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Effects of blocking farm mink's feed access with open water

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Thirty-eight farm mink were used to investigate whether open water in some instances could be a barrier to farm mink. Half of the animals grew up with free access to swimming water in a basin, the other half to an empty middle cage. Access between the cage containing the nest box and the cage containing the feed was either through the basin/middle cage or through a tunnel above it. Twenty-four hours before observations, the animals were confined without feed to the cage containing the nest box. Observations were carried out over two and a half hours after re-opening one of the access routes to the feed.

When access was through the water filled basin, the animals were slower in reaching the feed and crossed between the feed and the nest box fewer times compared to both the same animals using the tunnel and the animals having a dry middle cage. In addition, animals scratched more at the blocked tunnel access when the available route was through the water than when it was through the dry middle cage.

The results led to the conclusion that, under some circumstances, water can act as a barrier when farm minks are approaching feed. This indicates that water for swimming is not necessarily an environmental enrichment for, and that the lack of it would not impair the welfare of ranch mink.

Key words: welfare, stereotypy, swimming

Introduction

In the wild, mink are associated with lakes, streams or seashores and, when necessary, they swim to catch prey in the water (Dunstone 1993). Farm mink have been shown to work for access to water for swimming when they have prior experience with water for that purpose (Cooper and Mason 1997). Other investigations (Hansen 1999) have shown that farm mink experienced with water for swimming to some extent make use of such a facility but with great individual variation. Some individuals do not use it at all whereas others swim for up to 0.5 hour a day. Other investigations on the effects of access to water have shown, that some measurements of welfare (frequency of stereotypies and reproduc-

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tion) are not affected by such access (Skovgaard et al. 1997a, 1997b). Based on the above, it is premature to conclude whether swimming is a behavioural need for mink or not and whether its welfare is affected by access to water. However, some indications of a positive response to water for swimming are suggested.

The present investigations form part of a larger project which aims to evaluate the behavioural and welfare consequences of long term absence from water for swimming. Previous publications include Skovgaard et al. (1997a, 1997b), Hansen and Jeppesen (2000a, 2000b) and more are in preparation. In the present experiment we examine if open water in some instances could also be negative to farm mink. We do so by providing different access routes to the feed using two groups of mink. For mink with previous experience with water for swimming, access was either through a water filled basin for swimming or a tunnel above the basin. For the other group without earlier experience with water for swimming, the route was either through a dry cage or a tunnel above it. Our hypothesis is that water would act as a barrier in that situation thereby delaying access to feed and inducing signs of frustration when feed access is possible only through water.

Material and methods

The animals and experimental conditions

Thirty female and eight male farm mink (*Mustela vison*) were placed in two different types of housing, each consisting of three connected standard mink cages (cage size length 900 mm x width 300 mm x height 450 mm, 0.27 m^2 and 0.12 m^3). In half of the units the middle cage contained a basin fitting the size of the cage bottom. This was filled with water 15 cm deep and with a few exceptions these were cleaned and refilled once a week. In the other half of the units the cage was empty. In both types the left cage included a nest box and the right cage was used for feeding. The connection between the left and the right cage was through either the middle cage (dry or basin) or a tunnel above the basin. If an animal wanted to go through the middle cage with the water basin, it had to dive into the water. The size of the basins had previously proved sufficient for the animals as both sexes were observed using them for swimming. Animals were introduced into the set-up for the first time in March 1994. These original mink were randomly allocated to the units. During the summer 1995 all mink were replaced with members of that year's litters. The new animals were all allocated to the same type of units in which they were born and raised. The animals were subjected to normal Danish farming procedure with feeding at noon. In 1996, after weaning, four females (two in the "dry" and two in the "water" group) were each replaced with one of their daughters. In the summer of 1997 the thirty-eight mink had been in their type of unit since birth (except for the four females, all were two years of age). In each of the two groups, "water" and "dry", the proportions of males to females were the same and had been constant since the beginning. They were all considered in good health.

