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Sex, but not relatedness nor age, affect the social network of horses in a semi-natural reserve

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For time now, social network analysis provides tools to describe concisely the social structure of animals. Nevertheless, the factors that shape the social network and determine the frequency of different types of affiliations are often unclear. For example, the effects of relatedness on social networks have been only studied on relatively few species. Both among social or sub-social species the effects ranged from no effect to a substantial effect. Here we test the hypothesis that relatedness has an effect on the social network of horses (*Equus caballus*) that live freely in semi-natural conditions, and specifically, that individuals with high values of relatedness to their neighbors in the network will have fewer links (Wolf et al, 2011). This hypothesis is based on the notion that related individuals have common interests and are likely to assist each other, and may need less links to other, unrelated individuals. In addition, individuals of similar age and sex are likely to have common needs, and thus are more likely to be associated. We thus tested a second hypothesis: homophily to individuals with similar age and sex will have a role in determining the associations within the social network. The field study was conducted on 27 horses in the Blauwe Kamer reserve in the Netherlands (1.1 sq km). We videotaped horses and their groups and used the information from 22 horses, after excluding the five foals from the analysis. Relatedness was calculated from the pedigree, which was based on parentage, determined by DNA analysis. The social network was constructed based on spatial proximity data. We assessed the influence of relatedness, age-homophily and sex-homophily on the network structure with Multiple Regression Quadratic Assignment Procedure (MRQAP) (Krackhardt 1988), with the R package sna. The results show that there was no significant effect of relatedness on the network, nor an effect of age-homophily. Nevertheless, we found a significant effect of sex-homophily, the tendency of individuals to associate with individuals of the same sex. We argue that the lack of a relatedness effect is not

likely to have been caused due to the inability to detect who is kin. The structured social system in horses includes strong associations between often unrelated individuals, alongside with young individuals leaving their natal harem as part of the inherent inbreeding avoidance (Linklater & Cameron 2009; Boyd et al. in press). The significant effect of sex-homophily could stem from the protection females get from associations with other females, e.g., in the reduction of harassment from males. Previous studies on feral horses showed that mares that were better connected with other females in their harem benefited from higher survival rates to their foals (Cameron et al. 2009). The associations among bachelor males could also contribute to the strength of the sex-homophily effect.

In order to generalize from our results, one needs to examine additional populations of horses, because the conditions in the Blauwe Kamer reserve may not be representative, mainly due to the limited opportunity for dispersal in a restricted area.

Keywords:

Long-term affiliation; spatial proximity, kin detection

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