Experiences with a bachelor group of red pandas – match or no match?

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In 2016 GaiaZOO added red pandas (*Ailurus fulgens fulgens*) to the collection. Together with the Red Panda EEP coordinator in Rotterdam Zoo it was decided to house a bachelor group consisting of four males; the largest bachelor group so far. Given the solitary lifestyle of the species, the formation was a trial to evaluate the feasibility of single sex groups as a solution to surplus problems, now and in the future. We received our first pair of red pandas on the 16th of April 2016; two brothers "Alan" and "Steve" from Wingham Wildlife Park in England. They were released into the enclosure after two days and adjusted well. At the same time we also released two Chinese muntjacks (*Muntiacus reevesi*) "Fifi" and "Jack" (8th of July a third muntjack "Lily" was added to the group) and 8 common shelducks (*Tadorna tadorna*), without any issues. On the 2nd of May the third red panda "Mojo" arrived from Nürnberg zoo in Germany. He was introduced to the others the next day, which all went very well. Two tundra swans (*Cygnus columbianus bewickii*) "Trump" and "Melania" were released in the enclosure on 5th of September and on the 21st September our fourth and last red panda "Peter" arrived from Zoologique la Boissière in France, he was also introduced to the rest in the outside enclosure after two days.

The red panda enclosure consist of a pond, lots of tall trees, grass, tree trunks and an inside enclosure. The animals have access to the inside enclosure all day. The red pandas get fed unlimited leaf eater pellets and fresh bamboo every day. We do however remove the leaf eater pellets from 10.00-14.00 in the months where we train them (explained further down). During the summer months, when plenty of browse is available in the enclosure, they show no interest in the bamboo at all and so we do not feed bamboo during this time.


It appeared that Peter was not comfortable within this situation. He was found to often pace in front of windows both in the inside and outside enclosure. Also negative interactions, such as chase, between him and the other red pandas were seen. Given that we only know so little about red panda bachelor groups in zoos, further investigation was required.

From February until June 2017, Lizzy de Feijter from the University of Applied Sciences Van Hall Larenstein, Leeuwarden, the Netherlands, conducted behavioural observations aimed at

investigating the behaviour, particularly social interactions, of the four males. Every day, except weekends, all four males were observed for two hours per day, in two sessions each lasting one hour. The observations times were randomly selected and took place between 8.00 and 15.00. Every two minutes the general behaviours, including stereotypic, of the animals was noted as well as the distance between the focal animal and the closest neighbour. Furthermore the frequency of specific social interactions between the males was noted per hour. The social interactions could be both positive (e.g. play) and negative (e.g. physical aggression), and it was noted who initiated the behavior and who received it. Also the frequency of marking behaviours were noted.