Procedure

Observations were carried out from July 1st to July 23rd 1997 after weaning. Twenty-four hours before observations, the animals were confined to the left cage with the nest box by blocking the entrances to the tunnel and the middle cage. Thus, they were denied access to the feed and the feeding place. At the onset of the observation period one gate was removed thereby giving access to the feeding site through either the middle cage or the tunnel. Each day eight animals were observed continuously for two and a half hours starting at either 0900 or 1400. Over 20 days of observations, every animal had two periods (of two and a half hour each) with access through the middle cage and two periods

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through the tunnel. Morning and noon observations were evenly distributed between the water and the dry group. The experiment then became a 2x2 experiment with two groups, dry (D) and water (W) and two access routes, tunnel (T) and middle cage (M), the latter being dry for the D group and containing the water filled basin for the W group.

Both the position and the behaviour of the animals were recorded. The four alternatives of the position were: nest box, left cage, middle cage or tunnel and right cage. The definitions of the behaviour were largely based on Bildsøe et al. (1990):

Eating	
Scratching:	Fast repetitive movement of front paws on a gate.
Stereotypy:	Any movement fitting the definitions of Stereotypy given by Ödberg (1978).
Inactive:	Lying still either in the cage or in the nest box.
Other Activity:	In cage or nest box, all other activities not otherwise recorded.

For both position and behavioural parameters duration, frequency and latency since start of observations for first entry (two feet in area) or performance were recorded using Psion-Work*about* ™ and calculated by using the SAS© ver. 6.10 package. If a certain behaviour was not performed or a place not entered by an animal a latency of 9000 seconds (=2½ hour) was used. From data averages were calculated as per animal per period (of 9000 seconds). When data permitted it, t-tests were used. If not, distribution free tests were applied.

Results

All results are presented in Table 1. Please note that for the latencies median values and not mean values are displayed. This is due to the fact that a few members of the "dry" group showed such a high latency that the mean figures are not illustrative.

Between the groups with and without water a number of differences occurred, especially if the animals were denied access to the tunnel (WM vs. DM). In that situation, the animals from the water group spent more time in the right cage and less time in the water filled basin in the middle cage than the dry group in the right cage or the dry middle cage. They were present less often in both the middle cage and the right cage. They also took longer to reach both cages and to eat. They were less Inactive, displayed more Other Activities and showed a tendency to more Stereotypy ($P<0.06$). They also scratched much more on the gate to the tunnel than did the dry group when the dry group's only access was through the middle cage (WM vs. DM).

When the only access was through the tunnel, the water group (WT) was once again less Inactive and showed more Other Activity than the dry group (DT). No other differences between groups could be found with this access route.

Within group differences between access routes occurred in both the "water" and the "dry" group but mostly in the former. Within the "water" group less time was spent in the right cage and more in the left cage when access was through the tunnel (WT) than when it was through the basin in the middle cage (WM). However, they visited more frequently the tunnel than the basin in the middle cage and were also more often in the right cage. With regard to behaviour, when access was through the tunnel (WT) they were also more Inactive and showed less Other Activity than if access was through the basin (WM).As the median latencies of the water/tunnel (WT) subgroup are nearly equal to the dry/middle cage (DM) subgroup, it appears strange, that whereas there is a significant difference between water/basin (WM) and the dry/middle cage (DM) subgroups there is none between the water/basin (WM) and the water/tunnel (WT) subgroups. An inspection of the paired data within groups reveals, that whereas the results of the basin/middle cage-latency minus the tunnel-latency in the dry group are distributed

Table 1. Observations over two groups (Water (W) and Dry (D)) and two access routes (Tunnel (T) and Middle Cage (M)). Middle refers to either a water filled basin for the W group or a dry middle cage for the D group. Figures are averages/animal/period (s.d.). Each period lasted 9000 seconds. For latencies, figures are medians (25% Q – 75% Q). Probabilities are between subgroups based on combinations of groups and access routes. Unless otherwise stated, tests are Mann-Whitney U-test for between groups and Wilcoxon Signed Rank test for between access routes. The (t) after a parameter designates t-tests for this parameter (paired for between access routes and not paired for between groups).

