

Tuesday, 18th April 2000.

(10.30 a.m.)

THE CHAIRMAN: Good morning to everyone and welcome to the first of our seminars. This is one stage of our inquiry and to a degree we will have to develop the process as we go along. So today may be part, as well as learning about the subject, may also be a bit of a learning experience as far as the process is concerned. We are very grateful to have the draft report from Professors Bateson and Harris. So far it only deals with deer, although we are intending to have work on other hunted species.

In our agenda note for today, we have suggested that the opening speaker should take maybe 20 minutes or so to present their paper. We would then have the opportunity for questions on points of fact or clarification. Then I would like to invite other members of the seminar to make points if they wish. Hopefully, that should identify the main topics for further discussions and in general terms, I would like to follow the order that the topics are dealt with in the draft report.

If I could make one plea to the distinguished members of this seminar, and that is to keep this simple. There are a lot of us to whom many of these terms are quite difficult. We have to report to a wider audience and we need some help in doing that rather than in complicating, if that is at all possible.

The other feature I would say by way of introductory remarks is that it is clear that we could

conclude from this that lots more work is necessary. We do not have that luxury. We have to come to a view about what can be said at this point, even if it means quite a lot of uncertainty. Again I would hope that people could recognise the position that we have that we actually have to write something in something like 6 weeks's time rather than seeing this as the first stage in an elaborate research schedule. That may have to follow at some point and maybe that should be done, but that is not what we can do. We have to try to come to a view about what it is that can be concluded about this subject.

So unless people have got any points to make about process, about timetable, et cetera I would like to ask Patrick Bateson to kick off please.

PROFESSOR BATESON: Thank you very much. I can tell you that Lord Harris and I felt that a lot more work was needed and when I was reading our drafts, I realised how many typos there were in it and so on. Neither of us have had to work at this rate before and I think you will find that from all people who have done reports for you. In some ways it is quite good because if we had had more time we would have expanded to fill the space available, I am sure we would have done that.

What we are going to do in presenting this is I will say a little bit about the hunting process which, I think, is entirely uncontroversial and look at behaviour. Roger will then talk about the laboratory findings, that have been obtained by both him and his co-workers and study that Elizabeth Bradshaw did, and

then I will deal with the welfare issues at the end, and get to the sort of nub of the problem.

So first of all just to talk about the hunting process, if you put on the first slide, just to -- most people will know this -- remind you that the deer hunts, which we are going to talk about today, take place in the south-west of England and Devon and west Somerset. The hunting is regarded as essential by everybody -- or the hunting and culling of one kind or another -- because if it did not happen the population would explode and it would eat out the habitat. So everybody agrees that deer need to be culled in one way or another.

As far as hunting with hounds is concerned, there are 3 hunting seasons: an autumn hunting season when the mature stags are hunted, a winter season when the hinds are hunted and then a spring season when the spring stags are hunted. What you can see perhaps from the slide is that in the early part of the seasons, the hunts are a little bit less successful than they are in the later part of the seasons and you can see, on average, about one in two days the hunts are successful in getting a deer. So that gives you a rough idea. So half of the deer hunted pretty well get away.

This is a deer escaping after an early stage in a hunt. What the hunts do is to take a few experienced hounds called tufters to go out after a stag which has been identified early in the morning, or the previous evening and chase it, get it away from the other deer and then when it has got away, the rest of the pack, the

hounds, are brought up and then they look for the scent and then follow the deer. The deer has run away fast and probably will hide for quite a while before the hounds get anywhere near. Then it will break away and go on running away and there will be a series of episodes like that and I will come back to that part in a moment. This shows the distance hunted of those deer that are killed and you can see that, on average, about -- it is hunted for about 18 kilometres. That is combining the data from both Roger Harris's study and our study. The duration of the hunts -- the mode is about 3 hours ranging from quite short hunts to very long ones.

The most interesting slide, I think, is the next one which is the speed of the hunt and you can see that the mode is actually quite low, it is about 5 kilometres per hour and it is walking speed. The reason for that is, of course, because there are periods when they are hiding and there is no movement and periods when they are moving very quickly. It is worth looking at the points right up the end, up above 25, because that was one hind, in the joint University study, which was run continuously for about half an hour and that was going full pelt and you could see it was going about 25 kilometres per hour. So they can go fast but for most of the time they are not moving at all in a hunt. That is an important point to remember when we come to consider welfare.

One interesting feature about these hunts is that the deer tend to double back and so if you take the

distance between where they start and where they are finally killed, it is on average about 5 kilometres. It is much less than the total distance travelled, so they tend to circle back from where they have come from. It does not always happen but that is the pattern.

At the end of the hunt, as you will be hearing more from Roger, the deer start to visibly tire and in this case you can see the animal is dropping its head a lot, it is panting a lot. It will have difficulty in chasing, in getting over fences and it is much less able to move than it was at the beginning and you will see the reason why in a moment. If you just take a rough behaviour really measure of just how tired looking they are -- this is what actually most people who go to hunts will see perfectly well -- you can see the proportion of animals that are described as tired is going up very sharply.

This is a deer right at the end of a hunt, it is actually standing motionless, it is taken from a video and it is taken at the moment at which it is shot. Just to be clear about the details of hunts, the deer are not attacked by the dogs at the end of a hunt, they are well trained and they keep off the deer. At that point the deer is shot by a huntsman, usually with a shotgun but sometimes with a pistol to the head.

Here is a deer gone to water, as they very often do at the end of a hunt, being chased through the water by hounds and then here is a deer actually being shot, it has got into water and it is being located by the hunts people and their shooting pack.

I think that is all I want to say at this point.

Roger, if you would like to take over from me about what actually happens to the animals as they are being chased.

PROFESSOR HARRIS: Thank you. I am going to combine the 2 studies. I am going to look at the laboratory findings and I will try to give a very brief summary. There is a better explanation in the report itself than the brief explanation I can give now.

We are considering here just 2 studies, that is the one by Patrick Bateson and Elizabeth Bradshaw and ourselves. There is another study ongoing, which is by David Denny and preliminary data is available from that, although we have not had time to look at that.

As we have seen, the distance of hunts is really quite considerable and certainly will be in excess of the distances which we might consider that deer would be hunted by a natural predator.

The questions that we have to consider are: does the intense exercise which the deer is performing over these long distances result in, at least in the early part, lead to exhaustion and lead to the deer having to exercise under fairly extreme physiological conditions? We would like to know something about the capacity of deer for being able to undertake the type of exercise which they are being asked to do. This is always a relative thing so we need to know what it is relative to the hounds.

We need to know some idea what brings -- this is one of the objectives of the studies -- a hunt to a

conclusion, what are the factors which result in the hunt finishing? We would like to know what is the condition of the deer at the end of hunting. Finally, we would like to know what is the fate of deer which have escaped. These are the sort of questions and there would have been other questions as well, but these are the sort of questions which were attempted to be answered in the 2 studies.

So dealing with the adaptation or the ability of deer to exercise. The first thing to note is that they are fairly well adapted in terms of the musculature, they have a particular biomechanical form, which will enable them to perform fast exercise and efficiently as well.

Within the muscles we find that they have a high proportion of type 2 fibres. These are the fast contracting fibres. On the other hand, they have a very high proportion of the so-called sprint type 2B fibres and we might actually from that believe that they are well adapted to sprinting but have relatively low endurance capability. In fact when you look at the biochemical makeup, even of those type 2B fibres, you find a high proportion of oxidated enzymes and (inaudible). So between the fibre types and the biochemical composition of those fibre types you have a very effective motor which is capable of sustaining very fast bursts of speed and at the same time has good stamina or endurance capability.

We can go a little bit more into the biochemistry. We know that they have very high levels

of substances which are involved in buffering, production of acid. This means they have a very high tolerance of lactic acid production and that explains why they are able to move at high speeds for prolonged periods of time. The levels of those buffering substances compared to those found in horses and greyhounds and measurably higher than, for example, those found in humans.

Finally it is worth noting they have a very large glycogen store in the muscle, in other words they have a very large amount of petrol ready to power that motor; about twice the level found in human muscle but comparably to that found in horse muscle.

We can consider 3 models in which a hunt might go. It might be, in fact, a chase between a prey and a predator where the prey is infinitely inferior, athletically, to the predator, in which case we would anticipate a very short hunt and we would expect minimum glycogen loss in muscle. We would expect low -- I put low -- in fact in the report I mentioned high lactate, probably we would expect high lactate, it just depends how long that initial sprint lasted for. In these very short hunts we would not anticipate large changes in other biochemical parameters such as cortisol.

We might consider a hunt where the prey and the predator were of equal athletic ability, in which case we would find partial to moderate glycogen loss inside the muscle. We would anticipate finding raised levels of lactate and we would anticipate now quite moderate to high levels of cortisol.



Finally, the third model would be one where the prey is initially athletically far superior in its ability to perform exercise in terms of speed and to evade capture. Those hunts, that chase, would go on for a prolonged period of time and the limiting factor would eventually be running out of glycogen, more than anything else, inside the muscle and the removal of the ability of the prey to make an effective successful escape. In those conditions we would expect low lactates and at that time very high cortisol levels in the blood. This is a very superficial picture, it is the best I can do in the few minutes we have.

The laboratory findings that we have found generally fit with that third model in that glycogen was depleted in almost all instances. The only few instances where it was not depleted in the muscle was in deer which were casualty deer and where they were athletically unable to make that initial period of effective escape from hounds. The hunts lasted for a much shorter period of time. In those deer we tended to find the highest lactate levels.

We tended to find low levels of lactate at the end of these longer hunts, consistent with lower glycogen stores. Glucose was also low but, generally hypoglycemia was not a major problem; it did not seem to be a consistent explanation for the termination of the hunt. Cortisol levels were again very high at the end of most of the hunts.

We looked at muscle pathology. All studies, including the recent one by David Denny, have indicated

increased levels of muscle enzymes in blood. These are enzymes which are leaked from the muscle tissue. The one that we are considering most is creatine kinase. We found that 9 out of 85 deer, in the combined material from Patrick Bateson and ourselves, were above a level of 10,000 units which is a level which has been suggested might be of clinical significance, but is not necessarily indicative of extensive focus on muscle damage.

The highest level seen in any one deer was in our own study, 25,000 units, and this was a young hind which interestingly had undertaken periods of both negative and positive, it could run up and down inclines, and it is this work running downhill which can often be more damaging, in fact, than any other form of physical exercise.

There was an overall trend of increasing creatine kinase with distance, after removal of the very high levels, indicative that there is probably some low grade muscle damage occurring. But to give a proper picture of muscle changes, you need to undertake ultrastructural examination of the muscle and we were very fortunate in that we had co-operation with Tim Helliwell at this meeting who undertook a mammoth job in looking at the sections of muscle, from 3 muscles, for looking at necrosis and changes in some of the earlier markers of muscle damage that is loss of 2 key proteins in muscle tissue.

We also had electron microscopy to examine further the ultrastructure. Changes were observed but did not

indicate extensive focus muscle damage, except in one deer which was the one which had gone, as I noted earlier, which ran both uphill and downhill and had the high creatine kinase.

For the most part deer showed some degree of damage but it was not extensive, it was not threatening to the general welfare of the deer, as we observe at that point, which is of course, in samples taken at the end of hunting. We can draw many parallels to other situations in other species where such muscle damage would be observed and where muscle damage would be fully recoverable from and the bottom line simply sums it up by saying the indication was clinically unremarkable, except in the one hind.

Kidney pathology. The majority of blood samples we collected and Patrick Bateson collected showed a degree of reddening, indicating that some lysis had occurred of red blood cells at the break of the red blood cells. The method, I have to say that we used and Patrick Bateson has used, was criticised. It was essentially a bisection and exposure of the jugular vein and simply cutting across. We did not use venepuncture by injection which we now wish we had done. We tried, we started but we did have some problems with that and that would be a far superior technique.

Nonetheless, there is clear evidence that some break up of red blood cells does occur in that there are also increases in the bilirubin and this was tending to increase with the duration of the exercise. But we must bear in mind that lysis of red blood cells and damage to

red blood cells will occur always, whenever any species is undertaking prolonged exercise. The damage occurs, partly because of the mechanical disruption and break up of red blood cells but also chemical damage due to the production of free radicals in the various tissues which will attack and increase, resulting in increased red blood cell fragility.

The levels of bilirubin which we observed and which Patrick Bateson observed were of an order which one would anticipate seeing in prolonged exercise, except that we really do not have any comparative data for the deer in which to really be confident about that. We can only look to other species and draw parallels. Even if there is lysis, the question is does it really represent any major problem for the deer and the fact is that probably not. Provided the deer remains reasonably hydrated, a degree of haemolysis will not pose a major threat, necessarily, to kidney function. We looked at kidney sections partly because we observed release of muscle enzymes and alongside that will occur, at least possibly, higher globin from muscle cells. Of course, there is concern about whether or not haemoglobin that we were seeing in the plasma was something which had occurred during the hunting or possibly that it occurred as an artefact at the end of it.

Out of 30-odd deer that we examined and we took sections and these were stained with 2 different stains, one of which was pressure blue is sensitive to iron containing proteins. We could not detect any sign at the

end of hunting of any major changes in the kidney which would imply that there was any problem for these particular deer. Of course, we have not looked at the changes which might occur in the post-hunted deer, 1, 2, 3 days later.

And so my last slide, which I have probably been warned off against already, we just simply want a huge grant. Some very, very simple things that we really need to still do. It would have been nice to have increased our information on the athletic and oxidated and anaerobic capacity of deer, either by direct measurements in muscle tissue, or by looking at deer performing actual exercise.

We are speaking in the dark half of the time in that we look at the deer, it has the form which enables it to perform fast exercise, it has the right musculature but we still do not know what the changes are that occur with deer if deer were enabled to exercise intensively, but under fairly unstressful conditions.

We really do need to know what happens in escape deer and the at the moment most of what we can do is just speculation. We do not know for sure at all what happens in post-hunted deer and whether or not there is any compromise of any functions but let us say at this point in time, at the end of hunting there does not seem to be any indicators of severe pathology as would threaten the welfare of the deer.

I do believe that this question of hunting haemolysis, which really seemed to have captured the

intention of the media more than anything else, does need to be looked at again. I am not saying there is not some haemolysis, I think that is fairly sure and we would have been very, very surprised, based upon all our knowledge of other species, if there was not. There must be some haemolysis but the overt haemolysis which was indicated by the deep reddening of the plasma cells, I think, it is still questioned whether this was a real finding or an artefact of the procedures that we have used. I think this needs to be re-examined using more careful techniques and that is all I can say.

PROFESSOR BATESON: Back to me now. We are asked to look at the welfare of deer and obviously this is the thing concerns us most. I think the first thing to be said about welfare is that there is no one technique that will lead one to judge whether or not welfare has been compromised. What one tries to do is to use a variety of different techniques and if they all yield the same sort of answer, then one feels much more confident than if only some them do.

Clearly, when people think about welfare they are thinking about suffering and there is a very clear definition which you find in the dictionary which defines suffering as to have something painful, distressing or injurious inflicted on one and that is the definition which most people who work on welfare will use.

We cannot get inside the heads of deer, we do not know what their (inaudible) are, but what we can do is do what we do with each other, namely we can say it is

reasonable to assume that other people are experiencing the same things as we do? If that is the case, what criteria do we use for doing that? What we do of course is to judge from the anatomy and physiology of our fellow creatures and we judge from their behaviour. Now, if it is rational to do that, it is rational also to look at animals in the same kind of way, particularly if they have large brains relative to their body size which all mammals do.

So the first question we need to ask about welfare, is whether the state of the deer is in any way comparable to a human in pain or stress. The answer to that is yes, I mean, there are very high levels of a hormone called cortisol, which is associated with a variety of things -- not just simply stress, it is also induced by exercise -- and one of the really difficult issues that we have still unresolved is the extent to which high levels of cortisol are due to fear, distress and the extent to which they are due to exercise. That can only be sorted out in a laboratory study, it cannot be sorted out the field. That having been said, there have been now 15 or so studies done on the levels of cortisol in red deer because red deer is farmed extensively and it is important that the welfare of these farmed animals is cared for. In the great majority of the studies the levels are nothing like the levels that we see in hunted deer.

There is one study where the levels are much higher than in hunted deer and we need to ask why. In this study, done by Peter Goddard and his colleagues in

Scotland, what they found was deer which had been brought into paddocks -- they were wild caught deer -- and kept for several months under farm conditions -- the animals were very stressed and quite a few of them died.

What is likely to have happened there is that the adrenal glands get larger, and as a result of that they are able to produce more cortisol. Also there may be some change in the receptor sites of cortisol; there may be some tiny regulation in an animal which is chronically stressed like that. So we feel that study is not comparable to the other ones we have got and we think at the moment there is really good reason to think, without knowing anything more, that these animals are seriously stressed, which is not surprising, you would expect them to be because they are being chased. This brings me to the second point about behaviour and a glimpse of the obvious to say these animals prefer not to be hunted. But they clearly go on until they effectively cannot go on any further. It is obvious when you watch the animals and it is obvious from the data which Roger has been presenting to you that they run out of fuel and so they are pushing themselves to the point where they run out of fuel. So that suggests, very strongly, that these animals are very strongly motivated to get away from the hounds. It is not a game. There are other things which I would say about their cognitive abilities. Do they have any sense of the danger that they are in?

Here we only have anecdotes to go on, but there



are some very striking anecdotes and some striking video too which you can see, in which for example, a deer moves down a path, stops -- this is a deer being hunted, the hounds are not yet in sight -- turns round, comes back and then goes off to one side. This looks very much like a strategy for confusing the hounds. The hounds will come pounding along, get to the end of the trail and then get lost and they lose the trail.

There are many stories of deer which are being hunted disappearing into a herd, where the scent gets easily lost, deer going into bracken, which the hounds do not like going into. Even deer actually displacing other deer, and there are some stories in the classical literature of a stag spacing a hiding stag, moving it away and then the stag is displaced and it is hunted off.

So these things, these are just anecdotes but they strongly indicate that the deer do have some kind of cognitive awareness of what is going on, unproven, but it looks quite impressive.

The third issue is the ability of the animals to cope. Are they forced to cope in unusual ways?

Well, in a sense it must be true that they are forced to behave in unusual ways, because they would not normally run to exhaustion. We know from Ray Coller studies that deer tend to move very little. They will move around about a quarter of a kilometre, if you measure their rate of moving, they have small home ranges. Even though people think they are moving around a lot because when they see them they are moving away

from people, the undisturbed deer tend to move very little. So in the normal course of events they will not move a great deal and so, from that point of view, there are grounds for supposing that they may not be able to cope and in fact they cannot cope if they have been pushed to the point where they have run out of fuel. The next point on which we really do need more evidence is the extent to which they may overheat. We did not measure temperature in our study, the joint universities did and they have a couple of deer that have hunted for relatively short distances where the temperature in the rectum was right up at the top of the clinical thermometers.

Interestingly, in their study what happened was the longer the deer had been hunted the lower the temperature. As they ran out of fuel, of course, they would be moving more slowly; there would be less heat generated in their muscles and the temperature came down. But it was still pretty high and so there is a worry about them not being able to cope through overheating. That is an issue which we can only speculate about at the moment because it is a possible source of worry.

If we turn on to the question of physical damage, Roger has already dealt with this; again, there are lots of unknowns here. Both of us would have liked to have been able to have deer radio collared and then to have them hunted, and then the hunt stop at the end and then the deer to have gotten away and then we can see what happened to these deer. In my case it was stopped partly

by local opinion and in fact the League Against Cruel Sports was very much against that study. In Roger's case he could not get a Home Office licence and so we have not been able to do that, but that would be a very important bit of science to do to find out exactly what happens.

