



Module 21

Wild Animal Welfare: Management of Wildlife

Lecture Notes

Slide 1:

This lecture was first developed for World Animal Protection by Dr Christine Leeb (University of Bristol) in 2003 and updated by Dr Matt Leach (University of Bristol) in 2007. It was revised by World Animal Protection scientific advisors in 2012 using updates provided by Dr Caroline Hewson.

Slide 2:

Today's lecture introduces you to some of the biggest welfare issues affecting wildlife.

We will concentrate on the main issues affecting free-living wildlife, and then focus on the welfare of captive wildlife.

We will also touch on some ways that the welfare issues concerned might be resolved.

Slide 3:

In this module, we define a wild animal as: a free-living or captive animal from a species that typically lives without human intervention, and whose parents and forebears were not selectively bred for docility or ease of handling.

As with other species, our concern for the welfare of wild animals concerns their physical functioning, their mental state/feelings and the performance of behaviours that are important to them. Typically welfare concerns revolve around birds and terrestrial vertebrates. However, note that all vertebrates are sentient, including fish, and that many invertebrates are likely to be sentient too or, at least, to be able to suffer pain.

When we consider wild animals within the common ethical frameworks, respect for nature is commonly invoked by conservationists. That framework places more emphasis on the continuing welfare of the species as a whole, such that the functioning, feelings and behavioural aspects of an individual's experience may be subordinated to the collective feelings, functioning and continued natural behaviour of the species and, perhaps, the wider ecosystem.

So the welfare impact of human activities on wild species might be assessed more by the number affected, and the duration and severity of those effects.

However, as veterinarians we are still likely to be concerned about the welfare of individuals, especially as they may be brought to us for treatment if they are found by concerned members of the public. Our focus today is therefore mainly on the welfare of individuals, rather the protection of species.

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Factors that affect the welfare of wild animals can be broadly classified as those that:

- occur naturally, e.g. the prevalence of a naturally occurring disease, predation, drought or bush fire
- result directly or indirectly from human activities. Such factors are termed *anthropogenic*, i.e. created by humans, and this module focuses on them.

Anthropogenic factors are the biggest cause of reduced welfare in wild animals and, of those human factors, *human encroachment* is the most significant of all.

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We start with free-living wild animals.

In 2005, the World Society for the Protection of Animals (World Animal Protection) commissioned a survey of the most critical welfare issues affecting free-living terrestrial and river-dwelling wild mammals, birds, reptiles and amphibians in sub-Saharan Africa and Latin America (Leach et al., 2005). Although the experts identified a wide range of critical welfare issues in these two different regions, all of these issues could be broadly placed into three over-arching categories:

- trapping, hunting and fishing (see Module 22)
- trade in free-living wildlife or their parts (see Module 22)
- human encroachment on wild animal habitat.

These issues also apply to most or all species of free-living wild animals worldwide, as emerging reviews and research in different regions continue to demonstrate. Of the three categories, human encroachment is the main welfare issue, and we will now consider it in detail.

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Human encroachment is a very broad category, which describes the negative impact of human presence and activities on the welfare of wild animals, either directly or indirectly.

It comprises four main areas of concern:

- habitat loss
- pollution
- human contact
- management of wild animal populations.

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Habitat loss refers to the loss or degradation of the natural habitat in which animals live, because of a wide range of human actions. The main causes of habitat loss are as follows:

- Expanding human habitation leads to a reduction in the habitat available to wild animals due to the clearing of land for urban development and the movement of landless people into wildlife habitat. For example, the expanding urban development that is occurring in various parts of India is encroaching on the natural habitat of the tiger.
- Disruption of wildlife habitat by buildings, roads and fences. For example, the building of 'new' roads in many Latin American countries has caused injury and death to a wide range of wild animals including anteaters, tapir and deer. This has also caused a decline in population numbers.
- Exploitation of natural resources, including logging, charcoal-burning, mining etc. and the flooding/drought caused by dams to provide water for urban areas and agricultural land; for example, the growth of mining in British Columbia, Canada, has reduced the habitat of, and so caused a decline in, woodland caribou.
- Cultivation of fertile wildlife habitat for agriculture, including the clearing of land, draining of wetlands and development of coastal areas for growing crops or grazing of livestock; for example, the clearing of vast areas of rainforest in Latin America to grow crops to feed cattle and to create grazing land for livestock.
- Overgrazing by livestock, where livestock are allowed to graze in the habitat of wild animals: they compete for food and damage the natural balance of the ecosystem, which can lead to destruction of the resources that both the wildlife and livestock are dependent on. For example, the depletion of grasslands and scrub by cattle and goats in many African countries.

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The major welfare concerns relating to habitat loss refer to the suffering and distress that free-living wildlife experience due to:

- disturbance of their natural behaviour, movement patterns and migration routes
- fragmentation of populations and separation of social groups
- disturbance of breeding and nesting sites, which can lead to increased offspring mortality
- displacement of animals from their home ranges
- increased predator vulnerability
- increased inter-species aggression and competition
- competition with livestock for food and water, leading to starvation and dehydration
- animals may suffer from fear, due to the close presence of human beings
- in addition, severe pain, injuries and death may result if the animals collide with man-made objects, e.g. vehicles, buildings, fences, etc. There may also be deliberate attempts to eradicate animals if they are seen as 'pests'.

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The second area of concern for the welfare of free-living wildlife caused by human encroachment is *pollution*; that is, the release of environmental contaminants into the air, water and soil, as well as the excess light, sound and heat from human activities.

