

How to survive through the cold season in Finland: studies with malt flies

In our research group we aim to find out how adaptation of *Drosophila virilis* group flies (especially *D. montana*) to cold environmental conditions has occurred on northern latitudes in Finland and on high altitudes in USA (Colorado), and what kind of phenotypic and genetic changes it has involved. We pay special attention to variation in three phenotypic traits: annual rhythms in reproductive diapause, daily rhythms in fly locomotor activity and the cold tolerance of the flies. Our first data sets suggest that there may be differences between populations in the importance of different environmental cues on the onset of diapause and that diapause decreases the locomotor activity and increases the cold tolerance of the flies. Genetic basis of phenotypic changes is traced e.g. using a candidate gene approach, which offers a possibility to find out whether the genes identified in genetic model organisms are operating in a similar manner in wild populations of other species, and whether variation in the structure and function of these genes is responsible for variation in phenotypic traits important in adaptation processes. We have collected information on more than 300 candidate genes found to affect adaptive traits in insect species (mainly *D. melanogaster*) and prepared a candidate gene microarray for homologous genes in *D. montana* (the present array includes 112 genes and a larger array will be available in January 2009). Experiments on the effects of different developmental stages and different environmental conditions on the function of candidate genes will help us to choose the most interesting genes for closer inspection.