There are scattered anecdotes of deer which have been found dead after hunts. They are more often in the classical literature than they are found in others. There have been cases in recent years where deer are found like that. There are many accounts from other species of deer that have been captured and then dying as a consequence of being captured, these are other species of deer and species of antelope. But the phenomenon which got badly named, capture myopathy, which is implying all these deaths are due to muscle damage, there is good reason for thinking it can happen, not such good reason for thinking it happened after hunts because we really do not have the evidence and there are just a few cases where we think that we did have them. But that issue of damage is an important one. The question of haemolysis, which Roger has already touched upon, I think we may disagree a bit on this. I think that the evidence is of quite extensive haemolysis and Rosie Cooney who has been working with us to do a metro analysis of the extent to which the breakdown product of the cells, the red blood cells, namely bilirubin, which is formed slowly as a result of a conversion of haemoglobin (inaudible) to this breakdown product found in horses which are being run for 80

kilometres, a lot further than a normal hunt, 80 kilometres or more, are showing something like a two and a half per cent increase in bilirubin.

In the deer which are running for an average of about 18 kilometres there is a threefold increase in bilirubin and that is in a fairly short space of time.

It takes a long time to convert from haemoglobin to bilirubin, so I think already there is a good reason to think there is a substantial amount of blood damage going on. Whether it has any clinical significance -- I mean, Roger is quite right, we do not know what the clinical significance might be but at least there is some grounds for worry there.

Finally, the question of adaptation. Now we know that deer do not move around very much. We know that they do not have sweat glands, they are liable to suffer much from overheating. We know that they are not hunted for very long by wolves. Wolves are essentially ambushers and they will not push red deer or any other species of deer for very long. There are some cases of wolves following, particularly Bison, for much longer distances but there are no cases of red deer being pushed for long distances, nothing like the kind of hunt that you see in the West Country.

So predation by wolves is nothing like predation by hounds. There are a few other predators of red deer, bear sometimes take red deer but they -- do not need to think about it very hard. Deer do not run like dogs, again they will surprise deer. Lynx will sometimes take calves, but in general that is not a source of major

predation in red deer.

So we have good reason to think that deer are not particularly well adapted to the hunting process. As you saw, the average speed is very low and that is because a lot of time they are resting. The whole nature of the hunt is that they get away at a fast sprint as we have both described, they hide and sometime before they are discovered and then they go away and get very far. It is an episodic thing of very short sprints and eventually even these short sprints wear them out and they cannot go further.

I think probably the answer to all these questions is that deer are not in good shape during these hunts. There are serious welfare problems.

Now that is not of course the whole story, because if deer were not hunted by hounds they would have to be shot in order to keep the population stable. And in our work we did do some analysis of how much wounding takes place under conditions where stalkers are aiming to kill their animals but sometimes only wound them and they sometimes cannot get them, and the deer get away seriously injured.

Now we use two direct methods: either asking stalkers to tell us what their experience has been, or asking them to keep diaries. Both of these came up with figures somewhere around 5 per cent, probably less, that were actually escaping wounded. We used another technique and I think, I had a look for example on there, but I have got an overhead.

We know roughly the population of the Exmoor deer.

There are counts done there every February and a very conservative estimate of the deer is about 2,500 deer die. That is taken at the end of the winter, and by that time some 20 per cent of the population will have died one way or another. So we can reckon that at the time of calving there will be something like 3,000 deer on Exmoor. Now in order to maintain a stable population 20 per cent of that population will have to die each year and these are based partly on empirical data, partly on theory, so a 20 per cent cull each year. If we assume that the hunts are killing up to 150 deer and another 100 are dying from various other causes, that leaves 350 for stalkers to cull each year to maintain a stable population.

If the wounding rate is something like 2 per cent, then you will see there will be seven escaping wounded. If it was 15 per cent then there will be fifty-three escaping wounded, and clearly those numbers are greater if we have a population which is larger than 3,000 which many people think it is. So with a high wounding rate there ought to be a lot of wounded animals around on Exmoor. In fact only up to nine of the casualties which are found each year are attributed to stalking, the rest are due to road traffic accidents and mysterious things happening, possibly explained, but they are not due to shooting. So it looks as though, again, using this indirect method, that the level of wounding on Exmoor is pretty low. What we do not know is how long the animals that are wounded survive for. If an animal is shot in the belly it will probably die within

two or three days. If it is shot in the jaw, and occasionally deer have been found which have been shot in the jaw, they might survive until they are starved and that might take several weeks.

So there is a dispute about how one sort of calculates this, but clearly there is some facts here which we need to get if we want to really make a proper balance between these two methods of culling. But it gives you some sense. At the moment it looks as though the stalkers are doing a pretty good job. They are killing the animals without many of them getting away. So to conclude, we are left with two methods of culling and to a certain extent if we are thinking about humane ways of doing it you have to choose.

Now there will be obviously sharp divisions of opinion within this group about that.

I am going to quote, if we now have that,

J. Kirkwood who has recently reviewed the various studies which have been done on deer. I thought what he said certainly represents my view that:

"If managing deer populations with minimal suffering is the goal here then, where culling is necessary, shooting with very careful attention to procedures to minimise the risk of missed shots still appears likely to be the most humane route to pursue."

This is obviously something which people will argue about, but that is certainly my view.

THE CHAIRMAN: Thank you for that helpful presentation. Although Roger could not resist the temptation to ask for more work I think he did jolly well on my

request which was to keep it in a form we might begin to understand. I cannot say that was the case with all of it as far as I was concerned but a large part of it I think was achieved.

I would now like to move on to the next step which is to take points of fact and clarification other people in the seminar might have. I would prefer the issues not to be a stage for other people's opinions. I would like to come on to that after we have cleared up if there are any issues of fact or clarification, and if there are none we do not need to dwell on this at this stage, but it is simply to give anyone the opportunity to raise those issues and I would then propose to go and ask each member of the seminar, individually, if they have anything to say by way of comment and their own views on it.

PROFESSOR MORTON: Thank you Mr Chairman.

My name is David Morton from Birmingham.

I wondered if I could raise two points. There seems to be an awful lot of -- no, I do not know how much work is being done in the carted deer, because there you have an animal that is hunted, albeit on different terrain, and no mention was made of the muscle condition of those animals, whether they were hunted twice a week, or twice a month, or what happened and nothing about cortisol levels, so I would be interested to know if that is being done and what the results were.

The second point is that I was impressed by two parts in the report; one is that it said the deer were dazed, and another one that the blood clotted when you



tried to take it through a needle. And I wondered whether you had looked at the retinas of those animals, looked at the eyes, had they become blind because of some microclot in the retina? Were they fully sighted, in your opinion, when you looked at the histology of the eyes?

PROFESSOR HARRIS: I am going to take the second point first; no, quite honestly. We tried to collect samples by venepuncture only on one or two occasions. There were delays in those particular instances and they may have contributed to clotting occurring.

When we started the study we were very aware, or conscious, of the disruption that we would be causing. Our original plan was to in fact collate both blood samples and muscle samples at the site and this would be the preferred technique, but we were very conscious of the disruption we were causing. Certainly, we were conscious that the study itself, the second study, would attract attention and we did not want to put them to the people in the area involved to that exposure, so we eventually took, for pragmatic reasons, carried on with the technique, which in fact had been used by Patrick and Elizabeth Bradshaw, and samples simply by exposing, cutting and collecting free flowing blood from the jugular.

So I really cannot -- I do not think you should take too much note of just that one observation. We do not have any clear indication that blood regularly clotted. David Denny, however, has continued and he has been collecting blood by venepuncture and I believe it

is true to say, if you just nod your head, that in most instances clotting is not a problem; is that correct?

MR DENNY: That is right.

PROFESSOR HARRIS: Was clotting time measured.

PROFESSOR BATESON: Clotting time was not measured.

Can I say something about carted deer? We have been trying to get a full report of the carted deer study, which has been done, and I have seen one report which is a summary of what has been done, I have not seen all the details. Unfortunately, they did not measure cortisol which is a great pity. They did measure creatine kinase and that does decline in the deer after they are captured. They go back to the places where they are kept.

It should be said that the carted deer run for a much shorter distance than the deer on Exmoor. They run for something like 9 kilometres, if I remember rightly and it is over level terrain, so it is a quite different sort of experience. I think in the combined studies that we did, as Roger mentioned, we had 9 out of the 85 deer, for which we had samples, which had very high levels of creatine kinase and that may well have been used for sprains or other kinds of damage took place. Going over very uneven territory, sometimes running down hills very fast, sometimes having to dodge around, so, I do not think any of that would happen in a carted deer chase. So, unfortunately there are certain things we cannot compare between our studies and the Irish studies. It is a pity they did not measure things like cortisol, we do not have it here.

PROFESSOR HARRIS: I think the other point is the carted deer of course were not shot and one of the things that we have been concerned about for sometime is that in some of these sort of high creatine kinase levels may have been due to infiltration of damaged tissue into the blood, bearing in mind the very, very high activity of creatine kinase in the muscle tissue it would take a very, very small contamination to contribute to raised values. I am not for a moment suggesting this is the explanation in all, it may be just an explanation in one or two cases. I am fairly convinced, in fact, based upon the ultrastructural, the electron microscopy and the microscopy saying, for example, one deer which I noted which had the very high CK level, clearly did have evidence of general and focus possible damage and I do not think there is any dispute in that particular incidence.

One thing I would caution still is that the CK values appear very high; of course they are in thousands which always gives the indication of very high numbers. We must bear in mind that you can get widespread low grade damage. This will almost certainly occur in any animal which has been exercised for a long period of time. The damage that we are really concerned about is extensive damage which is leading to disruption and breakdown of muscle cells and that needs to be examined in techniques other than simply looking at the leakage of muscle enzymes.

THE CHAIRMAN: Would you like to follow up.

PROFESSOR MORTON: I was interested to know how frequently

the carted deer were hunted because by tradition they would do it presumably in a way that would not be disposed to this animals dying; so how often are they hunted?

PROFESSOR HARRIS: I cannot comment on that.

PROFESSOR BATESON: It is two or three times a year.

PROFESSOR HARRIS: I think it is very disappointing we have not been able to obtain the data. Patrick and I have both made attempts to see the data and see the results, but we know more or less what things have been measured and it is very regrettable that where they could have measured something like cortisol or one of the other parameters, which would have enabled a better comparison between the present data that we have and their data, it would have been very helpful despite the shorter distances and the different terrain over which they hunted, useful comparisons could have been made. However, we know that data was not collected and we also have been notably unsuccessful in obtaining and seeing the data from those sites.

THE CHAIRMAN: Well, thank you very much.

I would like now to offer other members of the seminar the opportunity to comment on what they have seen. You do not have to take the opportunity at this stage, but if you would like to comment then we would like to hear from you.

Could I start with Dr Kirkwood and work our way along the row. Do you have anything you wish to say at this stage in relation to the paper body presentation.

DR KIRKWOOD: I think not, thank you.

MR SQUIRES: Not at this stage. I think a little later.

MR YOUNGSTON: I think the same.

MR HELLIWELL: I think it might be helpful at this stage if I clarified the structural changes that Roger has referred to occurring in the muscle at the time that the end of the hunt. My background is in veterinarian muscle pathology, but I had an interest in trying to recognise damage to muscle for over 15 years and have developed various techniques, and I was asked by Roger to participate in this study.

The questions really were: was there evidence of damage at the end of the hunt and if there was what was the severity of that damage? To be sure that the changes we were looking at were related to the hunting and were not some artifact of the collection of the tissues, I was keen to use a variety of techniques which is why you have heard the terms like stained, desmin and dystrophin which I have used to try and support other changes that were present, and if I could just put up one overhead which I think will summarise the typical changes that we saw in these muscles.

What I was particularly looking for was evidence of necrosis, and on the left-hand of those three pictures there is one fibre which is pale, the other fibres are pink and the pink ones are normal. We are able to show exactly the same fibre with other stains showing loss of stain, which is one way was convincing me that this was genuine damage. That is a fairly typical appearance, that is medium power microscopic magnification. Each of those pictures there are probably

about a thousand fibres, so we are looking at one fibre in a thousand which is damaged. There was the exceptional deer which did show more damage than that, but that is a fairly representative view of the amount of damage. What does that mean? I think it probably is just coincidence we are sitting here two days after 30,000 people ran from just down the road here. I would think if we could have the opportunity to look at the muscles of those people they would show a similar degree of damage, probably rather more.

I view this as very mild damage. In my opinion there is no evidence for catastrophic damage that would actually limit the ability of the animals to have had structural damage not biochemical. The unknown factor here is what would happen if the animals escaped. We know from other studies that damage tends to become more obvious over a period of two to ten days after severe exercise. That is an unknown, and although we are not plugging further research, that is obviously an area that could be explored.

THE CHAIRMAN: Thank you very much. Dr Naylor.

DR NAYLOR: Are you just looking for factual, or general points?

THE CHAIRMAN: No, moving on now in a sense to any comments about either the paper or the presentations. I think I want to widen the debate. I think afterwards we will try to home in on some of the questions that have been raised and some of the conclusions and just to see to what extent there is a consensus.

DR NAYLOR: You just want us to start bringing up points.

THE CHAIRMAN: That is right.

DR NAYLOR: This whole thing is clearly an examination of physiological changes in animals when they are exercising, being hunted, and some relationship of their behavioral responses. It seems pretty clear to me, in my background as a veterinary exercise physiologist, that these are pretty athletic animals. Roger Harris has presented data looking at the muscle fibre types, buffering capacity, glycogen storage.

The species I work with almost exclusively is the horse which is another super athlete, and to my mind there are some distinct similarities there. We have been in contact with Valerius Geist, who is the expert on deer biology, and I am pretty happy that they are very well adapted to the sort of exercise that they are encountering here and the very fact that they can exercise in the way they do illustrates that they are well adapted for it. I do have a problem with this question though, of putting it to context, their feelings in relation to what a human would feel, for instance, in relation to temperature elevations and in relation to blood lactate concentrations. We will regularly run horses to very high lactate concentrations in training, they do not go sour in training because of it. We run them on treadmills, they do not refuse to go on, which they would do otherwise if they were not just stimulated, but lame.

The other one is temperature elevations. High temperature elevations in these athletic animals -- these are likely to have high aerobic

capacities, that is relating to high capacity to take up oxygen. All of the muscle picture points to that and so it is likely that they are going to sustain large temperature elevations in the natural course of their exercise response, as do horses and other athletic species; dogs. To relate their sensation of discomfort with that that a human will experience under similar physiological changes to my mind is totally erroneous. This also extends to the comments that the deer do not have sweat glands. Well, there are many, many different mammalian species that have different adaptations within a regulation. Look at the dog, for example; a very good athletic species, no sweat glands. They have panting levels and they are able to sustain prolonged exercise; Huskies, high intensity exercise, Greyhounds, without suffering great thermoregulatory disturbance. The temperature measured in these deer are compatible with the sorts of temperatures measured in exercising horses; so that is a starting point.

Another point that came up was the point about -- again relating behaviour and physiology -- that you cannot continue to exercise further at the end of the hunt. There is some reasonable clarity in that but they cannot continue to exercise at the intensity that might be required to keep escaping with the hounds. However, the point is even when their muscle glycogen stores are depleted they can still utilise fatty acids, but that will fuel the muscles at a relatively lower rate. They could continue to exercise but again there is a relationship between behavioural responses, they turn



and stand at bay as a defensive posture. Some of the young stags early in a hunt may turn and stand at bay for short periods as a sort of posturing, as it were, to the hounds. Then they will often of course break bone and carry on. So one has to bear in mind that these things are going along together and these things are subject to very different interpretations. The first half of this report is looking at the physiological changes, there is more agreement in regard to that, the second half of the report is pretty well using certain bits of physiological evidence in relation to one view on the behavioural changes in this particular species. So I just want to reinforce that.

One other comment that came up in the discussion was comments on the number of stalked deer that have escaped and a few of them are found as casualties. That seems to me some of them are found as casualties. If there are a number of these -- the next point I am making here is that if there is a concern over hunted deer escaping and then suffering and dying from myopathy and infectious diseases being proposed because they are compromised then where are those? Because they as far as I am aware, correct me if I am wrong, there are not numbers of those animals found after hunting than those people doing the hunting obviously would have some idea of the locations where they may be.

So those are some preliminary comments that I would like to make at this stage.

THE CHAIRMAN: Thank you.

MR SWIFT: Thank you very much.

I come to this problem from the point of view of what is going to make good sensible wildlife management, particularly of deer populations, and I have obviously followed John Swift from BASC -- followed Professor Bateson's work with great interest and my concern would be that one becomes preoccupied with what is in itself a very fascinating and important area of study and research, and preoccupied not just with the pathology and physiology of animals which are being hunted, but also preoccupied with the pathology of the individual animal which is being hunted as opposed to the benefit of the group or population which is also associated with that hunted animal. And I think that in trying to reach a conclusion about what is going to make good deer management, there are so many different aims and so diverse local circumstances that I would just urge at this stage that reconciling those differences and those interests really ought to be left to local people who are able to judge local circumstances in the light of social conditions which apply locally. If we caution against seeking to decide on the desirability of various forms of control, and here obviously we are talking about stag hunting, by reference to a preoccupation with pathology or with a particular form of culling strategy, then in my opinion we might be doing the deer a disservice.

If we consider numbers only, which was where I believe Professor Bateson was coming to at the end in terms of how many deer need to be culled, there appears to be almost universal agreement that shooting with a

rifle is the most effective method.

The practitioners and organisations consulted appear to agree that shooting by day is the most effective means of achieving the numbers to be culled.

Shooting is also regarded as humane and

Professor Bateson's discussion of the wounding rate, which he estimates at around 2 per cent, leads him to the conclusion that it would seem that efforts to train stalkers to high standards have been successful, and I would agree with that conclusion.

But these comments which -- and this particular study still cannot drag me away from the central contention that we have that the circumstances of each area, whether we are looking at Scotland or the South-west of England, are unique to themselves and the people who manage attractive land are best able to assess whether any form of control is appropriate and if so what form that should take.

If they were to make a mistake it would be the local land owner or occupier himself or herself who loses the process and the process is therefore to some extent self-policing.

If we look at the South-west situation, and Professor Bateson drew these figures out for us, it is estimated that we are looking for an annual cull of 20 per cent of the autumn population, required to arrest the population growth in red deer in the South-west. But the hunts they say account for only 2 to 4 per cent and therefore the hunt cull has to be supplemented by other means. But the fact is that this combination

suits the area in many different ways, and disturbance of a long established pattern in countryside management as an ecology can lead to undesirable and unforeseen consequences, and listening to the presentation that we have heard this morning, the word "preoccupation" sticks in my mind. Thank you.

MR ADDISON: A brief question on the first slide and the first welfare principle. Does the physiology resemble what is seen in humans in unpleasant situations? To me there is a control group missing. Can it also be found in humans who are in a not unpleasant situation? Because of diagnosis in many ways, the diagnostic order, with everybody that I have worked with, can either mean a creeping disease or nothing that matters very much within a group. We need to look at the benign situation as much as a nasty situation. Would that be a general criticism of the way welfare science brings out the possibility that the physiology could be found in a non unpleasant situation? Would that be a genuine criticism only; principles.

THE CHAIRMAN: Okay. Maybe we will take points together and I will ask Roger and Patrick to respond. Dr Wise.

DR WISE: Thank you Lord Burns.

Today, Ian Addison and I, Douglas Wise, are representing the Countryside Alliance in this seminar but we are here as scientists as well in a personal capacity. The animal welfare aspects of hunting is an extremely difficult area for scientists and there is little in the way of scientific evidence, and what there is relates principally to deer and is hotly contested.

Obviously, I am talking about hunted animals.

