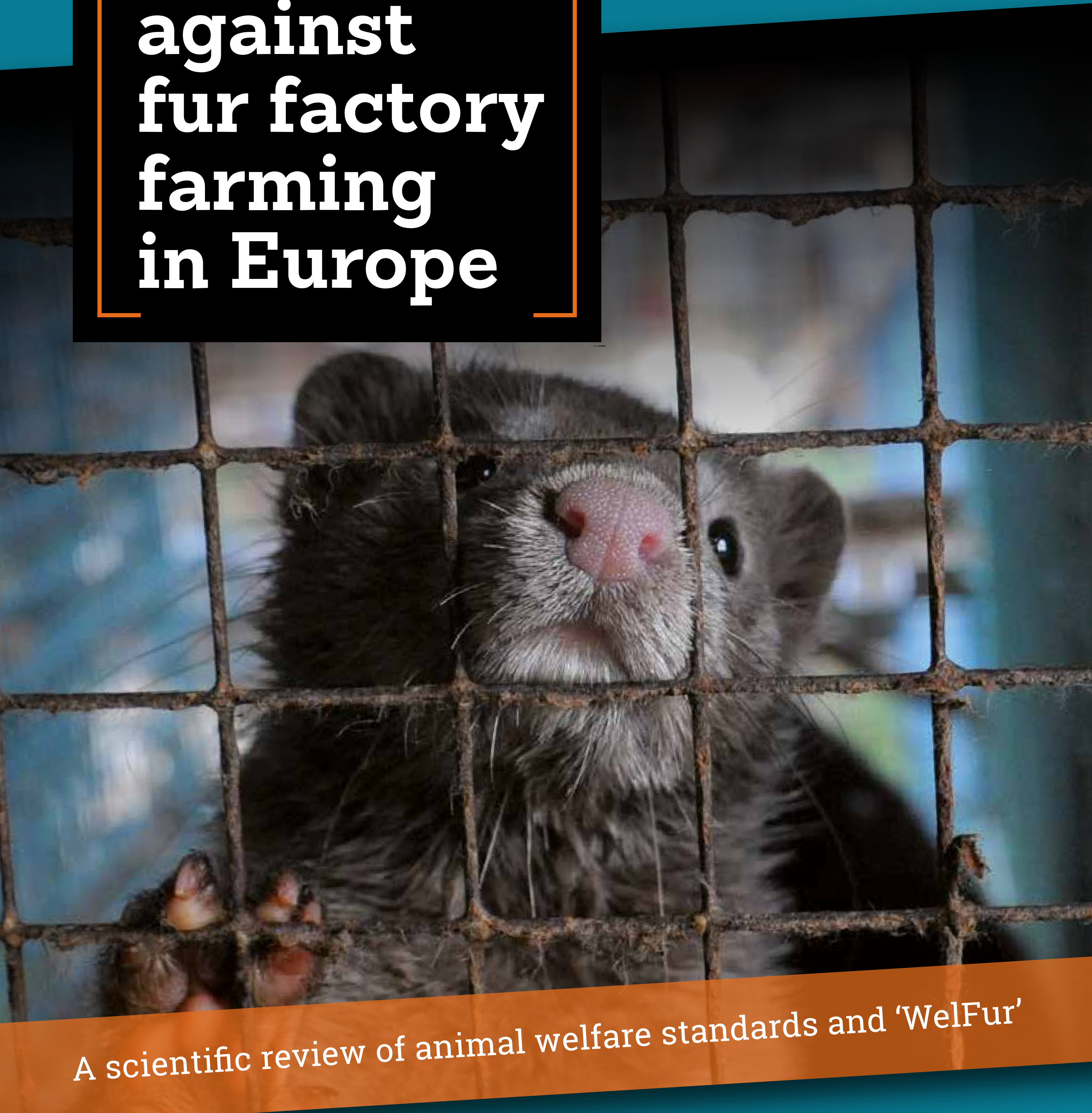
SECOND EDITION

The case against fur factory farming in Europe



A scientific review of animal welfare standards and 'WelFur'

A JOINT REPORT FROM

EUROGROUP FOR ANIMALS

respect for animals
FIGHTING THE INTERNATIONAL FUR TRADE

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THE CASE AGAINST FUR FACTORY FARMING IN EUROPE

A scientific review of animal welfare standards and 'WelFur'

SECOND EDITION

A report for Eurogroup for Animals and Respect for Animals

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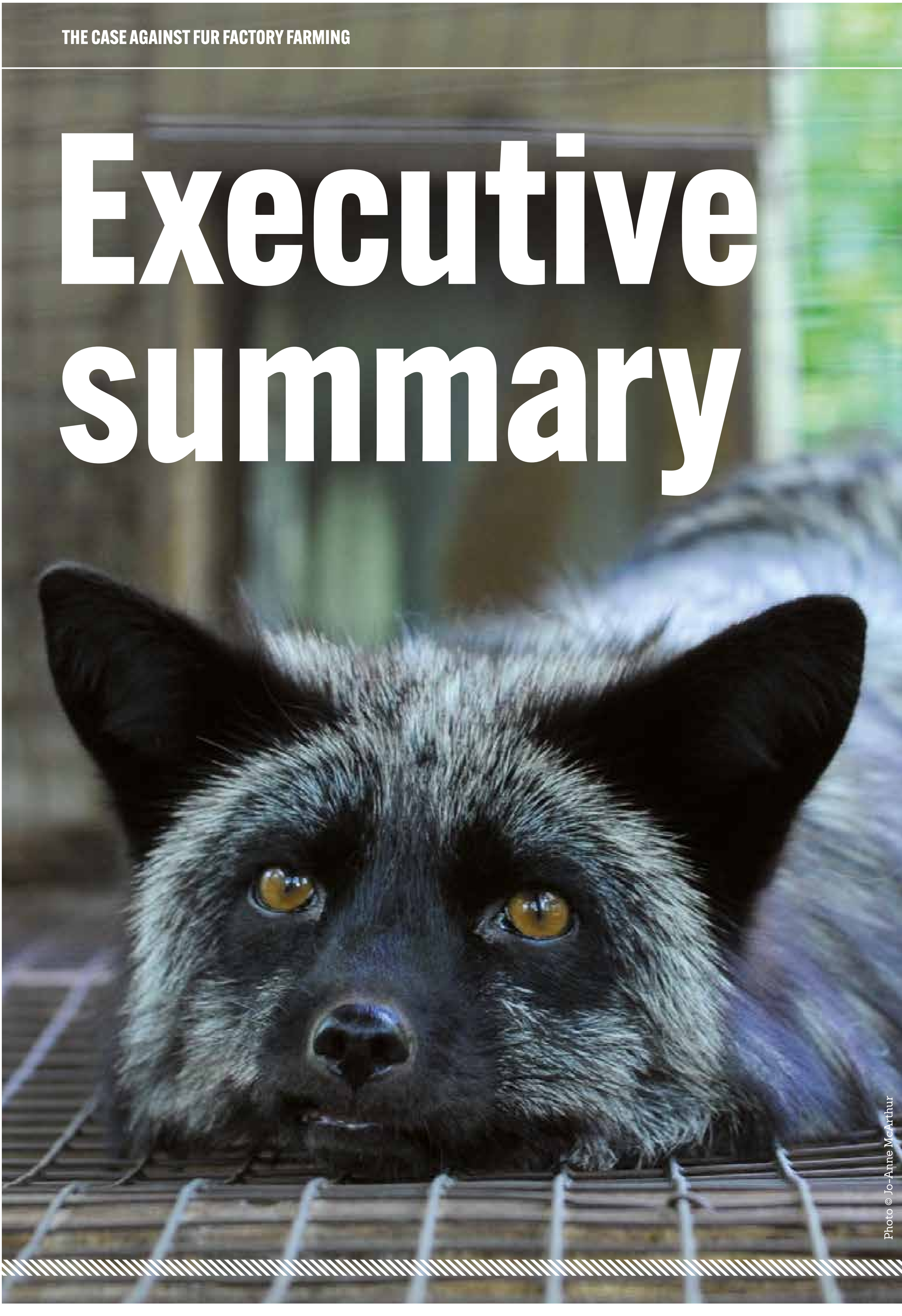

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Most fur sold globally is from farmed animals, with Europe and China being the largest producers. Since the first edition of this report was published, global fur production has been falling year-on-year, and there have been substantial reductions since 2020 as a result of mink culls in response to the COVID-19 pandemic. In 2021, an estimated 23 million mink, 12 million foxes and 9 million raccoon dogs were reared and killed for their fur.

The COVID-19 pandemic is believed to have originated in red foxes, raccoon dogs and/or hog badgers sold for food in the Huanan Seafood Market in Wuhan around November 2019. This pandemic caused the reported deaths of more than 6.5 million people by October 2022. The disease was identified in European fur farms as early as April 2020, and the virus spread to hundreds of mink farms, with new variants being transmitted back to humans. Farming mink, foxes and raccoon dogs represents a substantial, and unpredictable, zoonotic hazard.

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 about 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. Species farmed for their fur are essentially wild animals and, as such, not suited to captivity, least of all in small cages.

Recent scientific studies add further weight to the substantial body of evidence presented in the 2015 edition of this report that demonstrated that the needs of mink and foxes, and now raccoon dogs, are not met in current housing systems, and cannot be met in any commercial housing system used by the fur industry.

> *"Species farmed for their fur are essentially wild animals and, as such, not suited to captivity, least of all in small cages."*

Mink, foxes and raccoon dogs used for fur production are not domesticated

Domestication is an evolutionary process by which a population of animals becomes adapted to humans and captivity. It involves selection for a diversity of traits, of which tameness is a key feature: basically, domesticated animals tolerate, or welcome, human presence and handling. However, tameness alone does not imply domestication.

It is possible to breed tame silver foxes within relatively few generations when very stringent selection criteria are used. These animals actively seek human attention and are easy to handle. This is also possible with mink. Preliminary research suggests that it may be possible to breed arctic foxes with similar characteristics, although this has not been pursued to any great extent. No systematic selection for tameness has been carried out in raccoon dogs.

The breeding of animals on fur farms is controlled by humans, and they exhibit a number of physical differences from their wild counterparts; these are largely related to selective breeding for pelt characteristics and body size. However, mink, foxes and raccoon dogs on fur farms are still essentially wild animals and are not domesticated. Nor are they tame: they are generally fearful of human presence and are unsuitable for intensive farming. While selective breeding of fur animals that are more tolerant of human presence could be a positive step to improving their welfare, this would not address the significant welfare issues associated with the husbandry requirements of the fur industry. Nor would it be compatible with the fur industry's focus on selective breeding for pelt colour, size and quality.


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"The majority of European citizens polled in over 20 countries, including those with substantial fur production industries, are opposed to rearing animals in cages for their fur."

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

The Five Domains Model for assessing animal welfare was originally developed in 1994 to evaluate welfare compromises in sentient species used in research, teaching and testing. The model has been expanded over the years to include a range of negative mental/emotional experiences and to incorporate positive experiences. The focus of the model is on the presence or absence of various internal physical/functional states and external circumstances/interactions (domains 1-4) that give rise to negative and/or positive mental experiences/states (domain 5). The balance of positive and negative mental experiences determines the overall welfare of the animal.

The welfare of mink, foxes and raccoon dogs farmed for fur is severely compromised across all five domains. Negative conditions and interactions overwhelmingly outweigh positive ones in domains 2 (physical environment) and 4 (behavioural interactions), and may often do so in domains 1 (nutrition) and 3 (health). The highly restrictive and largely barren conditions on fur farms provide little opportunity for welfare enhancement and positive experiences. The overall mental state of the animals (domain 5) is therefore likely to be dominated by negative experiences, resulting in poor welfare and a 'life not worth living'.

Levels of fear, stereotypic behaviour, fur-chewing/tail-biting, physical deformities (bent feet), and reproductive failure/infant mortality show that the needs of mink, foxes and raccoon dogs on fur farms are not being met. Mink, foxes and raccoon dogs are highly motivated to access specific resources and perform species-specific behaviours that are not possible in the housing systems currently used on fur farms. There is no evidence that selective-breeding of animals used for fur production could fulfil their welfare needs in cage-rearing systems. Nor is there any evidence that current rearing conditions on fur farms result in the loss of species-specific behaviours, or that improvements in the housing systems used on fur farms could lead to significant improvements in the welfare of fur animals.

European citizens are opposed to fur farming

The majority of European citizens polled in over 20 countries, including those with substantial fur production industries, are opposed to rearing animals in cages for their fur. Public opinion was only divided in Denmark as to whether mink farming should be allowed to resume following the COVID-19 pandemic. A growing number of European countries have already implemented bans on rearing animals for fur, and there is widespread support for a ban at EU level.

WelFur cannot address the major welfare issues for mink, foxes and raccoon dogs farmed for fur

The European Fur Breeders Association (now Fur Europe) launched the WelFur project in 2009 to develop on-farm welfare assessment protocols for mink and foxes, which were published in 2015. A protocol for raccoon dogs was added in 2020. However, these protocols:

- **have been specifically designed around the very serious limitations of current housing systems and 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 engaged in the slaughter of fur animals**
- **downplay the importance of serious injuries associated with extreme suffering**
- **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 allows high scores on some elements to mask serious failings on others**
- **cannot achieve WelFur's stated aims of ensuring fur animals live 'a good life' and providing 'the latest 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'; and**
- **are misleading as the basis for a labelling system**

Thus WelFur cannot address the major welfare issues for mink, foxes and raccoon dogs farmed for fur, the issues associated with inhumane handling and slaughter methods, or serious inadequacies in current labelling and regulation. The 'best current practice' ceiling makes the WelFur scores both of limited use and misleading because most people would consider 'best current practice' to be an unacceptable level of welfare. Alternative rearing systems with the potential for higher levels of welfare do not exist for mink, foxes and raccoon dogs reared by the fur industry.

Conclusions and recommendations

The current regulatory framework for the protection of fur animal welfare in the European Union is inadequate. Enrichment of existing housing systems cannot address the serious welfare problems inherent in the cage systems used on fur farms. Fear of humans in the animals used by the fur industry, and difficulties in handling and management, present insurmountable obstacles to the adoption of more extensive systems. It is impossible for the welfare and biological needs of mink, foxes and raccoon dogs to be met by the fur industry.

The farming of mink, foxes and raccoon dogs for fur should be prohibited in accordance with Council Directive 98/58/EC, which states that *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* that *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 European Commission committed to proposing legislation to end the use of cages for animals farmed for food. It would be illogical and unjustifiable to continue to allow animals to be farmed for fur in cages while prohibiting the use of similar cages for animals farmed for food.

1 Introduction

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1. Introduction

In the first edition of this report, published in 2015, we examined the welfare of mink and foxes farmed for fur in Europe and evaluated the fur industry's WelFur protocols for on-farm welfare assessment. We concluded that WelFur could not 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 fur labelling and regulation in Europe.

Since the publication of that report, WelFur has been expanded to include raccoon dogs, the WelFur assessments have been implemented across Europe (and, to a limited extent, elsewhere), and WelFur is being used as the basis for the fur industry's labelling scheme to support claims that 'fur animals live a good life' [1].

In this revised edition of our report, we update the scientific evidence regarding the welfare of animals farmed for fur in Europe, assess claims that these animals are, or could be, domesticated, and the credibility of WelFur.

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2 The fur farming industry in Europe

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2. The fur farming industry in Europe

2.1 Scale of the fur farming industry in Europe and elsewhere

Around 90% of the fur sold globally is from farming, with the rest coming from trapping and hunting wild animals [2]. Mink (*Neovison vison*) account for the largest share of global fur production, followed by arctic (blue) foxes (*Vulpes lagopus*), silver (red) foxes (*Vulpes vulpes*), and raccoon dogs (*Nyctereutes procyonoides*), often referred to by the fur industry as Finnraccoon or Asiatic raccoon. Smaller numbers of other species are also farmed for fur: these include chinchilla (*Chinchilla lanigera*), coypu (*Myocastor coypus*), ferret (*Mustela putorius furo*) and sable (*Martes zibellina*). Around 650 million rabbits (*Oryctolagus cuniculus*) are reared each year [3]; most are reared for meat, but some fur is produced as a by-product of meat production and some rabbits are bred specifically for their fur.

In this report, we focus on the welfare of those animals that are farmed exclusively for their fur in Europe and are included in the fur industry's WelFur scheme, i.e., mink, arctic and silver foxes, and raccoon dogs.

Since the publication of the first edition of this report, global mink production has been falling year-on-year, and there have been further substantial reductions since 2020 as a result of the COVID-19 pandemic [4,5,6]. SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2, the virus responsible for the COVID-19 pandemic in humans) has been detected in mink on hundreds of farms in Denmark, as well as on farms in Canada, France, Greece, Italy, Latvia, Lithuania, Poland, Sweden, Spain, the Netherlands and the USA [7].

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Whole-genome sequencing of the virus isolated from mink on farms in the Netherlands has provided evidence of both human-to-mink and mink-to-human transmission [8]. Sequencing samples from humans infected with mink-related SARS-CoV-2 in Denmark revealed that the virus has accumulated mutations, which have potentially adverse consequences for human health [9]. As a result, a ban on mink farming in the Netherlands was brought forward from 2024 to 2021 [10], and mink farming was temporarily suspended in Denmark, France, Italy and Sweden, with millions of mink being culled [11]. Other studies showed that mutations in the mink-related SARS-CoV-2 strain in Denmark affect its susceptibility to antibodies in recovered COVID-19 patients and people who had been vaccinated [12]. France [13] and Italy [14] made the ban on fur farming permanent. The suspension in Denmark was extended until the end of 2022, although mink breeding will be permitted to resume in 2023 [15], and Sweden allowed mink breeding to resume in 2022 [16].

The first two cases of SARS-CoV-2 in mink farms in the Netherlands were identified in April 2020; by November 2020 more than half of the Dutch mink farms were infected. Workers such as farmers and drivers were largely responsible for the spread, although cats, dogs and wild animals such as badgers (*Meles meles*) could also have spread the virus between fur farms [17]. SARS-CoV-2 has now been reported on numerous mink farms across Europe and North America [18].

The rapid spread of SARS-CoV-2 in mink farms raises questions regarding their potential role at the onset of the pandemic and the impact of mutants on viral fitness, contagiousness, pathogenicity, re-infections with different mutants, immunotherapy, and vaccine efficacy [18]. Mutations have been observed circulating in mink on several occasions. Some of these have been transmitted to humans, with the associated risk of modification of transmissibility and pathogenicity [19]. The possibility of repeated re-infection of humans from a wildlife reservoir could severely hamper SARS-CoV-2 control efforts [20]. It is clear that *mink farming represents a substantial and unpredictable zoonotic hazard* [21].

The early cases of the COVID-19 pandemic started in the Huanan Seafood Market in Wuhan; it is believed that there were two separate transmission events in late November 2019. These appear to have originated from wild animals, most probably hog badgers (*Arctonyx collaris*), raccoon dogs and/or red foxes sold for human consumption [22,23]. This was the likely

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origin of the global pandemic: by the end of October 2022, the World Health Organization had recorded over 600 million cases of COVID-19 in people, with more than 6.5 million deaths [24].

In 2019 (i.e., prior to the COVID-19 pandemic), an estimated 48 million mink [25], 16 million foxes [26], and 14 million raccoon dogs [27] were killed to supply the global fur trade. Following large-scale mink culls, global mink production fell to an estimated 33 million in 2020 [28], and was expected to fall further in 2021 to an estimated 23 million [29]. Even before the pandemic, the fur industry was in steep decline from a peak in 2014, when global annual supply reached an estimated 114 million mink [30] (this figure is higher than that in the first edition of this report due to substantially higher production figures released by China), 12 million foxes [31], and 14 million raccoon dogs [31]. The fall in mink production was largely responsible for the rapid decline in global fur production. Annual production of fox pelts also declined from around 20 million in 2018 to around 12 million in 2021 [32]. Annual production of raccoon dogs declined from a peak of around 16 million in 2015 to around 9 million in 2021 [6,31].

China and Europe are the largest producers of fur. In 2019, Denmark was the largest producer of mink globally [4,27,33], before an estimated 15.7 million mink were slaughtered. Around 7.4 million were skinned to supply the fur industry and 8.3 million were destroyed [33]. China is currently the largest producer of mink, fox and raccoon dog pelts [6], and is also the largest consumer of fur [34]. The number of mink produced in China is unclear because industry estimates of global mink production sometimes present lower production figures than those reported by China [4]. According to the China Fur Breeders Commission of the China Leather Industry Association, Chinese production of mink pelts was 6.9 million in 2021 [6], down from a peak of 60 million in 2014 [31].

