Does wind affect emergence site selection in Odonata?

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All species have specific habitat preferences in which survival and reproduction are optimal. Understanding factors governing habitat selection is crucial in the field of community ecology and conservation biology (Schoener 1974; Pulliam & Danielson 1991; Morris 2003; Peterson & Dunham 2003; Johnson *et al.* 2004). Factors affecting a species' spatial distribution within a habitat are mainly the abiotic conditions, resource availability, predation, competition, and parasitism (Ricklefs & Miller 1999). During certain periods of their lifetime species are periodically vulnerable to abiotic and biotic external factors, making (micro-) habitat choice particularly crucial and producing direct and indirect demographic consequences on population and community (Cody 1985; Downie *et al.* 2004). Arthropod moulting is an example of such vulnerable life stages (Morgan & Miller 2005).

Between the aquatic larval stage and the terrestrial (aerial) adult phase, aquatic insects like Odonata (dragonflies and damselflies) pass through a critical step, which is emergence (Corbet 1999). During this stage the larva leaves the water, chooses a suitable support, and conducts the last ecdysis during which time the soft individual, vulnerable to wind damage, must remain immobile for a substantial period of time (usually from 0.5 to 2 hours) in order to complete the process and take the first (maiden) flight (Corbet 1962). Exuviae (the exoskeletons) remain at the emergence sites for some time after the adults have dispersed, signalling successful emergence (Raebel *et al.* 2010). Thus, the relative abundance (both spatially and temporally) of exuviae throughout a natural environment may be regarded as some indication of individual microhabitat selection decisions.

Wind is an important meterological factor that affects abundance (Murty *et al.* 2011), dispersal (Manoukis *et al.* 2011), food availability (Dunn 1975), foraging success (Turner 1980), and reproductive success of animal species (Weimerskirch *et al.* 2012). Jakob & Suhling (1999) have shown that strong wind can damage dragonflies during emergence. Deformity of soft wings condemns odonates to death or to lower reproductive success (Purse & Thompson 2003). One idea is that the level of wind disturbance in certain forest (similar to wetlands) would be heterogeneous, *i.e.* wind/gust intensity is more intense in open areas where vegetation is sparse and less so in highly vegetated ones (Webb 1999). Moreover, upper parts of emergent plants should also be more affected by wind than lower parts. Therefore, distribution of exuviae during windy days should be different in terms of vertical stratification and occupancy of vegetated areas.

We tested this hypothesis using the damselfly *Erythromma lindenii* Sélys as a model species because it is one of the earliest emerging odonates in North Africa, starting in late March to early April, a period dominated by windy days. The aim of the current investigation was to understand how this odonate uses heterogeneous habitat to cope with the environmental force of wind and successfully emerge from the water.

This study was undertaken in a 0.4 ha pond at 3 km northwest from El Fedjoudj province, Guelma, Algeria (36°31′54.30″N 7°22′48.08″E). Maximum water depth was 2 m and bank vegetation was heterogeneous and mainly consisted of *Typha angustifolia*, *Scirpus lacustris*, *Cyperus longus*, and *Paspallum distichum*.

Emergence of *E. lindenii* occurred mainly in the early morning. Exuviae were searched for and collected daily during the late afternoon (between 15:30 and 16:30 h) from 2 April (the onset of emergence season) to 1 May 2012 along 80 plots of 1 × 1 m of bank vegetation. The total number of exuviae collected in a given day was considered as the daily emerging population size.

For the rest of the paper, 'exuvia height' and 'support height' correspond to the vertical distance from the water surface to the tip of exuvia caudal lamellae and from the water surface to the tip of the plant used at emergence, respectively. Both variables were measured to the nearest cm using a 5 m decameter. Since exuviae used different emer-

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