Groups	Water		Dry		Probabilities Groups		Between Access	
Access Route	T	M	T	M				
	(19)	(19)	(19)	(19)				
Subgroup a					WT	WM	WT	DT
Subgroup b					DT	DM	WM	DM
Mean Relative Time in (in %)								
Right Cage	27.0	39.9	18.0	17.7	–	*	*	–
	(28.2)	(34.7)	(26.0)	(23.8)				
Tunnel/Middle	4.6	1.1	8.2	20.6	–	***	**	**
	(6.4)	(1.3)	(16.2)	(31.4)				
Left Cage	33.0	15.3	27.0	21.6	–	–	*	–
	(29.4)	(16.6)	(31.2)	(26.9)				
Nest Box (t)	35.5	43.6	46.8	40.1	–	–	–	–
	(28.9)	(30.6)	(34.7)	(33.7)				
Mean Frequency in								
Right Cage	16.0	5.7	14.2	16.0	–	**	**	–
	(11.6)	(6.2)	(11.2)	(9.8)				
Tunnel/Middle	32.3	10.1	28.3	27.5	–	***	***	–
	(23.4)	(11.1)	(22.1)	(17.7)				
Median Latency (in seconds) to/into								
Tunnel/Middle	17	134	16	15	–	**	–	–
	(9–266)	(68–280)	(8–61)	(7–58)				
Right Cage	19	141	25	22	–	**	–	–
	(10–270)	(105–296)	(12–63)	(14–128)				
Eating	150	478	184	157	–	**	–	–
	(87–571)	(297–619)	(104–293)	(53–386)				
Mean Total Time (in seconds) Spent on								
Inactivity (t)	6967	5591	7842	7386	***	***	***	*
	(841)	(1063)	(629)	(684)				
Other Activity	1477	2627	690	1055	***	***	*	*
	(805)	(1017)	(411)	(620)				
Eating (t)	490	564	438	529	–	–	–	–
	(259)	(179)	(298)	(228)				
Stereotyped	16	186	12	27	–	–	–	–
	(30)	(543)	(42)	(87)				
Scratching								
To Tunnel	–	32	–	3	.	*	–	*
		(51)		(10)				
To Middle	50	–	18	–	–	.	As above	
	(66)		(22)					

fairly randomly (Middle cage: 6 positive, 4 equal and 6 negative; Right cage: 9 positive, 0 equal and 7 negative; Eating: 5 positive, 1 equal and 10 negative), this is not so in the water group (Basin: 14:0:4; Right cage: 13:0:4; Eating: 13:0:4). This indicates that in the water group

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the mink tend to have higher latencies when entering through the water than when entering through the tunnel.

Within the dry group animals spent more time in the middle cage than in the tunnel. They were more Inactive and displayed fewer Other Activities when access was through the tunnel (DT) than when access was through the dry middle cage (DM). In addition, they Scratched more into the middle cage on the barrier to the tunnel.

Discussion

Though the mink is well equipped to swim, it is not as fully adapted as truly aquatic animals like the otters or the seals (Williams 1999). In addition, the normal behaviour of a mink when entering water is to investigate the water first, usually by head-dipping (Dunstone 1993). Swimming is a possible type of locomotion for a mink but assumingly not a preferred one. Since a terrestrial mammal moves slower in water than on land it is not surprising that there is a difference in latency in reaching the right cage through the basin/middle cage between the "water" (WM) group and the "dry" (DM)group. The higher latencies in entering the right cage through the water filled basin (WM) instead of the dry middle cage (DM), observed in this investigation, thus are logical. However, the large difference in latencies warrants the opinion that in addition to the differences in pattern of movement also other factors are affecting the latency. Cooper and Appleby (1995) found in hens that reducing the opening into a nest pen led to an increase in the latency to enter. Therefore, we find it reasonable to conclude that the difference in latencies between the dry cage (DM) and the water filled basin (WM) supports the hypothesis of open water acting as a barrier. We expected a significant difference between access routes within the water group. Though the observed differences proved not significant, more animals took a longer time to enter the right cage through the water filled basin (WM) than through the tunnel (WT). Thus the result found does not contradict the hypothesis.