The main causes of pollution are listed on the slide.

- Uncontrolled disposal of household and industrial rubbish, which is then found in the wild animals' habitat. Rubbish includes plastic bags, abandoned fishing nets, sharp metal tins, etc. Many seabirds are injured and die each year because they are either trapped in or consume household rubbish
- Contamination of the soil by inappropriate disposal of industrial and household waste, e.g. leakage from landfill sites, etc. For example, animals feeding on plastics or inadvertently consuming heavy metals
- The release of industrial and household chemicals into the water. Release can be from: chemical spills, inappropriate disposal, runoff from industrial sites, and chemicals that are leached from the soil, e.g. when oil is spilled on the soil. For example, the damage and death caused to seabirds around New Zealand due to the spill from the oil tanker *Rena* in 2011
- The release of industrial chemicals and particulates into the atmosphere from industrial processes, power generation, vehicle exhausts, etc. For example, the release of sulphur dioxide and nitrogen oxides leads to the formation of *acid rain*, which affects wild animals and their habitat around the world

- The disruption caused by excess light noise and heat produced by human activities, e.g. hot-water disposal from power stations into rivers, lakes and the oceans. For example, light pollution is altering the natural behaviour of many nocturnal animals, such as bats, foxes and coyotes in Europe and the USA.

Slide 10:

The third damaging aspect of human encroachment is caused by contact and interaction with humans and their domestic animals. The main forms of this contact with wildlife are:

- direct contact with humans and their domestic animals (companion animals and livestock) who are increasingly sharing wild animals' habitats. For example, the effect that domestic cats have had on wild bird populations around the world
- the study of wild animals where some of the methods used can have a potentially negative effect on the animals involved. For example, capturing and sedating animals in order to carry out measurements on them (e.g. mist-netting birds; darting large mammals such as elephant, rhino and big cats)
- tourism is an increasingly popular way of making sustainable use of wildlife and their habitat, but may also have negative effects. For example, the increase in ecotourism in many countries in sub-Saharan Africa may also provide a risk of disease transmission from humans to vulnerable primate populations.

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Contact with humans and domestic animals can lead to a wide range of welfare issues for wild animals, including the following.

- The transmission of disease parasites from humans and domestic animals to wildlife (at the 'livestock/wildlife interface') causing direct health problems, debilitation and death, e.g. canine distemper affecting African canids, and Bovine Tuberculosis (BTB) affecting buffalo and some other wildlife species. In countries that have suffered or that are suffering conflict, there may not be a government with sufficient resources to test for and control the health of livestock. As a result, infected livestock may be transported and allowed to come in contact with wildlife, transmitting diseases like BTB to the wildlife, which results in depressed wild population growth rates and may make them more susceptible to predation, as well as producing a reservoir of infection for livestock. Drought can also cause the spread of the disease, because pastoralists move their animals away from the usual grazing areas in search of fodder and water: often they move into areas with susceptible wildlife, and the disease spreads through those populations too.
- Disease and parasites can also be transmitted from wildlife to domestic animals, e.g. swine fever, foot and mouth disease. This can result in further encroachment on wild animals, because the diseases in livestock cause low production and death. To make up for this loss of meat from domestic animals, farmers and the general population may feed themselves by trapping, hunting and fishing. Please see the trapping, hunting and fishing section in Module 22 for more details.

- Domestic animals often attack smaller wild animal species, causing fear and distress from being stalked, chased and attacked in those who escape, and serious injury, infection and painful death in those who are caught and killed. For example, both domestic dogs and cats and their stray or feral counterparts attack a wide range of wild animals around the world and contribute to suffering and reduction in numbers of those species, some of which are endangered, e.g. cats hunting wild birds in Europe, and domestic dogs attacking deer, peccaries, anteaters, etc. in Latin America.
- Research activities can affect both the animals involved and their conspecifics, due to poor methods of capturing, handling, releasing and monitoring wildlife, which not only cause distress and potential injury to the individual involved, but also distress to other conspecifics. For example, marking animals in order to identify them, attaching transponders and radio collars or implanting telemetric devices may affect communication and interactions between animals. The smell of people on a tagged animal is a further concern, as is the risk that animals may be injured during capture and sedation.
- Tourism can benefit wildlife by making them a sustainable resource for local communities, but it can cause considerable distress due to the disturbance by visitors and their vehicles in the wildlife habitat, which can cause fear and alter the natural behaviour of wild animals. An increase in tourism can also result in pollution (e.g. from increased rubbish) and in the destruction of wild animals' habitats which are destroyed to provide the necessary infrastructure to support tourism. Also see Module 22 for further information on the impact of tourism on animal welfare.
- A further adverse effect on wildlife may occur especially in urban areas when members of the public mistake a young animal awaiting its mother's return for a sick animal and take the animal to a rehabilitation centre.

