

Part 5. Theme on 'Welfur for mink and foxes'

WelFur – mink: development of on-farm welfare assessment protocols for mink

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Abstract

European Fur Breeders' Association initiated the 'WelFur' project in 2009 in order to develop a welfare assessment protocol for mink and fox farms after the Welfare Quality® standards. The assessment is based on four welfare principles (*Good feeding, Good housing, Good health and Appropriate behaviour*) and 12 underlying criteria, to be measured on-farm. The major steps in the development of the WelFur mink protocols are described: (1) Writing literature reviews and listing potential measures. (2) Identifying valid, reliable and feasible welfare measures. (3) Developing registration protocols, descriptions, and schemes. (4) Testing preliminary protocols in relevant seasons of the annual production. This paper focus on the evaluation of validity, reliability and feasibility of the 22 measures that have been selected for the WelFur assessment protocols. These protocols have been tested in the three mink production seasons: Winter, spring, and autumn, in order to cover the life cycle of mink and proved feasible for a one-day visit.

Keywords: validity, reliability, feasibility of welfare measures, *Neovison vison*

Introduction

Society is showing a growing interest in the welfare of livestock and an increasing number of on-farm welfare assessment systems are being developed. 'Welfare Quality®' (WQ) is one of the latest and most ambitious animal welfare assessment approaches. It is based on a multidimensional animal welfare definition focusing on feeding, housing, health and behavioural aspects and aimed on certification. WQ have been developed for swine, cattle and poultry herds, as well as abattoirs (e.g. Welfare Quality®, 2009a,b,c). WQ was funded under the EU 6 Framework Programme 'Food quality and safety' and fur animals were therefore not included.

Existing welfare assessment systems, including WQ, are multi dimensional i.e. are based on numerous measures including different aspects of animal welfare (e.g. hunger, pain, fear etc.). Both resource-based (system and management) and animal-based measures (health and behaviour) have been considered in existing animal welfare systems (Figure 1). The focus has mainly been on indication of poor animal welfare – but recently also indicators of good welfare are included (Mononen *et al.*, 2012; Welfare Quality®, 2009a,b,c).

In order to assess the welfare in the strictly synchronous annual mink production (Møller *et al.*, 2003), this must include three seasons (Møller and Hansen, 2001) (Figure 2). The observations are limited to the last 6-8 weeks in each season, where the information value of the welfare

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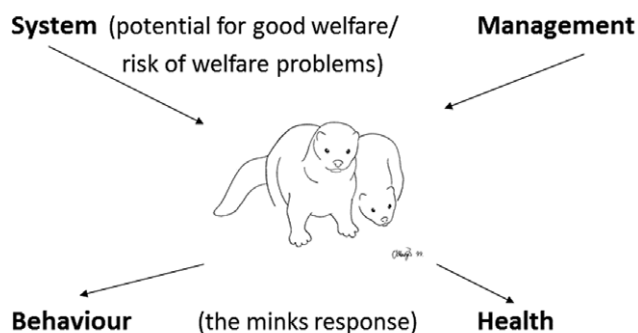


Figure 1. Resource- and animal-based based sources of information for assessing the welfare of farm mink.

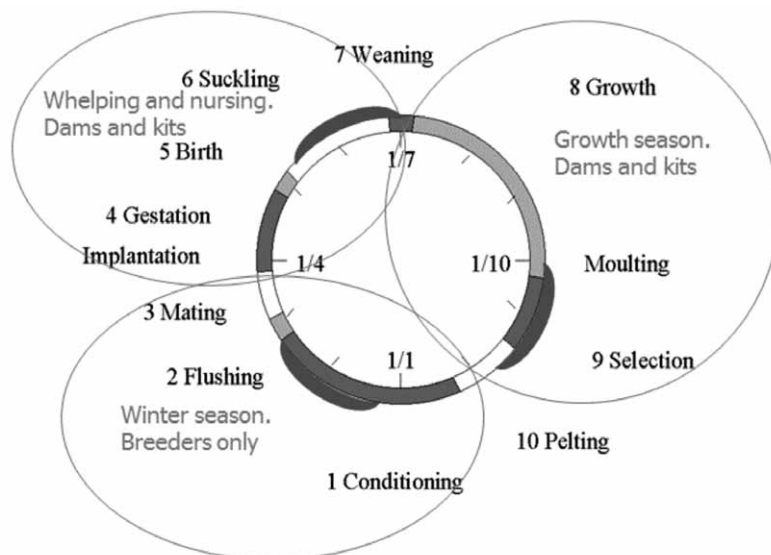


Figure 2. Three seasons of the year to be covered by Welfur Mink. Periods for assessment marked within each season.

measures is highest. These seasons are: (1) Winter. January 1st to February 20th, (2) Spring. May 5th to July 1st/weaning, and (3) Autumn. October 1st to November 30th/pelting (Figure 2).

