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Post-stocking behaviour, habitat use, and survival of hatchery-reared native fishes using acoustic telemetry

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ABSTRACT:

We used acoustic telemetry to assess post-stocking behaviour, habitat use and survival of hatchery-raised bloater *Coregonus hoyi* in Lake Ontario. Between November 2016 and April 2019, 309 bloater (36-409g) were acoustically tagged (Vemco V9, V9PT, and V9DT) and released within an array of 80-134 Vemco VR2W 69kHz acoustic receivers. Range test work identified complex temporal and spatial influences of environmental factors on detection efficiency (DE). However, DE was >50% at distances between 700-1,100 m under most conditions providing confidence in high tracking probability within our closely spaced (127 km²) array. Upon release, bloater quickly descended to the lake bottom (~50m). Although a laboratory study had revealed negligible effects of tagging on behaviour, growth and survival, short-term mortality was high (~58% in first two weeks). V9DT (predation) tags revealed 40% of the bloater were predated within 2 weeks (avg time to predation 5.5d, range 2-23 d). Analyses of tagged predators suggested lake trout (50%), brown trout (40%) and Chinook salmon (10%) were probable predators. Separate analyses also revealed predators may retain acoustic tags of prey fish (such as bloater) for considerable periods of time (30% were retained for >150 d) which could complicate behavioural analyses of prey fish data. Of the bloater that survived, telemetry suggests bloater quickly disperse with some moving several km in the first 24 hours. Bloater showed a preference for deep (>40m) water, and despite overlap in space use we found no evidence of schooling. Many tagged bloater exhibited diel vertical movements (up at night, down during the day) which has been inferred elsewhere in the Great Lakes, and which may partially explain the high mortality as this behaviour would make stocked bloater highly vulnerable to the

abundant salmonids in Lake Ontario. Acoustic telemetry has revealed critical information to understand the restoration potential for bloater in Lake Ontario. Recommendations for timing, location, and release strategies to maximise survival of hatchery-reared bloater have been discussed with the binational deepwater cisco restoration team.