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Effects of access to extra cage constructions including a swimming opportunity on the development of stereotypic behaviour in singly housed juvenile farmed mink (*Neovison vison*)

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ABSTRACT

The aim of the study was to find out whether an access to extra cage constructions including either a 180 l pool (SP group) or a pool-sized extra cage (0.61 m^2) (EC group) would slow down the development of stereotypic behaviour in singly housed farmed mink (*Neovison vison*). Mink housed in traditional mink cages (TC group) served as controls. The results show that stereotypic behaviour increased in all groups with advancing autumn, the increase being the greatest in TC group. Pair-wise comparisons between the groups showed that the occurrence of stereotypic behaviour was significantly lower in SP group than in TC group from November onwards (November–December: 1.4 ± 0.6–2.2 ± 0.6% vs. 6.0 ± 1.7–7.8 ± 1.3% of observations spent in stereotypic behaviour, respectively). Furthermore, the SP mink spent significantly less of their active time in stereotypic behaviour than the TC mink from November onwards (November–December: 6.2 ± 2.4–10.3 ± 2.8% vs. 21.4 ± 5.5–29.2 ±4.3% of active time spent in stereotypic behaviour, respectively). The mink that had an access to an extra cage of the similar size as the pool were intermediate in their level of stereotypic behaviour (November–December: 2.6 ± 0.9–4.7 ± 1.1% of observations spent in stereotypic behaviour) and the percentage of active time spent in stereotypic behaviour (November–December: 10.1 ± 3.5–17.6 ± 3.9%). The amount of stereotypic behaviour of the EC mink did not differ significantly from the amount of stereotypic behaviour of either the TC or SP mink. In conclusion, the present results show that extra cage constructions including a swimming opportunity slow down the development of stereotypic behaviour in singly housed farmed mink.

1. Introduction

It has been suggested that an opportunity to swim could improve farmed mink's (*Neovison vison*, earlier *Mustela vison*) welfare. Accordingly, effects of different kinds of swimming pools on the behaviour and welfare of mink have been intensively investigated during the last decade (see the review by Vinke et al., 2008). Although the wild mink has been regarded as a semi-aquatic animal (e.g., Dunstone, 1993), and European Commission (2001) in its conclusions about the welfare of farmed mink states that "farm mink show strong preferences for the opportunity to swim", Vinke et al. (2008) concluded that "swimming water is likely not an 'innate' need" for farmed mink. This conclusion was based on a review of a number of studies, in which a wide range of welfare assessment methods had been used. However, at the same time, the authors emphasized that the question of the welfare effects of a swimming opportunity in farmed mink is not solved.

Perhaps the most widely used behavioural indicator of welfare problems in captive animals is stereotypic

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behaviour, i.e., repetitive behaviour induced by frustration, repeated attempts to cope and/or central nervous system dysfunction (Mason, 2006). The relation between stereotypic behaviour and animal welfare is not, however, straightforward (Mason and Latham, 2004). Stereotypic behaviour may help an individual to cope, and, for example, mink that perform high levels of stereotypic behaviour are more confident and less fearful than mink stereotyping less (Hansen and Jeppesen, 2006; Svendsen et al., 2007). Nevertheless, stereotypic behaviour can be regarded as a valid animal welfare indicator e.g., in groups of animals subjected to different treatments (see Mason and Latham, 2004).

