Because natural selection is usually directional, which means that it favors one variant of a gene over the others, alternative variants should be lost from populations. Thus, the maintenance of more than one genetic variant in many traits (called genetic variability) is one of the greatest unresolved puzzles of biology. Such depletion of genetic variability should especially be the case with traits involved in competition between males for the access to females. This is because selection favoring a variant that bears advantage in male-male competition is particularly strong, even if mating with males possessing this variant is harmful to females (a situation called sexual conflict).

One of the mechanisms proposed to maintain genetic variability is selection that favors one genetic variant in one environment and the other variant in another environment. If a population's habitat consists of these two (or more) environments, such selection may maintain both (or many) variants.

In the proposed project, we are going to investigate the maintenance of two variants in *6Pgdh* gene in the bulb mite, in which one of the two variants provides advantage in male-male competition. At the same time, males possessing this variant decrease fecundity of their female partners, which is a clear indication of sexual conflict. In laboratory populations, only this variant is maintained, while the other is rapidly lost, but both variants persist in some natural populations. Previous studies suggest that they might be maintained by environment-dependent selection, but the exact mechanisms driving selection patterns are unknown. The project will combine diverse methods to comprehensively test for ecological factors that enable both variants to persist in (some) natural populations. Specifically, we are going to

1. screen a large number of natural bulb mite populations for 6Pgdh variants during different seasons to see how frequent and seasonally stable variability is;
2. record ecological and social factors describing screened populations to associate environmental factors with the presence of both variants;
3. investigate molecular signatures of selection maintaining both variants;
4. investigate physiological processes affected by different *6Pgdh* variants.
5. identify physiological processes associated with male harming effect on females and, hence, to find physiological bases of sexual conflict;
6. directly test the role of candidate ecological factors on the maintenance of both *6Pgdh* variants.