samples of oyster shell, and these were also used to make the two sample *t*-tests.

The mean of the greatest diameter measurements of the left valves was 85.6mm with a standard deviation of 10.7mm. Figure 5.46 shows an aproximately normal distribution of sizes spread over a range from 48 - 134mm. These are large specimens.

Age

The percentage of oyster right valves from each age group was plotted on a histogram - see Figure 5.47. The ages range from 1 to 11 years but most oysters were between 3 and 7 years with a peak at four years. Nowadays, young and tender oysters are preferred as they are usually eaten alive and raw. Older oysters have tougher meat which needs cutting up, chewing or cooking.

Growth rate

The absolute growth rate was been plotted using the mean size of right valve for each age group and can be seen in Figure 5.48. It is thought that growth rates may be characteristic of specific localities and/or climatic change. No attempt has been made yet to compare the growth rate of the Newport oyster shells with those from other localities.

Infestation

In the Newport shells evidence of the boring worms predominated. P. ciliata left its fine burrows on the outer surface of 35.6% of the shells while the much larger disfiguring U-shaped burrows of P. hoplura affected 56.4%. Infestation by other animals was negligible in comparison , with no records at all of calcareous or sand tubes. The pattern of infestation is illustrated in Figure 5.49.

Conclusions and discussion

Since only one sample was examined from the site, no intrasite comparisons could be made. The conclusions from this work related entirely to the intersite comparisons that were made with the data. These conclusions are explained in Chapters 9 and 10 that deal with intersite comparisons.

OYSTER SHELLS FROM 11 THE HUNDRED, ROMSEY

A small number of shells from the flat oyster (Ostrea edulis L.) were recovered from a large sub-rectangular pit in the middle of the approach access to the rear of a hotel in Romsey at 11 The Hundred. The pit also contained broken ceramics and bottles in addition to the shells, and had been backfilled with friable Romsey grit which is a by-product of washing gravel. The pit is thought to date from a period between 1830-1840 and that the rubbish in the pit was the result of a clear-out during renovation of a building - possibly the hotel.

Numbers

88 oyster shells were recovered. These comprised 37 right valves of which 3 were too badly damaged to be measured. There were 51 left valves of which 5 were unmeasurable. A single winkle shell (Littorina littorea L.) was the only other marine species of mollusc found.

Size

The size frequencies of the shells were plotted as a histogram which can be seen in Figure 5.50. The mean for the right valve maximum widths was 65.5mm (standard deviation 6.6mm); the mean for the left valve maximum widths was 70.7mm (standard deviation 6.1mm). These are not only small oysters but the range of sizes is exceedingly narrow.

Age

The ages of the oysters were estimated by examination of the growth lines and bands on the right valves. The distribution of oysters of different ages is shown in Figure 5.51. Here again the range is very restricted. There are almost equal quantities of three and four year oysters with just a single two year old.

Infestation

Only presence, not quantity, of infestation evidence was recorded. The numbers of shells (both right and left valves) affected by the different types has been converted to a percentage and plotted to give the rate of infestation in the sample by each type. The result can be seen in Figure 5.52. Eight types of organisms had left traces on the shell. Overall infestation was slight.

The small borings of the marine polychaete worm Polydora ciliata were most frequently found (25% of shells affected). The larger related species Polydora hoplura was also present but to a lesser degree (6.3%). The honeycomb-like borings of the sponge Cliona celata were in 3.8% of shells. Sealed-over boreholes, probably made by the dog whelk (Nucella lapillus) or the sting winkle (Ocenebra erinacea) in unsuccessful attempts to drill through the shell to eat the meat, were fairly common (13.8%). Evidence of encrusting forms was slight with the calcareous tubes of Pomatoceros triqueter being found on 1.3% of shells; barnacles of the Balanoides types on 2.5%; Polyzoa or seamats on 7.5% and sand tubes of Sabellid type worms on 7.5% of shells.

Other characters

Only 1.3% of the oyster shells appeared to be thinner than would be expected for the size and age of the shell, and only 7.5% seemed unusually thick and heavy. Chambering was uncommon, with 3.8% shells containing chambers. Chalky deposits, however, were fairly frequent - 37.5% of shells had them.

Although 6.3% of the shells were noted as worn, and 1.3% as flaky, the general impression of the shells is one of freshness and good preservation with the horny, prismatic layers of the right valves well in evidence. Many of the shells were creamy with pink coloured bands and a white interior (30%) but a fair number showed signs of discolouration in the form of grey patches inside or yellow staining externally, no doubt occasioned by the conditions of burial. A relatively high number of shells displayed some irregularity in shape (11.5%), mostly at the heel where the young oyster had settled. A few spat or juvenile oysters were attached to adults. No cuts or marginal notches were recorded as evidence of opening.

Conclusions

What interpretation can be placed on all the facts gathered for the oyster shells from Romsey 11 The Hundred? It is important, first of all, to emphasise that this sample is historically/archaeologically very recent. The size and age structure of the sample provide clear evidence that the shells have been graded for marketing. This is the reason for the extremely narrow range of sizes and ages represented, and is what one would expect for the Victorian and later periods. Oysters are graded at the present time according to size, weight, depth of cup and appearance of the shell and meat. There are currently four grades: "ones" being small, badly marked oysters suitable only for cooking purposes; "fours" being 3½ - 4 inches across (approximately 90-100mm), deeply cupped and comparatively heavy and the best for serving on the shell at table. It is not known what the definition of the various grades would have been around 1830-40 but it is likely that the Romsey shells would fall into one of the middle categories.

The source of the oysters would logically be the Solent: the fairly low growth rate, the colouring, and the infestation patterns tend to support this view. Large numbers of oysters are known to be attacked by sting winkles on the Sowley Ground in the West Solent. Boreholes possibly caused by the same predatory animal are fairly common in the Romsey shells. However, it is not possible with such a small and highly selected sample to say exactly from which oyster bed in the Solent the Romsey shells were collected. However, the shallowness of the shells, the number of irregular specimens, the paucity of evidence for encrusting organisms, and their general resemblance to the Solent type of oyster (especially recently dredged ones examined by the author) are indications that the oysters were dredged from natural beds and were not relaid for fattening.

In the 19th century oysters were the food of the poor people. Improved transport by canals, rivers, and especially by rail, meant that oysters were readily available and affordable at inland locations. The association of the Romsey shells with construction debris and other domestic rubbish connected with the renovation of a building, and the relatively small quantity, suggests that the oyster shells were the remains of the workmen's lunch.

This chapter has presented results - mainly concerning size, shape and infestation - from the examination of three sites in the Southampton region of Hampshire. It provides the first set of data for use in intersite studies of oyster shell variation. In the next chapter, samples of oyster shell from sites in the Poole region of Dorset will be considered. Oyster shells will be described from both archaeological sites and modern populations. The excavated shells came from the town of Poole itself and neighbouring Hamworthy; Corfe Castle and Wytch Farm on the southern shore of Poole Harbour; Kingston Lacey near Wimborne; the Greyhound Yard and Alington Avenue sites in Dorchester; and Halstock Roman Villa on the western boundary of the county. The modern oysters were fished from Poole Bay and Poole Harbour. Chapter 6 provides the second set of data for intersite comparisons.