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## **Red Deer Culls, Scots Pine & The Stalking Client<sup>1</sup>**

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### **Summary**

1. This study examines the prospects for changes in deer management which meet the needs of both the stalking fraternity and conservationists.
2. We approach the problem from a less familiar angle, namely that of the needs of people who pay for stalking and of deer managers.
3. The study applied an economic method called choice experimentation to establish the weight and the monetary value that stalkers attach to *attributes* of their stalking trip. Attributes include such factors as “numbers of stags”, “trophy value” and “the stalking landscape”. Their respective parameters can be combined to arrive at paying amateur stalkers’ valuation of alternative stalking *packages*, including such factors as higher quality stags typical of better deer management or more forested environments.

### **Introduction: The “Problem of High Deer Numbers”**

In the last 40 years, the red deer population has doubled to over 300,000 animals. Deer no longer have natural predators and this, together with an inadequate level of culling, a succession of mild winters and the expansion of forestry, has led to a massive increase in the density of animals and their expansion into new areas. The increase is leading to:

- damage of habitats that are sensitive to grazing pressure, both in the mountain zone and in the lower glens where deer winter;
- poor regeneration of Caledonian Pine forest where deer numbers are in excess of 5 animals/km<sup>2</sup>, as is commonly the case. What forest we have left is a valuable habitat for rare or localised species such as capercaillie, crested tit and pine marten. It is also a highly valued landscape feature;
- losses to commercial forestry when fencing is necessary to exclude deer from eating the growing shoots in young plantations;
- problems for agriculture, particularly sheep farms, who need good grazing;
- problems for traditional grouse moor, both from over-grazing and the spread of parasites – particularly ticks.

Most pertinently, overgrazing is also a problem for stalking estates themselves. High deer numbers mean that estates are not realising the full value of their stags. The lack of shelter and impoverished grazing means that the quality of stags is poor compared with those elsewhere. “Quality” refers to mean body and antler weight. Stalkers clearly value these characteristics and, in principle, should be willing to pay more for them.

There are, though, many formidable constraints to improved deer management. In the first instance, deer are often represented as a “common property” problem. In a sense, this isn’t quite accurate as the deer are owned

by nobody. However, deer do often follow a seasonal migration from higher to lower elevations and their movement will typically take them across several estate boundaries. It is this *mobility* of the species which is at the heart of the problem.

Landowners will be dependent on one another both for the maintenance of a healthy deer population and of their habitat; although not everybody gains to the same extent, even where all estates have sporting interests. Much of the most valuable grazing will be on higher summer pastures or, in winter, in the lower glens. Estates who only have this land will not have an income from stalking as they will hold the bulk of their deer outside the stalking season.

There is an element of *strategic uncertainty* in that individual owners can't be sure what others are doing. This is exacerbated by an increasingly diverse range of landowners now found in the Highlands. These include stalking interests, conservation interests and forestry interests. Often, a combination of these interests can be found on one estate.

The interdependence and mix of objectives causes conflict over the management of the deer, including culling, the level of sport shooting or the maintenance of the rangeland. The pay-off to any one owner's good management is therefore threatened by the poor management of others. It is precisely for this reason that the DCS has encouraged the formation of Deer Management Groups.

There is also *environmental uncertainty* in that while hind numbers have been increasing, the quality, and often the numbers, of stags have been decreasing. The argument that it is the denuded environment that is the reason for the poor quality of our stags is now accepted by many stalking estates. Nevertheless, uncertainty arises because it is quite another thing to demonstrate that costly culls or rehabilitation of the environment will improve matters. This is especially so where several landowners are involved or the exact origin of migrating deer is unclear.

Moreover, it is the deer manager or professional stalker – not the owner – who must implement any new deer management strategy. It is his job that is on the line in the event that stag numbers do not increase, such that the owner suffers a loss in stalking income or a reduction in his estate value.

## **Raising the Financial Return from Stalking**

To reduce the perception of risk involved in either radical hind culls or allowing forest regeneration, it is necessary to provide landowners with a clear incentive. For instance, to demonstrate to all the landowners in a management group, that there are financial benefits at the end of the tunnel.

Namely, would stalking clients pay *more* for a different (higher quality) stalking experience?

To answer this question, our study included a survey of amateur stalkers designed to find out what attributes they valued of their stalking experience. The attributes mentioned included:

**Numbers:** The typical expectation (and one which sporting agents consider critical) is of one stag per day's stalking. However, higher numbers increase the prospect of a kill. Many stalkers (particularly foreigners), also enjoy seeing large herds.

