Writing Assignment #5

It has been observed that in small, endangered populations of animals, high inbreeding occurs due to the genetic diversity being dominated by only a few lineages; these inbred populations consist of animals extremely susceptible to health problems from mutations and outbreaks of diseases.[1] In addition to the intrinsic threats, these populations also are more vulnerable for extinction due to extrinsic threats such as fire, deforestation, and climate change.[2] In small populations, when the descendants produced from one specific family lineage do not survive, the genetic diversity of that population dramatically decreases.[1] The term reproductive skew is described by the situation in which some families produce no offspring at all, while others produce many and they live. Reproductive skew has been identified as a major problem for animal conservation programs, as it causes a decrease in survival of the population long-term.[1] The substantial reduction of populations results in limited mates, making it more common for reproduction among relatives to occur.[2] This can be seen in many small populations of wildlife—for example, it is suspected that most cheetahs alive today descend from a few individual cheetahs.[1] It is important to note that despite a population of wildlife being large, the animals can still be close relatives, so genetic diversity overall remains quite low. This is why it is crucial to monitor populations of conserved wildlife for loss of lineage.[1]

A tiny population that is continually decreasing is Australia's critically endangered migratory parrots, called the orange-bellied parrots.[1] It has been observed that few of these parrots live long enough to reproduce more than one time, despite their capability to live up to 11 years of age.[1] Additionally, the mortality rate for juvenile orange-bellied parrots has been documented as being extremely high; leading researchers to wonder what happens when the high mortality is amongst siblings and non-random.[1] To come to a better understanding of the situation, researchers analyzed 22 years' worth of field data on wild orange-bellied parrots. The first thing documented was a higher frequency than expected by chance for non-random mortality of juvenile parrot siblings.[1] The process of natural selection maintains that only the fittest and healthiest genes are passed on to future generations; this is seen as loss of a family lineage in healthy, large populations.[1] However, most female orange-bellied parrots only have one chance to reproduce in their lifetime; so a female will produce no living offspring of breeding attempt fails.[1] In some specific family lineages, they may have important genetics, and if that lineage is lost the entirety of genetic diversity for the species impacted negatively. This is devastating as once lost, genetic diversity cannot be replaced.[1] Further results obtained—measuring observed heterozygosity and juvenile mortality—were from PVA analyses; results indicated a decreased genetic population diversity always occurring from non-random mortality amongst sibling parents, regardless of the mortality rates.[1] Though the problem at hand to solve is the high mortality of siblings, the underlying reason for it remains currently unknown.

Genetic diversity is such a crucial component to not only survival but the thriving of a wildlife population. Inbreeding causes devastating consequences to a species, even more so if the species is already small due to extrinsic problems. Mutations and diseases are observed contributions from inbreeding that impact wildlife negatively. It is with hope that conservation actions occurring earlier in a species decline that genetic diversity loss can be prevented.

References

[1] GrrlScientist. Inbreeding and families: how to save Australia’s orange-bellied parrot. https://www.forbes.com/sites/grrlscientist/2022/03/31/inbreeding-and-families-how-to-save-australias-orange-bellied-parrot/?sh=4a7208112a8f (2022).

[2] Spurgin, L. & Gage, M. Conservation: the costs of inbreeding and of being inbred. *Current Biology*; https://doi.org/10.1016/j.cub.2019.07.023 (2019).