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101 ways to skin a fur-bearing animal: the implications for zooarchaeological interpretation

Eva Fairnell

Cut marks can play a vital part in the interpretation of zooarchaeological data. For example, patterns in the style and position of cut marks are taken as indicators of types of butchery practice. While butchery processes such as defleshing and evisceration may be fairly apparent and have been well researched, cut marks pertaining to skinning alone are much more ephemeral and have not been researched in as much depth. This paper explores issues regarding the relationship between cut marks and skinning, and highlights the variability that must arise as a result of the different species that can be skinned for their fur, the different methods and tools that can be used, the different end uses of the fur and confounding effects of other uses of the species' carcasses and pelts. Some experimental skinning has been carried out on a small number of animals, informed by previous experience of taxidermy.

Introduction

In order to interpret any zooarchaeological evidence as potentially indicative of skinning, an understanding of the processes of skinning is required. The more thorough this understanding, the more informed the interpretation can be. Practical knowledge of the butchery process combined with experimental archaeology has added greatly to the study of butchery data (Seetah 2005; 2008). Skinning will usually play a part at some stage in the butchery of an animal but it is also a process that can occur in isolation, for example, in the exploitation of fur-bearing animals for their pelts. However, considering the *châine operatoire* (Renfrew & Bahn 2005; Seetah 2008) from a

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living fur-bearing animal to finished product, there are still many stages in the process, before and after the mechanics of skinning, that will have an impact on the evidence that could potentially be found in the zooarchaeological record.

Cut marks are perhaps the most obvious evidence of skinning that can be left on the skeletal remains of a carcass, and cut marks in certain areas of the carcass are interpreted as such evidence (Richter 2005). The main indicators of skinning are taken to be cut marks around the skull, particularly the eye orbits and muzzle (Hatting 1990), and cut marks around the lower parts of the limbs, particularly the feet and claws. Cut marks on the pelvis can also be taken as evidence of skinning (Strid 2000; Trolle-Lassen 1987). However, why a species is being skinned and the way it is being skinned bear further consideration from a zooarchaeological viewpoint. For example, the belly fur may be more desirable than the fur from the back, the head and distal limbs may not bear any fur that is worth skinning out, and the skinning could in fact be to help release other parts of the carcass, such as tendons and claws, rather than the pelt or meat. These requirements can lead to variation in the different methods of skinning, leading to different patterns of cut marks or perhaps no cut marks at all.

The first stage in taxidermy is releasing the pelt or skin from an animal in as perfect a condition as possible, so experience of taxidermy provides a useful analogy for interpreting zooarchaeological data that may relate to skinning. However, as a taxidermist I was never mindful of, nor documented, what evidence of the skinning would or would not be left on a skeleton. Documenting the skinning of some animals while considering the zooarchaeological implications would focus the experience, aid future interpretation and hopefully provide a resource available to other archaeologists. Accounts of hands-on skinning are not widely published, although examples do exist (Strid 2000; Trolle-Lassen 1987). Obviously, the greater the body of knowledge available to call upon, the more informed an archaeologist's interpretation of finds can be.

Archaeological interpretation has to consider the evidence that can be seen, in this case whether cut marks and bone elements that are present indicate skinning. What can then be overlooked or underplayed is the evidence that can not be seen, which in this case would be skinning that had not left any cut marks. Carrying out some skinning experiments without further butchery would help highlight the likelihood of occurrence and location of cut marks potentially left by skinning, working from the assumption that, in fact, no cut marks need be left at all.

A hypothesis to be tested by experimentation is therefore that skinning a fur-bearing animal can leave no cut marks. However, from the outset the planned skinning experiments were also intended to be experiential and shared. Direct experience of a process obviously informs methodology and interpretation (Seetah 2008) and sharing that experience can lead to further insights arising from observation and discussion. The experiments described below are on-going and very much work in progress. Such experimentation may in fact never have a natural end-point: as a zooarchaeologist with some experience of taxidermy, I will never have the life-time experience of skinning that a modern or past hunter, trapper, fellmonger, furrier, etc., would acquire. However, by carrying out documented experiments I can start to build up a body of data beyond my personal taxidermy experience that will also be of use to people who have not skinned an animal themselves. The results to date are presented with the

aim of sharing the experience and enabling discussion. Each experiment is described in detail so that it can be replicated. The focus was whether any cut marks on bones were indeed likely to be made solely as a result of skinning. The results, experiential and skeletal, have not been applied to any particular archaeological data set here but used to raise general discussion points and highlight the pitfalls in assuming a straightforward relationship between the presence of cut marks on some bones and evidence of the process of skinning.