I should state at the outset that the Countryside Alliance and hunting organisations are in our experience opposed to all forms of cruelty which the law defines as unnecessary suffering. We feel very strongly that the Committee should use the greatest rigour when considering what is meant by suffering, because terms such as stress, distress, suffering and poor welfare all have been used in the past and continue to be used interchangeably and often in different and incorrect contexts, and this has often led in our view to poor science.

I will attempt to define stress to see if anybody may disagree, but we are suggesting that it is a mechanism to promote and adapt a response. It is not in itself a cause of poor welfare. Suffering is defined by Professor John Webster in his submission to this inquiry as:

"Animals suffer when they fail to cope with the stress of life because these are too severe, too complex or are too prolonged."

Scientific language usually refers to this state of affairs "as poor welfare".

In this context I am satisfied, as a scientist, that hunted deer do not undergo unnecessary suffering, because the necessary suffering that deer do undergo during the final stages of the hunt is at least no worse than the suffering caused by stalking.

Deer have to be culled and the only two available methods are hunting and stalking. Since there is no

reliable evidence that hunting causes any greater suffering than stalking, then even applying the so-called precautionary principle for welfare, hunting should not be banned.

Hunting and stalking both cause suffering. The former, of low degree to most of those hunted animals that are eventually killed. The latter, of high degree to fewer animals. Furthermore, and I think this is extraordinarily important, the contribution to deer welfare that is made currently by the casualty service of the hunts is certain and it is now in place. Replacement services which would distribute as much to the welfare of the deer are very much speculation. Physiological findings, in our view, do not support Professor Bateson's conclusions, either in his 1997 report, or in his own section on animal welfare in the draft joint Harris/Bateson report to the inquiry. I will give two examples but I could obviously go on for a long time.

First, at page 66, Professor Bateson says that the chase of a red deer for average distances exceeding 19 kilometres produces physiological changes that could hardly be more severe. And that the suffering is likely to be very great. This is really totally inconsistent with the first part of the report coauthored by Professor Bateson and Harris.

Second, at page 42, Professor Bateson has relied on references by -- and I have difficulty with pronunciation with the chap, I think called Seiffge in 1983 and Taylor in 1983, to support his assertion

that red blood cells of red deer are known to collapse in sickle-like shapes in response to exercise. We have checked these reports, and I am unable to find any support for this assertion. In fact what the reports actually say is that these changes have only been observed in laboratory conditions and do not occur in deer as a response to exercise.

The subsequent Francis and Johnson reference, 1991, referred to on page 42, also appears to have been similarly misunderstood because it only refers to the clogging of fine blood vessels in humans, not in deer. In humans the physiological circumstances for sickling are the opposite of those in deer. Therefore, the conclusion that red blood cells of deer may collapse in response to exercise and may clog fine blood vessels is not correct.

Professor Bateson has also used behavioural observations in synthesis with his physiological science. We can only say that there appears to be a paucity of raw data on these observations.

Specifically, Professor Bateson has generalised about the welfare cost of the kill on the basis of only two observed instances. It would help the scientific debate considerably if Professor Bateson were to put his raw data in the public domain.

Whilst hunting is at least as humane as stalking, I accept that for a short period in the final stages of the hunt, a deer may experience some difficulty in coping. However, it is dangerous to assume that deer suffer for prolonged periods during the chase just

because humans would do so when experiencing similar physiology changes to those found in hunting deer. As Professor Geist has explained, deer have evolved to cope with the stresses of prolonged chase. Such stresses occur regularly in the life of preyed species and would contribute to its evolved adaptation. It is likely, but science has yet been unable to demonstrate either way, that the ability psychologically to cope with the stresses will have evolved in parallel with species' physiological adaptation.

The welfare stresses of hunting have wrongly been considered in the past in isolation, due to the emotive nature of the subject matter. An examination of welfare issues, of animals in general, rather than in isolation, strongly suggests that people's perception of poor welfare is highly dependent on the context. I will cite an example: it is very easy to argue that the captivity and treatment of damaged wild animals in welfare hospitals has a high associated welfare cost. This would be true whether the indices of welfare used were those of Professor Bateson or some other set of indices. Finally we note that the report does not refer to other quarry species although it is envisaged that sections will be included at a later date. We would hope to be given the opportunity to comment on such sections before the final report is made. Thank you, Lord Burns.

THE CHAIRMAN: Thank you very much. Mr Swann.

MR SWANN: Good morning Lord Burns and Members of the Committee, this is becoming a weekly rendez-vous.

THE CHAIRMAN: Sometimes even more than once a week.



MR SWANN: David Morton has already introduced himself, and he and I will represent the interests of Deadline 2000 today. David, as well as holding his chair at Birmingham, is Chairman of the Animal Welfare Science Ethics and Law Veterinary Association, and I shall leave it to David to speak about the science because I am not an academic.

My background is in welfare risk assessment, which is how welfare is applied on the ground, and in this respect in advising the British meat industry of the International Whaling Commission and other bodies, on how decisions for animal welfare should be made. Basically this method of looking at risk assessment is to start from looking at the animal behaviour and to try and make sensible decisions, and to try and apply the science to it in such a way that you can gain support for opinions that you have made. We may sometimes be wrong, because common sense judgments are not always as obvious as they seem, but as the science develops and as the science comes alongside, then opinions can change. One thing in looking at risk assessment is the way in which any animal is killed, whether it is in the wild or in a domestic situation, should try and minimise the distress that is caused to that animal. What that distress is is arguable and I am sure that many people will debate this for years to come. But basically, irrespective of the definition, what we can say is that if an animal can be killed with least disturbance in its natural environment, then we can make the assumption that that animal is going to suffer as little as

possible. And so I have always felt intuitively that chasing animals with dogs is wrong, but that is a common sense judgment, and now we have some scientific support for this through Professor Bateson and Professor Harris that there are physiological parameters which can be applied which support what has always been a common sense judgment.

I would like to sympathise with those two over the haemolysis problem. I have taken many thousands of blood samples and have been dogged throughout my career by haemolysis, and I do sympathise very much with the difficulties, even in venapuncture.

The couple of points I would like to take up, one is with the shooting statistics. I actually run the -- I live in the north of Scotland on one of the big Scottish shooting estates and, although shooting is now primarily for conservation reasons and not for stalking, the game keepers and people who work on that estate were quite surprised by the mis-hits that you actually described in your paper, and felt that their level of accuracy was much higher. This is something that the organisations which I represent have always had a strong view, that shooting -- to go back to James Kirkwood's definition -- if it is done properly, is a very humane way of killing animals in the wild and they would certainly expect to have miss rates and loss rates far lower than those that you quoted in the West Country. I have one other point that I am a little bit concerned about. We have heard a lot of referrals to work on horses and this does raise concerns for two

reasons: the concerns of those related to fitness. It is a little bit like taking the Rolls Royce down to do the groceries and, in the days when cars were built traditionally, you eventually had to take them out on the motorway to decoke them. Most horses are kept at a very high level of fitness, and so, if they are taken out for bursts of exercise for which they are designed, then it is less likely that you will see stress-related problems. However, most veterinary surgeons will be aware of the horse that has rested all week and taken out for a sprint at the weekend and develops a syndrome called tying up, which is very, very painful and which is as a result of the fact that that horse is not fit; it is not exercised on a regular basis.

I have made the point that deer, in most studies, are a sedentary species and suddenly to be put through what is an excessive amount of exercise, if that is indeed what it is -- we believe it is, I think the only way you could humanely come clear is by doing it every day, and to actually build up the level to a point where you have reached an exercise tolerance level. Those were the principal concerns. Just to basically reiterate that shooting, obviously from our organisation's point of view, is the preferred method, and secondly that Professor Bateson and Professor Harris have just reinforced what we have always said. Thank you.

PROFESSOR MORTON: I think I am here not as representing Deadline 2000, I just want to retain my veterinary independence. I would like to pick up on some of the points that have been made as well as make some fresh

points.

It seems to me that the matter in hand is one about how animals are feeling at a particular time and that is notoriously difficult. It is about mental states; it is about psychology of animals. The report that we have in front of us is one about subconscious changes in terms of the animal's physiology by and large.

Animal welfare science is a growing discipline.

There are two dedicated journals to it; there are probably hundreds, if not, thousands of papers written about animal welfare, and there are many textbooks. It is about whether the well-being or welfare of an animal is good or bad. That concept then embodies things like animal suffering and in the law of this country animal suffering is recognised as occurring, because unnecessary suffering is an offence.

Secondly, it can be assessed and that is what the courts of law do.

Thirdly, it asks a question whether it was necessary to cause that suffering.

Fourthly, whether it was avoidable in any way or not and I think that there are still key questions that are on the table today.

In humans we cannot ask babies whether they feel pain. It seems to me that not only is the scientific evidence pointing to the fact that they probably feel more pain than adults at the present time, but we do not simply say that babies do not feel pain because they cannot speak. We try and use other measures and that is

really where I think Professor Harris and Bateson and other people would like to get more money, in order to try of look at this perception of conscious feelings and self-awareness in animals and how far they are aware of their circumstances; about what is happening to them. As we cannot ask them, one of the approaches is that we use a critical anthropomorphic approach, which is to say humans and mammals are very, very similar. I believe Dr Wise used this approach when he said that a woman eaten alive recently did not feel any pain. By the same token if we take that as an approach we have to ask similar questions of whether the Zimbabwean farmers at the moment, when they are pursued by the war veterans, are frightened in anyway. If we think they are, by a perceived threat, then perhaps deer, because of their similarity in terms of structure and function, may also perceive the hounds or the hunt as a threat. After all that is probably why they try and move away from it. In laboratory animal work there is a condition called learned helplessness, where animals are exposed to an inescapable physical workload, and this causes them to go into a state called learned helplessness, which is being used as a model of depression in humans. It is undoubtedly true that there are some mental effects of exposing animals to an inescapable threat. So the question in my mind is coming down to one of how do animals think? What are they thinking? Do they, first of all when they are aroused, move on to say: "That is okay, I am going to move away now." Do they now go on to anxiety, being concerned and when they

feel, as I think is generally conceded in the last 20 minutes of the hunt, -- where that figure comes from I am not sure, but maybe it is not an unreal estimate -- that it is now inescapable, at which point perhaps they are feeling terrified that they cannot get away from this threat.

In a way this is very difficult to prove scientifically. Dr Patterson was arguing that some of the responses that have been measured like cortisol response, steroid release from the adrenal gland, actually occurs during many other normal activities as well and I think that is absolutely right.

But perhaps it is a question of degree to which this cortisol is released and I think Professor Bateson picked that up in the table with Professor Harris. I think they showed that simply confining animals or restraining them in some way certainly raised levels of cortisol more than when they were simply being shot and when they were grazing. When they were hunted they got up to something like 20 times higher than normal.

Similar work in sheep have shown that they respond to herding, they respond to transport, in terms of their cortisol steroid levels, but a highest level that was recorded in this one experiment was when they were exposed to a dog. It was a sheep dog that raised the level of cortisol steroid the most, so I suggest we should not use it as a blunt instrument but we should use it as a matter of degree.

On that point I think it is a matter of the weight of evidence. There is no one way in which we can measure

pain. There is no one way we can measure distress. What we can do is just take several scientific parameters and build up a body of evidence which makes it seem more likely that animals are suffering in that way.

So I think that is all I want to say at the moment, thank you.

THE CHAIRMAN: Thank you very much.

Before asking Professors Harris and Bateson to respond, could I just ask again whether Dr Wise or Dr Kirkwood have anything to say at this point? Then I will ask Roger and Patrick to, in a sense, round up their response to what has been said so far.

DR KIRKWOOD: I think it is clear here that both methods of controlling deer can lead to unpleasant feelings in deer. On the one hand, being chased by hounds may cause unpleasant feelings, at least towards the end of the hunt, in a large number of deer. On the other hand, those that are shot, those few that escape, will undoubtedly suffer the consequences of being shot. The debate in animal welfare is very often between people with conflicting views about these kind of situations, and how to reach a decision about which is the right view.

It is very difficult of course, because we cannot have any immediate access to an animal's feelings, and there is a danger in that what we think is right for the animal may be out of kilter with the animal's own perception. One approach that has been developed in recent years to try and get the animal's own view on whether it should be a case of a laying hen protecting a

small cage or a large one, is to try and develop ways of getting the animal to tell you what it thinks is best.

The thing that worries me about these deer that are chased for long distances is that the evidence from both Professor Bateson and Professor Harris suggests to me that these animals are running until they can run no more. In doing that they are telling us, as well as they are able, that they do not like being chased.

MR SQUIRES: My Lord, I would like, if I may, to come back to a couple of points raised around the table which is what I thought would probably happen, and specifically the issues raised by Dr Wise. He said quite clearly that hunting, in his opinion, caused low degree suffering in deer and that shooting caused high degree suffering in deer. I have difficulty with that concept, because I cannot actually see where the figures and the statistics are to back up that particular line of logic.

Can I say that I believe that we need to look very carefully at the results of both studies that we have heard of today. Both studies say quite clearly that deer suffer stress. They suffer stress to a lesser degree in the early parts of the hunt and it is accepted now that they suffer a greater level of stress, subject to each individual modified, in the last 20 minutes. I would suggest to you that that happens in every single case where the deer is hunted. So every single hunted deer is subjected to that level of stress.

Where shooting is concerned we have heard about the standard of shooting, the level of excellence and accuracy and so on. Like most things, unfortunately,



there are very few statistics to back it up. But certainly from my own personal experience I would say that the figures that Professor Bateson was quoting, in terms of injury rate, are regarded within the stalking world as being a fair assessment of they believe the situation to be on the ground. It does vary a little bit from region to region but his figures are not inaccurate, in our judgment.

What that says to me is that if you assume that 98 per cent of the deer are shot with one shot first line kill, and if you assume that in most cases the deer is not aware of the presence of the stalker, which if the stalker is at all competent there should not be, there is actually, I would suggest, precious little stress induced in the deer prior to that shot being discharged. The stress that Dr Wise is talking about occurs in the few instances where the first shot does not kill the deer and either the second shot is required, or regrettably in the odd instance, where the deer may move and it requires some following up.

I have not worked out the statistics quite clearly, but I would suggest to you that there is no basis for suggesting that shooting overall causes high suffering and hunting causes low, for the logic that I have just suggested. One could argue, based upon the Bateson figures, that only 2 per cent of the stalked deer actually are subjected to anything like suffering in the way that we have defined it.

THE CHAIRMAN: Could I just put one question before I ask Roger and Patrick to respond.

In the case where deer are shot, even when they are shot successfully, are they killed instantaneously, or is there some period between them being shot and actually dying? Are we talking here of seconds? Are we talking of minutes? I think I have read evidence which suggests that unless deer are actually shot in the head, which is not the normal thing, that death in fact is not instantaneous, but I do not yet have a clear view about what the gap is.

MR SQUIRES: There has been considerable debate on this issue. The first thing is, you are quite right, head shots are not recommended. The recommended area for a shot is the heart and lung area, and the reason for that is it is a relatively large area and a shot from a lethal rifle into that area will virtually guarantee, I cannot say 100 per cent, but virtually guarantee -- we are talking about maybe 1 or 2 per cent of shots in those areas which will not, for good reasons, cause the deer to die.

There is, however, generally a delay -- I say generally -- some deer shot in the heart and lungs will collapse straight away. There will be a small movement over a matter of seconds and then the carcass, the animal, essentially will be still. You carry out the reflex response on eyes, and for all intents and purposes the animal is dead. So we are actually looking at a period of time measured in seconds. That can extend, depending upon whether the deer is aware that you are there or not. A shot in the same area can cause it to run, but invariably the run is limited to probably

somewhere between 30, 40, 50 yards, no more, before it collapses, at which point it then dies.

If you actually then have a look at the impact of the bullet, in most cases you can see that that shot was a telling, killing shot. It would have destroyed the heart or the lungs, but the deer, still had sufficient reserves to be able to move over that relative short distance. I am not a scientist -- you will have to get the scientist to explain the reason why that is the case -- but nevertheless the animal is dead.

The other recommended place for shooting is in the neck, but that is only at short range and only recommended for very capable, competent shooters. You are aiming at the spine, and the aim is to separate the spinal column. In a case like that, if the spinal column is severed, quite clearly the animal is, for all intents and purposes, dead. Certainly the lower part, the rear of the animal is dead, although obviously there is still activity going on in the brain. A number of people have done some interesting work trying to determine at what point all sensation in the body ceases, all heart activity, all brain activity ceases. There are figures available in the market to indicate that.

But what I would say is that although the deer does not instantaneously fall dead, in a number of cases the damage caused to the animal is mortal, and the length of time that it will survive is measured in seconds, not in minutes.

I cannot be more precise than that.

THE CHAIRMAN: Mr Swann, I think, would like to --

MR SWANN: Thank you, Lord Burns. To add a further point on that, this issue was debated at considerable length with the International Whaling Commission's Humane Killing Workshop, with regard to shooting injured marine mammals that were actually at sea. What it was hoped to achieve was to reduce the time to insensibility as far as was practical, not instantaneous insensibility, but what was practical under those conditions.

Insensibility is important, not death, because it is at that point that the animal ceases to be aware of what is going on, either within itself or in its environment. It was also considered necessary to do it with the least possible disturbance in its natural environment.

They accepted that a shot would probably cause death by fatal internal haemorrhage, that it would destroy major blood vessels, and that haemorrhaging would be the reason that the animal became insensible. This of course is not instantaneous; you could not achieve instantaneous insensibility.

What was agreed is that the animal should be disturbed as little as possible after that shot; that once the shot has been fired and the animal is haemorrhaging, that you withdraw anything else that is likely to distress it until it just becomes insensible. In this respect I would ask that we do not lose sight of noise and smell, in respect of deer and perhaps some of the other quarry species, because if the animal is shot,

falls and haemorrhages in its own environment and is allowed to go into insensibility, we must compare that against the situation where noise, activity, handling -- and smell and sound, particularly, being so important to the species that we have under consideration. Thank you.

THE CHAIRMAN: Yes.

LORD SOULSBY: Thank you, my Lord.

Just a point of clarification, if I may, from Michael Squires, who mentioned a figure of 98 per cent.

Now is this a national figure of accuracy of kill by stalkers, or is it in Scotland, or in the South-west?

MR SQUIRES: My Lord, it is actually impossible to say, and the reason is because nobody has actually done the work to enable us to be able to determine those figures on a national basis. However, the work that we have done, the anecdotal evidence that we have put together, and the results of Professor Savage's report, indicates that the injury level is, in most cases, less than 5 per cent, and in a lot of cases in some areas is 2 per cent or less. Indeed we have heard one instant where the Scottish stalkers are suggesting that even 2 per cent is actually an extraordinarily high injury rate.

Unfortunately, there has been no research on a national basis, and therefore we cannot quote for it. That is essentially the best figures that we have at the moment.

THE CHAIRMAN: Thank you.

LORD SOULSBY: It would seem to me, from what we have heard, that Mr Swann has indicated that Scottish stalkers are much more accurate in the use of their firearms than

others, but we are focusing on the difference between hunting and stalking. I am wondering if your figure of 98 per cent is still applicable to the South-west where hunting and stalking are the alternates for control.

MR SQUIRES: I would say the original figure suggested by Professor Bateson is the one we should be guided by, and I think that figure was up to 5 per cent.

LORD SOULSBY: Of wounding?

MR SQUIRES: Of wounding, but bearing in mind that wounding can actually also mean the need for a second shot. It does not mean an escaped animal, it means an animal that has not been killed or, in the opinion of the stalker, might move and, in his judgment, requires a second shot. 5 per cent in those cases, I think, would be a realistic thing.

