ASSESSING THE WELFARE OF CAPTIVE ASIAN SMALL-CLAWED OTTERS (*AMBLONYX CINEREUS*): CAN INDUCTIVE METHODS PLAY A PART?

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Abstract: A large number of factors need to be taken into account when assessing an animal's welfare under field conditions. Grounded Theory, an inductive method, might be of use in correlating these factors with the results of scientific studies to produce a freely available IT tool that could be used by relatively untrained persons to assess the welfare of animals. This ongoing work is intended to establish whether inductive techniques can contribute to welfare assessment of captive Asian Small-Clawed Otters (Amblonyx cinereus).

INTRODUCTION

Whatever the ethics of keeping animals, it is a fact that they are kept. Asian Small-Clawed Otters (*Amblonyx cinereus*) are the otter species most commonly kept in captivity in the United Kingdom, with the number of collections exceeding forty and increasing every year. Public collections are required to abide by the Zoo Licensing Act, and private collections by the Dangerous Wild Animals Act (DWA); both are legally and socially expected to ensure the good welfare of the animals. The criteria used, however, vary widely. There are a number of published husbandry manuals, such as that of the AZA (LOMBARDI and O'CONNOR, 1998), but most collection owners appear to rely on advice from members of an elite: the Otter Trust, Battersea Children's Zoo, London Zoo, the German OtterZentrum, and others.

Two issues arise from this:

1. Does this advice form a single pool of consensus, or does it form several puddles, and if so, what degrees of overlap are there? Do these areas of agreement reflect the animal's needs and priorities?

2. The person performing the assessment is not necessarily conversant with the needs of the animal in question. In the experience of one private otter keeper, DWA inspections have been carried out by a variety of people including a dairy inspector, a local veterinary surgeon, a riding instructor and a fireman (Martin Neville, pers. comm.). Charitable organizations encourage welfare checks on zoos, which are carried out by members of the public who, whilst having the best of intentions, seldom have an awareness of the true needs and wants of the animal. For example, members of the public frequently assume that otters need a great deal of water, like seals.

Is the welfare of otters being compromised as a result?

ANIMAL WELFARE ASSESSMENT

The precise definition of good animal welfare depends on the ethical/philosophical position of the person making the definition. Three contrasting positions are given below:

➤ If an animal survives and reproduces, that is sufficient indication of good animal welfare.
➤ If an animal is not experiencing a mental state it finds unpleasant, that is good enough. Hence, would the creation of animals unable to perceive unpleasant stimuli 'solve' the welfare problem?

> Only optimum physical and mental health by comparison with an equivalent animal in the natural environment constitutes good animal welfare.

My position is that the gold standard of animal welfare is the optimum physical and mental well being of that animal by comparison with an equivalent animal in the natural environment, and that scientific investigation can indicate what needs to be done to achieve this.

Philosophical position also determines belief as to whether scientific investigation into welfare has any validity. This tends to be a binary situation, either a person "believes in science" or they do not, and both positions are a personal philosophy that is a summation of upbringing, education, experience, religious beliefs, emotional responses and many other factors.

Scientific investigation into animal welfare can be human-focussed or animal-focussed. Human-focussed investigations are concerned with the human view of an animal's welfare, and tend to apply a wide range of economic theories to the problem. Simple standard production theory considers that good welfare increases productivity; therefore, a more productive animal must de facto be in a better welfare situation than a less productive one. Gross welfare deficits may be detected by this method, but it is very simplistic. More complex analyses take into account social perceptions of animal welfare and its effect on product uptake, by assuaging guilt. In short, human-focussed methods are actually measuring human welfare changes caused by manipulating the conditions in which animals are kept (BENSON et al., 2000). There is, however, no guarantee that what the public perceive as better conditions actually benefits the animal - they may even be detrimental.

Animal-focussed methods seek to discover what effect a specific variable, or set of variables, has on an animal, or how strong a preference they have for one set of conditions over another. Scientific methods can be used to address these questions and there are a number of methodological approaches, some of which are listed here:

1. Physiological testing - For example, in MASON et al. (2001), urinary cortisol assay was used to assess stress levels in mink exposed to various situations;
2. Behavioural observation - For example, PELLIS (1984) examined play-fighting in captive Asian Small-Clawed Otters and showed that it was an important activity for them, allowing the inference to be made that depriving them of the opportunity to express this would have a negative impact on welfare.
3. Preference testing - For example, FRASER (1993) looked at which floor types are most often chosen by chickens;
4. Microeconomics - For example, the mink study by Mason et al. (2001), which looked at how hard mink were prepared to work to achieve access to different components of the environment such as a pool or new toys.

As well as the formal scientific measurement methods described above, there is a huge amount of other information about animals' needs, wants, preferences and idiosyncrasies in print (such as FYSON'S 1976 account of owning an Asian Small-Clawed Otter), as well as on television programmes, in magazine articles, etc. To date, this has gone largely untapped, as has the enormous reservoir of keeper experience, gained in day-to-day interactions with animals. These sources will be of varying quality in terms of accuracy. The natural history of A. cinereus must also be taken into account as this indicates the "norm" for which the animal evolved. Since "husbandry conditions" can be taken to consist of everything the animal perceives, there is potentially a vast amount of data available. How are we to make sense of it?