Skinning methodology

There are only two main methods of skinning: open skinning and case skinning (Churchill 1987; Kellogg 1984). Very simply, open skinning is where an incision is made along the belly of the animal, and the pelt opened out flat. Case skinning is where an incision is made from one back leg to the other, passing around the vent, and the pelt peeled off as a tube. The method of skinning used could be dictated by many factors, as touched upon above, including the species being skinned, the preference of the skinner, the condition of the pelt, how the pelt is to be cured and the intended end product.

For each skinning, the process was observed by zooarchaeologists and photographs were taken. The stoat (*Mustela erminea*) carcasses were placed in a compost heap so that the bones could be retrieved later and examined for cut marks. The hare (*Lepus europaeus*) was jointed and frozen to be cooked later, with a view to also examining the bones for cut marks. The pelts of both the stoats and the hare were put into a bucket of modern tanning solution. Variables between the experiments were documented; these were species, time since death of the animal, open versus case skinning and modern scalpel and knife versus recently knapped flint.

The first skinning was of a male stoat. The stoat had been found as fresh road kill and the skinning was carried out just after the carcass came out of rigor. A modern scalpel was used and the animal was open skinned. At the time of writing, the skeletal remains of this first stoat carcass have been retrieved and examined.

The second skinning was also of a male stoat. It was also found as fresh road kill but it was frozen for some months before being skinned. A recently knapped flint was used and the animal was open skinned. Thus two variables could be compared between the stoats: tool used and time since death.

The third skinning was of a female hare that had been obtained via a local butcher. It had been shot and was hung for a week before skinning. A sharp kitchen knife was used and the animal was case skinned. The variables introduced by this skinning were species, time since death and tool and method used.

Ideally only one variable would be different between each skinning, but that would require a much larger number of dead animals. However, the skinning of just these two stoats and one hare still enabled meaningful comparisons to be made between species, open and case skinning and blade use. More skinning experiments will be carried out when possible to build on the three reported here.

Results

The first stoat

For the first skinning, the method chosen was open skinning because this is a technique I have used on various species as a taxidermist. A modern scalpel was used, again as this was the tool I used as a taxidermist. By using a known method and tool, the variable being considered was time since death.

Anecdotal and published evidence, particularly of rabbits, suggests that the pelt of recently dead animals can be 'peeled' off with very little effort (Fearnley-Whittingstall 1997; Metcalf 1981). As this was the freshest carcass I have ever skinned, the expectation was that the skin would come away from the carcass much more easily than I had experienced in the past. This was not the case; the ease with which the skin could be separated from the carcass seemed to be the same as my experience of skinning previously frozen carcasses.

When making the first incision, care was taken not to puncture the body cavity, as this would have made the whole process very messy (Figure 4.1). It seemed that the only place where cut marks would be made was on the sternum while making the first cut, but even here the pressure of the blade could be on cartilage rather than bone. Once the first cut had been made, the blade was used to separate the pelt from the carcass, but by applying pressure rather than actually cutting to the carcass. If the pelt is kept taut, the blade is used to separate the membranes between pelt and carcass; avoiding cutting into the carcass is paramount in order to keep the process as clean as possible. The pelt was released from around the abdomen by using fingers as much as the scalpel blade.

The legs were also released by using the fingers as much as the blade, working to free the joint and push the leg 'inside-out', away from the pelt and towards the carcass (Figure 4.2). As more of the leg came free, the skinned proximal part of the limb was held firmly in one hand, and the inside-out pelt held firmly in the other, and the two were pulled apart (Figure 4.3). Quite a lot of effort was needed, but the pelt did eventually come away beautifully and left the leg, foot and claws completely intact and the pelt of the leg completely inside-out.

Great care was taken when using the blade and fingers around the vent area as the two scent glands were obvious. To puncture these would have made the process extremely unpleasant! Figure 4.4 shows how the hands were used to separate the pelt from the carcass.

