The Case Against Fur Factory Farming

A Scientific Review of Animal Welfare Standards and 'WelFur'

respect for animals

FIGHTING THE INTERNATIONAL FUR TRADE

The Case Against Fur Factory Farming

A Scientific Review of Animal Welfare Standards and 'WelFur'

A report for Respect for Animals

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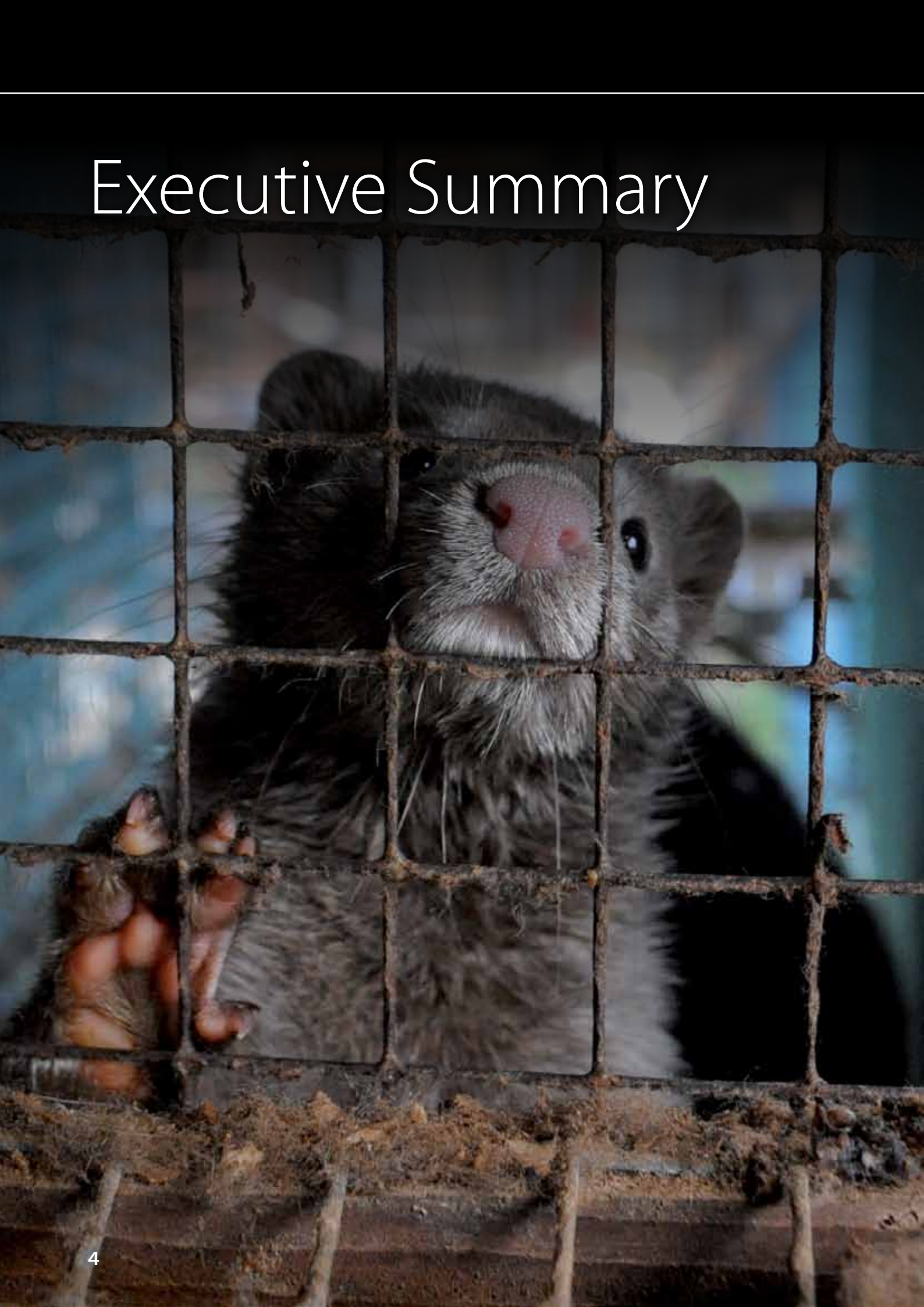


The global fur industry has grown rapidly, with increasing demand fuelled by growing affluence in developing economies, particularly China and Russia. Worldwide, around 95 million mink and foxes were killed for their fur in 2014. Most fur sold globally is from farmed animals, with Europe and China being the largest producers.

While fur animals are included in general EU legislation on animal welfare, transport and slaughter, **there is no detailed species-specific EU legislation setting welfare standards for animals farmed for fur.** Serious concerns for the welfare of animals farmed for fur were highlighted in the 1999 Council of Europe 'Recommendation Concerning Fur Animals' and the 2001 report of the Scientific Committee on Animal Health and Animal Welfare. **Recent scientific studies add further weight to the substantial body of evidence demonstrating that the needs of mink and foxes are not being met in current housing systems and cannot be met in any housing system with the undomesticated animals used by the fur industry.**

Mink and foxes used for fur production are not domesticated

Domestication is an evolutionary process by which a population of animals becomes adapted to humans and captivity. **The most important welfare aspect of domestication is the unique ability of domesticated species to interact with humans in a positive way.**

Although, experimentally, mink and silver foxes can be domesticated, this has not, and cannot, occur on fur farms because changes in the coat that are characteristic of domesticated animals are incompatible with the fur industry's demands. On fur farms, the emphasis is on selection for traits associated with pelt colour and quality, body size and litter size. These animals are not adapted to close contact with humans and cannot be considered in any way domesticated. **Fear of humans in the undomesticated animals used by the fur industry makes them fundamentally unsuitable for farming.**

The welfare of mink and foxes farmed for fur in Europe is extremely poor

Approaches to assessing animal welfare can be broadly summarised as 'biological functioning' (i.e. are the animals physically and mentally healthy?), 'affective (emotional) states' (i.e. are the animals happy/feeling good?) and 'natural/motivated behaviours' (i.e. 'do the animals have what they want?'). **Whichever approach is emphasised, the welfare of mink and foxes farmed for fur is seriously compromised because:**

- **The biological functioning of mink and foxes farmed for fur is impaired**, as indicated by levels of stereotypic (abnormal repetitive) behaviour, fur-chewing and tail-biting/self-injury, physical deformities (bent feet) and high levels of reproductive failure/infant mortality;
- **There is evidence of negative affective (emotional) states in farmed fur animals**, including fear (as indicated by avoidance/aggression towards humans), frustration (as indicated by stereotypies) and boredom/under-stimulation (as indicated by fur-chewing and tail-biting, long periods of inactivity when awake and heightened response to stimuli);
- **Animals farmed for fur are unable to perform many natural behaviours that they are motivated to perform and/or frustrated/stressed by the inability to perform**, such as interacting with water (for mink), interacting with a sand/earth floor (for foxes), using multiple nest sites, and foraging/ranging (as indicated by stereotypic behaviour).

The 'Five Freedoms' are widely used internationally as a framework for animal welfare assessment, legislation and assurance standards. **Farming systems for mink and foxes fail to satisfy any of the 'Five Freedoms':**

- **Freedom from hunger and thirst:** Restrictive feeding of overweight animals in preparation for breeding results in hunger and increased stereotypic behaviour.
- **Freedom from discomfort:** Mink and foxes farmed for fur in cages have very little control over their physical and social environment. Foxes are mostly kept without access to a nest box. Handling procedures cause significant stress and discomfort.
- **Freedom from pain, injury and disease:** Common problems include fur-chewing, injuries (both self-inflicted and from other animals), high levels of infant mortality, deformities (bent feet), difficulty in moving, diarrhoea and inhumane killing methods.
- **Freedom to express normal behaviour:** The small and largely barren cages used to house mink and foxes on fur farms do not allow the animals to swim, climb, run, dig, hunt/forage or range/disperse. Maternal deprivation and social stress can result from abrupt early weaning, isolation in individual housing, aggression in group housing and the close proximity of socially dominant animals.
- **Freedom from fear and distress:** Fear is a major welfare problem for animals farmed for fur because the mink and foxes used on fur farms are not domesticated.

The Farm Animal Welfare Council considers that minimum legal requirements should be such that an animal has a **'Life worth Living'**. Levels of fear, stereotypic behaviour, fur-chewing/tail-biting, physical deformities (bent feet) and reproductive failure/infant mortality clearly indicate that the needs of mink and foxes on fur farms are not being met. Mink are semi-aquatic and show 'inelastic demand' for water (i.e. they will continue to work for access to it, despite increasing costs). Mink accustomed to the provision of water, and foxes accustomed to having access to a clean dry substrate, may show stress when they can no longer enjoy these resources. Access to these resources would clearly be included within the Farm Animal Welfare Council's description of a 'Life worth Living'.

The welfare of mink and foxes farmed for fur is seriously compromised in current farming systems, which fail to satisfy all five of the 'Five Freedoms' and do not provide a 'Life worth Living'. Even if domesticated animals were to be used, current farming systems could not meet the needs of mink or foxes.

European citizens are opposed to fur farming

The fur industry's 'Origin Assured' labelling scheme does not stipulate any specific production standards and unenforceable industry codes of practice are sufficient for a country to be 'Origin Assured'. **The 'Origin Assured' label is used on fur produced in small wire cages, which have inherently low welfare potential and are opposed by the majority of European citizens.** Most consumers would not consider these conditions to be consistent with the scheme's claims of humane treatment.

The majority of European citizens recently polled in ten countries, including countries with substantial fur production, is opposed to the farming of animals for fur in cages. A number of European countries have already implemented bans and there is widespread support for a ban at EU level.

'WelFur' cannot address the major welfare issues for mink and foxes farmed for fur

The European Fur Breeders' Association launched the 'WelFur' project in 2009 to develop on-farm welfare assessment protocols for mink and foxes. These:

- have been **specifically designed around the very serious limitations of current housing systems** and generally reward the *status quo*, even where this is known to compromise welfare, rather than encouraging the development of systems with the potential to provide a higher level of welfare;
- do not adequately penalise practices that **fail to meet existing minimum standards** set out in the Council of Europe Recommendations;
- do not address **inhumane handling and killing methods** and the lack of training for all personnel carrying out killing of fur animals;
- downplay the importance of **serious injuries** that are associated with extreme suffering;
- will underestimate the true levels of **mortality and stereotypies**;
- use **inadequate measures** of hunger, human-animal relationships and positive mental states;
- use complex scoring systems to combine different welfare measures into a single category indicating the overall welfare level, which may allow high scores on some elements to **mask serious failings** on others;
- **will not achieve WelFur's stated aims** of ensuring 'a high level of animal welfare' on fur farms and functioning as 'the new scientific reference' for fur-farmed species;
- do not take account of societal concerns and **score welfare only up to a ceiling of 'best current practice'**;
- would be **misleading** if used as the basis for a labelling system.

WelFur is not able to address the major welfare issues for mink and foxes farmed for fur, the issues associated with inhumane handling and slaughter methods, or the serious inadequacies in current labelling and regulation. The 'best current practice' ceiling makes the WelFur scores of limited value and misleading because 'best current practice' still represents what the majority of people would consider to be an unacceptable level of welfare. Alternative systems with the potential for higher levels of welfare do not exist for mink and foxes.

Conclusion and recommendation

The current regulatory framework for the protection of fur animal welfare in the European Union is inadequate. Enrichment of existing housing systems is not sufficient to address the serious welfare problems inherent in cage systems. The use of undomesticated animals by the fur industry means that fear of humans and difficulties in handling and management would present insurmountable obstacles to the adoption of more extensive systems. It is therefore impossible for the needs of mink and foxes to be met by the fur industry. A ban is the only viable solution to the serious welfare concerns highlighted in this report.

The farming of mink and foxes for fur should be prohibited in accordance with Council Directive 98/58/EC: "No animal shall be kept for farming purposes unless it can reasonably be expected, on the basis of its genotype or phenotype, that it can be kept without detrimental effect on its health or welfare" and the Council of Europe Recommendation Concerning Fur Animals: "No animal shall be kept for its fur if: a. the conditions of this Recommendation cannot be met, or if b. the animal belongs to a species whose members, despite these conditions being met, cannot adapt to captivity without welfare problems."

1: Introduction

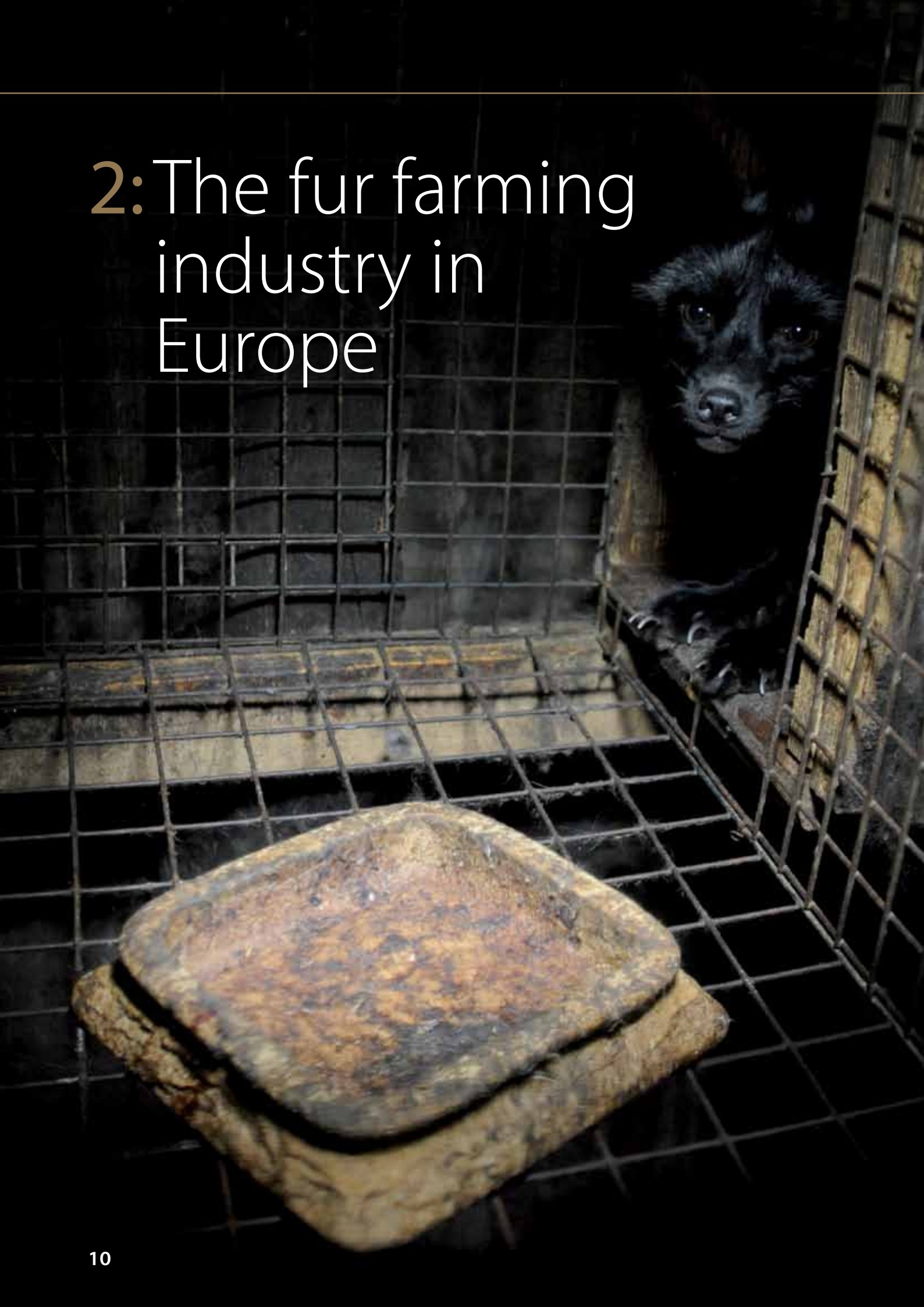
The global fur industry has grown rapidly in recent years, with increasing demand fuelled by growing affluence in developing economies, particularly China and Russia. Worldwide, around 95 million mink and foxes were killed for their fur in 2014.[1]

The farming of animals for fur is controversial. Welfare groups and many welfare scientists are concerned about high levels of abnormal behaviours in caged mink and foxes. Opinion polls indicate that the majority of European citizens are opposed to farming animals exclusively or primarily for their fur and growing numbers of countries have taken the decision to restrict or prohibit fur farming.

The fur industry has for many years tried to argue that conditions in fur farms are satisfactory and lobbies hard to maintain the *status quo*. It argues that the public is not well-informed about rearing conditions and welfare standards on fur farms. Partly aimed at addressing this perceived lack of understanding, the European Fur Breeders' Association (EFBA) launched the 'WelFur' project in 2009 to develop on-farm welfare assessment protocols for mink and foxes. These protocols have now been published and in 2015 were being trialled on fur farms in ten European countries, with full implementation of the assessments planned for 2016.[2] The EFBA states that the aim of WelFur is to "promote and ensure good welfare standards on all fur farms."[3] In this report, we evaluate whether WelFur is likely to achieve this goal.

Following a brief overview of the fur farming industry in Europe and its global context, we: introduce key concepts and approaches to the definition and assessment of animal welfare; briefly describe the natural behaviour of mink and red and arctic foxes; and address the question of whether mink and foxes on European fur farms can be considered domesticated. We then examine the scientific evidence to identify the major welfare issues affecting mink and foxes farmed for fur and ask whether WelFur is able to address these issues. Consideration of the ethical issues regarding the acceptability or otherwise of fur farming is beyond the scope of this report. We will, however, consider public opinion and the availability of consumer information on fur production and animal welfare and ask whether there is a role for a WelFur-based labelling scheme. We conclude with an assessment of the welfare contribution of WelFur and whether it is possible to achieve an acceptable standard of welfare on fur farms.

2: The fur farming industry in Europe



2.1 Scale of the fur farming industry in Europe and the world

Around 85% of fur sold globally is from farming, with the remainder from trapping and hunting wild animals.[4] Mink *(Neovison vison)* account for the largest share of global fur production, followed by foxes. Both red (silver) foxes *(Vulpes vulpes)* and arctic (blue) foxes *(Vulpes lagopus)* are farmed for their fur. Smaller numbers of other species are also farmed for fur, including chinchilla *(Chinchilla lanigera)*, raccoon dog *(Nyctereutes procyonoides)*, sable *(Martes zibellina)*, ferret *(Mustela putorius furo)* and coypu *(Myocastor coypus)*. More than a billion rabbits are also bred for meat or fur each year but, in this report, we will focus on the welfare of the main species farmed exclusively for their fur: mink and foxes.

During the 2013-14 fur auction season, 87.2 million mink pelts (with a total value of €3.7 billion) and 7.78 million fox pelts (with a value of more than €880 million) were produced globally.[5] Europe and China are the largest producers of fur globally and China's share of global production is increasing rapidly. Europe is the largest exporter of fur[6] and China is the largest consumer and importer, reportedly accounting for more than 50% of global fur consumption.[7]

In 2014, more than 41 million mink and two million foxes were reared and killed for fur in Europe *(see Table 2.1)*. The largest producers in Europe are Denmark, which produced 17.9 million mink pelts in 2014, followed by Poland (7.8 million mink) and The Netherlands (5.5 million mink). Finland is the largest European producer of fox fur (1.8 million) and also a significant producer of mink pelts (1.9 million).

Data from the International Fur Federation (IFF) indicate that China accounted for more than 40% of global mink fur production in 2014 (around 35 million pelts),[9] an increase from around 25% in 2011.[10] Some sources suggest that Chinese production may be even higher than this.[11] China is now the largest producer of fox fur, with China and Finland together accounting for 91% of global fox fur production.[12] Other significant producers globally include the USA (3.5 million mink pelts in 2014,[13] around 4% of global mink production), Canada (2.8 million mink pelts in 2013, around 3% of global mink production, and close to 8000 fox pelts)[14] and Russia (1.9 million mink pelts in 2014, around 2% of global mink production, and 0.7 million pelts of other species, including foxes).[15]

Table 2.1. Numbers of farmed mink and foxes killed for fur production in Europe in 2014.[8]

	Mink	Foxes
Denmark	17,880,000	6,000
Poland	7,800,000	75,000
The Netherlands	5,500,000	0
Finland	1,900,000	1,800,000
Greece	1,800,000	0
Lithuania	1,500,000	2,050
Sweden	1,000,000	0
Norway	850,000	165,000
Latvia	770,000	6,500
Spain	700,000	0
Romania	200,000	2,000
Belgium	200,000	0
France	200,000	0
Germany	200,000	0
Ireland	200,000	0
Iceland	190,000	0
Italy	180,000	0
Estonia	130,000	14,300
Czech Republic	20,000	500
Slovakia	4,000	0
Total	**41,224,000**	**2,071,350**

2.2 The regulatory framework for the welfare of animals reared for fur in Europe

There is currently no detailed species-specific EU legislation setting welfare standards for animals farmed for fur. They are covered by the general requirement in the Lisbon Treaty to "pay full regard to the welfare requirements of animals" when formulating and implementing EU policies, in recognition of their status as "sentient beings." Animals farmed for fur are also covered by the general provisions of Council Directive 98/58/EC of 20 July 1998 concerning the protection of animals kept for farming purposes.[16] The Annex to this Directive includes the following requirements:

"The freedom of movement of an animal, having regard to its species and in accordance with established experience and scientific knowledge, must not be restricted in such a way as to cause it unnecessary suffering or injury.

"Where an animal is continuously or regularly tethered or confined, it must be given the space appropriate to its physiological and ethological needs in accordance with established experience and scientific knowledge.

"No animal shall be kept for farming purposes unless it can reasonably be expected, on the basis of its genotype or phenotype, that it can be kept without detrimental effect on its health or welfare."

Under Article 5 of the Directive, the Commission is required to submit to the Council any proposals which may be necessary for the uniform application of the European Convention for the Protection of Animals kept for Farming Purposes and, on the basis of a scientific evaluation, any recommendations made under this Convention and any other appropriate specific rules. A 'Recommendation Concerning Fur Animals' was adopted by the Standing Committee of the European Convention for the Protection of Animals kept for Farming Purposes in 1999.[17] This was followed by the publication of a scientific report on 'The Welfare of Animals Kept for Fur Production' by the Scientific Committee on Animal Health and Animal Welfare (SCAHAW) in 2001, which highlighted significant welfare problems for farmed fur animals.[18] However, a decade and a half later, no proposals have been forthcoming from the Commission. The 1999 Recommendation recognises that:

"in contrast to the animals which over thousands of generations have been kept for farming purposes, animals kept for the production of fur belong to species which have only been farmed more recently and which have had less opportunity to adapt to farm conditions"

It also recognises that current husbandry systems often fail to meet the animals' needs:

"Considering that in the light of established experience and scientific knowledge about the biological needs of each of the various species of fur animals, including those satisfied by showing certain behaviours, systems of husbandry at present in commercial use often fail to meet all the needs the fulfilment of which is essential for the animals' welfare"

Article 1 (4) of the Recommendation states:

"No animal shall be kept for its fur if:

A. the conditions of this Recommendation cannot be met, or if

B. the animal belongs to a species whose members, despite these conditions being met, cannot adapt to captivity without welfare problems."

The Recommendation also includes general provisions for the housing, management and killing of fur animals and special provisions for certain species, including mink and foxes.

Council Regulation (EC) No. 1099/2009 of 24 September 2009 on the protection of animals at the time of killing[19] applies to animals bred or kept for fur production. The Regulation stipulates permitted stunning and killing methods for fur animals and includes an obligation that the killing of fur animals "be carried out in the presence and under the direct supervision of a person holding a certificate of competence". However, certificates of competence are not required for all personnel involved. It also includes general provisions, such as a requirement that animals "be spared any avoidable pain, distress or suffering during their killing and related operations". Animals farmed for fur are also covered by the provisions of Council Regulation (EC) No 1/2005 of 22 December 2004 on the protection of animals during transport and related operations.[20]

Trade in the fur of certain species is prohibited or restricted in the EU. Regulation (EC) No 1523/2007 of 11 December 2007[21] prohibits the placing on the market and the import to, or export from, the EU of cat and dog fur, and products containing such fur. Regulation (EC) No 1007/2009 of 16 September 2009,[22] as implemented by Commission Regulation (EU) No 737/2010 of 10 August 2010,[23] places restrictions on the trade in commercial seal products in the EU.

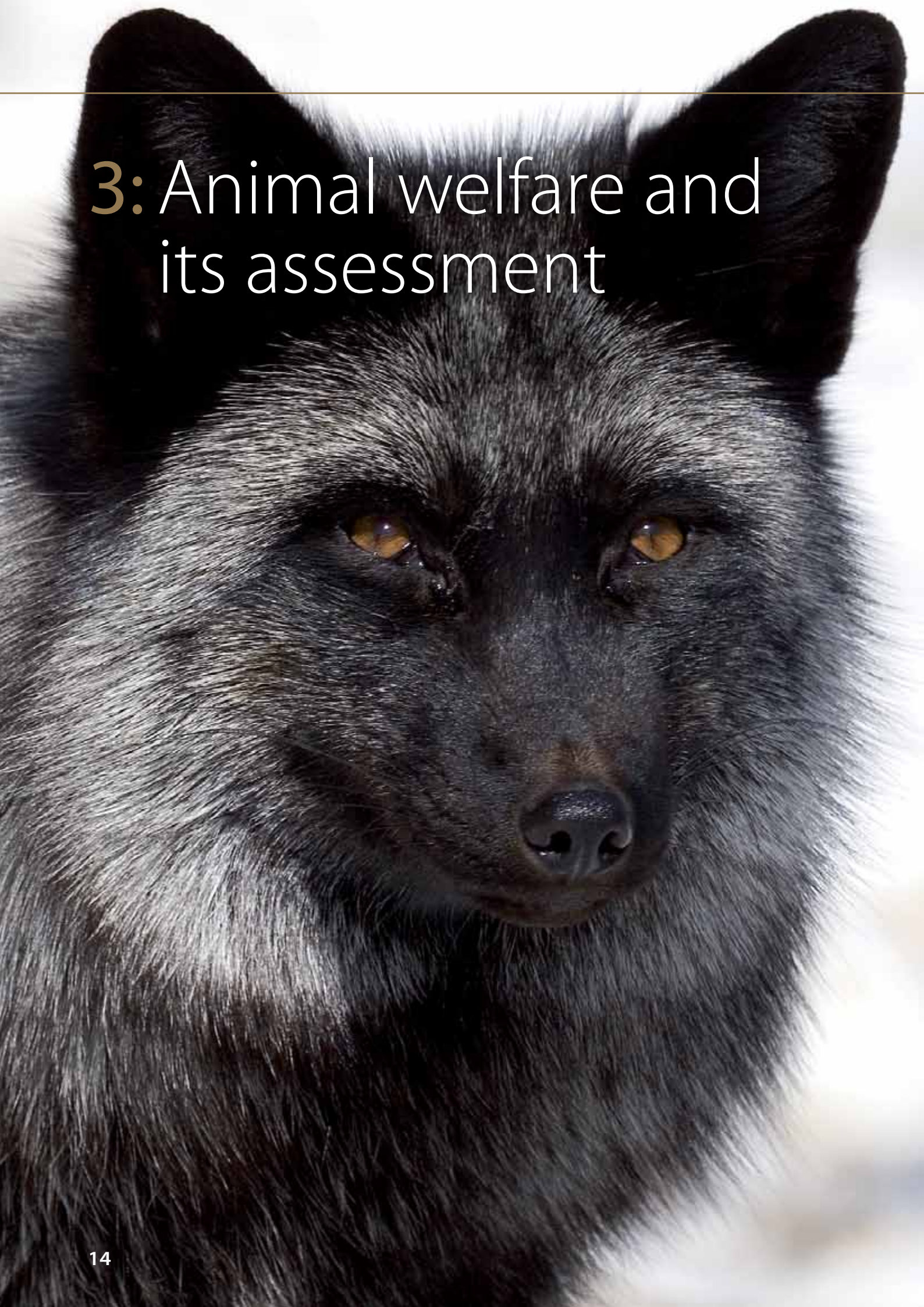
In the absence of action at EU level, several European countries have introduced legislation prohibiting fur farming at national level. All fur farming is banned in Austria, Slovenia, the UK, Croatia (from 2017), Bosnia and Herzegovina (from 2018), The Netherlands (from 2024)[24] and certain regions within Belgium and Germany. Farming foxes is being phased out in Denmark but it continues to be the second largest producer of mink fur globally. Other countries, such as Italy and Switzerland, have introduced more stringent welfare requirements for animals farmed for fur, including ground pens with additional space and enrichment.

