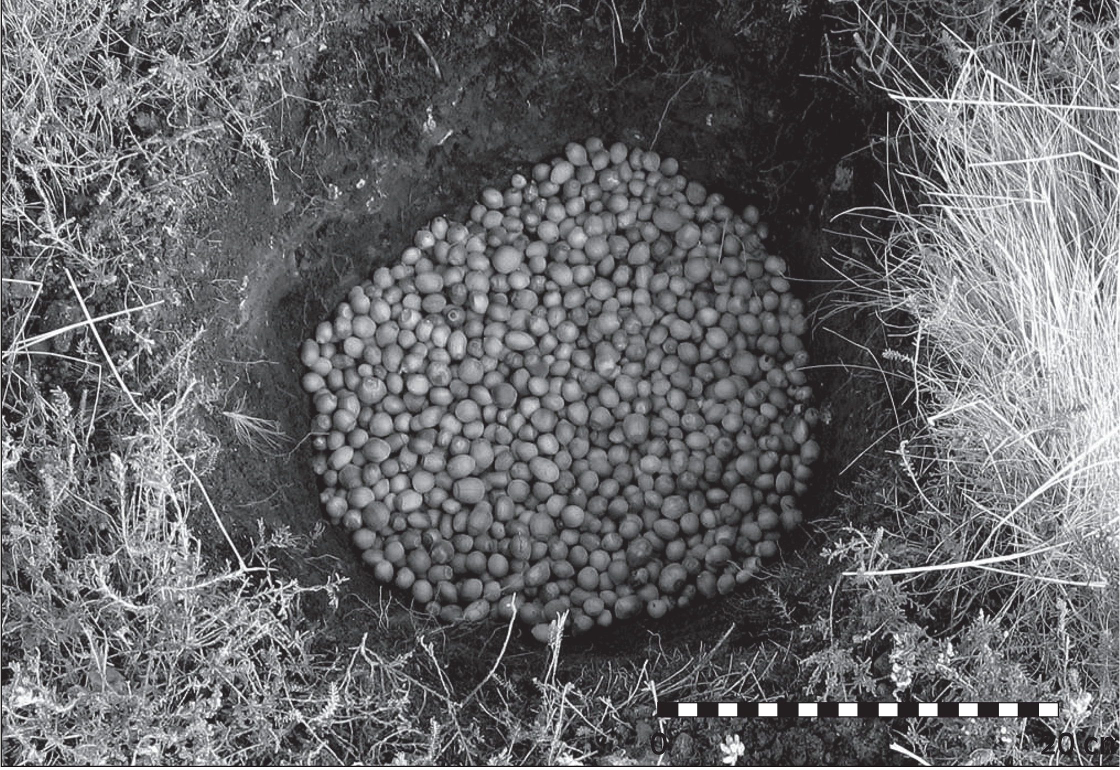

Fig. 1 Hazelnuts in Pit (scale 20 cm). ■

Assumptive holes and how to fill them

The contribution presents first results of experiments on pit storage of hazelnuts

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• **The contribution presents first results of experiments on pit storage of nuts and acorns.**

The past decade has witnessed an increased interest in understanding the presence of nuts, particularly hazelnuts and acorns, on prehistoric sites in Europe (*Mason 1992; McComb 1996, McComb and Simpson 1999, Score and Mithen 2000; Mason and Hather 2000; Hather and Mason 2002*). The traditional view is that, as a reliable and highly nutritious plant food resource, nuts formed a vital component of the Mesolithic diet (*Clarke 1976; Woodman 1985; Zvelebil 1994; Mithen 2000*). Whilst for or later prehistoric periods, the presence of nuts represents the continued, or the occasional, exploitation of a wild plant food as a supplement to the cereal based diet (*Moffett et al 1989; Legge 1989; Entwistle & Grant 1989; Jones 2000; Robinson 2000; Rowley-Conwy 2000*).

The archaeological evidence of pit storage in prehistoric Europe is very tentative, but the association of nuts with pits, coupled with their nutritional value, limited availability, and possible delayed consumption makes them ideal contenders for pit storage (*Woodman 1985*). Nevertheless, assumptions regarding the perception of prehistoric people's relationship with plant foods have hindered any serious academic investigation. For the Mesolithic period, a contradiction is assumed between being nomadic and storing food for later consumption (*Binford 1980; Rowley-Conwy and Zvelebil 1989; Halstead and O'Shea 1989; Mithen 2000*). Whereas for later prehistoric periods, archaeobotanical studies often ignore the evidence of nuts and other wild plant foods, with pit storage only seriously being discussed in relation to grain (*Hather and Mason 2002*). By empirically testing the pit storage potential of nuts, we are increasing our understanding of the archaeological evidence and challenging narrow perceptions of prehistoric plant exploitation, and, specifically, prehistoric nut exploitation.