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Management of wild populations refers to human interventions that are necessary to control wild animal populations so as to enable our safety and ongoing encroachment. However, management itself can cause further encroachment, because:

- The continued loss of habitat forces wildlife into smaller areas, leading to overpopulation. For example, the increasing loss of elephant habitat in South Africa has led to overpopulation of many species, including elephants, which now need to be controlled
- the building of fences and roads prevents natural movement and predation, leading to overpopulation. For example, the migration of many African species has been altered or prevented by fences put up to protect wildlife
- the creation of national parks and game reserves limit habitat and require managing to prevent overpopulation
- conflict between humans and wild animals due to competition over food or water (e.g. wild herbivores vs. livestock grazing), crop-raiding (e.g. elephants raiding and destroying crops), disease and predation risk for livestock (e.g. predators preying on livestock), and animals posing a risk to humans and their habitations (e.g. elephants destroying villages)

- the control of alien species which have either been accidentally or deliberately introduced into a new environment by humans and have a negative effect on the local fauna and flora. For example, in New Zealand, the introduction of rats and cats by European settlers has resulted in significant reductions in numbers of indigenous species there (*Drake et al 2011; Kakapo Recovery 2012*) Examples include:
 - Extinction on the NZ mainland of tuatara, a group of reptiles (ancient in evolutionary terms) that resemble spiny lizards. They are now only found on some outlying islands such as Stephen's Island and Somes Island.
 - Extinction of ground-dwelling birds. For example the Stephen's Island wren became extinct after firstly the introduction of rats, then later the development of feral cat populations from domestic cats who accompanied the Europeans. Another flightless bird, the kakapo, is now thought to be extinct on mainland NZ. In 2012, it is said only to be found on Codfish Island and Anchor Island.

Slide 13:

The major welfare concerns in the management of wild animals relate to the pain, suffering and distress caused by the methods that are used to control wild animal populations.

- In many cases, the initial stage in controlling animal populations will require animals to be caught. If the methods used to catch these animals are not humane, the welfare may be compromised in several ways (which are summarised in the trapping, hunting and fishing section of Module 22).
- In those animals who are being culled, the method of killing must be humane and final, otherwise severe pain, suffering and distress will be experienced by animals who are injured, but not killed (e.g. wounded animals that escape).
- When animals are being relocated, the conditions of transport can also cause pain, suffering and distress. Animals are often transported in inappropriate containers, resulting in overcrowding, social isolation and high mortality rates due to increased risk of disease and parasite transmission, starvation and dehydration. The general issues of animal transport are reviewed in more detail in Module 25 (on livestock transport and markets). In addition, the release of relocated animals into a new environment can cause suffering and distress, at least in the short term, because of placement into a novel environment and separation from conspecifics.
- If only certain members of a group or population are relocated or culled, this could cause considerable distress to other members of that social group because of separation, loss of the pack or herd leader, and increased predation or competition with other groups due to a decrease in group size.
- In those animals given contraception, the method of administration can cause suffering and distress if it requires animals to be caught; for example, when contraceptive devices or slow-release preparations need to be implanted such as the zona pellucida vaccine.

Slide 14:

Preventing the animal welfare problems caused by human encroachment involve:

- human communities and land use
- environmental changes (see next slide).

Potential solutions involving human communities and land use include those listed below.

- Broaden the debate and develop solutions by including the local communities who encroach on wildlife and nongovernmental organisations who are aware of the pressures that these people are under, e.g. by using participatory rural appraisal techniques, and by approaching community-based organisations.
- Help local communities to avoid encroaching on wild animal habitat (e.g. for farming, housing, etc.). Educating local communities and helping them to develop viable alternatives can protect wildlife habitats, while meeting local human needs. For example, permaculture (sustainable and self-sufficient agricultural ecosystems) as an alternative to unsustainable farming and bushmeat hunting, and handicrafts may be viable alternatives to traditional subsistence or commercial wildlife farming. This has worked in the lower Amazon region in Brazil where wild animals are no longer caught to be used for tourists posing with them for pictures, but handicrafts are now sold to tourists instead. Permaculture workshops have been given to several communities in the lower Amazon, which avoids 'slash and burn' use of the rainforest and so prevents habitat destruction.
- Increase the tolerance of local communities for living near wild animals; financial compensation could be given to communities whose livestock are killed by wild animals. National or local parks could be created where no communities live, and they could be connected by wildlife corridors.
- Avoid the need to kill wildlife for self-protection, by protecting communities from wildlife using fences (e.g. chilli fences to ward off elephants), defensive structures, buffer zones or inedible/aversive plants.
- Control animal numbers thorough translocation, culling or sterilisation programmes (but these measures need to be humane and viable habitat must be available for translocation).

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Potential solutions involving interactions with the environment include:

- building structures that pose less of a threat or obstruction to wild animal movement, for example roads with fencing and passing points to protect animals. Structures to enhance wild animal movements can include 'wild' bridges (e.g. for deer or elk), tunnels (e.g. for toads or small mammals), or wildlife corridors (e.g. hedges that connect two patches of forest or rivers/streams that connect ponds or lakes)

- preventing pollution of wild animal habitats by ensuring that:
 - household and industrial waste is disposed of in an appropriate and safe manner, away from wild animal habitat; and
 - light, noise and heat pollution from human activities is controlled
- the use of humane (and non-invasive) research techniques and appropriately trained staff so research can be carried out on wildlife in the most humane manner
- keeping domestic animals separate from wild animals whenever possible by:
 - ensuring that livestock are not allowed to graze uncontrolled in wild animal habitat and are appropriately protected, and
 - preventing domestic cats and dogs from roaming.

Slide 16:

Now that you are aware of the main welfare concerns posed by human encroachment, and general solutions, we shall look at some specific examples, starting with agriculture.

Around the world, farmed land occupies approximately one third of the earth's dry surface, and aquaculture is also a growing industry. On land, most wildlife lives either immediately on or around the farmland, or they pass through it during migration, etc. In both cases they can cause significant damage to crops and the farmers' income. This is a real ethical concern.