Annual mink production in Europe fell from 45 million in 2014 to an estimated 12 million in 2021 (Table 1). Following the cull in Denmark, Poland is now the largest European producer of mink. It is unlikely that mink production in Denmark will achieve anywhere near pre-pandemic levels. Only 13 mink farms (circa 1% of Danish mink farms) applied for compensation to enable them to maintain their business infrastructure until mink breeding is permitted to resume, whereas 1246 farms applied for compensation to close their businesses [35].

Other significant mink producers globally include the USA (1.4 million pelts in 2021, down from 2.7 million in 2019) [36], Russia (1.3 million pelts in 2021) [4,5], and Canada (1 million pelts in 2020) [37].

China produced 11 million fox pelts and 9 million raccoon dog pelts in 2021 [6]. Finland is the largest European producer of foxes (mainly arctic foxes) and raccoon dogs: 1.18 million foxes were bred in 2021, down from around 2 million annually prior to 2020, and 87,000 raccoon dogs, down from >150,000 annually in 2018 and 2019 [27]. Poland is now the second largest producer of foxes in Europe (30,000 pelts in 2021) following a substantial fall in production in Norway, down from 60,000 pelts in 2020 to 7000 in 2021 due to the impending phase-out of the industry by 2025 [5].

Table 1. *Number of farmed mink killed for fur production in Europe at the industry's peak (2014), prior to the coronavirus pandemic (2019), and subsequently (estimated figures for 2020 and projected figures for 2021 published on 27 May 2021). From [4], with nationally reported figures for Denmark [33] and Finland [5,38].*

* *denotes those countries in which fur farming has ended or is being phased out.*

\+ *indicates figures rounded to the nearest million.*

	2014	2019	2020	2021
BELARUS	900,000	600,000	750,000	650,000
BELGIUM*	170,000	80,000	115,000	115,000
DENMARK	17,888,000	12,825,000	7,400,000	0
ESTONIA*	170,000	30,000	0	0
FINLAND	1,900,000	1,000,000	780,000	850,000
FRANCE*	200,000	75,000	32,000	30,000
GERMANY*	350,000	0	0	0
GREECE	1,800,000	1,500,000	1,200,000	1,500,000
ICELAND	257,170	58,815	47,052	75,000
IRELAND*	175,000	90,000	100,000	60,000
ITALY*	180,000	120,000	45,000	0
LATVIA*	700,000	500,000	375,000	360,000
LITHUANIA	1,500,000	1,100,000	1,500,000	1,700,000
NORWAY*	850,000	600,000	200,000	60,000
POLAND	9,500,000	5,000,000	4,500,000	5,000,000
SPAIN	700,000	500,000	450,000	450,000
SWEDEN	1,050,000	600,000	470,000	200,000
THE NETHERLANDS*	5,515,950	4,500,000	1,000,000	0
UKRAINE	750,000	800,000	1,100,000	1,100,000
TOTAL+	**45,000,000**	**30,000,000**	**20,000,000**	**12,000,000**

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

There is no species-specific EU legislation setting welfare standards for animals reared for fur. They are covered by the general requirement of 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 [39]. The Annex to this Directive requires that:

- ***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. The *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 [40]. Two years later, the Scientific Committee on Animal Health and Animal Welfare (SCAHAW) published its report on *The Welfare of Animals Kept for Fur Production*. This highlighted significant welfare problems for farmed fur animals [41]. However, over two decades later, no proposals have been forthcoming from the Commission.


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The 1999 Recommendation states 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***
- ***… 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***
- ***No animal shall be kept for its fur if … the conditions of this Recommendation cannot be met, or … 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 particular 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 [42] applies to animals bred or kept for fur production. The Regulation specifies 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 the personnel involved in killing animals on fur farms. The Regulation 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 [43].

Trade in the fur of certain species is prohibited or restricted in the EU. Regulation (EC) No 1523/2007 of 11 December 2007 [44] 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 [45], as implemented by Commission Regulation (EU) No 737/2010 of 10 August 2010 [46], places restrictions on the trade in commercial seal products in the EU.

In the absence of action at EU level, a growing number of European countries (EU members and others) have introduced legislation prohibiting fur farming at a national level. Fur farming is banned in Austria, Belgium (from 2023), Bosnia and Herzegovina (from 2028, although the last Bosnian fur farm closed in 2020), Croatia, the Czech Republic, Estonia (from 2026), France, Ireland (last farms to close in 2022), Italy (last farms to close in 2022), Latvia (from 2028), Luxembourg, the Netherlands, Norway (from 2025), the Republic of North Macedonia, Serbia, Slovakia (from 2025), Slovenia, and the UK. Legislation to prohibit fur farming has also been proposed in Lithuania, Montenegro, Poland, Spain, and Ukraine.

Some other European countries have partial or effective bans as a result of other legal requirements. Bulgaria has banned the import and breeding of mink due to their impact on biodiversity (although implementation of the ban is suspended, pending an appeal by the industry). Denmark has banned fox and raccoon dog farming. Hungary has banned the breeding of coypu, foxes, mink and polecats for fur. Stricter animal welfare requirements have made fur farming uneconomic in Germany (for mink), Sweden (for chinchilla and foxes) and Switzerland. Construction of new mink farms is not permitted in Spain due to concerns about the effect of escaped mink on remnant populations of the critically endangered European mink (*Mustela lutreola*).

Elsewhere in the world, legislation in Japan on invasive alien species prohibited the construction of new mink fur farms, and all existing farms have now closed [47]. New Zealand has banned the import of mink, which effectively bans mink farming in the country [47]. Bans on the sale of fur have been, or are being, introduced in Israel, the US state of California, and several US cities [47]; a similar ban is under consideration in the UK [48].

The European Commission is currently revising EU animal welfare legislation and has explicitly included animals farmed for fur in this process. In its 'Farm to Fork Strategy', which was adopted on 20 May 2020 [49], the Commission has committed to an *Evaluation and revision of the existing animal welfare legislation, including on animal transport and slaughter of animals* by the end of 2023. A public consultation on the revision of EU animal welfare legislation identified mink, foxes and raccoon dogs as species that may need specific welfare requirements.

In 2021, the Commission published an Impact Assessment for the revision of EU animal welfare legislation, which identified two core problems associated with animals farmed for fur. These were a *lack of sufficiently specific, updated and detailed requirements for the protection of certain animal species, resulting in an inadequate protection of the welfare of those species*, and *unmet expectations of parts of* [sic] *citizens and consumers in terms of protection of animals* [50].

To address these issues, the Impact Assessment suggested that new requirements were needed *for fur animal farming to improve animal welfare conditions, in light of new scientific evidence and to improve enforcement.*

The Commission has indicated its intention to request that the European Food Safety Authority (EFSA) examines the issue of fur animal welfare, including mink, foxes and raccoon dogs, but not until after 2023 [51]. EFSA's Panel on Animal Health and Welfare (AHAW) is the successor to SCAHAW.

In June 2021, the Commission committed to proposing legislation to end the use of cages for animals farmed for food, including broiler breeders, calves, ducks, geese, layer breeders, laying hens, pullets, quail, rabbits and sows [52]. The proposal is expected by the end of 2023 as part of the revision of EU animal welfare legislation, with the expectation that the proposed legislation will come into force from 2027. However, to date, the Commission has not indicated that it intends to propose a ban on cages for animals farmed for fur.

In June 2021, Austria and the Netherlands, supported by Belgium, Germany, Luxembourg, and Slovakia, called for a ban on fur farming across the EU. The statement published by the Council of the European Union said that *Austria and the Netherlands have taken the initiative for a joint note to ask the Commission to take appropriate action to end fur farming in the European Union. We, together with our co-signers, believe that – now that many mink have been culled and several Member States have banned fur farming and breeding in their own countries – the time has come for the European Union to move forward on this topic and express their respect for animal welfare and their willingness to end an economic activity that is without doubt harmful for the wellbeing of animals kept in small cages for the sole or main purpose of obtaining fur* [11].

Many other member states have expressed their support for the initiative, including Bulgaria, Estonia, Ireland, Italy, Poland, Slovakia, and Slovenia [53].

Section 2 Summary

Most fur sold globally is from farmed animals: China and Europe are the largest producers. Worldwide, prior to the COVID-19 pandemic, an estimated 48 million mink, 16 million foxes, and 14 million raccoon dogs were killed in 2019 to supply the global fur trade. Following large-scale mink culls, global mink production fell sharply in 2020 to an estimated 33 million, and was predicted to have fallen to 23 million in 2021. Even before the pandemic, the fur industry was already in steep decline from a peak in 2014, when global supply reached an estimated 114 million mink, 12 million foxes and 14 million raccoon dogs. Mink production in Europe fell from a high of 45 million in 2014 to 12 million in 2021. Denmark was the largest mink producer globally in 2019, before all the mink in the country were culled in response to the COVID-19 pandemic. China is now the largest producer of mink, fox and raccoon dog pelts. In Europe, Poland is currently the largest producer of mink, and Finland is the largest producer of foxes and raccoon dogs.

Red foxes, hog badgers and/or raccoon dogs are believed to be the source of the global COVID-19 pandemic; this caused the reported deaths of over 6.5 million people by October 2022. The virus spread to hundreds of mink farms. Rearing mink, foxes and/or raccoon dogs on farms poses a significant risk to the health and safety of farm workers, and the human population more generally.

Fur animals are included in general EU legislation on animal welfare, transport and slaughter. However, there is currently no 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. The European Commission is currently revising EU animal welfare legislation, which specifically includes animals farmed for fur. The Commission has committed to proposing legislation to end the use of cages for animals farmed for food. However, to date, the Commission has not indicated that it intends to propose a similar ban for animals farmed for fur. In the absence of action at EU level, a growing number of European countries have introduced legislation prohibiting fur farming at national level.

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3 Animal welfare and its assessment

Photo © Oikeutta Eläimille

3 Animal welfare and its assessment

3.1 Animal welfare - concepts and definitions

Our understanding of animal welfare has developed considerably over recent decades. During the 1980s and 1990s, there were three different foci on animal welfare: some scientists emphasised the biological functioning of the animal in terms of health, growth and reproduction; others emphasised the affective (emotional) state of the animal in terms of positive and negative experiences; and some emphasised the degree to which the animal is able to behave 'naturally' [54].

In the 'biological functioning' approach, welfare was 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, which stated that *The welfare of an individual animal is its state as regards its attempts to cope with its environment* [55].

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 [56]. Negative emotional states, like frustration, may be reflected in behavioural and/or physiological changes, indicating that an animal is having difficulty coping. Some authors argued that this is not always the case and that the animal's feelings are what matter, irrespective of whether biological functioning is impaired. Duncan, for instance, argued that *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* [57].

Nevertheless, focusing exclusively on feelings may 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 combined both the 'biological functioning' and 'affective state' approaches into a succinct definition of animal welfare: he considered that welfare is good when an animal is *fit and happy*, or *fit and feeling good* for anyone uncomfortable with the word 'happy' [58].

Dawkins argued that there are only two questions that we need to answer about animal welfare: *Are the animals healthy?*, and *Do the animals have what they want?* [59].

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 live ('natural living') is necessary for good welfare, so that animal welfare is likely to be compromised if the conditions in which animals are kept are substantially different from those in which they evolved. Rollin argued 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]. So, *to be responsible guardians of animals, we must look to biology and ethology to help us arrive at an understanding of these needs* [60].

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 that *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 typically apply economic concepts, such as 'total expenditure' (i.e., the price for access to a resource, multiplied by the quantity 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, *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* [61].

Over time, a more unified understanding of animal welfare has been generally accepted. Biological function is now considered to include affective states, and affective states are recognised to be products of biological function. The two are seen to interact dynamically, operating as an integrated whole, and this understanding is regarded as fundamental to managing and improving animal welfare [62]. 'Natural living' remains a useful reference point to identify any potential welfare impacts of human-imposed restrictions on an animal's expression of behaviour in managed conditions [62]. Affective neuroscience observations support behavioural research evidence identifying reward-motivated behaviours that are likely to be accompanied by positive emotional states. For example, in stimulus-rich environments, exploration and food acquisition behaviours involve dopamine neurotransmitter pathways associated with reward. These generate positive experiences such as energised, goal-directed wanting/liking and expectancy, which are expressed behaviourally as species-typical highly-focused foraging or predatory stalking/attack [63].

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* [64]. 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 following 'Five Freedoms' [65]:

- **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 have been widely used internationally as a framework for animal welfare assessment, legislation and assurance standards. They describe aspects of an animal's welfare state or 'outcomes' (e.g., freedom from discomfort) and 'inputs' (e.g., a comfortable resting area) considered necessary to achieve this state. The Five Freedoms focus on the absence of negative experiences and play an important role as a set of signposts to appropriate action [66]. However, it is now widely accepted that good welfare is not just about the absence of negative experiences, but primarily about the presence of positive experiences such as pleasure [67].

The Five Domains Model for animal welfare assessment (Figure 1) was originally developed in 1994 to assess welfare compromise in sentient animals used in research, teaching and testing [68]. Subsequently, the model has been developed to expand the range of negative affective states and incorporate positive affective states [69]. The focus of the model is on the presence or absence of various internal physical/functional states and external circumstances/interactions (domains 1-4) that give rise to negative and/or positive mental experiences/affects (domain 5). The balance of positive and negative mental experiences determines the overall welfare state of the animal.

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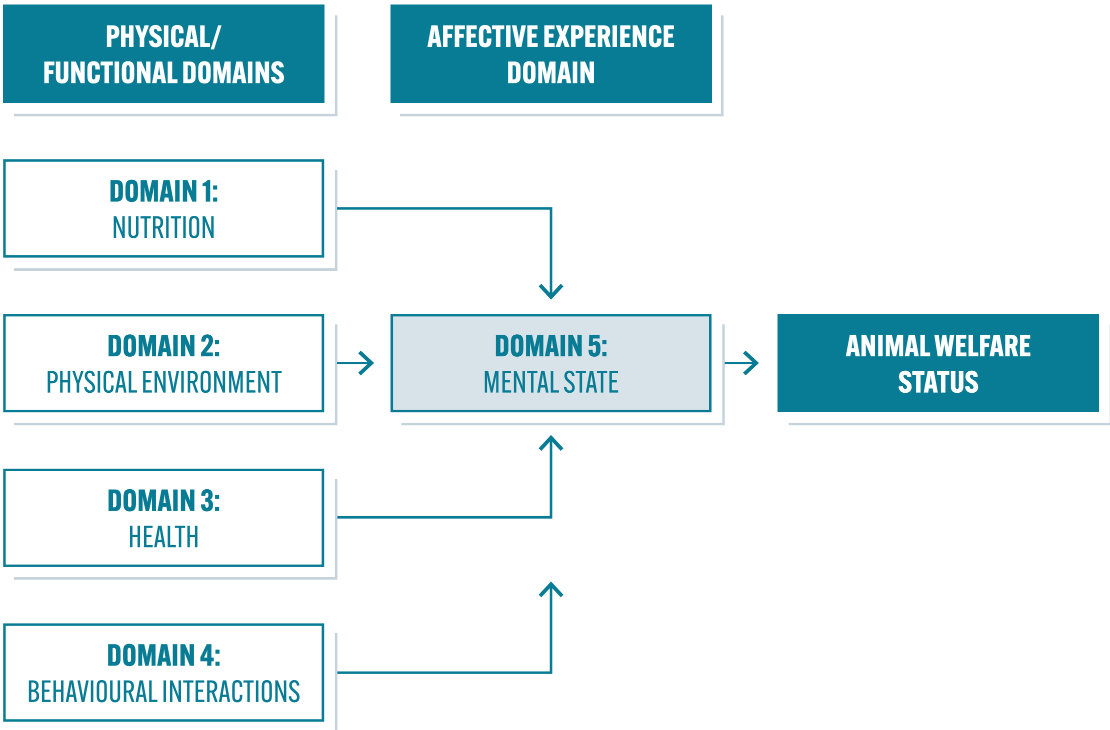
Figure 1.

An overview of the Five Domains Model [70]



Welfare assessment criteria (e.g., for use during an on-farm welfare assessment visit) can include both 'input' measures (such as the space and resources available to the animals, as well as management procedures), and 'outcome' measures (direct measurements of the 'outcomes' for the animals, such as levels of injuries and the 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 twelve 'Welfare Criteria' defined by Welfare Quality are [71]:

- **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 one point in time, such as during a welfare inspection visit. However, since these are usually arranged in advance, conditions can be altered, such as by providing additional bedding or enrichment material. There are also risks associated with relying on measuring welfare outcomes. Animals with the worst injuries or health problems may/are likely to be culled. So these animals will be excluded from measures of welfare outcomes, and behavioural problems may not be evident when 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. However, this does not mean that the use of outcome measures removes the need to stipulate adequate input

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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 might provide acceptable welfare standards. Welfare can be poor in any farming system if management practices and stockmanship are poor. Nonetheless, even if stockmanship is good, welfare is likely to be poor in barren, cramped conditions that severely limit opportunities to perform highly motivated behaviours.

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It is important to consider welfare over the whole life of the animal. FAWC proposed that the welfare of a farmed animal should be considered in terms of the quality of life it experiences over its lifetime, including the manner of its death [72]. On this basis, an animal's quality of life can be classified as:

- **A life not worth living**
- **A life worth living**
- **A good life**

This approach gives greater emphasis to the importance of positive experiences for the welfare of farmed animals, and reflects the shift in animal welfare science towards incorporating positive aspects of welfare into welfare assessment.

Section 3 summary

Our understanding of animal welfare has developed considerably over recent decades. During the 1980s and 1990s, three orientations to animal welfare thinking arose, 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 living/motivated behaviours' (i.e., 'do the animals have what they want?').

Over time, a more unified understanding of animal welfare has come to be accepted. Biological function is now considered to include affective states, which are recognised as products of biological function. The two are seen to interact dynamically, operating as an integrated whole entity, and this understanding is regarded as fundamental to managing and improving animal welfare. 'Natural living' remains a useful reference point to identify potential welfare impacts of human-imposed restrictions on an animal's expression of behaviour in managed conditions. It is now generally accepted that good welfare is not just about the absence of negative experiences, but primarily about the presence of positive experiences such as pleasure. Affective neuroscience observations support behavioural research that has identified reward-motivated behaviours that are likely to be accompanied by positive emotional states.

The Five Domains Model reflects the shift in animal welfare science towards incorporating positive aspects of welfare into animal welfare assessment. This model focuses on the presence or absence of various internal physical/functional states and external circumstances/interactions (domains 1: nutrition, 2: physical environment, 3: health, and 4: behavioural interactions) that give rise to negative and/or positive mental experiences/affects, as evaluated in domain 5 (mental state). The balance of positive and negative mental experiences determines the overall welfare state of the animal.

Welfare assessment criteria can include both 'input' measures (such as the space and resources available to the animals, as well as management procedures) and 'outcome' measures (direct measurements of the 'outcomes' for the animals, such as levels of injuries and the expression of various behaviours). 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 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, foxes and raccoon dogs farmed for fur

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4 Characteristics of mink, foxes and raccoon dogs farmed for fur

4.1 Biology and natural behaviour of mink, foxes and raccoon dogs

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 when trying to identify behaviours which 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 a heightened vulnerability to welfare problems in captivity. For example, carnivores that roam over large distances in the wild are more likely to display evidence of stress and psychological dysfunction in captivity [73,74]. So understanding the lifestyle of a species when it is free-living is essential to inform decisions about which species can, and cannot, be kept successfully in captivity without major welfare problems.

4.1.1 American mink

The American mink is a small carnivore with a long slender body and short legs, characteristic of the mustelid (weasel) family to which it belongs. Females are around 10% smaller and weigh 50% less than males [75]. In the wild the coat is dark brown, although several colour mutations occur occasionally [75]. Through selective breeding, fur farmers have produced several colour variations not seen in the wild.

Mink are adapted for a semi-aquatic lifestyle. Their coat has three times the density of guard hairs compared with terrestrial ferrets, and their feet have small but obvious webbing between the digits [41]. Mink move on land with a walking or bounding gait [76], and can climb and jump between trees [77]. They can dive to depths of 5-6m and swim underwater for up to 30-35m [75].

The native range of American mink covers most of North America except the extreme north of Canada and arid areas in 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 [41], and their territories always run along the edges of water bodies [41]. There may be some inter-sexual territory overlap between mink, but territories of animals of the same sex rarely overlap [78]. Mean linear home range size varies from 1.1 to 7.5km, depending on sex (generally larger for males than females) and habitat [75].