'Welfare Quality[®]' seems to become the de facto standard of welfare assessment in the European Union. The European Fur Breeders' Association (EFBA) launched the project 'Welfur' in 2009 with the aim to develop a protocol for use in welfare assessment of mink and fox farms by the standards developed in Welfare Quality[®]. This involved a number of steps, such as: getting familiarised with Welfare Quality[®] project and protocols; writing literature reviews and listing potential measures; identifying valid, reliable, and feasible welfare measures; developing

registration protocols, descriptions, and schemes; testing the protocols in all three seasons. The WelFur protocols for fox and mink (Mononen *et al.*, 2012) are based on the four principles and 12 criteria developed in WQ as these are considered independent of animal species (Veissier *et al.*, 2009). Furthermore, WQ dictates, that wherever possible, measures should be animal based. The aims of this paper are to: (1) Present the development of the WelFur-mink protocols. (2) Explain evaluation of the measures included (i.e. the evaluation of validity, reliability, and feasibility of the welfare measures included), using WQ concepts to develop a WelFur protocol for mink

A large number of potential measures have been applied in research on mink welfare or was suggested during the development. Many of these require blood-sampling, laboratory tests, video recording or were considered not feasible for other reasons. The definition of 'a measure' is somewhat arbitrary as some involves several observations (e.g. *Quality of nest box* includes 4 observations) while others could be divided into a large number of individual measures (e.g. the many potential diseases included in the measure *Obviously sick mink*) (Table 1). By reviewing previous work and thorough discussions we came up with 54 potentially feasible welfare measures for mink. For each of the three seasons each measure was evaluated according to their:

- Validity: the measure reflect some aspect of the actual welfare of the mink relative to the criteria.
- Reliability: the measure has acceptable inter or intra observer reliability and robustness to external factors e.g. time of day or weather condition.
- Feasibility: the measure is possible and practical to apply in practice with reasonable costs.

The review written for each of the 12 criteria was concluded by an assessment of the validity, reliability and feasibility of the measures based on a three point scale (EFSA, 2008: 64) (Table 1):

1. Low certainty: Scarce or no data available; evidence provided in unpublished reports, or based on personal observations or communications; authors' conclusions vary considerably between the reports.
2. Medium certainty: Some or only incomplete data available; evidence provided in small number of references; authors' conclusions vary from one to the other; solid and complete data available from other species which can be extrapolated to the species considered.
3. High certainty: Solid and complete data available; strong evidence in multiple references with most authors coming to the same conclusion.

A total of 22 welfare measures passed this evaluation and are included in one or more of the three seasonal protocols (Table 1). This inclusion is discussed according to the WQ template.

Validity of measures included

Good feeding: absence of hunger and thirst

Body condition score (BCS) was chosen as an animal-based measure with high validity (e.g. Damgaard *et al.*, 2004) and acceptable reliability (Hansen *et al.*, 2009) in all seasons for the criterion 'Absence of prolonged hunger'. *Continuous water availability*, and *Function and cleanliness of the drinkers* were chosen as valid (Møller, 1991), and reliable resource-based measures for 'Absence of prolonged thirst', as it was not possible to find feasible animal-based measures for this criterion.

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Table 1. Welfare measures included in one or more of the three seasonal assessment protocols for mink, under the four principles and 12 criteria. R/A=resource/animal-based measure. V=validity, R=reliability, and F=feasibility evaluation: 1=low, 2=medium, 3=high. Season of the measurement: 1=winter (breeding animals), 2=spring (breeding animals and pre-weaned kits), 3=autumn (growing juveniles and breeders).