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The four main threats to wildlife from agriculture are thought to be:

- disease transmission to and from domestic species, and associated efforts to eliminate wildlife that act as reservoirs of disease or damage the crop. In terms of disease, zoonotic diseases such as tuberculosis and rabies are a particular concern
- the non-targeted use of poisons to kill 'pest' species such as rodents may also kill non-pest species
- the physical use of the land, either during harvesting, ploughing, etc., or during clearance of bush to create agricultural land. Apart from direct physical damage, clearing bush and harvesting can expose some wild species to additional predation, reducing the viability of the prey species as a whole, sometimes to the point of making it endangered.
- the use of agrichemicals to enhance the productivity of the land and the health of the crops. However, these may destroy the foodstuffs of local wildlife and affect their reproductive success.

In many cases, more research is needed to establish more viable ways of preventing these welfare dangers to wildlife. However, some may be simple and cost-effective, e.g. maintaining wild borders around fields, or ensuring effective barriers between domestic and wild species

to reduce disease transmission. Others require more research, such as the use of vaccines to control transmissible diseases in wildlife, or effective methods of contraception to control the populations of pest species.

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Leading on from the example of agriculture, our second example concerns how we control pest species humanely, both in urban environments and on farms.

The issue is that animals are sentient and the methods used may cause an inhumane death, as well as potentially being non-targeted (i.e. affecting non-pest wildlife). Examples of methods used to kill rats and mice that do not kill instantly and may cause a slow and painful death include anticoagulants and the use of sticky pads. Mouse traps may also be ineffective if they do not instantly completely crush the chest.

Solutions to this challenge include government intervention, regulation of the available methods of killing rodents, and provision of economic incentives for the development of commercially viable humane methods. Theoretical modelling may also help, as it can provide estimates of the likely number of animals needed to be killed in a given area to control the population or the spread of disease.

This example illustrates how managing the interaction between wildlife and humans, for the good of all, is not easy.

Slide 19:

Our third example concerns the predation of wildlife by cats. In many regions this causes considerable conflict between those concerned about falling numbers of wildlife (and the suffering of wildlife when cats capture and kill them), and owners who want their cats to have a normal life outside. Often, cats who are kept only indoors may suffer from that confinement, unless their owners are very aware and provide a fully enriched environment for them.

A general solution would require some public support and enforcement, but could include four steps as follows:

- data confirming that predation is putting wildlife at risk: in many areas, such data exists, and confirms the need for action to protect the wildlife species concerned from further predation that might eradicate them altogether. However, even if there is uncertainty about the full extent of the risk, if consideration of the wildlife species generally implies that predation could be devastating for them, again action should be taken
- that action could include limits on the numbers of cats per household; curfews for cats; use of proven appliances to stop cats from succeeding in catching wildlife such as the *cat bib* which is a fabric bib that is attached to the collar and hangs in front of the cat's chest, preventing the cat from capturing prey. More research on this is needed, but the study concerned was controlled and randomised, and reduced wildlife killings significantly more than the use of a bell on the collar, or an electronic warning device. However, the

bib did pose some risk of cats getting their paw caught up in it, or the bib being caught in vegetation. 70 per cent of participating owners continued to use the bib, and when they were interviewed eight months later, approximately 60 per cent of their group were still using the bib and believed it was effective

- the whole approach should be conducted in consultation with experts and public representatives.

As you can see, the approach may seem idealistic. However, in some urban communities, it may be more likely to succeed in protecting wildlife than disconnected efforts such as educating pet owners in the veterinary clinic, or introducing local regulations without public discussion and public advice from experts.

Slide 20:

We shall now leave the welfare impacts of human activities on free-living wildlife and consider the welfare of captive wild animals.

Slide 21:

Wild animals who are held in captivity to be utilised by humans can be categorised as follows:

- zoo animals
- animals held in rescue and rehabilitation centres
- exotic pets, e.g. parrots, small primates
- farmed animals, e.g. ostriches, alligators, etc.
- working animals, e.g. elephants used in logging.

Many of the concepts that have been discussed concerning other types of captive animals in the other modules (including farm, working and pet animals) will also apply to these categories of captive wild animals

We will now discuss the general principles that apply to all captive animals, and then we will look at particular examples of each of the above categories of captive animals. The framework of the Five Freedoms (covered in Module 2) as applied through the Welfare Quality® project (covered in Module 9) can be used to assess the welfare of practically any captive animal. Then, you may use the principles of *environmental enrichment* (EE) reviewed in Module 15 to try to maximise the welfare of the animals concerned

Slide 22:

We start with the effects of confinement on animals.

First, note that being in captivity is very stressful for wild animals. This is because facilities are typically designed without their needs in mind. The housing, restraints and so on have been designed for human safety, efficiency, ease of animal observation and care, and other largely logistical benefits. This has meant that confinement has typically tended to involve barren or impoverished environments.

The main stressors of captivity for wild animals are:

- lack of sensory stimuli that are important to the species, and which the species is adapted to respond to. For example: particular light–dark cycles, sounds, smells, substrates
- restrictions in movement, feeding and other behavioural opportunities, so that the species' most typical behavioural adaptations cannot be expressed
- abnormal social groups and lack of areas to retreat to
- forced proximity to humans: this is a particular concern in zoos, circuses and exotic pets kept in homes
- too little environmental control: in impoverished environments animals do not have the stimuli or substrates to make decisions and enact choices. Such cognitive and behavioural processes are a natural part of an animal's agency as a sentient individual from a species that has evolved to engage with and adapt to its environment.