If the water makes the mink hesitate in shifting its position between the left and the right cage, we would expect it to enter fewer times and to stay longer in the right cage when there is water between the two cages. Cooper and Appleby (1995) found that the hens decreased the frequency and increased the duration of their stays when the opening width was reduced. The total amount of time the hens spent in the nest pen was not affected. In our study, when comparing total times and frequencies of both the same animals using the two different access routes (WM vs. WT) and of the water and the dry group (WM vs. DM), the presence of water on the route resulted in lower frequency and longer time spent. No difference in these parameters between the water and the dry group was found when the access was through the tunnel (WT vs. DT). Thus the observed difference between groups of basin/middle cage access (WM vs. DM) cannot be due to an intrinsic difference in animal groups.

The amount of scratching is an additional indication of the presence of water acting as a barrier, although passable. If the tunnel was closed, the mink with water to pass (WM) scratched much more onto the tunnel gate than the mink with an empty cage to pass (DM). That the dry group scratched more into the middle cage than into the tunnel may be because a barred middle cage left them with much greater loss of running space than a barred tunnel. It may be argued that since this difference in scratching in the dry group did not occur in the water group it may indicate that compared to the tunnel, the empty middle cage is more important to an animal used to this than a water filled basin is to an animal accustomed to that. However, if so we would have expected a difference in scratching towards the middle cage/basin between the two groups (WM vs. DM). There is a tendency toward this but it is not significant (P=0.140). Unfortunately the distribution of the data did not allow a two-factor ANOVA to be performed.

The differences in behaviour showed the water group to be less Inactive than the dry group (WM vs. DM and WT vs. DT) and the basin/middle cage access to yield more activity (less Inactive) than the tunnel access (WM vs. WT and DM vs. DT). That water/basin (WM) should result in more activity than dry/middle cage (DM) is not that surprising. If an animal is reluctant to enter the water, a longer time may elapse before it enters the feeding site to satiate its hunger. Hence, it will continue moving for a longer duration. It may also be that the water group has, in general, a higher level of activity than the dry group. This has been noted in a previous study when the animals were observed without interference (Skovgaard et al. 1997a). Also, if the water acts as a barrier between the animal and the feed, frustration is expected to occur. This may lead to an increase in both the level of activity and the level of stereotypies. Being hungry and not able to forage is a lack of control over the environment, which leads to frustration and a state of arousal. This may be channelled into an increase in activity and level of stereotyped behaviour. Appleby and Lawrence (1987) argue that hunger plus the inability to forage leads to a state of stress in pigs and Duncan and Wood-Gush (1972) concluded that, in domestic fowls, frustration caused by hunger and unreachable feed leads to stereotyped behaviour. Although none of the differences in level of stereotypy were significant, the P-value of 0.054 between the two access routes within the water group (WT vs. WM) indicates a greater tendency for stereotypy when the route was through the water. This is also to be expected if the animal is delayed in approaching the feed because it would prefer an easier, normally accessible route to the feeding site.

Conclusion

In conclusion it can be said that, even though in some situations mink use water for swimming and, as mentioned in the introduction, will work to gain access to this resource, the results of this investigation indicate that the presence of water may also act as a barrier causing delayed feeding and inducing frustration. Confirmation of our hypothesis thus supports the assumption that swimming is a pattern of movement that the mink can choose when hunting, but that this movement may be used with some hesitation. The results therefore do not support any claim of swimming being a behavioural need or that the lack of water for swimming would impair the welfare of ranch mink.

References

Appleby, M.C. & Lawrence, A.B. 1987. Food restriction as a cause of stereotypic behaviour in tethered gilts. *Animal Production* 45: 103–110.