Welfare principles and criteria	Welfare measures	R/A	V	R	F	Season
I. Good feeding						
1. Absence of prolonged hunger	body condition score	A	3	2-3	3	1, 2, 3
2. Absence of prolonged thirst	continuous water availability	R	3	3	3	1, 2, 3
	function and cleanliness of the drinkers	R	3	3	3	1, 2, 3
II. Good housing						
3. Comfort around resting	access to a nest box	R	3	3	3	1, 2, 3
	quality of nest box: dry, clean, sharp edges, fleas	R	3	2	3	1, 2, 3
	cleanliness of the fur	A	1	3	3	1, 2, 3
4. Thermal comfort	protection from exceptional weather conditions	R	2	2	3	1, 2, 3
	nest box and bedding material	R	2-3	3	3	1, 2, 3
5. Ease of movement	space available for moving	R	1-3	3	3	1, 2, 3
III. Good health						
6. Absence of injuries	lesions and injuries	A	3	2	3	1, 2, 3
7. Absence of disease	mortality	A	3	2	3	1, 2, 3
	diarrhoea (incl. sticky kits)	A	3	2	3	1, 2, 3
	lameness and impaired movement	A	3	3	3	1, 2, 3
	obviously sick mink	A	3	3	3	1, 2, 3
8. Absence of pain induced by management procedures	methods of killing:					
	individual mink	R	3	3	3	1, 2, 3
	mink at pelting	R	3	3	3	1, 2, 3
IV. Appropriate behaviour						
9. Expression of social behaviours	weaning procedures: age, distance, time between weaning and separation	R	2	3	3	2
	social housing	R	2	3	3	3
10. Expression of other behaviours	cage enrichment	R	2	3	3	1, 2, 3
	stereotypy	A	3	3	3	1, 2, 3
	fur-chewing	A	3	2-3	3	2, 3
11. Good human-animal relationship	temperament (stick test)	A	3	3	3	1, 3
12. Positive emotional state	frequency and duration of handling	R	3	3	3	1, 2, 3

Good housing: comfort around resting, thermal comfort and ease of movement

Most measures under this principle reached the highest validity scores (Table 1). The availability (Hansen *et al.*, 1994, 2000) and quality (Møller, 1990; Malmkvist, 2008) of a nest box are of great importance to mink, and are thus valid resource-based measures. Research is lacking or scarce on the measures *Cleanliness of the fur* and *Protection from exceptional weather conditions* and the inclusion of fur cleanliness is still under evaluation. The *Cage dimensions* are obviously important for the minks' ease of movement, but once a satisfactory cage size has been reached, the validity of welfare improvement with increased size is undocumented (see discussion in Mononen *et al.*, 2012).

Good health: absence of injuries, disease, pain

The prevalence of *Lesions and injuries*, which is generally low in mink production (Møller 2011) is a valid measure of *Absence of injuries*. European farmers are obliged to register the *Mortality* which is taken as a valid measure of *Absence of disease*. Due to the low prevalence (e.g. Rattenborg *et al.*, 1999) most potential diseases are pooled by the measure *Obviously sick mink*. Due to a higher expected prevalence *Lameness and impaired movement* and *Diarrhoea* (incl. *Sticky kits* in season 2) is observed separately. These are all animal-based measures with high validity in all three seasons (Table 1). Effective *Methods of killing* are scrutinised for pelting as well as for individual mink that need to be euthanized, are considered valid measures of '*Absence of pain induced by management procedures*'.

Appropriate behaviour: social behaviour, other behaviours, human-animal-relationship and positive emotional state

The majority of welfare research in mink is based on applied ethology research and most behavioural measures have been tested and documented prior to the Welfur project. The resource-based measure *Weaning procedures* needing further investigation and *Social housing* still under intense investigation are therefore considered having medium validity. Due to vast scientific documentation the resource-based *Cage enrichment* (e.g. Hansen *et al.*, 2007; Mason *et al.*, 2007), and the animal-based *Stereotypy* (e.g. Malmkvist *et al.*, 2011; Mason and Latham 2004), and *Fur-chewing* (e.g. Hansen *et al.*, 1998) are highly valid measures. *Stereotypy* and *Fur-chewing* are by definition abnormal behaviours mainly caused by inadequate environment and therefore often used signs of poor animal welfare although the relation between these measures and welfare at the individual level is not fully understood (e.g. Mason and Latham 2004). Stereotypic mink are more stress-sensitive (Malmkvist *et al.*, 2011), but the performance of stereotypic behaviour may relate to reduced stress at the brain level (Malmkvist *et al.*, 2012).