A note on predictability vs. unpredictability:

Predictability has value where animals lack environmental stimuli and control, e.g. they cannot forage for food when they feel hungry. It makes human labour easier, e.g. feeding animals in a certain way, at certain times, or turning the lights on and off at a certain time. Predictability may also reflect our modern human preferences to know what the future holds for us.

However, unpredictable feeding regimes have been beneficial in a range of species. For example, a study conducted on captive chimpanzees demonstrated that an unpredictable feeding regime increased the chimpanzees' activity and increased species-appropriate behaviour compared with a predictable feeding regime.

Note that predictability may also be a feature of the care of companion animals. While those animals may have environmental control, they may not be prepared for the unpredictability of being hospitalised or surrendered to a shelter. Research comparing stress levels in feral cats and owned cats at an animal shelter indicated lower levels of stress in the feral cats, perhaps because they were more used to novelty and unpredictability than were domestic cats.

Slide 23:

We shall now apply the Five Freedoms to the welfare needs of captive wildlife; first is the provision of food and water.

The way in which food and water are provided must take into account the basic needs of any captive animal in terms of the method of presentation, feeding frequency and nutritional balance. This will depend on the species' nutritional requirements, species-specific behaviour and the size, condition, physiological, reproductive and health status of the animals being housed. For example, animals who spend large amounts of time foraging should have their food scattered through their captive environment so they can forage (see also Module 15 on Environmental enrichment).

Slide 24:

Next is the provision of a suitable environment.

The environment of captive wild animals must provide appropriate conditions to promote comfort and wellbeing. Therefore, animals should be kept at an appropriate temperature and humidity, with adequate ventilation and lighting. For example, keeping nocturnal animals under high light intensities will damage their health and interfere with their natural behaviour.

Indoor and outdoor enclosures should offer captive wild animals shelter from extreme weather that they have not evolved to cope with or would not be exposed to in the wild, such as rain, sunshine and extremes of temperature and humidity.

Captive wild animals should also be protected from the constant presence of members of the public; for example, providing animals who are naturally solitary or secretive with a place to escape the constant gaze of the public in a zoo, e.g. snow leopards, Java rhino, etc. Such enclosures must be of a sufficient size, design and construction to allow animals to exhibit normal defence, flight and escape reactions to situations that cause fear, such as other animals who share the enclosure and the people outside the enclosure.

Enclosures and any barriers must be designed and constructed so that they do not injure animals in any way: for example, there must be no sharp edges, no places where animals can fall or become trapped, and no plants or materials that can harm the animals.

An animal's enclosure must be designed to offer a balance between sufficient hygiene to prevent disease from occurring and being transmitted, and sufficient complexity to meet the animal's needs (i.e. the enclosure must not be barren and sterile). For example, keeping animals in an empty concrete enclosure makes cleaning and disease prevention easy, but leads to boredom and frustration. Alternatively, keeping animals in environments that are difficult to clean could harbour disease or parasites and could cause injury to the animals, which would also compromise their welfare.

Slide 25:

Providing captive wild animals with the appropriate level of health care requires:

- routine observations and records of each animal's condition, health and behaviour. For example, animals should be monitored for disease, parasites, injuries and behavioural problems so that these potential problems can be treated
- the enclosure to be of a sufficient size and design to avoid causing injury to the animals it houses. Therefore, the enclosure should:
 - allow subordinate animals to escape from dominant animals, and prevent subordinate animals from becoming trapped by the dominant ones
 - provide sufficient resources and space so that animals do not need to compete for food, water and resting places, and the animals can move freely and exhibit natural social behaviour and dispersion.

Enclosures which must protect wild animals from predators:

- must protect them from attack (e.g. ground-dwelling birds preyed on by foxes)
- must protect them from the sight, smell and sound of predators housed nearby.
- also, enclosures should be designed to protect captive wild animals from the build-up and spread of disease and parasites. For example, they should be relatively easy to clean and maintain and should have separate enclosures where sick animals can be housed apart if necessary
- finally, all captive wild animals should be under the care of an appropriately trained veterinarian. This can be fulfilled by a staff veterinarian who is on site all the time (e.g. the case for many zoological collections) or one who is on call when necessary.

However, note that although knowledge of the clinical care of wild species continues to grow, we remain ignorant of the correct care and treatment of many species. This is one reason why ownership of 'exotic' pets such as many reptiles and rare birds should not be encouraged.

Slide 26:

The expression of normal behaviour: in order to promote the expression of behaviours that would be considered to be normal and positive if they were exhibited by animals in the wild, those who keep animals need a detailed understanding of the biology, behaviour, habitat and husbandry needs of each species that they keep. These can be separated into three categories:

- **physiological needs** – these are the species-specific requirements for environmental conditions, food and water
- **psychological needs** – this refers to keeping animals in a way that meets and promotes their psychological wellbeing and allows them to cope with life in captivity in a relatively normal and natural way for that species. For example, by promoting the exhibition of as many natural behaviours as possible (foraging, hunting, play, etc.), allowing them to react to environmental stimuli in an appropriate way for that species (e.g. escaping, threat displays, etc.), housing animals in appropriate groups with social species in compatible social groups (e.g. wolves in a pack) and solitary animals not confined with other members of their species (e.g. older bull elephants)
- **physical capabilities** – this refers to keeping animals in a way that meets their specific physical requirements and capabilities. For example, providing animals that fly with an environment of sufficient physical dimensions to allow them to do so (e.g. birds), providing climbing animals with an environment that allows them to climb both by its structure and by placing objects into the environment that can be climbed (e.g. providing primates with trees, rope climbing frames, etc.).