Section 2 summary

Most fur sold globally is from farmed animals. Worldwide, around 95 million mink and foxes were killed for their fur in 2014. Europe and China are the largest producers of fur globally and China's share of global production is increasing rapidly. Europe is the largest exporter of fur and China is the largest consumer and importer of fur, reportedly accounting for more than 50% of global consumption.

Fur animals are included in general EU legislation on animal welfare, transport and slaughter. However, there is currently no detailed species-specific EU legislation setting welfare standards for animals farmed for fur. Serious concerns for the welfare of animals farmed for fur are highlighted in the Council of Europe 'Recommendation Concerning Fur Animals' and the report of the Scientific Committee on Animal Health and Animal Welfare (SCAHAW). However, a decade and a half after the publication of these documents, no proposals for EU legislation on the welfare of animals farmed for fur have been forthcoming from the Commission. In the absence of action at EU level, several European countries have introduced legislation prohibiting fur farming at national level.

3: Animal welfare and its assessment



3.1. Animal welfare – concepts and definitions

There is no single unified definition of animal welfare. Different authors give greater or lesser importance to various aspects of welfare: some emphasise the biological functioning of the animal in terms of health, growth and reproduction; some emphasise the affective (emotional) state of the animal in terms of positive and negative experiences; and others emphasise the degree to which the animal is able to behave 'naturally'.[25]

In the 'biological functioning' approach, welfare is considered to be compromised when normal biological functioning is impaired, as reflected by, for example, increased mortality or morbidity, reduced growth or reproduction, or behavioural abnormalities such as stereotypies (repetitive behaviour patterns with no obvious function) and self-inflicted injuries. An example of this approach is Broom's definition:[26] "The welfare of an individual animal is its state as regards its attempts to cope with its environment."

While animals may grow, reproduce and appear healthy, they will have poor welfare if they experience subjective suffering such as prolonged frustration from having little space in which to move.[27] Negative emotional states, like frustration, may be reflected in behavioural and/or physiological changes, indicating that an animal is having difficulty coping. Some authors argue that this is not always the case and that the animal's feelings are what matter, irrespective of whether biological functioning is impaired. Duncan argues:[28] "Welfare is not simply health, lack of stress or fitness. There will usually be a close relationship between welfare and each of these. However, there will also be enough exceptions to preclude equating welfare with any of them. Thus, neither health, nor lack of stress, nor fitness is necessary and/or sufficient to conclude that an animal has good welfare. Welfare is dependent on what animals feel."

However, focusing exclusively on feelings may also be problematic. Things that make animals feel good in the short term may ultimately compromise their welfare if, for example, they have a negative impact on health, and *vice versa*. Webster combines both the 'biological functioning' and 'affective state' approaches into a succinct definition of animal welfare; he considers that welfare is good when an animal is "fit and happy" (or "fit and feeling good" for anyone uncomfortable with the word 'happy').[29]

Dawkins[30] argues that there are really only two questions that we need to answer about animal welfare: "Are the animals healthy?" and "Do the animals have what they want?"

The question then arises of how we know what animals want? Some authors consider that providing an environment similar to that in which their wild ancestors lived is necessary for good welfare and that animal welfare is likely to be compromised if the conditions in which animals are kept are substantially different from the conditions in which they evolved. Rollin[31] argues that animals have a right "to live their lives in accordance with the physical, behavioural, and psychological interests that have been programmed into them in the course of their evolutionary development and that constitute their telos [i.e. intrinsic nature]" and that "to be responsible guardians of animals, we must look to biology and ethology to help us arrive at an understanding of these needs."

However, 'naturalness' is no guarantee of good welfare. Being chased by a predator may be 'natural' but it does not necessarily follow that it is necessary for good welfare. Dawkins argues: "It is not the 'naturalness' of the behaviour that should be our criterion for whether an animal suffers but what the animal's own behaviour has shown us it finds reinforcing [i.e. the animal will work to obtain or avoid it] or not." So scientific methods have been developed that allow researchers to 'ask' animals which conditions they prefer when given a choice and how much they are motivated (in terms of how hard they are willing to work) to obtain or avoid particular conditions or resources. These methods often apply economic concepts, such as 'total expenditure' (i.e. the price, e.g. for access to a resource, multiplied by the quantity, e.g. of access, purchased), 'reservation price' (i.e. the highest price paid), 'consumer surplus' (i.e. the difference between the total amount an animal is willing to pay and the actual price paid) and 'elasticity of demand' (i.e. the effect of price on demand). According to Dawkins:[32]

"Withholding conditions or commodities for which an animal shows 'inelastic demand' (i.e. for which it continues to work despite increasing costs) is very likely to cause suffering."

3.2 Assessing animal welfare

In 1965, the 'Brambell Report' – an enquiry into the welfare of animals kept under intensive livestock husbandry systems – stated that farm animals should have the freedom "to stand up, lie down, turn around, groom themselves and stretch their limbs".[33] This list was subsequently developed by the then Farm Animal Welfare Council (FAWC), the British Government's advisory body on farm animal welfare, into the **'Five Freedoms'**:[34]

- **Freedom from hunger and thirst** (by ready access to fresh water and a diet to maintain full health and vigour);
- **Freedom from discomfort** (by providing an appropriate environment including shelter and a comfortable resting area);
- **Freedom from pain, injury and disease** (by prevention or rapid diagnosis and treatment);

- **Freedom to express normal behaviour** (by providing sufficient space, proper facilities and company of the animal's own kind);
- **Freedom from fear and distress** (by ensuring conditions and treatment which avoid mental suffering).

The 'Five Freedoms' are widely used internationally as a framework for animal welfare assessment, legislation and assurance standards. They describe aspects of an animal's welfare state (e.g. freedom from discomfort) and the 'inputs' (e.g. a comfortable resting area) considered necessary to achieve this state. More recently, scientists have started to develop welfare assessment criteria based on direct measurements of the 'outcomes' for the animals, such as levels of injuries and expression of various behaviours.

The European **'Welfare Quality'** project (2004-2009) designed methods to assess cattle, pig and poultry welfare, on-farm and at slaughter, using outcome-based measures as far as possible. The four 'Welfare Principles' and 12 'Welfare Criteria' defined by Welfare Quality are as follows:[35]

- **Good feeding**
  1. Absence of prolonged hunger
  2. Absence of prolonged thirst
- **Good housing**
  3. Comfort around resting
  4. Thermal comfort
  5. Ease of movement
- **Good health**
  6. Absence of injuries
  7. Absence of disease
  8. Absence of pain induced by management procedures
- **Appropriate behaviour**
  9. Expression of social behaviours
  10. Expression of other behaviours
  11. Good human-animal relationship
  12. Positive emotional state

Using outcome measures to assess welfare has a number of advantages. Measures can often be chosen that provide evidence of long-term consequences of housing systems and husbandry practices (e.g. body condition, chronic injuries), whereas input measures tend to give a 'snapshot' of conditions at a point in time (e.g. during a welfare inspection visit, which is usually arranged in advance so conditions could potentially be altered, e.g. by providing additional bedding or enrichment material).

However, there are also risks associated with relying on measuring welfare outcomes. Animals with the worst injuries or health problems may be culled, and so excluded from measurements, and behavioural problems may not be evident during the time animals are being observed, especially if measurements are taken over a short time frame, as is usually the case with farm inspection visits.

The use of outcome measures avoids making *a priori* judgements regarding the welfare impact of any particular farming system or practice but this does not mean that the use of outcome measures removes the need to stipulate adequate input standards. Rather, the assessment of appropriate and validated welfare outcome measures should provide a powerful tool to evaluate farming systems and practices, and inform decisions as to which farming systems are able to provide acceptable welfare standards. Welfare can be poor in any farming system if management practices and stockmanship are poor. However, systems vary in their potential to provide good welfare. Even if stockmanship is good, welfare is likely to be poor in barren, cramped conditions that severely limit opportunities to perform highly motivated behaviours.

It is important to consider welfare over the whole life of the animal. FAWC proposed that the welfare of farmed animals should be considered in terms of an animal's quality of life over its lifetime, including the manner of its death, and that this quality of life can be classified as:[36]

- **A 'Life not worth Living';**
- **A 'Life worth Living';**
- **A 'Good Life'.**

This approach gives greater emphasis to the importance of positive experiences to farm animal welfare and reflects an ongoing shift in animal welfare science towards attempts to incorporate positive aspects of welfare into welfare assessment.

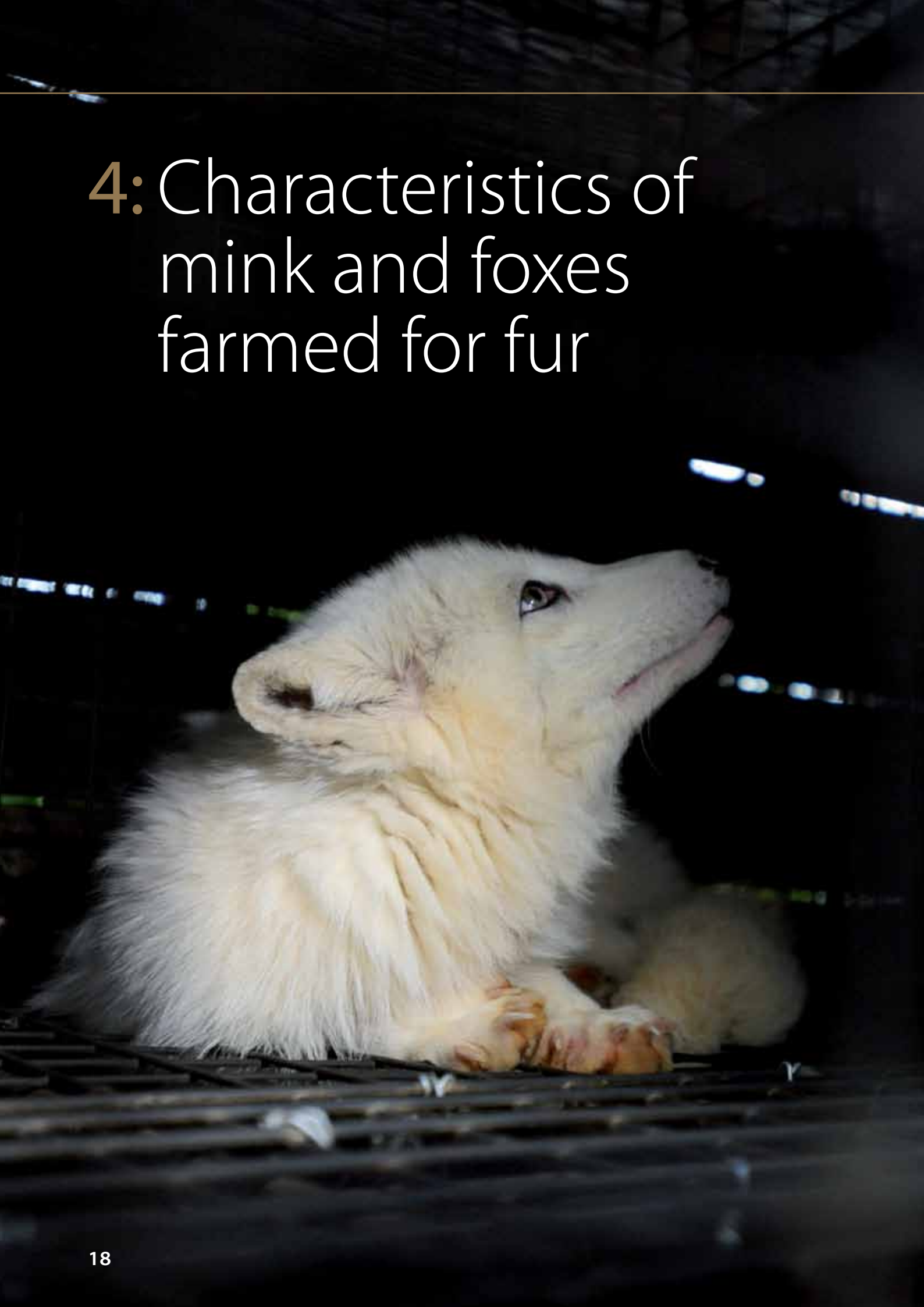
Section 3 summary

Different authors emphasise the importance of different aspects in assessing animal welfare, which can be broadly summarised as 'biological functioning' (i.e. are the animals physically and mentally healthy?), 'affective (emotional) states' (i.e. are the animals happy/feeling good?) and 'natural/motivated behaviours' (i.e. 'do the animals have what they want?').

The 'Five Freedoms' are widely used internationally as a framework for animal welfare assessment, legislation and assurance standards. They describe aspects of an animal's welfare state and the 'inputs' considered necessary to achieve this state. In recent years, there have been attempts to develop methods of assessing animal welfare directly using animal-based measures of welfare 'outcomes'. Assessment of appropriate and validated welfare outcome measures should provide a powerful tool to evaluate farming systems and practices, and inform decisions as to which farming systems are able to provide acceptable welfare standards. Welfare can be poor in any farming system if management practices and stockmanship are poor. However, systems vary in their potential to provide good welfare. Even if stockmanship is good, welfare is likely to be poor in barren, cramped conditions that severely limit opportunities to perform highly motivated behaviours.

There is an ongoing shift in animal welfare science towards attempts to incorporate positive aspects of welfare into welfare assessment. This is reflected in FAWC's proposal that farmed animals should have a 'Good Life', or at least a 'Life worth Living', when welfare is considered over the whole life of an animal.

4: Characteristics of mink and foxes farmed for fur



4.1 Biology and natural behaviour of mink and foxes

Although we cannot assume that the performance of all species-specific behaviours observed under natural conditions is essential for an animal's welfare, an appreciation of the natural behavioural repertoire of a species is a vital starting point in identifying which behaviours are likely to be important. Studying the preferences and motivation of animals under experimental conditions can reveal which behaviours are most important to the animal and which they need to be able to perform in captivity.

Certain aspects of an animal's biology are associated with particular vulnerability to welfare problems in captivity. For example, carnivores that roam over a large territory in the wild are more likely to display evidence of stress and psychological dysfunction in captivity, including high rates of stereotypical pacing and infant mortality.[37] An understanding of the lifestyle of a species in the wild is therefore essential to inform decisions about which species can (and cannot) be kept successfully in captivity without major welfare problems.

The American mink (Neovison vison)

The American mink is a small carnivorous mammal with a long slender body, short legs and a long tail characteristic of the mustelid (weasel) family to which it belongs. Females are around 10% smaller and weigh 50% less than males.[38] The coat is dark brown, although several colour mutations (albino, tan, blonde) occur occasionally.[39] Through selective breeding, farmers have produced several colour variations not seen in the wild.

The mink is adapted for a semi-aquatic lifestyle. The coat has three times the density of guard hairs compared with that of the terrestrial ferret, and the feet have small but obvious webbing between the digits.[40] Mink move on land with a walking or bounding gait[41] and are also able to climb and jump between trees.[42] They can dive to depths of 5-6m and swim underwater for up to 30-35m.[43]

The native range of American mink covers most of North America except the extreme north of Canada and arid areas of the south-western United States. However, escapees from fur farms have established populations in much of northern Europe and Russia. Mink occupy a wide variety of wetland habitats, including streams, rivers, lakes, freshwater and saltwater marshes, and coast lines,[44] and their territories always run along the edges of water bodies.[45] There may be some territory overlap between mink of the opposite sex but territories of animals of the same sex rarely overlap.[46] Mean linear home range size ranges from 1.1 to 7.5km, depending on sex (generally larger for males than females) and habitat.[47]

Mink often have half a dozen, and sometimes as many as two dozen, dens used for sleeping and resting, eating larger prey items and caching surplus food.[48] These are generally <2m from water and are usually crevices between tree roots or abandoned burrows of other species.[49] Mink are mostly nocturnal (active at night) or crepuscular (active at dawn/dusk) but can also show a significant amount of diurnal (daytime) activity,[50] particularly where they are more reliant on aquatic prey.[51] Nightly movements range from zero to 12km[52] and mink may spend 80-95% of their time inside dens.[53]

Mink are strictly carnivorous: their diet varies according to prey availability, and typically consists mostly of fish, amphibians, crustaceans and small mammals, and opportunistically includes birds and their eggs, reptiles, aquatic insects, earthworms and snails.[54] Most foraging activity is along waterways.[55] On land, mink typically hunt with their nose to the ground, poking into crevices, under boulders and into burrows.[56] Both on land and in water, prey are caught with short bursts of activity rather than sustained pursuit.[57]

Adult mink are generally solitary. Males and females associate briefly for mating in early spring and on average four kits (range two to eight) are born in late spring.[58] They are nutritionally independent by eight to ten weeks of age and typically begin to disperse when around 12-16 weeks old,[59] although young females may stay with their mother until they are ten or 11 months old[60] and kits of either sex may travel in pairs until late autumn.[61] Juveniles may travel a few kilometres up to 50km in search of their own territory.[62]

The red fox (Vulpes vulpes)

The red fox is a relatively small member of the canid (dog) family with an elongated muzzle, large pointed ears and a long bushy tail.[63] Males are about 1.2 times heavier than females.[64] There are three basic colour variations:[65] the 'common' fox is any colour from yellowish to deep rusty red, with a white, pale grey or sooty grey belly. The backs of the ears are black, as are the feet, and there may be a conspicuous white tip to the tail. The 'silver' fox is black with variable amounts of silvering, particularly on the rump, due to the silver tips of the guard hairs. The 'cross' fox is an intermediate form and is predominantly greyish-brown or blackish-red with a dark cross down the back and across the shoulders.

The red fox is the most widely distributed land mammal in the world, found across most of the northern hemisphere and widely introduced, most notably to Australia.[66] It is a carnivore and opportunistic omnivore, able to survive on a wide variety of food items and adapt to diverse habitats, from arctic tundra to semi-arid temperate deserts, forests, farmland and densely populated urban areas.[67,68] The diet may include small mammals, fish, birds and their eggs, reptiles, invertebrates, grass and leaves, berries and fruits, offal and carcases, and human refuse.[69,70] Surplus food is often cached in small holes which may be disguised with earth, twigs and leaves.[71]

Foxes are generally nocturnal or crepuscular but will also forage during the day in winter and when rearing young.[72] They are highly mobile, covering daily distances usually greater than 5km[73] and often in excess of 10km.[74] One study of activity patterns in sub-adult male foxes between 22.00 hours and dawn found that 42-55% of the time was typically spent foraging, 8-17% moving and 33-50% resting.[75]

Home range size varies from less than 20 hectares (0.2km^2) for some urban foxes to more than 1500 hectares (15km^2) in upland areas.[76] Males and females share a territory, and their social behaviour is highly flexible. They may live in male/female pairs or in family groups of up to ten adults and young; groups consist of equal numbers of adult males and females.[77] Generally only one vixen in the group breeds, and subordinate vixens that become pregnant may abort or desert their cubs, or they may be killed.[78] Sometimes two or more vixens rear cubs, either in separate dens or together.[79] Foxes usually have one or two preferred denning sites in their territory that they use to raise cubs, plus a number of smaller dens and above-ground lying-up sites.[80] Foxes dig dens themselves and also make use of abandoned rabbit burrows and badger dens.[81]

The cubs (typically three to six) are born in spring and start to emerge from the den at four to five weeks of age.[82] They establish their hierarchy through fighting in the first six weeks of life and, once established, play becomes the major activity.[83] By eight weeks of age the cubs will play several metres from the den and from about ten weeks onwards, depending on weather conditions, the natal den is progressively abandoned.[84] Weaning starts at around five weeks of age and is a gradual process, with the cubs being fully weaned when three months old.[85] From the age of four months, the parents ignore the cubs or become hostile and cubs start to disperse in the autumn, with peak dispersal towards the end of the year.[86] Dispersal patterns are flexible in response to prevailing circumstances, and both the proportion of cubs dispersing, and dispersal distances, are related to population density.[87,88]

The arctic fox (Vulpes lagopus)

The arctic fox is smaller than the red fox, with shorter limbs and snout, shorter and more rounded ears, a bushy tail, thickly furred feet and a dense winter coat, which changes colour seasonally.[89] There are two colour forms: the 'white' fox is white in winter and brown on the back with white on the underside in summer; the 'blue' fox is grey/blue in winter and dark brown in summer.[90] 70% of the arctic fox's coat is fine underfur, compared with 20% for the red fox.[91] Males are 5-20% heavier than females.[92]

Arctic foxes live in coastal and inland areas in the arctic regions of Eurasia, North America, Greenland and Iceland.[93] Their diet includes small mammals such as lemmings and voles, birds and their eggs, marine invertebrates, fish, carcasses and placentas of marine mammals, insects and larvae, berries and seaweed.[94,95,96] They remain active year-round and arctic foxes are able to conserve energy when faced with food shortages in winter by reducing both activity levels and basal metabolic rate.[97] Food caching is common when food is abundant.[98]

They are mostly nocturnal or crepuscular but may be active during the day.[99] Arctic foxes are territorial during summer, with home ranges typically between four and 60km^2.[100] However, they may move over very large distances, making seasonal and/or periodic migrations of hundreds or thousands of kilometres, travelling up to 24km per day.[101]

Dens are used for cub-rearing and for shelter during winter.[102] These are generally large complex structures, which often cover an area in excess of 100m^2 and typically possess five to 40, and sometimes more than 100, entrances.[103]

Arctic foxes are generally solitary outside of the mating and breeding season but have a flexible social system, sometimes forming large family groups.[104] They are monogamous and may mate for life.[105] A non-breeding female may help bring food to the cubs.[106]

Mating takes place in early spring and cubs (typically six to 12; range three to 25) are born in late spring.[107] Cubs emerge from the den at three to four weeks of age and by eight weeks they begin spending time away from the den.[108] They engage in play with each other and occasionally with adults.[109] Aggression between cubs is reported to be uncommon and not to cause serious injury.[110] Cubs generally play (33%) and rest (>50% of the time) when parents are away from the den.[111] Cubs are weaned at six to seven weeks, are independent by 12-14 weeks,[112] and disperse in early autumn, moving from a few kilometres to more than 1100km.[113]

4.2 Breeding and genetics – are mink and foxes on European fur farms domesticated?

Domestication and tameness – concepts and definitions

There are several definitions of 'domestication'. In the context of this report, it must relate to how animal welfare is affected by the domestication process. An appropriate definition is that utilised in the 2001 SCAHAW report on the Welfare of Animals Kept for Fur Production:[114] "an evolutionary process by which a population of animals becomes adapted to man and to the captive environment by genetic changes occurring over generations including those predisposing to environmentally-induced developmental events recurring in each generation".

Adaptation to captivity is achieved through genetic changes occurring over generations and environmental stimulation and experiences during an animal's lifetime.[115] As SCAHAW highlights:[116] "From a welfare point of view, the crucial aim is a well-adapted individual, regardless of the extent to which this is due to genetic or ontogenetic [developmental] events." **Important characteristics of domesticated animals include a capacity to live under anthropogenic constraints without problems such as reduced reproductive success or substantial fearfulness towards humans**.[117]

'Tameability' is a unique ability to interact with humans in a positive way and is a distinctive characteristic exhibited by domesticated species.[118] Tameness is an important behavioural trait of captive animals, since it facilitates handling and improves welfare.[119] The process of taming is an experiential (learning) phenomenon occurring during the lifetime of an individual.[120] Contact

with humans very early in life, during a sensitive period for socialisation, greatly facilitates the process of taming.[121] While genetics can set limits on the degree of tameness achieved under a given set of circumstances, experience can determine the extent to which taming actually occurs.[122]

The changes that occur during domestication affect more than just the behaviour of the animal and responses to humans. Comparative studies of domestic stocks and their wild ancestors across a range of species indicate that behavioural changes are accompanied by an array of alterations in other traits, including colour, size and physiology, giving rise to a typical 'domestication phenotype' (the phenotype of an animal is its observable characteristics, which are determined by a combination of genetics and environment).[123] This 'domestication phenotype' is typically characterised by the appearance of white or piebald (spotted) coat or plumage colour, a reduction in the size of the brain and skull, a shortening of the legs, a shortening and/or curling of the tail, the appearance of floppy ears and wavy or curly hair, increased reproductive capabilities, faster and more flexible development, and being less fearful, more sociable and more risk-prone towards predators.[124,125] While domestication affects many aspects of behaviour, there is little evidence that it results in the loss of behaviours from the species repertoire or that the basic structure of the motor patterns for such behaviours has changed.[126] Thus, the needs of domesticated animals are closely related to the evolutionary history of their ancestors.[127]

Experimental domestication of mink and foxes

The Council of Europe Recommendations state:[128] "in contrast to the animals which over thousands of generations have been kept for farming purposes, animals kept for the production of fur belong to species which have only been farmed more recently and which have had less opportunity to adapt to farm conditions." The first mink farms were founded in the 1860s in Upstate New York.[129] Farming silver foxes began on Prince Edward Island in southeastern Canada in the 1890s.[130] The first silver fox farm appeared in Europe in 1914.[131] Blue (arctic) foxes were first kept in captivity in 1885, on small islands off the coast of Alaska, and have been farmed in Europe since the late 1920s.[132]

However, the degree of domestication is not necessarily dictated by the length of time that a population of animals has been maintained in captivity. If response to humans is the sole selection criterion, and is strictly applied (e.g. less than 10% of animals are bred to produce the next generation), it is possible to produce a domesticated phenotype in relatively few generations.[133] Belyaev and Trut started work on the experimental domestication of silver foxes at the Institute of Cytology and Genetics (ICG) of the Russian Academy of Sciences in Novosibirsk, Russia, in the late 1950s and this study, known as 'the farm-fox experiment', is still ongoing.[134] 130 foxes that showed the least fearful and aggressive responses to humans were chosen from several commercial fox farms across the former Soviet Union and brought to the ICG to become the founders of the experimental population.[135] Breeding foxes for tameness started with selection against fear and aggression towards humans, and continued with selection for contact-seeking behaviour.[136] In parallel, starting in the 1970s, a separate population of foxes was bred for aggressive behaviour towards humans.[137]

The tame foxes at Novosibirsk behave much like domestic dogs, actively seeking human attention.[138] **Seeing a human at a distance, they whine, yelp and wag their tails in anticipation of contact, when they try to lick the experimenter's face and hands**.[139] This behaviour develops spontaneously, early in the cub's development, without any specific contacts with the experimenter needed to initiate the behaviour.[140] The first foxes classified as having 'elite' domesticated behaviour appeared in the 6th generation.[141] By the 42nd generation, over 70% of the animals were classified as 'elite' domesticated animals.[142]

The tame foxes had altered vocal responses towards humans, making 'cackles' and 'pants' but never 'coughs' or 'snorts', whereas aggressive and unselected foxes produce 'coughs' and 'snorts', but never 'cackles' or 'pants'.[143,144] Vocal responses to other foxes were similar in tame, aggressive and unselected foxes.[145] Tame foxes also display bursts of vocal activity in response to the approach of an unfamiliar human, believed to be to attract human attention due to a positive emotional state arising from interactions with people.[146] Tame foxes are as skilled as dog puppies in understanding human gestures.[147]

Domestication results in earlier eye opening and earlier onset of the first response to sound in fox cubs and prolongs the sensitive period of socialisation beyond 60-65 days of age (the upper limit is 40-45 days in unselected foxes).[148] Tame foxes have altered brain chemistry, including higher levels of serotonin[149] (a neurotransmitter involved in the suppression of aggressive behaviour[150]). Domestication is associated with changes in the hypothalamic-pituitary-adrenal (HPA) axis, which is the main hormone system involved in the adaptation of animals to captivity.[151] For example, basal and stress-induced blood cortisol levels were, respectively, three- and five-fold lower in tame foxes than in farm-bred foxes.[152]

Physical characteristics typical of the 'domestication phenotype' emerged in the domesticated foxes, including retention of the floppy ears of young cubs to a greater age (three to four weeks instead of two to three weeks, with ears remaining floppy to three or four months in some

animals and occasionally throughout life), the appearance of curly tails, changes in skull shape, localised depigmentation (piebaldness) and localised yellow-brown mottling in the coat.[153]

Trut *et al.* suggest their findings in domesticated foxes, together with other data from the literature, indicate that genes affecting pigmentation are located within the genetic systems involved in the regulation of behaviour and development.[154] The time of moulting in tame foxes is also longer than in unselected animals.[155] The domesticated foxes reach sexual maturity about a month earlier than non-domesticated foxes and give birth to litters that are, on average, one cub larger.[156] The mating season is longer in the domesticated foxes; some females mate out of season and a few mate twice a year.[157]

Studies carried out over four years in Finland and Norway have shown that it is possible to select for more confident behaviour in blue foxes, albeit with low to moderate levels of heritability.[158] However, to date, there is no population of domesticated blue foxes.

