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Protective behaviour of Konik horses in response to insect harassment

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Abstract

The natural protective behaviour displayed by Konik Polski horses against flies was investigated. The factors considered were age (adults versus foals), management system (forest reserve versus pasture), weather conditions and type of horse activity. Twenty-five Konik Polski adults and 18 foals were observed between 0800 and 2000h during two summer seasons (2000 and 2001). Individual protective behaviours (IB) eg tail swishing, head shaking, leg lifting, skin twitching and social protective behaviour (grouping for mutual protection) against insects were studied. Adult and forest-kept horses performed more IB than foals and pastured horses, respectively. Wet and windy weather conditions significantly reduced insect harassment and the frequency of responses to insects. Therefore, if it is not possible to apply chemical repellents against insects, then allowing horses to aggregate into groups or providing them with refuge, especially on hot and windless days, may have significant welfare benefits.

Keywords: *animal welfare, forest reserve, horse, insect harassment, pasture, protective behaviour*

Introduction

Fly infestation can have detrimental effects on the welfare, daily activity, health and productivity of grazing animals by causing chronic irritation to sensitive body parts such as eyes, nostrils and anal openings and causing pain through biting and subsequent blood losses; causing seasonal dermatitis (sweet itch) related to hypersensivity to biting midges (*Culicoides* spp) (Greiner 1995) and possible transmission of bacterial and viral diseases by insect vectors.

The efficacy of fly control using ear tags impregnated with chemical repellents has been well established in cattle (eg Derouen *et al* 1995). However, different species of flies are not controlled to the same extent by ear tags (Block & Levis 1986) and insecticidal ear-tags may be ineffective in younger animals (Wollard & Bullock 1987).

Primitive Polish Konik horses are increasingly used for landscape cultivation as living 'mowing machines' as they are well-adapted to a free-roaming lifestyle. Under such conditions human intervention is minimal, thus rendering all protective measures against insects that require horses to be caught and/or restrained for dosing with chemical repellents or covering with protective nets totally impractical. Maintenance methods such as providing horses with shelter, or biological methods, like promoting native predators for insects, are often questionable due to possible interference with the natural habitat. Thus, the spontaneous protective behaviour of Konik horses plays an important role during periods of insect harassment. The aim of this study was to investigate the protective behaviour displayed by native Konik Polski horses maintained as a genetic resource. The effects of age (adults versus foals), habitat (forest reserve versus conventional pasture) and weather conditions were estimated and implications for welfare are discussed.

Materials and methods

Twenty-five Konik Polski adults and eighteen foals were observed between 0800 and 2000h during two consecutive summer seasons from the end of May to the middle of September in 2000 and 2001. The horses were maintained either as a free-roaming herd in a forest reserve the whole year round, with no shelter (11 adult mares, 1 stallion and 9 foals) or under conventional stable conditions, ie on a pasture during the day and in the stable during the night (a group of 13 adult mares and 9 foals). Both the reserve and stable horses could be observed from a distance of 3-5 m. The forest reserve of 1618 hectares (approximately 92% woodland and 8% open grassland) and adjacent fenced pastures for stable horses (30 hectares divided into 15 paddocks), were situated on the same 9 × 3 km peninsula, surrounded by three lakes in the Masurian region of north-east Poland.

Individual protective behaviours (IB) to dislodge insects were recorded within 2-minute observational bouts of focal horses that were grazing, standing motionless or standing in a head-to-tail position. During the first minute of the bout, tail swishing and head shaking were recorded and leg lifting and skin twitching during the second; both via manual

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Table 1 Mean (± SD) frequencies of individual protective behaviours (IB) as related to different factors.

