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Zoo Research Guidelines

Studies of the effects of human visitors on zoo animal behaviour

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Zoo Research Guidelines: Studies on the effects of human visitors on zoo animal behaviour

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1. INTRODUCTION

The effects of the presence of human visitors on the behaviour of zoo animals are largely unknown; however the presence of people in close proximity is likely to be a significant variable affecting animal behaviour. It should therefore be something that is relevant to anyone interested in undertaking scientific research projects on zoo animal behaviour as it may affect how their results can be interpreted.

Published research which aims to determine the effects of visitors on zoo animals has tended to focus on non-human primates, and there is a pressing need for us to know more about visitor effects on other mammals, birds, and the less charismatic reptiles and fish (for example we are largely ignorant of the effect on reptiles and fish of people tapping on glass-fronted tanks). Furthermore, much has happened in zoos since the first zoo-visitor studies were published in the 1980s. Naturalistic cages, environmental enrichment, free-range exhibits – all of these are a common part of the modern zoo, and it is not at all clear how they affect the animals' responses to human visitors. For those with more theoretical interests, the detailed analysis of inter-species interactions and communication is itself a current topic, and again one which has largely been unexplored outside of the primates.

Fundamentally, we need to know whether the presence of visitors has any implications for the well-being of zoo animals. This is of utmost importance since many zoos rely on the revenue generated by visitors to provide other aspects of animal care which are key to welfare, for instance, veterinary care and food. Therefore, zoos are particularly interested that clear, unambiguous results come from these studies, to inform best practice in maintaining captive animals.

These guidelines are designed to offer help in all aspects of visitor effects studies. The information contained here is divided into 6 parts; Initial practicalities, Different types of audience and audience conditions, Animal factors, Enclosure effects, Sampling techniques, References.

1. INITIAL PRACTICALITIES

1.1 Pilot Study

- It is highly recommended that you allow time at the beginning of your research schedule to carry out a pilot study. Heuristic observations will enable you to determine important factors that will influence your study methods, such as:
 - Typical visitor attendance patterns at the exhibit (quiet and busy times/days)
 - Typical visitor dwell times at the exhibit
 - Types of visitor behaviour that may be important
 - Types of animal behaviour that may be important
 - “Hotspot” areas where high concentrations of animal–visitor interactions take place. You may decide that your study only needs to take account of behaviour at these locations
 - Key individuals in large groups of animals that may be more important to observe than others. This will be dictated by your research question (Be careful that you do not engage in non-random selection of study animals unless it is justifiable in the context of your study).
- You can also use a pilot study to test your sampling procedures and ensure that they will enable you to effectively measure the variables in question and test your study hypotheses. An important aspect of this will be how often you record visitor behaviour. This will depend on factors such as the number of visitors and location and design of the exhibit (see below, section 5).
- A pilot study will also allow the animals to become accustomed to your presence as an observer i.e. will allow for habituation. Although most zoo animals are used to many human observers some may still react to you and this reaction is likely to decrease over time. It is essential that this change occurs before your main data collection begins. It may be useful for you to record some measure of this process.

Example: You may find that the duration and frequency of vigilance in the direction of the observer declines throughout the pilot study, perhaps indicating that the animals are becoming less interested in the observer.

1.2 Tools and Equipment

- To carry out a visitor effects study you need to observe both animal and visitor behaviour. This creates practical problems such as how to observe both at the same time. Your university or college may be able to provide equipment to help overcome this problem. Most zoos will not be able to provide such equipment and should not be relied on to do so.
- A video camera could be used to record either the animals in the enclosure or the public viewing area. However, there may be difficulties in positioning a camera to record the whole area required, ensuring it is safe from animals and visitors and easily accessible to change tapes and battery packs as necessary.
- Another possibility is to have two (or more) observers, one for the visitors and one for the animals. A problem with this technique is the simultaneous timing of events. Both observers must time their observations very accurately in order to later match their observations. It also should be noted that when using the two observer technique, the observers should avoid swapping between the animals and visitors. This would introduce the problem of inter-observer reliability and repeated trials would be needed to determine variation in data collected by the two observers.
- Other pieces of equipment which may be useful are a decibel recorder to measure visitor noise levels (ideally taken from within the animal enclosure), a clicker to count visitors and a Dictaphone to enable more rapid recording of quickly changing events. However you should consider the limitations of any equipment you use.
- If your study requires the use of other types of equipment to test a condition e.g. camouflage netting to obscure the view of the visitors to the animals, make sure you have full approval from the zoo to use this equipment in the context you intend.
- You may find that there are other ways of measuring some variables. For instance, noise levels may correlate well with total visitor numbers. You could also test if the number of visitors at your enclosure correlates reliably with the total number of visitors through the gate. If so you may be able to use daily gate admission numbers (which most zoos record anyway) as your measure of visitor pressure.
- Visitor self-assessment could be an option you would like to explore. Questionnaires asking for information such as group size, age, clothing, items being carried, time spent at the exhibit, own behaviour and the animals' behaviour can be handed to the visitors to complete. This may help to reduce your work load during your observation periods. However, you should consider the reliability of this method and check whether it would be acceptable to the zoo at a very early stage of your project. Many zoos may prefer visitors not to be bothered in this way.