Work on the experimental domestication of mink has also been carried out at Novosibirsk. As with silver foxes, breeding for domesticated behaviour in mink resulted in the emergence of coat colour changes, such as the appearance of the 'black crystal' colour-type, which has white spotting on the underside and veil-like white guard hairs covering the body and particularly the head.[159] Similar changes in HPA-axis function, such as reduced cortisol levels, were also found in mink bred for domesticated behaviour.[160]

A number of tests have been developed to test the responses of mink to potentially stressful situations. The 'stick test' has been used to categorise mink as 'fearful', 'exploratory/confident' or 'aggressive', depending on their response to a wooden spatula inserted into the cage.[161] In the 'hand-catch test' ('Trapezov's hand test'), an experimenter opens the animal's cage and slowly reaches for, and tries to catch, the animal with a gloved hand.[162,163] This has a higher sensitivity (i.e. is able to detect fear in more animals) because it is more threatening than the 'stick test'.[164]

Since 1988, two lines of mink of the 'scanblack' type have been bred for 'exploratory/confident' or 'fearful' responses at the Danish Institute of Agricultural Sciences (DIAS).[165,166] Originally a third line was bred for 'aggressive' responses but this was stopped after three generations because too few showed this response.[167] By the tenth generation, 5% of animals in the 'exploratory/confident' line showed fearful responses in the stick test, compared with around 95% in the 'fearful' line.[168]

Both 'confident' and 'fearful' mink show an acute stress response to handling.[169] After first capture, there was no difference in stress-induced hyperthermia (an increase in body temperature in response to a stressful situation) between 'confident' and 'fearful' mink.[170] However, the stress response of 'confident' mink decreased over time while held in a trap, whereas the response of 'fearful' mink increased.[171] Also, when captured a second time, 'confident' mink showed a reduced response compared with first capture, whereas 'fearful' mink showed an increased response.[172] 'Confident' mink can be mated earlier[173] and have higher reproductive success[174] than 'fearful' mink.

While the DIAS research demonstrates that it is possible to reduce fearfulness in farmed mink, the animals in the 'exploratory/confident' line are still a long way from being domesticated. Although more than 35% of mink from the 'exploratory/confident' line would tolerate a gloved hand in the cage with no physical contact (score of +1 in the hand-catch test), and more than 35% would make physical contact with the gloved hand if it was held still (score of +2), only around 2% would tolerate the gloved hand being moved to touch them without showing avoidance or aggression (score of +3), around 2% explored the hand from the nest box (score of +4), and no mink could be held without lifting (score of +5) or be handled and lifted (score of +6) without avoidance/biting.[175] More than 10% took flight (score of -1) and more than 10% took flight and maintained maximum distance from the hand (score of -3). By contrast, the mink selectively bred for tameness at Novosibirsk do not show any signs of fear or aggression on contact with humans and can be handled without gloves.[176]

Are mink and foxes on fur farms domesticated?

While it is possible to breed mink and silver foxes with many of the features typical of domesticated animals, this cannot occur on fur farms. As we have explained above, the traits associated with selectively breeding for domestic phenotypes have negative impacts on fur quality. In contrast to domestication, the emphasis on fur farms has been to select for traits associated with pelt colour and quality, body size and litter size, with little attention paid to behavioural traits.[177,178] Individuals that exhibit particularly problematic behaviour may be excluded from breeding, resulting in some limited unconscious selection against the most aggressive individuals, but traits related to welfare and fearfulness have not been systematically considered in breeding programmes.[179,180] In 2001, SCAHAW concluded that:[181] **"Generally, in comparison with other farm animals, species farmed for their fur have been subjected to relatively little active selection except with respect to fur characteristics."**

However, captive breeding has resulted in a number of physical differences between farmed and wild populations of mink and foxes. A number of colour varieties of mink have been produced, including the 'sapphire', 'pearl', 'topaz' and 'winter blue'. These colour varieties are generally the result of one or more recessive mutations and are often associated with reduced fertility, litter size

Breeding for increased pelt size has led to welfare problems associated with obesity in farmed foxes

and vitality.[182,183] Farmed mink weigh approximately twice as much as wild mink[184] and have relatively smaller brains, hearts and spleens.[185,186] Breeding for increased body/pelt size has resulted in animals that tend to become overweight when fed *ad libitum*. As a result, mink are usually fed a restricted diet to reduce their weight in preparation for breeding, leading to hunger and an increase in stereotypic behaviour[187] *(**see Section 5.2**)*. Selection has also resulted in increased litter size in farmed mink,[188] which contributes to welfare problems associated with loss of body condition during lactation.[189]

As with mink, blue foxes have been bred to be larger than their wild counterparts to increase pelt size, which has favoured fast-growing and fat individuals.[190] **Obesity in farmed blue foxes is associated with high levels of bent feet, difficulty in moving and diarrhoea**.[191] Welfare assessments carried out on ten Finnish fox farms (71% blue foxes) in 2011 found that 54% of foxes had slightly bent feet and 23% had severely bent feet; 43% of foxes had some difficulty in moving, 2.7% had major difficulties in moving and 1% did not move; and 45% of foxes had diarrhoea.[192]

There appears to have been some limited progress made in reducing fear in mink on commercial farms. The proportion of adult female mink on a sample of Danish farms classified as 'exploratory/confident' in the stick test was higher in 1999 (62%)[193,194] than in 1987 (45%).[195] However, even mink classified as 'exploratory/confident' in the stick test generally cannot be handled without showing fear/avoidance/aggression[196] and therefore remain unsuitable for farming.

In the hand-catch test, which is more representative of the level of human contact mink are subjected to on commercial farms, the vast majority of mink respond with fear and/or aggression. In a study in Russia, 81% of 'standard' (brown) mink responded fearfully in the hand-catch test, trying to avoid the hand, running about the cage in panic and shrieking; 16.2% responded aggressively, while 2.8% showed a calmer, more exploratory reaction.[197] The proportion of less fearful individuals appears to be greater in some colour varieties, but is still very small. In 'sapphires', 75.3% responded fearfully, 19.1% aggressively, and 5.6% with an exploratory reaction. Only 0.03% of 'standard' mink and 0.2% of 'sapphires' would allow themselves to be handled without showing signs of fear or aggression.

Domesticated ferrets, like the domesticated mink and silver foxes at Novosibirsk, are easy to handle without restraint devices or protective gloves.[198] Mink and foxes on fur farms cannot be handled without protective gloves (for mink) or restraint devices (for foxes) to reduce the risk of injury to the handler *(**see Section 5.1**)*. So the animals are not adapted to close contact with humans and cannot be considered in any way domesticated. The use of these handling methods may have contributed to the lack of attention to behavioural traits in breeding programmes. SCAHAW states:[199] **"The use of neck-tongs and snout-clips to avoid scratches and injuries from bites when handling the foxes may have retarded the conscious selection providing genetic progress related to tameness."**

The foxes at Novosibirsk are the only population of domesticated foxes in the world.[200] **Although reared in captivity, the red fox had not been domesticated previously.**[201] Commercially-reared foxes under standard farm conditions normally exhibit distinct patterns of aggressive and fear-aggressive behaviour towards

humans.[202] In Finland, the offspring of foxes from the domesticated population bred at Novosibirsk were housed under standard farm conditions, without any additional handling, and compared with normal Finnish farm foxes.[203] The domesticated foxes had higher domestication indexes and lower fearfulness scores than Finnish farm foxes. Almost all domesticated foxes started eating in the presence of a human and accepted a titbit from an unfamiliar person, whereas only a few Finnish foxes did so. The domesticated foxes had lower serum cortisol (stress hormone) levels both before and after stressful stimulation and showed lower stress-induced hyperthermia compared with Finnish foxes. Hybrids between the two fox populations showed intermediate results. The authors concluded that the welfare of the domesticated foxes was improved relative to the Finnish farm foxes and recommended that selection for less fearful foxes should be a major breeding goal on commercial farms.[204] However, the unstimulating cage environment would still be a major welfare problem *(see Section 5)* and the changes in the coat characteristic of domestic animals would be incompatible with the fur industry's demands. The authors suggested that the domesticated foxes might also be frustrated by a lack of regular petting from humans.[205]

It is possible to reduce long-term stress and fear reactions through intense early handling of silver[206,207,208] and blue foxes.[209] Both gentle/positive and neutral handling can be beneficial.[210,211] High levels of fear responses and enlarged adrenal glands indicate that non-handled animals suffer long-term stress.[212] However, farmers are not generally able to dedicate the amount of time needed to implement intense handling of all young animals.[213] SCAHAW concluded:[214] "Fearfulness of humans is a common feature of foxes on commercial farms. Genetic selection has been used experimentally to produce much less fearful foxes and experience of gentle human handling can substantially reduce fear. However, the less fearful genetic strains are not being used commercially, and farmers are not necessarily devoting the substantial amount of time which is needed for handling of all their foxes. As a consequence, **fear of humans is a major and very widespread welfare problem on fox farms."**

Fear of humans in the undomesticated animals used by the fur industry makes them fundamentally unsuitable for farming. The farming of mink and foxes for fur is therefore in contravention of Council Directive 98/58/EC: "No animal shall be kept for farming purposes unless it can reasonably be expected, on the basis of its genotype or phenotype, that it can be kept without detrimental effect on its health or welfare" and the Council of Europe 'Recommendation Concerning Fur Animals': "No animal shall be kept for its fur if: a. the conditions of this Recommendation cannot be met, or if b. the animal belongs to a species whose members, despite these conditions being met, cannot adapt to captivity without welfare problems."

Section 4 summary

Appreciation of the natural behavioural repertoire of a species is a vital starting point in identifying which behaviours are likely to be important for welfare. Carnivores that roam over a large territory in the wild are more likely to display evidence of stress and psychological dysfunction in captivity, including high rates of stereotypical pacing and infant mortality.

'Domestication' is an evolutionary process by which a population of animals becomes adapted to humans and to the captive environment by genetic changes occurring over generations, including those predisposing to environmentally-induced developmental events recurring in each generation. Domestication does not result in the loss of behaviours from the species repertoire. Therefore the needs of domesticated animals remain closely related to the evolutionary history of their ancestors. The most important aspect of domestication from a welfare perspective is the unique ability of domesticated species to interact with humans in a positive way.

If response to humans is the sole selection criterion, and is strictly applied, it is possible to breed domesticated silver foxes within relatively few generations, which actively seek human attention and are easy to handle. Domestication of mink is also possible and preliminary research suggests that it may be possible to breed domesticated blue foxes, but this has not been pursued to any great extent.

However, domesticated animals are not used on fur farms because changes in the coat characteristic of domesticated animals are incompatible with the fur industry's demands. On fur farms the focus is on breeding for pelt colour, size and quality, and fear of humans in the undomesticated animals currently used by the fur industry makes them fundamentally unsuitable for farming. Farming mink and foxes for fur is therefore in contravention of Council Directive 98/58/EC and the Council of Europe 'Recommendation Concerning Fur Animals'.

5: Major welfare issues for mink and foxes farmed for fur in Europe

5.1 Farming systems, handling procedures and killing methods

Housing systems

Farmed mink are generally housed in wire mesh cages, elevated above ground level and typically arranged in two, but in some cases up to ten, rows under a long (50-100m) roof, often without side walls.[215,216] The cages are usually largely barren except for the inclusion of a nest box. In some cases a wire cylinder and/or a platform may be provided.

Farmed foxes are housed in closed or open-sided sheds, commonly holding two, but in some cases up to eight, rows of wire mesh cages raised 60-100cm above the ground.[217] The cages are generally bare except for the temporary inclusion of a nest box for a vixen with young and, often, the provision of an elevated resting platform (commonly made of wire mesh) and an object (such as a wooden block) for gnawing. Large numbers of small cages are used to maximise the number of animals that can be reared in a given space.

Handling

Handling and restraint methods for mink and foxes are designed to protect the handler from injuries and increase the efficiency of handling procedures. Mink are generally handled with heavy gloves and are sometimes caught in a metal trap placed in the cage, or grasped with metal body-tongs.[218] These have a pair of flattened jaws that are used to grip the mink just behind the front legs.[219] For fur grading and live exhibitions, a special trap is used where the floor can be pushed upwards, completely immobilising the mink.[220] Mink show an acute stress response to capture and immobilisation.[221] SCAHAW states: "Immobilisation causes welfare problems especially when prolonged" and advises: "Mink should not be kept in a carrying cage or in a trap for more than one hour".

The most frequent method of handling adult and sub-adult foxes is to grasp the neck with a pair of metal tongs and then grab them by the tail.[222] Neck-tongs are made of steel, around 50cm long, with a handle to open and close the rounded jaws, which typically have a diameter of 7.5cm for females and 8.5cm for males.[223] Handling and restraint are acutely stressful for both silver[224,225] and blue[226] foxes. Dental injuries can occur when animals bite the tongs.[227] **Neck-tongs continue to be used routinely on fur farms despite a clear statement in the Council of Europe Recommendations prohibiting this:[228] "The routine use of neck tongs for catching foxes shall be avoided."** A metal snout clip may also be used to immobilise the fox's jaws when foxes are exhibited at shows.[229] SCAHAW recommends:[230] "The use of neck tongs and snout clips in foxes should be avoided as much as possible. Bare metal tongs should not be used."

Mink and foxes are usually killed on the farm so fur animals are not routinely transported.[231] However, animals may be transported to exhibitions and also between farms when breeding stock are bought and sold.

Killing

Mink are usually killed by gassing with carbon dioxide (CO_2) or carbon monoxide (CO).[232] Both of these are commercially available in compressed form in a cylinder and the latter can also be supplied by the exhaust gases (which also include some CO_2 and other toxic gases) from a petrol-driven engine. It is a legal requirement in the EU for exhaust gases to be filtered and cooled before being used to kill mink.[233] However, in practice this is not always the case. A survey of more than 100 mink farms in Finland in 2010 found that exhaust gases were not filtered on 8% of farms.[234] Exhaust gases were not cooled on 43% of farms, and 86% of farms did not check the temperature of the killing chamber.[235] Cylinder CO is usually used in the Netherlands, whereas filtered exhaust CO or cylinder CO_2 are generally used in Finland.[236]

Typically, a mobile gassing unit is moved along the shed and animals selected for killing are removed from their cage and placed into the killing box one after another. Between 30 and over 100 mink may be placed in the unit at any one time.[237,238,239] Unless loss of consciousness is instantaneous, there is likely to be stress due to confinement with so many other animals, and animals may pile up and be killed in part by suffocation.[240] Both the mink being killed and mink remaining in their cages often vocalise, suggesting that the process causes stress for both handled and non-handled mink.[241]

Mink find CO_2 highly aversive, responding with coughing, sneezing and rapid recoil from a chamber containing the gas.[242] The 2006 report of the 'International Consensus Meeting on Carbon Dioxide Euthanasia of Laboratory Animals' concluded:[243] "If animals are placed into a chamber containing a high concentration of CO_2 (above 50%), they will experience at least 10-15 seconds of pain in the mucosa of the upper airways before the loss of consciousness. This is a serious welfare problem." EU legislation permits the use of CO_2 with a minimum concentration of 80% for killing mink.[244] This concentration kills mink within an average of four to five minutes,[245] whereas a concentration of 70% CO_2 does not kill mink within seven to 15 minutes.[246,247]

A number of reviews have concluded that the use of CO_2 is not an acceptable method of killing mink. The

2001 SCAHAW report recommends:[248] **"Killing mink with CO_2 should be avoided, and humane methods developed."** A 2008 report from the working-group to the Scientific Advisory Committee on Animal Health and Welfare (SACAHW) in Ireland concluded:[249] "There is strong evidence, therefore, that carbon dioxide is an unsuitable method for killing mink and that its use results in significant welfare compromise [. . .] **The use of carbon dioxide for killing mink is not acceptable and should not be permitted"**.

CO is thought to induce unconsciousness and death through deprivation of oxygen,[250] although other mechanisms may be involved.[251] Being semi-aquatic, mink have specific adaptations for swimming and diving, including the ability to detect and respond to the effects of hypoxia (low oxygen levels).[252] This raises questions regarding the welfare consequences of exposing mink to CO.[253]

EU legislation currently permits the use of a gas mixture containing more than 4% CO from a pure source or more than 1% CO associated with other toxic gases from filtered exhaust gases.[254] In practice, the concentration of CO in the killing chamber is often not measured.[255] A concentration of up to 3% CO in filtered exhaust gases is ineffective, with mink taking more than 7-15 minutes to die or not dying at all.[256] SCAHAW states:[257] "filtered exhaust gases [...] induce unconsciousness slower than pure CO, and it is preceded by excitation and convulsions." The 2008 SACAHW report concluded:[258] **"The use of carbon monoxide, from exhaust gasses, for killing mink is not acceptable and should not be permitted."**

Foxes are usually killed by electrocution while restrained with neck-tongs.[259,260] EU legislation stipulates that electrodes be applied to the mouth and rectum with a minimum current of 0.3 amperes and a minimum voltage of 110 volts for at least three seconds.[261] When tested with sedated foxes, this method brought about an immediate and irreversible state of unconsciousness.[262] However, animals are not sedated on fur farms, and there is potential for poor welfare if cardiac fibrillation occurs prior to loss of consciousness due to incorrect application of the electrodes.[263] The 2008 SACAHW report states:[264] "international recommendations suggest that intravenous injection of barbiturate is the method of choice for killing foxes. This should be performed by a veterinary surgeon." However, the prolonged restraint necessary for administration of a lethal injection is likely to cause additional stress and may not be considered practical for large numbers of animals.

Unlike other farmed species, EU legislation does not currently require certificates of competence for all personnel carrying out stunning and killing of fur animals, although killing must be supervised by a person holding a certificate of competence.[265] This represents an additional risk to the welfare of fur animals if these procedures are carried out by inadequately trained personnel, given the importance for welfare of correct application, and assessment of the effectiveness, of stunning and killing methods. The 2008 SACAHW report recommends:[266] **"A requirement for formal training of all those involved in on-farm killing of fur animals should be introduced. Such training should be documented and subject to inspection by the competent authority"**.

Because they are not domesticated, mink and foxes on fur farms cannot be handled without protective gloves (for mink) or restraint devices (for foxes) to reduce the risk of injury to the handler. Metal neck-tongs continue to be used routinely to handle foxes on fur farms, despite being in contravention of Council of Europe Recommendations. Reviews of the scientific evidence have condemned some commonly used killing methods as inhumane. There is currently no requirement for training or certificates of competence for all personnel carrying out killing of fur animals.

5.2 Abnormal behaviour – stereotypies, fur-chewing and self-injury

Farmed mink perform locomotor stereotypies which typically involve pacing along the cage wall, vertical rearing in a cage corner, repetitive circling or nodding of the head/front half of the body, and/or repeatedly entering and leaving the nest-box.[267] Of the various forms of mink stereotypy, pacing (sometimes called 'pendling') is the most common.[268] Mink stereotypies are not seen in the wild, nor in much-enriched enclosures in zoos.[269]

The extent to which mink engage in stereotypic behaviour varies between farms and seasons. In a survey of Dutch mink farms, the proportion of time spent stereotyping ranged from 10.9% in summer to 32.0% in winter on a farm with standard housing conditions, and from 0.8% in summer to 4.1% in winter on a farm that had made the most modifications aimed at enriching the environment and improving welfare.[270] On a survey of Swedish mink farms, on average 20% of mink performed stereotypies prior to feeding.[271]

Stereotypy also occurs in farmed foxes. Welfare assessments carried out on five Norwegian fox farms (with mostly silver foxes) in 2012 recorded between 7% and 13% of active foxes behaving stereotypically. Lower levels were recorded on ten Finnish farms (with mostly blue foxes) where between 0% and 5% of active foxes were behaving stereotypically.[272] Animals may stop stereotyping in response to the presence of an observer[273] so the true levels of stereotypy may be significantly higher.

Another abnormal behaviour is fur-chewing and tail-biting, where animals repeatedly suck or bite at themselves, usually on the tail but sometimes also on

the back or limbs. On every farm there are mink with patches of shortened or missing fur, especially on the tail, and some mink have substantially shortened tails from chewing and, more rarely, chewed limbs.[274] The incidence of such severe self-mutilation is difficult to ascertain as seriously affected individuals are likely to be culled. However, a significant proportion of tail-biters or pelt-biters may eventually progress to major tissue damage and infection.[275] Tail-biting also occurs in farmed foxes.[276]

The proportion of animals that engage in fur-chewing varies between farms and seasons, ranging from less than 5% to more than 60% in a survey of Dutch mink farms,[277] and from less than 20% to more than 60% in a survey of Swedish mink farms.[278]

Locomotor stereotypies and fur-chewing appear to be elicited by different factors. Locomotor stereotypies may be related to frustrated foraging[279] or ranging behaviour,[280] whereas fur-chewing may be related to under-stimulation.[281] There is a positive correlation between locomotor stereotypies in captive carnivores and their minimum home range size in the wild.[282] Stereotypies peak in speed, frequency and prevalence just before feeding time, and are increased by hunger[283] and restrictive feeding to prepare animals for breeding.[284] The porridge-like consistency of the feed given to farmed fur animals provides only marginal oral manipulation,[285] which may contribute to the development of oral stereotypies in foxes.

Stereotypies have been defined as "repetitive, invariant behaviour patterns with no obvious goal or function".[286] Proximate causes of stereotypic behaviour involve the frustration of specific highly-motivated behaviour patterns,[287] along with perseveration (tendencies to repeat actions inappropriately) which may be associated with central nervous system (CNS) malfunction.[288] Reflecting this growing understanding of the causes of stereotypy, a new definition has been proposed by Mason based on the causal mechanisms of repetition:[289] **"stereotypic behaviours are repetitive behaviours induced by frustration, repeated attempts to cope, and/or CNS dysfunction."**

Where data exist, most situations that cause/increase stereotypies also decrease welfare.[290] Stereotypy-eliciting situations are thus likely to be poor for welfare.[291] However, there is some evidence that at least some stereotypies may be an attempt to cope better with adverse conditions.[292] If this is the case, in a housing system that elicits stereotypic behaviour in some individuals, we should be just as concerned about the welfare of the least stereotypic animals.[293] Therefore, conditions that cause stereotypic behaviour in some animals are likely to cause suffering for all animals housed in those conditions.

It is possible to reduce stereotypic behaviour[294] and fur-chewing[295] through selective breeding. However, if stereotypies are used by animals as a method of coping with adverse conditions, selection against stereotypic behaviour may result in animals that are more inactive and more fearful.[296] Mason and Latham advise that "stereotypies should not be reduced by means other than tackling their underlying motivations".[297] The Council of Europe Recommendations stress that "the environment and management have to fulfil the animal's biological needs rather than trying to "adapt" the animals to the environment".[298] The Recommendations also state:[299] **"Where there is a significant level of stereotypy or self-mutilation in mink on a farm, the system of housing or management shall be changed appropriately so that the welfare of the animals is improved. If these measures are not sufficient production should be suspended."**

The cramped and unstimulating cage environment on fur farms leads to the development of stereotypies, fur chewing and self-injury in mink and foxes. Stereotypies are caused by frustration of highly-motivated ranging and foraging behaviours, repeated attempts to cope with adverse conditions and/or abnormal brain development in the highly restrictive cage environment. These abnormal behaviours are indicators of poor welfare in animals farmed for fur and conditions that cause these behaviours in some animals are likely to cause suffering for all animals housed in those conditions.

5.3 Space, environmental enrichment, motivation and preferences

Mink

Space

For mink, the Council of Europe Recommendations stipulate a minimum cage height of 45cm and a minimum floor area of 2550cm^2 for a single adult, a single adult with kits, or a pair of juveniles after weaning (with an additional 850cm^2 for each additional animal above two).[300] The required area for a standard cage is therefore approximately the same area as an A2 sheet of paper (i.e. four sheets of standard A4 typing paper). A typical cage in Europe measures 70-90cm x 30cm.[301,302] Stride length in the mink is around 20-40cm[303] so the animal can take no more than four paces in any direction before reaching the edge of the cage.

Doubling the standard cage size, without any additional enrichment, has no effect on stereotypies, fur-chewing and physiology linked to welfare in pair-housed juvenile mink.[304] With larger cages (i.e. around nine times the floor area and 1.5 times the height of a standard mink cage) stereotypies may be reduced, but not eliminated.[305]

Moderate increases in space, of a magnitude that might be possible on commercial fur farms, do not eliminate stereotypies or fur-chewing in farmed mink.

Environmental enrichment

Nesting and hiding opportunities

Farmed mink are usually provided with a nest box throughout the year, which is used for sleeping and hiding as well as breeding.[306] The nest box is usually as wide as the cage with a depth of between 15 and 30cm.[307] For mink, the Council of Europe Recommendations state:[308] "A nest box of thermoinsulating material, which is not hazardous to the health of the animals, with a sufficient floor area shall be available. The design of the opening of the nest box shall allow new born animals to be retained while providing easy access for other animals. Suitable bedding and occupational material such as straw shall be regularly provided, and its adequacy must be checked, especially during the period of giving birth and in the cold season."

Litter size and kit mortality are both relatively high in farmed mink (compared with most farmed species) and the majority of kit deaths occur during the first day *post partum*.[309] A 2007 study found that eight kits were born alive per litter, on average, and 6.5 were alive one day after birth (18.75% mortality during the first day).[310] Problems during birth are important contributors to suboptimal maternal behaviour and increased early kit mortality.[311] Longer duration of parturition and high variation in inter-birth intervals are related to increased kit mortality.[312] Mothers that have litters with low mortality spend more time in kit-directed behaviour.[313]

Several different types of nesting material are currently supplied to mink on commercial farms,[314] although they differ substantially in their suitability for nest building.[315] Access to straw for nest-building reduces variation in inter-birth intervals, whereas an artificial nest alone has no such effect.[316] Mothers with access to straw in combination with an artificial nest are more attentive and quicker to retrieve a kit placed away from the nest.[317] A nest box with wood-shavings only, as is often used on commercial mink farms, is associated with higher kit mortality, reduced kit growth and higher basal cortisol level (an indicator of stress) in the mother and is insufficient as a nesting environment.[318]

Female mink are typically transferred to another housing environment prior to delivery.[319] Early transfer of females (after mating) reduces stress and increases maternal care, compared with the usual commercial practice of transfer later during pregnancy.[320] Mated females build and maintain a nest at least one month prior to delivery when transferred to an environment with free access to nest-building material.[321] Mink value the opportunity to use more than one nest site and will work for access to an alternative nest box.[322]

Inadequate nesting material type, and inadequate duration of access to nesting material, as often occurs on commercial farms, limits nesting behaviour in mink and contributes to problems during parturition, reduced maternal care and increased kit mortality. Mink are motivated to use more than one nest site, reflecting their use of multiple dens in the wild.