The same technique as used on the legs was tried to skin the tail: once some of the pelt had been released from the base of the tail, pulling the tail inside-out was attempted. This did not work. The pelt was very reluctant to part with the tail; some pliers were used in the end to keep hold of the released part of the carcass, but eventually the tail broke, leaving some of the carcass inside the pelt, although the pelt was intact (Figure 4.5). Clearly pressure and crush marks, as well as cut marks, could be left on the proximal tail vertebrae.

The front legs were released in the same way as the back legs, and the pelt then released, again with the fingers as much as the blade, down to the skull. Only once the skull was reached was the scalpel blade used in earnest, and this time the action

Figure 4.1 *(top left), Making the first incision just below the sternum and rib cage, peeling the skin back as soon as possible with the fingers. Photo taken by Jen Harland.* ***Figure 4.2*** *(top right), Beginning to push the limb through, towards the rest of the carcass and away from the skin. Photo taken by Jen Harland.* ***Figure 4.3*** *(middle left), Pulling the pelt and limb apart, revealing the foot, which remained intact. Photo taken by Jen Harland.* ***Figure 4.4*** *(middle right), Using the hands to pull the pelt off the carcass. Photo taken by Jen Harland.* ***Figure 4.5*** *(bottom left), Trying to get a firm grip on the tail so that it could be pulled inside-out like the legs. The tail broke, leaving some of the tail inside the pelt. Note the intact feet. Photo taken by Sue Archer.*

did bring the blade in direct contact with the bone of the skull and mandibles, in order to release the pelt intact over the ears, eyes and lips.

The second stoat

The second stoat was also open skinned but this animal had been frozen before skinning and a flint blade was used (Figure 4.6). The blade had been freshly knapped by Professor M. Edmonds during a knapping workshop held at the University of York, and had been worked to give a sharp cutting edge on one face and a blunt surface on the other, to prevent it cutting into the skinner's hands. It worked exactly like a modern scalpel blade and the same blade was used for the whole carcass. There was no need to rework the blade at all. If anything it was easier to use the flint than the modern scalpel because there was no handle getting in the way.

Figure 4.6 *The flint used to skin the second stoat. Photo taken by Pat Hadley.*

The ease with which the skin parted from the carcass felt the same as it had with the unfrozen carcass, reinforcing the impression that, for stoats at least, there is no difference between skinning a fresh and frozen carcass. The areas where it was felt some marks could be left on the bones were again perhaps the sternum and definitely over the skull. Once again the vent area was treated with great caution, as this appeared to be an older male and the smell was already very strong without puncturing the scent glands. As with the first stoat, the tail was the most difficult to skin, and again it was not skinned successfully. This time the end of the tail broke off completely, pelt and bone, away from the rest of the carcass and pelt.

The hare

The hare was case skinned in order to document a different method. As the hare is an acceptable food animal, it was hung in accordance with common methods of preparing hare to eat (Fearnley-Whittingstall 1997). A 4-inch bladed stainless steel kitchen knife was used for the skinning, to compare with the scalpel and flint but also because a hare carcass is significantly larger than a stoat carcass.

The hare had been shot, although it was not immediately apparent from the carcass where the damage had been done by the pellets. What was apparent was that the hind

legs had been twisted and tied together in order to transport the dead animal, and the bones were already badly broken and shattered. The hare was initially suspended by tying one of the back legs around the foot to an overhead beam, but the pressure of working on the carcass during skinning broke the carcass away from the foot at the area where the bone had already been damaged. The hare was then held by someone else so that the process could continue as a suspended case skinning.

Making the initial cut on one back leg, down towards the vent, was actually very difficult on this first attempt because hare fur is very dense and fluffy. It was realised that the simplest way was to get a flap of fur and skin from around the abdomen, cut into that and then, with the blade orientated away from the carcass, through the pelt, cut up towards the back leg. The cut marks likely to be left were around the hocks or anywhere on the back legs where it was decided to release the pelt, i.e. instead of pulling the foot free of the pelt, here a decision was made regarding from which point it was not worth trying to keep the skin as part of the pelt. These marks would be around the circumference of the bones, rather than striations along the length of the bones. The longer blade was definitely an advantage on the hare; a smaller blade would have been lost in the fur.

No attempt was made to skin out the tail; the pelt was cut free around the base of the tail, taking care to avoid the vent region. Cut marks could therefore have been left on the vertebrae at the base of the tail.