An analogy can be drawn with the situation of the Forensic Examiner, faced with a very large body of potential data at a crime scene. The results of experiments can be used to make sense of detail, and more experiments can be run to confirm specific findings, but the process is overall one of inducing the theory from the observed facts. A similar attitude is required of a Veterinary Surgeon called upon to diagnose what is wrong with an animal. Can we use this kind of approach in a formal, rigorous manner to help us in animal welfare assessment?

DEDUCTIVE AND INDUCTIVE ARGUMENT

Both "deduction" and "induction" can be defined in many ways, all with different (sometimes radically different) meanings depending on whether the author is a philosopher, mathematician, logician, or

pragmatic user. Since I have a background in Information Technology, I use the logical definitions, rather than the philosophical ones found in, for example POPPER (1959). The versions given here are from the Macmillan Encyclopaedia (ISAACS (ed) 2001):

➢ Deduction (logical): In logic, argument from general principles to particular conclusions. It is thus analytic and certain, in contrast to induction, the conclusions of which are never more than strong probabilities". For example, "All mammals give milk; otters are mammals therefore otters give milk".

➢ Induction (logical): The process of making an empirical generalization by observing particular instances of its operation. The conclusion goes beyond the facts, since not all possible instances can be examined. From induction predictions can be made but they are always liable to falsification." For example, "For the last five years, this otter has taken her ball into the pond to play every day; therefore she will probably take her ball into the pond to play today". If the otter has done this every day for ten years (adding more premises), the probability that the second statement is true becomes greater, so there is good reason to believe the conclusion is true, but this is not definitely established - today, the otter may, for some reason, abandon her ball.

Since hypotheses are developed by induction from observations of fact, and are tested by experiment (deduction), both approaches are complementary. In classical animal welfare research, the emphasis has been on experimental investigation of specific factors. In contrast, when called to a collection to assess the welfare of Asian Small-Clawed Otters, the examiner is faced with an entire situation composed of hundreds of potentially interacting factors, some of which may never have been deductively investigated. It is in this situation that I believe that induction, specifically Grounded Theory, may be of use, and am currently developing an approach that incorporates it into welfare assessment.

METHOD

The way in which the study is being done is that as much information as possible about Asian Small-Clawed Otters is being collected. This is then being analysed using Grounded Theory to produce rules (or theories) and data, which can be stored electronically and made accessible so that details of a husbandry regime can be input, and an assessment of that regime's likely welfare implications produced supported by evidence, and with suggestions for improvement, again supported by evidence. The method itself I have called KASBAH (Knowledge Analysis System Benefiting Animal Husbandry). KASBAH has three phases: knowledge acquisition, inductive analysis and tool synthesis. The end result will be a database (and knowledge base) accessed by a web interface. The process described below is currently being carried out for the Asian Small-Clawed Otter, and will then be repeated for the Horse (*Equus caballus*), two dissimilar species. A very large amount of data is available for the Horse, but less is known about the Otter - if the method gives reliable results for the Horse, it implies that the results for the Otter could also be relied on.

Grounded Theory, first formally described by GLASER (1998), is a process for making sense of large amounts of qualitative and quantitative data from disparate sources. It is widely used in IT, Nursing, Management Theory, Education Theory, Anthropology and Sociology. The method itself is a kind of iterative categorisation of information, allowing the structures and correlations implicit in the data to emerge. The first step is to collect data. "Data" is anything perceived by the animal (for example pen layout, bedding, food, heating, lighting, climate, social group size and composition), the animal's behaviour, anything written or experienced by people about the animal - a fundamental tenet of Grounded Theory is that "All is Data". Overall, about 80% of the total effort goes into data collection. In my study, as well as using scientific literature and printed anecdotes (the explicit data), I am attempting to capture the implicit and tacit data possessed by otter keepers. Implicit data is the information that is easily written down, but tacit information, the most valuable, are the facts and observations that a person doesn't realise they know. For example, a keeper may be subconsciously aware that the otters do not 'like' to be given then1 food in metal dishes but prefer to eat from the ground, so that keeper always tips their food out for them. The person may not even be aware that he is aware of this, or of how he has become aware of it, and have never given the matter conscious thought, yet this could be an important observation from a welfare point of view. This information is being collected by a process of semi-formal interviewing leading to free-form conversations. I am also carrying out behavioural observations at otter-keeping establishments, to correlate behaviour patterns with husbandry regimes.

