



Genetics for studbook keepers

Basic, simple rules to avoid inbreeding or gene loss now and in the future



Why keeping a studbook

- We keep studbooks to ensure a genetically healthy subpopulation in captivity.
- We want to keep the captive population genetically strong enough to avoid inbreeding depressions in captivity and to keep the option of reintroduction open.



Goals to achieve

1. Avoid inbreeding
2. Avoid gene loss



Take care of (sub) species

- If the studbook species is known to have a large and or highly scattered range the existence of subspecies and or geographical forms is very likely.
- If possible it is advisable to conserve these (sub)species /geographical forms by keeping them in different groups within the studbook



Managing a studbook population

- To avoid inbreeding it is important to have an even distribution of bloodlines.
- So the first question to ask oneself on starting a studbook is; "How large a studbook do I want to (am I able to) manage"



Managing a studbook

- After the studbook size decision the number of bloodlines available must be evaluated.
- The simple division of the desired studbook size divided by the number of bloodlines gives the optimal offspring per bloodline.
- Try to reach this number in as little generations as possible



Hints on studbook size

- If possible the size of the studbook should be about 100 animals per generation.
- Since genes are lost by the generation it could be a good idea to increase generation length by preferably use the last born animals for the studbook (be careful of possible mutations caused by the age of the parents)



Choosing breeding pairs

- Basic rule is combine rare bloodlines with rare bloodlines and abundant bloodlines with other abundant ones.
- Try to keep breeding pairs together. (in species without sperm storage this is not really necessary, but it will make your life (and mine as genetic advisor) a lot easier)



Selection

- No selection of breeding animals should take place.
- As exception to this rule; **very** unwanted gene's in **well established bloodlines** might be selected out.



Group breeding

- Several species need to be kept in groups to successfully reproduce or need a social environment for their well being.
- Sometimes there is a surplus of females/ males in the population.
- Another reason for group breeding is that you don't need as many enclosures.



Group breeding 2

- If possible try to avoid group breeding with unrelated males/ females if the parenthood is not easily determined.
- If group breeding is essential then keep a second group of males and exchange the breeding male as often as possible (for long living species once a year will suffice)



Group breeding 3

- Group breeding with a group of strongly related females (for instance sisters) combined with a group of strongly related males (of course not related to the females) is acceptable and will, when carefully managed, not lead to unnecessary gene loss.



Group breeding 4

- When it is necessary to keep more bloodlines in a group special care should be taken to ensure that all animals in the group (and the possible male group) have an equal chance of reproducing.



What is a bloodline

- Each animal which is supposedly completely unrelated to all other animals in the studbook population represents one bloodline.



How do I count bloodlines

- Each wild caught, or otherwise completely unrelated animal fit for breeding now or in the future represents 1 bloodline. As long as this animal is or could become fit for breeding its offspring does not represent separate bloodlines and should not be counted.
- Offspring is supposed to represent half the genetic information of each parent.



Some examples

- For all the examples a breeding pair representing 2 bloodlines is supposed.
 - 1 If the breeding pair becomes 1 young this animal represents 1 bloodline
 - 2 With 2 offspring these represent 1,5 bloodlines
 - 3 3 offspring represent 1,75 bloodline etc.
- Of course the offspring can never represent more bloodlines than the parents.



Breeding a surplus

- Breeding a surplus means that animals should be excluded from the studbook. This is acceptable, but here also some simple rules apply;
 1. Describe all animals possibly with unique markers last known owner etc. and mark them in sparks as lost for studbook.
 2. Do not accept animals from outside the studbook unless they are from a **known** and **valuable** bloodline.
 3. Give the new owner all available information about the animal. If possible on the transfer sheet, and try to convince him to keep the information with the animal, and with possible offspring of the animal.
 4. Avoid losing genetically important animals by placing them outside the studbook.



Conclusions

- Studbook growth in the first generations
- Combine rare bloodlines with other rare ones and abundant with abundant
- Group breeding preferably with related animals and with regular chance of sire
- Conserve bloodlines
- Make animals that are lost to the studbook recognizable.