Overall, there were more negative social interactions performed than positive social interactions among the four males. The two brothers, "Alan" and "Steve", performed the most positive interactions. "Peter" on the other hand had absolutely no positive interactions with the other males. "Mojo" was the one who initiated the most negative interactions (Figure 1), and "Peter" was often the one receiving the negative interactions. "Peter" was also the one showing the most stereotypical behaviour and he hardly showed any marking behaviors (Figure 2).
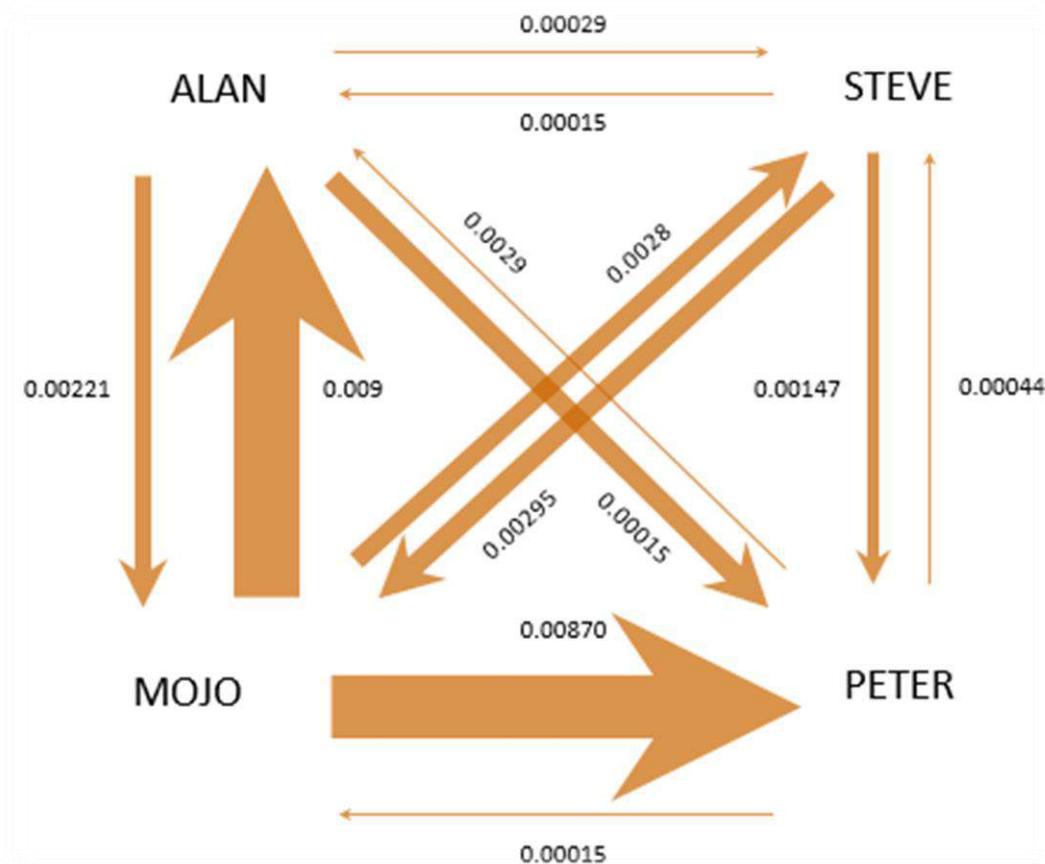
Figure 1: Sociogram displaying the average frequency per minute negative social interactions between each possible male combination, where direction of the arrow showcases initiator to receiver of the interaction and the thickness of the arrow corresponds to the average frequency per minute of the interaction.
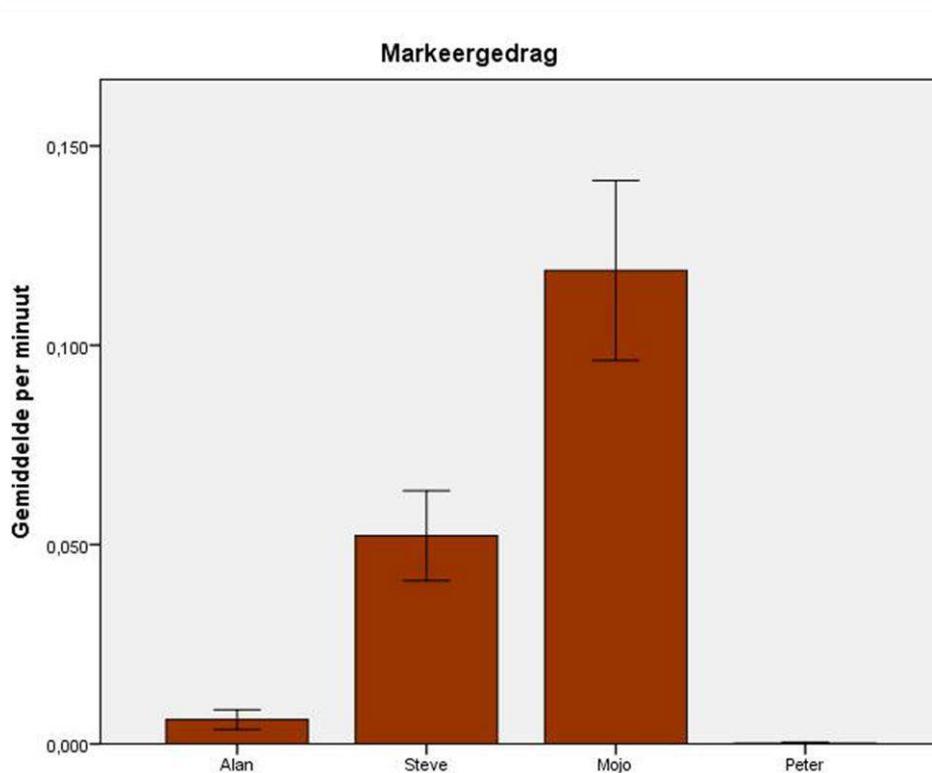
Figure 2: Average (+/- standard error) frequency per minute of marking behaviours per individual.

