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Aspects of Fish Growth and Predator-Prey Interactions: Modeling Relative Weight, Predicting Maximum Prey Size, and Evaluating Predator Growth and Prey Survival in Experimental Ponds

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Abstract.–Increased understanding of fish growth and predator-prey interactions can advance the scientific basis for fisheries management. This study addresses several topics involving fish growth, predators, and prey. First, two laboratory experiments assessed how largemouth bass *Micropterus salmoides* allocate new tissue to growth in weight and growth in length. Results show that when fish condition is good, increases in weight are primarily allocated to increasing in length while maintaining condition, whereas when condition is poor, increases in weight are primarily allocated to improving condition. Second, a mathematical model was developed to help summarize the information from these experiments in terms of changes in relative weight in relation to recent growth rate. For juvenile largemouth bass, relative weight appears to be a useful index of average growth rate and food consumption over the previous few weeks. Third, because larger bluegills *Lepomis macrochirus* can be predators on smaller bluegills, measurements were made on the gape and maximum body depth of a wide size range of bluegills; laboratory experiments evaluated the predicted gape limitation. New equations were developed to relate gape of bluegills as predators and maximum body depth of bluegills as prey. Fourth, pond experiments were conducted to assess juvenile walleye *Sander vitreus* and adult bluegill predator growth and predation rates in the presence of different densities of juvenile bluegills as prey. Average growth of individually marked walleyes generally increased with density of bluegill prey. An experiment in ponds over winter indicated that adult bluegills are not likely to cause appreciable predatory mortality when age-0 bluegills are potential prey.