Hazelnut pit storage experiments 2001-2002

The 2001-2002 experiment explored the possibility of storing hazelnuts in pits, and built on the results from other pit storage experiments, archaeological, ethnographic and historical data (*Cunningham 2002*). The archaeological evidence from the Mesolithic site of Mount Sandel, Northern Ireland, formed the inspiration for the storage pit methodology. This site had large quantities of charred hazelnut shells, numerous pits and features indicating that the site had several structures and activity areas. One pit (F56/1) in particular, had tentative evidence of being a storage facility; it was 100cm in diameter with a depth of 60 cm, at the base there were two indentations and other depressions on the vertical pit walls (*Woodman 1985*). Woodman (*1985*, 128, 163) interpreted the wall depressions as evidence of pegs to hold up some sort of lining.

The evidence of baskets and basketry lining to store acorns and chestnuts at some Jomon (10 000-300 BC) sites in Japan (*Miyaji 1999*), along with ethnographic and historical evidence (*Howes 1949*) supports Woodman's interpretation. Other experimental data, particularly Reynold's (*1974*) grain storage pits and McComb's (*1996*) hazelnut storage pits indicate that basketry does appear to aid storage. Whether it is advantageous to store hazelnuts in baskets is an issue that this experiment explored further by burying a third of the nuts in an open weave willow basket.

On the evidence from other pit storage experiments (*Reynolds 1974; McComb 1996*) the most suitable criteria for choosing the pit storage location was that the site had to be free draining. The site chosen in East Devon, England, is on an area of dry acidic lowland heath with acidic grassland, bracken, secondary forest and an underlining geology of greensands with a capping of clay, flint and chert. Although the soil is clayey, it does suffer from summer drought and the flint and chert ensure that it is free draining (*www.habitats.freeserve.co.uk/fire1.htm. 2000*).

The evidence of any sort of pit capping is missing from the Jomon and Mount Sandel sites, or simply not recognised, this is mainly due to erosion of the occupation layer. Reynolds (*1974*) found that to successfully store grain in pits the capping

Pits	Depth of pit	Quantity of hazelnuts	Quantity of cobnuts	Diameter Top / Bottom	Storage method	Depth	Capping	Storage duration
1	30 cm	266 g toasted	4900 g toasted	28 x 37 cm 28 x 9 cm	Straight into pit	16 cm	Soil mixed with chert and flint	18 weeks
2	30 cm	266 g	4900 g	34 cm 22 cm	Straight into pit	15 cm	Soil mixed with chert and flint	18 weeks
3	40 cm	266 g	4900 g	37 cm 26 cm	Basket	35 cm	Twigs, leaves, soil mixed with chert and flint	18 weeks

Table 1 2001-2002 Pit Storage Methodology. ■

had to be impermeable. However, McComb's (*1996*) experiments demonstrate that there is no need to seal the capping of hazelnut storage pits. The design of these experiments meant that only natural materials available at the pit site, materials that would have also been available in the Mesolithic, would make a suitable capping.

In designing this experiment, the weather and environment became the most important variables. Consequently I had to constantly address, and re-address, the experiment methodology. To counteract the lack of control over the weather, a number of constants remained stable including location of pits, the quantity of nuts in each pit and the duration of storage (**Table 1**).

Methodology

The autumn of 2001, saw the gathering of wild hazelnuts (*Corylus avellana*) in three woods in south Devon, England, as part of a gathering study (*Cunningham 2002*). Unfortunately, 2001 proved to be a lean year for hazelnuts across England (*Game pers comm. 2002*); to make up the quantity needed for the experiment, commercially grown cobnuts (*Corylus maxima*) formed the main bulk of the nuts. The results of the gathering study puts into question the assumption that hazelnuts were an annually reliable plant food resource, for hazel tends to produce nuts biannually, and have occasional universal lean years (*Cunningham 2002; Game 1999*). The low quantity of hazelnuts gathered and cobnuts purchased, forced a reduction in the size of the experimental storage pits to 50% smaller than pit F56/1 from Mount Sandel.

