

Report of a RSPCA/APHA meeting on the welfare of wild animals used in research

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Note: the views expressed in this report do not necessarily represent those of the authors or their affiliated organisations.

Introduction

This is a report of a one-day meeting jointly convened by the RSPCA and the Animal and Plant Health Agency (APHA), which brought together around 70 researchers, veterinarians, animal technologists, regulators and others with an interest in the welfare of wild animals used in regulated procedures, either in the wild or in captivity. The meeting, which was held in the UK in September 2015, addressed a range of topics including regulations around the use of wild animals in research, reducing the impact of field procedures such as capture and trapping, reviewing and reducing the impact of devices used to monitor or track animals, refining housing and care when in captivity and assessing welfare. The meeting consisted of a series of presentations and discussion sessions.

PART ONE

The first half of the meeting focussed on the use of wild animals in procedures conducted in the field.

Wild animals and the Animals (Scientific Procedures) Act, 1986: Update from the Animals in Science Regulation Unit

Kate Garrod, Home Office

The use of wild animals in research raises specific legal, ethical, practical and animal welfare issues and requires specific justification under the Animals (Scientific Procedures) Act, 1986 as amended in 2012 (ASPA). Capture from the wild, manipulation for assessment of any existing health conditions and being held in captivity can all cause distress to an animal even before any 'regulated procedure' takes place. Regulated procedures themselves then have the potential to cause pain, suffering, distress or lasting harm, as might acts such as restraining, handling and marking or otherwise identifying an animal, which could be more stressful for wild compared to captive-bred animals. Finally, there are important ethical, animal welfare and environmental considerations around

whether and how an animal should be released back to the wild.

As a result of transposing the requirements of the European Directive on the Protection of Animals used for Scientific Purposes (2010/63) there have been a number of changes to the way that the use of protected wild animals for scientific or educational purposes is regulated (through ASPA) in the UK.¹

The Home Office has produced an Advice Note² to consolidate and update the various existing sources of information and to help those working with wild animals understand some of the additional welfare issues and their legal and ethical obligations under the revised law. The Advice Note explains the terms used when working with wild animals in establishments and at other places. It also explains when authority under ASPA is required for working with wild animals and highlights situations where authority from other regulators may be needed as well. The presentation at the RSPCA/APHA meeting focussed on the requirements relating to capture and on the information required in project licence applications proposing the use of animals taken from the wild in regulated procedures. Key points included:

- Providing that the method of capture does not cause avoidable pain, suffering, distress or lasting harm, the act of capturing a wild animal for their subsequent or eventual use in scientific procedures is itself not currently considered to be a 'regulated procedure' in the UK – unless the process of capture is actually the subject of the scientific study.
- The method of capture and information about its expected immediate impact on animals and likely after-effects, must be provided within the application for a project licence and will be considered by the Home Office alongside the harm-benefit assessment which considers the justification for animal use.
- Capture of animals must be undertaken by a competent person. The project licence holder is responsible for ensuring this.
- Any animal found to be injured or in poor health following capture may not be subjected to a regulated procedure, unless and until they have been examined by a veterinary surgeon (or other competent person) and action has been taken to minimise the suffering of the animal.
- Non-veterinarians assessing the condition of captured animals should have undertaken appropriate training, their competency should be assessed by a veterinary surgeon and they should follow direction from a veterinary surgeon when making decisions about the health of captured animals. It would be considered good practice if a record of the training and competency assessment was kept by the establishment's Named Training and Competency Officer in the usual manner.
- Any equipment used should be well maintained and transport containers and means of transport adapted to the species concerned needs to be available at capture sites, in case animals need to be moved for examination or treatment (e.g. either to the establishment where they will be housed, or to a place where they can receive veterinary care if necessary).
- A project licence cannot be granted unless the programme of work is designed to enable the regulated procedures to be applied in the most humane and environmentally sensitive manner possible.
- Trapping and removal of animals from the wild, or the regulated procedure performed, may result in unintended consequences. For example, removal of an individual animal may cause wider social disturbance or lead to dependent young or eggs being harmed; or traps may inadvertently capture or harm non-target species. These factors, along with issues around any impact on endangered species (as defined under ASPA), the use or release of non-native species and compliance with the requirements of environmental regulators will also be considered by the Home Office when assessing the harms and benefits of the project.
- Consideration must be given to the potential for and impacts of, failure to recapture and remove transmitting or other devices and the effects of such animals entering the human or animal food chain.
- Researchers should also be aware of the consequences and impact that their own presence in the environment may have, e.g. through the possible spread of pathogens or parasites to other study sites via contaminated equipment or damage to fragile habitats. They should also have plans for how they will appropriately dispose of anaesthetic drugs (e.g. used in water holding wild-caught fish) or other substances (such as ectoparasiticides used to determine infestation rates in wild caught birds) so as not to pollute the environment.
- During the course of a regulated procedure persons involved must take the maximum possible care to safeguard the animal's well-being.
- Any animal set free at the end of a procedure must not be at any competitive disadvantage (either from the impact of the procedures or simply by the time they have spent in captivity) and no additional dangers should be posed to humans, other animals or the environment by doing so. For more on this issue, see the later presentation by Knight, along with further relevant Advice Notes from the Home Office.^{3,4}
- At the end of regulated procedures, there is a requirement for the actual severity experienced by each animal to be recorded and subsequently reported to the Home Office within the Return of Procedures.⁵