Bildsøe, M., Heller, K.E. & Jeppesen, L.L. 1990. Stereotypies in adult ranch mink. *Scientifur* 14: 169–177.

Cooper, J.J. & Appleby, M.C. 1995. Nesting-behavior of hens – effects of experience on motivation. *Applied Animal Behaviour Science* 42: 283–295.

– & Mason, G.J. 1997. The behavioural priorities of mink (*Mustela vison*) in a closed economy. *Proceedings of the British Society of Animal Science*: 17.

Duncan, I.J.H. & Wood-Gush, D.G.M. 1972. Thwarting of feeding behaviour in the domestic fowl. *Animal Behaviour* 20: 444–451.

Dunstone, N. 1993. *The Mink*. T & A D Poyser Ltd.: London.

Hansen, C.P.B. 1999. Normal Behaviour of Ranch Mink With Access to Swimming Water. *Proceedings of Nordic ISAE Winter Meeting at Flämslätt 1999*.

– & Jeppesen, L.L. 2000a. Short term behavioural consequences of denied access to environmental facilities in mink. *Agricultural and Food Science in Finland* 9: 000–000.

– & Jeppesen, L.L. 2000b. The Swimming Activity of Farm Mink (*Mustela vison*) and its Relation to Stereotypies. *Acta Agriculturae Scandinavica Section A* (in press).

Ödberg, F.O. 1978. Animal Behaviours: Stereotypies. *1st World Congress in Ethology and Applied Zootech-*

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nology. p. 475–480.
Skovgaard, K., Jeppesen, L.L. & Hansen, C.P.B. 1997a. The effect of swimming water and cage size on the behaviour of ranch mink (*Mustela vison*). *Scientifur* 21: 253–259.
– , Jeppesen, L.L. & Hansen, C.P.B. 1997b. Would you like a swim, Madam Mink? *Scientifur* 21: 247–251.
Williams, T.M. 1999. The evolution of cost efficient swimming in marine mammals: limits to energetic optimization. *Philosophical Transactions of the Royal Society of London-Series B Biological Sciences* 354: 193–201.

SELOSTUS

Tarhatun minkin syömään pääsyn estäminen vesialtaalla

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Tutkimuksessa selvitettiin, onko vapaa vesi joissakin olosuhteissa este tarhatulle minkille. Tutkimus tehtiin 38 minkillä, joilla kullakin oli käytössään kolme häkkiä. Puolella eläimistä keskihäkissä oli vedellä täytetty allas ja toisella puolella eläimistä keskihäkki oli tyhjä. Laitimmaisesta pesäkoppihäkistä pääsi toisella laidalla sijaitsevaan ruokintahäkkiin joko häkkien seinissä olevien aukkojen tai keskihäkin läpäisevän yhdystunnelin kautta. Eläimet suljettiin pesäkoppihäkkiin ilman ruokaa 24 tunniksi ennen havaintojen aloittamista. Havainnot tehtiin yli kahden ja puolen tunnin aikana sen jälkeen kun toinen kulkureiteistä ruokintapaikalle oli avattu.

Kun eläimet pääsivät ruokintapaikalle vesialtaan kautta, ne pääsivät perille hitaammin, mutta ne etenivät määrätietoisemmin kuin eläimet, jotka pääsivät ruokintapaikalle tunnelin tai kuivan keskihäkin kautta. Lisäksi eläimet pyrkivät suljettuun yhdystunneliin useammin silloin, kun vapaa reitti kulki vesialtaan kautta kuin silloin, kun reitti kulki kuivan keskihäkin kautta.

Tulosten perusteella voidaan sanoa, että joissakin olosuhteissa tarhaminkki voi kokea vesialtaan esteeksi pyrkiessä syömään. Tämä osoittaa, että uimavesi ei välttämättä kehitä tarhaminkin elinympäristöä ja että uintimahdollisuuden puute ei heikennä sen hyvinvointia.