Effects of DC and PDC Depletion Sampling on Injury, Stress, and Survival of Appalachian Stream Fishes

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Abstract: Depletion electrofishing is a common management tool for obtaining quantitative data on trout populations in wadeable streams. Very few studies have examined the effects of electrofishing on native non-game fishes and in particular those non-target species that can be subjected to multiple electrical shocks routinely used in three-pass depletion sampling programs for salmonids. In this study we evaluated DC and PDC electrofishing forms at multiple power settings (100V DC, 100V PDC 60Hz, and 200V PDC 30 Hz) on several species common to Appalachian streams including brook trout (*Salvelinus fontinalis*), rainbow trout (*Oncorhynchus mykiss*), Potomac sculpin (*Cottus girardi*), and green sunfish (*Lepomis cyanellus*). Fish were held in four rectangular fiberglass tanks (190 × 66 cm) equipped with electrodes, a gravel/cobble substrate, and continuous water flow. Three tanks served as experimental chambers and the other as a control. An anode and cathode were placed at opposite ends of the tanks and connected to a Smith Root Type LR-24 Backpack Electrofisher. Voltage gradients were measured for each electrofishing field with a Fluke Model 199C oscilloscope and the average voltage gradient (mV/cm) was calculated. Fish were exposed to either one, two, or three shocks spaced 1 h apart. A minimum of 10 fish were examined for hemorrhagic trauma and for spinal deformities, compressions, and fractures. Radiographs were made with a Tech America MT8020 for 180 sec at 20kv. Overall stress was measured by monitoring whole blood glucose (mg/dL) and serum lactate (μM) 30 minutes post-shock. Rainbow trout were used as a preliminary species in order to establish the ranges of effective electrofishing in our tanks. We found that hyperglycemia and hyperlactemia were observed to be dose-dependent with treatment and number of shocks among these species. Lactate was the more reliable predictor of physiological stress. Both glucose and lactate values showed positive correlations with hemorrhagic trauma scores. The effects of electrofishing treatments were most severe on rainbow trout at 200V PDC 30 Hz with incidences of hemorrhagic trauma of 100% and spinal trauma of 80%. In general, the non-salmonids experienced less trauma than the salmonids under similar treatments and in general, 30-day post treatment survival was >95% for all species regardless of the treatment. Reductions in condition factor (K) with increasing electrofishing power and number of shocks were evident in all species, and we often observed that shocked fish did not feed after treatment for several days. Differences among electrofishing treatments and species were described and discussed relative to management applications.

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