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# Population Dynamics of Bluegills Subjected to Harvest within the 5.0- to 6.9-Inch Size Range

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*Abstract.*— We conducted a nine-pond experiment to test the effects of exploiting bluegills *Lepomis macrochirus* under a slotted size limit. For 5 years, bluegills from 5.0 to 6.9 inches were harvested annually via pond draining at three rates (0%, 25%, and 55%), in three ponds each. The 0% harvest rate was considered the experimental control. Density, size structure, growth, mortality, harvest, and reproduction of bluegills were monitored in each pond to help describe specific details of the population dynamics. The mean standing crop (weight/area) of bluegills larger than 7 inches was significantly greater ($P < 0.05$) in 25%-harvest ponds than in 0%- or 55%-harvest ponds, but we think this might have been due to chance differences in initial stocking rates. Even after 5 years, all fish over 7 inches in the ponds were survivors from the initial stocking. No significant differences were found between harvest rates for mean standing crops of bluegills 5.0 to 6.9 inches or less than 5.0 inches. From the standpoint of fishery potential, bluegill size structures that developed in all experimental ponds would be classified as stunted. Bluegills smaller than 6.0 inches made up over 99% of the populations by number and 93% to 97% by weight. Natural mortality of bluegills was density independent, but individual growth rate and population reproductive success were density dependent. Reproductive success was highly variable and not related to harvest rate. Reproduction failed in 22 of 45 year/pond combinations. Stepwise multiple-linear regression showed that reproductive success was negatively correlated with density of 1.0- to 3.9-inch bluegills (possibly representing predators or competitors of newborn fish), positively correlated with density of 5.0- to 5.9-inch bluegills (possibly representing the majority of sexually mature females), and positively correlated with density of 9.0-inch-plus bluegills (possibly representing the majority of reproductively fit males). In conclusion, bluegills possessed two qualities which made their populations unstable and which led to size structures unsuitable for good fishing: 1) 1.0- to 3.9-inch fish had the ability to avoid starvation and survive at high densities for several years while growing slowly; and 2) 4.0-inch-plus fish had the ability to reproduce large year classes whenever density of small fish was low. Normal sportfishing cannot directly affect either one of these things. Hence, we believe special fishing regulations, if applied directly to bluegills, could not be effective in correcting or preventing overpopulation and stunting. Rather, special fishing regulations should be designed to maintain high densities of predators which might be able to reduce survival and abundance of 1.0- to 3.9-inch bluegills and prevent stunting.