Almost simultaneously, as data is collected, it is examined line by line to see what facts, rules or opinions it contains; these are then categorised ("*coded*") - the datum may fit an existing category, a category may be modified to contain it, or a new category may be needed. Rules and relationships begin to emerge, which are noted ("*memoed*") - this is where theory is captured. For example, the new piece of data may say that the otter's housing is made of concrete blocks. The operator looks at the current "housing" category, and finds it has sub-categories "dimensions", "heating", "lighting". The new piece of information does not fit an existing category, but it does not require a major reorganisation to do so, just the creation of a new category, "Material". The existing data that has already been processed must be briefly re-examined to see if any of it also fits this new sub-category, and if there appears to be any relationships or connections between existing data and the new piece that are not covered by existing memoed relationships. Because the process iterates with each new datum, the operator must be prepared to discard existing structure if the new fact requires it. For this reason, results cannot be discussed until the process is complete. Completion is the point at which all new data fits existing categories and no new rules or relationships are emerging. This point is called saturation, and requires skill to recognise as it is sometimes artificially induced by selecting kinds of data to process (*forcing the data*). If the data available has been exhausted before saturation is achieved, the analysis is incomplete and cannot be relied on.

Once saturation is reached, the *writing* stage can go forward. This is the point at which the analysis becomes useful, and the form of the writing stage will depend on the purpose of the investigation. In this study, I intend to use the analysis in two ways:

1. To produce hypotheses that can be tested in future studies by other workers;
2. To build a freely available web-interfaced database tool that can be used to assess the welfare of Asian Small-Clawed Otters, providing justifications for its conclusions and for any suggested improvements.

DISCUSSION

The strength of deductive methods is that they are very focussed, for example, there are many papers on urolithiasis in Asian Small-Clawed Otters. This is also their weakness: in the welfare situation; we must consider whole individual animals, not a collection of paws, alimentary systems or play-fights.

Induction attempts to integrate this focussed information to represent the whole situation. Inductive methods always produce probabilities rather than certainties, which is why a great deal of data from different sources is desirable. Many variables are involved, but a profile for a given husbandry regime can be derived, along with a behavioural profile for the animals under that regime. Correlation of these, referencing the structures found in the data, should allow predictions to be made, which is what will produce the recommendations for improvement. Decisions must be made about the accuracy and validity of the data. This will often be achieved by noting the number of sources that confirm a specific observation.

At first, induction seems a very subjective method, since the researcher chooses the initial data categories. The iterative nature of the analysis, however, gradually removes this as the "truth" in the data - the underlying structure - is approached. Reliable results obtained for both the otter and the horse would indicate that it could be extended to cover other species. The method should also demonstrate where there are gaps in knowledge that could be usefully investigated, and I expect theories to emerge from the data that can then be taken and examined deductively in future work to see if they are 'real' or artefacts of the method.

CONCLUSION

If the method works, and can be trusted, in that its predictions are considered valid for both disparate species, the benefits will be fourfold. Firstly, areas where more research is needed will be demonstrated, and new theories to investigate will appear. Secondly, welfare assessors will have a tool to help them judge situations objectively and in a standard way. Thirdly, animal keepers will be able to assess then1 own husbandry regimes and receive advice on improvements if needed. Fourthly, otters will be happier as their conditions more closely meet then- needs. If the method does not work, then the

reasons why not can be examined and judgement made as to whether this is because of lack of data or a failure of the method itself.

The work I am doing will indicate whether Grounded Theory can make a useful contribution to animal welfare assessment.

APPEAL

If you would like to know more about this study, or help by providing anecdotes and observations, arranging a site visit, or in any other way, please contact me: Lesley Wright, 1.58, Rl, Rutherford Appleton Laboratory, Chilton, Didcot, Oxon, OX11 8SR, United Kingdom or e-mail L.C.Wright@rl.ac.uk.

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RÉSUMÉ
DES MÉTHODES "INCITATIVES" PEUVENT-ELLES CONTRIBUER À ÉVALUER LE BIEN-ÊTRE EN CAPTIVITÉ DE LA LOUTR NAINE CENDRÉE ASIATIQUE (*AMBLONYX CINEREUS*)?
Un nombre important de facteurs doit être pris en compte pour evaluer le bien-être d'un animal in situ. Théorie fondamentale et méthodes incitatives doivent être mise en jeu pour corréler ces divers facteurs, ces recherches aboutissant à produire un outil disponible qui puisse notamment être utilisé par des gens relativement peu expérimentés en la matière. La présente contribution vise à établir si ces techniques incitatives peuvent avoir un rôle pour 1'évaluation du bien-être en captivité de la loutre naine cendrée asiatique (*Amblonyx cinereus*).

RESUMEN:
EVALUACIÓN DEL BIENESTAR DE LA NUTRIA DESGARRADA ASIÁTICA (*AMBLONYX CINEREUS*): ¿PUEDEN SERVIR DE ALGO LOS MÉTODOS INDUCTIVOS?
Un gran número de factores deben ser tomados en cuenta cuando se evalúa la condición de los animales bajo condiciones de investigación en el campo. La Grounded Theory, una técnica inductiva, puede ser empleada para correlacionar estos factores con resultados cientificos para generar una herramienta gratuitamente disponible que puede ser empleada por personas con relativamente poco entrenamiento para evaluar el bienestar de los animales. Este trabajo en curso intenta determinar si las técnicas inductivas pueden usarse dentro del proceso de evaluación del bienestar de los ejemplares de nutria desgarrada asiática (*Amblonyx cinereus*) en cautiverio.