DR NAYLOR: Are those the figures provided by the stalkers themselves because we are comparing here an objective study of hunting and we are now comparing the figures with the stalkers' own verdict. I suspect they would have their own slightly coloured view on this exception.

PROFESSOR BATESON: Can I answer that? We did three direct techniques. Two of them involved game stalkers, and they came up with these very low figures.

We then tried to see whether we could get any evidence of wounding from the carcasses that were brought to the butchers locally. Although you can not get evidence of walking wounded from that, obviously because they are dead animals, what you can get is some estimate of how likely deer were to be wounded and then survive for a certain period of time. Interestingly,

the experts who looked at the data provided by the butchers who handled the game, came to the conclusion that the estimates originally provided by the stalkers were actually reliable.

The other way of doing it, which is the one I underlined very briefly this morning, is to say well if it were the case that there were a lot of animals being wounded, we would expect to see a lot of wounded animals on Exmoor. I absolutely agree with the point that the same thing applies to myopathy but I think it has to be applied both ways round. If animals that are dying from the effects of hunts are not found very frequently then no more are the animals that are dying from the effects of bad shooting, so I think the argument is symmetrical.

THE CHAIRMAN: Let me say in terms of our timetable, I do not want to spend too much more time on the shooting because I would like to come back to that after lunch as being one of the questions that I would like to go a little bit further on. I would like to lay out some of the issues that we might take further after lunch and I would like to give Professor Harris and Professor Bateson a chance to respond to this session before we break. I say that simply, are you prepared to hold fire.

MR WISE: Yes.

THE CHAIRMAN: This is the last go on this particular thing. I think what would be sensible is, if we now heard from Professor Harris and Professor Bateson and see how you would like to respond at this stage to some of the things that have been said this morning.

PROFESSOR BATESON: I would like to take up first a question

of expert opinion about how well deer are adapted to exercise. It is indeed true that V. Geist takes a view they are well adapted but there are other experts, who studied deer for as long as him and indeed longer in some cases, who take a contrary view.

One is Rory Putnam who has worked on deer, published a book on it. He takes the view that they are not well adapted. There are some paleontologists who take the same evidence as V. Geist, Janis and Wilhelm, who take the view that the reason why deer have long legs and have structured legs was to reduce the amount of energy that was involved in locomotion. They do not think it was a response to (inaudible).

Finally -- and this I think was an offer to the Committee from John Fletcher who runs a deer farm up in Scotland -- he takes the view that these animals get very quickly exhausted and he says it is very easy for him to run them down, let alone animals and he said: come along to my farm and I will show you any time. So there you have an offer if you want to convince yourself.

So on the question of adaptation, I think there are clearly differences among expert scientists who know deer very well and I do not think you should just take the one view.

On the question of sickling, which Douglas Wise brings up, I would like to say that when this was originally discovered, it was discovered because deer had been chased. Now there is no doubt that sickling takes place after death and that is what is in the



reports that he cites, this was commented on, but I think there is still the case that it can occur in vivo. At the moment we do not know very much about it but it seems to be a phenomenon of deer cells, they are very small and apparently they can very easily sickle, even in life, not just after death.

I am glad that David Morton brought up the point about learned helplessness because one of the things that is very striking from the human literature, as well as from the other laboratory studies, is that the thing that is most illusive of extreme stress is where the same cycle of events which cause extreme fear occurs again and again and again. That is precisely the character of deer hunting, a repeated cycle of the animal being forced to escape, clearly very frightened, highly motivated, driving itself to the point where it has run out of fuel. So I think we should not forget that, in considering the behavioural aspects of these animals when they are being hunted.

THE CHAIRMAN: Thank you very much. Roger.

PROFESSOR HARRIS: I am going to start again with the adaptation to exercise. The form of the deer, for whatever reason it has evolved, does enable the deer to undertake a fast and prolonged exercise. It certainly carries the musculature to support this. It is not really an endurance animal; it is more of a repeated sprint and a good recovery level. The form of the muscles are very much orientated towards good sprinting ability but they also show highly oxidated characteristics which would imply very, very good

recovery.

I think this comes over extremely well when you look at the records of individual hunts. The distances which these deer go are enormous and there is no question that they could not do that without that ability.

But it is also a question of relative ability, relative ability to the chasing predator. You could easily think of many other situations. But as long as the prey has the upper hand on the predator then inevitably the hunt will continue until something changes.

I think the one aspect -- and I do not want you to see me as being cynical here -- but the one aspect which deer failed to evolve was the sufficient knowledge and intelligence on good exercise physiology. Because the simple fact is that, if they were to take a more measured response to the initial hunt, they would easily outpace and easily lose the hounds if just the one pack were to be used.

Now that does not in any way diminish the severity of the exercise being performed and I hear everything that is said about the general consideration of the level of stress.

In the report and in the study that we undertook, we wanted to focus on the physiological aspects. We left it to others to make those sort of judgments. But it seemed to us that for a major part of the hunt, at least, deer would be physiologically stressed but not necessarily distressed; able to cope with the challenge

faced by the predator, which is the hound, and it would only be when circumstances changed that they lost that ability; that there would be an exponential rise in the difficulty of repeating escapes and at that point we would see distress coming into the equation.

Of course it is for you to make the judgment on different culling methods but, from a purely physiological point of view, I put it to you that in fact the stress of deer in the early part of hunting -- there would be parallels found in nature elsewhere and whether or not that is considered pertinent or not I leave it to you.

I am not going to say anything about sickling. One thing I will say, there was a comment earlier about synthesis of bilirubin. I think we have to bear in mind that the maintenance and the clearance of haemoglobin that is released from the break up of red blood cells is something that happens in all species.

Deer in fact may be a little unusual in this respect in that they have another protein known as hectoglobin, low levels of hectoglobin, which is involved in the clearance of haemoglobin. And that the bilirubin, the dynamics, really the whole dynamics of haemoglobin clearance and the formation of bilirubin, really we are still speculating and talking from the point of view of ignorance and we need far more information before we can really make a positive judgment.

Cortisol was of course one parameter which has been discussed endlessly and for animal welfare is

certainly seen as an indicator of stress. For people working in exercise physiology it is seen as an adaptive, as a protein, a hormone which responds to different states of arousal and physiological stress without necessarily being, causing distress.

The very high levels must surely be due to the fact that there is repeated disturbance of the deer and that this is causing a series of arousals and there will be a constant release of cortisol. Given the fact that the recovery time of this level in this protein is very slow that will cause an accumulation.

I think possibly the -- I mean we must realise in fact that the cortisol levels that we measure are not the total output that has occurred. If, for example, one stimulation had been applied, the levels that we are observing are probably lower than the total amount which has been released if it was all accumulated in one instant. Indeed, in the longest hunts, it is conceivable that near total exhaustion of the adrenal gland may have occurred but that does not necessarily imply that that was done. The reasons for distress, associated with distress, may have occurred as a result of the pattern of exercise which has been occurring during the actual hunting.

It would be very nice to study that with deer being exercised under relatively unstressed conditions if that could ever be achieved. It would be very, very different. But I think we are debating, almost from two angles here, the nature or the cause of cortisol increase. We must be very careful not to get hung up on

a particular numerical value and look perhaps a little bit wider in fact to the more general information that is available on why the deer are being stressed and whether they are being distressed outside the level, a wild animal, an animal living in the wild, might encounter or might have encountered in its prehistory. I do not think I can say any more.

THE CHAIRMAN: Thank you very much. I think we have made some useful progress, certainly in terms of our understanding and I am beginning to identify the issues where there are differences.

I propose that we break for lunch now and we take an hour and we start again at 1.30 p.m. I would then like to go through the report and look at the main sections and the conclusions.

We have on page 25 some conclusions about the suitability of exercise and the nature of the exercise in the hunt and various statements made. I would just like to test how much of a consensus there is to the risk part of that.

I think then on page 29 there is a similar conclusion about muscle damage and page 32 about kidney damage; the observations you made, Patrick, about general welfare measures in the statements. In each occasion I would just like to see to what extent we have got a consensus about that and then move on to the issue of welfare aspects of shooting.

Finally, whether anyone is prepared to chance their arm on how far, if at all, any of the things that have been said about deer have implications for hunting

of the other species.

We might then just collect together the issue of further work. I emphasise the reason I am not keen to discuss it perhaps as a high priority in our discussions is not so much we do not have the money, although we certainly do not, but more particularly we do not have the time.

But nevertheless I think it would be useful if we could again come to a view as to the direction further work would go if other people wished to pursue this question at a later stage, long after we have reported. So if you are content with that approach, I think we will have a break now and then we will just try and go through each of the key paragraphs in the report and see to what extent people agree with them.

Thank you very much.

(Adjourned for Lunch).

THE CHAIRMAN: Let us begin the afternoon session, and I think maybe some of the people who were listening this morning have gone off for a longer lunch break!

I would like to begin with the question of the suitability of deer for the exercise they face, the question of what brings the hunt to an end, how severe it is and really what stage the welfare effects become significant. I am looking at the paragraph headed, "Conclusion" which on my document is on page 25. I hope it is 25 on everybody's document. There was a reference this morning to a page which was not quite the same as it was on mine, so I am slightly holding my breath here. This sets out the conclusions and I thought I

would ask Roger to, in a sense, lead us into that and tell us whether there was anything you heard this morning which would cause you to change your mind at all and just to make your points again.

Then I would like to ask others if anyone has any difficulties with this paragraph.

PROFESSOR HARRIS: I have difficulty in finding it!

THE CHAIRMAN: It comes immediately in front of "Muscle damage". On my version it is on page 25.

PROFESSOR HARRIS: This is the conclusion at the end of "Muscle damage" or before?

THE CHAIRMAN: It is before.

PROFESSOR HARRIS: Because we had a printout, or at least I had a printout from my own computer, I do not think it was the same as yours.

THE CHAIRMAN: What page is it on your version?

PROFESSOR HARRIS: I do not want to tell you; it is 25!

PROFESSOR MORTON: The title on page 23.

PROFESSOR HARRIS: This is the conclusion, which begins, "Metabolic indices are best explained by a model..."

THE CHAIRMAN: If I can just interrupt: My feeling was this summarised quite neatly what it was that had gone before, certainly for those of us who might struggle with some of the technical terms who I just wanted to be sure to see what the general response was to this paragraph.

PROFESSOR HARRIS: I will begin by saying it is almost a disappointment when you spend a lot of time measuring a great number of parameters -- some with some difficulty -- and at the end of the day you come down to a single

parameter which could be measured extremely simply, and in fact Patrick Bateson measured glycogen in an even more simple way than we did, simply by looking at post mortem Ph, the final Ph, the pieces of muscle eventually obtained, as an indicator of the glycogen status.

We did not really look at that data as closely as we should have done and it is rather difficult actually looking at post mortem post-exercise Phs, pieces of muscle, to understand the message that was coming over very clearly, but when we did the glycogen measurements ourselves, this reinforced what had already been seen and the single message that comes out is how consistent this finding was, that virtually every single deer that we examined had extremely low levels of muscle glycogen, with the exception of deer which had been in some way -- where there was injury to the deer prior to the actual hunt. Actually you have the same thing and if we concentrate only on the ones which are depleted, you can only explain this in fact by a single model.

The model is of one of repeated disturbance with repeated bouts of intense exercise being undertaken, where the deer will run and probably will run initially close to its maximum pace. It will be a very heavy carbohydrate utilising time of exercise. If an adequate distance is placed between the deer and the hounds, the pace will be allowed to reduce and there will be a period of recovery and during that period some of the stores, some of the biochemicals will return to more normal levels. Do not mistake this: This is not a recovery in the muscle glycogen; that is a very slow



process. This will continue and there will be a gradual attrition, in fact, of the muscle energy stores within the deer to a point that the later stages of the hunting, although it has adequate fat reserves and fat in theory could provide energy of a sufficient rate to maintain the average power output required, average power output of the total length of the average, sustain the average pace, this fluctuating sprint, slow down sprint, slow down model requires carbohydrate and once that is depleted, then the deer will attempt successively further escapes and this will become successively more and more difficult. The periods of successful sprinting will become reduced. The distance which the deer are able to put between themselves and the hounds will become reduced.

Eventually, in fact, these periods of escape will merge almost into one fast continuous run, and during that period, as I said, the deer will face increasing efforts almost exponentially to achieve that escape. At that point the deer, we suppose, will surmise, seek an alternative strategy which may be to either seek cover or turn on the hounds themselves.

I do not see any other way to explain that finding. To me that is a most important finding. Except for the deer that turn to bay fairly early on, these were short hunts. As I say, most of those deer had some problem and in those cases you find high levels of lactate, and in such cases, you can imagine that they are in some way inferior, they are not able to compete against the hounds. The hounds, therefore, will be

approaching the problem much faster and those hunts will terminate in periods of fast exercise with carbohydrate stores intact and the causative factor in this case will be fatigue, local muscle fatigue, caused by marked, or contributed by marked acidosis.

That is in contrast to the others, the longer hunts where in all cases it will be just a depletion of glycogen, if you like, metabolic exhaustion which is the causative factor in bringing the hunt to an end.

We do have to add to that the fact that the longer the hunt goes on, there will be some changes in other parameters within the body and we have heard about the possibility of overheating. In fact overheating is not a term I would use -- body temperature is raised. We did not measure rectal temperature incidentally. We measured temperature in the rectal space in post mortem animals. There will be heat movement from the muscles into the rectal compartment during this period, so the temperature we measured is somewhere between muscle temperature and rectum temperature. It is not a true measure in any way of rectum temperature.

The highest temperatures are close to 40, 42, 43 degrees. We can see 43.9 in horses. So those sort of muscle temperatures -- sorry, I should mention in horses 43.9 is a muscle temperature, so 43, 44 degrees are observable in other species. Nonetheless, in some of those deer that we measured the temperature was high. Whether or not this would have contributed further to a desire to stop, I do not know, but it certainly was not overriding because even in those deer we find glycogen

depletion as the main characteristic.

THE CHAIRMAN: Could I ask Roger: These levels of glycogen at the end of the hunts, for those of us who do not know about these things, how low are the numbers that you are seeing? Are they extremely low? Do you see levels as low as that in horses after the Grand National, for example? Or what would be the comparable figures? Do we have anything by comparison? Are we talking here about the lowest measures that you would ever see, or are they measures which do occasionally crop up in other extremes?

PROFESSOR HARRIS: The levels are low. I think we were down to the 20, 30 from a value of 600 to begin with. It is almost complete depletion of glycogen levels. Yes, you would see them. You would see endurance forces markedly reduced glycogen levels. In some muscle fibre types you would certainly see complete depletion of glycogen and this has been reported a long time ago by David Stern. In humans we will encounter glycogen depletion fairly often in such activities as professional football, in marathon running. A good number of the marathon runners on Sunday would have faced the state of glycogen depletion. But there is a difference, this is made clear in the report. The difference is in humans and in horses there is the option to reduce pace, and when we talk about glycogen depletion, we do not mean that all the energy stores within the deer are depleted as, indeed, in football players or in endurance horses, but the carbohydrate levels have now declined to such a point that to engage in another fast rapid escape would be extremely difficult and, well, would be extremely

difficult for the deer to undertake. But, as I say, in humans we have an option. Football players, if you look at a football match, there will be much more walking towards the end of the game and this correlates with the depletion of possibly glycogen in the main leg muscles.

THE CHAIRMAN: Thank you very much. Patrick, do you want to say anything at this stage?

PROFESSOR BATESON: No, that is very clear.

THE CHAIRMAN: After that opening, are there any other comments from other members of the seminar about this contribution, or do we have a high level of agreement?

LORD SOULSBY: Could I just ask one question about the progress of the physiological biochemical changes. From the clinical point of view, the age of the animal and how it seems during the hunt, is there any point that one can look at the animal and say, "That animal is beyond the point where depletion of resources is acceptable"?

PROFESSOR HARRIS: I think that is the wrong way of putting it. I think that what is happening is as the energy stores are becoming more and more depleted, deer will find it increasingly more difficult to make an escape and put a distance -- somebody used the word "bubble" this lunchtime -- if you like, a bubble of safety around them so they can escape the hounds to a point that they are not any longer being perceived to be threatened. Once they run out of glycogen, even the act of trying to do that, and it is not even running out of glycogen, it is as glycogen stores start to become lower the act of trying to do that will become progressively more

difficult.

Now, we used a figure in our report of 20 minutes, and we said right from the very beginning we were speculating on that 20 minutes. It is based by an analogy to human athletes, and the best we can say is that in the final stages of hunting and once that metabolic state has been obtained, then there will be rising effort -- and we would use the word "distress" at that point. If that is unacceptable, then yes, from a clinical point of view, then that period is the period that you would focus on.

What happens earlier on I do not know. It depends so much upon the individual hunt, whether it has involved rapid periods of uphill downhill running. Every hunt is quite individual. It is very difficult to get a feel for an average and there is quite possible that at some point, even for deer who go off for a long period of time, that early on they will engage in rapid sprint exercise which does cause them considerable fatigue within the muscles, but there may be periods during which they will recover from this adequately and certainly in those that go on for a much longer period, they must be able to recover from them.

THE CHAIRMAN: Does the fact that it takes on some occasions 10 kilometres to get down to this level, on other occasions it takes 25 kilometres to get down to this level, does that vary according to the animal, or is it to do with the nature of the chase and probably whether or not there have been periods in between? Do we have any information on it?

PROFESSOR BATESON: We have some -- we have looked at the effects of topography on the early parts of the hunt and how that affects later events. We can find no relationship. That is not to say there is not a relationship. We could not find one. I suspect the critical thing is not going to be topography, but more the time the deer has to recover between the bouts of sprinting. That seems to be more likely, but we do not have any hard evidence on that.

DR WISE: Lord Burns, could I ask Roger whether he considers that the exhaustion that we are talking about, would you like to define different types of exhaustion? I would tend to think -- I personally would say these deer have reached the stage of volitional exhaustion which many marathon runners describe as hitting a wall. Would you agree that that is the physiological state reached by the deer?

PROFESSOR HARRIS: It is quite difficult. They have reached a state of exhaustion where to try to engage in another escape, response, would cause them perceived increasing effort. It is a bit like a marathon runner; you are coming along and you would like to increase your running pace. If you attempt to do at that stage you would find it quite distressful to you. So, yes, I think that they have reached that stage of exhaustion, or they have reached that state. If they were left, if the hunt then withdrew at that point, or if they found sanctuary and were able to be left alone, at that point they would recover and although that would take quite a period of time, they would recover so in that sense they are

exhausted, but they still have the potential to make a recovery.

DR WISE: Can you explain why marathon runners can very frequently run through the wall by increasing pace? Are you saying it would take a long time for them to recover; do you mean their glycogen?

PROFESSOR HARRIS: Yes. If the pace of the hunt -- if the deer can understand that if it kept up even a modest pace it could probably hold the hounds back a little, maybe the hunts would go on a little bit longer. The deer will engage in what comes naturally to it and that is it will, every time it is disturbed, encroached on it, want to undertake a fast escape to distance itself as quickly as possible from the hounds. That is a very, very expensive type of exercise. If the deer could be allowed to just simply drop its pace down, I am quite sure even deer at the end of hunting still have some option to undertake some form of escape, at a fairly low to modest pace, but they are no longer capable of reacting in the way in which they would like to react to the encroachment of the hounds and therefore at that point they must seek an alternative. They have no alternative.

DR NAYLOR: Could I just add to that? Exhaustion is a term we would often reserve for a select stage, whereas this may refer to a more extended form of fatigue, where they probably can continue at a certain lower work rate, where exhaustion is often in exercise physiology circles, I suppose, reserved for more of an end stage, which is often not just (inaudible) patients we are

talking about here, but thermoregulatory disturbances, electrolyte imbalances, extending to severe dehydration and a number of other physiological problems that occur with exercise, heat stroke and so on. To my understanding, we have not seen evidence of those changes in what has been measured so far in these deer, as compared with the findings that occur in other species.