Numerous references render the test of *Temperament* in mink a very well validated indicator of the emotional state in mink (see e.g. Malmkvist and Hansen, 2002; Kirkden *et al.*, 2010). It can also be argued to reflect a human-animal relationship although it is different from social species that often relate more direct and long term towards humans. This animal-based measure is therefore taken as a highly valid score of the combined criteria of 'Good human-animal relationship' and 'Positive emotional state' in season 1 and 3 (Table 1). Testing the protocol proved

the temperament test less valid in season 2, as the nursing dams often stay with or aggressively defend their litter. The *Frequency and duration of handling* are situations that inflict fear and frustration in the mink and the amount of research is sufficient to grade the validity with high certainty (Hansen and Damgaard, 1991).

Reliability of measures included

The reliability of most resource-based measures is high (Table 1) as they are measured without the involvement of subjective assessment. Furthermore the registrations are independent of external factors such as time of day or weather condition. The two exceptions from objective assessments are: (1) *Quality of nest box* (assessment of whether the nest box is *wet, dirty, have sharp edges, or fleas*) and (2) *Protection from exceptional weather conditions* (assessment of protection against wind, heat, cold, and rain from the shed and cage system). The reliability of these depends highly on skills and training of observers.

The reliability of most animal-based measures is also high (Table 1) as they are measured under standardized conditions making them robust to external factors. Their reliability have been tested for use in some seasons (see discussions in Mononen *et al.*, 2012) and are being tested further if included also in other seasons (Møller *et al.*, 2012). The three exceptions are: (1) *Lesions and injuries* for which the observations depend on how the mink present itself. (2) *Mortality* that depends on the farmers' observations and registrations. (3) *Diarrhoea* for which the observations depends to some degree on the frequency of mucking out the trough for the slurry system. These are all measures depending highly on observer skills and training, and measures for which robustness to external factors are not yet documented.

An important part of reliability of behavioural welfare measures is the robustness to external factors e.g. time of day. Stereotypic behaviour illustrates this challenge, as it is mainly displayed during active periods at dawn and dusk, and, if feeding is restricted, also in relation to feeding time (Hansen and Møller, 2008). Quantification of mink that display stereotypic behaviour as part of their repertoire, therefore, depends heavily on time and method of observation. In WelFur, the goal is to measure the proportion of stereotypers in a standardized way, by postponing the feeding and observing the unfed mink. This will prompt only the established stereotypers to display this behaviour. Robustness is obtained by calculation of stereotypy in percent of all active mink. E.g. the sound of a feeding machine during observation will tend to increase activity as well as stereotypy, rather than the proportion between them. This standardization allows for observation of stereotypy in most situations, while further validation is needed, e.g. for farms that feed at different times every day. In that case, the sound of a feeding machine has been suggested as a way to standardize the test situation – but this has to be validated.

Feasibility of measures and protocol

The literature rarely reports on feasibility so the evaluation is mainly based on practical experience. Many potential animal-based welfare measures are unfeasible due to cost, time or procedure involved e.g. video recordings, hormone analysis and catching the animals. Animal-based measures are often time-consuming because they vary, and thus have to be measured for

each individual mink. Resource-based measures often have little (e.g. cage design) or no (e.g. watering system) variation within a farm and are therefore fast to sample.

As animal-based measures are favoured in WelFur, the observation procedures are planned to facilitate this. All measures have high feasibility and are taken on a stratified sample of 120 cages irrespective of farm size. This sample is taken to represent the farm according to welfare relevant variation in housing and animals and is described further in Rousing *et al.* (2012). Therefore most animal-based measures can be observed simultaneously, e.g. while scoring the body condition or the temperament.

Not only each measure but also the combination of measures in the welfare assessment protocol should be feasible to assess at a one-day farm visit. For this purpose the mink WelFur protocols have been tested in 9 farms in Denmark in each of the three seasons and testes have also been carried out in The Netherlands, Sweden and Norway. Based on these tests and the experience from different countries the protocols, description of measures, and registration schemes have been refined. Furthermore the sampling strategy and size (Rousing *et al.*, 2012), and the Inter Observer Reliability (Møller *et al.*, 2012) have been tested in season 2 and 3, while the robustness of the protocol to the age of the kits in season 2 is currently under investigation.

Concluding remarks

The present WelFur mink welfare assessment protocols, descriptions, schemes, and scoring calculation systems (see Botreau *et al.*, 2012) are almost ready for implementation. Despite the validation described in this paper, it is anticipated that testing and implementing the protocols in all EFBA member countries will reveal farm conditions and situations in which the protocols are not robust, where some measures will prove less valid or reliable than expected. Based on the results and experiences from these countries a refined Version 2 of the WelFur mink protocol can be build.

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