To promote the expression of normal behaviour, the animals' captive situation must meet these needs, which can ultimately be accomplished by re-creating as many of the positive aspects of the animals' natural environment and life as possible.

However, in reality, most of these needs are not met, and many zoo animals show abnormal behaviours that would either not occur in the wild at all (e.g. stereotypes) or to a much lesser extent than in zoos (e.g. aggression). Even the 'best' zoos may have problems with animals who cannot cope; some zoos have decided to not to keep certain species any more, such as elephants or polar bears, as most of them appear not able to adapt to life in captivity.

The exhibition of normal behaviour can basically be achieved by housing animals in appropriately designed enclosures that are suitably enriched (see Module 15).

Slide 27:

The way in which all captive wild animals are kept must protect them from abnormal levels of fear and distress as much as possible. This can be accomplished in a number of ways:

- animals are only cared for and handled by people who are appropriately qualified and/or experienced at working with each individual species in captivity
- handling, training and working of captive wild animals must be carried out in such a way to avoid causing unnecessary discomfort, distress or injury. For example, training animals should only be carried out using reward-based training rather than the often more 'traditional' training which involves punishment (e.g. hitting, beating, etc.)
- animals should only be housed in appropriate environments for that species. For example, by housing social species together in appropriate groups; by providing animals with a place to escape from frightening or distressing situations (e.g. dominant animals or the presence of humans) and preventing unresolved conflict between animals housed together either by separating them or by removing the source of conflict (e.g. housing the sexually mature male animals of some species separately during the breeding season, or by providing food at multiple sites in an enclosure to prevent competition).

Slide 28:

Environmental enrichment (see also Module 15) is one of the most widely used and popular methods of improving the way in which captive wild animals are kept so that their life in captivity meets their needs. Briefly, the principle of environmental enrichment can be thought of as *how the environments of captive animals can be changed for the benefit of their inhabitants*.

Enrichment can also be more easily thought of in terms of its goals:

- to increase the frequency and diversity of positive natural behaviours; for example, scattering food into the environment, instead of placing it in a pile in a specific place, induces the animal to exhibit more natural foraging behaviour
- to decrease the occurrence of abnormal behaviours by promoting a wide range of natural behaviours, and in doing so reduce boredom and frustration. For example, giving elephants browsing material as well as a concentrated diet stimulates more normal feeding behaviour and so decreases the performance of stereotypies
- to maximise the utilisation of the environment; for example, providing climbing animals with trees and climbing frames allows them to use all three dimensions of their environment, as they would in the wild
- to increase the animal's ability to cope with the challenges of captivity or the wild if reintroduced, for example, by providing a place for zoo animals to escape the gaze of members of the public, or providing moving branches and perches for birds and small primates who are going to be reintroduced into the wild.

Although enrichment is most widely implemented for zoo and exotic pet animals, other types of captive wild animals may also have their lives enriched, for example, by allowing logging elephants to forage in the jungle when not working.

Slide 29:

The type of enrichments given to captive wild animals should depend on the reason for keeping the animals.

Long-term residents are animals who are likely to spend long periods or a lifetime in captivity (e.g. animals who are kept in zoos, or for captive breeding, research or entertainment). They will often have some fundamentally different requirements from those animals who are only being held in captivity for a short period before being reintroduced into the wild (short-term residents).

For the long-term residents, enrichment must reproduce or mimic only the salient positive features of the natural environment that improve welfare.

For example, the environment must have some complexity, promote natural behaviours, provide stimulation, house animals from social species groups, etc. Note that the method of environmental enrichment does not necessarily have to be naturalistic, e.g. a 'fake' termite mound for chimpanzees can be filled with food items which the chimps can 'fish for', but it does not have to resemble a termite mound as long as it produces the same behavioural response (see also Module 15).

In addition, enrichment for long-term residents should wherever possible exclude the negative features of the natural environment that are likely to reduce the welfare of these animals in captivity.

For example, the natural habitat of many species is a hard and dangerous place in which to live. Food is widely distributed, hard to find and sometimes scarce, which can lead to malnutrition. Poor welfare conditions can lead to thermal and physical discomfort. Animals will not receive treatment for injury, parasites or disease.

Slide 30:

For **short-term residents**, all salient features of the natural environment should be reproduced, whether they have a positive or negative effect on the animals' welfare.

Therefore, the environment and captive life you provide these animals still has many of the enriching aspects of the environment of long-term residents. However, it also reproduces some of the negative features of the natural habitat in order to increase their chance of survivability on reintroduction into the wild. Note that these features of the captive environment may reduce the welfare of these animals while still in captivity: for example, exposure to climatic extremes, thermal discomfort, variable and widely diverse food sources, exposure to sub-toxic food, parasites, pathogens and environmental features that may change (e.g. loose branches).

However, these extremes are not a good idea when an animal is sick or recovering from injury prior to release into the wild.

Creating a representation of the 'wild' environment in captivity must not break the laws that protect captive animals in many countries.

Slide 31:

Captive wild animals need to be able to survive when they are reintroduced into the wild, either following captive breeding or rehabilitation. The skills they need can be classified into the following categories:

- orientation, e.g. the ability to successfully navigate and move around their environment
- feeding and foraging, e.g. the abilities to locate and consume sufficient quantities of food and avoid foods that will cause injury, disease or death
- obtaining suitable places to rest and sleep, e.g. being able to identify, locate and, if necessary, build a safe place to rest and/or sleep
- appropriate inter-species interactions, e.g. understanding which animals to approach and which to avoid, such as predators
- appropriate intra-species interactions, e.g. understanding how to interact with different members of the group or species at different times, such as breeding, appeasement, threat behaviours, etc.

