REDEEMED FROM THE HEATH

The Archaeology of the Wytch Farm Oilfield (1987 - 90)

Peter W. Cox and Carrie M. Hearne

Dorset Natural History and Archaeological Society Monograph Series No. 9

for BP EXPLORATION and its partners in the Wytch Farm Development

REDEEMED FROM THE HEATH

THE ARCHAEOLOGY OF THE WYTCH FARM OILFIELD (1987-90)

PETER W. COX and CARRIE M. HEARNE

major contributors
Mike Allen and Rob Scaife

with contributions by
Ian Barnes, Nick Branch, Wendy Carruthers, Tony Clark,
Rosamund Cleal, Hilary Cool, Chris Copson, Brenda Dickinson,
Dave Farwell, Andrew Fitzpatrick, Rowena Gale,
Sheila Hamilton-Dyer, Frances Healy, Julie Lancley,
Gerry McDonnell, Lorraine Mepham, Jo Mills, Elaine Morris,
Eric and Jenny Roberts, Steve Staines, David Williams,
Jessica Winder

Dorset Natural History and Archaeological Society
Monograph Series: Number Nine
Series editor Jo Draper
1991

Considering the much smaller amount of excavated material, a greater proportion of mammal bone was recovered from the pre-midden material than from the midden.

No fish remains were present in the other contexts (Phases 1, 6 and unstratified), probably a result of poorer preservation rather than real absence. These contexts contained mostly cattle, ovicaprid and unidentified ungulate fragments. Unlike the material from Ower Peninsula the bone was not extremely eroded and there was no strong bias in favour of teeth. One context (2999, watching brief) contained the scapula of a very young sheep and a pair of mandibles with the first molar not yet in wear. Bones from young animals are porous and usually lacking from sites with poor preservation, and their recovery from this site illustrates the better conditions there as compared with others in the study. Better preservation of faunal material here is due to the highly calcareous conditions of the midden itself, and probably also to the fact the Ower Farm site is of Medieval date and thus considerably younger than the rest of the faunal material available for study although bone from Medieval sites is not always as well-preserved as it is at Ower Farm.

General comments

Although the animal remains from these sites are sparse and often poorly preserved they are an important contribution to our knowledge of the economy of the heathland. Bone from heathland is extremely rare and comparatively little material has been recovered from elsewhere in this area from any period. Any information is therefore important in attempting to understand the local economy and environment. The lack of good collections of material is, undoubtedly, due to the acidity of the soils. The resulting taphonomic bias in the material makes interpretation difficult. However, these limited quantities provide a basic core of information for comparison with future material. Good faunal preservation has been demonstrated where specialised deposits produce localised calcareous conditions, such as in shell middens. The bone material in such contexts may, however, be quite different in composition from that originally disposed of in other features such as pits, ditches and occupation horizons. Fish bones are more likely to be disposed of in these coastal shell middens and thus their occurrence here is not only a factor of preservation, but also one of disposal patterns. They may even be incidental catches of the shell fishing activity. Future excavations should continue the extensive recovery programmes undertaken in the Wytch Farm Project, but also recognise the value of midden assemblages and the possible enhancement of survival of material in close proximity to these features.

MARINE MOLLUSCA

J. M. Winder

Marine mollusc shells were recovered from three archaeological sites on the Wytch Farm project; Furzey Island, Ower Peninsula and Ower Farm. The species present at each site were identified and the numbers of shells counted. The small quantities and fragmentary nature of the shells associated with the middle Iron Age occupation at Furzey Island and late Iron Age settlement at Ower Peninsula limited interpretation to a general recognition of the species being exploited. In contrast the material from the 12th/early 13th century midden at Ower Farm was recovered in sufficient quantities to enable detailed analyses to be undertaken with the aim of providing information about diet and economy of the local Medieval inhabitants and the nature of the harbour environment.

Furzey Island and Ower Peninsula

A small marine shell midden (context 803, Fig 24, S.42) was found on the north shore of Furzey Island dating to the middle Iron Age (Phase 2). Sieved samples from this deposit contained fragments representing at least 1859 cockle shell valves but no other species.