Mink often have half a dozen, and sometimes as many as two dozen, dens that are used for sleeping, resting, eating larger prey items, and caching surplus food [41]. Mink may spend 80-95% of their time inside dens [41]. These are generally <2m from water, and are typically crevices between tree roots or abandoned burrows of other species [75]. Each night mink travel up to 12km [75]. They are mostly nocturnal or crepuscular (active at dawn/dusk), but also show a significant amount of diurnal activity [79], particularly where they are more reliant on aquatic prey [80].

Mink are carnivores and their diet varies according to prey availability. Typically, this consists of fish, amphibians, crustaceans and small mammals, and opportunistically includes aquatic insects, birds and their eggs, earthworms, reptiles, and snails [75]. Most foraging activity is along waterways [75]. On land, mink typically hunt with their nose to the ground, poking into crevices, under boulders and into burrows [41]. Both on land and in water, prey is caught with a short burst of activity rather than sustained pursuit [41].

Adult mink are generally solitary. Males and females associate briefly for mating in early spring, and an average of 4 kits (range 2-8) are born in late spring [75]. They are nutritionally independent by 8-10 weeks of age, and typically begin to disperse when 12-16 weeks old [81]. However, young females may stay with their mother until they are 10 or 11 months old [41], and kits of either sex may travel in pairs until late autumn [82]. When dispersing, mink may travel up to 50km in search of their own territory [41].

4.1.2 Red fox

The red fox is a medium-sized member of the canid (dog) family [83]. Males are about 1.2 times heavier than females [41]. There are three basic colour varieties [84]: 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 now the most widely distributed land mammal in the world, found across most of the northern hemisphere and widely introduced, most notably to Australia and parts of the United States [85]. It is an omnivore, able to survive on a wide variety of food items, which is why it can adapt to diverse habitats, from arctic tundra to semi-arid temperate deserts, farmland and forests, and densely populated urban areas [83,86]. Throughout their range, small mammals and invertebrates predominate in their diet [87]. However, foxes are opportunists, and also eat birds and eggs, reptiles, fish, berries and fruits, offal and carcasses, and human refuse [41,86]. There are, however, clear geographic trends. The incidence of small and large mammals and birds is greater away from the equator, and the greater the human footprint, the higher the incidence of birds and fruit in the diet [87]. Surplus food is often cached in small holes which may be disguised with earth, leaves, and twigs [88].

While foxes are generally nocturnal or crepuscular, they also forage during the day, especially when rearing young [41]. 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 [89]. In suburban Bristol, male red foxes were active for an average of 8.8 hours per 24-hour period, females for 7.6 hours [90].

Red foxes are highly mobile; the daily distance travelled is typically >5km [91], and often >10km [92]. However, these figures are likely to be under-estimates, especially for large territories. Even in some of the smallest territories recorded for red foxes (in suburban Bristol), where the average annual home range was 24.4 hectares for males and 17.1 hectares for females, the average annual nightly distance travelled (based on 5-minute fixes) was 8.8km for adult males and 6.7km for adult females [90].

In Britain, home range size varies from circa 20 hectares (0.2km^2) for urban foxes to more than 1500 hectares (15km^2) in upland areas [93]. Males and females share a territory, and their social behaviour is highly flexible. They live in male/female pairs or in family groups of up to 10 adults and young; these groups consist of equal numbers of adult males and females [93]. Typically, only one vixen in the group breeds, and subordinate vixens that become pregnant may abort or desert their cubs, or they may be killed [93]. However, it is not uncommon for two or more vixens to rear cubs, either in separate dens or together [93]. Foxes usually have one or two preferred denning sites that they use to raise cubs, plus a number of


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smaller dens and above-ground lying-up sites [41]. Foxes may dig dens themselves or use abandoned rabbit burrows and badger dens [93].

The cubs (typically 3-6) are born in spring and emerge from the den when 4-5 weeks old [93]. They establish their hierarchy through fighting in their first 6 weeks and, once established, play becomes the major activity [41]. By 8 weeks of age the cubs will play several metres from the den, and the natal den is progressively abandoned from about 10 weeks onwards, depending on weather conditions [94]. Weaning is a gradual process: it starts at around 5 weeks of age, but is not completed until the cubs are 3 months old [41]. Cubs start to disperse in the autumn, with peak dispersal towards the end of the year [95]. Dispersal patterns are flexible in response to prevailing circumstances, and both the proportion of cubs dispersing, and dispersal distances, are related to population density [95,96]. Straight-line dispersal distances recorded for red foxes can be up to a few hundred kilometres [97], although the actual distance travelled by each fox would have been several times higher.

4.1.3 Arctic fox

Arctic foxes are smaller than red foxes, 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 [98]. There are two colour forms: the 'white' fox is white in winter and brown on the back with a white underside in summer, while the 'blue' fox is grey/blue in winter and dark brown in summer [41]. 70% of the arctic fox's coat is fine underfur, compared with 20% for the red fox [41]. Males are 5-20% heavier than females [98].

Arctic foxes live in the arctic regions of Eurasia, Greenland, Iceland, and North America [41]. They are mostly nocturnal or crepuscular, but may be active during the day [41]. Their diet includes lemmings and voles, birds and their eggs, marine invertebrates, fish, carcasses and placentas of marine mammals, insects and larvae, berries and seaweed [41,98,99]. Food caching is common when resources are abundant [98]. They are active year-round, but conserve energy during winter food shortages by reducing activity levels and basal metabolic rate [98].

Arctic foxes are territorial during summer, with home ranges typically between 4 and 60km^2 [98]. However, they can make seasonal and/or periodic movements of hundreds or thousands of kilometres [98]. For instance, a young female left Spitsbergen (Svalbard Archipelago, Norway) on 26 March 2018, and reached Ellesmere Island, Canada 76 days later. Based on GPS tracking, the cumulative distance she travelled from her natal area was 3506 km, i.e., an average of just over 46 km per day [100].

Dens are used for cub-rearing and for shelter during winter [98]. These are generally large complex structures, which may cover an area in excess of 100m^2. They typically possess 5-40, and sometimes more than 100, entrances [101].

Arctic foxes are generally solitary outside the breeding season, but have a flexible social system, sometimes forming large family groups [41]. They are monogamous and may pair for life [98]. A non-breeding female may help provision the cubs [41]. Mating takes place in early spring and cubs (typically 6-12, range 3-25) are born in late spring [98]. Cubs emerge from the den when 3-4 weeks old, and begin spending time away from the den when 8 weeks old [102]. They play with each other and occasionally with adults [102]. Aggression between cubs is uncommon and does not lead to serious injury [102]. Cubs generally play (33%) and rest (>50% of the time) when parents are away from the den [98]. They are weaned at 6-7 weeks, are independent by 12-14 weeks [98], and disperse in early autumn.

4.1.4 Raccoon dog

The raccoon dog is also a canid: it is about the same weight as a red fox but with shorter legs and tail [103]. There is no sexual dimorphism in body size [41], but there is a 30-40% variation in weight between spring and October-December [104]. The head is small, with a sharply pointed muzzle and short rounded ears, and the face resembles that of a raccoon with a black mask covering the eyes [103]. The basic colour is yellow-brown, with black hair tips on the shoulder, back and tail [41]. There are several sub-species; the one used on fur farms is *Nyctereutes procyonoides ussuriensis*.

The native range of the raccoon dog is China, Mongolia, and eastern Russia [41]. The Japanese raccoon dog is now considered to be a separate species (*Nyctereutes viverrinus*). *Nyctereutes procyonoides ussuriensis* was introduced from southeast Siberia to multiple locations in the former Soviet Union by the fur industry during the 20th century [105]. From there it has spread across much of Europe and is still spreading west and south; it might also spread further north as a consequence of climate change [105].

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Raccoon dogs prefer areas that provide thick protective cover [103], especially waterside habitats [106]. Throughout its native and introduced ranges, the raccoon dog occurs near lakes, rivers, streams, and marshes [103]. Raccoon dogs are omnivorous and opportunistic in their feeding habits; there are large differences in diet between different habitats and seasons [103]. Their diet includes small animals (rodents, reptiles, fish, amphibians, birds and their eggs, molluscs, and arthropods) and a variety of plant parts (roots, stems, leaves, bulbs, fruits, nuts, berries, and seeds) [103]. Raccoon dogs are more opportunists than predators, and spend a large proportion of their active time foraging; their small and weak canines and carnassials, and relatively long intestines, reflect their foraging strategy [107,108].

Long-term camera trap data from Russia indicate that raccoon dogs are mostly nocturnal in spring and autumn, active at irregular intervals during the day and night in summer, and largely inactive in winter [109]. Home ranges in Europe vary from 0.5km^2 to more than 8km^2 [106]. Raccoon dogs travel substantial distances within these home ranges: in Japan movements tended to be higher in autumn and lowest in winter [110].

While raccoon dogs form strong (probably lifelong) monogamous pairs, a recent study suggested the possibility of multiple paternity in wild raccoon dogs in Japan [111]. The home ranges of a male and female pair overlap almost completely, and pairs travel together or close to each other throughout the year [112,113]. Mated pairs do not appear to defend an exclusive territory [113].

In Poland raccoon dog pairs shared resting sites on 84% of days [114]. They frequently engage in social grooming [103], and the male brings food to the pregnant female and assists in postnatal care of the offspring [103]. During lactation, the male guards the litter while the female forages to meet her increased energy requirements [115]. The average litter size is 5-7, although up to 19 have been recorded [103]. The young are weaned at 30-40 days, are self-supporting by 4-5 months, and reach sexual maturity when around 9-11 months old [103]. The offspring often remain with the parents throughout the summer, and become independent in late summer/early autumn. Typical straight-line dispersal distances are up to 10km [112], but may be substantially further [116].

Raccoon dogs have multiple dens and shelters, often using dens of badgers and other species, as well as hollow and fallen trees, dense vegetation, and structures on the ground [114]. They may use the same den from year to year for wintering and a different den for breeding [114]. Raccoon dogs are almost always hidden when resting (>99% of rest-days) [114].

The raccoon dog is the only canid known to have a period of winter sleep in areas with harsh winters; pairs share a nest during winter sleep, which can last for 4-5 months during cold and snowy periods [104,117]. This period of winter sleep is preceded by autumn fattening (hyperphagia), and raccoon dogs typically fast for several months [117]. However, their body temperature typically only decreases by around 2°C [117,118], and they may undergo occasional periods of arousal, food intake and defecation [119]. In Finland, raccoon dogs usually stayed in their dens when the temperature was below 10°C, snow depth greater than 35cm, and day length less than 7 hours; they moved around when the temperature was above 0°C, there was no snow, and day length exceeded 10 hours [120]. They changed winter dens on average three times [120]. In areas with mild winters, raccoon dogs do not exhibit winter sleep, and may often change resting site [106].

4.2 Breeding and genetics - are mink, foxes and raccoon dogs on European fur farms domesticated?

4.2.1 Domestication and tameness - concepts and definitions

Our understanding of domestication has evolved over time. Some definitions focus on the control of breeding by humans and the purpose for which the animals are bred in terms of the benefits for humans. Others focus on the adaptation of the animals, including the process by which that adaptation occurs, and the behavioural and other changes observed in the animals (Table 2).

Table 2. *Some attempts to define domestication.*

DEFINITIONS FOCUSING ON HUMAN CONTROL AND BENEFITS FOR HUMANS	SOURCE
Domestication is the *condition wherein the breeding, care and feeding of animals are more or less controlled by man*	[121]
A domestic animal is one that has been bred in captivity for the purposes of economic profit to a human community that maintains complete mastery over its breeding, organization of territory, and food supply	[122]
Domestic animals may be provisionally defined as those kept and bred in and around human habitation to be used constantly to human advantage	[123]

DEFINITIONS FOCUSING ON ADAPTATION OF THE ANIMALS	SOURCE
Domestication is the *process by which a population of animals becomes adapted to man and to the captive environment by some combination of genetic changes occurring over generations and environmentally induced developmental events recurring during each generation*	[124]
Domestication is the adaptation of animals to environmental circumstances defined by humans, and is manifested as a 'domestic phenotype', which is the expression of those traits collectively enabling this adaptation	[125]
Domestication is an evolutionary process during which the biobehavioural profile (comprising e.g. social and emotional behaviour, cognitive abilities, as well as hormonal stress responses) is substantially reshaped	[126]

Domestication is a multi-faceted process in which many different features have been selected over several thousand years to produce the majority of domesticated species [127]. While tameness/human-animal interactions are just one aspect of domestication, definitions that focus on the adaptation of the animals, and how animal welfare is affected by the domestication process, are most relevant for this report. From this perspective, an appropriate definition to use as a starting point is that used in the 2001 SCAHAW report, i.e., domestication is *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* [41].

Adaptation to captivity is achieved through selective breeding over generations, and environmental stimulation and experiences during an animal's lifetime [128]. As SCAHAW highlighted, *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* [41]. 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 [41].

'Tameability' is a unique ability to interact with humans in a positive way; it is an important behavioural trait of captive animals that facilitates handling and improves welfare [128,129]. The process of taming is an experiential (learning) phenomenon that occurs during the lifetime of an individual [128]. Contact with humans very early in life, during a sensitive period for socialisation, greatly facilitates taming [128]. 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 [128]. A recent review entitled *The process of animal domestication* concluded that, while *The genetics and the physiological and morphological correlates of tameness have … been a central focus of studies of domestication … tameness alone does not imply domestication, as exemplified by tamed elephants living in close association with humans* [127]. So while many animals can be tamed, they would not be considered to be domesticated.

The changes that occur during domestication affect more than just the behaviour of the animal and its 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 what has been described as a 'domestication phenotype'. The phenotype of an animal is its observable characteristics, which are determined


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by a combination of genetics and environment [130]. The domestication phenotype, sometimes referred to as the 'domestication syndrome', is typically characterised by the appearance of white or piebald (spotted) fur or plumage, 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 [130,131]. Some definitions of domestication consider that the expression of the domestication phenotype is a necessary part of what makes an animal population domesticated [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 [128]. For instance, feral dogs (*Canis lupus familiaris*) rapidly revert to behaviours typical of wolves (*Canis lupus lupus*), their domesticated ancestor, and also hybridise with both wild wolves and coyotes (*Canis latrans*) [132]. Thus, the needs of domesticated animals are closely related to the evolutionary history of their ancestors [133].

4.2.2 Experimental 'domestication' of mink and foxes

The Council of Europe Recommendations state 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* [40]. The first mink farms were founded in the 1860s in upstate New York [41]. Farming silver foxes began on Prince Edward Island in southeastern Canada in the 1890s [134]. The first silver fox farm appeared in Europe in 1914 [41]. Arctic foxes were first kept in captivity in 1885, free-living on small islands off the coast of Alaska rather than in small cages, and have been farmed in Europe since the late 1920s [41]. Following some earlier failed attempts, raccoon dogs have been farmed for their fur since the early 1970s [41].

However, the degree of domestication is not necessarily dictated by the length of time that a population of animals has been maintained in captivity. Dmitri Belyaev and Lyudmila Trut started work on the experimental 'domestication' of silver foxes at Novosibirsk, Russia, in the late 1950s. 130 foxes that showed the least fearful and aggressive responses to humans were chosen from several commercial fox farms across the former Soviet Union

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to found the experimental population at Novosibirsk [134]. Breeding foxes for tameness started with selection against fear and aggression toward humans, and continued with selection for contact-seeking behaviour [134]. In parallel, starting in the 1970s, a separate population of foxes was bred for aggressive behaviour toward humans [134].

The foxes selectively bred for tameness behaved much like domestic dogs, actively seeking human attention [135]. Seeing a human at a distance, they whined, yelped and wagged their tails in anticipation of contact, when they tried to lick the experimenter's face and hands [135]. This behaviour developed spontaneously, early in the cub's development, without any specific contacts with the experimenter needed to initiate the behaviour [135]. The first foxes classified as having 'elite' domesticated behaviour appeared in the 6th generation [135]. By the 42nd generation, over 70% of the animals were classified as having elite domesticated behaviour [135]. This study, widely referred to as 'the farm-fox experiment', is still continuing [136]; the history, and aims, of the study are described in the book by Dugatkin and Trut entitled *How to tame a fox* [137].

The tame foxes also had altered vocal responses towards humans, making cackles and pants but never coughs or snorts, whereas aggressive and unselected foxes produced coughs and snorts, but never cackles or pants [138,139]. Vocal responses to other foxes were similar in tame, aggressive and unselected foxes [140]. Tame foxes also displayed 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 [141]. Tame foxes were as skilled as dog puppies in understanding human gestures [142].

Selection for tameness resulted in earlier eye opening and earlier onset of the first response to sound in fox cubs, and prolonged the sensitive period of socialisation beyond 60-65 days of age; the upper limit is 40-45 days in unselected foxes [143]. Tame foxes had altered brain chemistry, including higher levels of serotonin [144], a neurotransmitter involved in the suppression of aggressive behaviour [145]. Tame foxes also showed increased neurogenesis (formation of new neurons) in the hippocampus, which is also associated with reduced aggression [146].

Domestication is associated with changes in the hypothalamic-pituitary-adrenal axis, which is the main hormone system involved in the adaptation of animals to captivity [147]. For example, basal and stress-induced blood cortisol levels were, respectively, three- and five-fold lower in tame foxes than in farm-bred foxes [148]. Selection for tameness is associated with unique hypothalamic gene profiles, partly shared with other brain regions, and differentially expressed genes involved in development, differentiation and immunological responses [149]. With the publication of the fox genome in 2018, researchers were able to analyse the genomes of foxes from the tame, aggressive and conventional farm-bred (control) populations, and have identified more than 100 genomic regions associated with the response to selection for behaviour [150].

Physical characteristics typical of the domestication phenotype emerged in the foxes selectively bred for tameness. These included retention of the floppy ears of young cubs to 3-4 weeks instead of 2-3 weeks, with ears remaining floppy to 3-4 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 [135]. Trut *et al.* suggest their findings in foxes, together with other studies, indicate that genes affecting pigmentation are located within the genetic systems involved in the regulation of behaviour and development [135]. The time of moulting in foxes selected for tameness was also longer than in unselected animals [151]. The tame foxes reached sexual maturity about a month earlier than other foxes and gave birth to litters that, on average, had one more cub [131]. Their mating season was also longer; some females mated out of season and a few mated twice a year [131].

Novosibirsk foxes can now be purchased as pets. However, even after such intense selection for tameness for over 50 generations, they retain all their wild characteristics, and are not what most people would consider to be a domesticated pet. When left alone, for instance, they need to be secured in a large outdoor pen (i.e., they cannot be left alone indoors), and require a great deal of attention/human interaction to avoid the development of destructive behaviours [152].

Studies carried out over four years in Finland and Norway have shown that it is possible to select for more confident behaviour in arctic foxes, albeit with low to moderate levels of heritability [153]. However, to date, there is no comparable population of tame arctic foxes.

Work on the experimental domestication of mink has also been carried out at Novosibirsk. As with silver foxes, selection for tameness and aggressiveness in mink resulted in changes in the occurrence of white piebald patterning [154]. American mink from feral populations in western Siberia show six variants of specifically localised white spots. After selection for fur quality traits in commercial populations, white spotting is reduced and 7% had no white spots [154].

Mink selected for an aggressive response to humans have the least area of spots; there is a complete absence of white spotting in 27%. In mink selected for tameness, the penetrance and expressivity of white piebalds increased considerably, producing mink showing well-pronounced colour-markers. These colour aberrations have never been recorded in the control commercial population [154]. A number of novel colour variants appeared for the first time during selection for tame behaviour in mink, including 'silvery', 'black crystal', 'star' and 'blue' [155]. As in foxes, similar changes in hypothalamic-pituitary-adrenal axis function, such as reduced cortisol levels, were found in mink selectively bred for tameness [156].

A number of tests have been developed to quantify how mink respond 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 [157]. 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 [158,159]. This has a higher sensitivity (i.e., is able to detect fear in more animals) because it is more threatening than the stick test [160].

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 [161,162]. Originally a third line was bred for 'aggressive' responses but this was stopped after three generations because too few showed this response [161]. 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 [162].

Both 'confident' and 'fearful' mink showed an acute stress response to handling [163]. 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 [163]. However, the stress response of 'confident' mink decreased over time while held in a trap, whereas the response of 'fearful' mink increased [163]. Also, when caught for a second time, 'confident' mink showed a reduced response compared with first capture, whereas 'fearful' mink showed an increased response [163]. 'Confident' mink can be mated earlier [164], and have higher reproductive success, than 'fearful' mink [165].