THE CHAIRMAN: Do you have information on what these measures look like in horses that have been racing, race horses, or steeplechases?

DR NAYLOR: They would be more akin to changes occurring in endurance horses in prolonged exercise when there is very extensive muscle glycogen depletion and a number of those sorts will continued towards the end of the ride, despite extensive muscle glycogen depletion, and remember we have only looked at three particular muscles here, which are principal driving muscles for exercise, but there are other muscles which do not have such an important role until this fatigue process ensues, so maybe there are other muscles where you could measure glycogen where there would have still been glycogen present which allows them still to produce these short bursts of activity, admittedly getting harder each time, but in exhausted horses and humans, as I say, there are pronounced electrolyte imbalances, the salts in the blood which control muscle contraction, and so on. There are gastro-intestinal disturbances, renal disorders, neurological disfunction; often the animals become disorientated and stagger about, but I do not think



there is a lot of evidence of that with hunted deer in my understanding, and correct me if I am wrong about that.

So there is a big difference, important difference I think, physiologically and pathologically, between what I would call exhaustion, and what we may be seeing here is certainly a fairly extended type of fatigue.

MR ADDISON: A very quick point: Most human marathon runners turn at bay at about 18 miles, as it were, and they make a decision to carry on and they might make a dash for the pub, a long dash at the end.

PROFESSOR HARRIS: Can I just comment? Generally, I do not think you can question the fact that at the end of certainly the longest hunts, with the complete depletion of the glycogen stores and the fact that deer will have tried to have made some final more escapes, that they must be close to a state of -- I do not like to use the word "exhaustion" myself because, like many of the other words which have been bandied around in this debate, they have both undefined and a defined meaning, so they are difficult. If you like, it is severe multiple fatigue, severe multiple fatigue, which they are experiencing, which may be associated with other feelings of distress as a result, and here I mean distress associated with other changes in some individual deer, but not in all, by any means, but do not misunderstand; this is a very, very severe exercise and it must be quite intense feelings of fatigue in those deer when they try to respond, yet again, to the final stages to further encroachment by the hounds. I

cannot believe that at that final stage it can be anything but.

DR NAYLOR: Countering that, I was making the points about physiological --

PROFESSOR HARRIS: I do not like the use of this word "exhaustion", because physiologists tend to look upon it in a different way to other people and it has strict meanings, but if we use the more precise term "multiple" or "intense fatigue", then I think we understand fairly closely what we mean.

DR NAYLOR: The difference, of course, relates back to the recovery processes; intense fatigue can be recovered from more rapidly. The exhaustion syndromes often may lead to death if not treated appropriately with electrolyte fluids.

PROFESSOR MORTON: I think there is another way of looking at this, that is the deer is in a situation, if you get into the mind of this deer, where it may say this strategy of running away is not working, so mentally, because that is what we are talking about, mental exhaustion sometimes as well as physical exhaustion, and decides this is not working so it is going to take a different stance on it. It does not mean that it is not self-aware enough, because these are very, I suspect, intelligent creatures by and large, they are very well aware of their own condition and how exhausted they are becoming, but have just decided this is not a strategy that is going to work, which would account for some of the anecdotal tales of deer when they are held at bay being quite belligerent and able to fend off dogs and

things like that, so the self-awareness may, on the one hand, be evidence that these animals are able to suffer mentally, which is, I think, what this debate is about, as well as physically.

PROFESSOR HARRIS: I think the two are closely connected, particularly towards the end, and that is repeated effort to escape will become progressively more difficult and that may have an impact upon their state of mind as well.

DR WISE: Lord Burns, sorry to interrupt again. I would hasten to say that I do not think anybody -- I am speaking as an individual -- from the Countryside Alliance would be naive enough to suppose that deer enjoy being hunted, nor would I suggest that they do not experience fear. Fear, however, should not -- well, again, I am quoting Professor Webster -- but should not be defined as suffering until that fear becomes inescapable. It is our contention that there is a stage when the fear does become inescapable, but this stage occurs at the end of the hunt and it arises exponentially. It is not particularly a grudge of experience, because although Roger might describe a gradual procedure, in fact, it is almost certain that because the deer can get so far in front of the hounds for a lot of the hunt, whether or not the glycogen is very low at the time, will not really be affecting it mentally until the hounds actually close up. So the fact that it may be lying out with very little glycogen is probably not going to affect its mental state until the hounds close and, thereafter, we would suggest a very

short period of mental suffering.

The other point I think one should make is that fear in humans is very, very different probably from fear in animals. We are not saying it does not happen, but humans anticipate death, and most welfarists would suggest that animals do not have that ability. So the sort of fear, the fear that is not a cognitive fear in quite the same sense, although there will be some cognition, but it would not involve understanding or anticipation of death.

THE CHAIRMAN: If there are no more comments on this, it seems to me, with some changes in emphasis in one or two places, we have really quite a large measure of agreement about this paragraph which from our point of view is very helpful.

If I could move on then. In my version the next set of conclusions are on page 29 which are the conclusions about muscle damage. Again, Roger, would you like to?

PROFESSOR HARRIS: I think one of the comments that we have to be clear of is muscle damage can come in various forms. Muscle damage simply means that the cells have become changed in some way; they may be leaking individual proteins and through the outer membrane, or there may be much more serious fundamental changes in the disruption of the, if you like, contractile machinery within each muscle cell. If you use the term "low grade" to indicate where there is just increase in the permeability of the membranes to constituents within the muscle fibre to explain the sort of low level damage

that you get, this is not damage which is going to cause a major problem either to performance and it probably is not going to cause any major problems in the recovery in the next two or three days in those deer which escape. It is going to lead to increases in the appearance, or increases in proteins, such as creatine kinase appearing in the bloodstream which are very easily measured. That low grade damage will occur in us; it will occur in all athletes. It occurs -- I say "even in us", when we are doing our regular activity if we are engaged in more intensive bursts of activity, but what is more serious is where you get focal damage, focused damage, which is really causing a break up and disruption of the ultrastructure within the muscle fibres and then it becomes more of a problem, certainly for those deer that were to escape and may survive for a few days later. The results of the original study indicated losses of creatine kinase, or appearance of creatine kinase, in blood which could have been interpreted in two different ways. One is the low grade and the other is a more severe form of damage. We, in our study, looked at three different muscle groups. We took, I think, three samples from each muscle group, is that correct? I would not like to quote to you the numbers of thousands of fibres which were looked at and screened by Liverpool, and the results of that hard effort was that in fact with few exceptions there was very little sign of any overt muscle damage which at the end of hunting would give concern at a clinical level as to those deer that escape and would survive for a -- would survive.

I would refer in fact to Tim Helliwell, since he did all the looking down the microscope at this stage. He has already commented upon it.

The only other thing that I will say is that I say in one deer we saw clear evidence of extensive muscle damage. That was a young hind and that deer was notable in that it had done exercise both up and downhill and it is that work, going up and downhill, which can often cause the greatest amount of damage.

Would it be appropriate for Tim to make a comment at this stage?

DR HELLIWELL: Thank you. I think, as I said before, the questions that were in my mind were where the damage was present and also whether it was going to be catastrophic to a degree that would impair the function of the animals. The changes that we have seen are exactly those that one would expect as a result of exercise, both of the right microscopic level and using the electron microscope, so the nature of the damage is sort of broadly as would be predicted.

The extent of the damage, I think, in most animals was mild. There were exceptions where it was more extensive. I think in terms of what this actually means, trying to relate what I saw down the microscope with measurements such as the creatine kinase level did not produce a nice straight line relationship in terms of intensity of damage. That I did not find surprising. From my background it is, in looking at human muscles, the relationship between enzyme levels, like creatine kinase, what you see down the microscope is actually

very poor and it certainly seems that muscle fibres can become leaky and release this enzyme without actually undergoing necrosis, actually death of the muscle fibres, so there are subtle things going on in that different measures of damage do not necessarily correlate precisely.

As I said before, anyone who has undertaken extensive exercise, done the marathon for example, will be aware that the symptoms of muscle damage, the pain and soreness of the muscles are not at their greatest immediately after the exercise but they develop over a period of a few days thereafter, and such experimental studies that have been done do show that the amount of damage you can see down the microscope does increase over that period of time. That is one of the answers to the questions as to exactly how it would apply in this particular situation.

I think the other comment I would make is that if one is looking at the effects of exercise on an animal that is not particularly trained for that exercise, in humans there was one report on the effects of exercise in US marines when they first went to base camp and were suddenly exposed to whatever endurance exercise and torture they put them through there. They did not look at any muscle samples histologically, but they did measure CK levels and levels of 50, 80,000 were in excess of what we are looking at here, as their most extreme levels of damage in, I presume, relatively fit individuals. These individuals all recovered without any lasting damage as far as I can see.

DR VICTORIA EDWARDS: I was just going to ask if you could help. In terms of the time factor, the muscles that you examined were ones that were taken immediately after the hunt and you have said that the symptoms take time to manifest themselves, presumably also the damage therefore takes time. I appreciate that you have not got any evidence for the deer, but to what extent with other mammals do we know at what peak after the event does the damage manifest itself, and what degree, what factor of increase would you expect?

DR HELLIWELL: There is really very little good evidence on this. Most laboratory studies have really looked at the short-term effects of damage in small animals in the laboratory over perhaps a period of hours and have not really followed them up over a period of a week or two. Conversely, studies using human volunteers have exercised them and then out of a group, tissues would be studied from one or two individuals at intervals of several days. So we do not actually have the comparable data to know what was happening at day nought to what was happening ten days afterwards.

That is in terms of the sort of pathology of the muscle. But sort of putting the studies together, I think different species do seem to behave similarly and that is why I say I would expect there to be an increase -- it is very difficult to put it, it is very difficult to quantify.

PROFESSOR HARRIS: Can I just add to that. Tim, perhaps you can comment. The subjective responses known as delayed onset muscle soreness which can appear 24 to 48 hours



after, subjective not backed up necessarily by histological evidence.

DR HELLIWELL: I think my interpretation of the literature is that this muscle soreness reflects the response of the body to the tissue damage, and you obviously start getting inflammatory changes in the damaged muscle when there becomes more fluid in the muscle; it becomes more edematous, and that is when the symptoms are at their greatest.

DR WISE: Could I just -- I believe we have talked about carted stags before, but the CK levels in the carted stags dropped very much more quickly than one would have anticipated had the damage been significant. I believe very often CK levels in true damage go on rising for some days, even after muscle damage. That was not the case in the carted stags, but I accept what Professor Bateson says about the carted stags in a slightly different form of hunting, but it should be noted, I think, that the CK levels at the end of hunting in the carted stags were as high as, if not in certain cases higher than anything found in these studies.

PROFESSOR HARRIS: I think actually, Douglas, what you are talking about there is the observable effects of this fairly low grade muscle damage, which is causing increased permeability of the membranes to these enzymes, rather than major damage causing necrosis of the muscle fibres. Tim, would that be correct?

DR HELLIWELL: Probably.

MR ADDISON: Is this the point to comment on the difference between muscle strains and tears and the general fatigue

we are talking about? By a human muscle pull, shall I say, it just brings them to a halt and then pop up and down and hop along. So if such things were to happen in a quadroped, would it be immediately observable; would their gait change? I would like to put the question to our quadropedal colleagues.

DR NAYLOR: You can sometimes identify muscle strains in horses. It is an injury they do sustain, but it is not very common.

MR ADDISON: I want to make the point that the feeling of the muscle pull is nothing like the increasing fatigue of running. It brings you to a halt: Bang, and everybody knows it. I mean, you must have seen it on (inaudible).

DR NAYLOR: Can I just add a comment to that? In the second half of the report there are a number of references to muscle tears, extreme exercise being involved with tearing of muscles and release of muscle enzyme in the blood plasma. I must say that that particular term I find quite misleading, because I think there is a big distinction. What has been identified -- maybe you would like to comment on this -- what you have been identifying is a few necrotic muscle fibres is a world apart from a muscle tear as such.

DR HELLIWELL: That is how I understand the terminology. Muscle tear is something pretty dramatic. If an athlete experiences that, then the muscle ceases to function immediately because of the haemorrhage and that is way in excess of what we have been seeing here.

DR NAYLOR: There are a number of references to that.

PROFESSOR BATESON: Can I just ask a question, because it is

important: When you did your sampling muscle did you look for tears?

DR HELLIWELL: I did not sample the muscle. I was provided with the samples.

PROFESSOR BATESON: Perhaps whoever took the samples.

PROFESSOR HARRIS: I would have to ask you what you mean, what you are meaning by tears in fact. Are you talking about tears, talking about what in essence -- Ian, would you like to explain what you are talking about?

MR ADDISON: It feels totally different; it brings you to a halt, as opposed to just getting more and more tired.

PROFESSOR HARRIS: My understanding of a tear is something entirely different to what we have been discussing over there. In a way I can turn the question back on Patrick to see if there were tears, then my belief is that this would cause fairly immediate and very obvious changes in the rhythmicity in their running. Now, Patrick, you have been looking at this, and there are, I know, other people around this table who probably have some observations which they could add to this because they have seen hunting Does the evenness of the gait change frequently, dramatically, towards the end of hunting, which would be consistent with the type of tear, muscle tear -- this is at the macro level rather than the micro level -- that occurs?

PROFESSOR BATESON: We are saying there was certainly one case in our study where a deer was chased for a long time and it was not recognised as being odd and finally when it was killed it turned out to have one of the ends of its leg missing and it was not spotted up to that

point, so clearly -- this was an animal that probably had this injury for some time. I mean, it is a good question whether you would notice an obvious alteration to the gait.

PROFESSOR HARRIS: At the same time we did see a slide earlier which showed, I believe, a deer escaping, running away, and obviously you cannot tell very much from a single still frame, but my guess is from everything that I have seen --and I have only ever seen two hunts -- is that the deer are moving just as fluidly towards the end as they are at the beginning. So would you like to --

PROFESSOR BATESON: The whole pattern of the gait is getting different by the end.

PROFESSOR HARRIS: Of course it is, but is there any dysfunction in that gait: Are they showing indications of lameness at all? Jeremy, you are a trained vet and you have actually -- sorry.

THE CHAIRMAN: Ian is trying to get in.

MR ADDISON: A dog with a sore leg can go on three legs; would a deer?

PROFESSOR BATESON: Yes, it will.

PROFESSOR HARRIS: Yes, but it is not as even with three legs as it was with four.

DR NAYLOR: If I can add clinically, genuine muscle tears are very, very rare in athletic horses of all type; that is what I deal with. If you do have something which you can later recognise as a genuine muscle injury, with a localised muscle damage, call it what you like, usually that horse will be quite lame during exercise

successively and afterwards, but we are talking very spurious things here, we are going round in circles.

MR SWANN: Just to make one comment, and I know David would want to make another: It would depend whether the injury had mechanical consequences. If the injury led to mechanical instability, the leg would carry on working but the capacity of the leg to carry on working would depend if the leg had a physical consequence to the actual physical working of the leg.

PROFESSOR MORTON: In my misspent youth I went to greyhound tracks. Certainly you get dogs, as Ian said, when they get a torn muscle as a recognised condition go on three legs and they just stop racing, and I assume it is a torn muscle because it swells up and is very painful and it is usually the hamstring muscles.

THE CHAIRMAN: I think we have probably pressed this as far as we can and I think we may just have to look at it a little more carefully in the transcript.

PROFESSOR BATESON: Can I just say one thing: In this conclusion it says quite correctly there is yet no clear evidence to suggest the damage would bring about pathological changes and I think we also have to say there is no clear evidence it does not. I mean at the moment we do not know.

THE CHAIRMAN: I think we have taken that point that this whole question of what happens afterwards and that that would require further study.

The next point that I had was the conclusions to the next section, which is on haemolysis and kidney damage which, on my version, is at the bottom of page 32

and, again, just to check whether we are in agreement on this. Anything you want to say? I think you spoke on this yesterday -- I am sorry, not yesterday; it does not seem that long ago.

PROFESSOR MORTON: You had a snooze at lunchtime!

THE CHAIRMAN: I meant this morning.

PROFESSOR HARRIS: I would just say that in this respect we do still have some slight difference of opinion between us as to whether the high haemoglobins seen were extra or intravessel, that is to say they resulted during the hunting or occurred after, but we are in agreement, however, that there is a degree of haemolysis occurring during the hunting, but perhaps not as much as to account for those very high haemoglobin levels.

PROFESSOR BATESON: I think that is right. I think some of the values that we reported were probably due to a lot of that; I think that is correct. That having been said, I am impressed by the high bilirubin levels which would not be produced after death; it would have to be produced before death, and the conversion from haemoglobin to bilirubin is very slow, so we have reason to think there must be quite substantial involvement taking place while the animal is alive and just how much is something we want to debate a bit further.

THE CHAIRMAN: Any observations on this?

DR NAYLOR: The only comment I have is on the paragraph before that when he is talking about the change in urine consistent with necritis, which go against that, and I would say there is a change in urine consistent with the changes in urine with exercise. Necritis is inflammatory

kidney disease. I would have a problem with that statement.

PROFESSOR HARRIS: Jeremy, I think you are reading that incorrectly. That is referring to the results of Cross and Shot. It is saying not that the changes in urine that we observed are consistent with necritis; the changes in Cross and Shot they claim, or they interpret as being consistent with necritis.

DR NAYLOR: It is only a small point.

DR WISE: Could I just make a few observations on the subject of haemolysis. Again, going back to the carted deer, the evidence is that they are not haemolysed, although in this study it was suggested that the haemolysis occurred earlier in the hunt. Therefore, one would have anticipated it in carted deer, even though they are shorter.

Secondly, there are several things -- Roger touched on one, and this is the sort of very low hectoglobulin level of ruminants would suggest that any haemolysis that was present may well be more likely to sort of be turned into bilirubin than would otherwise be the case.

Secondly, that the elevated levels of free fatty acids quite possibly compete with anionic receptors so that they are not taken out of the circulation as far as during exercise as they would be otherwise.

Thirdly, there would be haemodynamic changes, such that the uptake of bilirubin during exercise from the blood is quite likely to be lower.

Fourthly, that if the deer are not used to severe

exercise, as indeed would appear to be the case, they should not be totally analogous to human athletes who have already destroyed most of their erythrocytes to the extent that the erythrocyte lifespan of an athlete is about half the length that it is in non-athletically minded humans, like myself. If you are going to start running an animal which is slightly -- let us say, less fit -- it has a lot more rotten old erythrocytes to get rid of.

The other thing about deer and horses, unlike humans, is their splenic contractors and they tend to store a big reserve of rather shoddy erythrocytes in their spleens, which get squelched out at the beginning of exercise, and those erythrocytes are much more likely to damage, so I think we have to be very careful about assessing this because of species differences as to whether it has any significance whatsoever in welfare terms.

It is agreed that in the absence of dehydration, which has not been found in either of these studies, there is no problem as far as the kidneys are concerned in shipping haemoglobin through the kidneys.

I would like to ask Roger Harris why on one of his slides he had up suggested that myoglobin, which is about a quarter of the molecular weight of haemoglobin, why he thinks that that is more nephrotoxic than haemoglobin.

PROFESSOR HARRIS: Only because I saw the main route of haemoglobin disposal as not actually involving the kidney and that the disposal of myoglobin, on the other



hand, if extensive haemoglobin was released, would be or could involve, it is just I did not see the haemoglobin involved.

DR WISE: You would accept myoglobin is less likely to block?