Environmental samples taken from the late Iron Age settlement at Ower Peninsula (contexts 469, 674 and 680 -Phase 1-) provided greatly comminuted remains of at least 3172 cockle valves, 10 winkles, 107 carpet shells in context 680 only, and a few fragments of mussels and oyster shells. Earlier work from the site (Coy 1987b, 118-119) recorded the same range and proportion of species.

Discussion

The fact that cockles were the only marine mollusc species recovered from Furzey Island suggests that either they were the only species available at this location in the middle Iron Age or that they were being selectively collected. Ower Peninsula, however, is situated such that there is easier access to a greater variety of habitats and species of shellfish. The presence of oyster shells in small

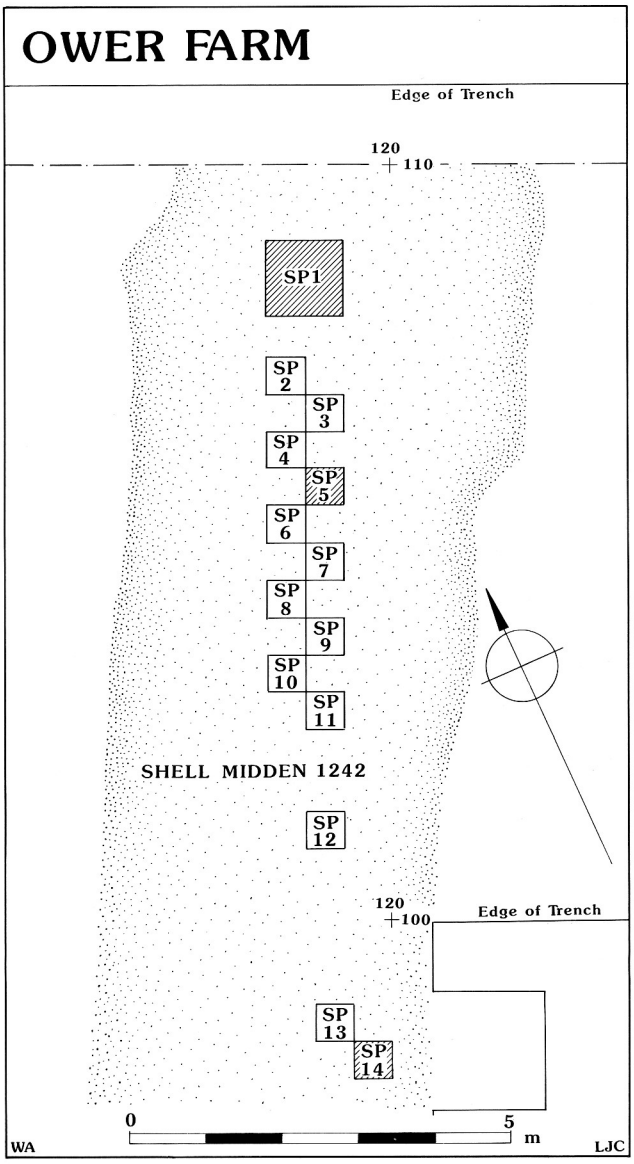

Fig. 88: Ower Farm: location of sample pits (SP) for recovery of marine mollusca. Cross-hatched pits are those analysed.

numbers on this site may reflect the increasing abundance of, or increasing preference for, this species in the late Iron Age - a phenomenon which has previously been observed at Owslebury, Hampshire (Winder 1988) and Piddington Roman Villa, Northamptonshire (Friendship-Taylor 1989, 321).

Ower Farm

Excavation of the 12th to 14th century settlement site at Ower Farm revealed a linear, north-south orientated, shell midden (Fig. 39). It comprised compact lenses of common marine mollusc species (Fig 40, S.69) such as cockles, winkles, oysters, mussels and carpet shells. This well-defined deposit was surrounded by a general scatter and small individual dumps of shell. The midden comprised a series of interleaved lenses of individual species which suggests that only one species was collected at a time with the implication that the species may have been collected from separate locations. The lenses observed in the midden were interpreted as localised dumps of material rather than continuous layers of shell. Differences in vertical distribution of species along the length of the midden were neither consistent nor patterned and confirms observations of occasional non-selective dumping. No evidence of seasonality in shellfish could be determined from distribution alone. All the species recovered from the deposit could have been collected throughout the year.