While the Danish research demonstrated that it is possible to reduce fearfulness in farmed mink, the animals in the 'exploratory/confident' line were still

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a long way from being domesticated. 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); more than 35% would make physical contact with the gloved hand if it was held still (score of +2); but 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), but no mink could be held without lifting (score of +5) or be handled and lifted (score of +6) without avoidance/biting [159]. 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 did not show any signs of fear or aggression on contact with humans, and could be handled without gloves [158].

4.2.3 Are mink, foxes and raccoon dogs on fur farms domesticated?

The multiple features of the domestication syndrome may be linked to alterations in the migration of neural crest cells during embryonic development [166]. Neural crest cells are stem cells in vertebrate embryos that arise from the dorsal part of the neural tube and migrate to various parts of the body, where they give rise to a number of cell types. Selection for tameness leads to a reduction of neural-crest-derived tissues that are of behavioural relevance. As an unselected by-product, this neural crest hypofunction produces the morphological changes in pigmentation, jaws, teeth, ears, and other features associated with the domestication syndrome. Genomic data lend support to the neural crest hypothesis [167]. This suggests that it may not be possible to decouple selection for domesticated behaviour and the depigmentation and other features of the domestication syndrome that accompany it. So it is likely to be challenging, if not impossible, to breed domesticated animals that would meet the fur quality characteristics desired by the fur industry.

Some authors have argued that no consistent set of traits defines the domestication syndrome, and have questioned both its existence and the extent to which the farm-fox experiment provides supporting evidence [168]. Others argue that this misrepresents the domestication syndrome, treating it as a specific and constant set of characteristics across domesticated mammals, rather than something that manifests slightly differently from species to species [169]. So, for instance, floppy ears occur in domesticated rabbits, pigs and sheep, whereas smaller but similarly shaped ears occur in camels, cats and ferrets.

It has also been suggested that some of the traits associated with the domestication syndrome were already present in some of the foxes on Prince Edward Island, the founding population for the foxes on Russian fur farms and hence the farm-fox experiment [168]. However, none of the traits associated with the domestication syndrome were present in the founding population at Novosibirsk, and they did not emerge until several generations into the experiment [169].

An Opinion published by the Scientific Council for Animal Welfare of the Swedish University of Agricultural Sciences in 2018 stated that *It is sometimes claimed that the mink would not be domesticated because it has happened for such a short time. If one studies definitions of domestication in the literature, it is difficult to understand on what grounds it could be argued that the farmed mink in particular would not have been domesticated* (translated from Swedish) [170].

However, SCAHAW concluded that *The ferret is the most domesticated species of animals kept for fur production. In other species, there has been only a limited amount of selection for tameness and adaptability to captive environments* [41]. This is reinforced by Broom and Fraser, who state that *The mink … red or silver fox … Arctic or blue fox … raccoon dog … are not domesticated … The coat characteristics* [of these animals, especially of mink and foxes] *have been substantially changed* [but] *as the animals have been kept in wire cages, seeing humans only intermittently and often in rather disturbing situations, there has been relatively little adaptation to human presence* [171]. That remains the position today.

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4.2.3.1 Selective breeding of fur-farmed animals

In 2001, SCAHAW concluded that *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* [41]. The emphasis of fur farmers has been to select for traits associated with pelt colour and quality, body size and litter size, with little attention paid to behaviour [41,157]. Captive breeding mink, for instance, has produced several colour varieties, including 'sapphire', 'pearl', 'topaz' and 'winter blue', which are generally associated with one or more recessive genes [41,172].

Farmed mink weigh approximately twice as much as wild mink [41] and have relatively smaller brains, hearts and spleens [173,174]. Breeding for increased body/pelt size has resulted in animals that tend to become overweight when fed *ad libitum*. So mink are usually fed a restricted diet to reduce their weight in preparation for breeding, which leads to hunger and an increase in stereotypic behaviour [175] (Section 5.2). Selection has also resulted in increased litter size in farmed mink [176], which contributes to welfare problems associated with loss of body condition during lactation [177], and increased bite wounds and mortality in kits (Section 5.4.1) [178,179].

Arctic foxes have also been selectively bred to be larger than their wild counterparts to increase pelt size, which has favoured fast-growing and fat individuals [180]. Increases in pelt size in arctic foxes in recent decades have been due to more than doubling in body weight. Most arctic foxes are 'fat' or 'extremely fat' prior to killing, even when fed various experimental diets with reduced energy content in the late growing period [181]. Obesity in farmed arctic foxes is associated with high levels of bent feet, difficulty in moving, and diarrhoea [182]. Welfare assessments carried out on ten Finnish fox farms (71% arctic 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, 3% had major difficulties in moving, and 1% did not move; and 45% of foxes had diarrhoea [182]. Selection for a fast growth rate, high body weight and large body size in arctic foxes is associated with leg weakness and impaired ability to move, while selection for increased fur density is associated with poorer eye health [183].

4.2.3.2 Confidence/tameness in fur-farmed animals

In 2015 we reported that there had been some limited progress in reducing fear in mink on commercial farms. The proportion of adult female mink in a sample of Danish farms classified as 'exploratory/confident' in the stick test was higher in 1999 (62%) [157,162] than in 1987 (45%) [162]. However, data from WelFur inspections of European fur farms between 2017 and 2019 suggest little progress thereafter [184]. For adult mink in assessment period 1 (see Section 7 for details of the WelFur assessment protocols), the proportion of 'exploratory/confident' mink averaged 65% in Denmark and 61% in the rest of Europe, although any progress in Denmark will have been lost when all their farm mink were culled (Section 2.1).

Furthermore, the stick test is a relatively insensitive test of fear reactions [160], and even mink classified as 'exploratory/confident' in the stick test generally cannot be handled without showing fear/avoidance/aggression [159], and so are unsuitable for farming. In the hand-catch test, which is more representative of the level of human contact that mink experience on commercial farms, the vast majority of mink showed fear and/or aggression. A Russian study found that 81% of 'standard' (brown) mink responded fearfully in the hand-catch test, running about the cage in panic, and shrieking; 16% responded aggressively, while 3% showed a calmer, more exploratory reaction [158]. The proportion of less fearful individuals was greater in some colour varieties, but was still very small. In 'sapphires', 75% responded fearfully, 19% aggressively, and 6% showed an exploratory reaction. Only 0.03% of 'standard' mink and 0.2% of 'sapphires' could be handled without showing signs of fear or aggression [158].

While Danish legislation recommends including selection for 'confidence' in mink breeding programmes to improve welfare, *farmers may consider this criterion risky due to possible negative consequences on other traits* [185]. Mink bred at the Foulum Research Farm at Aarhus University showed no significant genetic correlation between behaviour (exploratory or fearful) and production traits (live pelt quality, live body weight, dried pelt length, dried pelt quality, and fertility), suggesting that selection for confidence among farm mink might be achieved without detrimental effects on economically important production traits [185]. However, while selection can be an efficient tool for improving welfare, this is not an alternative to developing better production environments, and teaching farmers more appropriate management routines [162].

It should also be remembered that the mink bred at the Foulum Research Farm were classified as 'exploratory' or 'fearful' using the stick test (the small number of animals classified as 'aggressive' or 'indecisive' were excluded from the analysis). Since this is an insensitive test of fear reactions, it is probable that animals classified as 'exploratory/confident' were still a long way from being handle-able. So characteristics considered problematic in terms of fur quality would not have emerged in the mink included in this analysis.

The research at Novosibirsk suggests that selection for fur quality traits tends to reduce the coverage of white fur patches [154]. Because fur farms focus on improving fur quality and pelt size, it is possible/probable that this could act in opposition to selection for more confident behaviour. Depigmentation of certain sites on the skin/fur cover (piebaldness) appears to be the first morphological consequence of selection for tameness across species, including foxes, mink and rats [154]. So any adaptation is not sufficient to allow mink to be farmed without their welfare being compromised by fear of humans. Traits related to welfare and fearfulness have not been systematically included in breeding programmes on fur farms [41,162].

Commercially-reared foxes under standard fur-farm conditions normally exhibit distinct patterns of aggressive and fear-aggressive behaviour toward humans [129]; because they are fearful of humans, they have short-term welfare problems in the vicinity of people. The increase in the proportion of time spent vocalizing and the shift of energy toward higher frequencies may be integral vocal characteristics of short-term welfare problems in farmed silver foxes [186].

In Finland, the offspring of foxes bred at Novosibirsk were housed under standard farm conditions, without any additional handling, and compared with normal Finnish farm foxes [187]. The Novosibirsk foxes had higher 'domestication indexes' and lower fearfulness scores than Finnish farm foxes. Almost all the Novosibirsk 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 Novosibirsk foxes also had lower serum cortisol (a measure of stress) levels both before and after stressful stimulation. They also showed lower stress-induced hyperthermia compared with Finnish foxes. Hybrids between the two fox populations showed intermediate results.

Harri *et al.* concluded that the welfare of the Novosibirsk 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 fox farms [187]. However, the unstimulating cage environment would still be a major welfare problem (Section 5), and any associated changes in coat characteristics would be incompatible with the requirements of the fur industry. Harri *et al.* also suggested that tame foxes might be frustrated by a lack of regular interactions with humans [187]. SCAHAW concluded that *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* [41]. As we show in section 4.2.3.3, fur farmers are unable to dedicate the amount of time needed to implement intense handling of all young animals.

For raccoon dogs, SCAHAW reported in 2001 that *No selection for tameness has been carried out and the domestication history is less than 30 years.* Indeed, some researchers have warned against selecting raccoon dogs for tameness because of the negative associations between tameness and productive performance/fur quality in foxes. One study cautioned that *most of the characters associated with the tameness* [in foxes selected for tameness] *are not beneficial regarding productive performance or fur quality. Therefore before the association between the animals' tameness and their productive traits have* [sic] *been evaluated in more detail, farmers should not be encouraged to select their* [raccoon dog] *breeding animals for a certain behavioural pattern* [188].

In a Finnish study, the proportion of adult female raccoon dogs classified as showing a 'non-domesticated' response in Trapezov's hand test varied from 29% to 58% [189]. Since the number of animals in each scoring category was not provided, it is not possible to see how many (if any) of the raccoon dogs scored highly enough that they would allow themselves to be touched or handled without showing fear or aggression. In a Polish study, 11% of adult female raccoon dogs were classified as very fearful, 22% fearful, 49% calm, 12% aggressive, and 6% very aggressive [190]. Some farms exclude the most aggressive animals from breeding but others do not, e.g., due to small herd size [190].

The mink and silver foxes bred for tameness at Novosibirsk are easy to handle without restraining devices or protective gloves [41]. Mink and foxes on fur farms cannot be handled without protective gloves (for mink) or restraining devices (for foxes) to reduce the risk of injury to the handler (Section 5.1.2). So the animals are not adapted to close contact with humans, and the use of these handling methods may have contributed to the lack of attention to behavioural traits in breeding programmes. SCAHAW stated that *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* [41].

Neck-tongs are also used for raccoon dogs, although they are relatively easy to handle [41]. However, this should not be taken as evidence of a lack of fear or a greater degree of domestication in these animals, since it is a feature of this species to 'play dead' when threatened, and free-living raccoon dogs are also easy to handle [106].

Fear of humans in the mink, foxes and raccoon dogs used by the fur industry makes them unsuitable for farming. This is in contravention of Council Directive 98/58/EC, which stipulates that *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* that *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.*

4.2.3.3 Stockmanship

An investigation of the animal welfare perceptions of people working on Danish mink farms found that employees' views were affected by the working conditions on the farm. Catering to the needs of the animals was sometimes seen as something that was in conflict with the needs, or preferences, of humans: *negative working conditions can be taken out on the animals* [and] *animal welfare can come to be seen as unimportant compared with human welfare.* A growing number of foreign workers were employed on Danish farms, particularly mink farms; *there is a risk that foreign employees are socially isolated, and that they also work in working conditions that are worse than those in* which *Danish employees work. Animal welfare is likely to seem less important to those who feel that human welfare is being neglected.* No specific courses on animal welfare need to be completed to work with animals on Danish farms; *increased focus on education and training programmes in stockmanship should be based on a more thorough knowledge of the behaviour and needs of farm animals and the interpretation of those needs* [191].

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There is growing evidence that the attitudes, skills, and knowledge of humans influence their behaviour towards animals, and the attitude and consequent behaviour of stockpeople has a significant effect on an animal's fear of humans. This in turn influences both productivity and welfare [192]. There is also increasing evidence that animals can recognise human facial expressions, and that they prefer positive human emotional expressions [193].

Studies on a variety of farm animals have shown that they are particularly sensitive to human stimulation early in life. On fur farms, for instance, fox cubs handled from 2-8 weeks of age were less stressed and showed less fear of people [194,195], and it is possible to reduce long-term stress and fear reactions through intense early handling of silver and arctic foxes [196-199]. Both gentle/positive and neutral handling can be beneficial [195,196]. Post-weaning handling had positive consequences for the later behaviour of growing arctic foxes, and appears to be a means to adapt the foxes to farm routines, including human-animal interactions. When the object is to improve welfare, growing foxes should have intense human contact and a shelter design which does not hinder (or delay) their adaptation to human proximity and farm routines [199]. High levels of fear responses and enlarged adrenal glands indicate that non-handled animals suffer long-term stress [196].

However, stocking densities on fur farms prevent staff from spending time interacting with animals. For instance, prior to the cull, there were almost 800 mink farms in Denmark (excluding smaller and non-specialised holdings), with the equivalent of 2,600 full-time employees and 2.5 million breeding animals producing 5 to 6 pups each. Thus there were 2.5 million adult animals and (with an average of 5.5 pups) 13.75 million pups, i.e., 16.25 million mink, with each employee responsible for the day-to-day management, and welfare, of 6250 mink [200]. In Finland in 2021, 886 person-years were required to look after the animals on 700 fur farms: 778,000 mink, 1,059,000 arctic foxes, 39,000 silver foxes, 81,000 cross-bred foxes, and 87,000 raccoon dogs were born that year. With an average of 5.1 cubs per female fox and 4.3 kits per mink, there would have been 231,200 breeding female foxes and 180,900 breeding female mink. This gives a total of 2,456,100 animals, excluding the males that were left after the post-breeding season cull of the male breeding stock, and the breeding stock of raccoon dogs. This suggests that there were around 2.5 million animals on Finnish fur farms in 2021, and so each person employed on Finnish fur farms was responsible for the day-to-day management, and welfare, of 2820 animals [5].

These calculations are almost certainly minimum estimates, since they assume that everyone working on fur farms in Denmark and Finland was responsible full-time for animal husbandry, which is unlikely. However, they show that each employee involved in day-to-day husbandry is responsible for several thousand animals, which precludes time for any interactions that might improve animal welfare. Since staff on fur farms do not have the time or opportunity to develop bonds with the mink, foxes and raccoon dogs for which they are responsible, any efforts to increase the welfare of animals in fur farms are at best marginal, and have little if any impact on their well-being.

In a recent update to the Five Domains Model, human-animal interactions believed to have negative impacts on animal welfare include: people near animals that have had little or no prior human contact; people whose presence adds to already threatening circumstances, such as when the animal is closely confined with no refuge; people whose current actions are directly unpleasant, threatening and/or noxious, such as serious mistreatment or neglect, physical restraint for aversive management, and separation from dependently bonded companion animals; and people whose prior actions are remembered as being aversive or noxious, such as unskilled animal handlers and stockpersons who apply routine noxious procedures. Interactions likely to have a positive impact on animal welfare include: the companionable presence of people who provide company and feelings of safety; people who provide preferred foods and/or tactile contacts, such as staff who provide food enrichments; people participating in enjoyable routine activities; people participating in engagingly variable activities; the calming presence of familiar people in threatening circumstances; and people acting to end periods of deprivation, inhibition or harm, such as delivering company or liberty from confinement [70].

It is clear that negative human-animal interactions greatly outweigh positive interactions on fur farms.

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.

Many definitions of domestication have been proposed. Some focus on the control of breeding by humans, and the purpose for which the animals are bred in terms of the benefits for humans. Others focus on the adaptation of the animals, including the process by which that adaptation occurs, and the effects of that adaptation in terms of the behavioural and other changes observed in the animals. In the context of this report, the definitions that focus on the adaptation of the animals, and therefore relate to how animal welfare is affected by the domestication process, are more relevant. The most important issue from a welfare perspective is the unique ability of domesticated species to interact with humans in a positive way. However, domestication does not result in the loss of behaviours from the species repertoire, and so the needs of domesticated animals remain closely related to the evolutionary history of their ancestors.

If response to humans is the sole selection criterion, and is strictly applied, it is possible to breed silver foxes which actively seek human attention, and are easy to handle, within relatively few generations. Breeding tame mink is also possible and preliminary research suggests that it may be possible to breed tame arctic foxes, but this has not been pursued to any great extent. No specific selection for tameness has been carried out in raccoon dogs.

However, changes in the coat characteristic of domesticated animals are incompatible with the fur industry's demands. The focus on fur farms is selection for pelt colour, size and quality, and fear of humans in the animals currently used by the fur industry makes them unsuitable for farming. Farming mink, foxes and raccoon dogs 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, foxes and raccoon dogs farmed for fur in Europe

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5 Major welfare issues for mink, foxes and raccoon dogs farmed for fur in Europe

5.1 Farming systems, handling procedures and killing methods

5.1.1 Housing systems

Farmed mink, foxes and raccoon dogs are typically housed in wire mesh cages, elevated above ground level and arranged in two, but in some cases up to ten, rows under a long (50-100m) roof, with or without side walls. Large numbers of small cages are used to maximise the number of animals that can be reared in a given space [41].

Cages for mink are largely barren except for the provision of a nest box; a wire cylinder and/or a platform may also be provided [41,201]. Vixens with young are provided with a nest box, and foxes are typically given an elevated resting platform (commonly made of wire mesh) and an object (such as a wooden block) for gnawing [41].

These housing conditions lead to high levels of stress in silver foxes (Section 5.4.2). The close proximity of other foxes results in stress-induced hyperthermia, which is most pronounced in previously infanticidal vixens. Important measures to improve animal welfare in silver foxes should include the avoidance of housing breeding vixens in close proximity [202].

Pressure and friction from the uncomfortable wire floor can result in callus formation and ulceration of the feet, which is likely to be painful [203]. A study of four farms in Denmark found foot lesions on 34-53% of mink that were inspected after they had been killed for their fur [203].

The housing systems currently used on fur farms are designed to maximise the number of animals that can be housed in a small space without consideration of their biological needs. This leads to high levels of stress. Wire floors on current cages lead to high levels of foot lesions.

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5.1.2 Handling

Handling and restraint methods for fur animals are designed to protect the handler from injuries and increase the efficiency of handling procedures. Mink are generally handled with heavy gloves. Sometimes they are caught in a metal trap placed in the cage, or grasped with metal body-tongs; these have a pair of flattened jaws designed to grip the mink just behind the front legs [41]. For fur grading and live exhibitions, a special trap is used where the floor can be pushed upwards, completely immobilising the mink [41]. Mink show an acute stress response to capture and immobilisation [163]. SCAHAW stated that *Immobilisation causes welfare problems especially when prolonged* and advised that *Mink should not be kept in a carrying cage or in a trap for more than one hour* [41].

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 [41]. 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 [41]. Handling and restraint are acutely stressful for both silver [204,205] and arctic foxes [206,207]. Dental injuries can occur when animals bite the tongs [41]. Neck-tongs continue to be used routinely on fur farms despite a clear statement in the Council of Europe Recommendations prohibiting this, i.e., *The routine use of neck tongs for catching foxes shall be avoided* [40]. A metal snout clip may also be used to immobilise the fox's jaws when foxes are exhibited at shows [41]. SCAHAW recommends that *The use of neck tongs and snout clips in foxes should be avoided as much as possible. Bare metal tongs should not be used* [41].

The most common restraint devices used in raccoon dog farming are similar to the ones in fox farming, i.e., tongs and snout clips [41].

Mink, foxes and raccoon dogs are usually killed on the farm, so fur animals are not routinely transported [41]. However, animals may be transported to exhibitions and between farms when breeding stock is bought and sold.

Handling and restraint methods used for fur animals are designed to protect the handler from injuries and increase the efficiency of handling procedures: they do not consider the welfare needs of the animals. This leads to high levels of stress and possibly dental and other injuries.