The bought cobnuts arrived still attached to their damp husks, which began to rot almost immediately; removal of the husks seemed the only way to save the cobnuts. The hazelnuts had no sign of any mould, so to prevent the mould from spreading the two types of nuts were kept separate whilst drying. During the two-week drying phase, several problems occurred with the hazelnuts, particularly shrivelling and mould, which highlighted how difficult it is to dry nuts naturally for storage in a damp climate. By placing a third of the nuts in the embers of a dying fire for a few minutes it was possible to test whether artificially dried hazelnuts have an extended storage life.

The storage experiment commenced at the beginning of October 2001, with the dried hazelnuts and cobnuts placed in three pits, capped and left.

Pits 1 & 2. (**Table 1**) Both pits had a depth of 30 cm at which point there was a marked change in soil from loosely packed soil, flint and chert to a much wetter clayey soil at the bottom. The nuts were simply placed in the pit to a height of 14 cm (Pit 1) and 15 cm (Pit 2) (**Fig. 1**). The capping consisted of lose soil, flint and chert and the depth of capping was intentionally thick (16 cm & 15 cm) and made flush with the ground in an attempt to prevent any people, dogs and any other animal detecting the hazelnuts and digging them up. The weight of the capping also ensured that the nuts were tightly compacted to help prevent shrivelling (*Howes 1949*).

Although some effort went into toasting the hazelnuts, both pits were intentionally simple and quick to implement, with little disturbance to the local environment; the nuts and a tool to dig the pits were all that was required.

Pit 3. (**Table 1**) In this pit, the same change in the soil profile occurred at a depth of 30 cm, but because of the basket, the pit had to be deeper and wider than Pits 1 & 2. The greater width prevented the basket from touching the sides of the pit and two small logs prevented it touching the base. This allowed air to circulate around and beneath the basket. The design had two functions;

(1) to test if the basket and air hindered, or helped, the preservation of nuts, and

(2) to test if the weight of the basket on the logs left an indentation at the base of the pit similar to those found in pit F56/1 at Mount Sandel.

The design of Pit 3 meant that it required a different type of capping made from materials available in the surrounding woodlands. Across the top of the basket and into the walls of the pit, a series of hazel twigs formed a latticework, followed by a layer of leaves and finally the soil, flint and chert. Rather than make the capping flush with the ground, the soil was used to create a mound 20 cm high with a diameter of 80 cm, in an attempt to protect the pit from unintentional trampling (**Figs 2a – 2c**). The design of the capping reflects the importance of making spontaneous solutions to problems in response to the local environment. There was no forward planning for this capping method.

It is important to stress that there is no archaeological evidence to indicate the methodology or materials used for storing plant food in pits in northern Europe. I could have used the same storage methodology of sandwiching a layer of acorns or nuts between layers of reeds, brash and clay as found at the Jomon site of Sobata, Japan (*Miyaji 1999*), but I felt that the Jomon method reflects a cultural response to that environment, rather than a universal methodology. The methods I have used in this experiment explored the simplicity of storing hazelnuts in pits by using freely available materials.

Fig. 2a Latticework layer (scale 20 cm). ■

Fig. 2b Leaf layer (scale 20 cm). ■

Fig. 2c Soil capping (scale 20 cm). ■

Recovery and Results

The storage period was eighteen weeks, from early October 2001 to the middle of February 2002 during the heart of winter, when food is naturally in short supply. The recovery timing differed from McComb's (*1996*) storage experiments as she stored hazelnuts in pits for up to eighteen weeks from mid-November to the beginning of April. After discovering that the hazelnuts had started to sprout and had become rather bitter, McComb concluded that eighteen weeks is too long to store hazelnuts underground.

Recovery of the stored hazelnuts brought a number of surprises; although the storage pit site is free draining, the clayey sections within the soil prevented water drainage in two of the pits. Consequently, Pits 1 and 3 were partly filled with water. In Pit 2, the nuts were very muddy and damp but had no excessive water (**Tables 4 & 5**). Contrary to McComb's (*1996*) experiments, none of the hazelnuts showed any sign of mould or sprouting although they were very damp. With no visible difference, there was no need to record the condition of the nuts on the outer edges separately from those in the middle of the pit.

