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Heterozygosity-Fitness Correlation and Reproductive Success in Alpine ibex (*Capra ibex*).

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Abstract

The principal aim of this thesis is to assess the effect of genetic variability on fitness and to investigate the reproductive success of male Alpine ibex (*Capra ibex*).

The first chapter entitled “Effects of heterozygosity on a secondary sexual trait is mediated by body mass in Alpine ibex” analysed the effect of individual multilocus heterozygosity on body mass, horn growth, and parasite resistance in male Alpine ibex. The Alpine ibex population of Gran Paradiso National Park was found to suffer from inbreeding depression. Heterozygosity had an effect on all of the analysed fitness-related traits, and higher levels of heterozygosity were more favourable for individual fitness. A further analysis demonstrated that the effect of heterozygosity on horn growth is mediated by body mass which, thus, represents an honest signal of individual quality.

The second chapter entitled “Heterozygosity-fitness correlation despite low variation at Major Histocompatibility Complex in Alpine ibex (*Capra ibex*), evidence for selection or signal of inbreeding?” analysed heterozygosity at microsatellites linked to the Major Histocompatibility Complex (MHC) which is a large gene complex responsible for the immune response in vertebrates. We found extremely low genetic diversity at MHC and, contrary to expectations, no clear evidence of selection at this genome region. Heterozygosity at MHC linked microsatellites was not correlated to heterozygosity at neutral microsatellites, but nevertheless, it had an effect on fitness-related traits with an exception on parasite resistance.

The third chapter entitled: “Quality matters: individual quality and environmental conditions influence reproductive success in Alpine ibex (*Capra ibex*)” investigated reproductive success of male Alpine ibex in four different years using molecular techniques. We found that the age that first reproduction occurs in Alpine ibex is earlier than what was previously described, and that young individuals gave an important contribution to recruitment. Individual quality was suggested to be a factor influencing reproductive success. We also found that environmental conditions and, in particular, snow depth may have an influence on the age in which males achieve reproductive success.

The fourth chapter entitled: “How to continue measuring horn growth after capture in Alpine ibex” presents a new and simple method to measure horn growth in the years following capture. Horn measure is a very important tool in studies on the life history and ecology of ungulates, and it is also used in all chapters of this thesis. The proposed method consists of analysing pictures of horns from marked animals using one of the annuli measured during capture as a reference unit to calculate the annuli grown in the following years.

Each of the four chapters of this thesis corresponds to a manuscript that I wrote during my PhD research project.