The results regarding the effects of an access to a pool on the welfare and stereotypic behaviour of farmed mink are still contradictory. Mononen et al. (2008) found that swimming opportunity reduces stereotypic behaviour in farmed mink whereas this was not observed in Skovgaard et al. (1997), Hansen and Jeppesen (2000b, 2001a) and Vinke et al. (2006). Mononen et al. (2008) concluded that "long-term access to baths may alleviate frustration in singly housed juvenile mink". Contradictory conclusions have been reported by e.g., Korhonen et al. (2003), "swimming is not a very essential need for farm bred mink" and Hansen and Jeppesen (2000b), "water for swimming is not necessarily an environmental enrichment for, and lack of it would not impair the welfare of ranch mink". One reason for the contradictory results is that the methods used in the studies on the subject are far from standardised (see Vinke et al., 2008). In some of these studies, behavioural observations have been carried out only during the daytime (e.g., Vinke et al., 2005) or during only some hours of the day (e.g., Hansen and Jeppesen, 2000b, 2001a), while in some studies the observations include one (e.g., Hansen and Jeppesen, 2003) or several (e.g., Korhonen et al., 2003; Mononen et al., 2008) 24-h recordings. The size of the pools has varied from small baths (42 cm × 26 cm with 12 cm water depth, Hansen and Jeppesen, 2003) to large pools (168.5 cm × 68.5 cm with 60 cm water depth, Warburton and Mason, 2003). Some of the studies have focused on the effects of pools in mink that have got pools only as adults (e.g., Korhonen et al., 2003) while some have studied the effects in mink that have had an access to pools from their early age onwards (e.g., Vinke et al., 2006; Mononen et al., 2008). In addition, e.g., colour type of the experimental mink (e.g., black colour type: Korhonen et al., 2003; wild type: Warburton and Mason, 2003), climatic conditions during the experiments (e.g., below zero temperatures from late autumn onwards: Mononen et al., 2008; temperatures higher than 0 °C during the whole experiment: Hansen and Jeppesen, 2001b) as well as the route to the water (via a ramp: Mason et al., 2001; no ramp: Hansen and Jeppesen, 2001a) have varied from one study to another. Furthermore, not all the studies on the subject have considered stereotypic behaviour in their behavioural analyses (see Vinke et al., 2008). In their article, Mononen et al. (2008) suggested that the 24-h recordings would reveal any differences in the frequency of stereotypic behaviour between the pool and control groups better than observations limited to only few hours or moments of the daytime. They also pointed out that the effects of the swimming opportunity might better be revealed in juveniles than in adults that have already established stereotypic behaviours (see Korhonen et al., 2003).

The present study, which is already included in Vinke et al.'s review as a short congress manuscript with only preliminary statistical analyses (Mohaibes et al., 2003, in Vinke et al., 2008), continued to assess the effects of an access to a swimming pool on stereotypic behaviour of farmed mink. We studied the development of stereotypic behaviour in juvenile mink that were housed singly in either a traditional cage (0.26 m^2) or a traditional cage with an extra access to either a 180 l pool (0.61 m^2) or a pool-sized extra cage (0.61 m^2). We analysed the 24-h behaviour of the mink several times during the experiment lasting from mid-July to early-December in order to get a precise picture of the development of stereotypic behaviour. Furthermore, we used only juvenile mink that had not presumably developed any serious stereotypic behaviour before the onset of the experiment. By doing this, we wished to assure that the forthcoming stereotypic behaviour would represent the effects of extra cage constructions rather than the effects of earlier housing conditions of the mink. We also used large swimming pools (with 180 l water) that gave the mink the opportunity for proper swimming behaviour. Furthermore, we used in the analysis of the data more sophisticated statistical methods than what were used in the preliminary results of the study (Mohaibes et al., 2003, in Vinke et al., 2008).

2. Material and methods

The study was carried out in an unheated animal barn at the Research Station of the University of Kuopio, Finland. The study was approved by the Institutional Animal Care and Use Committee of the University of Kuopio (licence number 01-34).

2.1. Animals and housing conditions

Altogether 17 scan-glow mink litters including the experimental animals were born in May in traditional mink cages (85 cm × 30 cm × 45 cm, L × W × H) with a standard wooden nest (27 cm × 31 cm × 39 cm) with bedding inside. The litters were weaned from their mother at the age of 51 ± 2 (mean ± SD) days. After the weaning, the cubs born earlier (cubs from 12 litters) were kept one week in groups of three cubs before the cubs were separated from each other; the cubs born later (from five litters) were kept one day in groups of three cubs before separating them. Altogether 45 female kits were randomly selected from the litters (three kits from 13 litters, two kits from two litters and one kit from two litters). The kits lived singly in traditional cages with nests until the mid-July.

In mid-July, the 45 randomly chosen kits were divided into three groups taking into account the litter. The three groups were: (1) traditional cage (TC) group ($N = 15$), (2) swimming pool (SP) group ($N = 15$) and (3) extra cage (EC) group ($N = 15$). The mink in TC group continued their living in their previous conditions, i.e., each TC mink was housed singly in a traditional cage with a standard nest. In addition to a traditional cage and a nest, each SP mink got an access