Removing the nuts in 5 cm spits, with the nuts in each spit bagged separately, made it possible to assess whether there was any difference in condition based on their vertical position. The nuts in Pit 1 were all uniformly black having lost the tan brown to black colour array they had prior to storage and after toasting. Removal of the nuts from spit 1 and 3 cm of spit 2, revealed the rest of the nuts swimming in water, consequently, to test if there was any difference in edibility between those nuts above and below the water, spit 2 became spit 2a and 2b. There was a very distinct smell of rotting nuts coming from this pit, this was the only pit to emit such an odour and when the results were analysed it was clear that this pit had the fewest edible nuts (**Tables 2 & 3**). The results also indicate that there was no difference in edibility between the nuts in water and those above the water in Pits 1 and 3 (**Tables 2, 3, 6, 7**).

In Pit 3, the basket was standing in water, which covered the nuts in spits 2 and 3. Lifting the basket out of the pit revealed one floating log and one underwater and very firmly embedded in the bottom of the pit. The hazelnuts and cobnuts all looked the same, displaying no evidence of mould, fungi or sprouting (**Tables 6 & 7**).

Three months later, I returned to the pit storage site and excavated Pit 3 to see whether the embedded log had left an indentation in the base of the pit. Although there had been no rain for over two weeks before excavating, Pit 3 still held water and therefore it was impossible to detect the presence of an indentation. Nevertheless, we can conclude that there is a least one indentation at the base of Pit 3 because of the embedded log, but cannot accurately compare it with the depressions from pit F56/1 at Mount Sandel.

	Depth	Blind	Inedible	Edible
Spit 1	17 cm	4	4	5
Spit 2a	22 cm	7	19	11
Spit 2b	25 cm	12	4	5
Spit 3	27 cm	22	48	34
Total		45	75	55
Percentage		26 %	43 %	31 %

Table 2 Results from Pit 1- Hazelnuts. ■

	Depth	Blind	Inedible	Edible
Spit 1	17 cm	1	23	54
Spit 2a	22 cm	1	22	27
Spit 2b	25 cm	1	5	22
Spit 3	27 cm	0	19	58
Total		3	69	161
Percentage		1 %	30 %	69 %

Table 3 Results from Pit 1 - Cobnuts. ■

	Depth	Blind	Inedible	Edible
Spit 1	15 cm	9	2	27
Spit 2	20 cm	37	3	43
Spit 3	25 cm	29	9	61
Total		75	14	131
Percentage		34 %	6 %	60 %

Table 4 Results from Pit 2 - Hazelnuts. ■

	Depth	Blind	Inedible	Edible
Spit 1	15 cm	0	0	78
Spit 2	20 cm	0	3	75
Spit 3	25 cm	1	0	76
Total		1	3	229
Percentage		1 %	2 %	98 %

Table 5 Results from Pit 2 - Cobnuts. ■

	Depth	Blind	Inedible	Edible
Spit 1	11 cm	19	1	2
Spit 2	16 cm	15	5	11
Spit 3	21 cm	16	13	116
Total		50	19	129
Percentage		25 %	10 %	65 %

Table 6 Results from Pit 3 - Hazelnuts. ■

	Depth	Blind	Inedible	Edible
Spit 1	11 cm	1	2	75
Spit 2	16 cm	2	0	76
Spit 3	21 cm	0	1	76
Total		3	3	227
Percentage		2 %	2 %	97 %

Table 7 Results from Pit 3 - Cobnuts. ■

Testing edibility involved cracking open all the hazelnuts and 20% of the cobnuts from each pit and from the condition of the kernel it was possible to tell whether it was edible, inedible or blind (an empty shell). It was unnecessary to test all the cobnuts because they are morphologically different; being larger and having a thicker shell than the hazelnuts and are not native to England. Although, the edibility methodology is rather subjective it did prove to be adequate for this experiment.

The results (**Tables 2-7**) indicate that the cultivated cobnuts had the greatest survival rate with over 69% in each pit compared with over 31% for the hazelnuts. The cobnuts also had the least inedible and blind nuts probably because they were commercially grown and therefore had their ecological and nutritional requirements met. Although they were slightly toasted, the results indicate that Pit 1 had the least number of edible nuts (**Table 2 & 3**). In Pits 2 and 3 (**Tables 4, 5, 6, & 7**), despite the wet conditions, the hazelnuts had over 60% survival rate, with the hazelnuts in the basket having the greatest number. The presence of water and the location of the basket within the pit also contributed to the preservation of the basket.

However, if we dismiss the blind nuts from the equation, as it is likely that experienced gatherers would recognise the feel and colour of a blind nut, and discard it before storage; we find that Pit 2 had a slightly greater quantity of edible nuts probably because they did not have an extended period in water (**Table 8**).