The midden has been dated to the 12th-early 13th century (Phase 3) on ceramic evidence and no temporal variation within the midden could be discerned from the pottery sequence which suggested a comparatively short period of deposition. The large number of shells led to the speculation that the midden may have accumulated as a result of shellfish processing, probably to supply the land owners at Milton Abbey who owned the Ower landholding.

The role of shellfish in the diet and economy has been considered along with possible sources and methods of collection based on comparisons of the archaeological shells with samples from other sites and with modern specimens from specified locations. The biology and habitat preferences of the various marine mollusc species and recent, mostly unpublished, physical, chemical and biological survey work in Poole Harbour has been used to consider the local maritime environment during the 12th-13th century when the shells were collected.

Sampling strategy and retrieval

The midden was sampled along its north-south axis with a 1 m^2 sample pit (SP1) at its northern end and a series of thirteen 0.5 m^2 sample pits excavated alternately along this axis (Fig. 88). Three sample pits were selected for analysis; SP1 (context 1310), at the north end of the midden; SP5 (contexts 1314, 1348, and 1349), midway along the midden; and SP14 (context 1382), at the southern extremity of the midden.

The contents of the sample pits were dry sieved using a 5 mm mesh to separate soil from the main bulk of shells. It is inevitable that some fragments of shell will have been lost during this process, including hinges of bivalves and apices of gastropods. This means that counts of shells will be under-estimates. However, as all samples were treated in the same way, comparisons between the samples are still valid.

The shells were then washed over a 250 μ sieve and whole shells removed. The remaining shell fragments and sand were air-dried and separated using a 2 mm sieve. The fragments were examined for diagnostic hinge parts of bivalves and apical segments of gastropods which were considered representative of individual specimens that could be added to the counts of whole shells.

Species representation and variation

The main species of marine mollusc recovered from the midden were cockles (*Cerastoderma edule* (L)), winkles (*Littorina littorea* (L)), oysters (*Ostrea edulis* L), mussels (*Mytilus edulis* L) and carpet shells (*Venerupis decussata* (L)). A few examples of other species included netted whelks (*Nassarius reticulatus* (L)), saddle oysters (*Anomia* spp), sting winkles (*Ocenebra erinacea* (L), tellins (*Tellina* sp), variegated scallop (*Chlamys varia* (L)), whelk (*Buccinum undatum* L), rissoids (*Rissoa* spp), razor shells (Solenidae) and a small piece of lobster carapace (*Homarus vulgaris*).

In the midden, winkles and cockles were by far the most common species whilst oysters, mussels and carpet shells never accounted for more than 5%. The relative abundance of the species in the different sample pits varied (Table 41). In SP1 (context 1310) winkles were dominant, accounting for 51.2% of the sample, with cockles following closely with 44.4%. Although the greatest numbers of oyster shells were recovered from this context (minimum numbers of individuals = 818), they only formed 3.1% of the total shells in the sample. Mussels and carpet shells each contributed 0.6% of the sample.

In SP5, the proportions of oysters, mussels and carpet shells remained small. The level of winkles decreased to 23.8% of the sample whereas the percentage of cockles increased to 67.7%. The highest numbers of carpet shells were found in this sample.

In SP14 oysters, mussels and carpets were again just a small proportion of the sample. Winkles were dominant as in SP1 but with a higher percentage (77.6%). Cockles were at their lowest with only 20.7%.

The percentages of winkles and cockles varied from almost co-dominance in SP1, to cockle dominance in SP5, and winkle dominance in SP14. Although winkles were

	SP1		SP5						SP14	
CONTEXT	1310		(1314		1348		1349)		1382	
	n	%	n	%	n	%	n	%	n	%
Winkles	13409	51.2	620	23.7	97	26.0	20	18.9	5902	77.6
Cockles	11627	44.4	1850	70.6	204	54.6	45	42.5	1571	20.7
Oysters	818	3.1	16	0.6	15	4.0	21	19.8	88	1.2
Mussels	163	0.6	122	4.6	7	1.9	3	2.8	36	0.5
Carpets	154	0.6	13	0.5	51	13.6	17	16.0	9	0.1
Total MNI	26171		2621		374		106		7606	

TABLE 41: *Marine Mollusca: species' representation in the three sample pits at Ower Farm (MNI = Minimum Number of Individuals)*

slightly more numerous overall, in terms of meat yield the cockles would have been equally important.