**Body weight and antler size:** While always important factors, sporting agents advise that, while foreigners like to collect a *trophy*, Scottish stalkers are more excited by the stalk itself.

**The stalking environment:** Stalkers are attracted by rugged hunting terrain. In the study, we were also interested to know if they'd accept a proportion of pine forest or a mix of shooting environments.

**Wildlife sightings:** These are a drawing factor for some stalkers. Although the rarities are to be found in the forest; the more spectacular sightings – of eagles and the like – are available on the open hill.

**Other activities:** Agents said that clients were becoming more interested in mixed shooting or a range of family activities. These can help to compensate for a poor week's shooting in the event of bad weather or bad luck.

In addition, there are various other attributes such as the type of accommodation, traditional hospitality, the character of the professional stalker, shooting before, during or after the rut, etc.

## Survey and Questionnaire Design

In the survey of paying stalkers, we asked stalkers for details of their last trip and also presented them with a variety of alternative stalking trips.

This involved the use of a *choice experiment* (Adamowicz *et al* 1984). In this, subjects are asked to select between alternative packages of attributes, or stalking trips (choice sets). The choice approach is more realistic than expressed 'willingness to pay' or rating exercises. In real life we are forced to *choose* between buying one package of goods or another, travelling to one place or another, etc.

However, to arrive at a value for each attribute, the choice experiment requires that subjects are presented with a systematically varied sample of the full range of attributes and their various levels of provision. This requires a factorial design. While there are literally thousands of possible combinations of attributes, the particular design adopted by the study allowed subjects to be presented with a full one-third of all the possible attribute combinations.

This did, however, require the number of *attributes* to be limited to five, namely trip price, stag numbers, stag quality, alternative activities and landscape (mix of open hill or forest stalking). This meant combining in the description of the attribute, such factors as landscape or prospect of wildlife sightings, or neutralising others. An example of the latter was 'accommodation' for which subjects were asked to imagine they were staying in the same accommodation as their last trip.

The design also required limiting the number of *levels* of each attribute to three. "Levels" are the degree of provision, for example "less than one stag per day", "one stag per day", "more than one stag per day". The exception was "trip price". Price needed to be represented at the maximum possible number of levels (ie nine) to get an accurate indication of what stalkers would be prepared to pay.

In all, the following attribute levels were used in the survey. Each of these was described in more detail on a preceding page of the survey (including a description and photograph of Caledonian pine forest which was intended especially for foreign hunters unfamiliar with this landscape).

**Table 1 Attributes and Attribute Levels.**

<b>Numbers</b>	N1	It is difficult to locate animals and so it is likely that 2 out of 6 days will be blank.
	<b>N2</b>	Each rifle has one chance to shoot a stag each day.
	N3	There are many deer ... more than one chance to shoot at least one stag each day.
<b>Quality</b>	<b>Q1</b>	Most of the stags are light (8 points or less and 80kg max).
	Q2	Most stags are mature 8-10 pointers of 90-110kg.
	Q3	All stags are mature, but some are Royals over 120kg.
<b>Activities</b>	<b>A1</b>	No other activities are available.
	A2	In season, you can also fish or shoot grouse.
	A3	You can also fish or shoot grouse as well as play golf, sail, etc.
<b>Landscape</b>	<b>L1</b>	Deer here are found in high open mountain scenery.
	L2	Mixed days are possible as deer are found in both open mountain areas and pine forest.
	L3	Deer here are found only in low density Caledonian pine forest.

The levels highlighted in bold are the reference levels that represent typical expectations for Scotland (although naturally there are variations).

The big advantage of using this technique – as also with contingent valuation – is that subjects can be presented with *hypothetical* situations, although it is important that these fall within the realms of acceptability.

The attributes were selected using the factorial design and inserted into each questionnaire using a computer program so that each subject received an almost *unique* combination of six choice sets such as the example below.

**Figure 1 Example choice sets.**

**Trip A**

**There are many deer and each rifle has more than one chance to shoot at least one stag each day.**

**Most stags are mature 8-10 pointers of 90-110kg.**

The estate offers few other activities, is in open moorland and stalking here will cost you **the same** per stag as you usually pay.

**Trip B**

**It is difficult to locate animals and so it is likely that 2 out of 6 days will be blank despite good weather.**

**Most of the stags are light (8 points or less and 80kg max).**

The estate offers few other activities, is in open moorland and stalking here will cost you **25% less** per stag than you usually pay.