Pits	Inedible	Edible	Percentage of edible Hazelnuts
1	75	55	58
2	14	131	90
3	19	129	87

Table 8 The results from all three pits if we exculde the blind hazelnuts and all the cobnuts from the calculations. ■

This experiment has demonstrated that hazelnuts will store in pits for 18 weeks, even in conditions that are less than ideal, and that the use of a basket helps prevent the hazelnuts from spoiling whilst in the water. However, toasting hazelnuts was not a successful method. When storing the nuts it is unlikely that the actual size (in terms of the diameter and the shape) of the pit had a large effect on the nuts. It is likely that the depth of the pits did, as the soil became clayey, having less flint and chert, with the clay retaining water within two of the pits. The experiment demonstrates that the underground storage of hazelnuts is neither a complicated nor a difficult task, but to store hazelnuts successfully in pits does require an understanding of the pit site environment and that responding to this environment in a constructive way ensures success (*Cunningham 2002*).

Pit Storage Experiments 2004-2005

Using the results from 2001-2002, further storage experiments are presently in progress. For the 2004-2005 experiment, it was decided that the main objectives are to extend the storage period to 24 and 32 weeks and to include evidence of nut storage from later prehistoric periods, particularly the use of acorns as well as hazelnuts (*Jørgenson 1977; de Ceunyncik 1991*). The extended storage will help to determine if there is a threshold point beyond which yields of viable nuts will decline rapidly, in other words an optimal storage period. There is a possibility that, if the conditions are right, the hazelnuts will sprout in early spring as they are genetically programmed to do so. The two native English species of acorn, *Quercus robur* and *Quercus petraea*; germinate at different times. *Quercus robur* acorns lie dormant until the spring, whereas *Quercus petraea* acorns germinate almost immediately after falling.

By extending the storage period, we will also have a better understanding of the role basketry plays in pit storage as the extended period may cause the baskets to decay (*McCombs 1996*). Archaeological and ethnographic evidence indicates that storing acorns in baskets in pits is possible (*Mason 1992; Miyaji 1999*), but we do not know whether success is dependant on the type of environment and whether to ensure success both the nuts and basket must be kept very wet (*McComb 1996*).

When the nut gathering began, the majority of hazelnuts were still green, although their collection was kept to a minimum, there was a problem with shrivelling and mould amongst the earliest gathered hazelnuts during the drying phase. The nuts gathered during the beginning of September will prove to have a greater percentage of blind nuts, compared to those gathered later in the month, if the maturity of the hazelnuts is an important factor in the timing of gathering. The results will have implications for understanding the timing of hazelnut gathering in prehistory and will contribute to the discussions of McComb (*1996*), McComb and Simpson (*1999*) who believe that hazelnuts must be collected before they are fully ripe, and Mason and Hather (*2000*) whose microscopic study of hazelnut shell morphology indicates that hazelnut gathering probably took place at Stasonaig, Colonsay, when fully ripe.

Gathering hazelnuts and acorns took place in numerous woodlands in south Devon, England throughout September and October 2004. The amount of time spent collecting the hazelnuts compared to the acorns was phenomenal, especially when comparing the quantities gathered. The quantity of hazelnuts is less than the combination of the hazelnuts and cobnuts from the previous experiment, but with this experiment, they are all wild hazelnuts. Hazelnut gathering began in early September and continued over a four-week period. An extended gathering period induced an extended drying phase for the hazelnuts. To gather enough acorns took only two gathering sessions over two days.

Once collected, the acorns very quickly began to sprout, confirming that the majority of the acorns are *Quercus petraea*. The only way to stop this process was to dry the acorns using heat as soon as possible after gathering. As the weather was so wet after collecting, drying was not possible in the sun. Placing the acorns by an open fire prevented any further sprouting and accelerated the drying process, but many began to shrivel and the shells became very brittle. The condition of the shells meant that a simple squeeze of the acorn and the shell split. Whilst this makes shelling quicker, a few cotyledons had become very soft indicating that maybe they were beginning to turn and may not store very well. I am not sure what causes the shrivelling. With hazelnuts, shrivelling is caused by the absence, or disintegration, of the kernel, but the majority of the acorn cotyledons still looked viable. For this storage experiment, I excluded as many of these acorns as possible, but no doubt, a few were stored. The archaeological evidence from northern Europe of acorns tends to be just charred cotyledons. This may indicate that acorns were shelled before storage. However, the ethnographic evidence indicates storage with the shells was the most common method for pit storage (*Mason 1992*).