As keepers we have had several challenges of our own with this setup. The size of the enclosure and the tall trees makes it difficult to get a good idea of the health of our red pandas, since they are high up in the trees most of the time. So when we received a zookeeper trainee from Denmark, Christina Christensen, in June 2017, she established a training plan and started training the red pandas with the goal of getting them more comfortable with us, getting them inside and preferably also crate trained. Her plan was to give the red pandas a reward using a very long bamboo stick and slowly lowering the stick getting them on to the ground and inside. "Alan" and "Steve" responded very well to the training. They were also used to public encounters at Wingham Wildlife Park, which probably made it easier. It only took a few weeks before they came inside, and she was able to start crate training with them, which went very well. At the end of her traineeship both "Alan" and "Steve" were very comfortable with being in the crate. "Mojo" was more careful and it took more time before trust was made. Eventually he did come down from the trees and we were able to handfeed him. With "Peter" we never really succeeded in finding a reward that he liked. Christina left in December 2017 and we took over with the training. When spring started, it made the training very difficult and we had to stop around the beginning of April, because of the lack of interest from the red pandas in their rewards. The enclosure was full of cherries and fresh leaves, so they had no interest in us or the grapes. We also have other challenges, in regards to training the red pandas, such as our male swan "Trump". He is very aggressive towards us and has to be locked inside whenever we want to train the red pandas. He does not always want to come inside, which means that we sometimes have days where we can't train them. The muntjacks also presented a problem,

mostly when training "Mojo". They are very comfortable with us and we don't have the option of locking them away when training. When "Mojo" would finally come to the ground and take grapes from us, the muntjacks would sometimes come up to us for treats and that scared him so he would run back up the trees. We will start the training up again in the fall and hopefully find a reward that works for "Peter".