The pelt then came away beautifully over the body of the carcass, pulling it down towards the head (Figure 4.7). Just gentle pulling pressure was needed. The front paws were cut off at a point distal to which it was felt there was no fur or meat of any use, and the legs were pulled inside-out from the pelt as for open skinning. Once the pelt was released down to the skull, the decision was made not to skin out the head. The pelt was cut through, from the inside-out, around the skull, but the blade was going through the pelt without coming into contact with the head.

Post-skinning, the head was detached from the carcass after the neck had been cut to drain off any

Figure 4.7 *The pelt peeling off the torso of the hare, requiring only slight pressure from the hand or knife. Photo taken by Sue Archer.*

blood. The hare was then gutted and jointed; the bones will eventually be examined for any evidence of the skinning and butchery. At the time of writing, the stoat and hare pelts are still in the tanning bucket, so consideration of the time of death and quality of pelt has yet to happen.

The bones

So far, the only bones that have been retrieved and examined are those from the first stoat skinning. The carcass had been disposed of intact tied within a stocking and placed in an active compost heap. The idea was to simulate the carcass being thrown on an active midden heap but with the need to keep the skeleton contained. After three months the stocking was beginning to go to small holes in places and the carcass 'rattled', indicating the bones were no longer covered in flesh, although there were still some maggots present. The carcass was removed from the compost heap and left, still in the stocking, within a plastic container on a tray outside until all signs of life had disappeared! At no stage before the stocking was cut open did it look as if the carcass had been scavenged in any way and great care was taken to make sure that no bones were lost from the container once they had been turned out of the stocking. The small holes were not large enough for the major limb bones to fall through and the stocking was checked very carefully to make sure no bones remained inside.

Although the vast majority of the small bones of the metapodia and most of the vertebrae were present, neither of the femora nor the pelvis was. Only one tibia had survived the decomposition of the carcass. The skull and mandibles were very fragmented, which was expected because the skull had been crushed by the road accident. Some of the mandible fragments showed striation cut marks, which again was expected as this was where the blade was known to have come into contact with the bone. It had been hoped that the pelvis was available so that it could be examined closely for cut marks, as it was felt that the blade never came into contact with bone in this area. The caudal vertebrae were the only place where cut marks were possibly expected. Differential survival of the carcass, however, meant that the bones of the abdomen and proximal hind legs had decomposed completely (Figure 4.8). This is very interesting, given that the pelvis, femur, tibia and sacrum are relatively large and robust bones. The most obvious explanation for their non-survival is that they were nearest the abdomen and contents of the lower gut, and the microbiota and aggressive putrefaction environment of this area must have led to a different rate of decomposition. This clearly has taphonomic implications, as the presence of only the front long limb bones would never be taken as indicative of skinning. However, if disposing of a complete carcass that has not been gutted can cause such differential taphonomy, missing bones does not mean the whole carcass was not originally there. This confounding factor is not unique to looking for evidence of skinning, but the lack of evidence, as ever, can not be taken as unequivocal evidence an event never took place.