Platforms, cylinders, 'activity' objects, water baths and running wheels

Adding various combinations of simple enrichments (such as plastic or wire mesh cylinders or platforms, balls and pieces of rope or lengths of hose) to standard or enlarged (e.g. double) mink cages may reduce, but does not eliminate, tail-biting[323,324] and stereotypies.[325] In many cases, levels of stereotypy are unaffected by provision of simple enrichments.[326,327]

A number of early studies, mostly using adult mink, found little effect of access to a water bath on stereotypies in caged mink.[328] However, recent studies found that access to a water bath may reduce the occurrence,[329] and slow down the development,[330] of stereotypic behaviour in individually-housed juvenile mink. Thus long-term access to a water bath may reduce, but does not eliminate, frustration in farmed mink.[331] Access to water for swimming (in addition to a cylinder and platform) increased play behaviour in juvenile mink, compared with access to a cylinder and a platform without swimming water.[332] The opportunity to perform play behaviour may enhance an animal's coping capacity in later life.[333]

Mason *et al.* devised the most comprehensive analysis to date to determine whether mink suffer due to deprivation in the small barren cages used on fur farms and to identify which activities are most important for their welfare.[334] Mink, individually-housed in standard cages, were each given access to seven cages containing different resources:

- a water pool measuring 1.5m x 0.5m and filled with 0.2m of water;
- a raised platform, reached by a 2m vertical wire tunnel;
- novel objects such as traffic cones and packaging, which were changed daily;
- an alternative nest site (a box of hay);
- toys for manipulation and chewing (e.g. tennis balls);
- a plastic tunnel;
- an empty compartment to control for the importance of additional space.

Costs to 'pay' to reach the facilities were imposed by weighted entrance doors. Four different measures of value were used. The water bath was found to be the most valuable resource on all measures: it attracted the greatest total expenditure and had the highest reservation price, the greatest consumer surplus, and the most inelastic demand *(**see Section 3.1 for definitions of these measures**)*.

Next, the reactions of the mink to having their access blocked for 24 hours were recorded for resources with high (water bath), intermediate (alternative nest site) and low (empty compartment) value and compared with their reaction to deprivation of an essential physiological resource: food. When denied access to the water bath, the mink experienced a high level of stress, evidenced by an increase in cortisol production that was indistinguishable from that caused by food deprivation. Cortisol excretion was not increased by blocking access to the other two resources. The authors concluded that mink are highly motivated to swim and that caging mink on fur farms causes frustration by denying them the opportunity to do so.[335]

Mink will work for access to a running wheel, with a similar elasticity of demand to that for access to a water bath, suggesting that mink value these two types of enrichment equally highly.[336,337] Simultaneous access to both resources did not affect the elasticity of demand for either resource, and when one resource was free the mink did not increase their use of the free resource as the price of the other resource increased, indicating that these two resources are valued independently and one is not able to substitute for the other.[338] This suggests different underlying motivations for using the water bath and the running wheel. Motivation to use a water bath may be related to foraging behaviour, both on land (running, exploring sides) and in the water (exploring, head dipping, swimming).[339] Motivation to use a running wheel may be related to ranging behaviour. A small study found that the distance travelled in the wild was correlated with the distance run in a wheel in wild-caught caged carnivores.[340]

The value of a resource to an animal is not necessarily related to the amount of time it chooses to spend interacting with it. Swimming and running in a wheel appear to be equally highly valued by mink but the amount of time spent using the wheel is greater than the amount of time spent in water.[341] This may be because a relatively short period of time in the water is sufficient to satisfy the mink's motivation to swim.[342] Indeed, mink may show some hesitation when obliged to swim to reach food[343] but this does not detract from the fact that they are highly motivated to access water for swimming and show a stress response when that opportunity is taken away.[344]

Mink housed in standard cages and provided with access to a running wheel will use the wheel instead of performing stereotypies.[345] Mink with access to a wheel used the wheel for the same amount of time and with the same daily activity pattern as the control animals (housed without a wheel) performed stereotypies. Mink selected for high levels of stereotypies used the wheel more than mink selected for low levels of stereotypies. There was no difference in plasma cortisol levels between mink with and without access to a running wheel. Therefore, access to a running wheel does not necessarily improve welfare because use of the wheel is simply an alternative form of abnormal behaviour that reflects the same frustrated motivation. Both stereotypy and wheel running can be defined as repetitive, unvarying and functionless and may be considered abnormal behaviour.[346]

Boredom, apathy and depression are often hypothesised to occur in animals housed in impoverished environments,[347] and the behavioural responses of mink housed in standard barren cages were consistent with a state of boredom, indicated by heightened investigation when presented with diverse stimuli and much time spent lying still but awake.[348] Impoverished environments also make male mink less successful as mates because neurophysiological changes underlying stereotypy may make males behave abnormally when interacting with females.[349]

The unstimulating cage environments used on fur farms lead to boredom, mental dysfunction and abnormal behaviour in mink. The addition of a variety of enrichments to mink cages does not eliminate tail-biting and stereotypies. As would be expected for a semi-aquatic species that always lives in association with water in the wild, mink are highly motivated to swim and are frustrated when denied the opportunity to do so and stressed when that opportunity is taken away. Mink are also highly motivated to access a

running wheel. However, running in a wheel is still an abnormal repetitive behaviour and does not reduce stress in caged mink and so is not an adequate substitute for the ability to engage in genuine ranging behaviour.

Foxes

Space

For foxes, the Council of Europe Recommendations stipulate a minimum cage height of 70cm and a minimum floor area of 0.8m^2 for a single adult, 2.0m^2 for a single adult with cubs, and 1.2m^2 for a pair of juveniles after weaning, with an additional 0.5m^2 for each additional juvenile above two.[350] Fox cages typically have a floor area of 0.6-1.2m^2 and a height of 60-75cm.[351] The upper end of this range for floor area is roughly equivalent to the area of a typical office desk.

Doubling the height or the width of standard cages had no effect on stereotypic behaviour, and increased the time taken for capture, in pair-housed juvenile blue foxes.[352] Housing pairs of juvenile blue foxes in larger wire-floored pens (5m x 3m with a height of 1.8m) reduced, but did not eliminate, tail-biting, and reduced inactivity but increased stereotypies compared with standard cages.[353]

As with mink, moderate increases in space, of a magnitude that might be feasible on commercial farms, are not sufficient to make substantial improvements to the welfare of farmed foxes.

Environmental enrichment

Nesting and hiding opportunities

The Council of Europe Recommendations state:[354] "Foxes must be able to conceal themselves from people and from animals in other cages or enclosures." All weaned animals must have access to "a secluded area" and, for silver foxes, the secluded area must have solid walls. The Recommendations also require access to a nest box for pregnant vixens and vixens with cubs.

Nest boxes are not usually provided for farmed foxes other than pregnant vixens and vixens with cubs. Continuous access to a nest box, shelter or opaque screen would provide an opportunity for foxes to retreat and hide when frightened. When provided with access to a top box, floor box and platform, silver foxes spent most time on the platform, while blue foxes spent most time in the top box.[355] Blue foxes were observed in the shelters twice as frequently as silver foxes.[356] When disturbed, most blue foxes fled into the top box (some fled into the side box), whereas silver foxes mostly fled to the opposite side of the cage (some fled into the top box).[357] 24-hour recordings suggest that blue foxes tend to avoid areas of the cage where opaque screens obstruct their view.[358] However, when the screens protrude into the cage (along the edge of a raised platform, rather than being attached to the wall of the cage) some foxes use them to hide from an approaching human.[359] As well as providing an opportunity for refuge, nest boxes are mostly used for resting. Juvenile blue foxes provided with a nest box will make much use of the box at night, when there are no humans on the farm.[360]

Adult male blue foxes work for access to a nest box and increasing the workload did not decrease the amount of time spent in or on the nest box.[361] When they had the opportunity, blue fox vixens frequently moved cubs from one nest to another.[362] Silver fox vixens provided with year-round access to a nest box were less fearful in behavioural and capture tests, and showed reduced long-term stress levels.[363] However, access to a nest box/opaque shelter after weaning may increase fearfulness in blue foxes.[364,365,366] Forced early visual contact with humans prior to weaning (by opening a door in the nest box between two and eight weeks of age) may reduce fearfulness in blue foxes.[367] However, a transparent front wall in a top box provided to blue foxes after weaning did not reduce fear-related reactions.[368] To improve welfare, growing blue foxes should have intense human contact and a shelter design which does not hinder or delay exposure to human proximity.[369]

There is an intractable problem in rearing foxes in a cage environment: the animals are fearful and value the availability of a nest box or shelter in which to rest and hide from approaching humans, but allowing them to do so may make them even more fearful because they are not forced to maintain regular visual contact with their keepers. Vixens are motivated to use more than one nest site, reflecting their use of multiple den sites (silver foxes) or large complex dens (blue foxes) in the wild.

Platforms and 'activity' objects

The Council of Europe Recommendations stipulate that all weaned foxes must have "either an elevated platform or a nest box with a roof on which the animal can rest and observe the cage door or enclosure entrance."[370] The Recommendations also state:[371] "The environment shall be enriched with objects that provide suitable stimuli to gnaw and any other occupational material."

Both silver and blue foxes appear to show a preference for access to an unobstructed view of their surroundings.[372,373] Platforms are used for observation and sleeping.[374] The presence of a platform does not appear to have a significant effect on fear reactions in farmed silver foxes but some animals may retreat to the platform when disturbed.[375]

Access to bones,[376] or to wooden blocks and straw,[377] stimulates play behaviour and may reduce, but not

eliminate, oral stereotypies in blue foxes. Foxes may interact with bones more than wooden blocks because the bones may provide more varied sensual experiences (tastes and odours) than a wooden block.[378]

When blue fox vixens were transferred into a standard fox cage furnished with multiple activity enrichments (bone, scratching plate, hockey buck (puck), ceiling rope, wall rope and straw) and resting enrichments (wire-mesh platform and top nest box) for 26 days, the enrichments were used frequently and stereotypies were reduced but not eliminated.[379] Access to the enrichments increased exploration but did not improve confidence in capture tests.

Platforms and 'activity' objects are frequently used by caged foxes but do not eliminate stereotypies or reduce fear in farmed foxes.

Floor type and opportunities for digging

Blue foxes are willing to work to gain access to a sand floor from a wire floor.[380] However, they will also work for access to a solid concrete floor and to an additional wire floor, as well as to sand floors of two different depths (3-4cm and 15-30cm); no difference was found in the demand elasticity or the intensity of the demand for each floor type.[381] The authors of this study conclude that juvenile blue foxes do not value solid floor materials more than a wire mesh floor. However, the experimental set-up allowed animals to work for access to only one floor-type at a time and only for a short period of time (three-hour test sessions). Mason points out that a "prerequisite for the results to be valid is that the animal is tested in a 'closed economy', a set-up in which the animal lives with all the resources under test for a realistically long period of time."[382] The authors acknowledge that the apparatus may have stimulated exploration and the foxes may have been motivated to patrol the entire

accessible area regardless of floor type.[383] They also acknowledge that measuring a single demand function may be insensitive at distinguishing between demands for closely-related resources. So this experiment provides no information about the relative motivation of foxes to access different floor types, although the sand floor stimulated more digging, playing, rooting and vole jumping (prey pouncing behaviour) than a concrete or wire mesh floor and thus provided environmental enrichment which is likely to improve welfare.[384] In another study, adult male blue foxes were willing to work for access to a sand floor and increasing the workload did not decrease the amount of time spent interacting with the sand.[385]

Blue foxes housed in pairs with access to both a wire floor and an earth floor spent more time on the wire floor.[386,387] However, Mason cautions that "simple time-budgets alone do not reveal much about the importance of different enrichments for welfare."[388] A sand floor stimulates digging, rooting and play in blue foxes.[389] Blue foxes with access to both an earth floor and a wire floor showed less oral stereotypic activity than animals with a wire floor only.[390] A rebound effect in digging, playing and sniffing was observed after the foxes were given access to an earth floor again after a period of deprivation.[391] In another study, wire mesh, dry sand and dry wooden floors were preferred by blue foxes over wet or icy sand.[392] When given a choice of wire or sand floor on two levels, blue foxes preferred a sand floor for activity and a wire floor for resting if these were elevated.[393] Of two identical wire-floored cages, the elevated one was preferred. Pair-housed blue foxes housed in earthen-floored pens (5m x 3m with a height of 1.8m) performed significantly fewer locomotor stereotypies compared with those housed in wire mesh-floored pens of the same size.[394] Access to a sand floor is beneficial for the wearing of the claws of blue foxes.[395] Once blue foxes are provided with access to a clean and unfrozen sand floor, they may show a stress response if they are not allowed to enjoy this floor type all the time.[396]

Solid floors were highly preferred by silver foxes when the floor was dry, but not when it was wet or icy.[397] Dry wooden flooring was highly preferred (over wire mesh, dry sand, wet wood and icy sand) for resting in both winter and spring. A dry sand floor was preferred for activity in spring, and dry wooden flooring and a dry sand floor were equally preferred for activity in winter.

While the quality of the evidence is limited, the available studies show that foxes are motivated to access a sand/earth floor. There is evidence of clear welfare benefits from access to a sand floor, in terms of an enhanced behavioural repertoire and a reduction in stereotypies. However, in fur farms, there are practical difficulties in providing access to a sand floor in a cage environment and keeping it clean.[398]

5.4 Social environment, weaning age, reproductive failure, infant mortality and infanticide

Mink

Mink farmed for fur in cages have very little control over their social environment. The welfare consequences of housing large numbers of territorial animals in close proximity on fur farms are not well understood. An important aspect of the behaviour of mink is their use of chemical messages to exclude other members of the same species from their territory. Mink use their faeces, anal sacs and other specialised scent glands to mark their territory.[399] The messages contained in these various scent marks are complex and poorly understood, but are widely used in territorial defence (i.e. to deter other mink from entering an area that is already occupied). The accumulation of urine and faeces under cages, and scent marking within cages, means that mink on fur farms are subjected to an extremely high intensity of chemical messages. Animals on fur farms cannot respond appropriately to these chemical messages and the impacts on their welfare are unknown, but allowing faeces to build up under cages has been identified as a potential cause of social stress.[400]

Adult mink kept for breeding are housed in individual cages until mating takes place in March. The males and unmated females are killed shortly afterwards. The mated females give birth in May and the young are typically weaned at six to eight weeks of age. After weaning, kits are normally housed as litters until 11 to 12 weeks of age and then further divided into male-female pairs (in some cases an adult female and one of her male kits may be housed together). In the Netherlands, kits may be divided into groups of three at weaning. Most of the animals are killed ('pelted') in November and the animals kept for breeding are housed individually until the following March.

The Council of Europe Recommendations state:[401] "Weaning of young shall take place at an age which is most beneficial to the welfare of the mother and the young, and shall take place not earlier than eight weeks of age. Only in exceptional circumstances where the welfare of the mother or the young is endangered, can the weaning take place at a younger age." Mink kits are not nutritionally independent until eight to ten weeks of age and at ten weeks of age they still make distress calls if separated from their mother.[402] In the wild, or in large enclosures, mink kits do not begin to disperse until 12-16 weeks of age.[403] Husbandry practices that lead to maternal deprivation, through earlier-than-normal separation

from the mother and/or inadequate maternal care, can contribute to the emergence of stereotypic behaviour in the offspring[404] *(see Section 5.2)*. Mink kits weaned at seven weeks are more likely to develop tail-biting behaviour than those weaned at 11 weeks and the degree of tail damage is greater (completely bald tail tips were only found in the early-weaned group).[405] Early-weaned kits are also more likely to chew other items in their environment, such as plastic drinker dishes.[406] While early weaning, individual housing and small cages all promote the development of stereotypies in farmed mink,[407] the influence of early weaning on stereotypies appears to decline with age, while effects relating to individual housing and small cages appear to be more persistent.[408] Kits weaned at six weeks vocalise twice as much as those weaned at eight to ten weeks, even if weaned in a litter.[409] So all these studies indicate that later weaning is likely to be beneficial for the welfare of the kits.

Most mothers show a prolonged stress reaction to having their kits removed at six weeks and mothers of kits weaned at six or eight weeks show more stereotypy, such as nodding and up-and-down movements, than females whose kits are weaned at ten weeks.[410] However, keeping litters with their mother for longer in the confines of a small cage may be stressful for the mother. The amount of stress experienced by the mother, inferred from the level of circulating eosinophils (a type of immune cell), increased with age of the kits when separation occured at six, eight or ten weeks.[411] Based on an increase in stereotypic behaviour, some mothers may be frustrated by forced cohabitation with their kits by the seventh week.[412] Providing nursing mothers with an elevated 'get-away bunk' (a wire mesh cylinder attached to the cage ceiling) and enrichment objects (balls and suspended items to chew) can reduce, but does not eliminate, stereotypic behaviour in nursing mink.[413,414]

A number of trials have looked at the possibility of housing mink in family groups until pelting, usually by connecting three standard cages. There were some benefits for both the mother (lower levels of stereotypy)[415] and the juveniles (less long-term stress and possible thermoregulatory benefits from huddling during cold weather).[416] However, there were negative welfare consequences of family housing for both the mother (raised cortisol levels and a high proportion of swollen or bitten teats, fur damage and bite marks)[417] and the juveniles (more bite scars).[418] Problems with aggression and injuries are likely to be unavoidable in the highly restrictive cage environment.

Similar welfare concerns (increased fur damage and increased morbidity and mortality) have been identified when housing juveniles in litter groups, from weaning through to pelting, in cages connected in a row or stacked on top of each other,[419] although there were some benefits from reduced stereotypies.[420]

Mason suggests that leaving mink kits with their mother until 11 weeks of age would be expected to improve welfare, provided that problems of overcrowding are avoided.[421] SCAHAW recommends:[422] "Mink should not be weaned before nine weeks of age."

There is an insurmountable conflict created by the cramped conditions on fur farms. Early weaning compromises the welfare of mink kits but, within the highly restrictive cage environment, later weaning may compromise the welfare of the mother. Housing in family groups or whole litter groups through to pelting, in interconnected cages, can have some benefits but welfare problems due to aggression are likely to be unavoidable.

Foxes

As with mink, foxes are territorial and use their urine, anal and other specialised scent glands, and possibly their faeces, in territorial defence.[423] The accumulation of urine and faeces under cages, and scent marking within cages, means that foxes on fur farms are subjected to an extremely high intensity of chemical messages to which they cannot respond appropriately. Since these chemical messages convey information about health and status,[424] they are likely to cause social stress in vixens with dominant neighbours.

Breeding animals are housed in individual cages, except during mating, when the female is moved briefly to a male's cage. Weaning is usually carried out by removing the vixen from the cage, leaving a group of cubs, which initially may be kept together or sub-divided. The juveniles are then usually housed in pairs until September and then individually until they are killed.

Reproductive failure is a significant problem in farmed foxes and is influenced by the social status of the vixen.[425] Some silver fox vixens will attack and kill their cubs soon after birth.[426] Silver fox vixens which, under standard farming conditions, wean most of their cubs unharmed, are typically socially more dominant.[427] Vixens which had killed or hurt their cubs just after delivery, weaned more cubs unharmed during the next reproductive season when they were visually and spatially isolated from the other vixens on the farm.[428] A vixen of low competition capacity (i.e. more socially subordinate) was observed to give good maternal care to another vixen's cubs one hour after she had killed and eaten her own cubs and she successfully reared the new cubs unharmed until weaning at seven weeks.[429]

In another study, silver fox vixens with high competition capacity weaned more cubs unharmed than vixens with low competition capacity.[430] Vixens with low-competition-capacity neighbours weaned more cubs than vixens with high-competition-capacity neighbours.[431] Low-competition-capacity vixens failed to wean any unharmed cubs if the neighbouring vixens were of higher competition capacity.[432]

The Council of Europe Recommendations state:[433]
"Where there is significant incidence of infanticide, a farm production system shall be changed appropriately, for example, by changing the housing conditions for breeding vixens or genetic strains. If these measures are not sufficient, the production should be suspended."

Infanticide was not observed in a study of blue foxes.[434] However, cub losses were still high. The mean litter size at birth was 10.8 cubs but this declined to 7.8 cubs at weaning. Approximately 2% of cubs were stillborn and 80% of the cub deaths occurred during the first week of life. Postnatal cub mortality was 32.7% in primiparous vixens (those having their first litter) and 16.7% in multiparous vixens (those that had previously given birth to a litter).

Juvenile (nine weeks of age) female silver foxes showed a clear preference to seek contact with a familiar or unfamiliar female of the same age over an empty cage.[435] However, at 24 weeks of age, silver fox vixens appeared to show no preference for social contact with a familiar or unfamiliar vixen over an empty cage. However, this study used a very short test period (26 hours) and test vixens were pair-housed with the familiar vixen in between testing. Mason points out: "It would be invalid, for example, to use brief testing periods to investigate how important social contact is to an animal, and between tests re-house it to a home pen where it can interact with conspecifics! [other members of the same species]."[436] When tested in a 'closed economy' over a longer period of time (five and a half weeks) silver fox vixens at 7-8 months (i.e. around 28-32 weeks) of age chose to spend much of their time with another vixen of the same age and were willing to 'pay' for this social contact.[437]

Although silver fox vixens are motivated to have social contact with other vixens, and may show increased levels of play and synchronous resting when housed in pairs,[438] the highly restrictive cage environment can lead to significant problems with aggression and injuries[439, 440] when vixens are housed in pairs or groups of three, and the welfare of subordinate vixens is likely to be impaired.[441, 442] Reproductive success was reduced in

various systems of pair-housing blue fox vixens compared with housing in individual cages.[443]

Housing whole litters together until pelting, with or without the vixen, could provide a more socially stimulating environment for farmed foxes. Group or family housing in interconnected cages may reduce stereotypic behaviour in silver fox cubs[444] and long-term stress levels in blue and silver fox cubs.[445,446] However, the higher number of bite marks suggests that the welfare of female blue fox cubs may be impaired in groups[447] and silver fox cubs housed in litter groups may not become accustomed to human presence to the same extent as cubs housed singly.[448]

High levels of reproductive failure and infant mortality are indicative of poor welfare in farmed foxes. The housing of large numbers of vixens in close proximity on fur farms results in high levels of social stress and contributes to reproductive failure. Vixens are motivated for social contact with other vixens but the welfare of subordinate vixens is compromised in social housing within the highly restrictive cage environment. Housing families or litter groups through to pelting may offer some welfare benefits but may reduce welfare for some cubs and increase fear of humans.

5.5 Could alternative systems be developed that could meet the welfare needs of farmed mink and foxes?

Mink

In the wild, juvenile mink typically disperse before the age at which they are pelted on farms. However, families or large groups of juveniles can be housed successfully through to pelting in much larger, highly-enriched enclosures and they do not develop stereotypies under these conditions. Mink housed in their litter groups in 20m^2 enclosures, enriched with natural vegetation, water pools and climbing branches, engage in more play and do not show behavioural disturbances such as stereotyped running and repeated scratching at the wire, as seen in mink housed in the standard cages used on fur farms.[449]

Groups of 20 juvenile mink housed in 300m^2 enclosures, with access to a rectangular swimming pool (surface area 20.5m^2, depth 30cm), a round pond (surface area 4.9m^2, depth 80cm) and a running creek (length 10m, depth 4cm), used all the water features extensively.[450] During the course of the study (from August to December) there was an overall increase in frequency and duration of use of the water basins. There were no problems with hygiene: the animals remained in good health and the quality of the water was very good. The mink often chose to share nest boxes.

Substantially larger, highly-enriched outdoor enclosures, including water for swimming and multiple nest sites, could potentially provide enormous welfare improvements for farmed mink by providing a more complex environment to enable fulfilment of a wide range of highly-motivated behaviours. Stereotypies can be eliminated by keeping mink in these conditions. However, the use of undomesticated animals by the fur industry means that fear of humans and difficulties in handling and management would present insurmountable obstacles to the adoption of more extensive systems.

Foxes

A number of studies investigated the possibility of housing silver foxes in larger (7.5m x 15m or 5m x 10m) outdoor enclosures in family or sibling groups. However, reduced human contact in these systems may result in greater fear of humans.[451,452] The inability to make exploratory movements and disperse in late autumn may also be stressful for male cubs.[453] Environmental enrichment of the enclosures was limited to one or two nest boxes, a resting shed and an earthen floor. More ambitious attempts to provide a more richly structured environment[454] and feeding enrichment[455] may be expected to have greater benefits.

However, even under zoo conditions, where animals typically have significantly more space and a more enriched environment, cub mortality is high in both red and arctic foxes.[456] Higher levels of infant mortality in captivity occur in species which, in the wild, have larger home ranges, greater median and minimum daily travel distances, and territorial behaviour.[457] Infant mortality in the wild, in contrast, is not related to home range size.[458] Clubb and Mason suggest that enclosure designs and enrichments focusing on carnivores' ranging tendencies (e.g. providing more space, multiple den sites, greater day-to-day environmental variability/novelty, and/or more control over exposure to aversive or rewarding stimuli) could improve welfare but that it may be better to phase-out keeping wide-ranging carnivores in captivity.[459]

Substantially larger, highly-enriched outdoor enclosures, including an earthen floor for digging and multiple nest sites, could potentially improve welfare for farmed foxes by providing a more complex environment to enable them to fulfil a wide range of highly-motivated behaviours. However, infant mortality is still high when foxes are kept in these conditions and is an indicator that wide-ranging carnivores like arctic and red foxes are fundamentally unsuitable for rearing in captivity. The use of undomesticated animals by the fur industry means that fear of humans and difficulties in handling and management would also present insurmountable obstacles to the adoption of more extensive systems.

5.6 Overall assessment of welfare – do current farm conditions meet the 'Five Freedoms' and provide a 'Life worth Living'?

Serious concerns for the welfare of animals farmed for fur were highlighted in the 1999 Council of Europe 'Recommendation Concerning Fur Animals'[460] and the 2001 report of the Scientific Committee on Animal Health and Animal Welfare.[461] Much research has been published since the publication of these documents. As we have highlighted, some of this research is of poor quality with questionable validity but there are also excellent high-quality studies. Taken as a whole, **recent research adds further weight to the substantial body of evidence demonstrating that the needs of mink and foxes are not being met by the fur industry.**

As discussed in Section 3.1, different authors emphasise the importance of different aspects in assessing animal welfare, which can be broadly summarised as 'biological functioning' (i.e. are the animals physically and mentally healthy?), 'affective (emotional) states' (i.e. are the animals happy/feeling good?) and 'natural/motivated behaviours' (i.e. 'do the animals have what they want?'). **The available scientific evidence, reviewed in this report, indicates that, whichever approach is emphasised, the welfare of mink and foxes farmed for fur is seriously compromised in current farming systems because:**

- **The biological functioning of mink and foxes farmed for fur is impaired**, as indicated by levels of stereotypic behaviour, fur-chewing and tail-biting/self-injury, physical deformities (bent feet) and high levels of reproductive failure/infant mortality;
- **There is evidence of negative affective (emotional) states in farmed fur animals**, including fear (as indicated by avoidance/aggression towards humans), frustration (as indicated by stereotypies) and boredom/under-stimulation (as indicated by fur-chewing and tail-biting, long periods of inactivity when awake and heightened response to stimuli);
- **Animals farmed for fur are unable to perform many natural behaviours that they have either been shown experimentally to be motivated to perform, or have been found to be frustrated/stressed by the inability to perform**, such as interacting with water (for mink), interacting with a sand/earth floor (for foxes), using multiple nest sites, and foraging/ranging (as indicated by stereotypic behaviour).

Current farming systems for mink and foxes fail to satisfy all five of the 'Five Freedoms':[462]

- **Freedom from hunger and thirst**: Restrictive feeding of overweight animals in preparation for breeding results in hunger and increased stereotypic behaviour.
- **Freedom from discomfort**: Mink and foxes farmed for fur in cages have very little control over their physical and social environment. Foxes are mostly kept without access to a nest box. Handling procedures cause significant stress and discomfort.
- **Freedom from pain, injury and disease**: Common problems include fur-chewing, injuries (both self-inflicted and from other animals), high levels of infant mortality, deformities (bent feet), difficulty in moving, diarrhoea and inhumane killing methods.
- **Freedom to express normal behaviour**: The small and largely barren cages used to house mink and foxes on fur farms do not allow the animals to swim, climb, run, dig, hunt/forage or range/disperse. Maternal deprivation and social stress can result from abrupt early weaning, isolation in individual housing, aggression in group housing and the close proximity of socially dominant animals.
- **Freedom from fear and distress**: Fear is a major welfare problem for animals farmed for fur because the mink and foxes used on fur farms are not domesticated.

FAWC considers that minimum legal requirements should be such that an animal has a **'Life worth Living'** and states:[463]

"Achievement of a life worth living requires provision of an animal's needs and certain wants, and care by all involved. Wants are those resources that an animal may not need to survive or to avoid developing abnormal behaviour, but nevertheless improve its quality of life. They may well stem from learned behaviours so that once an animal has become accustomed to their provision then withdrawal may lead to an adverse mental experience. They may also be innate such as space to play, to groom or engage in other normal behaviours."