5.1.3 Killing

Mink are usually killed by gassing with carbon dioxide (CO_2) or carbon monoxide (CO) [208]. Both are commercially available in compressed form in a cylinder; the latter can also be administered 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 [42]. However, a survey of more than 100 mink farms in Finland in 2010 found that exhaust gases were not filtered on 8% of farms [209]. Exhaust gases were not cooled on 43% of farms, and 86% of farms did not check the temperature of the killing chamber [209]. Cylinder CO is normally used in the Netherlands, whereas filtered exhaust CO or cylinder CO_2 are generally used in Finland [209].

Typically, a mobile gassing unit is moved along the shed and animals selected for slaughter are removed from their cage and placed in the killing box one after another. Between 30 and 100 or more mink may be placed in the unit at any one time [41,209,210]. 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 in part die from suffocation [41]. Both the mink being killed and those remaining in their cages often vocalise, suggesting that the process causes stress for both handled and non-handled mink [41].

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Mink find CO_2 highly aversive, responding with coughing, sneezing and rapid recoil from a chamber containing the gas [211]. The 2006 report of the 'International Consensus Meeting on Carbon Dioxide Euthanasia of Laboratory Animals' concluded that *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* [212]. EU legislation permits the use of CO_2 with a minimum concentration of 80% for killing mink [42]. This concentration kills mink within an average of 4-5 minutes [208], whereas a concentration of 70% CO_2 does not kill mink within 7-15 minutes [208,213].

A number of reviews have concluded that the use of CO_2 is not an acceptable method for killing mink. The 2001 SCAHAW report recommended that *Killing mink with CO_2 should be avoided, and humane methods developed* [41]. A 2008 report from the working group to the Scientific Advisory Committee on Animal Health and Welfare (SACAHW) in Ireland concluded that *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* [210].

CO is thought to induce unconsciousness and death through deprivation of oxygen [214], although other mechanisms may be involved [215]. 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) [214]. This raises questions regarding the welfare consequences of exposing mink to CO [214].

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 [42]. In practice, the concentration of CO in the killing chamber is often not measured [209]. 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 [208]. SCAHAW stated that *filtered exhaust gases … induce unconsciousness slower than pure CO, and it is preceded by excitation and convulsions* [41]. The 2008 SACAHW report concluded that *The use of carbon monoxide, from exhaust gasses, for killing mink is not acceptable and should not be permitted* [210].

Foxes and raccoon dogs are usually killed by electrocution while restrained with neck-tongs [41,210]. EU legislation stipulates that, for foxes, 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 [42]. When tested with sedated foxes, this method brought about an immediate and irreversible state of unconsciousness [216]. 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 [210]. The 2008 SACAHW report stated that *international recommendations suggest that intravenous injection of barbiturate is the method of choice for killing foxes. This should be performed by a veterinary surgeon* [210]. 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.

EU legislation does not specify the parameters for electrocution of raccoon dogs. So it is unclear what current, voltage or duration is necessary to cause irreversible loss of consciousness in this species.

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 [42]. 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 recommended that *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* [210].

Reviews of the scientific evidence have condemned some commonly used killing methods for fur animals as inhumane. There is currently no requirement for training or certificates of competence for all personnel involved in killing fur animals.

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

Farmed mink perform locomotor stereotypies: these 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 [41]. Scrabbling (scratching at the cage boundaries) is also seen [217]. Of the various forms of mink stereotypy, pacing (sometimes called 'pendling') is the most common [41]. Mink stereotypies are not seen in the wild, or in much-enriched enclosures in zoos [41].

Animals may stop stereotyping in response to the presence of an observer, so the true levels of stereotypy may be significantly higher than reported in the literature [218]. The extent to which mink engage in stereotypic behaviour also varies between farms, seasons and situations. For instance, the proportion of time spent stereotyping in Dutch mink farms ranged from 11% in summer to 32% in winter on a farm with standard housing conditions, and from <1% in summer to 4% in winter on a farm that had provided the maximum number of modifications aimed at enriching the environment and improving welfare [219]. In Swedish mink farms, an average of 20% of mink performed stereotypies prior to feeding [220].

Stereotypy also occurs in farmed foxes and raccoon dogs. Welfare assessments carried out in 2012 on five Norwegian fox farms (with mostly silver foxes) recorded between 7% and 13% of active foxes behaving stereotypically. Lower levels were recorded on ten Finnish farms (with mostly arctic foxes), where between 0% and 5% of active foxes were behaving stereotypically [221]. Stereotypy was recorded in up to 10% of foxes on over 80 farms assessed in Finland in 2012-2014 [222].

Locomotor pacing and circling are the most commonly observed stereotypies in raccoon dogs [223], which have been observed to move to and fro along the side of the cage in bouts lasting 15-25 minutes [108]. In pair-housed juvenile raccoon dogs, stereotypies were recorded during 3% of observations. They peaked after sunrise and sunset, as well as before and after feeding [224]. In another study of pair-housed juvenile raccoon dogs, stereotypical pacing tended to be more frequent in September, when it occupied around 2% of observations, and peaked in the morning/before feeding [225]. This might reflect the natural time of dispersal in the wild or increased feeding motivation in autumn.

Another abnormal behaviour is fur-chewing/fur-biting/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 [41]. The incidence of such severe self-mutilation is difficult to ascertain as seriously affected animals are likely to be culled. However, a significant proportion of tail-biters or pelt-biters may eventually progress to major tissue damage and infection [41]. There is no significant difference in the frequency of hair chewing between mink kept in pairs or singly [226]. The proportion of animals that engage in fur-chewing varies between farms and seasons, ranging from 5% to over 60% in a survey of Dutch mink farms [219], and from less than 20% to over 60% in Swedish mink farms [220].

Fur-chewing/tail-biting also occurs in farmed foxes [227].Fur-chewing has been recorded on up to 93% of Finnish fox farms, affecting up to 30% of animals on a farm [222]. In more than 80 farms assessed during winter (period 1 in the WelFur protocol, when adults for breeding are present on the farm), fur-chewing was observed on average in 10±7% of the estimated total number of foxes [222].

Fur-chewing in raccoon dogs was reported in up to 27% of animals in one study [228], and in almost a quarter of raccoon dog litters and 15% of animals in a Polish study [229].

Locomotor stereotypies, scrabbling and fur-chewing in animals on fur farms appear to be elicited by different factors. Locomotor stereotypies may be related to frustrated foraging [230] or ranging behaviour [231]. Scrabbling appears to be motivated by the unsuitable social conditions on fur farms, as it is usually directed at neighbouring animals that are close to the shared cage partition. In mink, for instance, it is elevated by having all-male neighbours and reduced by removing neighbours [232]. Fur-chewing may be related to under-stimulation [230], or possibly hunger when animals are restrictively fed in preparation for breeding [233].

There is a positive correlation between locomotor stereotypies in captive carnivores and their home range size in the wild [74,231]. Stereotypies peak in speed, frequency and prevalence just before feeding time, and are increased by hunger [41] and restrictive feeding in preparation for breeding [169]. The porridge-like consistency of the feed given to farmed fur animals provides only marginal oral manipulation, which may contribute to the development of oral stereotypies in foxes [234].

Stereotypies have been defined as *repetitive, invariant behaviour patterns with no obvious goal or function* [235]. Proximate causes of stereotypic behaviour involve the frustration of specific highly-motivated behaviour patterns [236], along with perseveration (tendency to repeat actions inappropriately) which may be associated with central nervous system (CNS) malfunction [237]. Reflecting this growing understanding of the causes of stereotypy, a new definition has been proposed by Mason based on the causal mechanisms of repetition; this states that *stereotypic behaviours are repetitive behaviours induced by frustration, repeated attempts to cope, and/or CNS dysfunction* [238].

Where data exist, most situations that cause/increase stereotypies also decrease welfare [239]. However, at least some stereotypies may be an attempt to cope with adverse conditions [240]. So we should be just as concerned about the welfare of the least stereotypic animals in a housing system that elicits stereotypic behaviour in some individuals [239], i.e., conditions that cause stereotypic behaviour in some animals are


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likely to cause suffering for all the animals housed in those conditions. As one study on captive carnivores concluded, *Ample evidence shows that SB* [stereotypic behaviour] *reflects poor lifetime wellbeing … but SB can be insensitive as a welfare indicator because not all individuals or species develop it when stressed, some displaying inactivity instead … Thus while the presence of SB indicates poor welfare … the absence of SB does not guarantee good welfare* [74].

It is possible to reduce stereotypic behaviour [241] and fur-chewing [162] through selective breeding. However, if animals use stereotypies as a method of coping with adverse conditions, selection against stereotypic behaviour may result in animals that are more inactive and more fearful [242]. Mason and Latham advise that *stereotypies should not be reduced by means other than tackling their underlying motivations* [239]. The Council of Europe Recommendations are clear that the *environment and management have to fulfil the animal's biological needs rather than trying to "adapt" the animals to the environment* [40]. The Recommendations also state that *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* [40].

The cramped and unstimulating cage environment on fur farms leads to the development of stereotypies, fur-chewing and self-injury in mink, foxes and raccoon dogs. 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. Stereotypies, fur-chewing and self-injury are indicators of poor welfare in animals farmed for fur, and the conditions that cause these behaviours in some animals are likely to cause suffering for all the animals housed in those conditions.

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5.3 Space, environmental enrichment, motivation and preferences

5.3.1 Mink

5.3.1.1 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 cubs, or a pair of cubs post-weaning, with an additional 850cm^2 for each additional animal [40]. So the minimum area of a standard cage is approximately the same area as four sheets of standard A4 typing paper. A typical cage in Europe measures 70-90cm x 30cm [41,201]. Stride length of mink is around 20-40cm [76], so the animal can take no more than four strides in any direction before reaching the edge of its cage.

Doubling the standard cage size, without any additional enrichment, has no effect on stereotypies, fur-chewing and welfare-associated physiology in pair-housed juvenile mink [243]. Stereotypies may be reduced, but not eliminated, with cages that are around 9 times the floor area and 1.5 times the height of a standard mink cage [244].

> *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.*

5.3.1.2 Nesting and hiding opportunities

Farmed mink are usually provided with a nest box throughout the year, which is used for sleeping, hiding and breeding [41]. The nest box is usually as wide as the cage, with a depth of 15cm to 30cm [41]. For mink, the Council of Europe Recommendations state that *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* [40].

Litter size and kit mortality are both higher in farmed mink than most farmed species, and the majority of kit deaths occur during the first day *post partum*. A 2007 study found that, on average, 8 mink kits were born alive per litter, but only 6.5 were alive the next day, i.e., nearly a fifth of kits die within 24 hours of birth [245]. Problems during birth are important contributors to suboptimal maternal behaviour and higher early kit mortality. Longer duration of parturition and high variation in inter-birth intervals are related to increased kit mortality. Mothers that have litters with low mortality spend more time engaging in kit-directed behaviour [245].

Several different types of nesting material are supplied to mink on commercial farms, although they differ substantially in their suitability for nest building [246]. Access to un-cut straw for nest-building reduces variation in inter-birth intervals, whereas an artificial nest by itself has no such effect. 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 [246]. A nest box with wood-shavings only, as is often used on commercial mink farms, is insufficient as a nesting environment. It is associated with higher kit mortality, reduced kit growth, and higher basal cortisol level (an indicator of stress) in the mother [246]. While un-cut straw improves litter size and kit survival compared with wood-shavings [247], chopped straw does not provide the same benefits [248].

Female mink are typically transferred to alternative housing prior to delivery. Doing this after mating reduces stress and increases maternal care, compared with the usual commercial practice of transfer later during pregnancy [249]. When transferred to a cage with free access to nest-building material, mated females build and maintain a nest at least a month prior to delivery [249]. Indeed, female mink are motivated to build a nest even before mating, so nest-building is not just a maternal behaviour [250]. Primiparous females (those having their first litter) with access to nesting material from 15 January immediately built nests and tended to show reduced stress (measured using faecal cortisol metabolites). They also reduced active behaviour, including stereotypies and similar movements, and activity that might be interpreted as restlessness. These females had better reproductive outcomes, including increased litter size and offspring survival, compared with those that were not provided with nesting material until 23 March (mating took place between 2 March and 18 March). Provision of straw on top of cages (where it has to be pulled through the wire) is not sufficient for nest-building; the quality of the nest is markedly increased when straw is provided in a loose pile inside the cage [250]. Mink value the opportunity to use more than one nest site, and will work for access to an alternative nest box [251].

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

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

Adding various combinations of simple enrichments (such as plastic or wire mesh cylinders, 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 [243,252] and stereotypies [252,253]. In many cases, levels of stereotypy are unaffected by provision of simple enrichments [252,254]. In WelFur assessments carried out on mink farms between 2017 and 2019, Danish farms scored on average more highly than farms in other European countries for the provision of enrichments in cages, yet stereotypies and fur-chewing were more common on Danish farms [184]. So cage enrichments did not reduce abnormal behaviours.

Environmental enrichment (provision of a shelf and tube) increased the proportion of mink showing an exploratory response in the stick test (Section 4.2.2). However, even then only 30% of mink from enriched cages were classified as exploratory, compared with 17% of mink from barren cages [255]. Breeding females with environmental enrichment (ramps, tunnel, additional nest, swing, circulating water for wading, manipulable objects and additional space) stereotyped less and tended to make better nests than females in standard cages, but there were no significant effects on infant growth rates or infant mortality [256].

A number of early studies, mostly using adult caged mink, found little effect of access to a water bath on stereotypies [257]. However, more recent studies found that access to a water bath may reduce the occurrence [258], and slow down the development [259], 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 [258]. 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 [260]. The opportunity to perform play behaviour may enhance an animal's coping capacity in later life [260].

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 [251]. 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 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).

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 food, an essential physiological resource. 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. So mink are highly motivated to swim, and denying mink on fur farms opportunities to swim causes frustration [251].

Although consumer-demand experiments consistently show that mink place a high value on swimming water, there has been some debate about whether access to swimming water is a 'behavioural need' for mink [261]. Kornum *et al.* argue that measurements of motivational strength and welfare indicators, as well as observations of wild and feral mink, should all be included in the assessment of the significance of swimming to the welfare of mink. They concluded that *Seen from a more complex understanding of behavioural needs, we suggest that lack of swimming opportunities for farmed mink constitutes a welfare problem* [261].

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 [262]. 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 when the price of the other resource increased, indicating that these two resources are valued independently, and that one is not a substitute for the other [262]. This suggests different underlying

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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) and in the water (exploring, head dipping, swimming) [257]. Motivation to use a running wheel may be related to ranging behaviour. Distance travelled in the wild appears to be correlated with the distance run in a wheel in wild-caught caged carnivores [263].

However, the value of a resource to an animal is not necessarily related to the amount of time it chooses to spend interacting with it. While swimming and running in a wheel appear to be equally highly valued by mink, the amount of time spent using the wheel is greater than the amount of time spent in water [262]. This may be because a relatively short period of time in the water is sufficient to satisfy the mink's motivation to swim [262]. Indeed, mink may show some hesitation when obliged to swim to reach food [264]. Nevertheless, mink are highly motivated to access water for swimming and show a stress response when that opportunity is removed [251].

Mink housed in standard cages and provided with access to a running wheel used it for the same amount of time, and with the same daily activity pattern, as 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. So access to a running wheel does not necessarily improve welfare because using the wheel is 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 [263].

Boredom, apathy and depression are often believed to occur in animals housed in impoverished environments [265]. 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, including aversive stimuli [265,266]. Boredom is an important welfare concern since it is likely to be aversive, and may lead to depression-like states or self-injurious behaviour [267]. Impoverished environments also make male mink less successful as mates because neurophysiological changes underlying stereotypy may make them behave abnormally when interacting with females [268].

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. They are frustrated when denied the opportunity to do so, and stressed when that opportunity is provided and then removed. Mink are also highly motivated to access a running wheel. However, running in a wheel is another abnormal repetitive behaviour and does not reduce stress in caged mink. So it is not an adequate substitute for the ability to engage in ranging behaviour.

5.3.2 Foxes

5.3.2.1 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 thereafter [40]. However, in this context the use of the term 'juvenile' fails to recognise the social development of foxes: the term 'cub' should be used for animals less than 6 months old, which remain part of a social group until they disperse in the autumn [95].

Fox cages typically have a floor area of 0.6-1.2m^2 and a height of 60-75cm [41]. The upper end of this range for floor area is roughly equivalent to the area of a small table. Restricted space, combined with obesity resulting from selection for increased pelt size, predispose farmed arctic foxes to orthopaedic abnormalities [269].

Doubling the height or width of standard cages had no effect on stereotypic behaviour, and increased the time taken for capture in pair-housed juvenile arctic foxes [232]. Compared with standard cages, housing pairs of juvenile arctic foxes in larger wire-floored pens (5m x 3m with a height of 1.8m) reduced, but did not eliminate, tail-biting; it also reduced inactivity, increased stereotypies and capture time, and did not improve bone strength [227,270,271]. When comparing the effects of low and high housing densities on reproductive success of arctic foxes, the only significant difference for primiparous vixens was for the onset of oestrous; there were no significant differences between multiparous vixens [272].

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.

5.3.2.2 Nesting and hiding opportunities

The Council of Europe Recommendations state that *Foxes must be able to conceal themselves from people and from animals in other cages or enclosures* [40]. 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 arctic foxes spent most time in the top box [273]. Arctic foxes were observed in the shelters twice as frequently as silver foxes [273]. When disturbed, most arctic foxes fled into the top box (some fled into the side box), whereas silver foxes mostly fled to the opposite side of the cage, although some fled into the top box [273]. 24-hour recordings suggest that arctic foxes tend to avoid areas of the cage where opaque screens obstruct their view [274]. 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 [274]. As well as providing an opportunity for refuge, nest boxes are mostly used for resting. Juvenile arctic foxes provided with a nest box make a lot of use of the box at night, when there are no humans on the farm [275].

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Adult male arctic 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 [276]. When they had the opportunity, arctic fox vixens frequently moved cubs from one nest to another [277]. 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 [278]. However, access to a nest box/opaque shelter after weaning may increase fearfulness in arctic foxes [199,279,280]. Juvenile arctic foxes provided with concealment screens were challenging to catch and more fearful of humans [281]. Forced early visual contact with humans prior to weaning (by opening a door in the nest box between 2 and 8 weeks of age) may reduce fearfulness in arctic foxes [282]. However, a transparent front wall in a top box provided for arctic foxes after weaning did not reduce fear-related reactions [280]. To improve welfare, growing arctic foxes should have intense human contact and a shelter design which does not hinder or delay exposure to human proximity [199].

> *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. However, allowing them to do so may make them even more fearful because they are not forced to maintain regular visual contact with people. Vixens are motivated to use more than one nest site, reflecting their use of multiple den sites (silver foxes) or large complex dens (arctic foxes) in the wild.*

5.3.2.3 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* [40]. The Recommendations also state that *The environment shall be enriched with objects that provide suitable stimuli to gnaw and any other occupational material* [40].

Both silver and arctic foxes appear to show a preference for access to an unobstructed view of their surroundings [283,284]. Platforms are used for observation and sleeping [285]. The roof of a nest box may be preferred to a platform as an elevated location [286]. The presence of a platform does not appear to have a significant effect on fear reactions in farmed silver foxes, although some animals may retreat to the platform when disturbed [287]. In juvenile silver foxes, access to a platform did not affect stress levels (salivary cortisol) or fear reactions [288].

Access to bones [289], or to wooden blocks and straw [290], stimulates play behaviour and may reduce, but not eliminate, oral stereotypies in arctic 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 [289]. In a comparison of enrichment objects, a cattle femur bone was clearly preferred by juvenile silver foxes, followed by a rawhide bone, and a pulling device [291]. Straw and a plastic cube were the least favoured enrichments, based on interaction time. Gnawing was the predominant activity with the cattle bone.

When arctic 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 [292]. Access to the enrichments increased exploration but did not improve confidence in capture tests. In juvenile silver foxes, access to wooden sticks for gnawing did not affect fear reactions, but may have temporarily reduced stress levels. Salivary cortisol measurements were significantly lower in foxes with wooden sticks than in those without at 10 days after provision of the enrichment, but there was no significant difference at 69 days [288].

While platforms and 'activity' objects are frequently used by farmed foxes, they do not eliminate stereotypies or reduce levels of fear.