PROFESSOR HARRIS: Yes. I think it both would have been channelled in the direction of the kidney, yes. That is, however, not how I meant that slide to appear. My apologies.

PROFESSOR BATESON: Just one thing about the carted deer, you may have seen data which I have not seen, what I saw was whole haemoglobin; it was not actual haemolysis, but you may have seen data which has not been made available to us.

DR WISE: No, the only data I saw was that there was no physical haemolysis from the samples in most cases.

PROFESSOR BATESON: You mean they were not read.

DR WISE: Yes, there was no miscolouring of the blood.

THE CHAIRMAN: I am afraid I am now out of my depth on this issue. You said Patrick said that he was impressed by the bilirubin and the extent to which this was an indication that it may not be all artefact. I am not quite sure whether Douglas Wise's response to that captures in any way the point you made, but I cannot go much further before sinking in this conversation but if there is any explanation that we can understand then --

PROFESSOR BATESON: I think the only thing to be said which is worth saying is that one molecule of bilirubin will come from one molecule of haemoglobin, so it indicates there is some haemolysis taking place. Whether it is

because it has been squirted out of the spleen or whether it is because these animals are not particularly fit is a good question and we do not know the answer to that, but there is some haemolysis taking place in this animals I think there is no doubt.

DR NAYLOR: The important point in this whole measuring is whether it is a clinical problem for the animal and one of the major routes if there were to be a clinical problem is through damage to the kidney; kidney samples were measured and there was no evidence of kidney damage at this stage and no one can comment on what is going to happen 24 hours down the line, but at that stage.

THE CHAIRMAN: Kidneys are the same as muscles, the damage can occur.

DR NAYLOR: There was no damage.

THE CHAIRMAN: But it can look different after the event?

DR NAYLOR: Yes, and there is regenerative capacity in the kidney.

DR VICTORIA EDWARDS: I was going to ask the same question I asked before which has been asked, that is we might expect that further down the line maybe I think you have said you would like to do surveys between one and three days after that. Is there evidence in other mammals where that has been possible of the factor of increase of damage and which is the best period at which to repeat that sample?

DR NAYLOR: I am not a kidney pathologist, but in the experience of having problems with endurance rides often you will see acute changes happening shortly after the end of endurance rides where they have gone into heat

stress problems and consequent kidney damage. Sometimes, yes, the damage will get worse over the next 24 to 48 hours.

PROFESSOR BATESON: I have asked haematologists about this and their feeling is that the damage will express itself more and more in the few days after the cause of the damage, but then when I asked for references they would not give me them, so I do not know what they are basing it on.

THE CHAIRMAN: Could I ask a question, just for my information: This phrase about endurance horses, what is this?

DR NAYLOR: They are horses that compete over distances anything from 25 miles up to 100 miles. Sometimes they do 100 miles in one go.

THE CHAIRMAN: It happens in this country?

DR NAYLOR: Yes, on a regular basis every weekend. It is a very, very popular sport. 100 mile rides are less common, but certainly very, very popular are 25 mile, 50 and 75.

MR ADDISON: Few of us can have bilirubin on exercise. I am told it can come from something rather fearsome called sequalslack, which means never try to run on two legs, but it could not possibly--

THE CHAIRMAN: I came to that conclusion a long time ago!

MR ADDISON: Very slight liver contusion in humans, particularly with human athletes I think the evidence of blood cell loss.

PROFESSOR BATESON: Can I ask Ian Addison for the reference?

PROFESSOR HARRIS: I can provide some references on that. In

fact this is just a case of both mechanical damage -- I use the word "mechanical" and "chemical damage" earlier. Mechanical damage can be various forms in humans, including foot strike, but the other part is chemical damage where any period of prolonged exercise in any species is going to result in production of free radicals, and these are several reports where you have damage to the membranes of the red blood cells by the free radicals, and this will increase their fragility to mechanical disturbance. I can only imagine that something like this is happening. There was in both studies a trend towards higher bilirubin levels with time, that is correct. This to me suggests that what we are looking at is this accumulative effect of exercise producing the chemical damage rather than mechanical damage, although that can also be linked in with time and duration. But there is a progressive low grade disruption, break up of a small amount of red blood cells in exactly the same way that you would expect to find in any other animal which is performing prolonged exercise of this type.

THE CHAIRMAN: Thank you very much. I think that probably takes us to the end of that section. I now move to the report. There is a section about the hunt which we discussed this morning which I do not propose to dwell on.

We then come to the bottom of page 39 in my copy, where there is the general discussion, Patrick, about welfare measurement which ends at the top of page 43, where you set out the factors that you have taken into

account. I simply wanted to ask whether there was any other points you wanted to make about this section and to give other people the opportunities as to whether they wished to comment on the approach that you use.

PROFESSOR BATESON: I thank you. I think the only point I want to re-emphasise is that the more prongs you can use the better. It is not as if there is a kind of magic bullet which will give you the answer to the question and it is partly because of the difficult nature of the problem, because we cannot get inside the head of the animal, but what we can do is to use all the approaches on this approach, that kind of high different dimensions, and if they start to converge then we are more confident than if they do not start to converge. That is all I think I can say.

THE CHAIRMAN: Does anyone wish to comment on that?

Well, let us --

DR NAYLOR: The only specific comment on this section is that what you are referring to?

THE CHAIRMAN: Yes. If I may say by way of a general comment, on the remainder there are not big conclusions sections as there were on the first part. I thought the best thing was to take it section by section and to see if there were any comments.

DR NAYLOR: There is a number of comments that I find hard to sort of understand without back up. Page 35 at the bottom:

"The deer living in more open country do not appear to be more athletic than they would living in the woods."

I just do not understand the point that is made in that comment.

PROFESSOR BATESON: This is going back to the previous section. What we did there was simply to look at how far deer were hunted in these different habitats, and there was no significant difference between the distances hunted in these three habitats, as far as starting habitat is concerned. As far as finishing habitat is concerned, there was a difference, but in a sense that might be obvious. In the more open habitats they tend to run for longer. It did not seem to be affected at all by where they started.

DR NAYLOR: Another comment comes up page 37:

"They may also do so because they suffer from muscle pain or they overheat."

Again, that, as far as I can see, is mainly speculation

PROFESSOR BATESON: I think that is covered by the word "may"

DR NAYLOR: If that is the case, that is fine.

THE CHAIRMAN: What about the next section, pages 41 through to the top of 43? Does anyone want to offer an opinion on those? Otherwise I propose to take the next section, and then section by section. Okay.

Let us move on.

DR NAYLOR: Sorry, can I? Again on page 42 this question of ischemia, it occurred and causes pain in humans and this question of clogging blood vessels. That is really going out on a limb from any evidence that is available.

PROFESSOR BATESON: There is evidence, contrary to what Dr Wise said, that you can get sickling in live animals.

DR NAYLOR: Is there any evidence that will cause ischemia?

PROFESSOR BATESON: No, there is not, but there is in humans, and so it is statistics, sure, but it is something that we have to take into account.

THE CHAIRMAN: I think we are just getting slightly confused here about the page numbering. You were referring to --

DR NAYLOR: Page 42.

THE CHAIRMAN: What does the paragraph begin with? That is the next section. Your numbering, I am afraid, is not the same as ours. Mine comes to the bottom of page 43.

DR NAYLOR: It is at the bottom of the paragraph:

"Is the deer's state comparable with a human in pain or distress."

It just strikes me as going out tremendously on a limb to make comments about ischemia during exercising deer because their cell may sickle.

DR WISE: Lord Burns, could I ask if Professor Bateson contends that there is evidence of sickling in deer in response to exercise in vivo? It would be very helpful if he could provide reference to that fact, because it certainly is not in the two references that he has given and it may be in the one in 1840 --

PROFESSOR BATESON: Gulliver.

DR WISE: 1840. Do you not think when they took blood in those days it could easily have sickled after collection?

PROFESSOR BATESON: The point he made there is a difference between the animals which have been chased and the animals that have not been chased.

DR WISE: The point that Taylor makes -- I am sorry, not

Taylor, yes, sorry, Taylor, he specifically says that deer, blood cells, do not sickle and Seiffge gives a reference to the cells -- sorry, in vivo -- and Seiffge gives a reference to in vivo sickling in seeker deer where those deer were injected with very, very high levels of alkaline and forced to breathe pure oxygen and they died, but he did manage -- allegedly -- to get in vivo sickling. That is the only circumstance in modern times where it has been reported, except by Whitton in 1967, and Whitton is now generally regarded as incorrect, and his conclusion was that there was sickling in vivo, but it was a totally benign phenomenon, because the sickle cells were so rubbery they went through the vessels without clogging, but his work has mainly been discredited.

PROFESSOR BATESON: You are not a haematologist, and nor am I.

DR WISE: No, but I have read the references you have given and you have not given the true facts here.

PROFESSOR BATESON: Well --

THE CHAIRMAN: I think that this has taken a slight turn for the worst. I am more than happy for people to make comments and to give others the opportunity to reply to them. If we cannot sort it out, I think we then have to sort it out on another occasion, but I do not want a Newsnight style of engagement taking on. Do you want to say anything, Patrick?

PROFESSOR BATESON: I think obviously we will clarify these actual points in the final report. I have to emphasise, again, that we were working against the clock here, and



we had very little time, and I shall clarify this point and make sure that what we say is properly referenced. I am perfectly prepared to believe that Douglas Wise is right about some of the things here, but there is more to be said.

THE CHAIRMAN: Are there any other points on the remainder of this section which on my numbering goes through to 46?

PROFESSOR HARRIS: I wonder if I could add one comment? If this point is important, if you felt it is important, how long would it take for that examination to be made on one or two samples? This would be almost as quick as it would be to rewrite that section. Is that not correct?

PROFESSOR MORTON: Money?

PROFESSOR HARRIS: It would be relatively easy, at no cost. I believe it would be relatively easy to do, would it not, for an examination to be conducted? Douglas?

DR WISE: Sorry, may I answer?

THE CHAIRMAN: Yes.

PROFESSOR HARRIS: How difficult would it be to obtain confirmation of whether or not cells have sickled at the end of (inaudible) or not?

DR WISE: Professor Bateson has very correctly said I am not a haematologist. It is a question that can be addressed elsewhere.

PROFESSOR HARRIS: Perhaps David Morton.

PROFESSOR MORTON: I am not a haematologist either, but the point is it could be done because presumably blood samples can be taken and they could be given to a

haematologist to do. This is an important point, that is an important question, it is a crucial point.

THE CHAIRMAN: I have to say I am not in a position to judge, but let us take that away and ask whether or not we can improve our own understanding of this.

DR NAYLOR: Can I make a separate point, nothing to do with that? There is this section.

THE CHAIRMAN: Yes.

DR NAYLOR: It is in mine -- I do not have the page number on this one, but is the paragraph before, "What may be inferred from the behaviour of deer?"

THE CHAIRMAN: Yes.

DR NAYLOR: Here the comment is made very strongly:

"Therefore comparisons between hunted deer and deer injured in other ways, the release of muscle enzymes into the bloodstream are relevant."

I would counter that entirely, because this whole question of muscle enzymes being indicative of injury cannot be taken that far. I have taken many blood samples of horses that have run successfully in all sorts of competition that have been very high and there is no clinical evidence of muscle damage, so I think to make that so hard and fast is, in my humble opinion, wrong. This business of tearing goes there within this graph. You can use another term, but tearing is inappropriate.

THE CHAIRMAN: Then the next section, "What may be inferred from the behaviour of deer?"

DR VICTORIA EDWARDS: Forgive me if this is in your report, but this relates to the reading of it as well, but I am

interested in the cumulative effect of stress and to what extent that is an issue in the long-term. If animals are experiencing these changes in hormone levels, is there a cumulative effect because of this periodic change?

PROFESSOR BATESON: I am not sure there is any evidence specifically as a result of the hormonal change, but I think, as David Morton has already said, there is reason to think a cycle of stressful events is in itself progressive. David, perhaps you could say more about this than I can, but I think in the most extreme case it leads to the animal just kind of going completely torpid and in human terms it looks depressed and it was used as a model of depression for a long time.

PROFESSOR MORTON: I think there are two issues here about long-term -- what you mean by "long-term". If you repeatedly stress an animal over a period of days or weeks or months, then that can lead to a serious effect on its physiology so that its growth rate will be affected so that its reproductive cycling will stop and things like that, and that has been very well worked out by things like MOBO. The point about helplessness is that -- the point I wanted to make anyway -- is that the animal cannot escape it and it was having an effect on it, albeit after a few days or a few exposures on it mentally, so that that inescapability was affecting its mental state.

The question in my mind is whether that is going to occur after one chase, and I was linking that with something in the report about the hunting strategy. It

said they could recognise stags but not hinds. How many times has the same hind chased? If you cannot recognise a hind, which is really what was inferred in some of the documents, is it likely that a hind may be chased on more than one occasion? If so, that may be, again, suffering mentally, because it now knows what it is going to be exposed to and it may actually have a shorter chase time in that situation, I do not know. But the emphasis was really about saying putting an animal into a position where you get inescapability and in some cases unpredictability as well which can affect its mental state.

THE CHAIRMAN: Thank you. I think the next section are things in a way we have looked at already today and made a certain amount of comment on, but does anyone have anything to raise of an important nature before we get to the section headed, "Conclusions of welfare of deer", which is on page 58? Is there anything up to that point, otherwise I propose to take the conclusions.

DR WISE: Might I just raise the subject of cortisol. I am rather concerned that the cortisol -- we have measures of cortisol in some tables here, giving a whole range of levels. I think we are going back to page 21, but it is in a sense relevant to this section, because it relates to a cumulative effect of stress and we must remember that stress is not a source of suffering. It is only when it becomes so cumulative that it becomes difficult to cope with and, therefore, there could be some relevance in the actual absolute level measured at the end of a hunt, although, as we have heard, that is

debatable because of repeated challenges and the long half life of cortisol, but I think one should be very careful before comparing the wild and farmed species. If one goes through this table, there is quite a lot of indication that wild caught animals tend, even without exercise, to show very high levels. Now that might mean that it is much more frightening for them to bleed them, but it certainly shows that you have to be very careful how you define what a high cortisol level means. In this table there is a Zomborszky et al, 1993, for example, where there was a direct comparison made, and it is not in this table where experimentors went out and they bled something like 40 farm deer and 30 recently caught wild deer, or something the other way round, and the results were that the cortisol levels of the farm deer were 40, and over 200 for the wild ones. In Goddard's paper that was referred to, some of the levels -- in fact in groups of deer -- went up to about 538, although the highest level here is quoted at 376, and I am perfectly willing to accept that could well be chronic stress, but there is work by Ingrams and a lot of other people where they have compared total farm stresses with the sort of stresses that you would get as a result of maximal chemical challenge by ACTH, and in fact Ingrams et al concluded that many farming procedures produced maximum levels of cortisol response, so I think one ought to be very, very careful when we have complications of wild verses tame and what you mean by the welfare significance of a maximum response. Also the comments that have been repeatedly made that high

levels of cortisol typically are not associated with exercise. Is that comment valid for ruminants, because the only reference I have been able to come up with in ruminants is in training sheep or trained lambs where, in fact, even aerobic exercise on a treadmill, fairly mild exercise produced very nearly a maximum response in a very short time.

So I think, okay, it may be true for humans and horses, but I am not sure it is true for ruminants that exercise does not produce a maximum cortisol response. All I am saying I do not think you can deduce anything from cortisol one way or the other.

PROFESSOR BATESON: I think you can deduce something. It is an indicator. As I was emphasising in the beginning, you would not use that as the only indicator.

PROFESSOR MORTON: Could I respond? I am sorry, I think Professor Bateson is absolutely right. It is one of a number of indicators that one would use to measure animal well-being within, but in itself it can be misleading unless you look at the degree to which cortisol has been released, and also have some sort of comparator, and I think it is -- it would be slightly unfortunate if we thought the deer was such a peculiar species that it did not fall in line with many of the other mammals that we have domesticated in farming, because there are distinct differences in degrees of challenge and it does represent something that with commonsense you would say is obviously stressful. For example, I quoted the work on sheep, whereas herding them from a distance and herding them close up

with a dog produce marked differences in cortisol response so from that one would say it does have a value.

THE CHAIRMAN: What I would like to do now is to have a quick word about the conclusions about the welfare of hunted deer which begins on page 58 and then if we can finish that, and I propose that we have a short break and then we come back and deal with the last three-quarters of an hour or so with the welfare of stalked deer.

Anything you want to say, Patrick, about this section of conclusions? Obviously the sentence which stands out to interested amateurs like myself is on the top of page 59 which is:

"All these pointers have been challenged, but stacked together may produce a compelling case for the view that hunting with hounds is a challenge to the welfare of deer that would not be tolerated in other walks of life."

PROFESSOR BATESON: I think that is correct, actually. There is legislation from the use of animals in many areas and research, animals in transport and these areas, I think these kind of indicators, would lead to that practice being stopped. I think that -- there are two experts on animal welfare actually round the table, and I do not know what you think, but that is my reading of it all.

DR KIRKWOOD: Possibly it is worth saying Professor Harris was unable to get a Home Office licence to do the radio tracking study, and one is unable to say what the reasons for that might be, but they might have included

concerns that it was not a justifiable thing to put the deer through such distress of such a study. Perhaps you could -- do we know what the Home Office's thinking was on that?

PROFESSOR HARRIS: No, we do not. We went through the process. We applied for the Home Office advice and we were turned down and we went through the appeals. The appeal was found in our favour, but that was again turned down, so we never went any further and we never got a full explanation.

PROFESSOR MORTON: I think there is some other evidence as well in as much as rodeos were banned in this country, which is a similar sort of use of animals in terms of human pleasure, and in this country we tend to take a utilitarian view of animals and say that we are trying to balance all the time the pleasures or the benefits to humans against the harm and cost done to the animals and, as Professor Bateson says and Professor Harris has just reiterated, the Home Office have to make this judgment under the Animal Scientific Procedures Act. They have to weigh the predicted harm to the animals as against the potential benefit that is going to come from that research.

On that basis presumably the Home Secretary decided that it was not acceptable for that study to go ahead. Pity he did not give his reasons. It might have helped this Committee. So there have been other instances where animal uses have been prevented. Bull fighting is another one that we do not carry out in this country; circuses are now being debated, so I think this



is yet another example of how society treats animals and whether it is acceptable or not.

PROFESSOR HARRIS: Can I just clarify? The application was only to immobilise deer for the fitting of a radio collar. Thereafter the deer were then to be hunted in the normal way. Maybe the Home Office viewed that once the radio collar had been fitted then it was a true experiment, in which case they would regard the entire thing rather than just a simple procedure.

DR NAYLOR: Going back to those two sentences, again, I would disagree with that conclusion in terms of its physiology and other things. The deer is not well adapted to a long chase, and my own view on all of the consideration of these findings would counter that and I would have to -- my opinion is there is no compelling case at all based on the physiological changes, because if that were the case, then many horse sports would be under question equally, and that may be the desire of other people considering those sorts of physiological changes, but the physiological changes in the deer per se, in themselves, are very similar to those that occur in many horses under competitive athletic activity and also dogs, and I could certainly not agree with those conclusions.

MR SWANN: I would make the Committee clear that it is a matter of opinion and open to debate and as a matter of opinion, it is one I would not agree with because I am very concerned about drawing comparisons between horses which are training for very specialist procedures and have had many, many years of specific breeding for

specific purposes -- trying to draw comparisons with what is an artificial situation. We have been told that we should not draw conclusions by Douglas Wise, who said we should not look at interspecies comparisons for certain parameters. I think this is one there are great dangers in drawing comparisons between an artificially bred and domestically trained animal and an animal which is living completely in the wild and which will not expend energy. A deer will not expend energy for no purpose. The situation is arguable.