	Frequency per minute			
	Tail swishing	**Skin twitching**	**Head shaking**	**Leg lifting**
Age group				
Adult horses	29.2 ± 18.7	11.4 ± 9.6 $^{A+}$	2.8 ± 5.4 $^{A+}$	0.8 ± 2.7^{A}
Foals	29.1 ± 21.3	5.6 ± 5.3^{B+}	1.1 ± 1.6^{B+}	0.7 ± 1.2^{B}
Maintenance				
Forest reserve	33.3 ± 21.0^{A+}	10.5 ± 10.0^{a}	1.7 ± 3.0^{A+}	1.1 ± 3.1^{A+}
Pasture, stable group	24.9 ± 16.8^{B+}	8.8 ± 7.5^{b}	2.9 ± 5.8^{B+}	0.5 ± 0.9^{B+}
Weather conditions				
Hot weather, sunshine	29.9 ± 21.0^{A+}	9.7 ± 8.8^{A}	2.5 ± 4.9$^{A+\,A}$	0.8 ± 1.4^{A+}
Cloudy	26.1 ± 22.0^{B+}	9.7 ± 9.7^{B+}	1.3 ± 1.8^{B+}	1.1 ± 5.3^{B+}
Rainy, cool weather	6.3 ± 17.8^{C+}	2.4 ± 5.2$^{C\,C+}$	0.2 ± 0.5^{C}	0.7 ± 0.2
Wind				
Strong wind	15.3 ± 12.5^{A+}	5.6 ± 5.0$^{A\,A+}$	0.5 ± 0.7	0.2 ± 0.5
Weak wind	25.6 ± 16.5^{B+}	8.0 ± 7.2^{B}	2.2 ± 4.1	0.5 ± 0.8
Windless	30.7 ± 20.2^{C+}	10.3 ± 9.4$^{A\,C+}$	2.4 ± 4.8	0.9 ± 2.6
Biome within the reserve				
Forest area	36.0 ± 21.1^{A+}	11.8 ± 10.4^{A+}	2.0 ± 3.6	1.6 ± 4.0^{A+}
Open grassland	26.7 ± 18.2^{B+}	8.9 ± 8.2^{B+}	2.4 ± 5.0	0.5 ± 1.0^{B+}
Behaviour				
Standing motionless	29.7 ± 20.4 $^{A+\,A}$	9.7 ± 9.0$^{A+\,A}$	2.4 ± 5.2	0.8 ± 1.4$^{a\,A}$
Head-to-tail position	33.8 ± 17.3 $^{B+}$	12.7 ± 9.5^{B+}	2.0 ± 3.8	1.1 ± 2.0$^{b\,B+}$
Grazing	26.3 ± 19.5 $^{A+\,C}$	8.4 ± 8.3$^{A+\,C}$	1.7 ± 3.2	0.7 ± 3.2$^{C+\,C}$

Groups with different superscripts differ significantly:
$^{a, b, c}$ $P < 0.05$, $^{A, B, C}$ $P < 0.01$, $^{A+, B+, C+}$ $P < 0.001$.

counters. Additionally, the number of steps per minute when the horses moved around was recorded. Other social protective behaviours ie aggregation into subgroups, circling or bunching, were noted in terms of occurrence but not analysed statistically. The observational bouts were repeated 30–40 times per horse in order to balance the data obtained at different hours of the day, during different weather conditions, and on different biomes.

Statistical analysis

A total of 1433 two-minute observational bouts were analysed statistically. The following factors were analysed: age of horses (adults versus foals), keeping system (forest reserve versus conventional pasture), weather conditions (wind, sun activity, air temperature), activity of the horses (grazing, standing, standing in head-to-tail position), and biome within the reserve (forest versus open grassland).

Since the observed traits did not demonstrate a normal distribution, the non-parametric statistical tests (Mann-Whitney, Wilcoxon, Friedman and Kruskal-Wallis tests) were applied.