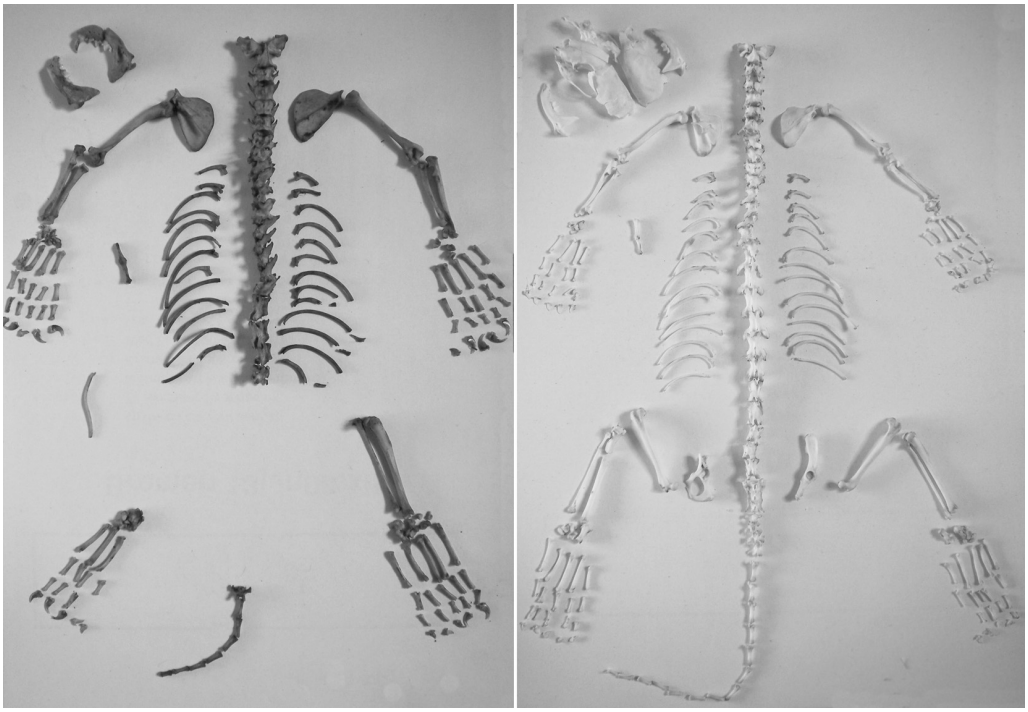

Figure 4.8 *The first skinned stoat (male) on the left compared with a reference collection stoat on the right (female), highlighting the anatomical position of the missing elements, i.e. some ribs, some lumbar vertebrae, the pelvis, sacrum, both femora, one tibia and one fibula. The baculum was not near the abdomen when it was put in the stocking; it was separate from the rest of the carcass after skinning and put carefully into the stocking. Photo taken by Eva Fairnell.*

Discussion

Carrying out the skinning experiments in the company of other zooarchaeologists greatly added to what was being learned; real-time discussion of the process and the taphonomic implications as the skinning was taking place was much easier than trying to remember, describe and discuss afterwards, and added to the learning experience for all. Even before any bones could be examined post-skinning, many issues regarding absence and presence of cut marks arising solely as a result of the process of skinning became apparent. Thus the experiments and experience informed the following discussion.

The first interesting issue was that skinning an animal that was only freshly out of rigor did not seem to be any easier than skinning a defrosted carcass. Many people who have shot and skinned rabbits have told me that they are very easy to skin: just cut off the head and feet and pull the skin off. I have also heard, talking to a taxidermist, that freshly killed sheep at an abattoir can be skinned by just pulling off the skin. The skins of sheep and goat can be separated from a carcass with air pressure, by

the skinner blowing into a small incision made, for example, around the ankle joint (Metcalf 1981; Simmonds 2001). What seems to be key is that the carcass is still warm. This has implications for the zooarchaeological record: if an animal is live trapped and killed only when the hunter is about to skin it, and the skinning is done by making an initial incision into a flap of skin and then pulling by hand, there could be a whole carcass left at the kill site with no cut marks on it at all. If the head and feet were removed and then the rest of the pelt pulled off by hand, just chop marks on the neck and legs might be visible rather than any finer cut marks. If the kill site is away from any human settlement, the carcass may never even enter the archaeological record.

On the whole, the type of tool used for skinning did not seem to make any difference. When a blade was needed it had to be sharp in order to cut cleanly and neatly through the pelt and to skin out over the head, but whether it was a scalpel, flint or knife did not matter. The only factors were perhaps the nature of the fur and the relative size of the animal; the knife, being larger, was easier to use through the thicker pile of the hare fur. If the head and feet were to be removed, a chopping tool would be better than a fine blade. However, if the anatomy of the joints is well known, a combination of a small blade and just twisting or pulling could be used to detach parts of the carcass by disarticulating rather than chopping them, particularly of smaller fur-bearing animals. One of the back feet of the hare was removed in this way, twisting and pulling, made even easier by the prior damage to the bones and joints by the shooter. In general, skinning depends as much on using your hands as using a blade.

The species being skinned is definitely a variable that can dictate how an animal is skinned, but the intended end use of the fur, and how it is processed in between, is likely to be a major factor too. The stoats were open skinned in these experiments because that is the technique in which I am practised, and I wanted this to be more than just an experiment of what happens when an amateur skins for the first time. I still do not claim to be an efficient skinner, and the skeletal evidence left by experienced skinners needs to be looked at. Using the skills of a taxidermist is also limited as an analogy for skinning an animal for its pelt, as taxidermists try to make the belly incision as small as possible and take great care around the feet and skull, possibly leaving foot bones attached to the pelt and being very careful not to cut the skin around the skull.

