Applied Animal Behaviour Science 194 (2017) 112–119

Contents lists available at ScienceDirect

Applied Animal Behaviour Science

journal homepage: www.elsevier.com/locate/applanim

Effects of group size on behaviour, growth and occurrence of bite marks in farmed mink

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ARTICLE INFO

Keywords:
Mink
Group housing
Behaviour
Growth
Bite marks
Animal welfare

ABSTRACT

The aims of this study were to investigate the occurrence of stereotypic behaviours and the activity level in farmed mink when group housed in climbing cages and if group housing increase aggression by assessing the prevalence of bite marks. This was studied in juvenile mink of the colour types "demibuff" (n = 165) and "half sapphire" (n = 165). The animals were housed in standard cages (S2: one male, one female), or in climbing cages (C2: one male, one female; C3: one male, two females; C4: two males, two females). Behaviours were recorded for two hours beginning at sunrise and two hours before sunset during six periods of five days each from August-October. After pelting, the leather side of the undried skins were visually inspected for bite marks. Stereotypic behaviours were infrequent (0.1% of observations). Pair housed mink in climbing cages were more "inactive out in cage" than pair housed mink in standard cages ($p < 0.0001$), but cage type had no effect on the behaviours "being in nest box", "active out in cage", "interactions with enrichments" or "social interactions" (n.s.). Group sizes of three or four mink increased the behaviours "active out in cage" ($P < 0.0001$) and decreased "being in nest box" ($P < 0.001$) but had no effect on "interactions with enrichments", "inactive out in cage" or "social interactions" (n.s.). Males had lower growth when kept in groups of four compared to groups of three or pairs ($P < 0.001$), and shorter skin lengths when kept in groups of four compared to pairs ($P < 0.001$), but females did not differ in growth or skin lengths between group sizes (n.s.). Number of bite marks on the leather side of the skins did not differ between cage types (n.s.) or group sizes (n.s.). In conclusion, neither the cage design nor the group size affected the occurrence of stereotypies or the occurrence of bite marks, but activity levels increased and the use of a nest box and male growth decreased in larger groups.

1. Introduction

A more complex cage environment, as well as access to several enrichments such as shelves, cylinders and biting objects has been shown to decrease the frequency of stereotypic behaviours in mink compared to standard cages without enrichments (Jeppesen et al., 2000; Hansen and Jeppesen, 2001). Hansen et al. (2007) showed that access to tubes attached to the ceiling and ropes to pull and chew reduced the occurrence of tail-chewing and stereotypic behaviours and the level of faecal corticoid metabolites, whereas access to double sized empty cages had no effect on stereotypic behaviours, fur-chewing or physiology linked to welfare (Hansen et al., 2007). These results are consistent with findings from previous studies (Hansen, 1988; Hansen et al., 1994) indicating that complexity in the cage is more important for the welfare than the size of the cage. Housing or management practices that induce or increase stereotypic behaviour have been linked to reduced welfare at the population level but not at the individual level (Mason and Latham, 2004). Stereotypic behaviours in young mink are very rare and develop over time (Hansen et al., 2011). In mink, the stereotypic behaviours occur primarily during restricted feeding and are often performed before feeding (Axelsson et al., 2009), indicating that feeding motivation is an important factor for the development of stereotypic behaviours in mink (Damgaard et al., 2004; Hansen and Damgaard, 2009). Stereotypic behaviours can also be elicited in situations not involving feeding motivation, e.g. in mink females with kits before weaning (Lidfors et al., 2012).

On commercial farms, mink are usually housed in pairs in the growing season (July until end of November); however, the European Convention (1999) has approved group housing in mink for welfare reasons. One reason for this is that group housing could be regarded as a form of environmental enrichment, and in some studies it has been found that group housing decrease the frequency of stereotypic behaviours (Pedersen and Jeppesen, 2001). However, de Jonge (1996) and Hansen et al. (1997) found no difference in stereotypic

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http://dx.doi.org/10.1016/j.applanim.2017.05.008
Received 29 August 2016; Received in revised form 5 April 2017; Accepted 5 May 2017
Available online 15 May 2017

behaviours between pair housed and group housed mink. The climbing cage is a more complex cage than the standard cage and provides possibilities for further enrichments, which includes housing groups of mink together. Group housing of mink in the growing season has been shown to increase aggression and the occurrence of bite marks observed on the leather side of the skin after pelting (Mononen et al., 2000; Pedersen et al., 2004; Hansen and Houbak, 2004; Hänninen et al., 2008a,b), which compromises the welfare of the mink as a solitary and territorial species (Gerell, 1970; Dunstone, 1993). Pedersen et al. (2004) also found that group housed mink in stacked housing (climbing cages) use the nest box less than mink housed in pairs which may be due to "resource competition and deprivation from food and nest box as a consequence".

Increased social competition may affect the growth of mink raised in groups. Several studies have included the growth of the mink when comparing the effect of group and pair housing, but the results are ambiguous (Hansen and Damgaard, 1991; Damgaard and Hansen, 1996; de Jonge, 1996; Mononen et al., 2000; Pedersen and Jeppesen, 2001; Hänninen et al., 2008b). None of these studies include the feed allowance; therefore, the different results could be due to differences in feeding management practises between pairs and group housed mink.

