**Within-group variation in larval growth and development mediated by food abundance in the water strider *Aquarius remigis.***

*Aquarius remigis* is a common water strider on North American streams (Andersen, 1990). Adults and juveniles prey and scavenge upon small animals (primarily insects, including smaller conspecifics) trapped on the water surface (McLean, 1990; Blanckenhorn, 1991). Adult individuals of both sexes hold foraging positions for extended periods of time and are flexibly territorial under some environmental conditions (Wilcox & Ruckdeschel,1982; Rubenstein, 1984; Blanckenhorn, 1991; Kaitala & Dingle, 1993; Blanckenhorn & Perner, 1996), which is also true for later-instar juveniles (Wilcox & Ruckdeschel, 1982). In the field, nymphs of all instars and adults co-exist for a large part of the year (Blanckenhorn, 1994). Juveniles and adults thus naturally compete, at least in part, for the same prey items, both by interference and exploitation. Due to their smaller size and interference competition by larger conspecifics, the smaller nymphs are typically found foraging closer to the banks of a stream.

Groups of *A. remigis* nymphs were allowed to develop under field conditions at different levels of competition by keeping the numbers of competitors per group constant and varying the amount of resources they had. I expected that lower food levels would intensify competition and consequently magnify individual differences within groups. This should lead to increased mortality as well as increased within-group variation in development time as food became more limited and with time, i.e. instar (Rubenstein, 1981; Wall & Begon, 1987).

**Methods**

For seven consecutive weeks (**COHORTs**), I randomly collected first instar larvae from a stream at the Albany, New York, Rural Cemetery, starting 1 June. The individuals were transferred into 30x40 cm plastic rearing containers (**BUCKET**) filled with 8 cm of water and equipped with pieces of styrofoam as resting sites, at densities of 10 larvae per container. The containers were covered with window screening to prevent individuals from escaping, to exclude potential disturbances (e.g. predators), and to control food availability. They were located outdoors at a nearby field site, under closed canopy similar to that of the stream habitat.

I used three different food levels (**FOODLEVL**), based on quantities used to rear individuals in the laboratory: low food was initially 1/3 *Drosophila melanogaster* per strider per day, plus two cricket nymphs (*Acheta domestica*) ca. 6 mm in length per container per week; medium food was 1 *D. melanogaster* per strider per day, plus two cricket nymphs per container per week; and high food was 3 *D. melanogaster* per strider per day, plus two cricket nymphs per container per week. These amounts of food were doubled after two weeks and tripled after four weeks from the time each cohort was started to adjust for the size increase of the growing nymphs. The position of the containers at the field site was randomized with respect to food treatment to control for potential location effects.

I fed the striders three times a week. At every feeding, I began by blindly (i.e. randomly) dropping the large monopolizable prey item (the cricket) into the container. I scored the developmental stage (first to fifth instar or adult) of the individual that acquired the cricket (the nymphs could not be identified individually) and then delivered the remaining *Drosophila*. Thereafter, I noted the distribution of developmental stages of all individuals within a container. Any missing individuals were replaced with substitute individuals of the same instar, held at *ad libitum* food in separate containers, up to the fourth instar, but not thereafter. Overall mortality (**PMORTAL**) was calculated by the number of individuals that survived to adulthood divided by the total number of nymphs that entered the container. The experiment lasted until the final moult of the last strider of the last cohort.

For each BUCKET, the data yielded a distribution of moulting dates (with mean and variance(**VAR1-VAR5**)) for each of the five successive moults and consequently, by subtraction of the means, a mean duration of each juvenile instar except the first (**MEAN2-MEAN5**). As it tends to affect development, mean water temperatures in the buckets during the time of juvenile development are also provided (**AVTEMP**).

**References**

Andersen, N. M. (1990) Phylogeny and taxonomy of water striders, genus Aquarius Schellenberg (Insecta, Hemiptera, Gerridae), with a new species from Australia. Steenstrupia, **16**, 37-81.

Blanckenhorn, W.U. (1991) Foraging in groups of water striders: effects of variability in handling time and prey arrivals. Behavioural Ecology and Sociobiology, **28**, 221-226.

Blanckenhorn, W.U. (1992) Group size and the cost of agonistic behavior in pumpkinseed sunfish. Ethology Ecology and Evolution, **4**, 255-271.

Blanckenhorn, W.U. (1994) Fitness consequences of alternative life histories in water striders, Aquarius remigis. Oecologia, **97**, 354-365.

Blanckenhorn, W. U. & Perner, D. (1996) Life history dependent behavioural variation in water striders (Aquarius remigis). Ethology, **102**, 993-1007.

Kaitala, A. & Dingle, H. (1993) Wing dimorphism, territoriality and mating frequency of the water strider Aquarius remigis. Annales Zoolicae Fennici, **30**, 163-168.

McLean, E. B. (1990) Sesual dimorphism and predaceous feeding habits of the water strider Gerris remigis Say (Heteroptera: Gerridae). Canadian Journal of Zoology, **68**, 2688-2691.

Rubenstein, D.I. (1981). Individual variation and competition in the everglades pygmy sunfish. Journal of Animal Ecology, **50**, 337-350.

Rubenstein, D.I. (1984). Resource acquisition and alternative mating strategies in water striders, Gerris remigis. American Zoologist, **24**, 345-353.

Wall, R. & Begon, M. (1987) Individual variation and the effects of population density in the grasshopper Chorthippus brunneus. Oikos, **49**, 15-27.

Wilcox, R.S. & Ruckdeschel, T. (1982). Food threshold territoriality in a water strider Gerris remigis. Behavioural Ecology and Sociobiology, **11**, 85-90.