The effects of artificial light on river-riparian exchange

Artificial light at night is gaining increasing attention as a possible disturbance to ecological functioning (Rich and Longcore 2006, Perkin et al. submitted). One of the key components to ecosystem functioning is predator-prey interactions. In stream ecosystems, these predator-prey interactions are often between fish predators and drifting macroinvertebrate prey. Typically, aquatic macroinvertebrates drift in the stream only at night to avoid predation by visual predators, such as fish. However, previous studies have found that aquatic invertebrate drift is suppressed by exposure to lights (Bishop 1969), and that even the light from a full moon is strong enough to suppress drift rates (Anderson 1966). However, there have been very few empirical field studies to quantify how artificial light disrupts predator-prey interactions. Decreased activity rates of grazing aquatic invertebrates could lead to increases in algal biomass. Furthermore, these changes in rates of fish predation could also alter the emergence of aquatic insects to the riparian (terrestrial) environment.

While it is no surprise that many species of aquatic (and terrestrial) insects are attracted to artificial lights at night, it is unknown what role this attraction might play on the population dynamics of these insects. The adult insects also play a crucial role in both the aquatic and terrestrial ecosystem as they provide a food source for such varied predators as fish, amphibians, bats, spiders, and birds. Additional losses of insects to artificial lights may be beneficial to some terrestrial predators, but could reduce the number returning (aquatic) or falling (terrestrial) insects to the aquatic environment and therefore be lost to aquatic predators.

I have already conducted one experiment to understand how artificial lights at night influence aquatic insect dispersal (Fig. 1). Preliminary results show no difference in dispersal whether the experimental field was lit or dark; however, there is much more data to process and this result may change. I will examine the aquatic side of these ideas through a food web study in a remote research forest outside Vancouver, Canada. Streams will be lit or dark and I will look to see if the condition of predatory fish (cutthroat trout, *Oncorhynchus mykiss*) or the drift rates of aquatic invertebrates change in the dark vs. lit condition. Finally, I will specifically study the activity of grazing invertebrates and growth rates of algae in a controlled laboratory experiment.

Figure 1. Flight intercept traps were placed around an island in the Spree River to capture flying insects. These traps were either placed close to the water next to a light, close to the water without a light, 3 m back from the light, or in the center of the field (100-150 m from a light and edge of water). Emergence traps (pyramidal shape in photo) were placed in the water to determine how many aquatic insects emerged from the river each night.

Literature Cited

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