2. DIFFERENT TYPES OF AUDIENCES AND AUDIENCE CONDITIONS

2.1 Different types of audience

- In addition to visitors, there could be other categories of humans around the enclosure (e.g. keepers or vets) who might influence the animals' behaviour. These guidelines are concerned with the effects of visitors but you should be aware of these other types of audience and attempt to keep their occurrences (timing, duration, numbers etc) as constant as possible throughout your study

2.1.1 Observer

- As mentioned in section 1.1 above, measures can be taken to habituate the study animals to the observer's presence to reduce any impact on their behaviour.

- Even if complete habituation to the observer cannot be achieved this is not necessarily a problem, depending on your hypothesis. The observer is a constant presence throughout the study so comparisons between 'only observer present', 'low visitor numbers' and 'high visitor numbers' should still be reliable. A 'no humans present' condition cannot be achieved however, without a video camera (see section 2.2).

2.1.2 Keepers and other staff

- Keeper presence and its potential effects on the animals' behaviour cannot be avoided since the cleaning and feeding routines must continue regardless of whether a study is in progress. However, it is advantageous that the routines remain as constant as possible and keeper presence occurs at the same time and for roughly the same duration every day throughout your study. Good communication with the zoo and a clear study schedule that you stick to will help in this respect.
- Other non-routine events such as a veterinary visit or zoo maintenance staff working in the area may happen during your study. Again with good communication it may be possible for the zoo to arrange these events on days when you are not collecting data. However, in many cases this will not be possible and you will need to adjust for these events. You may have to decide to omit data from such sessions prior to analysis.

2.1.3 Visitors

- To understand the effect that visitors have on zoo animals, it will be necessary to collect data on the visitors themselves. In the simplest case this will be to measure visitor numbers. However, this is likely to overlook many complex factors influencing an animal's response to visitors.
- Visitor characteristics are very complex and there are many variables that could be measured:

Examples:

- Visitor numbers at enclosure (may be measured as daily gate numbers, see above)
- Distance from enclosure
- Distance from animals
- Sex /age of visitor
- Colour of clothing
- Objects carried eg. pushchairs, umbrellas
- Frequency of camera flashes
- Smells – any food being carried, perfume, hairspray etc

- Visitor behaviour is also very complex:

Examples:

- Noisy visitors
- Quiet visitors
- Groups / individuals who try to attract the attention of the animals, bouts of banging on glass etc.
- Groups / individuals who ignore the animals
- Eating around the enclosure
- Offering food to the animals
- Smoking around the enclosure

- You may wish to record visitor behaviour using the same techniques you are using to record the behaviour of the animals. A pilot study (see above section 1.1.) is vital to determine which of these factors might be important to measure.

2.2 AUDIENCE CONDITIONS

2.2.1 The “no audience” condition

- When carrying out a study into the effects of visitors on animal behaviour, it is generally assumed that visitor presence is a 'treatment' and that it is necessary to have different levels of visitor presence, ideally including a 'no visitor' baseline to which other levels can be compared. However, this can be difficult to achieve without confounding factors.
- A true 'no audience' condition is usually not possible due to the presence of the observer (see above, section 2.2) however an 'observer only' or 'no visitor' condition can sometimes be achieved.
- Ideally the 'no visitor' condition should happen during the zoos normal opening hours since this avoids the confounding variable of time of day. This may be achieved opportunistically or through experimental manipulation:
 - Opportunistically – most zoos will have quiet and busy periods. By observing regularly over periods of fluctuating visitor numbers it may be possible to cover all conditions needed for your question (a pilot study will allow you to be more predictive about when quiet and busy times are likely to occur which may help to reduce the total observation time). One way of carrying out this type of study is to record the behaviour of the animals during quiet 'off peak' periods, when visitor numbers are predictably low, and comparing it to data collected during school holidays or weekends, when visitor numbers are expected to be high.

Example: You could carry out observations in the week before and after Easter holidays for comparison with data collected during the Easter holidays.

Limitations: There are many factors that affect visitor numbers – weather, time of day, season etc. There is a risk of misidentifying visitors as a causal factor in a behaviour change when it may actually be one of these confounding variables. Also, waiting for opportunistic sampling of various visitor conditions may take a long time to get sufficient repetitions of each condition.