The cockles. The common cockle is a bivalve filter-feeding mollusc which occurs all round the British coasts buried to a depth of about 50 mm in a variety of bottom substrates from soft mud to stony gravel. Cockles are most abundant on the intertidal flats of large river estuaries where they can occur in densities of more than 1000 per square metre particularly between mid-tide level and low water of spring tides. The largest cockles are, however, often found on open coasts (Franklin 1972, 1).

Populations of cockles are common on shores within Poole Harbour today where they grow to a good size, i.e. around 35 mm long, (Graham 1956, 168-169) in very soft mud over which it is practically impossible to walk without mud pattens.

The nearest shores to the Ower Farm midden are those of Newton and Ower Bays (Fig. 89) which today consist of extensive mud flats. Recent work (McGrorty *et al.* 1987, 3 & 22-23) recorded no cockles from the liquid muds of Newton Bay, only small numbers from Ower Bay and a few were found on the northern side of Cleavel Point. It is interesting to note that mud sledges were used in the process of obtaining samples because the mud was so soft. Therefore, if Newton and Ower Bay appear the same today as they did in the 12th/13th century, then it seems unlikely that the midden cockles came from this close to the settlement.

In order to find where the cockles might have been collected the size frequencies of the shells from the different sample pits were compared with each other and with samples from four modern cockle populations in the harbour and Southampton Water (data supplied by MAFF from unpublished fieldwork results of an environmental science course at Southampton University 1971-72). The mean rib count of the archaeological cockle shells was used to determine the salinity regime in which they had been growing. Unfortunately rib count information was not available from the four modern cockle samples used.

The mean heights (from the hinge of the valve to the opposite margin) from individual sample pits of midden cockle shells varied from 28 to 30 mm with an overall minimum size of 19 mm and an overall maximum of 42 mm. Cockles from context 1310 (SP1) tended to be smaller than the other samples. The mean heights of individual samples of modern cockles varied from 22 - *c.* 30 mm and they ranged in height between 12 - 52 mm. Size frequencies of all the samples were compared using the Kolmogorov-Smirnoff test. The results confirmed that the sizes of cockles from contexts 1314, 1348, 1349 (SP5) and 1382 (SP14) were similar to each other and also indicated that they were like the cockles from Stone Island which were significantly different (larger) than the other three moder samples.

If a rough parallel can be drawn between modern cockles from Southampton Water (Barnes 1973) and those in Poole Harbour, then it is likely that the midden cockles were collected from a less muddy region of the harbour where salinity was perhaps relatively high in harbour terms. The lower densities of cockles to be collected in such places would be more than compensated for by their larger than average size and the relative ease of access over firmer substrates (compared with the very soft muds in Newton Bay).

The winkles. Winkles frequently occur in large numbers practically all around our coasts. They are found on clean algae-covered rocks, among small stones, on gravel, soft mud and rarely on sand. They may be found from about high water of neap tides to extreme low water of spring tides but in most places their location is more restricted. Winkles will live on shores with high wave exposure as well as sheltered estuaries and can tolerate lowering of the salinity of the water (Moore 1936).

Nowadays winkles are most frequently gathered by hand in the Harbour area and were probably hand collected in the past. They are regularly collected along the north shores of the Harbour and are quite abundant in the region of Whitely Bay (Mr. Whitley -Southern Sea Fisheries- pers. comm.) They have also been recorded at high tide level in Newton Bay where they were clustered beneath seaweeds attached to isolated stones scattered on the mud (Heriot-Watt University 1986, 69-74; writer's observation) but they have not been recorded at mid or low tide or on any of the other 14 stations sampled in the Harbour in recent surveys.