The Advice Note was produced with advice and consultation from individuals and bodies associated with research using wild animals and we hope it will be useful in clarifying the ASPA and helping ensure good welfare and science. Any comments and feedback would be welcome at: ASRUBusinessSupport@homeoffice.gsi.gov.uk (please put 'Advice Note – Working with animals taken from the wild' in the subject field of your email).

Action points:

- 1 Read the Advice Note and make sure that all relevant staff at your establishment are aware of it – this includes Named Persons, researchers and members of the Animal Welfare and Ethical Review Body (AWERB) and any other relevant bodies. The Advice Note may also be helpful for equivalent staff in other Member States and the Animal Welfare Body.
- 2 Provide feedback to the Home Office, to help identify any areas where more information is needed and to inform future revisions of the Advice Note.

Best practice in trapping mammals: adverse effects and how to avoid them

Sarah Beatham and Matt Gomm, National Wildlife Management Centre – APHA

Small mammals are captured using a variety of cage traps for use in research. Once caught in traps, these animals are very likely to experience stress which can be significant. In some cases this can lead to self-harm or injury through the performance of repeated escape behaviours. Indeed, the latter is the most likely cause of trap injuries. Once caught in traps, mammals may also be exposed to various adverse weather conditions such as rain, cold or heat and may be at risk of predation (e.g. crows or rooks may attack trapped rats).

For these reasons it is very important that careful consideration is given to whether and how to trap animals. There are many factors to critically consider, including species-specific differences in how animals behave and cope with confinement which need to be taken into account when trying to mitigate for and minimise all potential stressors. For example, trials have shown that rats and squirrels caught in a cage trap will spend most of the first hour displaying escape behaviour. Both rats and squirrels may be found with abrasions or cuts on their nose and forehead or with damage to teeth or claws. While escape behaviour declines in squirrels over a longer period, it remains consistent in rats. When caught in a trap for 24 hours, rats have been observed to spend over half the time

showing escape behaviour. In badgers, the most likely causes of escape-behaviour-related injury are usually repeated attempts to dig at the soil through the cage mesh causing abrasion to the forelegs. Abnormal behaviours (e.g. unresponsiveness) may also sometimes be observed in badgers and on rare occasions broken claws or teeth may be seen.

These kinds of injuries, and levels of stress, are obviously highly undesirable and we strive to avoid them wherever possible. This includes following 'best practice' guidelines when trapping, which should minimise the level of stress that a mammal would be exposed to, reduce the frequency of escape behaviour and therefore limit the potential for trap injuries. Whilst species-specific best practices are still being assessed and developed, there are some general principles which should currently be used to minimise stress levels during cage trapping of mammals. These include:

- avoid setting traps when poor weather conditions are forecast
- plan the timing and frequency of checks to minimise the potential time that animals could spend in a trap
- operate 'closed seasons' when no trapping takes place at all, for example, where it is not necessary to gather data over winter, do not trap badgers between December and April when cubs are most likely to still be dependent on the sows
- cover traps where possible to provide animals with a heightened sense of security and protection from adverse weather conditions



Figure 1. No injuries to squirrels were observed once traps were raised off the ground and cover was provided.

- cover the floor of the trap with a natural material
- place traps in an environment natural or familiar to the target species (e.g. up in trees for squirrels, or near to well used runs for badgers)
- pre-bait traps and lock them open so animals are used to feeding within the trap, before actually beginning the trapping protocol

As an example, we reviewed our protocol for trapping squirrels and began placing traps raised off the ground on tree branches and semi-covered (at least 50%) in bin liners which we believe provides a better sense of security for these animals. Since this change in the set-up (Figure 1), no injuries have been found on trapped squirrels.

Following on from these successful refinements to our trapping procedures, we are continuing to review and improve our practice for capture and trapping, based on the animals' behaviour in the traps and on 'circumstantial' evidence such as areas of damage to traps. Our aim is to keep adverse events and avoidable distress to an absolute minimum.