Using the same methodology for the 2001-2002 experiments, the end of October 2004 saw the storage of hazelnuts in three pits at the same site in east Devon, England. Following the same methodology acorn storage in three pits began in mid November.

Conclusion

The design of these storage experiments is a mixture of both scientific methodology and on-the-spot problem solving. We can see that these two, conflicting methods, work well together, as long as the design of the experiment is solid. By following too strictly an exclusive scientific methodology as advocated by Reynolds (*1999*), we are in danger of losing the human side to decision-making and problem solving as experienced with Reynolds (*1974*) storage pits; in other words, we lose the humanity in the past. However, by simply having no scientific methodology, as with McComb's (*1996*) pit storage experiment, it is impossible to interpret the results. This methodology is only possible because it has strong support from the detailed recordings of the experiment methodology and results.

The 2001-2002 storage experiment objective was to test whether it is possible to store hazelnuts in pits and the results have demonstrated that over 50% of hazelnuts survived for 18 weeks (**Table 8**). By proving that it is possible to store hazelnuts in pits, we can extrapolate that it was feasible for Mesolithic people. The simple and practical experiment design makes it realistic to believe that pit storage was practical for both nomadic and sedentary peoples. The 2004-2005 pit storage experiments are part of a study exploring the exploitation of nuts during the Mesolithic into the Iron Age in Europe and the Mediterranean. By including evidence from later prehistoric periods, we can challenge perceptions of the exploitation of a nutritious wild plant food across and beyond the great divide between hunter-gatherers and farmers.

Bibliography

Binford L. R. 1980: Willow smoke and dog's tails: hunter-gatherer settlement systems and archaeological site formation. American Antiquity 45(1):4-20.

Clarke D. 1976: Mesolithic Europe: the economic basis. In Sieveking G de G, Longworth. I. H. and Wilson. K.H. (eds) Problems in Economic and Social Archaeology. Duckworth: London. pp 449-81.

Cunningham P. 2002: Pits and hazelnuts: an experiment investigating the pit storage potential of hazelnuts and the implications for archaeological perceptions of the Mesolithic. Unpublished M.A. Dissertation: University of Exeter: Exeter.

De Ceunynck R. 1991: A find of charred acorns in Evergem-Ralingen near Ghent (Belgian Iron Age). In Renfrew. J. (ed) 1991 New Light on Early Farming: recent developments in Palaeoethnobotany. Edinburgh University Press: Edinburgh. pp 257-76.

Entwistle R. and Grant A. 1989: The evidence for cereal cultivation and animal husbandry in the southern British Neolithic and Bronze Age. In Milles. A., Williams. D. and Gardner. N. (eds) The beginnings of agriculture. BAR International Series 496: Oxford. pp 203-15.

Game M. 1999: In a nutshell: the story of the Kentish cobnuts. Chris Howkins: Surrey.

Halstead P. and O'Shea J. 1989: Introduction: Cultural responses to risk and uncertainty. In Halstead. P. and O'Shea. J. (eds) Bad Year Economics: Cultural responses to risk and uncertainty. Cambridge University Press: Cambridge. pp 1-8.

Hather J. G. and Mason S. L. R. 2002: Introduction: Some issues in the archaeobotany of hunter-gatherers. In Mason. S.L.R. and Hather. J.G. (eds) Hunter-gathers archaeobotany; Perspectives from the Northern Temperate zone. The Institute of Archaeology: London. pp 1-14.

Howes F. N. 1949: Nuts: Their production and everyday uses. Faber and Faber Ltd. London.

Jones G. 2000: Evaluating the importance of cultivation and collecting in Neolithic Britain. In Fairbairn, A.S. (ed) Plants in Neolithic Britain and Beyond. Oxbow Books: Oxford. pp 79-85

Jørgensen G. 1977: Acorns as a food-source in the later stone age. Acta Archaeologica 48: 233-9.

Legge F. 1989: Milking the evidence: a reply to Entwistle and Grant. In Milles. A., Williams. D. and Gardner. N. (eds) The beginnings of agriculture. BAR International Series 496: Oxford. pp 217-42.

McComb A. M. G. 1996: The ecology of hazel nuts in prehistoric Ireland. Unpublished Bsc dissertation. The Queens University Ireland. Belfast.