The size of winkles is related to their position on the shore. Medium sized individuals are found throughout the vertical littoral range; large individuals are mostly found at the lowest levels. The smallest winkles prefer the central part of the zone. The mean height ranges of individual samples of winkles from the midden were from 23.7 (± 2.9 mm) to 25.9 (± 2.5 mm). The height distributions of each midden sample were compared with each other and with heights of modern winkles from the sheltered muds of Newton Bay and the sheltered rocky ledges of Kimmeridge Bay on the open coast. The Kolmogorov-Smirnoff test results showed that the winkles from SP1 (1310), at the north end of the midden, were significantly different (smaller) than those from SP5 (1314) but the same height as the other samples from the midden and modern winkles from Newton Bay. There is therefore, a slight indication of a reduction in size of winkles in SP1 which may be attributed to over-fishing. Where winkles are regularly gathered from the flats over-fishing is easily achieved, resulting in a fall in the average size of the winkles and of the population and therefore a smaller yield per man hour of gathering (Graham 1956, 177-178).

Although at present winkles are not common in Newton Bay, they may have been more abundant in the past. The presence of such large numbers of winkles in the midden suggests that in the 12th-13th century considerable numbers of winkles grazed on the surface of the harbour muds and seaweeds. The boulders of the derelict ancient causeway between Cleavel Point and Green Island might have provided a suitable habitat for the attachment of large algae on which winkles could feed.

The oysters. The larger body of data relating to oysters meant that as much information could be derived from oyster shells as from cockles and winkles. However, oysters only accounted for 2.6% of the midden and therefore may have been only a very small component of the diet.

Oysters exhibit a great variability in size and other characteristics, which is to a large extent dependent upon their immediate environment. They generally grow sub-littorally on firm substrates and can tolerate a reduction in salinity of the water and may sometimes be found in intertidal positions where they are exposed to air at very low spring tides.

For at least three centuries oyster fishing in Poole Harbour has fallen into two categories: the collecting of oysters from naturally-propagating or wild beds, and the collection of natural oysters that have been relaid in nutrient-rich sheltered waters, such as the Harbour, where they are left to fatten up (Philpots 1890). Natural populations also exist in the deeper channels of Poole Harbour.

The earliest archaeological evidence for the oyster industry in the area is from an oyster midden in Poole dated to the 11th/12th century which pre-dates the town (Horsey and Winder in press). It seems likely that these shells were the by-product of an early systematic exploitation of the natural oyster beds (Winder forthcoming).

Only oysters from SP1 (1310) were recovered in sufficient numbers for statistical comparisons. They were compared with modern shells from natural beds in Poole Bay, relaid beds from South Deep and Wytch Channel and also with samples from the 12th/13th century archaeological sites at Poole and Hamworthy on the Harbour's edge, the 14th/15th century site at Lodge Farm near Wimborne to the north of Poole, and 17th and post 17th contexts at Corfe Castle.

A comparison was made between the 12th/13th century midden oysters and those of similar date from Paradise Street, Poole (1095 ± 108 AD HAR-2775) and the Shipwrights' Arms deposit in Hamworthy (1075 ± 90 AD HAR-3464). However, in terms of size, shape, infestation, age grouping and virtually all other features recorded for the midden oysters, they were different from the characteristics of both archaeological and modern shells from Poole. The mean size (maximum diameter) of the Ower Farm shells (70.07 ± 14.75 mm) was much smaller than the Poole samples. However, Kolmogorov-Smirnoff tests showed that there was no significant difference in size (as well as other characteristics) between oysters from the midden, Lodge Farm and Corfe Castle.

The oyster shells occurred in well-separated lenses of varying size within the midden. All the evidence suggests that, in contrast to oyster shells in dumps on the northern side of the Harbour of roughly similar date, oysters at Ower Farm were collected sporadically from a small, natural, overcrowded population that had settled on a rough substrate that included accumulations of empty cockle shells. The oysters may only have been uncovered at very low spring tides. The thin peripheral shell shoots together with the presence of small spat oysters are an indication that the oysters may have been collected in the late summer or early autumn.

It is possible that the remnants of the ancient wood and boulder causeway between Cleavel Point and Green Island (already mentioned in connection with suitable habitats for winkles) could have trapped both drifts of old cockle shells and, occasionally, oyster spat which developed into a small population of irregularly-shaped oysters which could be culled by hand at infrequent periods subject to tides.

The mussels. Only fragmentary remains of mussel shells were recovered from the midden. It was not possible to calculate the measurement of the whole shells. Mussels are bivalve filter-feeders which attach themselves to hard surfaces from high in the intertidal zone to depths of a few fathoms within sheltered harbours and estuaries, and on rocky shores of the open coast, often in dense masses (Tebble 1966, 40-43).