Action points:

- 1 Initiate a review of trapping practice, using records of any injuries, damage to traps, trap location, time of day and year. Seek advice on the causes of adverse effects and how these could be prevented or reduced; other research groups, the regulator and animal behaviour experts may all be able to assist.
- 2 Review the outcomes of any refinements and disseminate good practice to other research groups, Animal Welfare and Ethical Review Bodies (AWERBs) or relevant committees at other establishments doing similar work, and within any publications.

40 years of collaring badgers: lessons from a long-term study

Steve Carter, Andy Robertson and Dez Delahay, National Wildlife Management Centre – APHA

Devices that allow for the radio-tracking of animals have revolutionised wildlife studies – particularly with respect to species that are cryptic, nocturnal or range over large distances. Indeed, devices that monitor an animal and/or the environment they are living in are now widely used around the world. Tracking studies to date have involved the use of radio collars, backpack or tail harnesses, tags attached to the ears or skin or those surgically implanted into the body.

Tracking devices can map location, movement, activity and body temperature and more recent technological

advances such as GPS and proximity tags even enable the collection of information on the contact that animals have with other identified individuals. This has greatly increased the value of the data that can be collected. However, although ongoing reductions in device size have reduced their impact on animals and data quality has improved, there is still potential for animal welfare to be adversely affected.^{6,7} There are some general principles guiding the attachment of tags on mammals such as recommending tags be no more than 5% of an animal's bodyweight,⁸ and some excellent regional radio-tracking protocols.^{9,10} However, there are no globally agreed standards with respect to good practice that are widely applicable across a range of species.

During the course of a long-term study of badgers at Woodchester Park in Gloucestershire we have developed our own protocols for this species which may also be instructive for the collaring of other terrestrial mammals. Since the study's inception in 1975 more than 400 badgers at this site have been radio-collared. There are particular challenges that need to be overcome when ensuring that collars are correctly sized and fitted for badgers due to their body shape, seasonally fluctuating weight, rapid growth of cubs and subterranean lifestyle. Collars clearly can cause suffering if fitted incorrectly or if poorly designed, so careful consideration needs to be given to both aspects. In addition, general anaesthesia is necessary to fit the collars which itself has the potential to cause adverse effects. Therefore, the potential benefits of a collaring study need to be clearly understood and justified before initiating the use of radio tags.

Working closely with manufacturers of tracking equipment, we have developed a simple leather collar design using a strip of split rawhide that moulds to the shape of the badger's neck without becoming abrasive but is also capable of carrying a range of monitoring devices from standard VHF transmitters, accelerometers and GPS loggers, through to state of the art proximity devices for recording contacts between individuals. However, these leather collars are not suitable for carrying heavier GPS transmitters that transmit data via satellite as these devices typically require a continuous metal loop built into the collar. In our study we apply simple local working principles that aim to minimise any potential adverse effects of collaring on badgers. These are:

- do not collar badger cubs in their calendar year of birth
- do not collar badgers with existing neck injuries (e.g. from bite wounds)
- do not fit collars that weigh more than 5% of the animal's bodyweight
- lightly shave guard hairs around the badger's neck to allow a more comfortable fit (Figure 2a)

- when fitted, ensure two-three fingers can be comfortably inserted between the collar and the neck of the badger (Figure 2b) but that the collar cannot be easily removed
- use experienced staff to undertake the collaring or to closely supervise collaring carried out by trainees



a) b)

Figure 2. Collars are fitted under general anaesthetic. Guard hairs should be lightly shaven from around the animal's neck to allow for a more comfortable fit **(a)**; It should be possible to insert two to three fingers between the collar and the neck of the badger but without being able to easily pull the collar over the animal's head **(b)**.

The photos show a badger being collared in the field close to the sett of capture (a) and within the bespoke sampling facility at Woodchester Park (b) where the majority of collaring has been carried out.

Over the 40-year study period, substantial refinements have been made to the way the collars are fitted and designed, minimising any impact on welfare and enabling the incorporation of novel technology to improve data collection. Even the heaviest collar designs currently in use are less than 3% of the average bodyweight of an adult badger in June (typically when they are at their leanest). During the study, mild abrasions or chafing have rarely been observed (approximately 6 animals), along with one instance of a more serious injury where the skin on the neck was broken. This particular individual was repeatedly recaptured in good health over the next three years, so lived to be at least seven years old without any indication of any long-term adverse effects. In all the above instances, the collar was removed immediately. Although there have been no obvious observable effects of collaring on the overall condition of the badgers, it is acknowledged that there could be more subtle impacts on health and welfare. This is an area that is currently under investigation.

Action points:

- 1 If you are involved in collaring badgers or other large mammals, review practice in the light of this section.
- 2 If you have views, experience or data relating to

subtle or long-term effects of collaring, share with other interested parties and explore ways to evaluate effects and design projects to identify and monitor potential adverse effects.