In modern literature, the suggested method for skinning stoats is not open skinning but case skinning. This would make sense as the method used historically, as the bellies and backs of stoats can be used to make different patterns (Veale 2003). Case skinning, leaving the pelt as a tube, would mean a decision regarding which part of the pelt to use could be made later in the process. Clearly a cut down the belly would prevent that part of the pelt being used whole. However, another way to open skin would be to make the initial cut along the back. This is an interesting variation in the method, because this time the cut could be made quite hard against the carcass as the vertebrae would prevent the blade from puncturing the body cavity. This is possibly what can be seen on dog bones from the Bronze Age site of Százhalombatta-Földvár in Hungary (Vretemark & Sten 2006).

Open skinning as presented in the modern literature definitely seems to be the method of choice for larger species, and case skinning for smaller species (Churchill

1987; Kellogg 1984). Another reason for these choices could be the method of curing the pelt. Initially, pelts are often simply air-dried, salted or frozen to halt the process of decomposition (Reed 1972). To do this, the skin-side of the pelt has to be exposed as much as possible and air able to circulate around the pelt (Reed 1972); if the skin starts to decompose, the fur on the outside will slip, leading to a poor-quality pelt (Metcalf 1981). Open-skinned pelts can be stretched and tied onto a frame; case-skinned pelts can be stretched over ski-shaped boards (Churchill 1987; Kellogg 1984). If a pelt is to be stretched on a frame, it does not need to have been skinned neatly around the extremities, as this area will be punctuated with holes anyway to take the cordage to lace it to the frame. An alternative would be to use the limbs of the pelt with some of the bones still *in situ* as part of the cordage system; other variations can also be envisaged. Each variation could leave different marks on the carcass, particularly around the limb, head and feet bones, and different associated element assemblages. One reason for skinning out the head on smaller species could be to provide an end to the tube that goes over the top of the board, preventing the pelt being simply pulled down and off the board when it is stretched.

Cut marks on the skulls of fur-bearing species are often recorded and interpreted as skinning marks but, when you consider the amount of fur that it will make available, it does raise the question of why bother rather than just cutting the head off or detaching the pelt from the carcass in the neck area, as in the hare experiment. As suggested above, it could be that it facilitates a later stage in the processing of the pelt. Alternatively, it could be that an important part of the end product is the detail of the head, retaining some characteristics of the living animal. The cut marks therefore perhaps tell us more about why an animal was skinned rather than simply that it was skinned.

Another area that often has cut marks but where again an interpretation of skinning is perhaps simplistic is the phalanges; similar marks have been seen, for example, on otter and bear (Parks 2003; Trolle-Lassen 1987; Zeiler 1987). If the head of small to medium-sized fur-bearing species has little fur that could obviously be used as part of a later product, the paws would seem to offer even less. The stoat skinning experiments showed that it is relatively easy to pull limbs 'out' of the pelt; the use of a blade is totally unnecessary. For either open or case skinning, it may be expedient to simply cut the feet off rather than skin them out; the skeletal evidence of smaller fur-bearing species from Viking Age Birka in Sweden seems to show an example of this (Wigh 1998). If it is important to retain the claws and perhaps more of the paws on the pelt for the finished product, it would probably be easier, if not necessary, to leave the claws and phalanges attached to the pelt and to cure the pelt with these parts *in situ*, to prevent them becoming detached. An alternative explanation for cut marks on phalanges is that it is not about releasing the pelt from the foot bones but detaching the terminal phalanges from the rest of the carcass. The cut marks seem to occur where muscles from the terminal phalanges pass up the front of the limb (Ellenberger, Ditrich & Baum 1956; Goldfinger 2004); to cut here seems logical if the aim is to detach the claws. The claws could have been the desired end product, perhaps for pendants or hooks, whether or not the pelt was removed and used from the animal.