Guidelines and standards for reintroduction have been produced by the IUCN (International Union for Conservation of Nature). The guidelines state that the welfare of animals for release should be of paramount concern through all stages.

They highlight that captive-bred animals should acquire the necessary information to enable survival in the wild, through training in their captive environment. The guidelines also recommend that there must be a release strategy for each animal.

Established rehabilitation centres should also directly or indirectly support post-release monitoring activities (e.g. radio-tracking of selected individuals). Post-release monitoring helps to evaluate the likelihood of survival for rehabilitated animals in the wild, therefore giving a measurement of successful rehabilitation. By doing so, individual animal welfare is also assessed.

Slide 32:

The function of modern zoos should be to:

- educate their visitors about the animals they see, to promote appreciation for them, which should lead to a better understanding of the need for their conservation
- carry out research on their needs both in captivity (e.g. zoo design, nutrition, environmental enrichment and zoo animal medicine) and the wild (e.g. wild animal medicine, behaviour, reproductive biology etc.)
- promote and contribute to conservation of wild animals through captive breeding and reintroduction programmes, education, research and fundraising.

In addition, if zoos would like to entertain people, this should be done in appropriate ways (e.g. demonstrating the amazing natural aspects of an animal). These are admirable goals, but the welfare of the animals is paramount.

Slide 33:

Despite the positive aspects of zoos, there are serious concerns about the welfare of animals kept in them, as often the conditions do not fully meet their needs according to the Five Freedoms. The photo on the slide shows a very barren environment that provides little for the animal housed within it.

Slide 34:

There are potential ethical and welfare concerns about keeping wild animals in captivity. Most of these concerns relate to the environment, the way in which they are cared for, and the apparent lack of understanding of their needs.

Using a cost–benefit analysis, it can be argued that, although the welfare of the individuals kept in captivity may be compromised (costs) this can have a number of benefits for the rest of that species living in the wild. These benefits are:

- through research, we can gain a better understanding of these animals, which allows us to conserve them in a more effective manner in the wild
- by having captive animals, people can be educated about them, which can increase our empathy for them and their plight in the wild, which can help to conserve them
- rescuing wild animals and keeping them in captivity and/or breeding wild animals in captivity for reintroduction can bolster wild numbers and contribute to their conservation.

To justify the above cost–benefit analysis, those who keep wild animals in captivity must do so in a way that:

- ensures the highest standard of housing and care possible for the animals they keep – This can be accomplished through research into zoo design, nutrition, environmental enrichment and zoo animal medicine
- promotes education, research and conservation of the species they keep through the use of appropriate education schemes, research activities and captive breeding and release programmes.

These justifications have become recommendations throughout the world and, in many cases, requirements through legislation; for example, the Standards for Modern Zoo Practice set out in the European Directive 1999/22/EC.

Therefore it is no longer justifiable for modern zoos to keep animals to purely entertain their visitors, which has traditionally been the major reason. Today they must also work towards educating, researching and conserving these species.

Meeting objectives?

The reintroduction success of captive breeding programmes has been very low, especially those animals originating from breeding programmes in zoos. Animals from captive breeding establishments, where they have no contact with humans, have a better chance of survival in the wild. Examples of relative success include the golden lion tamarin monkey in the Amazon and the oryx in Saudi Arabia, as well as several bird of prey species reintroduced in Europe and North America.

The educational role of some zoos has been questioned, because they house animals in inappropriate environments that do not promote natural behaviour (and, in many cases, induce abnormal behaviour). This does not appropriately or adequately educate people about these animals.

Thanks to those zoos where the objectives of research, conservation/reintroduction and education have not been met, there is a danger that the public will turn away from zoos and conclude that the use of animals in zoos cannot be justified, whatever the benefit to their wild counterparts.

Slide 35:

A wide variety of wild animals are brought into rescue and rehabilitation centres around the world because they have been injured, orphaned, abandoned or found wandering in areas of human habitation. Sometimes public concern is misplaced, often in urban settings, so that young animals are separated from their mothers unnecessarily.

Keeping any wild animal in captivity (even for a short period) can be fraught with difficulties. This can lead to the animal's welfare being compromised, at least to some degree, while in captivity and potentially further when released. Therefore, the decision to rescue and rehabilitate should only be taken if:

- the animal's injuries, disease or general health status is treatable, so that the animal can make a complete recovery and not have a diminished chance of survival
- the animal can be returned to the original or similar habitat, i.e. the animal can cope and survive by being in a wild environment like the one he/she had before captivity
- there are sufficient resources, expertise and facilities to care for the animal. This will not only improve the animal's welfare in captivity, but also the chance of survival on release.

If the animal is an endangered species and is unable to be returned to the wild, then the animal may be put in a captive breeding programme and his or her progeny should be reintroduced to the wild.

If the animal does not meet any of these criteria, then it may be preferable for the animal to be humanely euthanised (see Module 17).

Slide 36:

A huge variety of wild animal species are kept as 'exotic' pets in various countries around the world either locally, or following import which may be legal or illegal (smuggling).

The welfare issues relating to the capture, transport and sale of these animals is covered in Module 22. Once in captivity, their welfare is affected by the way in which they are housed, cared for, and handled, etc.