Tracking and telemetry devices on mammals – impact of attachment technique and device load

Fiona Mathews, The Mammal Society

Wildlife research in the UK involves a range of wild mammals including dormice, voles, rats, bats, squirrels, foxes, badgers and seals. The techniques used to track these animals can also vary, from VHF telemetry, GPS tagging, ringing, micro-chipping or fur sampling. Because such research can include both unregulated procedures and those regulated by the ASPA, there is no reliable nationwide data available on how many animals are involved. As with any other area of animal use, there is a legal and ethical requirement to take every step possible to reduce the numbers of animals involved to the minimum necessary and to minimise the duration and level of any potential suffering.

During this presentation, some of the techniques utilised by those involved in studies using wild mammals were highlighted and some key issues to consider and opportunities available for reducing the impact of external devices on animals were discussed.

Identification

Studies may require the identification of individual animals using a variety of methods. As long as the process causes no more than momentary pain, suffering, distress and no lasting harm or biological or competitive disadvantage, then marking an animal is not considered an ASPA-regulated procedure, although a Statutory National Conservation Organisation licence may be required for certain species.

The method of identification used should be carefully considered, taking animal welfare, practical factors and scientific requirements into account. Some commonly used methods are listed below:

- **Microchips** can be a permanent method but the transponder chip can sometimes migrate within the body of the animal and even the smallest chip may be too large for some species.
- **Ringing** in mammals is usually confined to bats. Rings appear to be well tolerated but it is yet to be evaluated whether carrying a ring has any adverse impacts on factors such as breeding success or predation risk or whether use of an open ring is better than a closed ring. The use of rings on types of mammal other than bats is not recommended as this can cause abrasions.

- **Collars** may be appropriate for certain individuals of some species depending upon size, behaviour and morphology but there are associated risks of rubbing abrasions and entanglement, as well risks to growing animals. Furthermore, if the collar does not automatically drop off and the animal cannot be recaptured again for removal, then the collar will impose a lifelong burden on the animal and could even prove fatal.
- **Tags** should generally not represent more than 10% bodyweight in mammals – or 5% for those that fly – and all possible impacts on locomotory, social, predator-avoidance behaviours etc. should be critically considered, along with additional implications for animals at certain life stages such as growing animals, pregnant animals or those whose bodyweight varies across seasons.
- **Clipping** an area of fur is minimally invasive but removing fur from an animal (particularly if a large area) may have a detrimental impact on their ability to thermoregulate.
- **Radio-tracking** Telemetry devices are frequently employed to gather data about an animal's behaviour, activity, physiological functions or home range size. Devices can be attached to an animal in various ways, including with glue or as part of a collar or harness. There are important species and individual-specific factors to consider with each attachment method.

A glued-on tag should fall off after a period of weeks but this cannot always be guaranteed and the process for attachment will require an area of fur to be shaved, which can affect thermoregulation, as above. There could also be an adverse reaction to the glue used. Collars offer a longer term option but pose particular difficulties with growing animals and, as mentioned previously, carry an associated risk of causing entanglement or rubbing abrasions. Both methods require the animal to be trapped and restrained. If it is considered to be in the animal's (and the handler's) best interests for minimising distress or the potential for injury that device attachment is carried out under anaesthesia and if this is practically possible, then the animal should be anaesthetised. It is unethical (and also illegal, given the requirement for the method used to not cause avoidable suffering) for anaesthesia to be withheld simply to avoid the device attachment process becoming a regulated procedure under the ASPA.

All potential effects on an animal should be considered and the most refined method used. This means thinking about any and all adverse effects associated with trapping (e.g. increased stress, injuries caused by escape behaviours), handling and restraint (stress and distress), the physiological burden of carrying the device or tag (effect on locomotion, energy expenditure, bodyweight, feeding or social interaction) and, where applicable, the impact on dependent young

of the trapped parent while the device is being fitted.

It is also important to assess the likelihood of tag failure or loss. If this is likely, there will be implications for the harm-benefit assessment as the benefits become significantly less certain to be realised.

Action points:

- 1 Make no assumptions about the impact of devices or attachment methods on animals; research the evidence for current guidelines and review each case according to its specific harms and benefits.
- 2 Ensure that every step is taken to identify and minimise all potential impacts on the animal.
- 3 If the likely benefits to the animal of collaring under general anaesthesia outweigh the potential harms, then provide anaesthesia – even if this results in the procedure requiring regulation under the ASPA.

Tags on birds – how much are our guidelines flights of fancy?

Rory Wilson, Swansea University

Flight is one of the most spectacular features of most birds but it is also considered to be one of the most energetically demanding of their activities, only made possible by a suite of radical morphological adaptations. As such, the attachment of foreign bodies, such as tags which effectively change bird 'morphology', is likely to compromise their ability to fly in some way.