Levels of fear, stereotypic behaviour, fur-chewing/tail-biting, physical deformities (bent feet) and reproductive failure/infant mortality clearly indicate that the needs of mink and foxes on fur farms are not being met. Mink are semi-aquatic and show inelastic demand for access to water. Dawkins states:[464] "Withholding conditions or commodities for which an animal shows 'inelastic demand' (i.e. for which it continues to work despite increasing costs) is very likely to cause suffering." Mink that are

accustomed to the provision of water, and foxes that are accustomed to access to a clean dry substrate, may show a stress reaction when they can no longer enjoy these resources *(see Section 5.3)*. Access to these resources would clearly be included within FAWC's description of a 'Life worth Living'.

SCAHAW recommends: **"Since current husbandry systems cause serious problems for all species of animals reared for fur, efforts should be made for all species to design housing systems which fullfill [sic] the needs of the animals."** In theory, alternative housing in large, highly-enriched, outdoor enclosures could potentially provide a more complex and stimulating environment. However, the use of undomesticated animals by the fur industry means that fear of humans and difficulties in handling and management would present insurmountable obstacles to the adoption of more extensive systems. The needs of undomesticated animals cannot be met in any farming system.

Current farming systems could not meet the needs of mink or foxes even if domesticated animals were used. The needs of domesticated mink could possibly be met in large highly-enriched enclosures, including access to water for swimming. However, it is debatable whether the needs of foxes could be met, even in more extensive systems. The Council of Europe recommendations state:[465] **"Since all biological needs of foxes are not met in the systems of husbandry at present in commercial use, such systems shall be replaced as soon as possible by new systems which are better adapted to the biological characteristics."** Clubb and Mason conclude:[466] **"Our findings indicate that the keeping of wide-ranging carnivores should be either fundamentally improved or phased out."**

Fear of humans is unavoidable in the use of undomesticated mink and foxes for fur production and is in contravention of Council Directive 98/58/EC, which stipulates: **"No animal shall be kept for farming purposes unless it can reasonably be expected, on the basis of its genotype or phenotype, that it can be kept without detrimental effect on its health or welfare."**

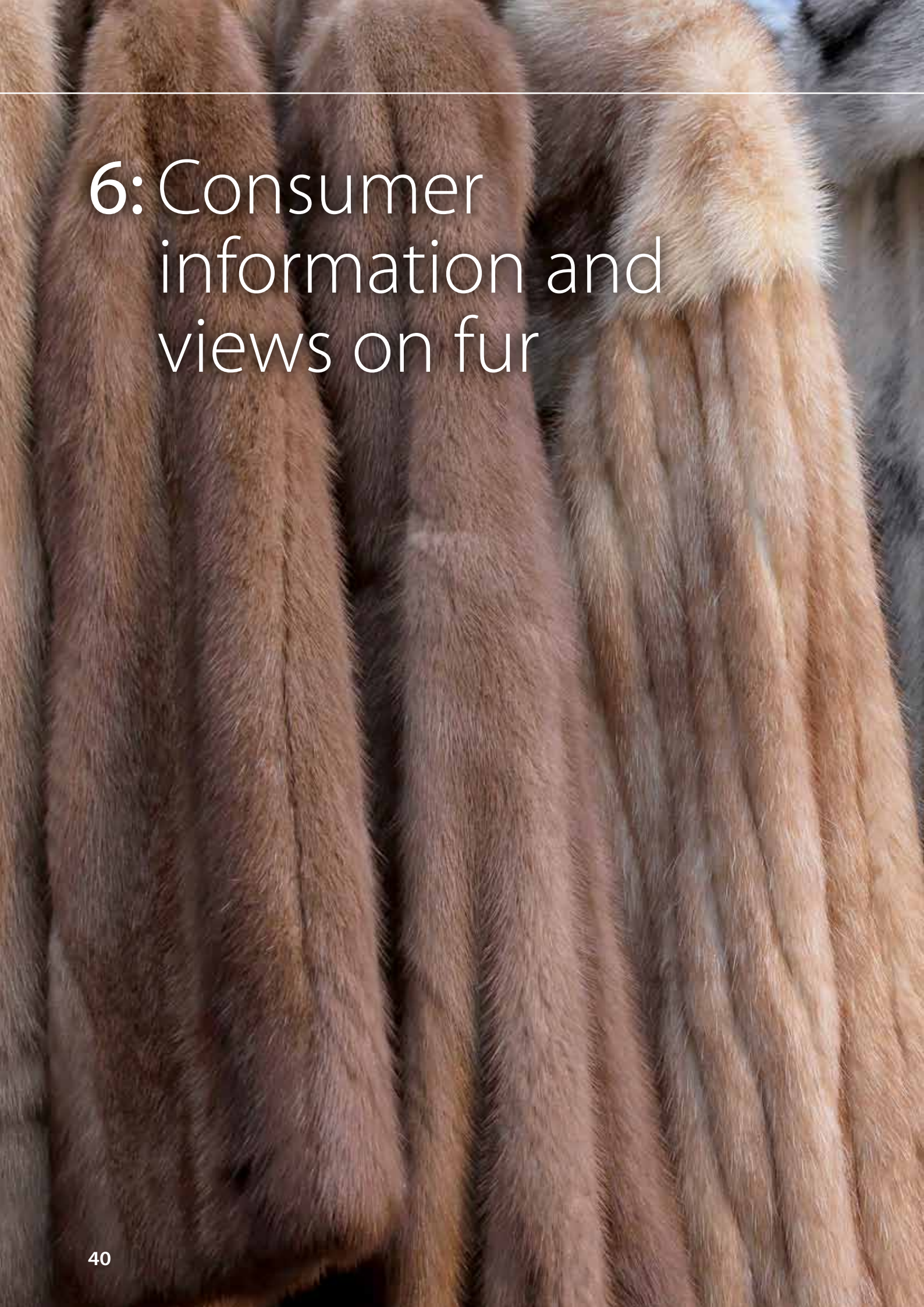
Section 5 summary

Mink and foxes farmed for fur in Europe are housed in small and largely barren cages. They cannot be handled without restraint devices or protective gloves. Several of the methods commonly used for killing fur animals have been condemned as inhumane.

Levels of fear, stereotypic behaviour, fur-chewing/tail-biting, physical deformities (bent feet), and reproductive failure/infant mortality clearly indicate that the needs of mink and foxes on fur farms are not being met. Mink and foxes are highly motivated to access resources and perform species-specific behaviours that are not possible in current housing systems.

The welfare of mink and foxes farmed for fur is seriously compromised in current farming systems, which fail to satisfy any of the 'Five Freedoms' and do not provide a 'Life worth Living'. The use of undomesticated animals by the fur industry means that fear of humans and difficulties in handling and management would present insurmountable obstacles to the adoption of more extensive systems.

Fear of humans is unavoidable in the use of undomesticated mink and foxes for fur production and is in contravention of Council Directive 98/58/EC, which stipulates: "No animal shall be kept for farming purposes unless it can reasonably be expected, on the basis of its genotype or phenotype, that it can be kept without detrimental effect on its health or welfare."



6: Consumer information and views on fur

6.1 Labelling of fur products

There is a legal requirement in the EU for textile products containing fur to be labelled as containing animal products but not specifically as containing 'fur'. Regulation (EU) No. 1007/2001[467] requires that products containing at least 80% textiles by weight and less than 20% animal products, such as fur or leather, must be labelled with "contains non-textile parts of animal origin".

This form of labelling is welcome but does not go far enough and could be misleading for consumers, especially where a garment also contains leather or suede. In the USA, the Fur Products Labeling Act,[468] originally passed by Congress in 1951, and amended by the 2010 Truth in Fur Labeling Act,[469] requires fur garments to be labelled with the species of animal and country of origin. This US type of labelling would make it easier for consumers to identify whether trims on items like garments and furnishings are made of real or imitation fur.

The 'Origin Assured' (OA) label, launched publicly by the International Fur Trade Federation (IFTF) in 2007, indicates that fur has been sourced from approved OA countries and species and claims to offer assurance on the humane treatment of animals.[470] The labelling scheme is administered by the IFTF with monitoring by Cotecna.[471] To become OA approved, a country must have regulations or standards governing fur production in force.[472] No specific requirements for these standards are stipulated. The standards do not need to be legally binding and, in some cases, unenforceable codes of practice developed and administered by the fur industry are considered to be adequate for a country to be OA approved.[473]

Approved countries for fur from farmed mink and foxes include:[474]

- All EU Member States;
- Other European countries that have incorporated the Council of Europe Recommendations into national legislation or codes of practice;
- USA and Canada, where codes of practice are in place.

OA-approved countries generally allow mink and foxes to be farmed in standard cage production systems, with inherently low welfare potential *(**see Section 5**)*. The OA label is likely to be misleading as most consumers would not consider these conditions to be consistent with the scheme's claims of humane treatment of animals *(**see Section 6.2**)*.

6.2 Public opinion on fur

Recent opinion polls indicate that the majority of European citizens in ten countries polled over the past decade, including in countries with substantial fur production, is opposed to the farming of animals for fur in cages ***(see Table 6.1)***. Some polls have asked whether fur farming should be banned and others have asked specifically about farming of animals for fur in current production systems using cages. In all cases, the majority is in favour of a ban or is opposed to current farming systems using cages.

Table 6.1. Summary of opinion poll findings over the past decade regarding views on fur in European countries.

Country	Opinion poll	Key findings
Austria	Survey of 1000 individuals (aged ≥14) conducted by Integral (commissioned by Vier Pfoten) in March-April 2013.[475]	**81%** think the rearing and killing of animals for the production of fur for the fashion industry is not justified (16% think it is justified).
Belgium	Survey of 1000 Flemish individuals (aged ≥18) conducted by IPSOS (commissioned by GAIA) in March-April 2015.[476]	**84%** are in favour of a ban on the keeping and breeding of animals for fur production (an earlier 2012 survey, representative of the population of the whole of Belgium, found similar results, with **86%** in favour of a ban[477]).
Croatia	Survey of 1000 individuals (aged ≥16) conducted by SPEM Communication Group Zagreb (commissioned by Animal Friends) in October 2006.[478]	**74%** agree that breeding animals for fur should be banned (12% disagree; 14% don't know).
Czech Republic	Survey of 1062 individuals (aged ≥15) conducted by CVVM (commissioned by Svobodu zvířat) in May 2013.[479]	**68%** are in favour of a ban on fur farming (23% are not in favour, 9% don't know).
Estonia	Survey of 1000 individuals (aged 15-74) conducted by Saar Poll LLC (commissioned by Loomus) in March 2014.[480]	**59%** do not support raising wild animals on fur farms for the sole purpose of producing fur; **81%** think that fur farming activities as currently practised in Estonia are not justified (one quarter of respondents support a ban on fur farming; 55% believe there should be more stringent standards for the animals' living conditions; 12% think fur farms should continue to operate as they do currently).
Italy	Survey of 1042 individuals (aged ≥18) conducted by Eurispes between December 2013 and January 2015.[481]	**91%** are opposed to activities linked to the production of fur using animals.
Norway	Survey of >1000 individuals (aged ≥18) conducted by Clint (commissioned by Dyrevernalliansen) in September 2014.[482]	**68%** think it is wrong to farm animals in cages for fur production (15% think it is right; 17% do not know).
Poland	Survey of 1102 individuals (aged ≥18) conducted by Instytut Badań Rynkowych i Społecznych (IBRiS) Homo Homini (commissioned by Otwarte Klatki) in February 2014.	**55%** think the breeding of animals for fur should be banned (38% think it should not be banned; 7% do not know).
Sweden	Survey of 1000 individuals (aged 15-89) conducted by Demoskop (commissioned by Djurens Rätt) in March 2014.[483]	**78%** do not think it should be allowed to breed mink in cages for the production of fur (17% think it should be allowed; 5% do not know).
UK	Survey of 2081 individuals (aged ≥18) conducted by YouGov (commissioned by Four Paws) in January 2014.[484]	**74%** think the use of animals for the production of fur for the fashion industry is wrong (9% think it is right; 17% do not know.

Section 6 summary

The fur industry's 'Origin Assured' labelling scheme does not stipulate any specific production standards and unenforceable industry codes of practice are sufficient for a country to be 'Origin Assured'. The 'Origin Assured' label is used on fur produced in small wire cages, which have inherently low welfare potential and are opposed by the majority of European citizens. Most consumers would not consider these conditions to be consistent with the scheme's claims of humane treatment.

The majority of European citizens recently polled in ten countries, including countries with substantial fur production, is opposed to the farming of animals for fur in cages. A number of European countries have already implemented bans and there is widespread support for a ban at EU level.

7: Is Welfur able to address the major welfare issues affecting mink and foxes farmed for fur in Europe?

The 'WelFur' project was launched by the European Fur Breeders' Association (EFBA) in 2009 to develop on-farm welfare assessment protocols for mink and foxes. These protocols have been published and in 2015 were being trialled on fur farms in ten European countries, with full implementation of the assessments planned for 2016.[485] The assessments are intended to be carried out in three separate periods during the production cycle: adults prior to mating (period one), adult females and young between mating and weaning (period two), and adults and juveniles between weaning and pelting (period three). The scores from the three periods are combined to give an overall classification for the farm. It is proposed that assessment visits should be made in all three periods during the first year and then one visit per year thereafter, with a different period being assessed each year.

The measures used in the WelFur protocols to assess the welfare of mink and foxes are summarised in Table 7.1. Around half of the measures are animal-based and around half are input-based.

Table 7.1. WelFur: 4 Principles, 12 Criteria and welfare measures for farmed mink and foxes, with classification into animal-based (AN) and input-based (IN) measures.[486,487,488]

4 Principles / 12 Criteria	Welfare measures
I. Good feeding	
Absence of prolonged hunger	***Both:*** Body condition score (AN)
Absence of thirst	***Both:*** Continuous water availability (IN)
II. Good housing	
Comfort around resting	***Fox:*** Cleanliness of the fur (AN) / Availability of a platform (IN) ***Mink:*** Access to a next box (IN) / Resting quality of the nest box/resting area (IN)
Thermal comfort	***Both:*** Protection from exceptional weather conditions (IN) ***Mink:*** Nest box material and bedding/nesting material (IN)
Ease of movement	***Both:*** Space available for moving (area and height) (IN)
III. Good health	
Absence of injuries	***Both:*** Skin lesions and/or other observed injuries to the body (AN) ***Fox:*** Difficulties in moving (AN)
Absence of disease	***Both:*** Mortality (AN) / Obviously sick animals (AN) / Diarrhoea (AN) ***Fox:*** Bent feet (AN) / Ocular inflammation (AN) / Impaired mouth and teeth health (AN)/ Urinary tract infection (AN) ***Mink:*** Lameness or impaired movement (AN)
Absence of pain induced by management procedures	***Fox:*** Killing method (IN) ***Mink:*** Killing methods for pelting of mink (IN) / Killing methods for individual mink (IN)
IV. Appropriate behaviour	
Expression of social behaviours	***Both:*** Social housing (IN) ***Mink:*** Age and procedures at weaning (IN)
Expression of other behaviours	***Both:*** Opportunity to use enrichment (IN) / Stereotypic behaviour (AN) / Fur chewing (AN) ***Fox:*** Opportunity to observe surroundings (IN)
Good human animal relationship	***Fox:*** Feeding test (AN) ***Mink:*** Temperament test (included below) (AN)
Positive emotional state	***Both:*** Temperament test (stick test) (AN) ***Fox:*** Transportation of live foxes (IN) ***Mink:*** Frequency and duration of handling and transportation (IN)

It is beyond the scope of this report to give a detailed critique of the WelFur protocols. However, in this section we will highlight some specific examples and general issues of concern to show that the WelFur protocols:

- have been **specifically designed around the very serious limitations of current housing systems** and generally reward the *status quo*, even where this is known to compromise welfare, rather than encouraging the development of systems with the potential to provide a higher level of welfare;
- do not adequately penalise practices that **fail to meet existing minimum standards** set out in the Council of Europe Recommendations;
- do not address **inhumane handling and killing methods** and the lack of training for all personnel carrying out killing of fur animals;
- downplay the importance of **serious injuries** that are associated with extreme suffering;
- will underestimate the true levels of **mortality and stereotypies**;
- use **inadequate measures** of hunger, human-animal relationships and positive mental states;
- **will not achieve WelFur's stated aims** of ensuring 'a high level of animal welfare' on fur farms and functioning as 'the new scientific reference' for fur-farmed species;
- use complex scoring systems to combine different welfare measures into a single category indicating the overall welfare level, which may allow high scores on some elements to **mask serious failings** on others;
- do not take account of societal concerns and **score welfare only up to a ceiling of 'best current practice'**;
- would be **misleading** if used as the basis for a labelling system.

How does WelFur differ from Welfare Quality?

WelFur was modelled on the European Commission's 'Welfare Quality' project, which developed welfare assessment protocols for cattle, pigs and poultry.

The Welfare Quality project aimed to develop a new way of assessing farm animal welfare that is scientifically rigorous and reflects broader public concerns. Social scientists worked alongside animal scientists to gain a deeper understanding of societal concerns about farm animal welfare.[489] In general, members of the public reacted very positively to the approach to farm animal welfare proposed by animal scientists working on the Welfare Quality project. However, there were some important differences in the concerns and attitudes of scientists and citizens. For example, focus groups and citizen jury participants tended to focus on positive aspects of welfare, such as positive emotions and freedom to move, whereas the criteria proposed by the scientists tended to focus on the avoidance of negative aspects of welfare, such as pain and suffering. Due in part to the high relevance of positive aspects of animal welfare for European citizens, it was decided to include 'positive emotional state' as one of the 12 criteria and to use Qualitative Behavioural Assessment (QBT) as a possible way of assessing it.[490]

This type of engagement with the wider public is important to ensure that welfare assessment provides the sort of information consumers and society in general seek, to enable informed decisions to be made regarding animal welfare. Fraser *et al.* state:[491] "Scientific research on 'animal welfare' began because of ethical concerns over the quality of life of animals, and the public looks to animal welfare research for guidance regarding these concerns. The concept of animal welfare used by scientists must relate closely to these ethical concerns if the orientation of the research and the interpretation of the findings is to address them successfully."

The reason given for not involving social scientists in the fur industry's WelFur project was:[492] "This situation is particular and mainly due to the fact that there is a polarisation of views when addressing the welfare of fur animals." Public surveys were carried out to identify the public's concerns but, instead of allowing public opinion to feed into the design of the WelFur protocols, the European fur farming sector will respond to public concerns by introducing "an Ethical Charter in order to assure the public that consistent ethical consideration is integrated with European fur production."[493] So the fur industry is dictating its own views on the acceptability of fur to the public rather than acting on society's concerns regarding the welfare of animals farmed for fur.

The WelFur protocols do not include QBT to assess positive mental states in fur animals. An alternative might be to observe the occurrence of play behaviour, as this is likely to be associated with a positive mental state. Instead, the WelFur protocols use measures of temperament and the frequency/duration of handling and transport of fur animals which, while undoubtedly important and potentially worthy of assessment, are of dubious value as indicators of positive mental states. Indeed, an explorative response to a stick used in the temperament test may even be an indicator of a state of boredom, since this would be expected to increase interest in diverse stimuli.[494] The 'stick test' is a relatively insensitive test of fear reactions *(**see Section 4.2**)* that is only suitable for use on fearful populations of mink,[495] so the very fact that the test can be applied suggests that the animals are in general highly fearful, even if there are differences between individuals. A more sensitive test, such as the 'hand catch test', would give a more realistic assessment of fear responses. The other measures, relating to handling and transportation, are also clearly looking at events that are associated with negative, rather than positive, mental states. It is very telling that the WelFur protocols are not able to include a measure of positive mental states, instead using (rather insensitive) measures of negative mental states. It is of course difficult to measure something that is very rarely observed.

Temperament tests are more suitable as measures of the human-animal relationship and they are also used for this purpose in the WelFur protocols but, again, more sensitive tests than the 'stick test' for mink and the 'feeding test' for foxes (which looks at whether the fox will eat in the presence of an observer) would give a more accurate assessment of fear/avoidance.

With the Welfare Quality protocols, the overall scores for each of the four welfare Principles are used to assign a farm to one of four welfare categories as follows:[496]

- **Excellent:** the welfare of animals is of the highest level;
- **Enhanced:** the welfare of animals is good;
- **Acceptable:** the welfare of animals is above or meets minimal requirements;
- **Not classified:** the welfare of animals is low and considered unacceptable.

With WelFur, these categories have been amended as follows:[497,498]

- **Best current practice;**
- **Good current practice;**
- **Acceptable current practice;**
- **Unacceptable current practice.**

The Welfare Quality protocols can be used to assess animal welfare in a range of farming systems, with varying potential to provide high standards of welfare. An important use of the Welfare Quality assessment system is as a research tool to evaluate farming systems and practices.[499] The WelFur protocols, by contrast, have been developed for use in the only housing system currently used commercially for mink and foxes: small wire cages. This housing system severely limits opportunities to perform highly-motivated behaviours and can therefore be considered to have low welfare potential *(**see Section 5**)*. **Since 'best current practice' involves the use of a farming system with low welfare potential, even the farms that score highest on the WelFur protocols will be providing a standard of welfare that most people would not consider to be acceptable. In contrast with the other species covered by Welfare Quality, alternative systems with the potential for higher levels of welfare do not exist for mink and foxes.**

Will WelFur ensure a 'high level of animal welfare' for farmed mink and foxes?

The European Fur Breeders' Association (EFBA) claims that WelFur will guarantee a high level of animal welfare:[500] "The objective of the WelFur program is to set a general certification protocol at European farm level, which will guarantee a high level of animal welfare on our fur farms." As discussed in the previous section, the 'best current practice' ceiling for the classification of farms using the WelFur protocol means that, in absolute terms, welfare is likely to be extremely poor even on farms that score highly.

Some examples are highlighted below to illustrate some key areas of concern which suggest that the WelFur project will not guarantee "a high level of animal welfare."

The WelFur protocols have been specifically designed around the very serious limitations of the standard cage housing system. This report has shown that there are numerous insurmountable problems in cages *(**see Section 5**)*. The animals are highly motivated to access resources that it is impossible or impractical to provide in cages. Family and group housing systems, which would provide a more socially-enriched environment for mink and foxes, are generally avoided because overcrowding leads to aggression and injuries. Rather than acknowledging these fundamental problems, the WelFur protocols simply reward the *status quo*. For example, both early (before eight weeks) and late (after eight weeks) weaning are penalised in the WelFur protocol for mink. Later weaning or housing in family groups through to pelting is likely to have considerable benefits for both mothers and kits, provided they are housed in systems with sufficient space and enrichment, but the WelFur protocol discourages the development of such systems. In this way, practices that are known to compromise welfare are awarded optimum scores by the WelFur protocols, simply because the problem cannot be solved in current housing systems.

The WelFur protocols do not address the inhumane handling and killing methods and lack of training for all personnel carrying out killing of fur animals highlighted in Section 5.2 of this report. The use of neck-tongs was originally included in the fox protocol[501] but the current version does not address this important issue, despite the routine use of neck-tongs being in contravention of the Council of Europe Recommendations. The mink protocol does not penalise the use of killing methods that have been condemned as unacceptable on welfare grounds (e.g. gassing of mink with carbon dioxide or carbon monoxide from exhaust gases).

The use of body condition scoring is likely to be a poor indicator of the subjective experience of hunger in animals that are deliberately bred to be obese and then restrictively fed to prepare them for breeding *(**see Section 4.2**)*. It is possible for an animal being fed restrictively to be of normal weight, or even overweight, and simultaneously be experiencing hunger. Furthermore, mink and foxes can be classified as 'thin' during certain observation periods and still be given the best available score by the WelFur protocols.

Measures of mortality exclude early mortality (before eight weeks for foxes[502] and before a fixed date of 15th May for mink[503]). Accurate assessment of early mortality may be challenging. However, in not even attempting to assess mortality until after this extended period, the WelFur protocols are likely to exclude the majority of mortality on most farms. This means that WelFur fails to

make any attempt to quantify levels of infant mortality and infanticide and therefore will not facilitate progress in addressing this important welfare issue, which is an indicator of stress in vixens *(**see Section 5.4**)*. In contrast, the Welfare Quality protocol for pigs[504] includes mortality of young piglets (excluding stillborn animals) and the protocol for broiler (meat) chickens[505] includes mortality from placement of the chicks (i.e. usually at one day of age). The Welfare Quality criteria are therefore likely to give a much better assessment of mortality across the whole production period.

The WelFur protocols specifically instruct assessors to avoid observing stereotypic behaviour when the animals can hear the sound of the feeding machine. Stereotypies are most likely to be performed at this time.[506] Avoiding this time may help to standardise the protocols but it will underestimate the true extent of stereotypies. Animals may also stop stereotyping in response to the presence of an observer, which will further contribute to an underestimation of the true level.

The WelFur protocols make little attempt to encourage progress in animal welfare beyond the minimum legal requirements already in place. In many cases the best available score for a criterion is awarded simply for meeting the Council of Europe Recommendations, which should be incorporated into the national legislation of all countries that are signatories to the European Convention for the Protection of Animals kept for Farming Purposes. For example, the Council of Europe Recommendations stipulate a minimum floor area for mink of 2550cm^2.[507] In the WelFur protocol for mink,[508] providing an area of 2550cm^2 scores the best available score. Providing 1000cm^2 (i.e. less than 40% of the minimum requirement) is awarded an intermediate score. The worst score is reserved for cages providing even less than this amount. There is no attempt here to encourage progress beyond already existing minimum standards and the assessment protocol appears to condone practices that breach minimum standards by a substantial margin.

The WelFur protocols appear to downplay serious welfare problems on European fur farms. For example, when scoring injuries, very severe injuries, such as the loss of a limb, are only given an intermediate score if the wound has healed. Such injuries in farmed mink and foxes are often self-inflicted and are associated with extremely poor welfare. It might seem inconceivable to most people that an animal whose welfare has been compromised to such an extent that it has chewed off its own limb, even if the wound has since healed, should be given anything other than the worst available score in recognition of this clear indication of extreme suffering.

With any welfare assessment protocol that seeks to combine different welfare measures into a single category indicating the overall welfare level on the farm, especially where complex calculations may obscure the findings on individual measures, there is a danger that high scores on some elements may mask serious failings on others. In combining the scores for different aspects in the WelFur protocols, minimum scores for all sections are imposed for each category. For example, to attain 'best current practice', a farm must score more than 80 out of 100 on two Principles and at least 55 out of 100 on all Principles (with a tolerance of 5%, so in effect 50% is sufficient). However, there are several Criteria within each Principle, so it is still possible for a poor score on one Criterion to be masked by good scores on others within that Principle. In this way, very serious welfare failings may not unduly affect the overall score, especially if those failings are scored too leniently to start with as in the example, given in the previous paragraph, of very serious injuries that have healed.

Broom emphasises:[509] "Since individuals vary in the methods which they use to cope with difficult conditions [...] ***any single indicator can show that welfare is poor."*** For this reason, a very poor score on any single Criterion should be sufficient to classify a farm as having an unacceptable level of welfare. Webster *et al.* [510] highlighted a "serious limitation of Quality Assurance schemes that seek to encompass many different elements of welfare into a single index that ranks overall welfare as acceptable or unacceptable. Specific farms [have] specific welfare problems and these [require] specific solutions."

Time constraints mean that generally only a small proportion of the animals on a farm can be included in the assessments, which may not necessarily be representative of the welfare of other animals on the farm.

Can WelFur be considered 'the new scientific reference' on fur-animal welfare?

The EFBA claims that WelFur will function as the new scientific reference for fur-farmed species:[511] "All existing scientific research about animal welfare for mink and fox has been reviewed for the WelFur protocols. As such the WelFur protocols function as the new scientific reference for fur farmed species."

While the existing scientific research may have been reviewed, the protocols themselves are necessarily constrained by the need to be able to carry out the assessments in a short period of time. The WelFur assessments are intended to be performed within approximately 5-7 hours.[512] Therefore, only welfare measures which can be performed quickly on-farm can be included. Wechsler states:[513] "A specific problem of on-farm animal welfare assessment is that there is often not enough time to collect sufficient data to make a judgement about the occurrence of normal behaviour."

