Abstract

A slotted size limit was established on a 14-km section of Michigan's Au Sable River. It allowed harvest of any trout between 203 and 305 mm or greater than 406 mm in length. Wild populations of brown trout (Salmo trutta), brook trout (Salvelinus fontinalis), and rainbow trout (Salmo gairdneri) coexisted in the section. Harvest of brown trout and rainbow trout was formerly restricted by a 305-mm minimum limit and harvest of brook trout by a 203-mm minimum limit. One of the primary purposes of the slotted limit was to help improve the growth rate of brown trout by reducing abundance of 203- to 305-mm fish through harvest.

We compared before- (1974 through 1978) and after-period (1980 through 1983) trout populations, catch, and fishing effort in the study section and in a control section where regulations remained constant. Mark-and-recapture population estimates were conducted annually from 1974 to 1983 to determine abundance and size structure of the populations, and samples of trout scales were aged to determine age structure, survival rates, and growth rates. Stratified, random sampling methods were used to estimate total catch, both harvested and released, and its species and size composition. Finally, we compared the effects of the slotted size limit on brown trout as determined from these field surveys to those predicted earlier with a mathematical model (Clark et al. 1980).

Abundance of brown trout smaller than 203 mm decreased in the study section by 8%, abundance of 203- to 305-mm brown trout decreased by 32%, and abundance of brown trout over 305 mm decreased by 47%. Growth rate of brown trout did not change significantly. Annual fishing mortality rate between ages 2 and 3 increased from near zero to about 30%, and this reduced the number of fish surviving to older ages and larger sizes. However, unfavorable changes in environmental conditions also contributed to decreases in abundance by reducing brown trout recruitment. Brook trout and rainbow trout abundance increased by 63% and 48%, respectively, but these increases were due to environmental factors and not to the change in regulations. For example, recruitment of age-0 brook trout increased 40% in the control section where regulations remained constant. Growth rates of brook trout and rainbow trout remained constant, as did their survival rates at age 1 and older. Total numerical harvest of brown trout increased nearly fivefold but consisted of smaller fish. Catch of 305- to 406-mm brown trout remained constant, despite their reduced abundance in the population. This was apparently due to multiple recaptures of released fish. Total catch of brook trout and rainbow trout increased by about the same amount as their numbers increased in their populations. The model predictions of the size and age structure of the brown trout population were accurate on a per-recruit basis, but the reduction in brown trout recruitment caused by environmental factors could not have been predicted.

The slotted size limit reduced the density of brown trout but did not improve their growth rate. Instead, the reduction in brown trout density may have been compensated, at least in part, by the increase in density of brook trout and rainbow trout. We concluded that the greatest effect of the slotted limit was in reshaping man's use of the trout populations. Biological effects were comparatively unimportant except for their influence on satisfying desires of different factions within the angling community.