Conventional wisdom advocates that attachment of devices not exceeding 3% or 5% of the bird's bodyweight are 'acceptable' but the reasoning behind this is not clear. Given the wide variation in size and shape of birds, along with vast species-specific differences in the amount of time spent in the air, under the water or on the ground and in the characteristics of their flight (e.g. powered flight versus soaring flight; fast versus slow; or the 'underwater flight' of penguins and auks), a 'one size fits all' approach is likely to mean that welfare is at times being significantly compromised. It would seem illogical to use exactly the same crude parameter when considering species as varied as hummingbirds, pigeons, penguins, ostriches and condors.

Whilst the attachment of devices to birds may have a physical effect (e.g. the device may rub the skin or cause feather loss), carrying the device may mean that the animal expends more energy (due to its weight or the effect that it has on aerodynamic efficiency) or it may mean that the animal has more difficulty thermoregulating (if feather coverage or quality, such as insulation thickness, is affected). This can impact on the animal's time budgets so that they must spend

longer feeding or searching for food in order to meet the increased energy requirement. They will therefore have less time available for essential behaviours such as resting, social behaviour or preening to maintain their feather condition.

A series of examples were provided to highlight the importance of taking into account the species- and individual- characteristics of a bird when considering the appropriateness of a tracking device. For instance, increased drag due to a device affects fast-flying birds correspondingly more than slow-flying species. At double the flight speed, the drag quadruples which requires eight times the power to overcome this drag.

The downward force exerted by a tag also depends on the behaviour of the bird. For example, a 1-gram weight on a bird flying at constant velocity exerts the same force as a 9-gram weight if a g-force of nine is experienced by birds (such as swifts) in flight.

These effects can be modelled using the work of Professor Colin Pennycuik – particularly the books ‘Newton Rules Biology’¹¹ and ‘Modelling the flying bird’¹² along with freely available online software¹³ called Flight 1.24. These resources can help the researcher to identify semi-quantifiable metrics for defining the physical detriment incurred by tagged birds, by considering factors such as mass, drag and the effects of moment arms.

Effectively modelling such forces should provide clear pointers to indicate when tagging studies might place unacceptable physiological demands on birds and cause significant avoidable suffering. Aside from ethical issues, such suffering is detrimental to the science, as data obtained under such circumstances relate to an animal endeavouring to cope with the challenge of an artificial load rather than representing the actual behaviour or physiology of the species. Applying a biomechanical approach to modelling the actual physical and physiological, impact of devices on birds should thus provide a more robust basis for predicting the potential harms to individuals used in tagging studies.

In summary, there is a clear need for those researchers using tags on wild animals, particularly birds, to develop more comprehensive, objective methods for calculating the likely impact of device attachment. This will help to ensure properly informed decisions on whether, how and when it is justifiable to use such devices.

Action points:

- 1 Critically examine device weight, attachment methods and location for tagging studies involving birds.
- 2 If using ‘traditional’ devices or attachment

protocols, use the references in this section to model the impact on the birds – and factor the results into the harm-benefit assessment.

- 3 When using and interpreting previously obtained data from tagging studies (e.g. in the literature), take device size, location and attachment method into account.

Re-homing and setting free wild animals used in scientific research

Katherine Knight, Home Office

Under the ASPA,¹ wild animals can be set free during the course of a series of regulated procedures or at the end of regulated procedures. Setting free during the course of procedures is managed through the controls on the Project Licence. Re-homing or setting free at the end of the procedures requires consent from the Secretary of State. As of 1st January 2013 this consent has been required both for wild animals used in regulated procedures and also animals purpose bred, kept or supplied for regulated use but then not used.

Re-homing or setting free wild animals is not mandatory under ASPA, as ethically, animals should only be re-homed or set free where it is in the best interests of the welfare of the individual animal. There are both ethical and welfare risks associated with releasing into the wild and, if necessary, animals should undergo a rehabilitation programme that minimises any biological or competitive disadvantage and increases the likelihood of survival in the ecological challenges of the natural environment. Where it is believed this may not be achieved, consideration should be given to re-homing the wild animal in captive collection, such as a zoo or wildlife sanctuary, if their long-term welfare can be reasonably assured.

Consent will only be given for re-homing or setting free if the Secretary of State is satisfied that the criteria specified by **ASPA section 17A section (3)** have been met:

- a) that the animal’s state of health allows it to be set free or re-homed;
- b) that the animal poses no danger to public health, animal health or the environment;
- c) that there is an adequate scheme in place for ensuring the socialisation of the animal upon being set free or re-homed;
- d) that appropriate measures have been taken to safeguard the animal’s well-being when re-homed or set free.

In addition, before animals that have been taken from the wild can be set free, **ASPA section 17A (4)** also

requires that the Secretary of State is satisfied that the animal has undergone a programme of rehabilitation or that it would be inappropriate for the animal to be required to undergo such a programme. For example, if an animal has only been held for a relatively short period and is unlikely to have lost condition or learned inappropriate behaviours.