This means that the protocols cannot be considered as a reference for the much larger body of more in-depth research carried out over longer periods of time, which has highlighted a great deal about the welfare problems on Europe's fur farms. The findings of this more detailed research must be considered in any decisions regarding

legislation and policy on fur farming and in informing public opinion.

There is always a danger that on-farm welfare assessments, which are necessarily limited in scope by time and technology constraints, may not reflect the findings of more detailed research carried out over longer periods of time and using technologies and techniques that cannot be applied in rapid on-farm assessments. Bracke stresses:[514] "selection of even the best animal-based parameters that have conventionally been used in experiments could have unacceptable consequences. Systems that are generally considered to be poor welfare systems may generate unacceptably high welfare scores. The monitoring systems could fail to match basic intuitions in society and the scientific community. In order to avoid this problem, available knowledge, e.g. about animal motivation derived from consumer demand studies and knowledge about the natural behaviour of animals, should be used explicitly in welfare assessment. This requires making inferences from knowledge about the relationships between environment-based and animal-based parameters using standard operating procedures. The on-farm measurement of animal-based parameters may be regarded as the measurement of critical control points, which must be compared and reconciled with predictions based on available scientific knowledge."

Mink and foxes are highly motivated to access resources and perform species-specific behaviours that are not possible in current housing systems. Because the protocols are designed around the very serious limitations of current systems, WelFur fails to take account of the clear evidence in the scientific literature that the needs of the animals are not being met.

Could WelFur improve transparency in fur labelling?

The EFBA states:[515] "WelFur is a certification program for European fur farms but unfortunately WelFur does not exist as a consumer label at the moment [...] It is the ambition of the European Fur Breeders' Association that a WelFur label will be developed in the future."

The WelFur logo includes the words "good feeding," "good housing," "good health" and "appropriate behaviour." If such a logo were to be used on consumer products, it would clearly imply that the welfare of the animals used in the production of the product was good and that they were able to behave appropriately.

However, all farmed fur is currently produced in systems that have inherently low welfare potential and do not allow 'appropriate' behaviour. Scientific research clearly demonstrates that the cage environment prevents the performance of highly-motivated behaviours and is associated with abnormal behaviours and aversive mental states *(see Section 5)*. **Most people do not consider that cages provide a 'good' standard of welfare and therefore a label which implied that this was the case would be misleading for consumers. Therefore, labelling based on WelFur would not address the serious inadequacies in the current 'Origin Assured' labelling system.**

Section 7 summary

The WelFur protocols have been specifically designed around the very serious limitations of current housing systems and generally reward the *status quo*, even where this is known to compromise welfare, rather than encouraging the development of systems with the potential to provide a higher level of welfare. The protocols: do not adequately penalise practices that fail to meet existing minimum standards set out in the Council of Europe Recommendations; do not address inhumane handling and killing methods and the lack of training for all personnel carrying out killing of fur animals; downplay the importance of serious injuries that are associated with extreme suffering; will underestimate the true levels of mortality and stereotypies; and use inadequate measures of hunger, human-animal relationships and positive mental states.

With any welfare assessment protocol that seeks to combine different welfare measures into a single category indicating the overall welfare level on the farm, especially where complex calculations may obscure the findings on individual measures, there is a danger that high scores on some elements may mask serious failings on others.

Unlike the original Welfare Quality project, public opinion has not been taken into account in constructing the protocols. The 'best current practice' ceiling makes the WelFur scores of limited value and potentially misleading because 'best current practice' still represents what the majority of people would consider to be an unacceptable level of welfare. In contrast with the other species covered by Welfare Quality, alternative systems with the potential for higher levels of welfare do not exist for mink and foxes.

WelFur is not able to address the major welfare issues for mink and foxes farmed for fur, nor the serious inadequacies in current labelling and regulation.

8: Conclusions and recommendations

It is possible to breed domesticated silver foxes within relatively few generations when very stringent selection criteria are used. These animals actively seek human attention and are easy to handle. Domestication of mink is also possible and preliminary research suggests that it may be possible to breed domesticated blue foxes, but this has not been pursued to any great extent. **Mink and foxes on European fur farms are not domesticated. These animals are fearful of humans and are fundamentally unsuitable for farming. Changes in the pigmentation and quality of the coat, characteristic of domesticated animals, are incompatible with the fur industry's demands, where the focus is on breeding for pelt colour, size and quality. The needs of undomesticated animals cannot be met in any farming system.**

Neck tongs continue to be used routinely on fur farms for capture and restraint of foxes, in contravention of the Council of Europe Recommendations. Some commonly used methods for killing mink (carbon dioxide or carbon monoxide from exhaust gases) have been condemned as inhumane in reviews of the scientific evidence. Unlike for other farmed species, there is currently no requirement for training or certificates of competence for all personnel killing fur animals. **WelFur does nothing to address the issues of inhumane handling and killing methods**.

As we have shown, the welfare of mink and foxes farmed for fur is seriously compromised in current farming systems, which fail to satisfy all five of the 'Five Freedoms' and do not provide a 'Life worth Living'. Levels of fear, stereotypic behaviour, fur-chewing/tail-biting, physical deformities (bent feet), and reproductive failure/infant mortality clearly indicate that the needs of mink and foxes on fur farms are not being met. Mink and foxes are highly motivated to access resources and perform species-specific behaviours that are not possible in current housing systems. There is no evidence that domestication results in loss of behaviours from the species repertoire. **Therefore, even if domesticated animals were to be used for fur production, their needs could not be met in current housing systems.**

The WelFur protocols have been specifically designed around the very serious limitations of current housing systems and generally reward the *status quo*, even where this is known to compromise welfare, rather than encouraging the development of systems with the potential to provide a higher level of welfare. The protocols do not adequately penalise practices that fail to meet existing minimum standards set out in the Council of Europe Recommendations.

Unlike the original Welfare Quality project, public opinion has not been taken into account in constructing the WelFur protocols. **The 'best current practice' ceiling makes the WelFur scores of limited value and misleading because 'best current practice' still represents what the majority of people would consider to be an unacceptable level of welfare. Unlike the other species covered by Welfare Quality, alternative systems with the potential for higher levels of welfare do not exist for mink and foxes.**

The 'Origin Assured' label is being used on fur produced in small wire cages, which have inherently low welfare potential and are opposed by the majority of European citizens. The label is likely to be misleading as most consumers would not consider these conditions to be consistent with the scheme's claims of humane treatment of animals. A labelling scheme based on WelFur would do nothing to improve this situation. A labelling system modelled on the US system would provide clear, objective information for consumers.

SCAHAW recommends: **"Since current husbandry systems cause serious problems for all species of animals reared for fur, efforts should be made for all species to design housing systems which fullfill [sic] the needs of the animals."** Carnivores that roam over a large territory in the wild are more likely to display evidence of stress and psychological dysfunction in captivity, including high rates of stereotypical pacing and infant mortality. Clubb and Mason advise that **"the keeping of naturally wide-ranging carnivores should be either fundamentally improved or phased-out."**

The current regulatory framework for the protection of fur animal welfare in the European Union is inadequate. WelFur is not able to address the major welfare issues for mink and foxes farmed for fur, the issues associated with inhumane handling and slaughter methods, or the serious inadequacies in current labelling and regulation.

Enrichment of existing housing systems is not sufficient to address the serious welfare problems inherent in cage systems. The use of undomesticated animals by the fur industry means that fear of humans and difficulties in handling and management would present insurmountable obstacles to the adoption of more extensive systems. It is therefore impossible for the needs of mink and foxes to be met by the fur industry. A ban is the only viable solution to the serious welfare concerns highlighted in this report.

The farming of mink and foxes for fur should be prohibited in accordance with Council Directive 98/58/EC: "No animal shall be kept for farming purposes unless it can reasonably be expected, on the basis of its genotype or phenotype, that it can be kept without detrimental effect on its health or welfare" and the Council of Europe Recommendation Concerning Fur Animals: "No animal shall be kept for its fur if: a. the conditions of this Recommendation cannot be met, or if b. the animal belongs to a species whose members, despite these conditions being met, cannot adapt to captivity without welfare problems."

The majority of European citizens recently polled in ten countries, including countries with substantial fur production, is opposed to the farming of animals for fur in cages. A number of European countries have already implemented bans and there is widespread support for a ban at EU level.

References

1 IFF (2015) *New production figures show the growth of the global fur trade.* International Fur Federation 25 March 2015. **http://www.wearefur.com/latest/news/new-production-figures-show-growth-global-fur-trade** (accessed 29.05.15).

2 EFIC (2014) *The WelFur programme spreads to 10 European countries in 2015.* European Fur Information Center, 7 October 2014. **http://www.furinformation center.eu/news/the-welfur-programme-spreads-to-10-european-countries-in-2015.aspx** (accessed 29.05.15).

3 EFBA (undated) *WelFur – The animal welfare project on fur farmed species: Overview.* European Fur Breeders' Association. **http://www.efba.eu/welfur/index.html** (accessed 29.05.15).

4 IFF (undated) *Fur farming and trapping.* International Fur Federation. **http://www.wearefur.com/about-fur/fur-farming-and-trapping** (accessed 01.06.15).

5 *Op. Cit.* IFF (2015).

6 IFF (undated) *About.* International Fur Federation. **http://www.wearefur.com/our-trade/about-the-fur-trade** (accessed 29.05.15).

7 Yuan, M. (2015) Fur trading shows no signs of slowing down in Asia. *Forbes*, 30 April 2015. **http://www.forbes.com/sites/myuan/2015/04/30/fur-trading-shows-no-signs-of-slowing-down-in-asia/** (accessed 01.06.15).

8 Fur Europe (2015) *Annual Report 2014.* Fur Europe, Brussels, Belgium.

9 *Op. Cit.* IFF (2015).

10 EFBA (2012) *Annual Report 2011.* **http://www.efba.eu/download/annual_report/2011/index.html** (accessed 01.06.15).

11 Anon. (2015) Official statistics key to China's fur farming industry. *China Daily USA*, 20 August 2015. **http://usa.chinadaily.com.cn/business/2015-08/20/content_21659736.htm** (accessed 24.10.15)

12 *Op. Cit.* IFF (2015).

13 USDA (2014) *Mink (July 2014).* National Agricultural Statistics Service (NASS), Agricultural Statistics Board, United States Department of Agriculture (USDA). **http://www.furcommission.com/wp-content/uploads/2014/07/NASSmink0714.pdf** (accessed 01.06.15).

14 Statistics Canada (2014) Table 003-0015 - Supply and disposition of mink and fox on fur farms, annual. *CANSIM* (database) (accessed 01.06.15).

15 *Op. Cit.* IFF (2015).

16 Council Directive 98/58/EC of 20 July 1998 concerning the protection of animals kept for farming purposes. *Official Journal*, L221/23, 08.08.98. **http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31998L0058&from=EN** (accessed 02.06.15).

17 Council of Europe (1999) *Recommendation Concerning Fur Animals*, adopted by the Standing Committee of the European Convention for the Protection of Animals kept for Farming Purposes on 22 June 1999. **http://www.coe.int/t/e/legal_affairs/legal_co-operation/biological_safety_and_use_of_animals/farming/Rec%20fur%20animals%20E%201999.asp** (accessed 02.06.15).

18 SCAHAW (2001) *The Welfare of Animals Kept for Fur Production.* Report of the Scientific Committee on Animal Health and Animal Welfare adopted on 12-13 December 2001. **http://ec.europa.eu/food/animal/welfare/international/out67_en.pdf** (accessed 02.06.15).

19 Council Regulation (EC) No 1099/2009 of 24 September 2009 on the protection of animals at the time of killing. *Official Journal* L303/1, 18.11.09. **http://ec.europa.eu/food/animal/welfare/slaughter/docs/regulation_1099_2009_en.pdf** (accessed 02.06.15).

20 Council Regulation (EC) No 1/2005 of 22 December 2004 on the protection of animals during transport and related operations and amending Directives 64/432/EEC and 93/119/EC and Regulation (EC) No 1255/97. *Official Journal*, L3/1, 05.01.05. **http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32005R0001** (accessed 02.06.15).

21 Regulation (EC) No 1523/2007 of the European Parliament and of the Council of 11 December 2007 banning the placing on the market and the import to, or export from, the Community of cat and dog fur, and products containing such fur. *Official Journal*, L343/1, 27.12.07. **http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32007R1523&from=EN** (accessed 02.06.15).

22 Regulation (EC) No 1007/2009 of the European Parliament and of the Council of 16 September 2009 on trade in seal products. *Official Journal*, L286/36, 31.10.09. **http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009R1007&from=EN** (accessed 02.06.15).

23 Commission Regulation (EU) No 737/2010 of 10 August 2010 laying down detailed rules for the implementation of Regulation (EC) No 1007/2009 of the European Parliament and of the Council on trade in seal products. *Official Journal*, 216/1, 17.08.10. **http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010R0737&from=EN** (accessed 02.06.15).

24 De Rechtspraak (2015) Judgement, case number 200 150 279/01, 10 November 2015. Court of the Hague, The Netherlands. **http://deeplink.rechtspraak.nl/uitspraak?id=ECLI:NL:GHDHA:2015:3025** (accessed 11.11.15).

25 Fraser, D. (2003) Assessing animal welfare at the farm and group level: The interplay of science and values. *Animal Welfare*, 12: 433-443.

26 Broom, D.M. (1986) Indicators of poor welfare. *British Veterinary Journal*, 142: 524.

27 Mendl, M. (2001) Assessing the welfare state. *Nature*, 410: 31-32.

28 Duncan, I.J.H. (1993) Welfare is to do with what animals feel. *Journal of Agricultural and Environmental Ethics*, 6 (Suppl. 2): 8-14.

29 Webster, J. (2005) *Animal Welfare: Limping towards Eden*. Blackwell, Oxford, UK.

30 Dawkins, M.S. (2004) Using behaviour to assess animal welfare. *Animal Welfare*, 13: S3-7.

31 Rollin, B.E. (2006) *Animal Rights & Human Morality*. Third edition. Prometheus Books, New York.

32 Dawkins, M.S. (1990) From an animal's point of view: Motivation, fitness, and animal welfare. *Behavioural and Brain Sciences*, 13: 1-61.

33 Brambell, F.W. Rogers (1965) *Report of the Technical Committee to Enquire into the Welfare of Animals kept under Intensive Livestock Husbandry Systems* (the Brambell Report). December 1965. HMSO, London, UK.

34 FAWC (1992) FAWC updates the Five Freedoms. *Veterinary Record*, 131: 357.

35 Botreau, R., Veissier, I. and Perny, P. (2009) Overall assessment of animal welfare: Strategy adopted in Welfare Quality. *Animal Welfare*, 18: 363-370.

36 FAWC (2009) *Farm animal welfare in Great Britain: Past, present and future.* October 2009. Farm Animal Welfare Council, London, UK.

37 Clubb, R. and Mason, G. (2003) Captivity effects on wide-ranging carnivores. *Nature*, 425: 473-474.

38 Hall, E.R. (1981) cited in: Lariviere, S. (1999) *Mustela vison*. *Mammal Species*, no. 608: 1-9. American Society of Mammalogists.

39 Lowery, G.H.Jr. (1974) cited in: Lariviere, S. (1999) *Mustela vison*. *Mammal Species*, no. 608: 1-9. American Society of Mammalogists.

40 *Op. Cit.* SCAHAW (2001).

41 Williams, T.M. (1983) Locomotion in the North American mink, a semi-aquatic mammal. II. The effect of an elongate body on running energetics and gait patterns. *Journal of Experimental Biology*, 105: 283-295.

42 Lariviere, S. (1996) The American mink, *Mustela vison*, (Carnivora, Mustelidae) can climb trees. *Mammalia*, 60: 485-486.

43 Peterson, R.L. (1966) cited in: Lariviere, S. (1999) *Mustela vison. Mammal Species*, no. 608: 1-9. American Society of Mammalogists.

44 *Op. Cit.* SCAHAW (2001).

45 *Op. Cit.* SCAHAW (2001).

46 Dunstone, N. And Birks, J.D.S. (1985) cited in: Lariviere, S. (1999) *Mustela vison. Mammal Species*, no. 608: 1-9. American Society of Mammalogists.

47 Lariviere, S. (1999) *Mustela vison. Mammal Species*, no. 608: 1-9. American Society of Mammalogists.

48 *Op. Cit.* SCAHAW (2001).

49 *Op. Cit.* Lariviere, S. (1999).

50 Zuberogoitia, I., Zabala, J. and Martinez, J.A. (2006) Diurnal activity and observations of the hunting and ranging behaviour of the American mink *(Mustela vison)*. *Mammalia*, 310-312.

51 Wellman, S.T. and Haynes, J.M. (2009) Diel activity patterns of Mink, *Neovison vison*, change with habitat. *Canadian Field-Naturalist*, 123: 368–370.

52 Arnold, T.W. and Fritzell, E.K. (1987) cited in: Lariviere, S. (1999) *Mustela vison. Mammal Species*, no. 608: 1-9. American Society of Mammalogists.

53 *Op. Cit.* SCAHAW (2001).

54 *Op. Cit.* Lariviere, S. (1999).

55 *Op. Cit.* Lariviere, S. (1999).

56 *Op. Cit.* SCAHAW (2001).

57 *Op. Cit.* SCAHAW (2001).

58 *Op. Cit.* Lariviere, S. (1999).

59 Mason, G.J. (1994) The influence of weight, sex, birthdate and maternal age on the growth of weanling mink. *Journal of Zoology, London*, 233: 203-214.

60 *Op. Cit.* SCAHAW (2001).

61 Mitchell, J.L. (1961) Mink movements and populations on a Montana river. *Journal of Wildlife Management*, 25: 48-54.

62 *Op. Cit.* SCAHAW (2001).

63 Voigt, D.R. (1987) cited in: Lariviere, S. and Pasitschniak-Arts, M. (1996) *Vulpes vulpes. Mammalian Species*, no. 537: 1-11. American Society of Mammalogists.

64 *Op. Cit.* SCAHAW (2001).

65 Butler, L. (1945) Distribution and genetics of the color phases of the red fox in Canada. *Genetics*, 30: 39-50.

66 Schipper, J., Chanson, J.S., Chiozza, F. *et al*. (2008) The status of the world's land and marine mammals: diversity, threat, and knowledge. *Science*, 322: 225-230.

67 Lariviere, S. and Pasitschniak-Arts, M. (1996) *Vulpes vulpes*. *Mammalian Species*, no. 537: 1-11. American Society of Mammalogists.

68 Basuony, M, Saleh, M., Riad, A. and Fathy, W. (2005) Food composition and feeding ecology of the Red Fox *Vulpes vulpes* (Linnaeus, 1758) in Egypt. *Egyptian Journal of Biology*, 7: 96-102.

69 *Op. Cit.* SCAHAW (2001).

70 *Op. Cit.* Basuony, M, Saleh, M., Riad, A. and Fathy, W. (2005).

71 Henry, J.D. (1996) cited in: SCAHAW (2001) *The Welfare of Animals Kept for Fur Production*. Report of the Scientific Committee on Animal Health and Animal Welfare adopted on 12-13 December 2001. **http://ec.europa.eu/food/animal/welfare/international/out67_en.pdf** (accessed 02.06.15).

72 *Op. Cit.* SCAHAW (2001).

73 Servin, J. Rau, J.R. and Delibes, M. (1991) Activity pattern of the red fox *Vulpes vulpes* in Donana, SW Spain. *Acta Theriologica*, 36: 369-373.

74 Goszczynski, J. (1989) Population dynamics of the red fox in central Poland. *Acta Theriologica*, 34: 141-154.

75 Woollard, T. and Harris, S. (1990) A behavioural comparison of dispersing and non-dispersing foxes *(Vulpes vulpes)* and an evaluation of some dispersal hypotheses. *Journal of Animal Ecology*, 59: 709-722.

76 Harris, S. and Yalden, D.W. (2008) *Mammals of the British Isles: Handbook*. Fourth edition. The Mammal Society. Southampton, UK.

77 *Ibid.* Harris, S. and Yalden, D.W. (2008).

78 *Ibid.* Harris, S. and Yalden, D.W. (2008).

79 *Ibid.* Harris, S. and Yalden, D.W. (2008).

80 *Op. Cit.* SCAHAW (2001).

81 *Op. Cit.* Harris, S. and Yalden, D.W. (2008).

82 *Op. Cit.* Harris, S. and Yalden, D.W. (2008).

83 *Op. Cit.* SCAHAW (2001).

84 Lloyd, H.G. (1980) cited in: SCAHAW (2001) *The Welfare of Animals Kept for Fur Production*. Report of the Scientific Committee on Animal Health and Animal Welfare adopted on 12-13 December 2001. **http://ec.europa.eu/food/animal/welfare/international/out67_en.pdf** (accessed 02.06.15).

85 *Op. Cit.* SCAHAW (2001).

86 Harris, S. and Trewhella, W.J. (1988) An analysis of some of the factors affecting dispersal in an urban fox *(Vulpes vulpes)* population. *Journal of Applied Ecology,* 25: 409-422.

87 *Ibid.* Harris, S. and Trewhella, W.J. (1988).

88 Iossa, G., Soulsbury, C.D., Baker, P.J., Edwards, K.J. and Harris, S. (2009) Behavioral changes associated with a population density decline in the facultatively social red fox. *Behavioral Ecology*, 20: 385-395.

89 Audet, A.M., Robbins, C.B. and Lariviere, S. (2002) *Alopex lagopus*. *Mammalian Species*, no. 713: 1-10. American Society of Mammalogists.

90 *Op. Cit.* SCAHAW (2001).

91 *Op. Cit.* SCAHAW (2001).

92 *Op. Cit.* Audet, A.M., Robbins, C.B. and Lariviere, S. (2002).

93 *Op. Cit.* SCAHAW (2001).

94 *Op. Cit.* Audet, A.M., Robbins, C.B. and Lariviere, S. (2002).

95 *Op. Cit.* SCAHAW (2001).

96 Pagh, S. and Hersteinsson, P. (2008) Difference in diet and age structure of blue and white Arctic foxes *(Vulpes lagopus)* in the Disko Bay area, West Greenland. *Polar Research*, 27: 44-51.

97 *Op. Cit.* Audet, A.M., Robbins, C.B. and Lariviere, S. (2002).

98 *Op. Cit.* Audet, A.M., Robbins, C.B. and Lariviere, S. (2002).

99 *Op. Cit.* SCAHAW (2001).

100 *Op. Cit.* Audet, A.M., Robbins, C.B. and Lariviere, S. (2002).

101 *Op. Cit.* Audet, A.M., Robbins, C.B. and Lariviere, S. (2002).

102 *Op. Cit.* Audet, A.M., Robbins, C.B. and Lariviere, S. (2002).

103 Dalerum, F., Tannerfeldt, M., Elmhagen, B., Becker, D. and Angerbjorn, A. (2002) Distribution, morphology and use of Arctic fox *Alopex lagopus* dens in Sweden. *Wildlife Biology*, 8: 185-192.

104 *Op. Cit.* SCAHAW (2001).

105 *Op. Cit.* Audet, A.M., Robbins, C.B. and Lariviere, S. (2002).

106 *Op. Cit.* SCAHAW (2001).

107 *Op. Cit.* Audet, A.M., Robbins, C.B. and Lariviere, S. (2002).

108 Garrott, R.A., Eberhardt, L.E. and Hanson, W.C. (1984) Arctic fox denning behaviour in northern Alaska. *Canadian Journal of Zoology*, 62: 1636-1640.

109 *Ibid.* Garrott, R.A., Eberhardt, L.E. and Hanson, W.C. (1984).

110 *Ibid.* Garrott, R.A., Eberhardt, L.E. and Hanson, W.C. (1984).

111 *Op. Cit.* Audet, A.M., Robbins, C.B. and Lariviere, S. (2002).

112 *Op. Cit.* Audet, A.M., Robbins, C.B. and Lariviere, S. (2002).

113 *Op. Cit.* SCAHAW (2001).

114 *Op. Cit.* SCAHAW (2001).

115 Price, E.O. (1999) Behavioural development in animals undergoing domestication. *Applied Animal Behaviour Science*, 65: 245-271.

116 *Op. Cit.* SCAHAW (2001).

117 *Op. Cit.* SCAHAW (2001).

118 Kukekova, A.V., Oskina, I.N., Kharlamova, A.V., Chase, K., Temnykh, S.V., Johnson, J.L., Pivovarova, I.V., Shepeleva, D.V., Vladimirova, A., Semenova, T.I., Gulievich, R.G., Schikhevich, S.G., Graphodatsky, A.S., Aguirre, G.D., Erb, H.N., Lark, K.G., Acland, G.M. and Trut, L.N. (2008) Fox farm experiment: hunting for behavioural genes. *Вестник ВОТиС*, 12: 50-62.

119 *Op. Cit.* Price, E.O. (1999).

120 *Op. Cit.* Price, E.O. (1999).

121 *Op. Cit.* Price, E.O. (1999).

122 *Op. Cit.* Price, E.O. (1999).

123 Jensen, P. (2006) Domestication – from behaviour to genes and back again. *Applied Animal Behaviour Science*, 97: 3-15.

124 *Ibid.* Jensen, P. (2006).

125 Trut, L.N. (1999) Early canid domestication: the farm-fox experiment. *American Scientist,* 87: 160-169.

126 *Op. Cit.* Price, E.O. (1999).

127 Jensen, P., Buitenhuis, B., Kjaer, J., Zanella, A., Mormede, P. and Pizzari, T. (2008) Genetics and genomics of animal behaviour and welfare – challenges and possibilities. *Applied Animal Behaviour Science*, 113: 383-403.

128 *Op. Cit.* Council of Europe (1999).

129 *Op. Cit.* SCAHAW (2001).

130 Kukekova, A.V., Trut, L.N. and Acland, G.M. (2014) Genetics of domesticated behavior in dogs and foxes, pp361-196 in: T. Grandin and M.J. Deesing. *Genetics and the behavior of domestic animals*. Second edition. Elsevier, London, UK.

131 *Op. Cit.* SCAHAW (2001).

132 *Op. Cit.* SCAHAW (2001).

133 Trut, L.N., Plyusnina, I.Z. and Oskina, I.N. (2004) An experiment on fox domestication and debatable issues of evolution of the dog. *Russian Journal of Genetics*, 40: 644-655.

134 Statham, M.J., Trut, L.N., Sacks, B.N., Kharlamova, A.V., Oskina, I.N., Gulevich, R.G., Johnson, J.L., Temnykh, S.V., Ackland, G.M. and Kukekova, A.V. (2011) On the origin of a domesticated species: identifying the parent population of Russian silver foxes *(Vulpes vulpes)*. *Biological Journal of the Linnean Society,* 103: 168-175.

135 *Op. Cit.* Kukekova, A.V., Trut, L.N. and Acland, G.M. (2014).

136 *Op. Cit.* Kukekova, A.V., Trut, L.N. and Acland, G.M. (2014).

137 *Op. Cit.* Kukekova, A.V., Trut, L.N. and Acland, G.M. (2014).

138 Trut, L.N., Plyusnina, I.Z. and Oskina, I.N. (2004) An experiment on fox domestication and debatable issues of evolution of the dog. *Russian Journal of Genetics*, 40: 644-655.

139 *Ibid.* Trut, L.N., Plyusnina, I.Z. and Oskina, I.N. (2004).

140 *Ibid.* Trut, L.N., Plyusnina, I.Z. and Oskina, I.N. (2004).

141 *Ibid.* Trut, L.N., Plyusnina, I.Z. and Oskina, I.N. (2004).

142 *Ibid.* Trut, L.N., Plyusnina, I.Z. and Oskina, I.N. (2004).

[143] Gogoleva, S.S., Volodin, J.A., Volodina, E.V. and Trut, L.N. (2008) To bark or not to bark: vocalizations by red foxes selected for tameness or aggressiveness toward humans. *Bioacoustics – The International Journal of Animal Sound and its Recording*, 18: 99-132.

[144] Gogoleva, S.S., Volodin, I.A., Volodina, E.V., Kharlamova, A.V. and Trut, L.N. (2009) Kind granddaughters of angry grandmothers: the effect of domestication on vocalization in cross-bred silver foxes. *Behavioural Processes*, 81: 369-375.

