**Dominance hierarchy in Damaraland mole-rat**

Aim: Social mole-rats have been suggested to possess linear dominance hierarchy in which males are generally dominant over females and breeding animals are dominant over non-breeding helpers. Because the sample size of this original study was of two colonies only and because individuals could not be aged, the predictor of dominance remain elusive.

Using 5 years of behavioural data collected on more than 30 captive breeding colonies, the proposed analyses aim to provide a more detailed analyses of dominance hierarchy in the Damaraland mole-rat. It will provide some insights on the existence of social queues for breeding inheritance and on the factors that shape them.

Because dominance hierarchies may be shaped by different factors across the sexes, each of the proposed analyses will first be carried out in each sex separately, then on both sex together. The age of originally wild-caught analyses is unknown yet could be estimated. The breeding status of originally wild-caught males that are still staying in their original colony is unknown while the breeding status of females is unambiguously known for every individual. As a possible extension of the proposed analyses, endocrine data could be incorporated into the models.

**Analyses 1: Predictors of dominance**

Determine what predicts, when submissive calls are emitted in a pair, whether an individual will be dominant or submissive.

1. Do individuals submit more to breeder. Within sex interaction can either occur between
2. Do individuals submit more to animals when interacting with animals that are just heavier. The weight difference could be plotted as an explanatory variable in the model but a quadratic effect should be included since the closer to 0 the weight difference is the more they could submit
3. Do individuals submit more when interacting with animals that are just older (basically that may just be one rank up the queue). The age difference could be plotted as an explanatory variable in the model but a quadratic effect should be included since the closer to 0 the weight difference is the more they could submit. This will confound the effect of litter number as animals that are born first in the colony have been suggested to follow distinct developmental trajectories that individuals born later
4. Do individuals submit more when interacting with same sex group members?
5. Do individuals submit more to less related individuals, situation that in our laboratory has arisen as a consequence of experimental immigration (cross foster experiment)

Prepare the DF:

Colony ID, FocalID, FocalWeight, FocalSex, FocalAge, FocalBreedingStatus, FocalLitterNB (to test for a possible effect of early life environment), PartnerID, PartnerWeight, PartnerSex, PartnerAge, PartnerBreedingStatus, PartnerLitterNB

Possible variable:

NatalColonyID, MotherID, FatherID to test whether animals that immigrated (as a result of experimental manipulation) are overall more dominant.

**Analyses 2: Distribution of submissive calls within the colony**

Multinomial analyses? What would it allow to answer that analyses 1 could not?

**Analyses 3: Predictors of dominance index**

Eloscore will be computed using the elorating package using the submissive calls recorded during both focal and scan observation and its predictors determined with Linear Mixed Models. How is that different from Analyses 1

Female and male analyses:

Eloscore ~ Breeding status + centred Weight (I think weight rank would be even better) + age + (1|colonyID) + (1|AnimalID)

Both Sex analyses:

Eloscore ~ Breeding status + centred Weight + Sex+ age + (1|colonyID) + (1|AnimalID)

Dataset 1: use colonies where all animal can be aged and all male breeding status can be safely assumed.

Dataset 2: use all colonies and estimate the age of the originally wild caught animals

For lab colonies: Litter NB, Sex, Age, Breeding Status, Weight

**Analyses 4: Does pass over indicate dominance?**

In social mole-rats, the passing over another individual has been suggested to indicate dominance yet the original evidence for the use of pass over as a proxy of dominance is very weak. In this analysis, we will investigate whether passing over is indeed a strong and reliable proxy of dominance.

1. Using a mixed modelling approach, repeat analyses 1 and or 2 but using the outcome of a pass as a response variable. Check whether the important explanatory predictors are the same as the ones in the model where eloscore based on submissive calls where used.
2. Test whether call eloscore and pass eloscore are positively correlated
3. Determine whether unexpected pattern of subordination within a pair are mirrored by pattern of passes over. If a non-breeding helper is dominant over a breeder will it pass over more often? If a small individual is more dominant than a larger one, will it pass over more often

**Methods:**

Coverage of submissive calls: One could have a look at the percentage of possible dyad for which there where submissive calls. How is it possible to establish the possible dyads? One could calculate the percentage of dyads

**Calculation of EloRating:**

Colonies in which less than XX scan sessions were excluded from the analyses. For statistical inferences, individuals which had been observed in less than 20 social interactions were excluded from the dataset

How steep are the hierarchy? What is the probability of the higher rank to win as a function of the difference in rank