5.3.2.4 Floor type and opportunities for digging

Arctic foxes work to gain access to a sand floor from a wire floor [293]. However, they 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. This suggests that juvenile arctic foxes do not value solid floor materials more than a wire mesh floor [294]. However, the experimental set-up only allowed animals to work for access to one floor type at a time, and only for three hours at a time. However, 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* [295]. As the authors of the study acknowledge, their apparatus may have stimulated exploration and the foxes may have been motivated to patrol the entire accessible area regardless of floor type [294]. They also accepted that measuring a single demand function may be insensitive at distinguishing between demands for closely-related resources. So this experiment provided 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, i.e., it provided environmental enrichment that has the potential to improve welfare [294].

Another experiment with juvenile male arctic foxes provided the opportunity to work for access to only one resource (nest box, platform, wooden block, sand floor, or wire floor/empty cage) in five periods, each of three weeks. This found that arctic foxes valued a sand floor (and wooden block and nest box) more than a platform or empty cage. The latency to start interacting with the resource after entering the resource cage was shortest for the sand floor, showing high motivation to interact with the sand floor [285]. Increasing the workload did not decrease the amount of time that adult male arctic foxes spent interacting with the sand [276].

Arctic foxes housed in pairs with access to both a wire and an earth floor spent more time on the wire floor [293,296]. However, *simple time-budgets alone do not reveal much about the importance of different enrichments for welfare* [295]. A sand floor stimulates digging, rooting and play in arctic foxes [296]. Arctic foxes with access to both an earth and a wire floor showed less oral stereotypic activity than animals that only had a wire floor [293]. A rebound effect in digging, playing and sniffing was observed after the foxes were given access to an earth floor after a period of deprivation [293], and arctic foxes preferred wire mesh, dry sand and dry wooden floors over wet or icy sand [297].

When given a choice of a wire or sand floor on two levels, arctic foxes preferred a sand floor for activity and an elevated wire floor for resting [297]. Of two identical wire-floored cages, the elevated one was preferred. Pair-housed arctic foxes housed in earthen-floored pens (5m x 3m with a height of 1.8m) performed significantly fewer locomotor stereotypies [227], and had stronger bones and a tendency for improved foot health [227], compared with those housed in pens of the same size that had a wire mesh floor. Access to a sand floor is beneficial for wearing the claws of arctic foxes [298]. Once arctic foxes are provided with access to a clean and unfrozen sand floor, they may show a stress response if they are not allowed to utilise this floor type all the time [298].

Solid floors were strongly preferred by silver foxes when dry, but not when wet or icy. Dry wooden flooring was strongly 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, whereas dry wooden flooring and a dry sand floor were equally preferred in winter [299].

While the evidence is limited, foxes are motivated to access a sand/earth floor. Access to a sand/earth floor enhances behavioural repertoire, reduces stereotypies, and improves bone strength. However, there are practical difficulties in providing access to, and cleaning, a sand/earth floor in small cages.

5.3.3 Raccoon dogs

5.3.3.1 Space

The Council of Europe Recommendations do not stipulate specific minimum cage height or floor area for raccoon dogs. However, they are included in the general requirement that *The design, construction and maintenance of enclosures and accommodation for fur animals shall at all times allow them, in accordance with their species-specific needs, sufficient room to carry out normal locomotor behaviour, to groom themselves without difficulty and to lie down, to rest, to adopt sleeping postures, to stretch their limbs freely and to rise* [40]. Generally, housing for raccoon dogs on fur farms is similar to that used for foxes [41].

Doubling the cage size by connecting two adjoining cages (each measuring 1.2m^2), without additional enrichment, increased locomotion but did not reduce stereotypies, and increased catching time in pair-housed juvenile raccoon dogs [223].

> *As with mink and foxes, moderate increases in space, of a magnitude that might be feasible on commercial fur farms, cannot lead to significant improvements in the welfare of farmed raccoon dogs.*

5.3.3.2 Opportunities for nesting and winter sleep

The Council of Europe Recommendations state that *Every animal shall have available to it an area where it can hide itself appropriately from people or from animals in other cages or pens* [40]. However, nests are not normally provided for raccoon dogs on fur farms outside of the kit nursing period due to concerns about soiling their fur [223,225,300], and possible delayed onset of heat if breeding animals are inside the nest during daylight hours [108].

Wild raccoon dogs exhibit autumn fattening followed by winter sleep (Section 4.1.4). Farmed raccoon dogs also exhibit autumn fattening but, while they may be less active in winter, they do not undergo an extended period of winter sleep because they are fed each day and are not provided with a suitable nest or den [119].

Sitting on a wire cage floor can cause wearing of the buttock fur [108]. Provision of a nest is important for comfort while resting: a nest box is preferred to a tube as a resting shelter [223]. Young female raccoon dogs caged individually over winter with access to a nest box spent more than 90% of their resting time (and more than 80% of their total time) inside the nest box [300]. A nest/den is an important resource for raccoon dogs in winter, and captive raccoon dogs with access to a nest box over winter were less active, and performed less nutritive behaviours, than those without a nest box. While their fur was not soiled, provision of a nest did not significantly reduce stereotypies (which constituted 1-2% of observations) and did not affect stress measures. As with foxes, providing a nest for raccoon dogs might increase fearfulness. A subjective evaluation of temperament in adult female raccoon dogs found less confident animals among those with access to a winter nest, although other temperament tests did not confirm this finding [189].

> *A suitable nest and/or den site is critical to the welfare of raccoon dogs, particularly over winter when they use it most of the time. Lack of access to a nest box on fur farms interferes with the species-specific behaviour of raccoon dogs.*

5.3.3.3 Platforms and 'activity' objects

Caged raccoon dogs did not appear to favour a platform for resting but used it sometimes, mainly during the day. When a nest box was not available, individually caged young female raccoon dogs spent 74-85% of resting time on the cage floor, compared with 15-26% on a platform [300]. In pair-housed juvenile female raccoon dogs without a nest, allohuddling on the cage floor was the preferred option (61-91% of resting time), especially at night [225]. Resting alone on the cage floor (9-20% of resting time) or on a platform (2-23% of resting time) was mostly observed during the day, so some of this resting may be related to boredom-like states [225]. Including other activities, the platform was used for 2-17% of total time, suggesting that it may be used for surveillance during the day [225].

Pair-housed raccoon dogs interacted frequently with a bovine cortical bone in autumn (2-3% of observations); interaction with the bone was maintained over time, and increased after two weeks' deprivation (up to 8% of time in 24 hours) [301]. Interaction with the bone included manipulation (oral and/or with paws), elimination on the bone, and activities during social interaction and play, such as jumping on the bone. Any impact of access to the bone on the occurrence of stereotypies or fur-biting was not reported.

Sometimes straw is provided as an additional source of fibre and may be used on the cage floor for various activities, including play [223]. Young female raccoon dogs were provided with access to straw and bovine cortical bone in various cage housing systems over winter (individually in 0.8m^2 cages, individually in 1.2m^2 cages with or without a nest box, and in pairs in 1.2m^2 cages) [300]. Straw (1-3% of observations) was utilised slightly more than the bone (1-2% of observations). Straw and bone were provided in all treatments, so it is not possible to compare the welfare of animals with and without these enrichments. However, stereotypies were observed in all treatments (1-2% of observations), including pacing and stereotypical head movements [300].

Welfare of juvenile raccoon dogs was compared in different housing systems between weaning and killing. Systems included pair housing in 1.2m^2 cages, pair housing in 2.4m^2 cages, groups of four in 2.4m^2 cages, and groups of four in 2.4m^2 cages equipped with a nest box and tube. In all systems, raccoon dogs had access to one or two platforms, one or two wooden blocks, and straw. Interaction with a wooden block (<1% of observations) was lower than observed for bone in other studies. The solid nest-box roof was preferred to the wire platform as an elevated location. No systematic differences were found in physiological parameters or the occurrence of stereotypical behaviour (1-3% of observations) between housing types. Agonistic interactions were not observed, but animal cleanliness was compromised in those cages equipped with a nest box and tube [223].

Caged raccoon dogs will interact with straw and a bone and, to a lesser extent, a wooden block. They will also make some use of a platform and tube when available. There are few studies that directly tested the impact on welfare of each of these provisions, but stereotypies and fur-biting were not eliminated in any of the studies where they were measured.

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

5.4.1 Mink

Mink on fur farms have very little control over their social environment. The welfare consequences of housing large numbers of territorial animals in close proximity in small cages are not well understood. Mink use their faeces, anal sacs and other specialised scent glands to mark their territory [302]. The messages contained in these various scent marks are complex and poorly understood, but are widely used in territorial defence. 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 olfactory messages, and the impacts on their welfare are unknown. However, allowing faeces and urine to accumulate under cages is an obvious cause of social stress [41].

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. Mated females give birth in May, and the young are typically weaned at 6-8 weeks of age. After weaning, kits are normally housed as litters until they are 11-12 weeks old, when they are divided into male-female pairs: in some cases an adult female and one of her male kits may be housed together. Most of the animals are killed for their pelts in November, and the animals kept for breeding are housed individually until the following March.

Infant mortality is relatively high in mink (Section 5.3.1.2). Mortality of kits from birth until weaning is typically 10-30%, with 60-70% of all deaths occurring in the first week [179]. Kit mortality is higher in larger litters and in certain colour types, e.g., 39% reported for Hedlund White [179]. Litters with >5 kits are associated with a higher risk of pre-weaning diarrhoea, known as 'sticky kits': it is commonly associated with increased kit mortality [303].

Aggression is a significant problem in farmed mink. Around 10% of mortality in mink kits is caused by bite wounds, which are most common shortly before weaning and towards the end of the growing period [304]. A survey in Denmark found one or more wounds in 31% of mink kits aged 1-2 months in June and 44% of juvenile and adult mink in October [304]. The large size of wounds around the base of the tail may be due to continuous biting because submissive mink cannot escape an aggressor in the small cages used on fur farms [304].

The Council of Europe Recommendations state that *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* [40]. Mink kits are not nutritionally independent until they are 8-10 weeks old, but still make distress calls if separated from their mother [81]. In the wild, or in large enclosures, mink kits do not begin to disperse until 12-16 weeks of age [81].

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 [305]. Mink kits weaned at 7 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 [306]. Early-weaned kits are also more likely to chew other items in their environment, such as plastic drinker dishes [306]. Early weaning, individual housing and small cages all promote the development of stereotypies in farmed mink [307], but the influence of early weaning on stereotypies appears to decline with age, whereas the effects relating to individual housing and small cages appear to be more persistent [307]. Kits weaned at 6 weeks vocalise twice as much as those weaned at 8-10 weeks, even if weaned in a litter [41]. All these studies indicate that later weaning is likely to be beneficial for the welfare of the kits, although crowding and competition in larger litters may lead to more biting among mink kits over 6-7 weeks old [178].

Most mothers show a prolonged stress reaction to having their kits removed when 6 weeks old, and mothers of kits weaned at 6 or 8 weeks show more stereotypy, such as nodding and up-and-down movements, than females whose kits are weaned when 10 weeks old [201]. Mothers separated from their litter at 7 weeks show a greater stress response, increased stereotypies, and increased calling, compared with separation at 8 weeks [308]. 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 occurred at 6, 8 or 10 weeks [309]. Based on an increase in stereotypic behaviour, some mothers may be frustrated by forced cohabitation with their kits by the seventh week [310]. 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 [311,312].

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) [313] and her cubs (less long-term stress and possible thermoregulatory benefits from huddling during cold weather) [314]. 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) [313] and her cubs (more bite scars) [314]. Problems with aggression and injuries are likely to be unavoidable in the highly restrictive cage environment relied on by fur farms.

Similar welfare concerns (increased fur damage and increased morbidity and mortality) occur when housing juveniles in litter groups, from weaning through to pelting, in cages connected in a row or stacked on top of each other [315], although there were some benefits from reduced stereotypies [316].

Mason suggests that leaving mink kits with their mother until they are 11 weeks old would improve welfare, provided that problems of overcrowding are avoided [306]. SCAHAW recommends that *Mink should not be weaned before nine weeks of age* [41].

> *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 both the mother and kits. Housing in family or whole litter groups through to pelting, in interconnected cages, can have some benefits but welfare problems due to aggression appear to be unavoidable.*

5.4.2 Foxes

Foxes are territorial and use their urine, specialised scent glands, and possibly their faeces, to mark their territories [93]. As with mink, 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 olfactory messages convey information about health and status [317], they are likely to cause social stress in both dog foxes and vixens with dominant neighbours [318].

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: her litter may be kept together or sub-divided. The cubs are then usually housed in pairs until September, and thereafter individually until they are killed.

Reproductive failure is a significant problem in farmed foxes and is influenced by the social status of the vixen [319]. Some silver fox vixens attack and kill their cubs soon after birth [320]; those which wean most of their cubs are typically socially more dominant [321]. Vixens which killed or injured their cubs just after delivery would wean more cubs unharmed during the next reproductive season if they were visually and spatially isolated from other vixens on the farm [321]. A vixen of low competition capacity (i.e., socially subordinate) was observed to give good maternal care to another vixen's cubs an hour after she had killed and eaten her own cubs, and she successfully reared the new cubs until weaning at 7 weeks of age [321].

Silver fox vixens with high competition capacity weaned more cubs unharmed than vixens with low competition capacity [321]. Vixens with neighbours with low competition capacity weaned more cubs than vixens with neighbours of high competition capacity [321]. Low-competition-capacity vixens failed to wean any unharmed cubs if the neighbouring vixens were of higher competition capacity [321].

The Council of Europe Recommendations state that *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* [40].

Even though cub losses were still high, infanticide was not observed in a study of arctic foxes. 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 cub deaths occurred during the first week of life. Postnatal cub mortality was 33% in primiparous vixens and 17% in multiparous vixens [322].

Nine-week-old silver fox cubs showed a clear preference to seek contact with a familiar or unfamiliar female of the same age over an empty cage [323], whereas 24-week-old silver fox vixens showed 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 between testing. As 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* [295]. When tested in a 'closed economy' over a longer period of time (five-and-a-half weeks), silver fox vixens at 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 [324].

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 [325], the highly restrictive cage environment can lead to significant problems with aggression and injuries when vixens are housed in pairs or groups of three, and the welfare of subordinate vixens is likely to be impaired [326,327]. Reproductive success was reduced in various systems of pair-housing arctic fox vixens compared with housing in individual cages [328].

Group-housing whole litters 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 [329], and long-term stress levels in silver and arctic fox cubs [329,330]. However, silver fox cubs housed in litter groups may not become accustomed to human presence to the same extent as cubs housed singly [329], and the higher number of bite marks suggests that the welfare of female arctic fox cubs may be impaired in groups [331].

The scientific evidence is clear: 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 litters through to pelting may offer some welfare benefits, but may reduce welfare for some cubs and increase fear of humans.

5.4.3 Raccoon dogs

Raccoon dogs are more socially tolerant than mink and foxes, and do not defend an exclusive territory in the wild (Section 4.1.4). Adults form strong monogamous relationships and rear their young together. On fur farms, breeding animals are typically kept in individual cages when not suckling cubs [332], and juvenile raccoon dogs are typically housed in male-female pairs from weaning until killing [224].

Young female raccoon dogs housed in pairs over winter allohuddled for more than 90% of their resting time, and spent time in body contact when awake/active, so that nearly three-quarters of their total time was spent in physical contact [300]. The number of scars was low, suggesting a low level of agonistic interactions.

Juvenile raccoon dogs housed in groups of six preferred to stay in tight groups throughout the growing season, and were more active and performed fewer stereotypies than those that were pair-housed [224]. Housing juvenile raccoon dogs in groups of four in double-cages (one placed on top of the other and connected via a platform) improved growth rates, but it did not alter general stress levels when compared with pair-housing in standard cages [333].

Koistinen *et al.* strongly recommend group housing of juvenile raccoon dogs based on their positive social interactions, including allohuddling and allogrooming, and a lack of agonistic interactions [223]. However, some studies suggested that fur quality may be slightly worse when raccoon dogs are housed in litter groups in a row cage system (compared with standard pair-housing) between weaning and killing [334].

Mortality in farmed raccoon dogs is often reported to be low, but this often excludes mortality of pups prior to weaning. The available data suggest that relatively high levels of infant mortality (10%-20%) occur in farmed raccoon dogs [190,335,336]. In Poland, the proportion of female raccoon dogs damaging their litters in various studies ranged from 10-20% [335], 24% [229], and up to 40% [335]. Reproductive success appears to be associated with the temperament of the mother. The proportion of mothers damaging their litters was 10% for females classified as 'fearful', 14% for 'aggressive' females and 20% for 'confident' females [335]. Fertility (proportion of females littering) was 50% in 'fearful' females and around 70% in 'confident' and 'aggressive' females [335]. The proportion of females becoming sterile was 9% for confident females, 14% for aggressive females, and 20% for fearful females [335].

Housing raccoon dogs kept for breeding in individual cages fails to recognise their behavioural needs for close affiliative social relationships. Raccoon dogs are more socially tolerant than mink and foxes, yet there has been little attempt to develop family group housing systems. High levels of infant mortality and infertility are indicative of poor welfare in farmed raccoon dogs.

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5.5 Could alternative systems be developed that could meet the welfare requirements of farmed mink, foxes and raccoon dogs?

5.5.1 Mink

In the wild, juvenile mink typically disperse before the age at which they are killed on farms. However, families or large groups of immature animals can be housed successfully through to killing in much larger, highly-enriched enclosures, and 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 [337].

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 [338]. During the course of the study (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 water quality was very good. The mink chose to share nest boxes [338].

Further studies using this set-up showed that, on average, at dawn and dusk mink spent 12% of their time engaging with, and 5.5% of their time in, the water [339]. Mink showed least preference for the creek: the pool and pond were used for swimming, diving, head-dipping, and social play, when groups of ten or more mink were observed swimming, diving, chasing and pulling each other out of the water. Despite frequent use, the total bacterial count and level of enteric bacteria in the water were always low, and there were no traces of *Salmonella* [339]. Mink kept in this manner developed a crepuscular activity pattern, and often shared nest boxes, preferring to be in company around 75% of the time when sleeping [340]. However, an increasing number of tail injuries were observed in older mink housed under these conditions [341].

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Substantially larger, highly-enriched outdoor enclosures, including water for swimming and multiple nest sites, provide a more complex environment that enables mink to fulfil a wide range of highly-motivated behaviours. Such enclosures could lead to enormous welfare improvements for farmed mink, including the elimination of stereotypies. However, conflict between animals may still cause problems as the mink get older, and it is likely that fear of humans and difficulties in handling and management would present insurmountable obstacles to the adoption of more extensive systems by the fur industry.

5.5.2 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 [342,343]. The inability to make exploratory movements and disperse in late autumn may also be stressful for male cubs [343]. 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 [344] and feeding enrichment [345] 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 [231]. 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 [231]. Infant mortality in the wild, in contrast, is not related to home range size [231]. Clubb and Mason suggest that enclosure designs and enrichments focusing on a carnivore's 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) might improve welfare, but that it may be better to phase out keeping wide-ranging carnivores in captivity [231]. While a later study failed to find an association between infant mortality in captivity and home range size/travel distances [74], high rates of infant mortality in captivity, whether or not associated with ranging behaviour, are indicative of compromised welfare and suggest that red and arctic foxes may be unsuitable for rearing in captivity.

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, such as arctic and silver foxes, are unsuitable for rearing in captivity. The fear of humans in foxes reared by the fur industry and difficulties in handling and management would present insurmountable obstacles to the adoption of more extensive systems.

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5.5.3 Raccoon dogs

Korhonen *et al.* investigated the social behaviour of raccoon dogs housed in large outdoor enclosures (5m x 6m or 8m x 17m, with a height of 2m) with a ground floor [346]. The animals were housed in family groups (mother with kits from weaning to killing, or mother and father with kits from prior to mating or from whelping), or as a group of three males (from weaning in July until the following May). The animals grew and bred normally, with acceptable litter sizes and body weights.

The pair bond was typically strong when the male and female were together before the mating season and, after whelping, the entire family grew into a close social group. Typically, the whole family used a common latrine and engaged in activities (walking, eating, drinking and sleeping) at the same time. The whole family typically ate together without any competition for food. Social interactions were mostly classified as 'friendship behaviour', and there was no marked aggression. In family groups, the mother and father engaged in 'muzzle-nibbling or licking', sometimes for more than 10 minutes at a time. This behaviour was particularly well-developed when the male and female were put together before mating, and was often imitated by the kits. Kits reared together without their parents from weaning, and kept together for almost a year, showed very similar activity patterns to kits kept with their parents [346].