[145] Gogoleva, S.S., Volodin, I.A., Volodina, E.V., Kharlamova, A.V. and Trut, L.N. (2010) Vocalization toward conspecifics in silver foxes *(Vulpes vulpes)* selected for tame or aggressive behavior toward humans. *Behavioural Processes*, 84: 547-554.

[146] Gogleva, S.S., Volodin, I.A., Volodina, E.V. and Kharlamova, A.V. (2011) Explosive vocal activity for attracting human attention is related to domestication in silver fox. *Behavioural Processes*, 86: 216-221.

[147] Hare, B., Plyusnina, I., Ignacio, N., Schepina, P., Stepika, A., Wrangham, R. and Trut, L. (2005) Social cognitive evolution in captive foxes is a correlated by-product of experimental domestication. *Current Biology*, 15: 226-230.

[148] Belyaev, D.K., Plyusnina, I.Z. and Trut, L.N. (1985) Domestication in the silver fox (*Vulpes fulvus* Desm): changes in physiological boundaries of the sensitive period of primary socialization. *Applied Animal Behaviour Science*, 13: 359-370.

[149] Popova, N.K., Voitenko, N.N., Kulikov, A.V. and Avgustinovich, D.F. (1991) Evidence for the involvement of central serotonin in mechanism of domestication of silver foxes. *Pharmacology, Biochemistry and Behaviour*, 40: 751-756.

[150] Popova, N.K. (2006) From genes to aggressive behavior: the role of serotonergic system. *BioEssays*, 28: 495-503.

[151] Gulevich, R.G., Oskine, I.N., Shikhevich, S.G., Fedorova, E.V. and Trut, L.N. (2004) Effect of selection for behavior on pituitary-adrenal axis and proopiomelanocortin gene expression in silver foxes *(Vulpes vulpes)*. *Physiology and Behaviour*, 82: 513-518.

[152] Trut, L., Oskina, I. and Kharlamova, A. (2009) Animal evolution during domestication: the domesticated fox as a model. *BioEssays*, 31: 349-360.

[153] *Op. Cit.* Trut, L.N., Plyusnina, I.Z. and Oskina, I.N. (2004).

[154] *Op. Cit.* Trut, L.N., Plyusnina, I.Z. and Oskina, I.N. (2004).

[155] Belyaev, D.K. (1979) Destabilizing selection as a factor in domestication. *The Journal of Heredity*, 70: 301-308.

[156] *Op. Cit.* Trut, L.N. (1999).

[157] *Op. Cit.* Trut, L.N. (1999).

[158] Kenttamies, H., Nordrum, N.V., Brenoe, U.T., Smeds, K., Johannessen, K.R. and Bakken, M. (2002) Selection for more confident foxes in Finland and Norway: Heritability and selection response for confident behaviour in blue foxes *(Alopex lagopus)*. *Applied Animal Behaviour Science*, 78: 67-82.

[159] Trapezov, O.V. (1997) Black crystal: a novel color mutant in the American mink *(Mustela vison* Schreber). *The Journal of Heredity*, 88: 164-166.

[160] Gulevich, R.G., Oskina, I.N., Kharlamova, A.V. and Trapezov, O.V. (2000) The cortisol and transcortin blood levels in the mink *Mustela vison* selected for behaviour after a long-term maintenance in pairs. *Zhurnal Evoliutsionnoi Biokhimii I Fiziologii*, 36: 410-413.

[161] Hansen, S.W. and Moller, S.H. (2001) The application of a temperament test to on-farm selection of mink. *Acta Agriculturae Scandinavica Section A, Animal Science*, 30: 93-98.

[162] Trapezov, O.V., Trapezova, L.I. and Sergeev, E.G. (2008) Effect of coat colour mutations on behavioural polymorphism in farm populations of American minks (*Mustela vison* Schreber, 1777) and Sables (*Martes zibellina* Linnaeus, 1758). *Russian Journal of Genetics*, 44: 444-450.

[163] Malmkvist, J. and Hansen, S.W. (2002) Generalization of fear in farm mink, *Mustela vison*, genetically selected for behaviour towards humans. *Animal Behaviour*, 64: 487-501.

[164] Meagher, R.K., Duncan, I., Bechard, A. and Mason, G.J. (2011) Who's afraid of the big bad glove? Testing for fear and its correlates in mink. *Applied Animal Behaviour Science*, 133: 254-264.

[165] Hansen, S.W. (1996) Selection for behavioural traits in farm mink. *Applied Animal Behaviour Science*, 49: 137-148.

[166] Malmkvist, J. and Hansen, S.W. (2001) The welfare of farmed mink (*Mustela vison*) in relation to behavioural selection: a review. *Animal Welfare*, 10: 41-52.

[167] *Op. Cit.* Hansen, S.W. (1996).

[168] *Op. Cit.* Malmkvist, J. and Hansen, S.W. (2001).

[169] Korhonen, H., Hansen, W., Malmkvist, J. and Houbak, B. (2000) Effect of capture, immobilization and handling on rectal temperatures of confident and fearful male mink. *Journal of Animal Breeding and Genetics*, 117: 337-345.

[170] *Ibid.* Korhonen, H., Hansen, W., Malmkvist, J. and Houbak, B. (2000).

[171] *Ibid.* Korhonen, H., Hansen, W., Malmkvist, J. and Houbak, B. (2000).

[172] *Ibid.* Korhonen, H., Hansen, W., Malmkvist, J. and Houbak, B. (2000).

[173] Malmkvist, J., Houbak, B. and Hansen, S.W. (1997) Mating time and litter size in farm mink selected for confident or timid behaviour. *Animal Science*, 65: 521-525.

[174] Jorhonen, H.T., Jauhiainen, L. and Rekila, T. (2002) Effect of temperament and behavioural reactions to the presence of a human during the pre-mating period on reproductive performance in farmed mink *(Mustela vison)*. *Canadian Journal of Animal Science*, 82: 275-282.

[175] *Op. Cit.* Malmkvist, J. and Hansen, S.W. (2002).

[176] *Op. Cit.* Trapezov, O.V., Trapezova, L.I. and Sergeev, E.G. (2008).

[177] *Op. Cit.* SCAHAW (2001).

[178] Hansen, S.W., and Moller, S.H. (2001) The application of a temperament test to on-farm selection of mink. *Acta Agriculturae Scandinavica Section S, Animal Science*, 51 (Suppl. 30): 93-98.

[179] *Op. Cit.* Malmkvist, J. and Hansen, S.W. (2001).

[180] *Op. Cit.* SCAHAW (2001).

[181] *Op. Cit.* SCAHAW (2001).

182 Belyaev, D.K. (1969) Domestication of animals. *Science Journal*, January 1969: 47-52.

183 *Op. Cit.* SCAHAW (2001).

184 *Op. Cit.* SCAHAW (2001).

185 Kruska, D. (1996) The effect of domestication on brain size and composition in the mink *(Mustela vison)*. *Journal of the Zoology, London*, 239: 645-661.

186 Kruska, D. and Schreiber, A. (1999) Comparative morphometrical and biochemical-genetic investigations in wild and ranch mink (*Mustela vison*: Carnivora: mammalian). *Acta Theriologica*, 44: 377-392.

187 Damgaard, B.M., Hansen, S.W., Borsting, C.F. and Moller, S.H. (2004) Effects of different feeding strategies during the winter period on behaviour and performance in mink females (*Mustela vison*). *Applied Animal Behaviour Science*, 89: 163-180.

188 Elofson, L., Lagerkvist, G., Gustafsson, H. and Einarsson, S. (1989) cited in: Malmkvist, J., Gade, M. and Damm, B.I. (2007) Parturient behaviour in farmed mink (*Mustela vison*) in relation to early kit mortality. *Applied Animal Behaviour Science*, 107: 120-132.

189 Henriksen, B.I.F. and Moller, S.H. (2015) The reliability of welfare assessment according to the WelFur-protocol in the nursing period of mink *(Neovison vison)* is challenged by increasing welfare problems prior to weaning. *Animal Welfare*, 24: 193-201.

190 Kempe, R., Koskinen, N. and Stranden, I. (2013) Genetic parameters of pelt character, feed efficiency and size traits in Finnish blue fox *(Vulpes lagopus)*. *Journal of Animal Breeding and Genetics*, 130: 445-455.

191 Ahola, L.K., Huuki, H., Hovland, A.L., Koistinen, T. and Mononen, J. (2012) WelFur – foxes: the inter-observer reliability of the WelFur health measures, and the prevalence of health disorders on fox farms during the growth period, pp 441-447 in: P.F. Larson *et al.* (eds.) *Proceedings of the Xth International Scientific Congress in fur animal production*. Wageningen Academic Publishers, Wageningen, Netherlands.

192 *Ibid*. Ahola, L.K., Huuki, H., Hovland, A.L., Koistinen, T. and Mononen, J. (2012).

193 *Op. Cit.* Hansen, S.W., and Moller, S.H. (2001).

194 *Op. Cit.* Malmkvist, J. and Hansen, S.W. (2001).

195 Hansen, S.W. and Moller, S.H. (1988) cited in: Malmkvist, J. and Hansen, S.W. (2001) The welfare of farmed mink (*Mustela vison*) in relation to behavioural selection: a review. *Animal Welfare*, 10: 41-52.

196 *Op. Cit.* Malmkvist, J. and Hansen, S.W. (2002).

197 *Op. Cit.* Trapezov, O.V., Trapezova, L.I. and Sergeev, E.G. (2008).

198 *Op. Cit.* SCAHAW (2001).

199 *Op. Cit.* SCAHAW (2001).

200 *Op. Cit.* Statham, M.J., Trut, L.N., Sacks, B.N., Kharlamova, A.V. *et al.* (2011).

201 *Op. Cit.* Kukekova, A.V., Oskina, I.N., Kharlamova, A.V., Chase, K. *et al*. (2008).

202 *Op. Cit.* Kukekova, A.V., Oskina, I.N., Kharlamova, A.V., Chase, K. *et al*. (2008).

203 Harri, M., Mononen, J., Ahola, L., Plyusnina, I. and Rekila, T. (2003) Behavioural and physiological differences between silver foxes selected and not selected for domestic behaviour. *Animal Welfare*, 12: 305-314.

204 *Ibid*. Harri, M., Mononen, J., Ahola, L., Plyusnina, I. and Rekila, T. (2003).

205 *Ibid.* Harri, M., Mononen, J., Ahola, L., Plyusnina, I. and Rekila, T. (2003).

206 Pedersen, V. (1994) Long-term effects of different handling procedures on behavioural, physiological, and production-related parameters in silver foxes. *Applied Animal Behaviour Science*, 40: 285-296.

207 Pedersen, V. (1993) Effects of different post-weaning handling procedures on the later behaviour of silver foxes. *Applied Animal Behaviour Science*, 37: 239-250.

208 Pedersen, V. and Jeppesen, L.L. (1990) Effects of early handling on later behaviour and stress responses in the silver fox *(Vulpes vulpes)*. *Applied Animal Behaviour Science*, 26: 383-393.

209 Pedersen, V., Moeller, N.H. and Jeppesen, L.L. (2002) Behavioural and physiological effects of post-weaning handling and access to shelters in farmed blue foxes *(Alopex lagopus)*. *Applied Animal Behaviour Science*, 77: 139-154.

210 *Op. Cit.* Pedersen, V. (1994).

211 *Op. Cit.* Pedersen, V. (1993).

212 *Op. Cit.* Pedersen, V. (1994).

213 *Op. Cit.* SCAHAW (2001).

214 *Op. Cit.* SCAHAW (2001).

215 Arke, A.K., Hovland, A.L., Bakken, M. and Braastad, B.O. (2008) *Risk assessment concerning the welfare of animals kept for fur production.* A report to the Norwegian Scientific Committee for Food Safety 9th May 2008. **http://www.vkm.no/dav/60f432aa07.pdf** (accessed 31.07.15).

216 *Op. Cit.* SCAHAW (2001).

217 *Op. Cit.* SCAHAW (2001).

218 *Op. Cit.* SCAHAW (2001).

219 *Op. Cit.* SCAHAW (2001).

220 *Op. Cit.* SCAHAW (2001).

221 *Op. Cit.* Korhonen, H., Hansen, W., Malmkvist, J. and Houbak, B. (2000).

222 *Op. Cit.* SCAHAW (2001).

223 *Op. Cit.* SCAHAW (2001).

224 Moe, R.O. and Bakken, M. (1997) Effects of handling and physical restraint on rectal temperature, cortisol, glucose and leucocyte counts in the silver fox *(Vulpes vulpes)*. *Acta Veterinaria Scandinavica*, 38: 29-39.

225 Moe, R.O. and Bakken, M. (1998) Anxiolytic drugs inhibit hyperthermia induced by handling in farmed silver foxes *(Vulpes vulpes)*. *Animal Welfare*, 7: 97-100.

226 Osadchuk, L., Braastad, B.O., Hovland, A-L. and Bakken, M. (2003) Handling during pregnancy in the blue fox *(Alopex lagopus)*: the influence on the fetal gonadal function. *General and Comparative Endocrinology*, 132: 190-197.

227 *Op. Cit.* SCAHAW (2001).

228 *Op. Cit.* Council of Europe (1999).

229 *Op. Cit.* SCAHAW (2001).

230 *Op. Cit.* SCAHAW (2001).

231 *Op. Cit.* SCAHAW (2001).

232 Korhonen, H.T., Eskeli, P., Sepponen, J. and Toikkanen, P. (2013) Individual and group euthanasia in farmed mink. *Annals of Animal Science*, 13(3): 623-632.

233 *Op. Cit*. Council Regulation (EC) No 1099/2009.

234 Korhonen, H.T., Sepponen, J. and Eskeli, P. (2013) A questionnaire study on euthanasia in farm-raised mink. *International Journal for Educational Studies*, 5: 241-250.

235 *Ibid.* Korhonen, H.T., Sepponen, J. and Eskeli, P. (2013).

236 *Ibid.* Korhonen, H.T., Sepponen, J. and Eskeli, P. (2013).

237 SACAHW (2008) *Welfare aspects of the slaughter of fur producing animals in Ireland.* A report from the working-group to the Scientific Advisory Committee on Animal Health and Welfare. **http://www.fawac.ie/media/fawac/content/publications/scientificreports/FinalReport-Welfare-fur-producing-animals-Ireland.2.doc** (accessed 14.08.15).

238 *Op. Cit.* SCAHAW (2001).

239 *Op. Cit.* Korhonen, H.T., Sepponen, J. and Eskeli, P. (2013).

240 *Op. Cit.* SCAHAW (2001).

241 *Op. Cit.* SCAHAW (2001).

242 Cooper, J., Mason, G. and Raj. M. (1998) Determination of the aversion of farmed mink *(Mustela vison)* to carbon dioxide. *Veterinary Record*, 143: 359-361.

243 Hawkins, P., Playle, L., Golledge, H., Leach, M., Banzett, R., Coenen, A., Cooper, J., Danneman, P., Flecknell, P., Kirkden, R., Niel, L. and Raj, M. (2006) *Newcastle Consensus Meeting on Carbon Dioxide Euthanasia of Laboratory Animals*, 27 and 28 February 2006, University of Newcastle upon Tyne, UK. 9 August 2006. **https://www.nc3rs.org.uk/sites/default/files/documents/Events/First%20Newcastle%20consensus%20meeting%20report.pdf** (accessed 14.08.15).

244 *Op. Cit*. Council Regulation (EC) No 1099/2009.

245 *Op. Cit.* Korhonen, H.T., Eskeli, P., Sepponen, J. and Toikkanen, P. (2013).

246 *Op Cit.* Korhonen, H.T., Eskeli, P., Sepponen, J. and Toikkanen, P. (2013).

247 Hansen, N.E., Creutzberg, A. and Simonsen, H.B. (1991) Euthanasia of mink *(Mustela vison)* by means of carbon dioxide (CO_2), carbon monoxide (CO) and nitrogen (N_2). *British Veterinary Journal*, 147: 140-146.

248 *Op. Cit.* SCAHAW (2001).

249 *Op. Cit.* SACAHW (2008).

250 Raj, M. and Mason, G. (1999) Reaction of farmed mink *(Mustela vison)* to argon-induced hypoxia. *Veterinary Record*, 145: 736-737.

251 Gorman, D., Drewry, A., Huang, Y.L. and Sames, C. (2003) The clinical toxicology of carbon monoxide. *Toxicology*, 187: 25-38.

252 *Op. Cit.* Raj, M. and Mason, G. (1999).

253 *Op. Cit.* Raj, M. and Mason, G. (1999).

254 *Op. Cit*. Council Regulation (EC) No 1099/2009.

255 *Op. Cit.* Korhonen, H.T., Sepponen, J. and Eskeli, P. (2013).

256 *Op. Cit.* Korhonen, H.T., Eskeli, P., Sepponen, J. and Toikkanen, P. (2013).

257 *Op. Cit.* SCAHAW (2001).

258 *Op. Cit.* SACAHW (2008).

259 *Op. Cit.* SCAHAW (2001).

260 *Op. Cit.* SACAHW (2008).

261 *Op. Cit*. Council Regulation (EC) No 1099/2009.

262 Korhonen, H.T., Cizinauskas, S. and Viitmaa, R. (2009) Evaluation of the traditional way of euthanasia of farmed foxes from an animal welfare point of view. *Annals of Animal Science*, 9: 73-87.

263 *Op. Cit.* SACAHW (2008).

264 *Op. Cit.* SACAHW (2008).

265 *Op. Cit*. Council Regulation (EC) No 1099/2009.

266 *Op. Cit.* SACAHW (2008).

267 *Op. Cit.* SCAHAW (2001).

268 *Op. Cit.* SCAHAW (2001).

269 *Op. Cit.* SCAHAW (2001).

270 Vinke, C.M., Eenkhoorn, N.C., Netto, W.J., Fermont, P.C.J. and Spruijt, B.M. (2002) Stereotypic behaviour and tail biting in farmed mink *(Mustela vison)* in a new housing system. *Animal Welfare*, 11: 231-245.

271 Olofsson, L. and Lidfors, L. (2012) Abnormal behaviour in Swedish farm mink during winter, pp 426-432 in: P.F. Larsen *et al.* (eds.) *Proceedings of the Xth International Scientific Congress in fur animal production*. Wageningen Academic Publishers, Wageningen, Netherlands.

272 Koistinen, T., Huuki, H., Hovland, A.L., Mononen, J. and Ahola, L. (2012) WelFur – foxes: do feeding test, temperament test and a measure of stereotypic behaviour differentiate between farms? pp 448-454 in: P.F. Larson *et al.* (eds.) *Proceedings of the Xth International Scientific Congress in fur animal production*. Wageningen Academic Publishers, Wageningen, Netherlands.

273 WelFur (2015) *WelFur welfare assessment protocol for mink.* Version 1, second edition. 1 May 2015. WelFur Consortium, Brussels, Belgium.

274 *Op. Cit.* SCAHAW (2001).

275 *Op. Cit.* SCAHAW (2001).

276 Korhonen, H.T., Niemela, P. and Jauhiainen, L. (2001) Effect of space and floor material on the behaviour of farmed blue foxes. *Canadian Journal of Animal Science*, 81: 189-197.

277 *Op. Cit.* Vinke, C.M., Eenkhoorn, N.C., Netto, W.J., Fermont, P.C.J. and Spruijt, B.M. (2002).

278 *Op. Cit.* Olofsson, L. and Lidfors, L. (2012).

279 Svendsen, P.M., Palme, R. and Malmkvist, J. (2013) Novelty exploration, baseline cortisol level and fur-chewing in farm mink with different intensities of stereotypic behaviour. *Applied Animal Behaviour Science*, 147: 172-178.

280 Clubb, R. and Mason, G.J. (2007) Natural behavioural biology as a risk factor in carnivore welfare: How analysing species differences could help zoos improve enclosures. *Applied Animal Behaviour Science*, 102: 303-328.

281 *Op. Cit.* Svendsen, P.M., Palme, R., Malmkvist, J. (2013).

282 *Op. Cit.* Clubb, R. and Mason, G.J. (2007).

283 *Op. Cit.* SCAHAW (2001).

284 *Op. Cit.* Damgaard, B.M., Hansen, S.W., Borsting, C.F. and Moller, S.H. (2004).

285 Koistinen, T., Ahola, L. and Mononen, J. (2008) Blue foxes' *(Alopex lagopus)* preferences between earth floor and wire mesh floor. *Applied Animal Behaviour Science*, 111: 38-53.

286 Mason, G.J. (1991) Stereotypies: A critical review. *Animal Behaviour*, 41: 1015-1037.

287 Latham, N. and Mason, G. (2010) Frustration and perseveration in stereotypic captive animals: Is a taste of enrichment worse than none at all? *Behavioural Brain Research*, 211: 96-104.

288 Dallaire, J.A., Meagher, R.K., Diez-Leon, M., Garner, J.P. and Mason, G.J. (2011) Recurrent perseveration correlates with abnormal repetitive locomotion in adult mink but is not reduced by environmental enrichment. *Behavioural Brain Research*, 224: 213-222.

289 Mason, G. (2006) Stereotypic behaviour in captive animals: Fundamentals and implications for welfare and beyond, pp 325-356 in: G. Mason and J. Rushen (eds.) *Stereotypic Animal Behaviour: Fundamentals and applications to welfare.* Second edition. CABI, Wallingford, UK.

290 Mason, G.J. and Latham, N.R. (2004) Can't stop, won't stop: is stereotypy a reliable animal welfare indicator? *Animal Welfare*, 13: S57-69.

291 *Ibid.* Mason, G.J. and Latham, N.R. (2004).

292 Rushen, J. and Mason, G. (2006) A decade-or-more's progress in understanding stereotypic behaviour, pp 1-18 in: G. Mason and J. Rushen (eds.) *Stereotypic Animal Behaviour: Fundamentals and applications to welfare.* Second edition. CABI, Wallingford, UK.

293 *Op. Cit.* Mason, G.J. and Latham, N.R. (2004).

294 Hansen, B.K., Jeppesen, L.L. and Berg, P. (2010) Stereotypic behaviour in farm mink *(Neovison vison)* can be reduced by selection. *Journal of Animal Breeding and Genetics*, 127: 64-73.

295 *Op. Cit.* Malmkvist, J. and Hansen, S.W. (2001).

296 Svendsen, P.M., Hansen, B.K., Malmkvist, J., Hansen, S.W., Palme, R. and Jeppesen, L.L. (2007) Selection against stereotypic behaviour may have contradictory consequences for the welfare of farm mink *(Mustela vison)*. *Applied Animal Behaviour Science*, 107: 110-119.

297 *Op. Cit.* Mason, G.J. and Latham, N.R. (2004).

298 *Op. Cit.* Council of Europe (1999).

299 *Op. Cit.* Council of Europe (1999).

300 *Op. Cit.* Council of Europe (1999).

301 *Op. Cit.* Arke, A.K., Hovland, A.L., Bakken, M. and Braastad, B.O. (2008).

302 *Op. Cit.* SCAHAW (2001).

303 *Op. Cit.* Williams, T.M. (1983).

304 Hansen, S.W., Malmkvist, J., Palme, R. and Damgaard, B.M. (2007) Do double cages and access to occupational materials improve the welfare of farmed mink? *Animal Welfare*, 16: 63-76.

305 Hansen, C.P.B. and Jeppesen, L.L. (2001) Swimming activity of farmed mink (*Mustela vison*) and its relation to stereotypies. *Acta Agriculturae Scandinavica Section A, Animal Science*, 51: 71-76.

306 *Op. Cit.* SCAHAW (2001).

307 *Op. Cit.* SCAHAW (2001).

308 *Op. Cit.* Council of Europe (1999).

309 Malmkvist, J., Gade, M. and Damm, B.I. (2007) Parturient behaviour in farmed mink *(Mustela vison)* in relation to early kit mortality. *Applied Animal Behaviour Science*, 107: 120-132.

310 *Ibid.* Malmkvist, J., Gade, M. and Damm, B.I. (2007).

311 *Ibid.* Malmkvist, J., Gade, M. and Damm, B.I. (2007).

312 *Ibid.* Malmkvist, J., Gade, M. and Damm, B.I. (2007).

313 *Ibid.* Malmkvist, J., Gade, M. and Damm, B.I. (2007).

314 Malmkvist, J. and Palme, R. (2008) Periparturient nest building: Implications for parturition, kit survival, maternal stress and behaviour in farmed mink *(Mustela vison)*. *Applied Animal Behaviour Science*, 114: 270-283.

315 *Ibid.* Malmkvist, J. and Palme, R. (2008).

316 *Ibid.* Malmkvist, J. and Palme, R. (2008).

317 *Ibid.* Malmkvist, J. and Palme, R. (2008).

318 *Ibid.* Malmkvist, J. and Palme, R. (2008).

319 Malmkvist, J. and Palme, R. (2015) Early transfer of mated females into the maternity unit reduces stress and increases maternal care in farm mink. *Applied Animal Behaviour Science*, 167: 56-64.

320 *Ibid.* Malmkvist, J. and Palme, R. (2015).

321 *Ibid.* Malmkvist, J. and Palme, R. (2015).

322 Mason, G.J., Cooper, J. and Clarebrough, C. (2001) Frustrations of fur-farmed mink: Mink may thrive in captivity but they miss having water to romp about in. *Nature*, 410:35-36.

323 *Op. Cit.* Hansen, S.W., Malmkvist, J., Palme, R. and Damgaard, B.M. (2007).

324 Meagher, R.K., Dallaire, J.A., Campbell, D.L.M., Ross, M., Moller, S.H., Hansen, S.W., Diez-Leon, M., Palme, R. and Mason, G.J. (2014) Benefits of a ball and chain: Simple environmental enrichments improve welfare and reproductive success in farmed American mink *(Neovison vison)*. *PLoS ONE*, 9(11): e110589.

325 *Op. Cit.* Hansen, S.W., Malmkvist, J., Palme, R. and Damgaard, B.M. (2007).

326 *Op. Cit*. Meagher, R.K., Dallaire, J.A., Campbell, D.L.M., Ross, M. *et al*. (2014).

327 Axelsson, H.M.K., Alden, E. and Lidfors, L. (2009) Behaviour in female mink housed in enriched standard cages during winter. *Applied Animal Behaviour Science*, 121: 222-229.

328 Vinke, C.M., Hansen, S.W., Mononen, J., Korhonen, H., Cooper, J.J., Mohaibes, M., Bakken, M. and Spruijt, B.M. (2008) To swim or not to swim: An interpretation of farmed mink's motivation for a water bath. *Applied Animal Behaviour Science*, 111: 1-27.

[329] Mononen, J., Mohaibes, M., Savolainen, S. and Ahola, L. (2008) Water baths for farmed mink: intra-individual consistency and inter-individual variation in swimming behaviour, and effects on stereotyped behaviour. *Agriculture and Food Science*, 17: 41-52.

[330] Ahola, L., Mononen, J. and Mohaibes, M. (2011) Effects of access to extra cage constructions including a swimming opportunity on the development of stereotypic behaviour in singly housed juvenile farmed mink *(Neovison vison)*. *Applied Animal Behaviour Science*, 134: 201-208.

[331] *Op. Cit.* Mononen, J., Mohaibes, M., Savolainen, S. and Ahola, L. (2008).

[332] Vinke, C.M., van Leeuwen, J. and Spruijt, B.M. (2005) Juvenile farmed mink *(Mustela vison)* with additional access to swimming water play more frequently than animals housed with a cylinder and platform, but without swimming water. *Animal Welfare*, 14: 53-60.

[333] *Ibid.* Vinke, C.M., van Leeuwen, J. and Spruijt, B.M. (2005).

[334] *Op. Cit.* Mason, G.J., Cooper, J. and Clarebrough, C. (2001).

[335] *Op. Cit.* Mason, G.J., Cooper, J. and Clarebrough, C. (2001).

[336] Hansen, S.W. and Jensen, M.B. (2006) Quantitative evaluation of the motivation to access a running wheel or a water bath in farm mink. *Applied Animal Behaviour Science*, 98:127-144.

[337] *Ibid.* Hansen, S.W. and Jensen, M.B. (2006).

[338] *Ibid.* Hansen, S.W. and Jensen, M.B. (2006).

[339] *Op. Cit.* Vinke, C.M., Hansen, S.W., Mononen, J., Korhonen, H. *et al*. (2008).

[340] Clubb, R.E. (2001) cited in: Hansen, S.W. and Damgaard, B.M. (2009) Running in a running wheel substitutes for stereotypies in mink *(Mustela vison)* but does it improve their welfare? *Applied Animal Behaviour Science*, 118: 76-83.