In order to satisfy the criteria for consent to set free, consideration will be given to:

- The animal's state of physical health (including any injuries they are carrying; any impairments to the senses; any risk of them introducing disease).
- The animal's behaviour (e.g. whether they have developed any detrimental stereotypic behaviours; whether their ability or motivation to forage has been impaired; how likely they are to be able to socially integrate back into their environment or to new surroundings; whether they have lost their fear of humans).
- The animal's ability to survive in the wild (e.g. evidence of sufficient body reserves).
- The release habitat and timing of release (e.g. species population distribution; sufficient food; whether the species would normally be hibernating, breeding or migrating; inclement weather; timing of predator activity).
- Whether there is an appropriate rehabilitation plan that incorporates socialisation to enable hard or soft release to be accomplished.
- Plans in place for post-release monitoring or intervention where animals are unable to adjust (including the likelihood of being able to recapture the animal).

If the Secretary of State is satisfied that consent can be given for re-homing or setting free, then this authorisation may be given in the Establishment Licence, within the relevant protocols of the Project Licence or in a letter for the release of the specified individual animal(s).

To assist those working in this area understand their responsibilities the Home Office has produced an Advice Note on 'Rehoming and setting free'³ which includes and further explains all of the above points.

Action points:

- 1 Ensure socialisation programmes for wild animals and consideration of rehoming and setting free are embedded throughout the AWERB process.
- 2 If humane killing of animals is the default following the procedures with which you are involved, consider whether there are any other options? Could you seek advice on rehoming or release, taking the animals' likely quality of life into account?
- 3 If rehoming or setting free, ensure the socialisation programme is fit for purpose and includes review

periods to ensure only animals that are likely to adequately adapt to their new home or environment are actually re-homed or set free.

- 4 If animals are rehomed or released, ensure that they are subsequently monitored as effectively as possible, and outcomes used to inform future rehoming or release protocols.

PART TWO

The second half of the meeting focussed on the welfare of wild animals captured and taken into captivity for use in studies.

The care of wild rats, stoats, badgers and birds in captivity

Patricia Pimlott and Matt Gale, Fera Science Ltd

At Fera a wide variety of wildlife is used in research studies aimed at reducing the conflict between humans and other animals, such as population management and assessing the risks of agricultural chemicals. In order to properly attempt to meet the needs of wild animals in captivity it is essential to have a good understanding of the species-specific ecology and behaviour. Good practice for housing, husbandry and care for these animals may require different approaches and procedures compared with laboratory-bred animals.

For example, CCTV recording is used to better monitor animals and improve our understanding of their experiences in captivity. We observed that many of the animals performed Abnormal Repetitive Behaviours (ARBs; see Clubb, overleaf). This led us to review and redesign the housing we provide, so as to allow a wider range of species-appropriate behaviours including climbing, nesting, foraging and caching food.

We have also set up a team of Species Experts, each of whom has the task of finding out about the biology and behaviour of one of the species in our care and how behavioural and physiological needs can best be provided for in captivity. The remit of a Species Expert is quite broad and includes approving the care and welfare provisions for the wild animals being brought into captivity, reviewing the number and purpose of animals being kept and used, trialling and assessing environmental enrichment, acting as a key point of liaison, contact and information for staff and the AWERB, and disseminating knowledge and advances in understanding externally at relevant conferences and meetings.

Together, these actions have enabled us to learn from experience how to improve the environment of each species to reduce the animals' stress and anxiety levels, thus improving health, welfare and scientific results.

Rats

Some wild mammals may have to be singly housed as a study requirement (e.g. if males cannot be kept together harmoniously, or if keeping a male and female together could result in an unwanted pregnancy). This is likely to be a significant welfare issue for social animals such as rats. To attempt to ameliorate the stress of single housing by providing a more stimulating environment we have worked with manufacturers to design an improved, multi-level rat cage which allows for a degree of choice within the environment. It also enables animals to be exposed to, and become familiar with, experimental equipment prior to procedures, reducing neophobia and improving ease of capture.

Stoats

Stoats can hold large territories in the wild and need space for exploration, though they do not like to be exposed in the open without cover. We have recently been trialling new housing in an external pen. This has allowed for a larger enclosure size and provided additional opportunities for us to hide food and for the animals to cache it. Different bedding materials and food items are also being trialled.

Badgers

We enrich the environment (see Figure 3) of these animals by providing areas of grass and mud to dig, wooden nest-boxes with straw, plastic paddling pools or containers with water, and plastic tunnels and other 3-dimensional apparatus (e.g. ramps) around the pen that improves animals' opportunity to explore and exercise.