The modern distribution of mussels in Poole Harbour is limited and apparently clumped. There are no records of mussels from the fifteen stations around the Harbour sampled by the Heriot-Watt University (1986). However, live specimens were found on transects across Swash Channel, Upper Main Channel, Upper Holes Bay and Lower Holes Bay by Dyrynda (1987, II 2-7) and natural populations were identified in the South Deep and Middle Wareham Channel. Although the natural populations are small they are indicative of favourable locations for mussels that exist within the more upstream, siltier sections of the subtidal channel network (*ibid.*, 4.47).

The carpet shells. Carpet shells were relatively infrequent (*c.* 0.7%) and broken in the midden but it was evident from the fragments and the few intact specimens that they reached a large size (up to 75 mm long). Carpet shells bury in sand, muddy gravel of stiff clay on the shore below mid-tide level. The Heriot-Watt (1986) and McGrorty *et al.* (1987) surveys of the intertidal area in Newton and Ower Bays failed to find any Venerupids. Empty carpet shells are, however, found on local beaches. Holme and Bishop (1980, 59-65) noted that muddy habitats in the Harbour supported *Venerupis pullastra* communities. In particular *V. pullastra* was noted as one of the dominant species at North Haven Point in a community developed within the shingle substrates. Both *V. decussata* and *V. pullastra* were found in the Salterns area on the north shore of the Harbour (*ibid.*).

Since identification of carpet shells from the midden was based mainly on small fragments it is possible that both species were present. Carpet shells may have been more common in the 12th/13th century but they are likely to have been collected accidentally intermingled with cockles on the lower parts of the shore. The presence of this genus in the Lilliput and North Haven areas (near the Harbour mouth and Stone Island) corroborates the idea that the cockles may have been collected in this area.

Composition, volume and content of the midden deposit

From the density of shells in the known volumes of midden obtained in the three sample pits, it was possible to calculate the density of each species in a hypothetical average cubic metre of midden. Such a cubic metre would contain 49,645 winkles, 24,269 cockles, 1,238 oysters, 775 mussels and 420 carpet shells.

The volume of the excavated part of the midden was calculated by multiplying the surface area, as defined by excavation, by the average depth of the midden. The mean volume of this part of the midden was thus estimated as 25.67 m^3.

Meat weight and energy value represented by the shell midden

By multiplying the number of shells of each species in the hypothetical average cubic metre of midden by the volume of the excavated midden, the quantity of shells in the