- Experimental manipulation - restricting visitor access to an exhibit for short periods in a day could produce the 'no visitor' effect to which other visitor conditions could be compared. However, full consent and support from the zoo will be required for closing exhibits so you must check with the zoo at the early stages of your project planning. Many zoos will not be willing to close off exhibits even for a short time, particularly in the busy summer season.

Limitations - by manipulating visitor conditions i.e. no visitors, many loud visitors, few quiet visitors, you may be creating an unrealistic situation, and therefore there is a risk of misinterpreting the animals' response to it.

- Another way of obtaining a 'no visitor' condition is to carry out observations outside public opening hours in the mornings or evenings. Although it guarantees no visitors there are serious limitations with this method:

Limitations Most animals have daily behaviour rhythms meaning that behaviour in the mornings and evenings is likely to differ to that in the main part of the day, irrespective of visitors. A similar problem may be encountered if trying to compare winter data to summer data due to changes in climate, natural behaviour rhythms, visitor numbers and categories. Another argument against observations out of zoo opening hours is that the observer effect may increase at these times since the animals are not used to having humans around. Therefore the impact on their behaviour will be greater and thus your data will be more confounded.

3. ANIMAL FACTORS

3.1 Behaviour

- When planning a project, the behaviours you record depend on the question you are asking. In the case of visitor effects studies your question should be as specific as possible with regard to what aspect(s) of visitor characteristics and animal behaviour are going to be studied.

- Broadly speaking the effects of zoo visitors may be negative, positive or neutral. It is crucial to identify carefully what types of behaviour demonstrate positive or negative effects and to support this with evidence from other published studies.
- You should, however, bear in mind the fact that these behavioural indicators may be species specific or specific to the individual.

3.1.1 Positive Behavioural Indicators

- It should not be assumed that the effect of visitors on the animals' behaviour is always negative. Some studies have shown that visitor presence may induce positive behavioural changes, and so, may be described as enriching.
- If you want to investigate whether visitors have any positive effects on your study animal, you should try to be specific about what you consider these effects to be and these should be expressed in your study question.

Examples:

Play behaviour: This is a clear sign of good welfare as animals perform it if other conditions are good (e.g. if they are not stressed). However, it occurs mainly in young animals and therefore it may not be a very useful indicator for older animals.

Non-aggressive interactions: In circumstances where animals are housed with conspecifics, non-aggressive interactions between them, such as social grooming, may be essential to the physical and psychological well-being of the individuals. Care must be taken when interpreting these behaviours though, as in some species social grooming may also occur more frequently after periods of aggression as reconciliation.

Signs of interest in the visitors: Vigilance and other information gathering behaviours aimed at visitors, without signs of fear, aggression or begging, may indicate an enriching effect. For example, watching visitors play on a climbing frame may be interesting to animals.

Greeting behaviour: If shown in response to visitors could indicate that there is a benefit to the animal.

Natural behavioural repertoire: If the repertoire is more natural in visitor presence it could be argued to be enriching. This not only includes general activity budgets and a broad behavioural repertoire, but may include body postures, facial expressions and vocalisations.

3.1.2 Undesirable Behaviour

- Visitors may stimulate the expression of undesirable behaviours. If your study requires measurement of changes in undesirable behaviour there are a number of behavioural patterns that you could record.

Examples:

Stereotypies: Defined as repetitive, non-functional behaviour, they can take many forms.

Locomotion / inactivity: Inappropriate levels of locomotion or inactivity can indicate a problem with welfare.

Vigilance: Repeatedly looking towards the visitors may indicate that the animal is not comfortable with the situation (care should be taken to define between this and vigilance towards the visitors that may indicate general interest).

Avoidance (hiding, turn back, cover, flee vertically): Actively avoiding the visitors may show a need to escape from this stimulus.

Infant shielding / clinging: Being over protective of youngsters, or constantly seeking reassurance from conspecifics can indicate fear.

Aggression: Tension caused by a stressful stimulus can result in increased intra-group aggression, or even aggression directed at humans.

Scent Marking: Inappropriately high levels of scent marking can indicate poor welfare in some species.

Urination / defecation (acute): If suddenly frightened, animals may urinate or defecate.

Self-directed behaviour: Increase in scratching in some species (e.g. primates) as well as other less frequent behaviours such as excessive grooming or self biting would be considered to be negative

Fear vocalisations: may be emitted if suddenly frightened by the appearance of visitors.

Decrease in good welfare indicators such as natural behavioural repertoire would be indicative of a negative impact of visitors.

