SFB 680

MOLECULAR BASIS OF
EVOLUTIONARY INNOVATIONS

Piotr Dawidowicz

University of Warsaw

Predation risk and evolution of *Daphnia* longevity

One Life-history theory predicts adaptive shifts in response to increased predation risk, namely earlier reproduction, smaller age/size at maturity and higher relative investment into reproduction. According to the classic evolutionary theory of senescence (ETS) such shifts bring about reduced lifespan of potential prey, while long lifespan evolves under low risk of extrinsic (e.g. predation-related) mortality. We tested this predictions in various ways using cladoceran species as model organisms. **First**, in standard laboratory conditions we determined the longevity of *Daphnia longispina s.l*. clones, isolated during a day from epilimnion (presumed risky habitat) and hypolimnion (presumed safe habitat) of three mesotrophic lakes. As expected the "epilimnetic" *Daphnia* started reproduction earlier and lived shorter than their "hypolimnetic" conspecifics. **Second**, in study performed in a thermally stratified indoor system ("plankton organ") with eight randomly-chosen clones of *D. longispina s.l*., we found a positive association between the preferred daytime residence depth and longevity, the latter being tested separately under fixed temperature regime (20°C). **Third**, we conducted life-table experiments with clones of *Daphnia longispina* and *Diaphanosoma brachyurum*, the species of contrasting anti-predatory strategies. The clones were derived from 7 lakes of different trophy and held in water with and without fish kairomone, under standard laboratory conditions. Exposure to the kairomone caused an expected decrease in age of first reproduction and an increase in early-life reproductive effort but also an about 20% decrease of longevity in both species. **We conclude that these results conform to the predictions of ETS. Individuals of clones (genotypes) isolated from environments of low predation risk (deepwater) live longer than those originating from high-risk (near-surface) habitats. Moreover, cladoceran longevity responds to manipulations of predation-risk cue (the fish kairomone), hence it can be counted among plastic life-history traits; shortened lifespan should be taken into account in considerations of costs and benefits of inducible anti-predator defenses in cladocerans. Moreover, our results indirectly support the predation avoidance hypothesis as the ultimate explanation for depth selection behavior in *Daphnia*.**

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Host: Eric von Elert

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