Results

Mean frequencies (± SD) of protective behaviours relative to different factors are shown in Table 1. Social responses to insect harassment involved horses grouping at particular sites both in the reserve (bare places among spruce trees) and on the pasture (bare-trampled sites). When aggregating, horses often bunched together with their heads directed towards the centre of the group or particular pairs of horses stood parallel in a head-to-tail position to use their tails to dislodge flies from each others' eyes and nostrils. The onset and termination of bunching episodes were determined by the movement of the horses. Stable horses on pasture moved more (9.4 steps per minute) than reserve horses (2.7 steps per minute); ($P < 0.01$) in response to insect harassment and occasionally sub-groups of 3 horses circled with their heads in close contact with the tail of the preceding group-mate.

Discussion

In comparison with cattle, horses displayed more frequent tail swishing and head shaking to dislodge harassing face flies (*Musca autumnalis*) (Dougherty *et al* 1993a), whereas stable flies (*Stomoxys calcitrans L*) evoked much more frequent dislodging movements in cattle (Dougherty *et al* 1993b). However, we did not estimate fly species, nor the approximate number of flies on horses' bodies. In our study, insect harassment was assessed only on the basis of the frequency of observed protective behaviours. Duncan and Vigne (1979) and Rutberg (1987) found that horses in large groups suffer from fewer flies per individual than smaller groups, however, according to Rutberg (1987), there is no evidence to suggest that horses merge into larger groups purely in response to fly harassment. We found no direct correlation between group size and protective behaviours, as there were no changes in the composition of the observed

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horse groups and, in the case of the reserve horses, the alpha-stallion maintains herd cohesion. However, we had the impression that horses stay closer to each other (bunching, head-to-tail position) during hot and windless days, when the insect harassment was apparently heavier. Submerging the body in water to escape heavy concentrations of flies, as reported by authors cited by Rutberg (1987), was not observed during the present study, although entering the lakes surrounding the forest reserve without complete submergence, has been observed historically in reserve horses. Lying down as a means of reducing fly harassment, eg as in red deer (Epsmark & Langvatn 1979), was not observed.

According to Keiper and Berger (1982) tail swishing in feral horses occurred least frequently on the beach and in the island bay sites as well as on higher slopes and ridges in the desert environments. These sites may be regarded as refuges from flies. The observed effect of weather conditions on the activity of harassing insects was similar to that observed by Strickman *et al* (1995), ie more frequent protective behaviours were observed during hot, sunny and windless days. Responses to attacking insects may be different in the same animal species depending on the animals' reproductive status. Kojola (1991) reported that lactating reindeer form large herds which are effective against insect harassment, whilst barren females and males avoid flies by moving rapidly and searching for patches with fewer flies. The fact that skin twitching occurred less frequently in foals compared to adult horses may be a result of the characteristic fuzzy baby hair of the foal coat. Head shaking seems to be more effective for dislodging insects when a horse has a long mane. Since foals have much shorter manes than adults they may apply head shaking less frequently. The protective behaviours against insects in the reserve horses were more frequent than in stable horses kept on pasture, but these differences disappear if the reserve horses stay in open grassland. In open grassland areas within the forest reserve, the horses generally demonstrated less frequent protective behaviours than in the forest. It is, therefore, somewhat puzzling why the horses remained, for long periods, at particular sites in the forest during hot, sunny and windless days. It is unclear whether horses are more motivated to stay in shadowed, cooler areas to evade insects or excessive heat. As it was beyond the scope of this study to observe subjects at the same time and during the same weather conditions at the other sites, it was impossible to determine whether their stay at the preferred sites was due to and effective for protection against flies. Our observations showed that the reserve horses stayed at these preferred sites for up to 12 hours without grazing and visited watering places (lakes) only once every 24 hours on extremely hot days. This may indicate that the motivation for avoiding excessive insect harassment by staying at sites which are probably more insect protected or for searching sun-protection, was greater than the motivation for normal grazing and frequent watering.

It may be concluded that, if applying chemical repellents against insects is not possible, allowing horses to aggregate into small, even-numbered groups for mutual protection or providing them refuge especially during hot and windless days could be beneficial to their welfare.

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