McComb A. M. G. and Simpson D. 1999: The wild bunch: Exploitation of the hazel in prehistoric Ireland. Ulster Journal of Archaeology 58: 1-15.

Mason S. L. R. 1992: Acorns in human subsistence. Unpublished PhD thesis. Institute of Archaeology, University College London: London.

Mason S. and Hather J. 2000: Parenchymatous plant remains. In Mithen. S. (ed) Hunter-gatherer Landscape archaeology: The Southern Hebrides Mesolithic Project 1988-98 Vol 2. McDonald Institute: Cambridge Monographs Series. pp 415-425.

Mithen S. 2000: The Mesolithic in the Southern Hebrides: Issues of colonization, settlement and the transition to the Neolithic and farming. Mithen. S. (ed) Hunter-gatherer Landscape archaeology: The Southern Hebrides Mesolithic Project 1988-98 Vol 2. McDonald Institute: Cambridge Monographs Series. pp 597-626.

Miyaji A. 1999: Storage pits and the developments of plant food management in Japan during the Jomon period. In Coles. B., Coles. J. and Scho-Jørgensen. M. (eds) Bog Bodies, Sacred Sites and Wetland Archaeology. WARP Occasional Paper 12. University of Exeter: Exeter. pp 165-170.

Moffett L., Robinson M. A. and Straker V. 1989: Cereals, fruit and nuts: charred plant remains from Neolithic sites in England and Wales and the Neolithic economy. In Milles. A., Williams. D. and Gardner. N. (eds) The beginnings of agriculture. BAR International Series 496: Oxford. pp 243-61.

Offwell Woodland and Wildlife Trust, 2000: Fire Beacon Hill. www.habitats.freeserve.co.uk/fire1.htm

Reynolds P. J. 1974: Experimental Iron Age storage pits: an interim report. Proceedings of the Prehistoric Society 40: 118-31.

Reynolds P. J. 1999: The nature of experiment in archaeology. In Harding. A. (ed) Experiment and design: archaeological studies in honour of John Coles. Oxford, pp 156-62

Robinson M. A. 2000: Further considerations of Neolithic charred cereals, fruits and nuts. In Fairbairn, A.S. (ed) Plants in Neolithic Britain and Beyond. Oxbow Books: Oxford. pp 85-90

Rowley-Conwy P. 2000: Through a taphonomic glass, darkly: the importance of cereal cultivation in prehistoric Britain. In Huntly J. P. and Stallibrass. S. (eds) Taphonomy and interpretation: symposia of the association for environmental archaeology 14: 43-53.

Rowley-Conwy P. and Zvelebil M. 1989: Saving it for later: Storage by prehistoric hunter-gatherers in Europe. In Halstead. P. and O'Shea. J. (eds) Bad Year Economics: Cultural responses to risk and uncertainty. Cambridge University Press: Cambridge. pp 40-57.

Score D. and Mithen S. 2000: The experimental roasting of hazelnuts. In Mithen. S. (ed) Hunter-gatherer landscape archaeology: The Southern Hebrides Mesolithic Project 1988-98 Vol 2. McDonald Institute: Cambridge Monographs Series. pp 507-512.

Woodman P. C. 1985: Excavations at Mount Sandel 1973-77. Northern Ireland Archaeological Monographs: No 2: Belfast.

Zvelebil M. 1994: Plant use in the Mesolithic and its role in the transition to farming. Proceedings of the Prehistoric Society 60:35-74.

Summary

Über vermutete Löcher und wie sie verfüllt werden können: Eine Serie von Experimenten zur Untersuchung des Lagerungspotenzials von Haselnüssen und Eicheln in Gruben

Das Experiment von 2001 und 2002, das durch die archäologischen Ergebnisse vom mesolithischen Fundplatz am Mount Sandel in Nord-Irland inspiriert wurde, untersuchte die Möglichkeiten, Haselnüsse in Gruben zu lagern. Die Wildnüsse wurden im Herbst 2001 gesammelt; wegen ihrer in diesem Jahr nur geringen Größe wurden sie jedoch mit kommerziell angebauten (größeren) Haselnüssen ergänzt. Im Oktober wurden die getrockneten Nüsse in drei Gruben eingebracht, in einer von ihnen in einem verschlossenen Korb. Die Lagerungsdauer betrug achtzehn Wochen, bis Mitte Februar. Während des Winters füllten sich die Gruben 1 und 3 teilweise mit Wasser. Trotz dieser Tatsache zeigten die Nüsse keine Anzeichen von Schimmelbefall oder begannen zu sprießen. Der Geschmackstest beim anschließenden Verzehr zeigte ebenfalls keine Unterschiede zwischen den Nüssen über oder im Wasser. Die im Korb befindlichen Nüsse zeigten den besten Lagerungszustand. Das Experiment hat gezeigt, dass Haselnüsse bis zu 18 Wochen in Gruben gelagert werden können, auch unter ungünstigen Bedingungen.

