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Candidate markers for adaptive conservation genetics of bumblebees

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Assessing genetic variation underlying ecologically important traits is increasingly of interest and importance in population and conservation genetics. For some groups generally useful markers exist for examining the relative role of selection and drift in shaping genetic diversity e.g. the major histocompatibility complex in vertebrates and self-incompatibility loci in plants. For invertebrates there is no such generally useful locus. However, phosphoglucose isomerase (Pgi) has been proposed as a useful functional marker in the conservation genetics of invertebrates. Where thermal microclimate varies, balanced polymorphisms may be maintained due to trade-offs between thermally stable and kinetically advantageous allelic forms. Loci underlying immunity also make good candidates in this context: they are expected to be important for population persistence and may exhibit diversifying or divergent selection. Predictions regarding the pattern of selection expected at immune system loci have been based on their interactions with pathogens, however, published studies report mixed results as to whether these are borne out or not. Social insects, including bumblebees, make an excellent model system to investigate genetic variation in this adaptive conservation genetic context. Species are variously threatened and isolated; some being ubiquitous and others occurring in highly fragmented populations. Threatened species have also been examined in a conservation genetic context using neutral markers in the past. Here, Pgi and innate immune loci were screened as candidate markers for assessing adaptive variation in bumblebees. Interestingly, in contrast to other taxa, very low levels of Pgi variation were found rendering this locus to be of little use as an adaptive marker in a conservation genetics context in bumblebees. Variation at IIR loci was also found to be very limited. Potential explanations and caveats regarding this lack of variation will be considered.