3.1.3 Chronic or Acute?

- When investigating whether a visitor effect is stressful it is important to identify whether your study animal is exhibiting signs of acute or chronic stress. Acute stress will be defined by short lived reactions to the stressor, for example, locomotion away from the stressor. Chronic stress will be defined by a response of longer duration; this may be long periods of inactivity following the stressor.
- For more information see **Zoo Research Guidelines: Monitoring Stress in Zoo Animals**

4. ENCLOSURE EFFECTS

- There may be many aspects of the enclosure which affect the behaviour of the animals and the visitors.

Example: Some visitors may bang on glass to get the attention of the animals, but this is not possible with an enclosure which is made up of wire fencing, therefore a different type of behaviour may be used to attract the animals' attention.

- The barrier type of the enclosure will determine the nature of many of the interactions between the visitors and the animals.

Example: If studying the effect that noise has on the animals it is advisable to measure the noise levels inside the enclosure and relate them to those outside since some barriers such as glass windows can muffle the sound drastically.

- Details about significant parts of the enclosures in your study will be essential if you are carrying out a multi-zoo study.
- Many enclosure designs allow the animal to remove itself from public view. In the case of visitor effect studies it may be advantageous to look at this behaviour in more detail as the animal may be recoiling from the audience, or may only come into view when the public are present.
- Likewise the distance of the animal from the audience may also be of importance in your study. It might also be worth examining the percentage of the enclosure edge which is accessible to the visitors since this will affect the degree to which the animals can avoid the visitors.
- Effectively quantifying the many variables of an animal's enclosure may be very complex and time consuming and may not appear obvious at first, for example, recording the vertical dimension of an enclosure may be very important for some species.

Example: You could consider visually dividing the enclosure into a 3D grid, and then recording the amount of usable space, refuge sites, food resources, shade etc. available in each one.

5. Sampling Techniques

- Your choice of sampling techniques depends very heavily on your study question, which should be as specific as possible (for details on constructing your study question and various sampling techniques refer to **Zoo Research Guidelines: Project Planning and Behavioural Observations**).
- One of the main questions in this type of research is how often to record visitor behaviour. A pilot study may help you to answer this question (see above section 1.1). Your sampling intervals must ensure that you are not missing potentially important events, but you may find you do not need to record everything, and doing so may be wasting your observation time. A specific study question will help.

Example: If asking "What are the animal's responses to a certain visitor behaviour (e.g. eating around the enclosure) or characteristic (e.g. red clothing)", you could continuously record the animal's behaviour for the duration that the visitor condition is present. This data could then be compared to data collected in sessions when the visitor condition is NOT present (using the same sampling technique), and controlling for other factors such as time of day, visitor density etc.

Example: For the question “Are high visitor numbers related to aggression in the study animal” you may be able to correlate number of aggressive bouts per day with high numbers of visitors through the gate. It is important to note that this technique should be validated in a pilot study to ensure that daily gate admission numbers reflect visitor numbers at the enclosure.

Example: If you were interested in finding a threshold of visitor numbers above which interactions with visitors and conspecifics become aggressive it would be wise to record visitor number at the enclosure as often as you record animal behaviour e.g. every minute. This would allow you to follow fluctuating visitor number with changing interactions with and between the animals. (N.B. This may create practical problems and the use of certain equipment may help, see section 1.2)

- You may wish to record the number of visitors by counts, or by ranked categories (e.g. low, medium and high visitor densities). It is important to understand the limitations of each technique before making your choice as it will also dictate subsequent statistical analysis.
- It is important to bear in mind that a factor which may impact behaviour (such as zoo visitors) may continue to have effects even after it has been removed. Therefore it is advisable to include observations after the animals have been exposed to high levels of visitors in your experimental design.

Example: Your study animals may respond to children banging on the glass, by immediately recoiling to the other side of the enclosure, therefore the reaction time may be quite short; but the animal may not return to the front of the enclosure for longer time periods so the duration of the response may be quite long. You should be sure that your observation periods are long enough to take account of this.

- It is a possibility that visitor effects might become obvious at night rather than just in the day, and therefore 24-hr studies might be an option. For example, high visitor densities may lead to disturbed sleep. Video analysis may be most appropriate to compare night-time activity following high and low visitor density days.
- Depending on your study question, it may be worth examining what initiates the visitor-animal interaction. Is it the animals or the visitors? What precedes the contact? The animal’s behaviour prior to an interaction may tell you something about how the animal perceives that event.

Example: Is the animal displaying signs of stress or frustration immediately before a visitor event, or does it appear relaxed and comfortable? Is the animal hiding from view or does it choose to be where the public can easily view it? Does the animal appear frightened or does it display signs of being interested in the visitors? You may be able to answer some of these questions by examining the animal’s body posture (in all cases you should become as familiar with your study species and its natural behaviour prior to data collection).

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