

## **Efficacy tests of a synthesized mating pheromone in sea lamprey management scenarios**

N. JOHNSON

Department of Fisheries and Wildlife, Michigan State University, East Lansing, MI, USA

Invasive species reduce biodiversity and cause an estimated US\$ 1.4 trillion of global economic damage annually. Invasive vertebrates are not efficiently managed because conventional pesticides pose physiologically and socially unacceptable threats to wildlife and humans. Vertebrates have never been controlled with pheromones despite that in pest insects, blends of synthesized female pheromones have been used to lure males into traps and disrupt reproduction. Vertebrate animals have not been expected to “fly up” pheromone plumes like insects, due to the increased complexity in contextual regulation for social behaviour and motor systems. Here we show in the sea lamprey that a single synthesized male pheromone component, 3kPZS, when released into a natural stream to reach concentrations at  $10^{-11}$ ,  $10^{-12}$ , or  $10^{-13}$  molar (M), lures approximately 50% of ovulated females into a trap. At these levels, synthesized 3kPZS also diverts ovulated females away from and disrupts ovulated female orientation to the full blend of the natural male pheromone. We also report that 3kPZS induces a robust, long lasting rheotaxis in ovulated females over hundreds of meters and over a wide range of concentrations ( $10^{-10}$  M to  $10^{-14}$  M). Our results demonstrate that a single pheromone component can effectively control females, which should be more effective than targeting males, as is currently done for most insect pheromones. Our findings may spur the discovery of other potent and environmentally benign pheromones to combat biological invasion, a process increasingly accelerated by globalization and exacerbated by climate change.