We also now use CCTV to help monitor the activity, feeding and general well being of the badgers, which is especially useful for observing them at night.



Figure 3. Enclosure for housing badgers.

Birds

Fera has experience of working with many different bird species, including sparrows and crows. We have improved the care of different wild birds by enriching aviaries during the acclimatisation period and in long-term accommodation. This has included the provision of: nest-building materials and boxes (see Figure 4); perches in a range of different diameters (which helps maintain foot condition); hides and cover to escape adverse weather; and water and dust baths for promoting natural behaviours and maintaining feather condition. We provide a variety of species-appropriate food types (such as dog food/biscuits, beef mince, humanely killed chicks or rats and eggs for carrion crows and wild bird seed, millet, fat-balls, mealworms and fine grit for sparrows) and encourage the animals to work for their food by scatter-feeding, hiding food or using puzzle-feeders.



Figure 4. Nest box for a Carrion crow.

Action points:

- 1 Consider initiating a Species Experts programme at your facility, including researching biology and behaviour and evaluating the impact of refinements to husbandry and care.
- 2 The idea of Species Experts need not be confined to wild animals; consider taking the same approach for conventional laboratory animals.

Bats, birds and boar: assessing welfare in wild species

Julie Lane, National Wildlife Management Centre – APHA

All human interactions with animals have the potential to cause stress and behavioural or physiological changes. This is particularly so for wild animals,¹⁴ where any kind of direct interaction is highly likely to be perceived as a threat.

Stress is an unavoidable and integral part of all animals' lives and there are many mechanisms for

coping with both psychological and physical stressors. However, acute or prolonged stress and distress, can have wide-ranging, significant and detrimental effects on the psychological and physiological health of animals. In the case of field studies, it is difficult to detect the onset of these stress-related effects because the animals are usually released into the wild before any indicators are apparent. Releasing animals whose health and welfare may subsequently be compromised is highly undesirable and should be avoided whenever possible. It is essential, therefore, to try to determine some reliable, appropriate and accurate indicators of animal welfare which can be used in these limited circumstances.

So, which indicators can be used to assess stress in wild animals? It has been established for nearly half a century that stressful experiences cause the synthesis and release of the glucocorticoids (cortisol and/or corticosterone) from the adrenal gland. These hormones have traditionally been measured by sampling the blood, a process which requires restraint and (in some cases) anaesthesia. Both of these not only have potential welfare effects on the animal but are stressful in themselves, so can affect the integrity of the data collected.

Non-invasive measures of physiology and behaviour would therefore be the ideal choice for assessing welfare, from both practical and ethical standpoints. We have coupled behavioural monitoring and non-invasive sampling to assess levels of glucocorticoids in a wide variety of wild species, and have been able to use these measures to monitor stress levels in animals in situations that would have rendered more traditional methods impossible. For example, we have used faecal cortisol to assess stress in wild rabbits in different types of housing, and the stress experienced by wild rats caught in cage-traps.

Techniques to measure glucocorticoids are becoming more sophisticated. This is enabling very small concentrations of these hormones to be measured accurately in animal by-products such as hair, which can be collected without the animal's knowledge. In many circumstances non-invasive glucocorticoid measurement¹⁵ can give an accurate and important insight into the welfare status of an individual or a group of animals, without causing distress or detrimental effects, which can be a useful tool for the wildlife researcher seeking to monitor and reduce adverse effects.

Action points:

- 1 Remember that all interactions with humans will be stressful for wild animals – in many cases, it will be interpreted as a close encounter with a predator.
- 2 Ensure that stress is adequately assessed before

animals are released, and that they have the opportunity to recover.

- 3 Keep up to date with the literature on non-invasive techniques for assessing stress, evaluating these and correlating them with other indicators wherever they may afford new insights into the animal's welfare state.

Stereotypies in the captive environment

Ros Clubb, RSPCA

Stereotypic behaviours are a subtype of Abnormal Repetitive Behaviours (ARBs), a diverse group of odd-looking behaviours found in captive animals. ARBs are very repetitive, consistent (in terms of the pattern or apparent goal of the behaviour) and either appear to serve no function or are maladaptive, harmful or inappropriate. Examples include repetitive route-tracing, somersaulting, digging, bar-mouthing, barbering and spot-pecking.

In the case of stereotypic behaviours, the cause is known to be either the frustration of natural behaviour patterns, repeated attempts to cope with a problem and/or impaired functioning of the brain.