Do you prefer the characteristics of either of the trips above to the same characteristics of your last trip?

yes A & B?      just A?      just B?      *neither*

Considering just A & B, which do you prefer?

A or B

For simplicity of response only two of the attributes were varied each time. In this example, those in bold, the Numbers and Quality attributes.

Respondents were asked which alternative they preferred to their last stalking trip (if any). An earlier question had already asked for the attributes of that last trip. They were then simply asked which of the two choice set alternatives they preferred.

Note that if you take these two questions together you have an implicit (rather than a directly expressed) preference ranking. This ranking provided valuable data for the analysis.

## **Response**

In total, 854 replies were received, 483 of which were for Red Deer with the balance being for a separate Roe Deer survey. This represented a reasonable response rate of 45%. As there have been no detailed socio-economic surveys of stalkers it was impossible to show the exact characteristics of the sampled population. Rather, the objective was to achieve a reasonable cross-section. North American hunters, who represent possibly 10-20% of stalking visitors to Scotland, were the only subset that was under-represented, responses being too few for an adequate analysis.

In addition, many questionnaires were distributed via sporting agencies. There are no licences issued for shooting, so it is not easy to locate stalkers. Therefore a lot of preparation went into establishing a good relationship with sporting agencies, many of whom, for reasons of confidentiality, sent the questionnaires on directly.

Questionnaires were sent to stalkers in the UK, North America and Continental Europe, the last of these having to be translated into French and German. An effort was also made to survey hunters who had never visited Scotland for stalking. Although too few replies from this group were received to conduct a separate analysis, these returns did provide a reasonable insight into foreign hunters' expectations.

## **The Analysis**

The data were analysed using an econometric package. Three lots of analyses were performed:

- a. A 'binomial' analysis, ie of the question "Do you prefer Trip A or Trip B?";
- b. A 'multinomial' analysis of the question "Do you prefer Trip A, Trip B or your last stalking trip?" This included the data on the characteristics of the respondent's last trip (the *status-quo*);
- c. An analysis of the implicit ranking data derived from the two choice questions.

The analysis was performed for Scottish, British and European subsets as well as a subset for those stalkers who usually prefer Roe deer (Roe deer are generally hunted in forests and we were interested in the forest question).

As some respondents *always* express a preference for their last trip, ie the type of stalking they're accustomed to, the analysis was run both with and without these individuals. The more statistically significant analysis was that which excluded those who always prefer the *status-quo*. Although, while stalkers are often presented as a rather conservative group, in fact only 14% always stuck with the *status-quo*.

## Results

Statistically significant results were obtained from each of the principal three sets of analyses. The best results were produced by an ordered logit analysis of the rank data. This is not surprising given that the analysis depended on the responses from two questions and therefore contained more data.

**Table 2 Results – coefficients.**

<b>Attribute</b>	<b>Scots</b>	<b>All British</b>	<b>Other Europeans</b>	<b>“prefer Roe”</b>
Numbers 1	-0.56	-0.35	<i>-0.11</i>	-0.33
Numbers 3	<i>0.16</i>	0.39	0.74	0.42
Quality 2	<i>0.15</i>	0.36	0.61	0.28
Quality 3	0.48	0.83	0.89	0.44
Activities 2	0.69	0.66	0.53	0.51
Activities 3	0.28	0.42	<i>0.12</i>	<i>0.18</i>
landscape 2	-0.50	-0.43	<i>-0.01</i>	<i>0.04</i>
landscape 3	-1.26	-1.46	-0.82	-0.87
Price	-0.27	-0.20	-0.32	-0.25

**Note:** figures in italics are not statistically significant.

**Table 2** provides a summary of the results. The analysis required the omission of the *status-quo* (typical) levels. High figures show that the attribute level is a desirable change over the preceding level. Hence, European hunters are very fond of a large number of stags (Numbers 3 = 0.74) compared to the typical one stag per day (Numbers 2). They would like to have some more sporting activities available (Activities 2 = 0.53), but are less interested in many more activities (Activities 3 = 0.12).

Negative figures indicate dissatisfaction. Hence, Price always has a negative figure (because nobody enjoys paying). Note too that the coefficient for Numbers 1 is negative, ie stalkers are disinclined to accept a reduction in the cull expectation to below one stag/day.

For the objectives of the study, the most interesting results relate to Quality and Landscape attributes.