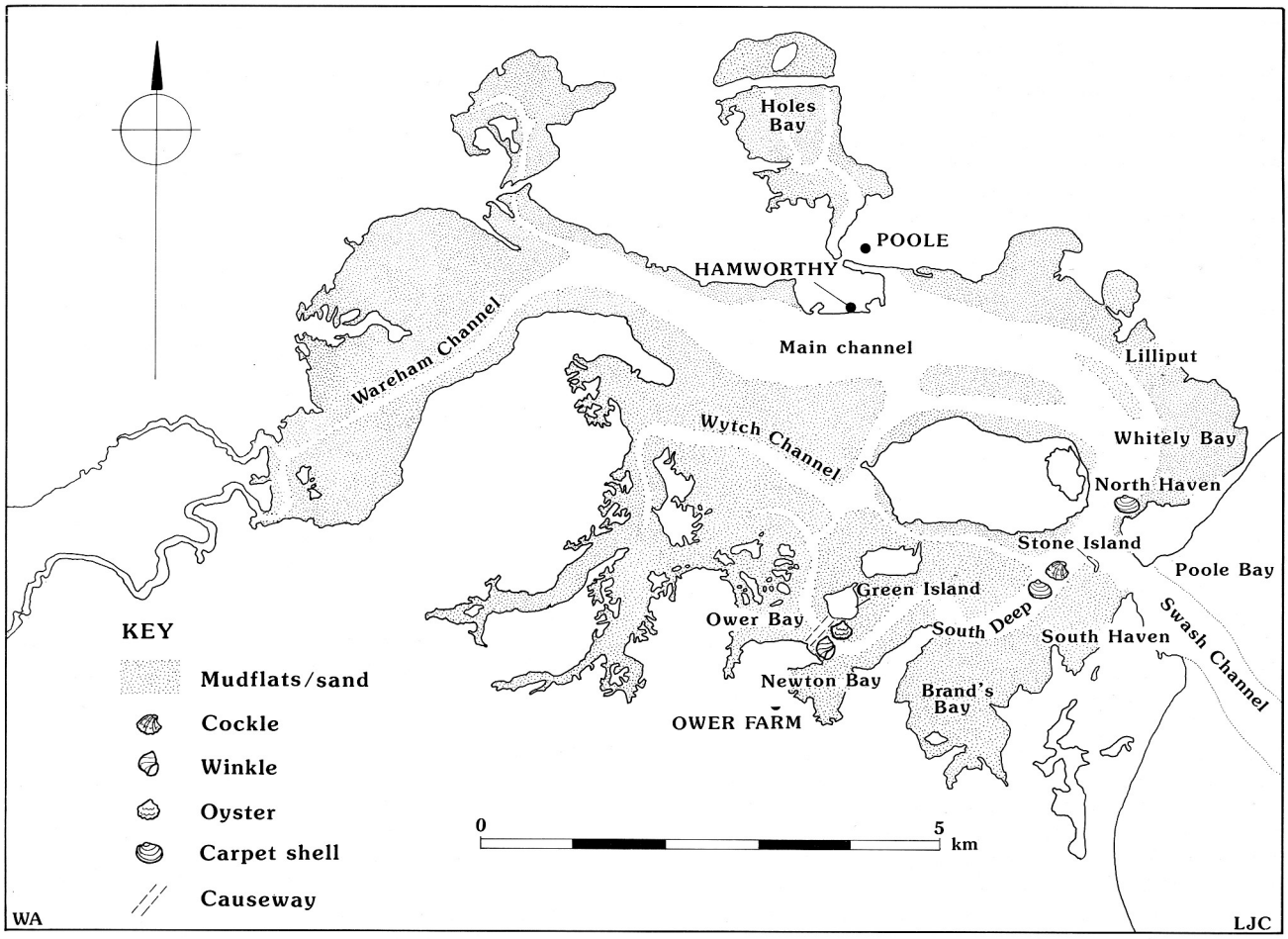

Fig. 89: Probable habitats of Marine mollusca exploited at Ower Farm.

excavated part of the midden could be calculated. Since the mean wet meat weight of each species was known (see archive), the total mean meat weight represented by the shells was calculated to be approximately 3.66 tonnes.

Using the energy values per 100 g of wet meat for each species, the mean total energy value represented by the shells in this part of the midden would be approximately 2,179,756 Kcals. What do these energy values mean in terms of food for a population? Shawcross (1968, 119-124) gives a figure of 2700 calories required by each person per day. Bowes and Church (1980) give various figures for daily requirement based on age and gender, e.g. 2900 for a man of 19 - 22 years; 2100 for a woman of the same age. As only an approximate idea of the value of this quantity of shellfish was required, a daily figure of 2500 Kcals per person was assumed. The midden therefore represents a total of 872 man days of food and it is unlikely that the shellfish would ever have constituted more than half the daily diet. It is plausible to think of the shellfish as being eaten by a family or group of people and the shells from the excavated midden alone could provide the daily meat requirement of a modest family unit for about five years. However, such statements are pure conjecture as it is not known where or who the final consumer was.

Diet and economy

Shell-gathering activities may have been an integral part of the daily life of the local inhabitants. The evidence from the midden showed that a variety of shellfish from various locations in the Harbour (Fig. 89) were eaten. Cockles and winkles were most common; the cockles may have been collected from around Stone Island requiring boats while the winkles were probably collected locally by hand from the ancient causeway between Cleavel Point and Green Island. Oysters, not being able to live in the muddy bays, were also probably collected from the ancient causeway and were not likely to have been cultivated or even fished regularly. Oysters are normally eaten raw and opened with a stout, fairly blunt, short-bladed knife and one such knife was found on the site (Fig. 71, 7). This operation often damages the shells and a number of examples from the midden displayed v or w-shaped notches probably caused by twisting a knife to prise the valves apart. Other species (mussels and carpet shells) were relatively uncommon and may have been collected from a number of locations in the harbour. The smaller species like the Rissoids and netted whelks would almost certainly have been accidental inclusions. A small piece of lobster carapace indicated that the occupants of the Ower Farm site may have eaten Crustaceans as well as marine molluscs. Fish bones were also found in the midden (Hamilton-Dyer, this Section).