Commonly seen in captive wild animals, considerable effort is devoted to trying to reduce or eradicate stereotypies – most often through environmental enrichment – and ideally to stop them developing in the first place. This is because stereotypies have been linked to poor animal welfare and indicate an underlying problem. Stereotypies are virtually never seen in free-living wild animals; they typically develop in barren, unstimulating environments that prevent animals performing highly motivated behaviours; their performance is typically increased by 'bad' experiences and decreased by 'good' experiences and the stereotypies themselves can be harmful. That said, the link with welfare is not always straightforward – stereotypies may actually help animals cope with poor environments and so animals who do not perform stereotypies may actually be worse off. Aside from the animal welfare implications, stereotypies can also interfere with the goals of research studies, not least because they can indicate the animal under study is not 'normal'.

The goal of any captive animal husbandry system should always be to have no animals displaying stereotypies. Research may be lacking to clarify whether an ARB is a true stereotypy (i.e. it reflects an underlying problem) in which case it is safer to assume it is so that necessary steps can be taken. If ARBs do appear, steps should always be taken to try to reduce their frequency and prevalence but this should never

involve blocking or preventing their performance (e.g. by placing objects in the path of route-tracing animals) as the behaviour may be helping them to cope with an inadequate environment.

Steps that can be taken to prevent or reduce the performance of ARBs include:

- Environmental enrichment that encourages the performance of highly motivated natural behaviours
- Minimising potentially distressing experiences.
- Maximising the reliability of signals and cues for events (especially stressful experiences such as cage-cleaning or restraint).
- Making the timing of the daily routine less predictable if possible (e.g. feeding routine, feeding locations, enrichment regime).

Finally, it is important to remember that the absence of ARBs does not mean that an animal automatically has 'good' welfare. It may be that animals not displaying ARBs are actually suffering more, but do not have an outlet or coping mechanism to express that frustration. This reinforces the importance that people must have a very good understanding of the animals (at species, breed/strain and individual level) they are using or caring for, to avoid suffering going undetected and untreated.

Action points:

- 1 Take any incidences of ARBs, including stereotypic behaviour, seriously. It should always lead to a review of housing, husbandry and care, with advice from a veterinarian, animal behaviour scientist or others with appropriate expertise.
- 2 Obtain expert advice on all of the above bullet points and set out a programme to ensure that these are acted upon.
- 3 If stereotypies occur, do not simply prevent the animal from performing them – aim to tackle the underlying cause.
- 4 Be aware that animals who are not stereotyping are not necessarily in a good welfare state. For example, an animal that is not stereotyping may instead spend its time hiding in the nest box because it is too afraid to leave or is in a depressed-like state.

Guidelines and resources for those using or caring for wild animals in research

Adrian Smith, Norecopa

Guidelines for good practice in any area of animal research, including wild animal care and use, can be difficult to find as they are often published singly alongside mainstream research papers in scientific journals.

Recognising this, Norecopa held a consensus meeting on the Harmonisation of the Care and Use of Animals in Field Research.¹⁶ A list of available guidelines¹⁷ was presented and areas were suggested for further work.¹⁸ The participants then published a consensus statement¹⁹ giving their opinion on the strengths and weaknesses of wildlife research, including a list of tasks to improve the situation. This statement provides in itself useful guidelines for the way ahead.

The implementation of EU Directive 2010/63, which includes specific provisions for wildlife research, should act as an incentive for more work on the welfare of wild animals. This has, for example, been the case for severity classification, where there are now specific guidelines for this work in fish²⁰ but none so far have been written for other wild animals. However, many of the remarks made in the fish guidelines can be applied to wildlife. For example:

- Many procedures that are commonly performed on terrestrial laboratory animals have very different welfare implications when applied to wildlife.
- Wild animals are a heterogeneous group with extreme biological variation and we have limited understanding of the welfare requirements of many of these species.

A recent Norwegian expert committee report on risk assessment and welfare of wild mammals and birds subjected to marking,²¹ and a subsequent public hearing on the subject, indicated an additional challenge: the need for guidelines produced by and for regulators and researchers when processing applications for wildlife research to ensure consistency and for close cooperation between regulators and those funding such work.

An electronic collection of currently available databases, guidelines, information centres, journals and discussion groups of relevance to the 3Rs has been available since 2014 (see Box 1). The 3Rs Guide database, which is a collaboration between the US Department of Agriculture and Norecopa, has recently been brought up to date and includes a comprehensive list of guidelines for wildlife research.

There is a real need to continue drawing together and publishing species-specific guidelines for wild animals in research, for further efforts to improve the quality of research undertaken and for regulators to provide clear and detailed guidance on their expectations.

Action points:

- 1 Ensure that there has been an effective search for all relevant guidelines when capturing, handling, housing and caring for wild animals and using them in research.

- 2 If you identify any unmet needs with respect to guidelines, consider initiating a process to produce some.

Box 1

3R Guide database (2016). **Guidelines for wildlife research.**

http://norecopa.no/search?fq=cat:%22Wildlife%22&fq=type:%22Guidelines%22&fq=db:%223r%22&sort=name%20asc&q=* (accessed 10 June 2016)

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