If I can say in the report in terms of what Professor Bateson has said, we must not lose sight of the fact the decisions in animal welfare historically have been made on the basis of behavioural observations and the broader picture is to equate the scientific findings to the behavioural findings. This, I believe, is the strength of Professor Bateson's work and it is one I feel is the major strength, because the two different approaches support each other and details, such as sickle cells and things, are not irrelevant, but I think they do have to be put in their place in not losing sight we have two very major approaches to animal welfare which support each other quite considerably.

MR SWIFT: There is a construction in this sentence which makes me uneasy drawing -- a comparison between animals in the wild and animals which might be subjected to certain treatments in the laboratory and that brings me to what is meant in this sentence, "By the deer". "All these pointers have been challenged, and stacked together they produce a compelling case for the view

that hunting with hounds is a challenge to the welfare of the deer." Of course it is, the deer that is being hunted; but in this situation we are dealing with a wild population which has been regarded in the round in its total number. Is it equally true to say that all these pointers have been challenged, but stacked together they produce a compelling case to the view hunting with hounds is a challenge to the welfare of the deer as a whole, as a group and as a population that would not be tolerated in other walks of life.

PROFESSOR BATESON: I think it is a very interesting point that one needs to distinguish between what happens to individual animals and what happens to a population and I fully take your point about that. There is a management issue which I think is not really part of our brief, but there is an issue to do with whether or not deer population will remain as it is, if a total ban were in force and that was not our concern.

THE CHAIRMAN: I think that is tomorrow.

PROFESSOR BATESON: Yes, exactly.

THE CHAIRMAN: Any other comments on this?

MR ADDISON: The point about behavioural observations. I mean, simply looking tired happens when things are not particularly unpleasant. I take the point you want observations of how tired the deer look, but they by themselves. If I was to stop in the middle of Oxford Street and put my hands on my knees and breathe hard, they might take me to hospital, but it is a normal thing I would do after a cross-country race. So I wonder how far -- I mean, animals are going to be tired, and look

it. So will humans in a willingly repeatable activity.

DR WISE: On this subject, could I suggest we have heard about utilitarian arguments, not just about hunting and that is certainly, I think, the view of many animal welfarists, but arguments relating to justice which were raised by Professor Webster, I trust we will eventually be discussing those insofar as if the welfare of the herd as a whole if you want is so -- if the individual may suffer it may be for the good of the deer during its lifetime and for the herd and also, in my view, the casualty argument is totally overwhelming, because I believe road accidents, wire entanglements and everything else probably cause more suffering to deer in the South-west than either hunting or stalking, and the presence of the hounds could not easily be replaced. We are not just looking for deer wounded by stalkers. Most of the deer are not wounded by stalkers. In fact, the other thing I would like to mention, as Professor Bateson suggested that he found evidence of nine deer I think in the casualty records. My own data suggests 26 per annum which would treble his wounding rate, but this is not necessarily wounding by stalkers; it is shotguns and rifles, and it probably represents the true picture of what goes on by people who shoot deer on Exmoor rather than by expert stalkers.

THE CHAIRMAN: I am suggesting that we deal with the question of the welfare of stalked deer after we have a break.

PROFESSOR MORTON: Could I just refer to the argument that Dr Wise has just made, because it seems to me one of

saying I can go home and beat my wife tonight because children are dying of starvation in Ethiopia because you can always find something worse going on which will discount it for yourself. I am very suspicious of those arguments. However, there is a Government report by Professor Michael Banner which I think would summarise this debate quite nicely. He said there are three principles: Firstly, is an animal use acceptable or unacceptable right from the outset? There is the sort of thing you just should not do. If that is not the case, then it may be possible to do something harmful to an animal, but there has to be good reasons to do it; and the third principle was that you should always carry that out causing the minimum amount of suffering. I think those are three principles which this Committee inevitably are going to have to wrestle with, but they are part of the Government report to the Ministry of Agriculture on use of animals in biotechnology.

DR HELLIWELL: There is a sentence in that conclusions paragraph that says:

"In terms of its physiology and behaviour the deer is not well adapted to a long chase."

I have a feeling that contradicts the conclusions from the first section of this report that many of the intrinsic attributes of the deer muscle did actually allow it to indulge in repeated sprints with periods of recovery. That may come down to the definition of what it is meant by "long chase", but maybe there is a contradiction there.

THE CHAIRMAN: It was the word "long" that I ringed in my copy and wondered if it was just a definition point we were talking about.

PROFESSOR HARRIS: Can I qualify that, if you had a new breed of horse with big teeth and long horns and it turned into the predator, then in that case the predator, the horse, is an aggressive predator. Relative then to the deer, the deer would be faced by something which is immediately probably its superior and in that case, that endurance exercise, those hunts would be very, very short. When you talk about endurance, it has to be relative to whatever it is that is chasing you. I suppose a tortoise has very good endurance when chased by an earth worm. It is a question of how long do you go on for? The deer has good durability relative to the hounds in that it can maintain a reasonable pattern of escape and recovery for a prolonged period of time.

Can I just myself add a couple of comments? In a way I am addressing Pat next door. You say all these pointers have been challenged, but stacked together they produce a compelling case. Are there not some points where the challenge perhaps does require a modification and if they are no longer a major point, then they have to be in a way taken out of the stack because they are no longer really pertinent. What are all these -- and I do not dispute there are some -- but what are the current lists of pointers which together then produce a compelling case?

PROFESSOR BATESON: I would say on each of the five dimensions there is a cause for concern. We all agree

that on the question of muscle damage more work is needed, but I think we have to say that although we have not got the evidence that we would like, we cannot say, and we have actually disproved, there is muscle damage and, in fact, as you know very well, we have nine animals which have very high levels of CK which, if one was to give a comparison with horses, would suggest they might be in difficulties later on.

There is a number of anecdotes which suggest that escaping animals do suffer and die, and, again, we need to have better evidence than the evidence we have, but it is not the case that the effects of extreme stress and capture are known in roe deer as they are well-known in other species and when red deer are chased with helicopters and transported, as they have been done in New Zealand -- when red deer were chased with helicopters and captured a lot of them died and so it does happen, and so it is not as though this is an unknown phenomenon in red deer. It is very well-known in other species and it is also well-known in red deer. That is one area where the evidence is not wonderful, but it is put together with the other stuff. The evidence of these animals will go on and on and on, which is the behavioural reasons for proposing that they are strongly motivated to get away. There is the evidence of coping, of adaptation and here there are disputes -- there is no question about it -- but I think we have good reason to suppose that these animals are not able to sustain at high speed for a long time. The average speed of these deer is, as you saw, 5 kilometres

per hour and that is because they are getting lots of rest.

That is not at all comparable to a marathon and it is not at all comparable to football. It is a quite different kind of scenario and I think that is why, when we take all these things together, I think there is a problem. Maybe we need to talk about this more.

PROFESSOR HARRIS: I wanted to carry on that sentence, if I can, that the hunting with hounds is a challenge to the welfare of the deer that would not be tolerated in other walks of life. We discussed, of course, other walks of life, meaning laboratory animals, but these are in fact animals in the wild where man has eliminated a substantial predator. What are the sort of challenges that one would admit in the wild as being acceptable, or can we draw an analogy like that at all?

MR SWANN: Chairman, could I perhaps make a quick comment on that? I think there is a general consensus in most fora that if people are the agent of the control, then you make moral judgments. In a wild encounter between a wolf and a deer, you cannot make any moral judgment. It might distress people considerably, but no moral judgment can be applied because you have a totally wild encounter. The moment you put people into the equation, I believe you have to start making moral judgments and you have to ask about the acceptability of the method and the overriding principle is you use the method which causes least distress and is the quickest method to achieve insensibility, and I think those are ingrained principles which are hammered throughout animal



management, not just of wild populations. So I think the moral element comes in because it is actually people who are taking the hounds out there. Comparisons with a natural encounter I think are totally irrelevant.

THE CHAIRMAN: Our tea is ready. I suggest we take 10 minutes out and maybe we will just see whether anyone wishes to make any other comments on this section before we move on to the issues. Could I say there is also tea for the audience at the back.

(Short break).

THE CHAIRMAN: Thank you very much. Any more contributions on this issue of the conclusions about the welfare of the hunt deer?

DR NAYLOR: I just have a contribution on a small point of detail -- I do not know if that is valid.

THE CHAIRMAN: Yes.

DR NAYLOR: It is in this section, "Is the deer adapted to a long chase?" The end of the second paragraph.

PROFESSOR MORTON: Which page?

DR NAYLOR: My page numbering would not match up to yours. Again, it would relate to any further work, but again it would also relate to the understanding of exercise science in this whole scenario:

"A more reliable method of determining the deer's capacity for extensive exercise would be to measure maximum aerobic capacity."

Again, it is a point of detail, but I would say that that probably is not the best way to do it. You cannot, for instance -- it is another athletic species used for racing, has a very low maximal aerobic

capacity, can run for prolonged periods, but it can maintain a very high percentage of that maximum for long periods, and that relates to its metabolic make up and how it utilises energy. So just measurement per se of that is not in its own right the end of the story. It may contribute.

THE CHAIRMAN: Thank you very much.

Shall we move on to the issue of the welfare of stalked deer? We had quite a lot of discussion about this this morning, but I would propose that we take this section really as a whole and see to what extent there are any observations on points that people wish to make. Patrick, do you have any opening remarks, or have you said your piece on this?

PROFESSOR BATESON: I think I have.

DR NAYLOR: Sorry to speak again, but it is something that does strike to my mind as very important if one is going to make comparisons of means of culling the excess numbers of deer in the West Country, and the comparison is obviously made between hunting with hounds and stalking.

The important point here is the percentage of deer that are wounded or maimed and potentially how long that may occur -- the suffering that may occur subsequent to that. As far as I can gather, these percentages are given by the stalkers and nothing against the stalkers, but if I was a stalker and I was asked to go on a percentage, I would tend to think of the good days, as it were, rather than the bad days. So I think it really has to be considered strongly that one is making these

comparisons whilst there has been some objective studies conducted now on hunting with hounds. As far as I am aware, the objectivity of the stalking percentages, while attempts have been made -- I accept that -- it probably does not hold up as a strong comparison at this stage, so if that is used in any overriding decision on this whole question, I hope that is considered very strongly.

THE CHAIRMAN: I think there is a question that has occurred to us on a number of occasions in a similar light, which is that if one was to cease shooting carried on by a wider group of people following the end of hunting, would that lead to greater levels of inaccuracy than are being reported in the occasions where it is being done by professional stalkers? I simply put that as a general question. But we have to ask not only how the present situation works, but also how it might be affected if there was to be a change of regime.

MR SWANN: Lord Burns, could I just make one quick point that I did quote this morning from experiences north of the border, which I know you were desperate to tease me about? The statistics there were from the National Trust State in Torrenden, the Bene National Nature Reserve, and an estate in Gerloch which is managed entirely for conservation purposes. The figures there were by professional shooters who were not shooting for financial gain; they were employed either by one of these organisations, and so you have probably the best scenario that you will get and this is why the figures which are shown, which Professor Bateson brought from

the West Country, surprised them because one would expect them to be far better, given that experience of marksmanship.

I think the crucial thing is to show that that level of marksmanship can be achieved and is achievable, those sorts of figures are achievable, and I think it is down to landowners to insist on this type of accuracy.

THE CHAIRMAN: I said earlier to you that one of the things I have learnt over the last ten days, if I did not know it already, is that everything is done better in Scotland!

DR WISE: Could I come back, Lord Burns, to this point of casualty deer? In my own figures, just as I say 26 deer per annum as opposed to Professor Bateson's nine, and I believe the difference is that quite a lot of these 26 were probably dead on arrival and, therefore, would not have been counted in his figures, but they would, nevertheless, represent deer that were not recovered by those who shot at them, either with a shotgun or with a rifle. If, in fact, one takes the nine from which Professor Bateson derived 4 and a half per cent figure, if you multiply by 3 up to 26.3, you do get a higher level of wounding. I think it is still -- you could say that is a low level in one respect, but those deer probably suffered badly for a long time.

I think it is true to say the scientists who have been advising the Countryside Alliance have always said that if they believe for one moment that Professor Bateson's claims about capture myopathy and the great damage done to escaping deer were really true, then

hunting would not be justified. We see no reason to suppose that it is true, but we are sure that there is a degree of wounding, not necessarily all by good stalkers by any means, but we are also very persuaded by the casualty which must not be forgotten in all this.

In fact I think for every 77 healthy deer killed by the staghounds every year, there are a further 18.5 killed on hunting days and 45.5 casualties on call out days, plus a further 37.2 dead on arrivals. Of the live casualties on call out days, of those 45.5, some are clearly knocked down by the side of the road and do not need dogs to find them, but 29.6 of those per annum on average over five years required the use of hound. If you add that back to the 18.5, it does represent a very significant number of deer accounted for by hounds are, in fact, deer that would have had much more prolonged suffering had they not been so found by hounds. You could therefore argue with a great deal of conviction, I think, that the staghounds working in conjunction with stalkers are, in fact, contributing to the overall welfare of the deer in a positive rather than a negative way.

THE CHAIRMAN: It has been put to us a point that there are other types of dogs who could do this job, not necessarily dogs which chase deer but dogs which are more of the hunter variety and that if you were worried about the issue of casualty deer and even deer which have been wounded, then you can do this with other dogs; you do not need to keep a pack of staghounds in order to do it.

MR SQUIRES: Could I comment on that, gentlemen, and also the point Douglas raised? The first thing is I think all of us involved with deer and their welfare accept that there is a welfare equation as far as casualties are concerned. There are a phenomenal number of deer, as Douglas has quite rightly pointed out, which are injured in the countryside and on the roads on a daily basis and they have to be dealt with quickly. There is no doubt in my mind that where the hunts operate in the west of England they do an excellent job in terms of coping with the casualties. No doubt about that at all.

All I would say to you is that of course that is the relatively small part of the United Kingdom and elsewhere in the United Kingdom the same service is provided by a combination of the police, the RSPCA and the welfare organisations and stalkers, either all together or in various combinations, and most police forces have a call-out system based on their ops room which enables them to be able to call out stalkers, RSPCA and a whole plethora of people suitably equipped to deal with casualties throughout the United Kingdom. So I am not belittling what is done in the south-west; it is an important vital job, but it also happens to be done elsewhere in the United Kingdom as well by other organisations.

As far as the accident figures are concerned, or rather the injury figures are concerned, I think that the issue that concerns me with Douglas's analysis of the statistics, unless I am totally wrong, is it is based on hypothesis, because the research has not been

done in any depth to give us any confidence in the sort of figures that we are talking about. The only real research that I am aware of -- and I hasten to say, once again, I am not a scientist -- in this particular area is the research that was done by Patrick. Having been asked in the early stages by Patrick for these facts and figures and having to say they are not available nationally, and that is a reason why he had to go through the vacillations that he had to go through to try and get any feel for it at all. It is wrong. I believe we should have a feel for the national figures, but for a variety of reasons: Funding; interest; a whole range of activities, reasons. The facts are not available, so what I am suggesting is that all of the statistics that have been bandied around at the moment are based on a very shaky hypothesis because we do not know what we are talking about, with the exception of the figures that Patrick has produced.

MR WATSON: Could I make one more point about the casualty figures? Dr Wise has already mentioned that a number of those deer that have been reported by the hunt are actually sufferers of shotgun wounds. I think we have to differentiate here between those deer that have been legally shot at and those that have been illegally poached and there is a distinct difference. In the main, the deer control that takes place, even in the south-west of England, takes place with a high-powered rifle. Those deer hit by a shotgun are likely to be the deer that have been attempted to be poached. I do not dispute Dr Wise's figures, but whichever the figures are

I think we need to take that into account.

If I can make a second point about recreational and professional stalkers. Our membership includes over 10,000 stalkers, but 87 per cent of them are actually recreational stalkers and those stalkers aim to do the job to the same standard as the professional stalkers. The only difference is, to my mind, the number of deer those stalkers are shooting each year and there are different criteria for each of the two groups.

A professional stalker in the main is shooting a large number of deer in a very short period over the winter and is, therefore, under pressure of time. He therefore has to be quick and he has to be accurate. The recreational stalker has much more time on his side and will therefore take great care to shoot the deer humanely. He may not always succeed, but in the vast majority of cases his aim will be to shoot the deer cleanly and humanely and the difference is that he has the time to do that. Therefore the talk about the difference between recreational and professional stalkers, which you often hear about, yes, there is a difference, but to my mind the aim of all the stalkers is actually to do it to the same standard.

PROFESSOR MORTON: I think it would also be helpful to have some idea of these casualty deer about the extent of the injuries after they have escaped, because they may have, as I say, shotgun wounds which perhaps does not affect them materially at all, or they may have some serious injuries if we are going to try and look at the suffering involved.



PROFESSOR BATESON: It is worth saying that in the carcass analysis that was done by the gamekeepers there were some with shotgun wounds, and they clearly were not as a result of stalkers. Also the -- I have forgotten what I was going to say. It has been a long day!

MR YOUNGSTON: Thank you, Lord Burns. I would like to give you an opportunity about our plans for the future in Scotland and Ian, talking as an individual as well as a representative of the (inaudible), we are setting higher and higher culls for many of our deer management groups. Many of our stalkers, professional stalkers, are starting the cull at the beginning of the season and going right on until spring and, in fact, they are making use of authorisations, so really they are working flat out to make culls. Each professional is perhaps coping with several hundred carcasses a year. We are talking about red deer, but the same is true of seeker deer and roe deer in the woodlands.

We are moving ahead using the authorisation system. Obviously shooting is part of it and here we are quite exceptionally strict in who we authorise. Night shooting is all governed by authorisation of all species. So welfare plays a most important part of night shooting operations.

In some of our woodland areas, like Galloway, 16 per cent of the cull is taken at night. Again, if you compare this with some of our areas east of Europe, where quite a large proportion of the cull is taken at night of step deer. So really we are quite economical with issuing night shooting authorisations, but at the

same time a lot of people have rights to shoot, crofters, and here we are talking about crofters and old farmers who have suffered damage or are likely to suffer damage, again all species of deer. It is very difficult to legislate to improve their efficiency. Obviously they are going to protect their crops and some of them will be rather perhaps willing to take either longer shots than they should, or perhaps not placing the shot as accurately as a lot of our professionals or deer stalkers.

So anywhere in a ball game of perhaps increasing culls, everybody is playing a part and we are going down the road as well of control of (inaudible), which is a new section of our act, seeking the agreement of an area to reduce populations or modify them, again for a number of different regions, conservation, woodland regeneration, and so on. If that does not work, we are moving again towards statutory controls and here, again, we will be bringing in teams of controllers to reduce populations very quickly, to extract carcasses like other crops and all forms of hill vehicles.

So, again, we are going to have to, just as you are here, think very carefully about welfare issues, because these methods which are going to be used in the future are going to be fast rapid responses to situations.

The other point which we are discussing is now with events (inaudible). There is very little evidence now with the fallen venison prices that poaching is a very serious problem. The use of shotguns by poachers is

something which happened in the past and it is not very much of a part now in Scotland. The price is so poor of venison, less than 40p a pound skin on carcass meat for red farrow that it really is not worth a poacher's while. The examination of all carcasses of venison, clearly you keep tabs on all venison and their records very closely, but there is very little evidence of injury at all. You hardly see carcasses with shotguns. So really this is just an update on how we are tackling it and learning from the operations here.

THE CHAIRMAN: Thank you very much.

MR SWANN: It is not just me!

DR WISE: Lord Burns, could I answer your question about dogs and all pointing dogs and that sort of thing? I train pointing dogs, with varying degrees of success. One killed sheep, not by disembowelling it I might say, but that is no longer with us.

