

Abstract:

Understanding how fish populations respond to exploitation is critical for sustainable fisheries management. Walleye *Sander vitreus* have been exploited by tribal spear and angling fisheries in the Ceded Territory of Wisconsin (CTWI) since 1985, and harvest in individual lakes has been regulated using a 35% adult exploitation limit reference point since 1990. We conducted a 35% annual adult Walleye exploitation experiment (1993–1997: baseline exploitation at ~13%; 1998–2008: 35% exploitation) on Big Crooked Lake, Wisconsin, to test for responses in adult, male, female, age-0, and age-1 density and sex-specific mean length at age and proportional size distribution (PSD) indices. Adjacent Wolf Lake was used as the reference system. Adult Walleye density in Big Crooked Lake declined significantly between exploitation periods and was due to the experiment. Adult Walleye density declined from about 16 to 10 fish/ha and was about 7 fish/ha during 2001–2008. Male density declined significantly between exploitation periods, whereas female density did not change. Age-0 and age-1 density did not change as a result of the experiment. Male and female mean length at age across several age-classes increased significantly over time. The PSD indices did not change over time for males, but female PSD-Quality and PSD-Preferred increased significantly. Our results suggest that sustained 35% annual exploitation on the Big Crooked Lake Walleye population led to an undesirable adult density ($\leq 7.4/\text{ha}$) but improved growth. Walleye recruitment did not change in Big Crooked Lake under sustained exploitation; however, we caution that other CTWI populations may respond differently to this level of targeted exploitation. Based on our results, long-term declines in CTWI Walleye natural recruitment and productivity, and as suggested by other independent studies, we recommend that the limit reference point be lowered to reduce exploitation and be protective of all Walleye populations in the CTWI.