Another area to consider in more detail is the tail. From the experiments, and previous knowledge, the most difficult part of many fur-bearing species to skin out intact is the tail. Historically we know that stoat tails have been a very important design feature of clothing (Grover 1936; Veale 2003), for example as recently as Queen Elizabeth II's coronation robes. For processing and the end product, they may be needed attached to the rest of the pelt; or they could be processed detached from the pelt, perhaps with some bones retained inside (Grover 1936). If there is not much flesh on the tail, as would be the case for the smaller mustelids, the tail could be cured in its entirety. If the tail is detached from the rest of the carcass, there could be chop marks rather than fine cut marks at the base of the tail. If the bones are removed from the tail, there could be compression or grip marks on the lumbar and proximal caudal vertebrae where a purchase was made in order to pull the tail inside-out. Thicker tails could be open skinned, which might leave cut marks along the caudal vertebrae, although these bones are rarely recovered archaeologically. Once again, it can be seen that a large variety of evidence potentially exists; a collection of predominantly caudal vertebrae could be the remains of tails that had been detached and skinned out separately, or tails that had been chopped off and disposed of as an unwanted part of the pelt.

A final area of the carcass that has had cut marks interpreted as skinning marks is the pelvis (Richter 2005; Strid 2000; Trolle-Lassen 1987). This is interesting because in none of the skinning experiments carried out here did it seem that the blade went anywhere near the pelvis; the observers agreed with this view. As the pelvis of the first carcass has not survived the compost heap, this cannot be checked by direct observation of the bones. However, the point can be made that while some skinners and methods may leave cut marks on pelvis, equally others will not. As has already been stated, an accomplished skinner may not leave any cut marks, and the lack of evidence must not be overlooked by suggesting skinning did not take place.

The mere presence of bones identified as a fur-bearing species indicates at the very least that the species was available as a potential resource. Looking beyond cut marks, the element distribution may indicate skinning had taken place, by showing a preponderance or lack of certain elements, but again, as had already been touched upon, a great deal of variation can exist regarding which elements remain with the carcass and which with the pelt and at what stage they are separated. An assemblage of only feet and tail bones could represent the elements initially removed from the carcass before skinning, or elements kept with the pelt and removed later in the processing, or deposition of the pelt itself with elements that were kept attached to it (Barrett *et al*. 2004).

Rather than the bones of the animals, can any part of the curing process be represented in the archaeological record? Pelts on frames and boards (Grover 1936) could easily be stacked or bundled for storage and transport before the next processing stage. Both frames and boards are simple structures that could have been used for millennia but, even if they did survive in the archaeological record, they are not necessarily going to be recognisable as being part of the processing of pelts.

After drying, salting or freezing or a combination of these, pelts have to be cured further so that they become a flexible, workable product. Tanning is a specific process during which hides are changed chemically by tanning agents to create durable leather

(Reed 1972); it is a long-term process that can leave hard archaeological evidence in the form of pits and recognisable organic residue. While something is known about the chemistry and history of tanning, much less is known about the curing of furred pelts. From historical periods, we know there can be a great deal of specialisation; tawyers and whitawyers are distinguished from tanners by using different substances to achieve different end-products (Reed 1972; Veale 2003). These end products, such as dressed furs for clothing and fine linings for gloves, have not necessarily been tanned as leather and are much less durable than leathers. Some techniques for curing pelts use the properties of fatty acids, such as found in brain and egg (Grover 1936), rather than tannins. Smoking can also be used to cure skins and pelts (Gibby 1991). Fatty acids from sources that could also be food and smoke from fires that could have been domestic will clearly leave no archaeological trace that is unequivocally the result of skinning fur-bearing animals and curing their pelts.

Despite the limited number of variables investigated and animals skinned, and the lack of recovered bones to date, these experiments have nevertheless been very informative. It is apparent that choices regarding the end product can lead to a carcass being skinned without the skinning blade coming into direct contact with bone: key factors seem to be a fresh kill, a skilled skinner, a sharp blade and no need for the head fur. Skinning out the head is very likely to leave cut marks, while skinning out the tail could leave cut and grip marks. Cut marks on phalanges could be indicative of a variety of scenarios, including releasing the claws from the carcass rather than keeping the claws attached to the pelt. While there may only be two main methods of skinning an animal, to provide an open pelt or a tube, there must be at least 101 variations that can arise as a result of the desired end product from any particular instance of skinning. Placing the act of skinning within the context of the *châine operatoire* also highlights the variability that can arise at every stage in the processing of an animal for its pelt. However, this variability, while introducing confounding factors, has the potential to answer questions beyond whether or not an animal was skinned, for example how and why it was skinned. Taken together with contextual data, it may even be possible to ask questions regarding how the pelt was cured and who is doing the processing. Only knowledge of the whole skinning process can help answer those questions.

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