**Quality**, at both levels Quality 2 and 3, has a strong positive weighting. Europeans especially appreciate improvements in stag quality, ie Quality 2 and 3 (respectively 0.61 & 0.89). They clearly prefer this more than British stalkers (0.36 & 0.83), although British stalkers do have an interest in quality and trophy animals (Quality 3) *despite* the impressions of some stalking agents.

In relation to **Landscape**, a forested landscape, Landscape 3, is viewed very negatively by all stalkers. However, European stalkers appear ready to accept the option of stalking in a mixed open/wooded landscape. On this they are neutral. Most roe deer stalkers prefer a mixed landscape for red deer stalking, although the low coefficient of 0.04 suggests this preference is not strong.

## Converting Coefficients into Willingness to Pay

By dividing the weighting for each attribute level by that for Price, it is possible to transform these into the *actual prices* that stalkers are willing to pay for changes in these attributes. For example, an increase in the cull expectation from one stag per day to more than one stag per day is worth an extra £68 to British stalkers. An increase in Quality, from “light stags” to “mature, heavy 8-10 pointers”, is worth £71. Various figures can be estimated for different income groups.

These figures give an indication of the monetary value of improvements in the stalking attributes. They are, however, less robust than the original coefficients given that the actual amount that stalkers pay varies a lot around the typical £250 per day. Somewhat better results are given by a *percentage* change in price.

Nevertheless, if we use actual prices as a means of illustration, we can take a “bundle of attributes” to represent alternative stalking packages and reveal how much stalkers would be willing to pay for these alternatives. **Table 3** gives the value of different stalking trips for Britons and continental Europeans.

**Table 3 Value of different stalking experience.**

Typical Scottish expectation =	N2,Q1,A1,L1	£0
<b>British stalkers</b>		
open range – abundant deer/poor quality	N3,Q1,A1,L1	+£104
open range – better quality	N2,Q2,A1,L1	+£70
mixed hill/forest – other game	N2,Q2,A2,L2	+£110
full Caledonian Pine Forest	N1,Q3,A2,L3	-£207
<b>European stalkers</b>		
open range – abundant deer/poor quality	N3,Q1,A1,L1	+£68
open range – better quality	N2,Q2,A1,L1	+£63
mixed forest/hill – other game	N2,Q2,A2,L2	+£114
full Caledonian Pine Forest	N1,Q3,A2,L3	-£36

Note that British stalkers are willing to pay less for a Mixed Landscape when considered on its own. However, the higher amounts that they will pay for the better quality stags that are generally to be found in such a landscape means that they are prepared to pay £110 more for such a trip.

## Conclusions

The research had two objectives:

1. To develop a methodology;
2. To investigate the incentives for better deer management.

## Methodology

The Choice Experimental approach can be used to estimate the value of the individual attributes of an environmental good. This makes it more useful from a policy perspective than approaches that are used to value a total change.

We believe that it is also a more realistic approach than methods, such as contingent valuation, which ask people directly how much they are ‘willing to pay’ for a composite change. Furthermore, the results were plausible compared with prior expectations.



## **Stalking Provision**

In relation to stalking, the results show that the single most valued attribute was stag quality. They also show that mixed open hill/woodland stalking, and especially stalking in forests, is viewed negatively. At first sight, this appears to be a disappointment to conservationists anxious to encourage the re-establishment of Caledonian pine stands.

However, the results reveal that stalkers are prepared to pay more for higher quality stags. Such stags can be supplied by an artificial feeding regime, but will also be found in richer, especially more forested environments. Moreover, stalkers appear to be willing to pay more for the shooting of other game species that are likewise to be found in a mixed landscape, eg roe deer, blackcock, woodcock, etc.

There is therefore a clear financial incentive for sporting estates to adopt co-operative strategies that, either, reduce total deer numbers or directly aim to develop a richer vegetation. Given that afforestation, including the regeneration of woodland, is now being supported by grants, there is even more of an incentive to manage deer numbers and their habitat. Some estates argue that stalking can continue even where deer numbers have been reduced to five animals per km<sup>2</sup>. However, as stalkers evidently value clear expectations of a successful trip (the Numbers attribute), any reduction in expectations would need to be compensated by other benefits (eg stag quality or other game). Alternatively, afforestation could be gradual, although estates should remove excessive fencing if game bird mortalities are to be avoided.

A final point is that any survey will be based mainly on *existing* stalkers. Future sportsmen could be persuaded to prefer a different stalking experience, such as varied species, less guarantee of success, mixed woodland open-hill stalking, etc. Perhaps, it is time that estates experimented by offering more than the traditional stalking experience.

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