Marine mollusc shells are generally robust and survive well and the great bulk of shells in relation to other food remains such as cereals, fish and animal from Ower Farm could easily lead to an overestimate of the importance of shellfish. However, in this instance they must surely have made an important contribution of protein, vitamins and minerals to the diet.

Despite the fact that Ower Farm was owned by Milton Abbey during the period that the shells were deposited, and that there would have been a demand for fish and shellfish for the great number of days in each year when it was forbidden to eat meat, no definite evidence has been produced by the excavation to indicate that shellfish were being processed and sent to the Abbey. Processing and preserving shellfish for domestic use or trade cannot be ruled out at the Ower Farm settlement but there was no direct evidence for it apart from the large quantity of shells and small burnt and ashy areas near the midden. Shells accumulate quickly and their disposal can be a problem, If the shellfish had been boiled-up on the beach, then it might be expected that the shells would be left there.

Taphonomy

It is considered that the species in the midden are representative of the shellfish being exploited in the harbour area. Disposal biases may have been introduced with regard to oysters as it is common for this species, in particular, to be served in their shell, and thus if oysters were collected or fished for non-local consumption, i.e. in Milton Abbey, then it is possible that they would be significantly under-represented in the midden at Ower Farm. Cockles and winkles can also be served in their shells, but offer a greater option for pickling, roasting and serving in pies (Hartley 1954). Whether they were for immediate local consumption or for a wider market such as Milton Abbey to which Ower Farm was tied, one might expect the deposition of large numbers of shells. Thus although there is no direct evidence for servicing Milton Abbey, this cannot be disregarded.

Environment

It was assumed, for the purposes of this report, that the topography and hydrology of the Harbour had not changed significantly since the the midden was created. On this basis, strategems for shellfishing have been proposed - digging for cockles and carpet shells in the eastern part of the Harbour, and picking up winkles, oysters and mussels on the causeway because shellfish in the bays would have been scarce and collecting them impracticable. Despite evidence that the Harbour has locally changed a great deal over the centuries (May 1969), it is considered that changes may not have affected the shellfishing activities proposed.

Newton and Ower Bays today comprise extensive flats of very soft mud with narrow, deeper channels that retain water at low tide. The shores are fringed with saltmarsh in which the dominant species is the perennial grass *Spartina anglica*. This plant is an introduced species which was first recorded in 1890 at nearby Ower. Although the levels of muds in the sheltered areas of the Harbour were already rising at a steady rate before the introduction of *S. anglica* its colonisation has led to a rapid accumulation of deposits of up to 2 m in places. The Spartina saltmarsh developed very rapidly after its introduction; now it is declining by erosion almost as quickly (Gray 1986, 33). The channels are also known to shift continually in the way that old rivers meander over plains.

Therefore it is possible to say fairly confidently that Newton and Ower Bay would have looked different during the 12th and 13th centuries. However, the changes in the harbour are thought to have been ones of relative degree of silting/reclamation rather than the destruction or creation of habitats suitable for shellfish. The saltmarshes would have been less extensive and composed of different plant species. The depth of mud would not have been so great and possibly less glutinous but the bays would still have been muddy. Oysters could not have grown there. Cockles (if present) would have been the numerous, small, surface dwellers and not predominantly the larger specimens recovered from the midden. Winkles might have grazed the muds in greater numbers but would still have preferred to settle on the causeway. Less mud would have made it easier to traverse the muds in pursuit of winkles and also facilitate the launching of boats from the shore.

THE EXPLOITATION OF THE FLORA AND FAUNA AND ITS IMPACT ON THE NATURAL AND DERIVED LANDSCAPE

M. J. Allen and R. G. Scaife

Detailed information about the archaeology and use of the Purbeck heaths is provided by the analyses above. These analyses probably constitute one of the larger suites of environmental data in southern England covering the Iron Age through to the Medieval period. The paucity of data relating to the Bronze Age is unfortunate as are the inherent