Raccoon dogs were much more active in large enclosures than in cages. The adults typically spent over 700 minutes walking each day, and the kits close to 500 minutes. For adults caged under conventional farm conditions, locomotor activity varied from 111 minutes in October to 345 minutes in April. The time engaged in locomotion in the large enclosures was comparable with free-living raccoon dogs, where locomotion constitutes about half of all behavioural activities during a 24-hour period [108]. However, stereotypies have still been observed in raccoon dogs housed in outdoor enclosures larger than 100m^2 [347].

A more complex physical and social environment, available in substantially larger, highly-enriched outdoor enclosures, could provide enormous welfare improvements for farmed raccoon dogs. Raccoon dogs are more socially tolerant than mink and foxes, and are generally considered to be easier to handle (although neck tongs are still often used on fur farms), so it may be more feasible to manage raccoon dogs in large enclosures. However, fear of humans remains a major welfare issue in the animals used by the fur industry. Stereotypies still occur in raccoon dogs kept in larger enclosures, suggesting that the needs of the animals for locomotion/exploration/foraging are still not being met.

5.6 Overall assessment of welfare across the Five Domains - do conditions on fur farms provide a 'life worth living'?

Serious concerns about the welfare of animals farmed for fur were highlighted in the 1999 Council of Europe *Recommendation Concerning Fur Animals* [40] and the 2001 report of the Scientific Committee on Animal Health and Animal Welfare [41]. Since then, a great deal of research has been published on the welfare of animals on fur farms.

Taken as a whole, recent research reinforces the substantial body of evidence which shows that the welfare and other needs of mink, foxes and raccoon dogs are not, and cannot, be met by the fur industry.

The welfare of mink, foxes and raccoon dogs is severely compromised across all five domains (Table 3). Negative conditions and interactions overwhelmingly outweigh positive ones in domains 2 (physical environment) and 4 (behavioural interactions), and may often do so in domains 1 (nutrition) and 3 (health). The highly restrictive and largely barren conditions on fur farms provide little opportunity for welfare enhancement and positive experiences. The overall mental state of the animals (domain 5) is, therefore, likely to be dominated by negative experiences, resulting in poor welfare.

According to Mellor, *Close confinement and isolation of social animals in threatening and/or barren environments may lead to experiences that include various combinations of anxiety, fear, panic, frustration, anger, helplessness, loneliness, boredom and depression* [348].

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Table 3. *Summary of the negative and positive physical/functional states or situations (domains 1-4) and their associated negative and positive experiences/affects (domain 5) influencing the overall welfare status of animals farmed for fur. The balance between positive and negative experiences represents the quality of life of the animals. Based on the Five Domains Model* [70]

DOMAIN 1 - NUTRITION	DOMAIN 5 - MENTAL STATE
Negative conditions	**Negative affects**
• Excessive food intake (of animals bred for increased body/pelt size)	• Malaise (associated with obesity and related health problems)
• Restricted food intake (of overweight animals in preparation for breeding)	• Hunger (especially when feed restricted)
• Low food variety (uniform paste with minimal variation in texture and composition)	• Eating-related boredom
Positive conditions	**Positive affects**
• Drink correct quantities of water (except when supply may be restricted, e.g. during freezing temperatures)	• Wetting/quenching pleasures of drinking
• Eat enough food (when fed *ad libitum*)	• Postprandial satiety
• Eat a balanced diet	

DOMAIN 2 - PHYSICAL ENVIRONMENT	DOMAIN 5 - MENTAL STATE
Negative conditions • Close confinement (in cages) • Unsuitable substrate (wire) • Air pollutants (from urine/faeces accumulating below cages) • Aversive sounds, sights and odours (including from close proximity of socially dominant animals) • Monotony • Unpredictable events (e.g. handling/removal from cage for husbandry procedures) • Physical limits on rest and sleep (e.g. due to lack of appropriate nesting facilities) **Positive conditions** • Fresh air dissipates contaminants (in open-sided structures) • Shelter/shade available (some protection usually provided by a roof and mink usually have access to a nest box)	**Negative affects** • Physical discomfort • Respiratory discomfort • Olfactory discomfort • Frustration • Boredom • Pain • Fear • Anxiety • Helplessness **Positive affects** • Predictability of established routines (e.g. of feeding time)

DOMAIN 3 - HEALTH	DOMAIN 5 - MENTAL STATE
Negative conditions • Acute/chronic injuries (including from fur-chewing/self-mutilation and from other animals) • Acute/chronic disease (e.g. diarrhoea and eye disorders) • Functional impairment (e.g. bent feet and associated difficulty in moving) • Obesity (due to breeding for increased body/pelt size) • Underweight (e.g. towards the end of lactation due to breeding for larger litters) • Poor physical fitness (due to close confinement) **Positive conditions** • Appropriate body condition (for some animals/ at certain points in the production cycle) • Absence of injuries/disease (in some animals/ at certain times)	**Negative affects** • Pain • Debility • Weakness • Sickness • Malaise • Metabolic and pathophysiological sequelae of being too fat or thin **Positive affects** • Comfort of good health (in animals without acute/chronic health problems) • Comfort of functional capacity (in uninjured animals)

DOMAIN 4 - BEHAVIOURAL INTERACTIONS

Negative interactions with the environment

- Invariant, barren, confined environment
- Inescapable sensory impositions
- Choices markedly restricted
- Environment-focused activity constrained (e.g. by lack of access to water/digging substrate)
- Foraging drive impeded

Positive interactions with the environment

- Some interaction with bone/straw/ wooden block may be possible

Negative interactions with other animals

- Animal-to-animal interactive activity constrained (due to individual cages or inadequate space)
- Significant threats and limits on threat avoidance, escape or defensive activity
- Limitations on sleep/rest (e.g. due to lack of appropriate nests)
- Thwarted hunting drive
- Thwarted desire to swim
- Thwarted desire to dig
- Thwarted desire to play
- Thwarted desire to reunite with offspring (following abrupt weaning)

Positive interactions with other animals

- Rearing young (but typically with little opportunity for the mother to escape from her young during the nursing period)
- Sexual activity (opportunities for natural mating but with little or no agency in mate choice)
- Some play behaviour may be possible, especially when youngsters are housed together

DOMAIN 5 - MENTAL STATE

Negative affects

- Boredom
- Helplessness
- Depression
- Withdrawal
- Anxiety
- Fear
- Panic
- Terror
- Hypervigilance
- Anger
- Frustration
- Loneliness
- Yearning for company
- Insecurity
- Neophobia
- Confusion
- Uncertainty
- Persistent unease

Positive affects

- Engaged by activity (e.g. interaction with bone/ straw/wooden block)
- Maternal rewards
- Affectionate sociability (in some pair-or group-housed animals)
- Excitation/playfulness (e.g., when young animals are housed together, although play opportunities limited by lack of space and environmental complexity)

DOMAIN 4 - BEHAVIOURAL INTERACTIONS (cont.)	DOMAIN 5 - MENTAL STATE
Negative interactions with humans • Rough handling (e.g. use of neck tongs) • Inhumane killing methods **Positive interactions with humans** • Likely to be extremely limited due to fear of humans and insufficient time/too many animals for stock keepers to spend time interacting positively with individual animals	

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The FAWC considers that the minimum legal requirements should be such that an animal has a 'life worth living' and states that *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* [72].

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, foxes and raccoon dogs are not being met on fur farms. Mink are semi-aquatic and show inelastic demand for access to water. Dawkins states that *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* [61]. 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 (Section 5.3). Access to these resources would clearly be included within FAWC's description of a 'life worth living'.

SCAHAW recommends that *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* [41]. In theory, alternative housing in large, highly-enriched, outdoor enclosures could potentially provide a more complex and stimulating environment. However, fear of humans in the animals used by the fur industry, and difficulties in handling and management, present insurmountable obstacles to the adoption of more extensive systems. The needs of animals that are essentially wild cannot be met in any farming system.

However, current farming systems could not meet the needs of mink, foxes or raccoon dogs, even if they were domesticated. If mink and raccoon dogs were domesticated, their needs might possibly be met in large highly-enriched enclosures, including access to water for swimming (for mink) and nests. However, it is debatable whether the needs of foxes could be met, even in more extensive systems. The Council of Europe recommendations state that *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* [40]. In section 4 we showed that mink, arctic and red foxes, and raccoon dogs, travel substantial distances each day within their territory. Clubb and Mason state that *Our findings indicate that the keeping of wide-ranging carnivores should be either fundamentally improved or phased out* [73].


Photo © Otwarte-Klatki

Fear of humans is unavoidable in the use of mink, foxes and raccoon dogs for fur production, which are not domesticated animals. This is in contravention of Council Directive 98/58/EC, which stipulates that 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, foxes and raccoon dogs farmed for fur in Europe are housed in small and largely barren cages. They generally 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, foxes and raccoon dogs on fur farms are not being met. Mink, foxes and raccoon dogs are highly motivated to access resources and perform species-specific behaviours that are not possible in current housing systems.

The welfare of mink, foxes and raccoon dogs in current housing systems is severely compromised across all five domains. Negative conditions and interactions overwhelmingly outweigh positive ones in domains 2 (physical environment) and 4 (behavioural interactions), and may often do so in domains 1 (nutrition) and 3 (health). The highly restrictive and largely barren conditions on fur farms provide little opportunity for welfare enhancement and positive experiences. The overall mental state of the animals (domain 5) is therefore likely to be dominated by negative experiences, resulting in poor welfare and a 'life not worth living'.

The major welfare problems for animals farmed for fur are inherent in the highly restrictive cage housing system and cannot be addressed by moderate increases in space or the provision of 'enrichment' objects. Fear of humans in the animals used by the fur industry, and difficulties in handling and management, present insurmountable obstacles to the adoption of more extensive systems.

Fear of humans is unavoidable in the animals used on fur farms because they have not been selectively bred to promote tameness. It is in contravention of Council Directive 98/58/EC, which stipulates that *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.*

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6 Public opinion on fur

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6 Public opinion on fur

Recent opinion polls indicate that the majority of European citizens in more than 20 countries, including countries with substantial fur production, are opposed to the farming of animals for fur in cages (Table 4). Some polls asked whether fur farming should be banned and others have asked specifically about farming animals for fur in current production systems using cages. In all the countries surveyed, other than Denmark and France, there was a substantial majority in favour of a ban, or opposed to current farming systems using cages.

Table 4. *Summary of opinion poll findings regarding views on fur in European countries*

COUNTRY	OPINION POLL	KEY FINDINGS
AUSTRIA	Survey of 1028 individuals (aged 18-64) conducted by Kantar (commissioned by Vier Pfoten) in October 2020 [349]	**83%** considered keeping and killing animals for fur for the fashion industry was unjustifiable
BELGIUM	Survey of 1000 Flemish individuals (aged ≥18) conducted by IPSOS (commissioned by GAIA) in March-April 2015 [350]	**85%** were in favour of a ban on keeping and breeding animals for fur production. A survey in 2012, covering all of Belgium, found that **86%** were in favour of a ban [351]
BULGARIA	Survey of 800 individuals (aged ≥18) conducted by Sova Haris (commissioned by CAAI) in April 2021 [352]	**81%** did not support the killing of animals solely for their fur
CROATIA	Survey of 1000 individuals (aged ≥16) conducted by SPEM Communication Group Zagreb (commissioned by Animal Friends) in October 2006 [353]	**74%** agreed that breeding animals for fur should be banned
CZECH REPUBLIC	Survey of 1035 individuals (aged ≥18) conducted by CVVM (commissioned by Svoboda zvirat) in March/April 2017 [349]	**82%** did not agree with killing animals for fur
DENMARK	Three surveys conducted by Megafon for TV2 and Politiken (September 2021), YouGov for World Animal Protection Denmark (December 2021), and Epinion for Altinget (April 2022) [354]	Megafon: **44%** agreed or partially agreed with a ban on mink farming vs. 40% disagreed or partially disagreed with a ban YouGov: **50%** agreed or partially agreed that mink farming should not be allowed to resume vs. 20% who wanted mink farming to resume Epinion: **37%** disagreed that mink farming should be allowed to resume vs. 46% who agreed that mink farming should be allowed to resume
ESTONIA	National omnibus survey of 718 individuals (aged 18-60) conducted by Kantar Emor (commissioned by Loomus) in September 2020 [349]	**75%** disapproved of raising and killing animals such as mink and foxes for fur
FINLAND	Survey of 1001 individuals (aged 15-79) conducted by Taloustutkimus in November 2020 [349]	**62%** thought that breeding and killing animals for fur was not acceptable

FRANCE	Survey of 1000 individuals (aged ≥15) conducted by IPSOS (commissioned by One Voice) in August 2017 [349]	**51%** thought that breeding animals for fur should end
GERMANY	Survey of 1046 individuals (aged 18-64) conducted by Kantar (commissioned by Vier Pfoten) in October 2020 [349]	**84%** considered that keeping and killing animals to provide fur for the fashion industry was unjustifiable
GREECE	Survey of 1200 individuals (aged ≥18) conducted by Metron Analysis (commissioned by VeGaia) in December 2018 [349]	**80%** opposed the breeding and killing of animals for commercial exploitation for fur
IRELAND	Survey of 1043 individuals (aged ≥18 conducted by Red C (commissioned by Respect for Animals) in October 2018 [355]	**80%** considered that breeding and killing animals just for fur was unacceptable
ITALY	Survey of 1042 individuals (aged ≥18) conducted by Eurispes between December 2013 and January 2015 [356]	**91%** were opposed to activities linked to the production of fur using animals
LATVIA	Survey of 1005 individuals (aged 18-75) conducted by SKDS (commissioned by Dzivnieku briviba) in June 2021 [357]	**63%** did not support raising and killing animals for fur
LITHUANIA	Survey of 1000 individuals (aged ≥18) conducted by Vilmorus (commissioned by Tusti narvai) in November 2021 [349]	**77%** considered that raising and killing animals for fur was unacceptable
THE NETHERLANDS	Survey of 1017 individuals (aged 18-80) conducted by Motivaction (commissioned by Bont voor Dieren) in December 2021 [349]	**78%** considered fur farming unacceptable
NORWAY	Survey of 1000 individuals (aged ≥18) conducted by Cint (commissioned by NOAH) in October 2018 [349]	**64%** thought it was wrong to farm animals in cages for fur production
POLAND	Survey of 1000 individuals (aged ≥18) conducted by Centrum Badawczo-Rozwojowe Biostat (commissioned by Otwarte Klatki) in September 2019 [349]	**73%** thought that breeding foxes, raccoon dogs and mink for fur should not be allowed
SLOVAKIA	Survey of 1004 individuals (aged ≥18) conducted by FOCUS Research (commissioned by Humanny pokrok) in November 2020 [349]	**70%** considered that breeding and killing animals just for fur was unacceptable
SPAIN	Survey of 802 individuals (aged 18-65) conducted by IPSOS (commissioned by Tu Abrigo Su Vida) in December 2021 [349]	**76%** thought it unacceptable to breed and kill animals for their fur
SWEDEN	Survey of 1046 individuals (aged 18-79) conducted by Novus (commissioned by Djurens Ratt in April 2021 [349]	**76%** thought that breeding mink in cages for fur should not be allowed

SWITZERLAND	Survey of 993 individuals (aged 18-64) conducted by Kantar (commissioned by Vier Pfoten) in October 2020 [358]	**83%** considered it unjustifiable to keep and kill animals for fur for the fashion industry
UK	Survey of 1647 adults conducted by YouGov (commissioned by Humane Society International) in 2021 [359]	**93%** considered it unacceptable to keep foxes for their whole lives in wire cages measuring 1-1.5m^2

In response to public opposition, more and more luxury fashion brands and department stores are choosing to end their use of fur [360,361].

In the UK, where fur farming has been banned for two decades, 73% of 1687 adults surveyed by YouGov (commissioned by the Humane Society International) in February 2022 supported a ban on the import and sale of fur in the UK [362].

Section 6 summary

The majority of European citizens polled in more than 20 countries, including countries with substantial fur production, are opposed to the farming of animals for fur in cages. A growing number of European countries have already implemented bans and there is widespread support for a ban at EU level.

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7

Is WelFur able to address the welfare issues affecting mink, foxes and raccoon dogs farmed for fur in Europe?

Photo © Andrew Skowron

7 Is WelFur able to address the welfare issues affecting mink, foxes and raccoon dogs farmed for fur in Europe?

The WelFur project was launched by the European Fur Breeders Association (now Fur Europe) in 2009 to develop on-farm welfare assessment protocols for mink and foxes [218,363]. The protocols were published in 2015 and the initial assessments were implemented between 2017 and 2019. The protocol for raccoon dogs was published in 2020 [332].

The assessments are carried out in three separate periods during the production cycle: adults prior to mating (period 1), adult females and young between mating and weaning (period 2), and adults and young animals between weaning and pelting (period 3). The scores from the three periods are combined to give an overall classification for the farm. 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 welfare measures for mink, foxes and raccoon dogs used in the WelFur protocols are summarised in Table 5. Around half of these measures are animal-based and half are input-based.

Table 5. *The four principles, twelve criteria and welfare measures in WelFur for farmed mink, foxes and raccoon dogs, with classification into animal-based (AN) and input-based (IN) measures and recording period (1,2 or 3*)* [218,332,363,364]

FOUR PRINCIPLES/ TWELVE CRITERIA	MINK	FOX	RACCOON DOG
I. GOOD FEEDING			
1. Absence of prolonged hunger	Body condition score (AN, 1, 2, 3)	Body condition score (AN, 1, 2, 3)	Body condition (AN, 1, 2, 3) Availability of nutritional fibre (IN, 1, 2, 3)
2. Absence of thirst	Continuous water availability (IN, 1, 2, 3)	Continuous water availability (IN, 1, 2, 3)	Continuous water availability (IN, 1, 2, 3)
II. GOOD HOUSING			
3. Comfort around resting	Access to a next box (IN, 1, 2, 3) Resting quality of the nest box/resting area (IN, 1, 2, 3)	Cleanliness of the fur (AN, 1, 2, 3) Availability of a platform (IN, 1, 2, 3)	Opportunity for allohuddling (IN, 2, 3) Resting shelter (IN, 1, 2, 3)
4. Thermal comfort	Protection from exceptional weather conditions (IN, 1, 2, 3) Nest box material and bedding/nesting material (IN, 1, 2, 3)	Protection from exceptional weather conditions (IN, 1, 2, 3)	Cleanliness of the fur (AN, 1, 3) Protection from exceptionally hot weather (IN, 2) Protection from wind (IN, 1, 3)
5. Ease of movement	Space available for moving (area and height) (IN, 1, 2, 3)	Floor area (IN, 1, 2, 3) Cage height (IN, 1, 2, 3)	Opportunity for horizontal movement (AN, 1, 2, 3) Opportunity for vertical movement (IN, 1, 2, 3)

FOUR PRINCIPLES/ TWELVE CRITERIA	MINK	FOX	RACCOON DOG
III. GOOD HEALTH			
6. Absence of injuries	Skin lesions or injuries to the body (AN, 1, 2, 3)	Difficulties in moving (AN, 3) Skin lesions and/or other observed injuries to the body (AN, 3)	Difficulties in moving (AN, 1, 2, 3) Skin lesions and other injuries to the body (AN, 1, 2, 3)
7. Absence of disease	Mortality (AN, 1, 2, 3) Diarrhoea (AN, 1, 2, 3) Lameness or impaired movement (AN, 1, 2, 3) Obviously sick animals (AN, 1, 2, 3)	Bent feet (AN, 3) Ocular inflammation (AN, 3) Impaired mouth and teeth health (AN, 3) Diarrhoea (AN, 3) Urinary tract infection (AN, 1) Obviously sick fox (AN, 3) Mortality (AN, 1, 2, 3)	Bent feet (AN, 2, 3) Diarrhoea (AN, 1, 2, 3) Other disease (AN, 1, 2, 3) Mortality (AN, 1, 2, 3)
8. Absence of pain induced by management procedures	Killing methods for pelting of mink (IN, 1, 2, 3) Killing methods for individual mink (IN, 1, 2, 3)	Killing method (IN, 1, 2, 3)	Emergency killing (IN, 1, 2) Killing at farm at end of Period 3 (IN, 3)

FOUR PRINCIPLES/ TWELVE CRITERIA	MINK	FOX	RACCOON DOG
IV. APPROPRIATE BEHAVIOUR			
9. Expression of social behaviours	Social housing (IN, 3) Age and procedures at weaning (IN, 2)	Social housing (IN, 3)	Social housing of juveniles (IN, 2, 3)
10. Expression of other behaviours	Stereotypic behaviour (AN, 1, 2, 3) Cage enrichments (IN, 1, 2, 3) Fur chewing (AN, 1, 3)	Opportunity to use enrichment (IN, 1, 2, 3) Opportunity to observe surroundings (IN, 1, 2, 3) Stereotypic behaviour (AN, 1, 2, 3) Fur chewing (AN, 1, 3)	Stereotypic behaviour (AN, 1, 2, 3) Fur chewing (AN, 1, 3) Availability of straw (IN, 1, 2, 3) Opportunity to use activity object (IN, 1, 2, 3) Complexity of the available area (IN, 1, 2, 3)
11. Good human animal relationship	Frequency and duration of handling and transportation (IN, 1, 2, 3)	Feeding test (AN, 1)	Voluntary approach test (AN, 1, 3)
12. Positive emotional state	Temperament test (stick test) (AN, 1, 2, 3)	Temperament test (stick test) (AN, 1) Transport of live foxes (IN, 1, 2, 3)	

★ ***Recording period 1****: assessment of adults carried out well after pelting but before mating*

Recording period 2*: assessment of adults and kits carried out after the offspring leave the nest and before weaning*

Recording period 3*: assessment of adults and juveniles; exactly when it is carried out depends on the development of the juveniles* [364]

It is beyond the scope of this report to give a detailed critique of every criterion in the WelFur protocols. However, below we highlight some specific examples and general issues which show that the WelFur 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 involved in killing fur animals**
- **downplay the importance of serious injuries associated with extreme suffering**
- **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 allows high scores on some elements to mask serious failings on others**
- **cannot achieve WelFur's stated aims of ensuring fur animals live 'a good life' and providing 'the latest 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'**
- **are misleading as the basis for a labelling system**

The WelFur standards have been specifically designed around the 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.

