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# **Using White Light and Alarm Cue to Direct Downstream Migrating Transformed Sea Lamprey into Traps**

Project ID – 2023-MIE-541021

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*April 2026*

## **ABSTRACT:**

Downstream-migrating juvenile sea lamprey (*Petromyzon marinus*) transit streams primarily at night and concentrate in the mid-water column during active migration, limiting the effectiveness of passive bottom traps during high-flow capture events. We conducted two years of controlled flume experiments (2023–2024) to evaluate whether overhead high-intensity white light arrays could redirect juvenile lamprey to the lower water column and to assess the potential enhancement effect of conspecific alarm cue, the influence of water velocity, and the interaction with elevated turbidity. During 2023, at a single water velocity (0.50 m/s), depth (1.0 m), and clear-water conditions, white light produced a strong, consistent shift in vertical distribution: 90–94% of juveniles occupied the lower 45 cm of the water column at the downstream detection zone during lighted trials compared with 46% in control trials, with no additive effect of alarm cue on vertical position. Juvenile lamprey transited the flume at approximately half the speed when exposed to light relative to dark control trials. Notably, juveniles exposed to both light and alarm cue transited faster than those exposed to light alone, suggesting that acute alarm cue exposure induced locomotor activation that partially offset the transit-slowness effect of light-driven depth redistribution. During 2024, experiments were expanded to three water velocities (0.25, 0.50, and 1.00 m/s) under both clear and turbid water conditions (43.7–56.8 Nephelometric Turbidity Unit), with two sequential light arrays. The location of sea lamprey in the water column were influenced by light, velocity, turbidity, and their interactions. The depth-guidance response was detectable upstream of the first light array at low velocity, indicating response initiation before direct overhead illumination. At higher water velocities, the response onset shifted downstream, requiring greater linear distance downstream through the flume to achieve a similar depth shift. The guidance response persisted under elevated turbidity but was attenuated in magnitude, consistent with light penetration being reduced by suspended particulates and the zone of effective illumination being spatially compressed. Alarm cue pre-exposure had no significant effect on vertical distribution in 2024. Collectively, these results support the feasibility of deploying overhead white light arrays to concentrate downstream-migrating juvenile sea lamprey in the lower water column across a broad range of flow conditions, improving the potential effectiveness of passive bottom-deployed traps during high-flow migration events that are otherwise difficult to target with conventional capture methods.