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Functional-ecological study of phenotype-fitness links in a damselfly along a latitudinal gradient

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Although many species show latitudinal size clines, like the well-known Bergmann cline, it is largely unknown whether this phenotypic variation is adaptive in the adult stage. The same holds true for the few documented clines in physiological traits. In the framework of a study on latitudinal clinal variation in morphological and physiological traits on a European scale, a two-week visit to Lund, southern Sweden, was conducted. Our aim was to jointly study latitudinal variation in adult phenotypic traits and associated fitness in the widespread damselfly *Ischnura elegans* for which we recently documented a latitudinal increase in size and immune function. Our major goal was to collect mated and unmated adult males and females in several populations in Southern Sweden. Females would be allowed to oviposit and eggs would be collected. Afterwards, animals would be stored at -80°C , and several morphological (e.g. wing load) and physiological (e.g. immune function, energy storage, hsp70,...) variables would be scored in the laboratory in Belgium. Parasite prevalence would also be scored, on-site. This would extend our current phenotypic dataset and allow linking these phenotypes with fitness components (short-term mating success and fecundity).

During the study visit we scored densities, sex ratios and female morph frequencies in three distinct *I. elegans* populations. A total of 467 individuals were collected. At least 10 clutches were obtained per population; the resulting larvae will be reared in the laboratory in Belgium in a common environment experiment at different temperatures in which individuals of two latitudes (Sweden and France) will be compared in behaviour and several morphological, physiological and life historical variables. We will focus both on fixed latitudinal differences as well as on latitudinal differences in thermal plasticity. A number of animals were stored in



liquid nitrogen and will be used for the analyses of immune function, energy storage, hsp70, allozymes and other relevant morphological and physiological components. These analyses will be started shortly. Parasite prevalence was scored on-site. Infestation with eugregarine gut parasites varied between 0% and 50% among populations. Of each population, we also stored a number of individuals in pure ethanol to study genetic differentiation among populations by means of microsatellite markers. Data from the different phenotypic end points will be integrated with the fitness measures and in a later step compared with similar results obtained at other positions along the latitude gradient. All collected data will be compared with recently collected data from France during a previous ESF funded visit.

Planned publications and further collaboration:

- Publications on latitudinal gradients in morphology, physiology and sexual selection of the damselfly *I. elegans* collected from the field;
- Publication on latitudinal differences in behaviour, morphology, life history and physiology of the larvae of the damselfly *I. elegans* reared in a common environment experiment at different temperatures;
- During this visit expertise rearing *I. elegans* larvae was exchanged and the development of additional polymorphic microsatellites discussed.