7.1 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 [365]. 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 twelve criteria and to use Qualitative Behavioural Assessment as a possible means of assessment [365].

Engagement with the wider public is important to ensure that welfare assessments provide the type of information sought by consumers and society in general, and to enable informed decisions to be made about animal welfare. *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* [sic] *to address them successfully* [366].

The reason given for not involving social scientists in the fur industry's WelFur project was that *This situation is particular and mainly due to the fact that there is a polarisation of views when addressing the welfare of fur animals* [363]. 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, it was decided that the European fur farming sector should 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* [363].

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So the fur industry is dictating its own views on the public acceptability of fur, rather than reacting to society's concerns regarding the welfare of animals farmed for fur.

The WelFur protocols do not include Qualitative Behavioural Assessment 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. Mononen *et al.* point out that the use of the stick test to measure one component of positive emotional state (exploratory behaviour) in foxes is poorly validated and is actually a test of human-animal relationships rather than exploratory behaviour [367]. Indeed, in mink, a state of boredom has been shown to increase interest in diverse stimuli (including aversive stimuli) [265], and so it is conceivable that animals experiencing a state of boredom might be more likely to show an exploratory response in the stick test. The stick test is a relatively insensitive test of fear reactions (Section 4.2) and is only suitable for use on fearful populations of mink [160]. So even being able to apply the test suggests that the animals are fearful, even if there are differences between individuals. As we have already explained, a more sensitive (though more invasive) test, such as the 'hand catch test', would give a more realistic assessment of fear responses.

The measures relating to handling and transportation also assess events associated with negative, rather than positive, mental states. It is telling that the WelFur protocols are not able to include a measure of positive mental states, but rely on insensitive measures of negative mental states. It is, of course, difficult to measure events that are 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. However, tests that are more sensitive 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 categories [368]:

- **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 [218,332,363]:

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

The Welfare Quality protocols can be used to evaluate animal welfare in a range of farming systems, with variable potential to provide high standards of welfare. In particular, the Welfare Quality assessment system can be used as a research tool to improve farming systems and practices [71]. In contrast, the WelFur protocols have been developed to assess the welfare of animals housed in small wire cages, which is the only housing system currently used commercially for mink, foxes and raccoon dogs. This poses severe limitations on their opportunities to perform highly-motivated behaviours. Since 'best current practice' involves the use of a farming system with low welfare potential, even farms that score highest on the WelFur protocols provide a welfare standard that most people consider unacceptable.

The WelFur protocols score welfare only up to a ceiling of 'best current practice'. Unlike the species covered by Welfare Quality, there are no alternative systems that could provide higher welfare standards for mink, foxes and raccoon dogs.

7.2 Could WelFur ensure 'a good life' for farmed mink, foxes and raccoon dogs?

Fur Europe claims that WelFur is designed to ensure that *fur animals live a good life* [1]. As we have shown in the previous section, the 'best current practice' ceiling for the classification of farms using the WelFur protocol means that welfare is still likely to be extremely poor on farms that score highly. WelFur will not ensure 'a good life' for animals farmed for fur; some of the key issues are:

- **There are numerous insurmountable problems with rearing and breeding fur animals in cages (Section 5). They are essentially wild animals and, as such, are highly motivated to access resources, which are neither possible nor practical, to provide in cages. Family and group housing systems, which provide a more socially-enriched environment for fur animals, are generally avoided by fur farmers 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 weaning of mink (before 8 weeks of age) and late weaning (after they are 8 weeks old) are penalised in the WelFur protocol. Later weaning or housing in family groups through to pelting could provide substantial benefits for both mothers and kits, provided that they are housed in systems with sufficient space and enrichment. However, WelFur discourages the development of such systems. So practices that compromise the welfare of animals reared on fur farms are awarded optimum scores by WelFur because current housing systems cannot address fundamental welfare issues.**
- **Raccoon dogs are more socially tolerant and choose to spend much of their time in body contact with conspecifics (Section 5.4.3). However, the WelFur protocol fails to encourage the development of group housing systems by excluding adults from measures of 'opportunity for allohuddling' and 'social housing of juveniles', and by interpreting the 'opportunity for allohuddling' as being available even when the animals are separated by a cage wall. This means that raccoon dogs held in individual cages are considered to be able to allohuddle so long as there is a raccoon dog in an adjacent cage.**
- **The interpretation of what constitutes a 'resting shelter' is similarly unsatisfactory; a single 25cm square of solid material attached to one side of the cage (with no other solid walls and no solid roof or floor) is considered to provide a resting shelter. So farmers can score quite well for 'comfort around resting' while housing raccoon dogs in individual cages without a nest box.**
- **The WelFur protocols do not address inhumane handling and killing methods, or the lack of training for all personnel involved in killing fur animals (Section 5.1). The use of neck-tongs was originally included in the fox protocol [364]: this**

issue has not been addressed in the current protocol, 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 such as gassing with CO_2 or CO from exhaust gases, even though these techniques have been condemned as unacceptable on welfare grounds.

- The use of body condition scoring is 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 (Section 4.2.3.1). Any animal on a restrictive feeding regime is likely to be experiencing hunger. Mink and foxes can be classified as 'thin' during some observation periods and still be given the best available score by the WelFur protocols.
- Measures of mortality exclude high mortality periods, i.e., before the fixed date of 15 May for mink kits [218], before foxes are 8 weeks old [363], and before weaning for raccoon dogs [332]. Since there is no attempt to assess early mortality, the WelFur protocols exclude the most important period of losses on fur farms. WelFur fails to make any attempt to quantify levels of infant mortality and infanticide, both of which are key indicators of stress in fur animals (Section 5.4). In contrast, the Welfare Quality protocol for pigs [369] includes mortality of young piglets (excluding stillborn animals) and the protocol for broiler (meat) chickens [370] includes mortality from placement of the chicks, usually at one day of age. So the Welfare Quality criteria 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, which is when stereotypies are most likely to occur [371]. While this may help standardise the protocols, it underestimates the true extent of stereotypies. Animals may also stop stereotyping in the presence of an observer, which also underestimates stereotypies.
- WelFur assessments on mink farms between 2017 and 2019 demonstrate just how meaningless, and potentially misleading, some measurements are [184]. Almost all mink farms scored 100% for 'good human-animal relationship'. As we showed in Section 4.2: mink on fur farms are not well adapted to close contact with humans; are generally fearful of humans when tested in a meaningful way; must be handled using thick gloves to avoid injury to the handler; and are

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farmed in such large numbers that it is not feasible for farm workers to dedicate the necessary time to gentle handling of young animals to facilitate some degree of taming. It is hard to see how this situation can justify a score of 100% for 'good human-animal relationship'. So the WelFur protocols include welfare measures that lack credibility.

- 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. For example, the Council of Europe Recommendations stipulate a minimum floor area for mink of $2550cm^2$ [40]. In the WelFur protocol for mink [218], 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 floor area. There is no attempt to encourage progress beyond already existing minimum standards, and the assessment protocol condones practices that breach minimum standards by a substantial margin.
- The WelFur protocols downplay other 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. For most people, it might seem inconceivable 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 healed, should be given anything other than the worst available score in recognition of this clear indication of extreme suffering.
- There is a very significant risk that, with any welfare assessment that uses complex calculations to combine different measures into a single category, high scores on some elements will mask serious failings on others. So the WelFur protocols cannot provide a realistic measure of the welfare standards on a particular fur farm. For example, to attain 'best current practice', a fur farm must score more than 80 out of 100 on two principles and at least 55 out of 100 on all principles. However, since there is a tolerance of 5%, in effect 50% is sufficient to achieve 'best current practice'. Furthermore, since there are several criteria within each principle, it is still possible for a poor score for one criterion to be masked by good scores on others within that principle. So extremely serious welfare failings may not unduly affect the overall score, especially if those failings are scored too leniently to start with, such as when very serious injuries have healed.
- Even the highest WelFur scores do not equate to good welfare in absolute terms, only to 'best current practice'. Furthermore, the bar for passing WelFur assessments is set extremely low. Farms can achieve 'acceptable current practice' with scores of just 20% on three principles and as low as 10% on one principle, again with a tolerance of 5%.

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As emphasised by Broom, *individuals vary in the methods which they use to cope with difficult conditions ... any single indicator can show that welfare is poor* [55]. Webster states that *one should, wherever possible, avoid the idea that a specific harm can be offset by another good. If there is a significant harm of any sort, efforts should be made to remedy it* [66]. 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.* 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* [372].

The WelFur protocols make little attempt to encourage progress in animal welfare beyond the minimum legal requirements that are already in place. The 'best current practice' ceiling for the classification of farms using the WelFur protocols means that welfare is still likely to be extremely poor on farms that score highly, and it is impossible for WelFur to ensure that animals farmed for fur live a good life.

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

The WelFur mink and fox protocols state that *In the preparation of the WelFur protocols for fur-farmed species (mink and fox), all existing scientific knowledge has been reviewed. Scientific research on animal welfare in farmed mink and fox have* [sic] *been conducted in a number of countries for more than 30 years. Consequently the WelFur protocols must be considered as the latest scientific reference with regard to animal welfare for fur-farmed species* [160,363].

While the existing scientific research may have been reviewed, the protocols themselves are constrained by the need to carry out the assessments in a short period of time. The WelFur assessments for a fur farm that holds many thousands of animals (see section 4.2.3) are intended to be completed within approximately 5-7 hours [218,363], so only welfare measures which can be performed quickly on-farm can be included. This also means that only a small proportion of the animals can be included, and so assessments may not be representative. As Wechsler highlights, *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* [373]. Thus the WelFur assessments cannot provide an alternative to the significant body of scientific evidence using technologies and techniques that cannot be applied during rapid on-farm assessments.

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So on-farm welfare assessments, which are necessarily limited by time and technology constraints, may not reflect the findings of more detailed research. Bracke stresses that *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* [374].

Mink, foxes and raccoon dogs are highly motivated to access resources and perform species- specific behaviours that are not possible in the housing systems currently used on fur farms. Because its protocols are designed around the very serious limitations of current systems, WelFur fails to take account of the scientific evidence which shows that the welfare needs of animals kept on fur farms are not being met.

7.4 Are WelFur audits performed by independent third parties?

The independence of the WelFur audits is, at best, questionable. The most recently published WelFur protocol states that *On-farm-assessments are undertaken by the independent third-party, Baltic Control, an ISO/IEC 17021 accredited, international certification body. Only Baltic Control can issue WelFur certificates to fur farmers. Baltic Control's fur farm assessors are trained by the scientists responsible for the relevant species protocol* [332].

In reality, some WelFur audits are sub-contracted. For example, the Finnish research company, Luova Oy, states on its website that *In Finland Luova Oy is* [sic] *subcontractors to Baltic Control. Audits for WelFur and the certification system in Finland are handled by Luova Oy from the beginning of 2017* [375].

In 2017, Mette Lykke Nielsen, the CEO of Fur Europe, said *It has been important for us that both the science behind WelFur as well as the farm assessments are 100 percent independent from the fur sector itself* [376]. However, the Finnish Fur Breeders' Association holds 38% of Luova Oy's stock [377,378], and several of Luova Oy's assessors appear to have close ties to the fur industry [379]. In its 2019 Sustainability Review, the Finnish Fur Breeders' Association stated that holding shares in Luova Oy did not affect the impartiality of the audits, but provided no evidence to support such a claim [378]. The World Wide Fund for Nature (WWF), for instance, advises that a *certification scheme must have several certification bodies accredited to avoid perceived or real conflict of interest* [380].

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For any set of standards to be credible, it is vital that multiple independent certification bodies undertake the assessments. There is a clear conflict of interest when audits are performed by a company in which the fur industry has a substantial holding.

7.5 Is WelFur able to address the inadequacies in current labelling and regulation?

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. 1007/2011 requires that products containing at least 80% textiles by weight, and less than 20% animal products, such as fur or leather, must be labelled to show that it *contains non-textile parts of animal origin* [381].

This form of labelling is likely to mislead consumers, especially if a garment also contains leather or suede. In the USA, the Fur Products Labeling Act [382], originally passed by Congress in 1951, and amended by the 2010 Truth in Fur Labeling Act [383], requires fur garments (including items containing relatively small amounts of fur) to be labelled with the species of animal and country of origin. Labelling comparable to that in the US would make it easier for consumers to identify whether trims on items such as garments and furnishings are made of real or imitation fur.

The fur industry has made several attempts to introduce a labelling scheme to try to convince consumers that fur is produced humanely. The International Fur Trade Federation (now the International Fur Federation or IFF) launched the 'Origin Assured' label in 2007. This indicated that the fur had been sourced from an 'Origin Assured' country (which included all EU Member States, some other European countries, Canada and the USA), which purported to offer assurance on the humane treatment of animals.

In December 2019, the first pelts carrying the WelFur label were sold at auction [384]. In 2020, IFF launched Furmark®, which it claims is a *comprehensive global certification and traceability system for natural fur that guarantees animal welfare and environmental standards* [385]. The first Furmark® 'certified' pelts were sold at auction in 2020, and the Furmark® label was launched to consumers in September 2021 [386].

Furmark® is an umbrella scheme incorporating WelFur and various other programmes for farmed fur, wild fur, and dressers and dyers. A separate report, published in 2021, examined the credibility of Furmark® against established principles of good practice for sustainability standards and certification. This showed that Furmark® lacks transparency and credibility, and that *The standards included in Furmark are generally not set at a level that adds value relative to existing national and international minimum requirements and normal industry practice and therefore would not be expected to result in significant positive sustainability impacts* [387].

Fur Europe claims on its website that WelFur ensures that *fur animals live a good life* [1]. The Furmark® website states that *The* [WelFur] *protocols are centered on the four principles of animal welfare: good housing, good feeding, good health and appropriate behaviour* [388]. These statements clearly imply that the welfare of the animals is good and that they are able to behave appropriately. However, we have shown that all farmed fur is produced in systems that have inherently low welfare potential and do not allow 'appropriate' behaviour.

As we showed in Section 7.2, 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. Numerous scientific studies have shown that the cage environment prevents the performance of highly-motivated behaviours and is associated with abnormal behaviours and aversive mental states (Section 5).

So the current regulatory framework for the protection of fur animal welfare in the European Union is inadequate (Section 2.2). Since most people do not consider that cages provide a 'good' standard of welfare, the use of labels such as WelFur and Furmark® are likely to mislead consumers and cannot be considered credible as a Self/Co-Regulation Initiative [389] for the regulation of animal welfare on fur farms in the European Union.

There are serious inadequacies in current labelling of fur products in Europe, and the use of WelFur and Furmark® as quality assurance schemes are likely to mislead consumers, most of whom would not consider that rearing essentially wild animals in small wire cages is consistent with the schemes' claims that the animals are treated humanely.

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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 encourage 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; do not address the lack of training for all personnel involved in killing fur animals; downplay the importance of serious injuries that are associated with extreme suffering; 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 to indicate the overall welfare level on the farm, there is a very real danger that high scores on some elements will mask serious failings on others. This is especially true where complex calculations obscure the results of individual measures.

Unlike the 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 potentially misleading because 'best current practice' still represents what most people 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, foxes or raccoon dogs.

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

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8 Conclusions and recommendations

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8 Conclusions and recommendations

It is possible to breed tame silver foxes within relatively few generations when very stringent selection criteria are used. These animals actively seek human attention and are easy to handle. This is also possible with mink, and preliminary research suggests that it may be possible with arctic foxes, but this has not been pursued to any great extent. No systematic selection for tameness has been carried out in raccoon dogs. Although their breeding is controlled by humans and they exhibit a number of physical differences from their wild counterparts, mink, foxes and raccoon dogs on European fur farms cannot be considered domesticated. They are essentially wild animals that are fearful of humans and are totally 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 essentially wild animals cannot be met in any fur 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 (CO_2 or CO from exhaust gases) are inhumane. No parameters for humane killing of raccoon dogs have been established. Unlike other farmed species, there is currently no requirement for training or certification of competence for all personnel involved in killing fur animals. WelFur does nothing to address the issues of inhumane handling and killing of animals reared on fur farms.

The welfare of mink, foxes and raccoon dogs in current housing systems is severely compromised across all five domains. Negative conditions and interactions overwhelmingly outweigh positive ones in domains 2 (physical environment) and 4 (behavioural interactions), and may often do so in domains 1 (nutrition) and 3 (health). The highly restrictive and largely barren conditions on fur farms provide little opportunity for welfare enhancement and positive experiences. The overall mental state of the animals (domain 5) is therefore likely to be dominated by negative experiences, resulting in poor welfare and a 'life not worth living'.


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Levels of fear, stereotypic behaviour, fur-chewing/tail-biting, physical deformities (bent feet), and reproductive failure/infant mortality are very strong indicators that the needs of mink, foxes and raccoon dogs on fur farms are not being met. Mink, foxes and raccoon dogs 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, or captive breeding of wild animals, results in loss of behaviours from the species repertoire. Therefore, even if it was possible for domesticated animals to be used for fur production, their welfare and other needs would 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 WelFur protocols do not adequately penalise practices that fail to meet existing minimum standards set out in the Council of Europe Recommendations.

Unlike the Welfare Quality project, public opinion has not been taken into account when 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 most people would consider an unacceptable level of welfare. Unlike the other species covered by Welfare Quality, alternative systems with the potential to provide higher levels of welfare do not exist for mink, foxes or raccoon dogs.

WelFur and Furmark® labels are used on fur produced in small wire cages, which have inherently low welfare potential and are opposed by the majority of European citizens. Such labels are likely to be misleading because most consumers would not consider that rearing essentially wild animals in small wire cages is consistent with the schemes' claims that the animals are treated humanely. A labelling system modelled on that in the US would provide clear, objective information for consumers.

SCAHAW recommends that, *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 move large distances in the wild are more likely to display evidence of stress and psychological dysfunction in captivity, including high rates of stereotypical pacing. In the wild, the species kept on fur farms (i.e.,

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mink, both species of foxes, and raccoon dogs) move substantial distances each night, and can undergo large dispersal movements covering hundreds or thousands of kilometres. The *keeping of naturally wide-ranging carnivores should be either fundamentally improved or phased-out* [73].

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, foxes and raccoon dogs 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 unable to address the serious welfare problems inherent in cage systems. Fear of humans in the animals used by the fur industry, and difficulties in handling and management, present insurmountable obstacles to the adoption of more extensive systems. This makes it impossible for the needs of mink, foxes and raccoon dogs 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, foxes and raccoon dogs for fur should be prohibited in accordance with Council Directive 98/58/EC, which states that *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*. Similarly, the Council of Europe *Recommendation Concerning Fur Animals* states that *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 polled in more than 20 countries, including those with substantial fur production, is opposed to the farming of animals for fur in cages. A growing number of European countries have already implemented bans on this practice and there is widespread support for a ban at EU level.

The European Commission has committed to proposing legislation to end the use of cages for animals farmed for food. It would be unjustifiable to continue to allow animals to be farmed for fur in cages while prohibiting cages for animals farmed for food.

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