In January 2018 six students from the Maastricht University conducted a preliminary study into developing a method of easily assessing personality in zoo housed red pandas. It would be an easy and essential tool when deciding which individuals can be housed together. They had also conducted this study at Rotterdam Zoo. Personality was determined through keeper rating assessments, behavioural observations and novel object testing. The rater assessments included 24 personality traits which were scored for each male by the four panda keepers and both Lizzy and Christina, and were assessed on their reliability based on the agreement between the raters. This led to 14 reliably assessed personality traits which were reduced to three bipolar dimensions using a Principal Component Analysis, labelled: Introvert, Antagonistic and Neurotic. Each male received a score for each personality dimension. This was then correlated with the behavioural observations and novel object testing to evaluate whether the behaviour of the red panda and its reaction to certain confronting situations could be predictive of its personality. Numerous correlations were found, for example if the male scored high on the Introverted dimension, it was found to generally spend more time on inactivity and vigilant behaviours. Figures 3 and 4 display the score for each red panda per personality dimension including the interactions between the males. However only few correlations could be detected for the novel object testing, but this may have been due to methodological errors. When including the red pandas in Rotterdam Zoo, the Netherlands, reliability of the personality traits only increased, which suggests that larger sample size is required to give more conclusive statements regarding this promising social management tool. Results have contributed to the foundation for future studies on establishing an effective method to determine personality in red pandas.
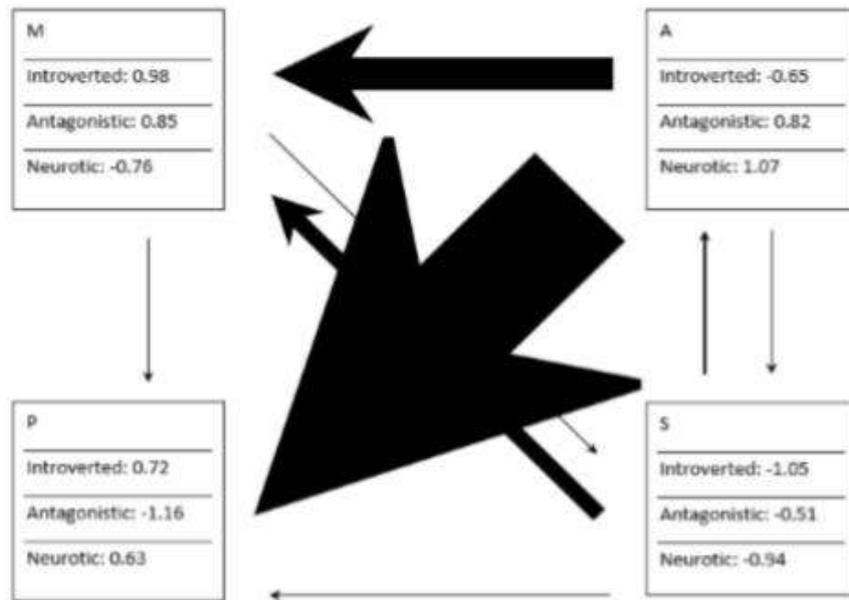
Figure 3: Sociogram displaying the antagonistic interactions between the four males where direction of the arrow indicates initiator and receiver of the interaction. The score per personality dimension per male is also displayed.
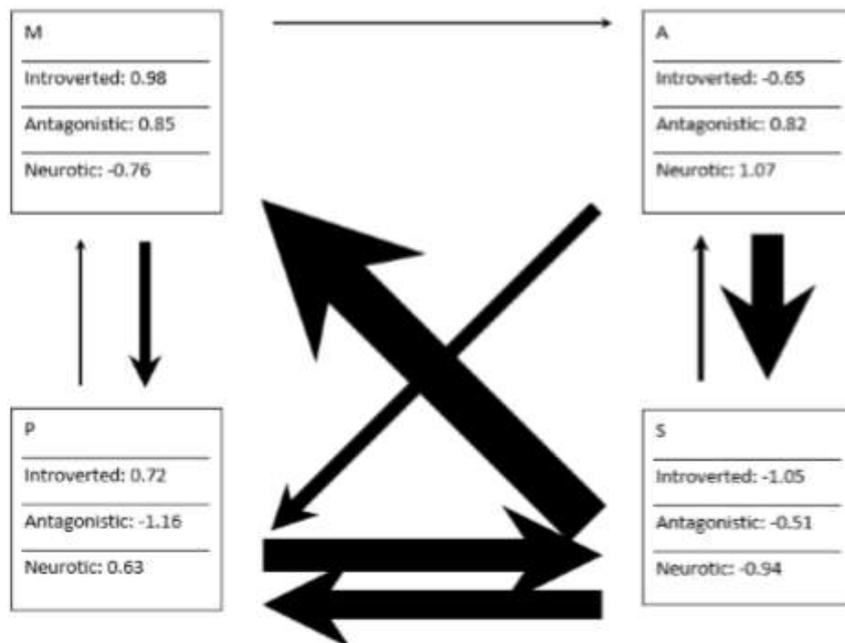
Figure 4: Sociogram displaying the displacement and avoidance interactions between the four males where direction of the arrow indicates initiator and receiver of the interaction. The score per personality dimension per male is also displayed.

In the beginning of 2018 we received the recommendation from the EEP coordinator to send "Mojo" to Pairi Daiza in Belgium for breeding purposes. "Mojo" left the group on the 10th of July and it does seem as if Peter is a bit more relaxed now, even though he still sometimes get chased around by "Alan". The future recommendations for our red pandas is that "Peter" will move to another zoo for breeding purposes. We will then probably receive one or two new pairs of brothers, having four or six red pandas in total. We hope to be able to conduct further research into bachelor group management.