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Title: Long-Term Effects of the Annapolis Royal Tidal Turbine on Two Fish Populations

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Category: Environment

Tidal hydropower has been proposed as one potential solution for sustainable energy sources. The first tidal turbine in North America was installed in the Annapolis River Causeway and began operation in 1984. Subsequently, it has been the focus of cause-effect studies on various aquatic species. American shad and striped bass, two anadromous fishes, are of concern due to their use of the river for spawning and tidal turbine impact on migrating adults and juveniles. Five assessments of the American shad spawning stock between 1981 and 1995 indicated significant change in population characteristics over time. Compared to pre-turbine population characteristics (1981-1982), change in post-operation characteristics during 1985-1995 suggested selective turbine mortality on older, larger adult shad. Mean length of the 1995 spawning population (412 mm and 447 mm fork length for males and females respectively) was significantly smaller than those of the 1981 spawning population (462 mm for males and 516 mm for females). Mean age of the shad spawning stock also declined significantly between; 6.83 and 8.31 yr for males and females respectively in 1981 compared to 5.94 years for males and 6.35 years for females in 1995. The percent repeat spawners declined from an average of 80.6% pre-turbine to 70.7% post-turbine and the estimated population mortality increased from $Z = 0.30$ to $Z = 0.76$. Overall, the pre-turbine adult shad population was older with numerous cohorts whereas the post-turbine population is younger with few cohorts. The 1981/82 population estimates for the spawning run was 100 000 - 150 000 adult shad while the 1995 estimate was lower, at ~58,000. Additionally the Annapolis River once supported an important sport fishery for striped bass around the causeway. Records kept by a select group of anglers during the period 1976-2008 indicate a decline in catch by numbers and weight. During the pre-turbine period, between 1.4 and 3.6 larger bass (mean weight of 7.4 kg) were caught/d with combined total weight of all bass ranging from 162.0 to 294.4 kg/d. Catches fluctuated about a mean of 2.1 bass/d until 1991, when they began to decline, eventually to 0 bass/d between 2000- 2008. Angler notes describe only a few small bass (under legal limit) remained around the causeway between 1997- 2008. Comparatively, there has been an abundance of large striped bass captured in Minas Basin during the same period the Annapolis angling collapsed. At present the Shubenacadie River, unencumbered with a tidal turbine, has maintained a healthy population of striped bass most recently estimated (2003) at 10,000+ adults.