In Folge der Resultate von 2001 und 2002 werden derzeit weitere Lagerungsexperimente durchgeführt. Für das Experiment von 2004 bis 2005 wurde entschieden, die Lagerungsdauer auf 24 sowie auf 32 Wochen auszudehnen und Kenntnisse aus jüngeren prähistorischen Perioden mit einzubeziehen, vor allem auch zur Nutzung von Eicheln. Das Sammeln der Haselnüsse und der Eicheln wurde im September und Oktober 2004 durchgeführt, wobei die benötigte Menge an Eicheln bereits nach zwei Tagen, die Menge an Haselnüssen jedoch erst nach vier Wochen eingesammelt war. Die Eicheln mussten durch Aufwärmen getrocknet werden, um ihr Sprießen zu verhindern.

Die Fragestellung für das Lagerungsexperiment von 2001 und 2002 bezog sich darauf zu testen, ob es möglich sei, Haselnüsse in Gruben zu lagern; die Resultate zeigten, dass mehr als 50 % der Haselnüsse eine Lagerungsphase von 18 Wochen gut überstanden. Die einfache und praktische Durchführung des Experiments lässt es als realistisch erscheinen, dass eine Lagerung in Gruben sowohl für nomadisch als auch für ortsfest lebende Menschen gut möglich war. Die Experimente zur Grubenlagerung von 2004 und 2005 sind Bestandteil einer Studie, die die Nutzung von Nüssen vom Mesolithikum bis zur Eisenzeit zum Thema hat.

Fosses supposées et comment les remplir: série d'expérimentations vérifiant les possibilités du stockage des noisettes et des glands.

Dans les années 2001 - 2002, une expérimentation, à partir des vestiges archéologiques provenant du site mésolithique de Mount Sandel, en Irlande du Nord, a vérifié la possibilité du stockage des noisettes dans les fosses de stockage. En automne 2001, on a cueilli des noisettes sauvages et, étant donné une faible récolte cette année-là, on a du se servir encore de noisettes cultivées pour le marché. En octobre, on a introduit des noisettes sèches dans trois fosses; dans un cas, les noisettes avaient été versées dans un panier. Puis, on a recouvert les fosses et on les a abandonnées. Le temps du stockage a fait 18 semaines, jusqu'à mi-octobre. Pendant l'hiver, l'eau a partiellement rempli les fosses 1 et 3. Toutefois, on n'a observé ni moisissure ni germes sur les noisettes. Le contrôle de la comestibilité n'a révélé aucune différence parmi les noisettes d'au-dessus et celles d'au-dessous de l'eau. Les noisettes déposées dans le panier ont passé l'hiver le mieux. Cette expérimentation a mis en évidence qu'on peut conserver les noisettes pendant 18 semaines, même dans des conditions défavorables.

D'autres expérimentations en stockage qui sont en train de s'accomplir, renouent avec les résultats des années 2001-2002. Pour l'expérimentation en 2004-2005, on a décidé de prolonger le temps de stockage de 24 à 32 semaines et encore de s'appuyer sur les vestiges qui datent des périodes plus récentes de la préhistoire - en particulier le stockage des glands, pas seulement des noisettes. Dans les mois de septembre et d'octobre, on a cueilli des noisettes et des glands. Tandis qu'on a ramassé une quantité suffisante de glands pendant deux jours, la collecte des noisettes a pris 4 semaines. Afin de ne pas germer, les glands ont été séchés à la chaleur vive.

L'expérimentation des années 2001-2002 a suivi l'objectif de vérifier si l'on peut conserver des noisettes dans les fosses de stockage et les résultats ont mis en évidence que plus de 50% se conservaient pendant 18 semaines. Cette expérience simple et utile fait remarquer qu'on peut supposer la pratique du stockage dans les fosses pour des populations nomades ainsi que celles sédentarisées. L'expérimentation de 2004-2005 fait partie des recherches menées sur l'utilisation des noix en Europe du Néolithique à l'Age du fer.