[341] Hansen, S.W. and Jensen, M.B. (2006) Quantitative evaluation of the motivation to access a running wheel or a water bath in farm mink. *Applied Animal Behaviour Science*, 98:127-144.

[342] *Ibid.* Hansen, S.W. and Jensen, M.B. (2006).

[343] Hansen, C.P.B. and Jeppesen, L.L. (2000) Effects of blocking farm mink's feed access with open water. *Agricultural and Food Science in Finland*, 9: 157-163.

[344] *Op. Cit.* Mason, G.J., Cooper, J. and Clarebrough, C. (2001).

[345] Hansen, S.W. and Damgaard, B.M. (2009) Running in a running wheel substitutes for stereotypies in mink *(Mustela vison)* but does it improve their welfare? *Applied Animal Behaviour Science*, 118: 76-83.

[346] *Ibid.* Hansen, S.W. and Damgaard, B.M. (2009).

[347] Meagher, R.K. and Mason, G.J. (2012) Environmental enrichment reduces signs of boredom in caged mink. *PLoS ONE*, 7(11): e49180.

[348] *Ibid.* Meagher, R.K. and Mason, G.J. (2012).

[349] Diez-Leon, M., Bowman, J., Bursian, S., Filion, H., Galicia, D., Kanefsky, J., Napolitano, A., Palme, R., Schulte-Hostedde, A., Scribner, K. and Mason, G. (2013) Environmentally enriched male mink gain more copulations than stereotypic, barren-reared competitors. *PLoS ONE*, 8(11): e80494.

[350] *Op. Cit.* Council of Europe (1999).

[351] *Op. Cit.* SCAHAW (2001).

[352] Korhonen, H.T. and Orjala, H. (2010) Effect of cage dimensions on welfare and production of farmed blue fox. *Annals of Animal Science*, 10: 311-324.

[353] *Op. Cit.* Korhonen, H.T., Niemela, P. and Jauhiainen, L. (2001).

[354] *Op. Cit.* Council of Europe (1999).

[355] Pedersen, V. and Jeppesen, L.L. (1993) Daytime use of various types of whole-year shelters in farmed silver foxes *(Vulpes vulpes)* and blue foxes *(Alopex lagopus)*. *Applied Animal Behaviour Science*, 36: 259-273.

[356] *Ibid.* Pedersen, V. and Jeppesen, L.L. (1993).

[357] *Ibid.* Pedersen, V. and Jeppesen, L.L. (1993).

[358] Mononen, J., Kasanen, S., Harri, M., Sepponen, J. and Rekila, T. (2001) The effect of elevated platforms and concealment screens on the welfare of blue foxes. *Animal Welfare*, 10: 373-385.

[359] *Ibid.* Mononen, J., Kasanen, S., Harri, M., Sepponen, J. and Rekila, T. (2001).

[360] Koistinen, T. and Korhonen, H.T. (2013) Complex housing environment for farmed blue foxes *(Vulpes lagopus)*: use of various resources. *Animal*, 7: 1354-1361.

[361] Koistinen, T., Jauhiainen, L. and Korhonen, H.T. (2009) Relative value of a nest box, sand floor and extra space during the breeding season in adult blue fox males. *Applied Animal Behaviour Science*, 120: 192-200.

[362] Pyykonen, T., Ahola, L., Hanninen, S. and Mononen, J. (2010) Nest provision influences reproductive success in breeding blue fox vixens: a preliminary study. *Animal Welfare*, 19: 101-105.

[363] Jeppesen, L.L. and Pedersenm V. (1991) Effects of whole-year nest boxes on cortisol, circulating leucocytes, exploration and agonistic behaviour in silver foxes. *Behavioural Processes*, 25: 171-177.

[364] Korhonen, H.T., Jauhiainen, L. and Rekila, T. (2006) Effects of year-round nestbox availability and temperament on welfare and production performance in blue foxes *(Alopex lagopus)*. *Annals of Animal Science*, 6: 149-167.

[365] *Op. Cit.* Pedersen, V., Moeller, N.H. and Jeppesen, L.L. (2002).

[366] Harri, M., Mononen, J., Rekila, T., Korhonen, H. and Niemela, P. (1998) Effects of top nest box on growth, fur quality and behaviour of blue foxes *(Alopex lagopus)* during their growing season. *Acta Agriculturae Scandinavica Section A, Animal Science*, 48: 184-191.

[367] Pedersen, V. (1991) Early experience with the farm environment and effects on later behaviour in silver *Vulpes vulpes* and blue foxes *Alopex lagopus*. *Behavioural Processes*, 25: 163-169.

[368] *Op. Cit.* Harri, M., Mononen, J., Rekila, T., Korhonen, H. and Niemela, P. (1998).

[369] *Op. Cit.* Pedersen, V., Moeller, N.H. and Jeppesen, L.L. (2002).

[370] *Op. Cit.* Council of Europe (1999).

[371] *Op. Cit.* Council of Europe (1999).

[372] Mononon, J., Harri, M., Rouvinen, K. and Niemela, P. (1993) The use of resting platforms by young silver foxes *(Vulpes vulpes)*. *Applied Animal Behaviour Science*, 38: 301-310.

[373] Mononen, J., Harri, M., Sepponen, J. and Ahola, L. (1998) A note on the effects of an unobstructed view on cage choices in farmed foxes. *Applied Animal Behaviour Science*, 61: 79-84.

374 Korhonen, H., Niemela, P. and Tuuri, H. (1996) Seasonal changes in platform use by farmed blue foxes *(Alopex lagopus). Applied Animal Behaviour Science*, 48: 99-114.

375 Korhonen, H. and Niemela, P. (1996) Temperament and reproductive success in farmbred silver foxes housed with and without platforms. *Journal of Animal Breeding and Genetics*, 113: 209-218.

376 Koistinen, T., Turunen, A., Kiviniemi, V., Ahola, L. and Mononen, J. (2009) Bones as enrichment for farmed blue fosex *(Vulpes lagopus)*: Interaction with the bones and preference for a cage with the bones. Applied *Animal Behaviour Science*, 120: 108-116.

377 Korhonen, H.T., Jauhiainen, L., Niemela, P. and Sauna-Aho, R. (2002) Wooden blocks and straw as environmental enrichments for juvenile blue foxes *(Alopex lagopus)*. *Acta Ethologica*, 5: 29-37.

378 *Op. Cit.* Koistinen, T., Turunen, A., Kiviniemi, V., Ahola, L. and Mononen, J. (2009).

379 Korhonen, H.T. and Eskeli, P. (2015) A study on multi-enriched housing environment for blue foxes. *Open Journal of Animal Sciences*, 5: 77-85.

380 Koistinen, T., Ahola, L. and Mononen, J. (2007) Blue foxes' motivation for access to an earth floor measured by operant conditioning. *Applied Animal Behaviour Science*, 107: 328-341.

381 Koistinen, T. and Mononen, J. (2008) Blue foxes' motivation to gain access to solid floors and the effect of the floor material on their behaviour. *Applied Animal Behaviour Science*, 113: 236-246.

382 Mason, G. Cooper, J. and Clarebrough, C. (1999) Using techniques from human economics to measure what animals value, as illustrated by experimental work on the American mink *(Mustela vison),* pp 111–117 in: V.J. Hare, K.E. Worley and K. Myers (eds.) *The Shape of Enrichment*, Proceedings of the Fourth International Conference on Environmental Enrichment, Edinburgh, Scotland, 29 August–3 September 1999.

383 *Op. Cit.* Koistinen, T. and Mononen, J. (2008).

384 *Op. Cit.* Koistinen, T. and Mononen, J. (2008).

385 *Op. Cit.* Koistinen, T., Jauhiainen, L. and Korhonen, H.T. (2009).

386 *Op. Cit.* Koistinen, T., Ahola, L. and Mononen, J. (2008).

387 Koistinen, T., Orjala, H., Mononen, J. and Korhonen, H.T. (2009) Position of operant cost affects blue foxes' time budget between sand floor and mesh floor. *Applied Animal Behaviour Science*, 116: 266-272.

388 *Op. Cit*. Mason, G, Cooper, J. and Clarebrough, C. (1999).

389 *Op. Cit.* Koistinen, T., Orjala, H., Mononen, J. and Korhonen, H.T. (2009).

390 *Op. Cit.* Koistinen, T., Ahola, L. and Mononen, J. (2008).

391 *Op. Cit.* Koistinen, T., Ahola, L. and Mononen, J. (2008).

392 Harri, M., Kasanen, S., Mononen, J. and Sepponen, J. (2000) Preferences of farmed blue foxes for different floor types. *Behavioural Processes*, 49: 111-119.

393 *Ibid.* Harri, M., Kasanen, S., Mononen, J. and Sepponen, J. (2000).

394 *Op. Cit.* Korhonen, H.T., Niemela, P. and Jauhiainen, L. (2001).

395 Ahola, L., Koistinen, T. and Mononen, J. (2009) Sand floor for farmed blue foxes: effects on claws, adrenal cortex function, growth and fur properties. *International Journal of Zoology*, article ID 563252, 6pp.

396 *Ibid.* Ahola, L., Koistinen, T. and Mononen, J. (2009).

397 Harri, M., Mononen, J. and Sepponen, J. (1999) Preferences of farmed silver foxes *(Vulpes vulpes)* for four different floor types. *Canadian Journal of Animal Science*, 79: 1-5.

398 *Op. Cit*. Koistinen, T. and Korhonen, H.T. (2013).

399 Dunstone, N. (1993) *The mink*. Poyser, London, UK.

400 *Op. Cit.* SCAHAW (2001).

401 *Op. Cit.* Council of Europe (1999).

402 *Op. Cit.* Mason, G.J. (1994) *Journal of Zoology, London*, 233: 203-214.

403 *Op. Cit.* Mason, G.J. (1994) *Journal of Zoology, London*, 233: 203-214.

404 Latham, N.R. and Mason, G.J. (2008) Maternal deprivation and the development of stereotypic behaviour. *Applied Animal Behaviour Science*, 110: 84-108.

405 Mason, G.J. (1994) Tail-biting in mink *(Mustela vison)* is influenced by age at removal from the mother. *Animal Welfare*, 3: 305-311.

406 *Ibid.* Mason, G.J. (1994) *Animal Welfare*, 3: 305-311.

407 Jeppesen, L.L., Heller, K.E. and Dalsgaard, T. (2000) Effects of early weaning and housing conditions on the development of stereotypies in farmed mink. *Applied Animal Behaviour Science*, 68: 85-92.

408 *Ibid.* Jeppesen, L.L., Heller, K.E. and Dalsgaard, T. (2000).

409 Houbak, B. and Jeppesen, L.L. (1987) cited in: SCAHAW (2001) *The Welfare of Animals Kept for Fur Production*. Report of the Scientific Committee on Animal Health and Animal Welfare adopted on 12-13 December 2001. **http://ec.europa.eu/food/animal/welfare/international/out67_en.pdf** (accessed 02.06.15).

410 *Op. Cit.* Arke, A.K., Hovland, A.L., Bakken, M. and Braastad, B.O. (2008).

411 Heller, K.E., Houbak, B. and Jeppesen, L.L. (1988) Stress during mother-infant separation in ranch mink. *Behavioural Processes*, 17: 217-227.

412 Brink, A.-L. and Jeppesen, L.L. (2005) Behaviour of mink kits and dams *(Mustela vison)* in the lactation period. *Canadian Journal of Animal Science*, 85: 7-12.

413 Dawson, L., Buob, M., Haley, D., Miller, S., Stryker, J., Quinton, M. and Mason, G. (2013) Providing elevated 'getaway bunks' to nursing mink dams improves their health and welfare. *Applied Animal Behaviour Science*, 147: 224-234.

414 Buob, M., Meagher, R., Dawson, L., Palme, R., Haley, D. and Mason, G. (2013) Providing 'get-away bunks' and other enrichments to primiparous adult female mink improves their reproductive productivity. *Applied Animal Behaviour Science*, 147: 194-204.

415 Pedersen, V. and Jeppesen, L.L. (2001) Effects of family housing on behaviour, plasma cortisol and performance in adult female mink *(Mustela vison). Acta Agriculturae Scandinavica Section A, Animal Science*, 51: 77-88.

[416] Hanninen, S., Mononen, J., Harjunpaa, S., Pyykonen, T., Sepponen, J. and Ahola, L. (2008) Effects of family housing on some behavioural and physiological parameters of juvenile farmed mink *(Mustela vison). Applied Animal Behaviour Science*, 109: 384-395.

[417] *Op. Cit.* Pedersen, V. and Jeppesen, L.L. (2001).

[418] *Op. Cit.* Hanninen, S., Mononen, J., Harjunpaa, S., Pyykonen, T. *et al*. (2008).

[419] Pedersen, V., Jeppesen, L.L. and Jeppesen, N. (2004) Effects of group housing systems on behaviour and production performance in farmed juvenile mink *(Mustela vison). Applied Animal Behaviour Science*, 88: 89-100.

[420] Hanninen, S., Ahola, L., Pyykonen, T., Korhonen, H.T. and Mononen, J. (2008) Group housing in row cages: an alternative housing system for juvenile mink. *Animal,* 2: 1809-1817.

[421] *Op. Cit.* Mason, G.J. (1994) *Animal Welfare*, 3: 305-311.

[422] *Op. Cit.* SCAHAW (2001).

[423] *Op. Cit*. Harris, S. and Yalden, D.W. (2008).

[424] Arnold, J. (2009) *Olfactory communication in red foxes (Vulpes vulpes).* Ph.D. thesis, University of Bristol, Bristol, UK.

[425] Bakken, M. (1993) Reproduction in farmed silver fox vixens, *Vulpes vulpes*, in relation to own competition capacity and that of neighbouring vixens. *Journal of Animal Breeding and Genetics*, 110: 305-311.

[426] Braastad, B.O. and Bakken, M. (1993) Maternal infanticide and periparturient behaviour in farmed silver foxes *Vulpes vulpes. Applied Animal Behaviour Science*, 36: 347-361.

[427] Bakken, M. (1993) The relationship between competition capacity and reproduction in farmed silver fox vixens, *Vulpes vulpes. Journal of Animal Breeding and Genetics*, 110: 147-155.

[428] *Ibid.* Bakken, M. (1993) *Journal of Animal Breeding and Genetics*, 110: 147-155.

[429] *Ibid.* Bakken, M. (1993) *Journal of Animal Breeding and Genetics*, 110: 147-155.

[430] *Op. Cit.* Bakken, M. (1993). *Journal of Animal Breeding and Genetics*, 110: 305-311.

[431] *Op. Cit.* Bakken, M. (1993). *Journal of Animal Breeding and Genetics*, 110: 305-311.

[432] *Op. Cit.* Bakken, M. (1993). *Journal of Animal Breeding and Genetics*, 110: 305-311.

[433] *Op. Cit.* Council of Europe (1999).

[434] Pyykonen, T., Mononen, J., Ahola, L. and Rekila, T. (2005) Periparturient behaviour in farmed blue foxes *(Alopex lagopus). Applied Animal Behaviour Science*, 94: 133-147.

[435] Akre, A.K., Bakken, M. and Hovland, A.L. (2009) Social preferences in farmed silver fox females *(Vulpes vulpes)*: Does it change with age? *Applied Animal Behaviour Science*, 120: 186-191.

[436] *Op. Cit*. Mason, G., Cooper, J. and Clarebrough, C. (1999).

[437] Hovland, A.L., Mason, G.J., Kirkden, R.D. and Bakken, M. (2008) The nature and strength of social motivations in young farmed silver fox vixens *(Vulpes vulpes). Applied Animal Behaviour Science*, 111: 357-372.

[438] Arke, A.K., Hovland, A.L. and Bakken, M. (2010) The effects of resource distribution on behaviour in pair housed silver fox vixens *(Vulpes vulpes)* subsequent to mixing. *Applied Animal Behaviour Science*, 126: 67-74.

[439] Hovland, A.L., Arke, A.K. and Bakken, M. (2010) Group housing of adult silver fox *(Vulpes vulpes)* vixens in autumn: agonistic behaviour during the first days subsequent to mixing. *Applied Animal Behaviour Science*, 126: 154-162.

[440] Hovland, A.L. and Bakken, M. (2010) Group housing of adult silver fox *(Vulpes vulpes)* vixens during autumn and its consequences for body weight, injuries and later reproduction: a field study. *Applied Animal Behaviour Science*, 127: 130-138.

[441] *Op. Cit*. Hovland, A.L., Arke, A.K. and Bakken, M. (2010).

[442] *Op. Cit.* Hovland, A.L. and Bakken, M. (2010).

[443] Pyykonen, T., Ahola, L., Hanninen, S. and Mononen, J. (2009) A note on the reproductive success of primiparous blue fox vixens in social groups. *Animal Reproduction Science*, 112: 409-414.

[444] Ahola, L., Mononen, J., Pyykonen, T. and Miskala, M. (2006) Group housing of farmed silver fox cubs. *Animal Welfare*, 15: 39-47.

[445] Ahola, L., Harri, M., Kasanen, S., Mononen, J. and Pyykonen, T. (2000) Effects of group housing in an enlarged cage system on growth, bite wounds and adrenal cortex function in farmed blue foxes *(Alopex lagopus). Animal Welfare*, 9: 403-412.

[446] *Op. Cit.* Ahola, L., Mononen, J., Pyykonen, T. and Miskala, M. (2006).

[447] Ahola, L., Mononen, J., Pyykonen, T., Mohaibes, M. and Hanninen, S. (2005) Group size and space allocation in farmed juvenile blue foxes *(Alopex lagopus). Animal Welfare*, 14: 1-9.

[448] *Op. Cit.* Ahola, L., Mononen, J., Pyykonen, T. and Miskala, M. (2006).

[449] Erlebach, S. (1994) Effects of environment on the behaviour of mink. *Applied Animal Behaviour Science*, 40: 77.

[450] Heyn, E., Langner, J., Bergman, S. and Erhard, M.H. (2011) Studies on the hygiene and behaviour of minks *(Neovison vison)* using open water systems. *Animal Hygiene and Sustainable Livestock Production.* Proceedings of the XVth International Congress of the International Society for Animal Hygiene, Vienna, Austria, 3-7 July 2001, Volume 1: 309-311.

[451] Ahola, L., Harri, M., Mononen, J., Pyykonen, T. and Kasanen, S. (2001) Welfare of farmed silver foxes *(Vulpes vulpes)* housed in sibling groups in large outdoor enclosures. *Canadian Journal of Animal Science*, 81: 435-440.

[452] Ahola, L., Harri, M., Kasanen, S., Mononen, J. and Pyykonen, T. (2000) Effect of family housing of farmed silver foxes *(Vulpes vulpes)* in outdoor enclosures on some behavioural and physiological parameters. *Canadian Journal of Animal Science*, 80: 427-434.

[453] *Ibid.* Ahola, L., Harri, M., Kasanen, S., Mononen, J. and Pyykonen, T. (2000).

[454] Kistler, C., Hegglin, D., Wurbel, H. and Konig, B. (2010) Structural enrichment and enclosure use in an opportunistic carnivore: the red fox *(Vulpes vulpes). Animal Welfare*, 19: 391-400.

455 Kistler, C., Hegglin, D., Wurbel, H. and Konig, B. (2009) Feeding enrichment in an opportunistic carnivore: the red fox. *Applied Animal Behaviour Science*, 116: 260-265.

456 *Op. Cit.* Clubb, R. and Mason, G.J. (2007).

457 *Op. Cit.* Clubb, R. and Mason, G.J. (2007).

458 *Op. Cit.* Clubb, R. and Mason, G.J. (2007).

459 *Op. Cit.* Clubb, R. and Mason, G.J. (2007).

460 *Op. Cit.* Council of Europe (1999).

461 *Op. Cit.* SCAHAW (2001).

462 *Op. Cit*. FAWC (1992).

463 *Op. Cit.* FAWC (2009).

464 *Op. Cit.* Dawkins, M.S. (1990).

465 *Op. Cit.* Council of Europe (1999).

466 *Op. Cit*. Clubb, R. and Mason, G. (2003).

467 Regulation (EU) No 1007/2011 of the European Parliament and of the Council of 27 September 2011 on textile fibre names and related labelling and marking of the fibre composition of textile products and repealing Council Directive 73/44/EEC and Directives 96/73/EC and 2008/121/EC of the European Parliament and of the Council. *Official Journal*, L272/1, 18.10.11. **http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011R1007&from=EN** (accessed 21.07.15).

468 *Fur Products Labeling Act 1951*. 15 U.S.C. § 69. **https://www.ftc.gov/node/119458** (accessed 26.10.15).

469 *Truth in Fur Labeling Act 2010*. H.R. 2480. **https://www.govtrack.us/congress/bills/111/hr2480/text** (accessed 26.10.15).

470 Origin Assured (undated) *Background.* **http://www.originassured.com/index.php/initiative/** (accessed 28.07.15).

471 Origin Assured (undated) *Who is involved?* **http://www.originassured.com/index.php/initiative/whoisinvolved/** (accessed 28.07.15).

472 Origin Assured (undated) *Approved OA™ fur production.* **http://www.originassured.com/index.php/initiative/approvedcountries/** (accessed 28.07.15).

473 *Ibid.* Origin Assured (undated). *Approved OA™ fur production.*

474 Origin Assured (undated) *Countries and species approved for production of Origin Assured fur.* **http://www.originassured.com/images/oa/approved_countries_and_species_v4.pdf** (accessed 28.07.15).

475 Integral (2013) *Vier Pfoten Österreich: Pelzfragen*. Study no. 4723/2013, March 2013. **https://www.vier-pfoten.ch/files/Austria/Presseaussendungen/2013/1304_Integralumfrage_Pelzmode_AT.pdf** (accessed 21.07.15).

476 IPSOS (2015) *Prioriteiten in verband met dierenwelzijn tijdens de legislatuur 2014-2019*. **http://www.gaia.be/sites/default/files/paragraph/files/ipsos_gaia_dierenwelzijn_vlaanderen_final.pptx** (accessed 21.07.15).

477 GAIA (2012) *Pelsdieren.* **http://www.gaia.be/nl/campagne/pelsdieren** (accessed 21.07.15).

478 Animal Friends Croatia (2007) *73.7% of Croatian citizens against fur farming*. **http://www.prijatelji-zivotinja.hr/index.en.php?id=700** (accessed 21.07.15).

479 Moravcová, L. (2013) *Kožešinová zvírata*. Na základe dat CVVM SOÚ AV CR, v.v.i., pro Svobodu zvírat. **http://www.protisrsti.cz/dokumenty/Zaverecna_zprava_CVVM_2013.pdf** (accessed 21.07.15).

480 Loomus (2014) Press release: *More than half of the Estonian population does not support raising wild animals on farms with the purpose of producing fur.* 5 June 2014. **http://loomus.ee/press-release-more-than-half-of-the-estonian-population-does-not-support-raising-wild-animals-on-farms-with-the-purpose-of-producing-fur/** (accessed 21.07.15).

481 Eurispes (2015) Press release: *Eurispes Rapporto Italia 2015.* 30 January 2015. **http://eurispes.eu/content/eurispes-rapporto-italia-2015-italia-burocrazia-il-%E2%80%9Cgrande-fardello%E2%80%9D-comunicato-stampa** (accessed 21.07.15).

482 Dyrevernalliansen (2014) *Klart flertall mot pelsdyroppdrett*. 12 September 2014. **http://www.dyrevern.no/politikk_samfunn/politikk/klart-flertall-mot-pelsdyroppdrett** (accessed 21.07.15).

483 Djurens Rätt (2014) *Stark opinion mot mink farmning.* **http://www.djurensratt.se/min-rost-for-minkarna/stark-opinion-mot-minkfarmning** (accessed 21.07.15).

484 YouGov (2014) *Fur in the UK market.* Fieldwork time: 17-20 January 2014. Conducted by YouGov on behalf of Four Paws.

485 *Op. Cit*. EFIC (2014).

486 Mononen, J., Moller, S.H., Hansen, S.W., Hovland, A.L., Koistinen, T., Lidfors, L., Malmkvist, J., Vinke, C.M. and Ahola, L. (2012) The development of on-farm welfare assessment protocols for foxes and mink: the WelFur project. *Animal Welfare*, 21: 363-371.

487 WelFur (2015) *WelFur welfare assessment protocol for foxes*. Version 1, second edition. 30 March 2015. WelFur Consortium, Brussels, Belgium.

488 *Op. Cit*. WelFur (2015) *WelFur welfare assessment protocol for mink*.

489 Keeling, L., Evans, A., Forkman, B. and Kjaernes, U. (2013) Welfare Quality principles and criteria, pp91-114 in: H. Blokhuis, M. Miele, I.Veissier, and B. Jones, (eds.) *Improving Farm Animal Welfare: Science and society working together – the Welfare Quality approach*. Wageningen Academic Publishers, Wageningen, The Netherlands.

490 *Ibid*. Keeling, L., Evans, A., Forkman, B. and Kjaernes, U. (2013).

491 Fraser, D., Weary, D.M., Pajot, E.A. and Milligan, B.N. (1997) A scientific conception of animal welfare that reflects ethical concerns. *Animal Welfare*, 6: 187-205.

492 *Op. Cit*. WelFur (2015) *WelFur welfare assessment protocol for foxes*.

493 *Op. Cit*. WelFur (2015) *WelFur welfare assessment protocol for foxes*.

494 *Op. Cit*. Meagher, R.K. and Mason, G.J. (2012).

495 *Op. Cit*. Meagher, R.K., Duncan, I., Bechard, A. and Mason, G.J. (2011).

496 Welfare Quality (2009) *Welfare Quality assessment protocol for pigs (sows and piglets, growing and finishing pigs)*. 1 October 2009. Welfare Quality Consortium, Lelystad, Netherlands.

[497] *Op. Cit*. WelFur (2015) *WelFur welfare assessment protocol for foxes*.

[498] *Op. Cit*. WelFur (2015) *WelFur welfare assessment protocol for mink*.

[499] *Op. Cit*. Botreau, R., Veissier, I. and Perny, P. (2009).

[500] *Op. Cit*. EFBA (undated).

[501] *Op. Cit.* Mononen, J., Moller, S.H., Hansen, S.W., Hovland, A.L. *et al*. (2012).

[502] *Op. Cit*. WelFur (2015) *WelFur welfare assessment protocol for foxes.*

[503] *Op. Cit*. WelFur (2015) *WelFur welfare assessment protocol for mink.*

[504] *Op. Cit*. Welfare Quality (2009) *Welfare Quality assessment protocol for pigs (sows and piglets, growing and finishing pigs).*

[505] Welfare Quality (2009) *Welfare Quality assessment protocol for poultry (broilers, laying hens).* 1 October 2009. Welfare Quality Consortium, Lelystad, Netherlands.

[506] Mason, G. and Mendl, M. (1997) Do stereotypies of pigs, chickens and mink reflect adaptive species differences in the control of foraging? *Applied Animal Behaviour Science*, 53: 45-58.

[507] *Op. Cit.* Council of Europe (1999).

[508] *Op. Cit.* WelFur (2015) *WelFur welfare assessment protocol for mink.*

[509] *Op. Cit.* Broom, D.M. (1986).

[510] Webster, A.J.F., Main, D.C.J. and Whay, H.R. (2004) Welfare assessment: indices from clinic observation. *Animal Welfare*, 13: S93-98.

[511] EFBA (undated) *WelFur – the animal welfare project on fur-farmed species: F.A.Q. on WelFur.* European Fur Breeders' Association. **http://www.efba.eu/welfur/faq.html** (accessed 20.09.15).

[512] *Op. Cit.* EFBA (undated) *WelFur – the animal welfare project on fur-farmed species: Overview.*

[513] Wechsler, B. (2007) Normal behaviour as a basis for animal welfare assessment. *Animal Welfare*, 16: 107-110.

[514] Bracke, M.B.M. (2007) Animal-based parameters are no panacea for on-farm monitoring of animal welfare. *Animal Welfare*, 16: 229-231.

[515] *Op. Cit.* EFBA (undated) *WelFur – the animal welfare project on fur-farmed species: F.A.Q. on WelFur.*

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To see more of Jo-Anne's work visit **www.weanimals.org** or email her at **info@weanimals.org**

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