About 20 per cent of stalkers, I believe, have dogs, and a dog is extraordinarily useful, as long as it is properly well-trained, to find deer that have run off wounded after a stalker has shot. They are trained to come back to the stalker and lead him into where the deer is lying. I think the problem is that very often on Exmoor, and other casualties, it is not the shot animals; it is the ones that have been hit by vehicles and run off. They are seen by somebody in a locality and one does not know quite where they are, they have gone to lie out somewhere. The single dog may or may not find the deer if after an hour or two you have managed to get the stalker on site and he is one of the 20 per cent of

stalkers with a dog, but the response time is likely to be low and a single dog will have a very great difficulty in holding a deer that is still capable of running away. Maybe the stalker will get a shot, maybe he will not.

Equally, as you will not know whose property that deer is on at the time, there may be difficulties for the stalker in following that deer up. I think there is a general agreement with most people for casualty service that the hounds work frightfully well and I do not see anything else that would do as well. That is not to say that stalkers should not have dogs. I think they should be encouraged.

THE CHAIRMAN: I think I read somewhere that it is the case that in Germany stalkers are required to have dogs.

MR WATSON: Yes, there are two points really. We did a survey about four years ago which looked at the number of dogs owned by stalkers and, in fact, the figures that came out were 37 per cent -- sorry, 39 per cent for professional stalkers and something over 20 per cent for recreational stalkers. That is not to denigrate the point that Mr Wise is making.

In certain European countries it is mandatory to have a dog with you; in other countries it is mandatory to have a dog available to follow up a deer, if necessary.

MR SWANN: If I could just make the point, Lord Burns, please, that where the RSPCA is asked to help with injured deer, then first of all with the assistance of a police officer power of entry to a property is not a

problem. Secondly, the RSPCA does have a list of people with suitable dogs in areas where they can call on them if there is a need to do so.

Once again, obviously, in certain areas it is easier than others, but it is something which people are used to dealing with and I think this point was made earlier, that these are things that people are not used to dealing with in areas where hunting is not practised.

THE CHAIRMAN: Any other points on this issue?

I suspect we are probably entering into the stage of fatigue; whether very serious fatigue or not and I am not sure.

Would it be sensible if we simply had one further round of the table and then call it a day so that people could take the opportunity, if they wished, to make any final comments?

For my purpose we have had a very useful discussion and a lot of good points have come up and I am sure that the authors will be looking at them. So if I start maybe with Professor Morton and simply ask if you wish to make any final points. You do not have to, if there is nothing you wish to add.

PROFESSOR MORTON: Thank you. Maybe I could just say some of the points that I crystallise in my mind: One is that I think it is important to look at the evolution of the species and Professor Bateson has made this point, but I think the species has evolved to cope mentally as well as physically. It is a sedentary animal, it is used to short chases to get away from wolves and I am talking about evolution taking place over tens of thousands of

years, not the selective culls that have probably gone on in deer hunts for the last thousand or so.

We have been breeding rats for research, for example, for at least 100 years, but when you put them back into the wild they go straight back into their wild behaviour, so despite domestication they have always got those wild instincts which is rather interesting and I suspect that deer, although they have been selected in some way or another it has probably been pretty random and they are still probably as they were several tens of thousands of years ago.

So when they come up against an inescapable threat, I think that mentally that is going to have severe consequences on them and I think that has generally been conceded in terms of the last 20 minutes or half an hour.

I think you have a very, very difficult job here, because you are talking about how you compare two things in terms of the suffering that may go on for two or three hours of a hunt with 50 per cent of the animals escaping and not knowing what happens to those -- it does seem to me the catted deer would still provide some answers and we need to have more information from them -- against the X per cent of 5 per cent or less, probably as we have heard it could be over 99 per cent if suitable controls were put in of deer that are shot and some of those escape and they may have a slow lingering death, so how does one add them up?

It is a burden that I am pleased I do not have. I think as a general rule as a society we wish to treat

animals well, we wish to be humane. As Bill said, we are moral agents and part of that involves not abusing animals and it also involves causing the minimum amount of suffering and it involves trying to enforce good practice, if not best practice. I think it is on those sort of general criteria that can be accepted by most people that we are trying to find our way, looking at the evidence, to determine what is best practice and to try and not cause suffering that is avoidable.

In terms of the environmental ethics of the gentleman over there, talking about the herd as opposed to the individual, I think that is absolutely right, but at the end of the day what determines how concerned people are about it is the suffering of the individual. I think most people are concerned that herds have to be controlled in some way or another, I think we are just talking about the most humane way of doing it.

MR SWANN: Shall we just carry on?

THE CHAIRMAN: Yes, please.

MR SWANN: I do not want to say much because I endorse what David said. From one of the previous opening addresses I put a paragraph in and decided to take it out, but I have likened Professor Bateson's work to if what we are trying to construct in the animal welfare science world is a sort of jigsaw at the Houses of Parliament, we have now have the clock face at Big Ben which means we know what the building is but we have still got an awful lot of work to do.

In that context, I think the paper that we have discussed today has gone an awful long way to showing us

exactly what the overall picture is. Let us not forget all that work has to be done and in the meantime, while that work is getting done, we have to make ethical judgments and I thoroughly endorse what David said, is that we have to aspire to best practice. In my view best practice is based on the definition that we had earlier that it is least disturbance of the animal in its natural environment and it is the most natural route to insensibility. With those key points I will close.

PROFESSOR MORTON: Could I possibly come back just for one second because you did surprise me with going round that way?

One of the other things I wanted to say is that we have a dilemma about who gets the benefit of the doubt at the end of the day. If there is genuine doubt, as I think there is, then should we give that to the animal, or should we give it to the human benefit that evolves that is balanced against those animal harms?

DR WISE: Lord Burns, we have not actually discussed the adaptation. It has been stated repeatedly that deer are not adapted for a long chase. One piece of evidence Professor Bateson gave was the (inaudible) grade stance was a transport mechanism rather than for avoiding predators. Well, in that case it is a little surprising that the deer's muscle does not comprise a lot of different slow fibres types, type 1 fibres rather than fast type 2, 3, fibres and it is also a bit surprising it has so much glycogen and pethidine dipeptide if in fact evolution for the avoidance of predators was not important.



The next point arises as to whether the predators always catch deer in the short chases. One might almost suppose that the wolf, which was possibly the main predator of the red deer, might well have evolved into a cat if it was going to catch deer all the time and ambush it, because the wolf has an ability to use its nose and it has stamina. Professor Geist makes a very strong point that deer and wolves would both have evolved and been under most selection pressure at times when the prey species was relatively less plentiful and the wolves have to work harder. Under those circumstances there is no reason to suppose that wolves would not hunt in very much the same way as hounds and that would have been the more normal condition, I believe, under which deer would have evolved.

The evidence we have cited is from zoologists who go and study the few wolves that are left in areas where there are a heck of a lot of deer and they do not have to work very hard to catch them. Very often they study them in the middle of winter because it is very much easier to follow them. That way the deer fall through the snow, allowing wolves to travel on top, so I believe one has to be very, very careful indeed to suggest that the deer is not evolved capable of prolonged pursuit.

MR ADDISON: I was discussing at tea with my friend here and there is some evidence or possibility that exercise tends to absorb fear to some extent. It is very dangerous to argue for humans, but a lot of athletes are very fearful before a race starts, even to the point of throwing up, and once the gun goes that fear goes

completely. I have discussed this in terms of the flight and fight reaction, as to whether fear plus the flight and fight reaction are not additive, but actually one reduces the other. That is just a possibility.

One quick point: I actually have been chased by a helicopter, as it were, across the track at Stoke Mandeville Hospital which has a landing pad for helicopters and one day I was going up there and the helicopter took off and had to swing round because of the wind right over my head. I began to panic, so I think if I wanted to upset a deer's welfare I would hunt it by a helicopter. That might relate to some of the problems those who talk about Professor Bateson who were chased by helicopter. I think it is a very special case which is chased by a helicopter.

MR SWIFT: I think three broad points strike me. The first is that having heard a lot about the physiology and pathology of hunted individual deer, I still believe that one should be looking also in the context of the population as a whole, and also looking at that population in the socio-economic context in which it exists in the south-west of England. To lose that architecture around the problem is likely to be a dangerous proposition.

You say who should have the benefit of the doubt?

I am not convinced from the point that I said this morning that once you upset the very subtle relationships which exist in areas like the south-west of England, or in any rural area, then you start to have unforeseen consequences and probably unpredictable

consequences which could be harmful in quite a wide way, but that is a reaction that I have. I think that one needs to look at the population. You need to look at the wider context.

Professor Bateson's research addresses the particular question of wounding rates from stalking and I would just like to conclude about the comments that he makes about training of stalkers, which I would really like to underline at this stage.

As I said this morning, the research showed clearly that the current voluntary system of training produces very low levels of deer escaping wounded, and the estimates of 2 per cent are going to be very difficult to beat, and certainly they set a target which training should be directed towards achieving in all areas. I think that the voluntary system that has been developed by the NGOs in the UK over the last two or three years under the guise of deer management qualifications, which in turn falls into context with the deer initiative which has been cited in various places in the evidence that we had before this inquiry, that that training, that voluntary training system, is starting to work very well and in the last 16 months 2,793 people have taken the first stage of that training programme and 1300 and have proceeded towards the more advanced second stage of the deer stalker stimulant. I think that even though we have very high levels of stalking competence by and large, this is a step further in the right direction.

I think also that landowners are aware of and

endorse the various existing training programmes and they are increasingly expecting trained stalkers on their land. I do believe from experience and knowledge that there is an increased use of dogs by stalkers to track and locate shot deer and that that decreases the likelihood of escape of wounded deer.

Obviously from the stalking side we have to resist any sense of complacency, and Professor Bateson's study is unable to present any evidence that the present system of legal stalking is defective, certainly within the context that he was looking at the problem. I realise that is geographically restrictive.

You go on to say, sir, that the interests of animal welfare and stalking could be further refined so that the probability of suffering is very small. I think that was at page 68 of your report, but you give no suggestion of what those further refinements are, but I would just reassure this inquiry that, together with partner organisations in the stalking world, we are continuously working to improve training and skills, but we would, however, resist any suggestion that a system of mandatory testing would make an impact on already very low rates of wounding. I believe that for the following reasons: We believe that effort will be better spent on encouraging these systems that we have in place which we are developing at the moment, which will encourage the greatest level of support from those they are setting out to benefit. Thank you very much

DR TIM HELLIWELL: Thank you. I am going to make a brief general comment. I have been quite impressed by the

discussion today and the draft document that we have learnt a lot about the physiology and pathology of the consequences of exercise on deer as a result of the two studies we have been discussing. I think there has been really quite a surprisingly broad general level of agreement on the strengths and limitations of the scientific work, and really I hope that when there is a final draft of this, the final draft comes out, that we are able to avoid the selective quotation of particular items of evidence which lose the perspective that I think is present in most of this report. I think we are agreed in most areas when selective items are quoted that the science gets a bad name.

MR YOUNGSTON: Thank you, Lord Burns. I can only support the work which you have done in the report. I think our task is probably going to be made extremely difficult to implement the work because just about every continent of the world, increasingly (inaudible) is quite a threat to the habitats. So whatever we decide really has to be translated into methods which can be used by those in the field.

In this country as well with land reform and public access it is putting more of a stress on deer stalkers, what people we have, more disturbance you have and many times of year they need to be calm, quiet, using the resource, especially winter time and calving time. There are a lot of aspects which should tie up with your report. Thank you very much.

MR SQUIRES: I would like to start again with welfare of deer, if I may? The first is that the Deer Society is

delighted to see both the studies that have been tabled here. It is an area which has caused an awful lot of dissention in the past and comments tend generally to have been totally objective and partisan, depending on which side of the equation you happen to be standing on. We now have two scientific studies which actually, in my judgment, give us an excellent jumping off point to start looking at the issues in general and for that I think the Society would, with your permission, Lord Burns, wish to thank both studies for the considerable amount of work they have done.

There is no totally stress free method of controlling deer and anybody who believes that there is, is aiming for the sky and going to be disappointed. It does not matter whether you are talking about hunting or stalking, shooting, there is bound to be some level of stress involved to the animal. We have talked around the issues at some considerable length and I am not going to look again, but what I would say is that both have their strengths; both have their weaknesses, quite obviously. I suspect, rather as previous speakers have said, you are going to have an extremely difficult job to do trying to determine which particular path to follow. Not an enviable task at all.

As far as shooting is concerned, I can essentially emphasise the point that has been made by John Swift, we really ought to be looking at the shooting world to the various higher standards of shooting ability, shooting safety, coupled with welfare and a good understanding of the countryside and the pray. I would totally endorse

what he has previously said about the need for training, voluntary training, hopefully 100 per cent voluntary training, but certainly training to try and ensure that all the time we strive for higher and higher standards. The standards are good at the moment, but, like everything, we can do better and that is our aim.

A point on the hunts, if I may? I have been working in the West Country now intimately with the hunts Exmoor deer and so on for the last seven years and I would say to the Inquiry that the hunts provide quite extraordinary controls in the west of England. That is something I would ask you to take note of. Discussion of the number of deer culled by the hunts I believe is academic. That is not the issue. I believe -- and it has already been hinted at -- that probably a greater issue of the control of the deer is the control of the people, because it is the people who control the deer, and the level of control exercised in my judgment by the hunts over the people on Exmoor is significant. There is generally a broad consensus about what has to be done to the deer and the way that it has to be and the way that it should be done.

A part of the baseline upon which you are going to be debating is quite obviously is hunting, whether it should continue or not. I think very great emphasis ought to be placed on that level of consensus that the hunts have achieved and if, ultimately, the decision goes that the hunts go, then it is vital that there is not a vacuum left behind. It is critical, absolutely critical that the knowledge and the expertise that

exists in the hunts ideally should be incorporated into whatever new organisation is put in its place. I am not, hopefully, prejudging the exercise; I am just asking that that knowledge and expertise is not chucked out with the bathwater, otherwise we are going to have a vacuum and that potentially in that part of the world could be an Armageddon situation for the deer, which will be disastrous.

Both David Morton and William Swann have mentioned best practice. Without repeating it, I endorse 100 per cent what both of them have said and I subscribe to their arguments.

DR KIRKWOOD: It is clear that there is very great commitment to animal welfare on this debate and it is a far less simple debate than many people perceive, many people appreciate.

We have spoken quite a bit about adaptation. It seems to me there is a slight danger of taking this too far. The deer, as I see it, are quite clearly well enough adapted and fit enough through their personal history to keep running for as long as they do and no more. There has been talk of some further studies of adaptation, but I would ask people should ask very clearly what would be the purpose of that, because are we going to really be able to take that question much further than that? If they were better adapted or fitter they would be able to run a little bit further. If they were less well adapted and not so fit, they would run slightly less far.

We have talked about the interpretation of



physiological data and I think this point is well perceived, but it may be worth just saying it again that if we evolved a feeling system, a system of sticks and carrots essentially, that gives us fear and pain to move away from bad things and gives us good feelings to move towards things that are good for us from an evolutionary fitness point of view, then there can be two reasons why you run: One, because you want to get away from something bad, or because you want to move towards something that may be good.

The physiological effects of that running may be rather similar, depending on what you are doing, and you have to look at it in the context of what the animal or human is running for. I believe the deer are telling us in running to exhaustion that they probably have a severe dislike of being chased by hounds and I do not think anybody would disagree with that.

I think that it emerges from this that there are no perhaps better data on stalking which would be a good thing. I am not saying the data are not good. It is certainly as good as we have at the moment, but there do seem to be uncertainties about this and it is a very important issue, and whatever happens in the future we would all like to know what the injury rate is and how severe the injuries caused by misshots are.

My final point is that I think there has been a changing attitude to animals that has been going on for a number of years that is a reflection of our increasing knowledge of their biology and perhaps insight into the minds of animals, which perhaps started with Darwin, and

that hunting is an old tradition and perhaps if it had not begun pre-Darwin, it probably would not begin now. I think the issue should be judged on welfare. It is not an easy issue to judge and I congratulate the Inquiry on their efforts to deal with it.

THE CHAIRMAN: Thank you very much.

PROFESSOR BATESON: Could I say, Chairman, that when you outlined your scheme for running this thing I was a bit sceptical whether the seminar could achieve anything, but I have to say it has achieved a lot and I think both Roger and I will change the character of our report quite a lot as a result of discussion and I think that is thanks to everybody who is here.

I think you have done a remarkable job of keeping the temperature down and the light up and I think we are very grateful to you for that. I do not need to tell people here, but I have been accused of all manner of things and what I really am interested in is the evidence and I think what actually has been important about the study that we did and the study that Roger has done is actually it raised the standard of awareness and I think things said now would not have been said a few years ago and things which were said a few years ago which would not be said now. I think the quality of the rational argument has improved no end so I am pleased about that.

I think that is really all I want to say but to congratulate you on keeping it so calm.

PROFESSOR HARRIS: I think Patrick is speculating again and I am not sure how calm it has been, but perhaps we

should take some measurements or rectal measurements, possibly, to improve it.

The only thing that I would say is in the course of the report we will try and bring in some of the other data which is really the data that David Denny at the back there has been collecting and also the data that is from Ireland and we will try to include that.

I became involved with this in the end of 1997. I thought I had finished with it completely last year. I hope that with the end of this maybe that will be correct.

I think it has been a superb meeting. I have learnt a tremendous amount and have enjoyed it enormously and I hope from this will come a proper decision.

THE CHAIRMAN: Thank you very much and thank you for those kind remarks. People on this side of the table start from a much lower position of knowledge than people on the other three sides of the table. I think there have been times that we have been struggling, but I also feel that we have made quite a lot of progress.

I support the view that says that the science has contributed something to, in terms of findings, this process, but it is also my impression that it still cannot answer all the questions.

On the physiological measurement there seems to be quite a good measure of agreement. On some areas I think it is also agreed that more work is needed, muscle damage, kidney damage. I think it is also agreed there could be a better collection of the blood samples. We

cannot do that extra work and maybe it will be done at some stage, but we have to work with what it is that we have.

Clearly when it comes to the balancing of factors, life does become more difficult and there is less agreement about that. What we want to seek to do is to see how far different views are evidence based, how far they are interpretation and how far it is extrapolation of other situations. I think it does become more difficult, and we have seen as we went through the day and particularly the question of alternative methods of culling.

Finally, of course, we have not looked at other species where my understanding is there is a lot of agreement that one of the conclusions may be with regard to deer that it cannot be easily carried over to other forms of hunting and we have to take that issue on before we finish.

We are very grateful for all of the contributions.

I am very grateful for the patience and good humour that everyone has shown. I think it has been constructive. I hope that after further reflection we may be able to edge this nearer together. We very much look forward to the further report. I think we will also be looking at the transcript with a lot of interest. Sometimes on a second reading it is possible to get more out of it, but from my point of view, and I think the Committee's point of view, we have probably done as well today as we could hope to do.

As you said Patrick, when we started this process

and I outlined to Roger how it was that we were hoping to take it forward, it was speculative. I was not quite sure how far one could go, whether or not it was possible to move the debate forward. I hope that we have done that to a degree, and I hope that when it comes to the final report we will have been able to get even further along that road. I am very grateful to everybody for giving up their time because it has helped us a great deal. Thank you very much.

Could I make one other point: As for people who have not been contributing to the debate, we would of course welcome any written comments, either in terms of the paper or in terms of the discussion that has taken place. When the transcript does appear, which we hope as quickly as possible, I hope that those who feel that they have not had a chance, and some of them may be in the audience, if they have not had a chance to make their contribution they will make that contribution at a later stage.

(The Inquiry adjourned until 10.30 am on Wednesday, 19th April 2000)