Particular concerns for exotic pets are that:

- they may experience greater distress and fear due to confinement, especially because of lack of space and complexity; for example, parrots kept in cages that are too small for them to move or fly around in and that are often barren as they contain little or no things to occupy them (e.g. perches, toys, companions, etc.). The social behaviour requirements of the exotic pet are often impossible to replicate and so are rarely met. Social species are often kept alone and solitary species are sometimes kept with others
- close proximity to humans and also routine husbandry practices may be very distressing because exotic animals are often not habituated to human presence or handling

- they are often fed inappropriate diets, both in terms of nutrition and variety, which do not fulfil the animal's need to express particular feeding behaviours
- they pose both a disease and physical risk to humans and other domestic pets. This can lead to the exotic animals being mistreated, injured or abandoned. veterinarians may not have sufficient knowledge of health problems of exotic pets, which results in inadequate or inappropriate veterinary care of these species.

For such reasons, many exotic pets are considered unsuitable. This includes some species, such as psittacine birds, who have traditionally been kept as pets all over the world.

Slide 37:

A wide range of wild animals are used in farming in both developed and developing countries.

Ostrich, wild boar, alligator, kangaroo, buffalo, and so on are all farmed in Europe, the USA and Australasia to provide meat and other animal products. Several smaller camelid species are farmed for meat and wool in many Latin American countries (alpaca, llama, guanaco).

Several fur-bearing species (e.g. mink, fox, etc.) are farmed all over the world for their fur. Like most other farm animals, their welfare is affected by the way in which they are housed, cared for, transported and slaughtered. There are some particular concerns:

- wild animals may generally experience greater distress and fear when exposed to routine farm practices than domestic farm animals
- some of the farming processes will need to be modified to cater for wild animals and prevent considerable pain, distress and fear; for example:
 - method of slaughter, e.g. killing an ostrich or alligator, requires specialist equipment and expertise. Much research is still needed here, leaving aside the inherent problems of the species not yet being fully domesticated. However, some work is emerging. In 2012, a paper was produced (Hoffman, 2012) on the restraint of ostriches using a purpose-built device enabling electrical stunning and then exsanguination by a cut to the neck.

Slide 38:

We now briefly consider the welfare of wildlife who are used to work. These include:

- animals trained and used for labour, e.g., Asian elephants who are used in the logging industry throughout Asia (see picture).
- animals trained to assist disabled humans with daily activities, e.g. capuchin monkeys
- animals trained to carry out activities that are difficult or dangerous to humans, such as dolphins and rats used to search for mines
- animals used for entertainment, such as those in circuses and those trained to perform for television and film (see Module 20).

Particular concerns are:

- lack of domestication but close ongoing contact with their handlers which can cause fear and distress, e.g. training using injurious techniques
- due to the nature of the work, many animals may be restricted in their movements due to being chained or caged when not working, and this may prevent them from performing their normal behaviour
- in those working animals where captive breeding is not carried out, replacement animals are caught in the wild, causing further distress.

Slide 39:

Now that we have seen the many welfare concerns that affect wildlife, we should note that legislation varies throughout the world. Some applies to free-living wildlife and others to captive wildlife.

International examples include:

- CITES (1975): the Convention on International Trade in Endangered Species was agreed to prevent international trade from threatening species with extinction. More than 150 member countries control the import and export of an agreed list of species that are endangered or at risk of becoming endangered (see Module 22)
- The International Convention for the Regulation of Whaling (1946): this convention established the International Whaling Commission (IWC). The purpose of the Convention was to provide for the conservation of whale stocks on a worldwide basis while enabling the orderly and controlled development of the whaling industry
- The Convention on Migratory Species (CMS): this aims to conserve terrestrial, marine and avian migratory species throughout their range. It is one of a small number of intergovernmental treaties concerned with the conservation of wildlife and wildlife habitats on a global scale. Since the Convention's came into force on 1 November 1983, its membership has grown steadily to include 80 (as of 1 September 2002) parties from Africa, Central and South America, Asia, Europe and Oceania.

However, note that these laws do not stipulate the particular welfare needs of different species in captivity, but are concerned with the preservation of the species in the wild.

In contrast, more and more countries have local legislation that deals in part with the care and welfare of captive wildlife. One example is the Animal Welfare Act of the Philippines (1998) which aims to “protect and promote the welfare of all animals in the Philippines by supervising and regulating the establishment and operations of all facilities utilised for breeding, maintaining, keeping, treating or training of all animals either as object of trade or as household pets. For purposes of this Act, pet animals shall include birds.”

However, enforcing legislation can be difficult for reasons such as poor wording, lack of resources, etc.

Slide 40:

To sum up, anthropogenic factors are the main cause of welfare concerns in wildlife.

- The biggest welfare issues affecting free-living wild animals result from human encroachment.
- The welfare issues affecting captive wild animals relate to the way in which they are housed, handled and worked by humans.
- Although welfare issues affecting wild animals are often considered at the group (e.g. herd, pod, pride, etc.) or population level, the impact of these issues must also be defined and evaluated in terms of the individual animal affected.
- In order to continue to improve the welfare of both free-living and captive wild animals, people need to be aware of the issues that affect these animals, the causes of the issues, and how they can be solved.
- In the case of free-living wild animals, the vast majority of welfare issues are caused by the way in which we use them and their habitat. Solutions include some combination of education, community-based resource management, legislation and finding alternatives to the human activities that cause the issues.
- Veterinarians can play an important role here. You would need further training in wild animal health and welfare and wildlife management; this is a well-developed specialisation within the profession internationally.

Module 22 goes on to consider other welfare aspects of our interaction with wild animals, including trading and hunting.