The aims of this study were to investigate the occurrence of stereotypic behaviours and the level of activity in farmed mink when group housed in climbing cages and whether group housing increases aggression by assessing the prevalence of bite marks. We predicted that larger groups of animals would have more bite marks due to increased aggression. We also predicted lower levels of stereotypic behaviours in mink housed in climbing cages due to a more complex environment. Finally, we predicted an overall increase in activity and a decrease in the use of the nest box in larger groups due to having more social contact.

2. Material and methods

The study was approved by the Swedish Ethical Committee in Gothenburg (Dnr: 180-2005) prior to initiation.

2.1. Animals, housing and management

The study was carried out on a commercial farm in the southwest of Sweden from July until pelting in November 2005. The farm had approximately 12 000 breeding females and they had produced mink for more than 60 years on the farm. A total of 165 juvenile mink of the colour type "demibuff" and 165 of the colour type "half sapphire" were included in the study. All mink kits in the study were housed in long-roof sheds under standard farm conditions with their mothers and siblings until weaning at about 8 weeks. On the 4th of July, at about eight weeks of age, all animals were re-housed in one of four groups.

Top cages were joined on top of the standard cages to create climbing cages (total floor areas 4250 cm^2 and 45 cm high, Fig. 1). All of the standard cages were equipped with two types of enrichments; one wire mesh shelf (depth 10 cm x length 30 cm) situated 20 cm above the wire mesh floor on the back wall of the cage and one plastic cylinder (diameter 11 cm x length 25 cm) placed loose on the wire mesh floor. The top cages were equipped with one wire mesh shelf (depth 10 cm x length 30 cm) placed 20 cm above the wire mesh floor on the front wall (Fig. 1b). Consequently, climbing cages and standard cages included three and two pieces of enrichments, respectively. All cages were connected to one nest box with the dimensions 29 cm (length) x 22.5 cm (width) x 30 cm (height), which was provided with wheat straw. Drinking water was provided ad libitum through nipples connected to a central water system.

Groups consisted of pair housed mink in standard cages (S2: one male & one female), pair housed mink in climbing cages (C2: one male & one female), groups of three (C3: one male & two females) and groups of four (C4: two males & two females) in climbing cages.

There was a feed kitchen on the farm where fresh conventional mink feed was produced every day in accordance with the Nordic Association of Agricultural Scientists (NJF) recommendations for feed composition (Hansen et al., 1991). The average content of metabolizable energy (ME), MJ per kg feed in the diets was 5.7 ME during July- August and 6.4 ME during September-pelting. Average distribution, % of ME, was during July- August from protein 37%, fat 44% and carbohydrates 19% and during September- pelting from protein 32%, fat 51% and carbohydrates 17%. All mink were fed three times a day in July and August, twice per day in September and once per day in October and November.

Six animals died, at around 6 months of age, during the time the study was performed; these included two males housed in pairs in standard cages, one male housed in a pair in climbing cage and three females housed in groups of four in climbing cages. The corpses were autopsied at the National Veterinary Institute in Uppsala and none of the deaths could be connected to the conditions provided in the study, i.e. the dead mink had not been bitten.

2.2. Behavioural recordings

Behavioural data were collected in six periods with five days in each period. Observations were carried out during the periods 18–22 and 25–29 of August (approx. 4 months old), 15–19 and 22–26 of September (approx. 5 months old), 20–24 and 27–31 of October (approx. 6 months old). Behavioural observations were done using scan sampling (Martin and Bateson, 1993) starting at sunrise and ending two hours later and for two hours before sunset, because the activity level of the mink is highest during the crepuscular hours (Hansen and Møller, 2008). The observation time was adjusted to sunrise (August approx. 05:40, September approx. 06:40, October approx. 08:05) and sunset (August approx. 20:25, September approx. 19:05, October approx. 17:30) during the study, and feeding was done after observations ended. Each mink in the cage was individually observed 6 times during the two-hour observation session. During each session, the observer looked instantaneously at one animal and then switched to the next animal, and so forth until all mink had been observed. Thus, each mink was observed 12 times per day (in two observation sessions per day) during a total of 30 days, which resulted in a total of 360 scans per individual during the entire study. All observations were performed by the same observer from the nearby shed-house to minimize the observer's impact on the animals. Recorded behaviours were categorised as: stereotypic behaviour, activity, inactive out in cage, in nest box and interaction with enrichments (Table 1). The animals' position in the cage was also recorded; i.e. in nest box, floor in bottom cage, shelf in bottom cage, inside cylinder, floor of top cage or shelf of top cage.

2.3. Growth

At the start of the study on the 4th of July all animals were weighed before they were put in new cages. All animals were also weighed on the 8th of August, 14th of September, 17th of October and after being euthanised on the 29th of November.

2.4. Skin lengths and bite marks

At pelting on the 29th of November 2005, all animals were placed in individual transportation cages (a mink trap), which were put in to a larger box (killing box) fitting about 20 transportation cages at a time, after which they were euthanised with carbondioxide. This differ from the standard method of euthanising mink where mink are placed directly into a larger killing box with carbon dioxide. Our method was used to be able to identify the individual skins. Thereafter the bodies were weighed and taken to the machines that removed the skin from the body. Individual skin lengths were measured for all mink in