The Role of Size Limits in Walleye Management

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ABSTRACT

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The role that size limits play in protecting and improving walleye (*Stizostedion vitreum*) populations has traditionally been a controversial topic. The objectives of size limits may be presented from several perspectives: (1) to maximize yield; (2) to prevent overharvest and depletion of fish stocks; (3) to maintain favorable fish population and community structure; (4) to maintain favorable fish population dynamics and production, e.g., satisfactory rates of growth, mortality, reproduction and recruitment; and (5) to sustain the quality of fish and fishing and a level of benefits in proportion to the productivity of systems, i.e., optimum yield. These objectives can be met if the proper size limit is chosen. If not, more harm than good may be done to the fishery that the size limit is expected to enhance.

The control of exploitation is usually the primary reason for the imposition of a size limit on a walleye fishery. The fishery manager must first decide if a size limit is an option that is both biologically and socially acceptable. If it is, then the manager must determine what type of size limit is most likely to achieve management objectives. This cannot be done without knowledge of the structure or dynamics of the walleye population. This paper describes how a manager might choose a minimum, slot, or maximum size limit regulation for walleye sport fisheries.

Minimum Size Limits

The traditional approach to length-based harvest regulations was to impose a minimum size limit, whereby all fish caught below a specified length were to be returned unharmed to the water. By returning small fish, minimum size limits theoretically would maximize harvest and increase the mean size of fish harvested. Under a minimum length regulation, the majority of walleye in the population were normally allowed to obtain a size at which they were capable of spawning at least once before capture.

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Results of walleye minimum size limits have been mixed, and the technique has come under increased scrutiny in recent years. For example, Serns (1978, 1981) studied the effects of minimum size limits on two lakes in Wisconsin. A minimum size limit of 381 mm total length was established on Big Crooked Lake for the 1970–73 seasons and then reduced to 356 mm in 1974. During this time, the angler catch and yield of legal sized walleye decreased fourfold. There was also approximately a three-fold decline in the number of walleye above 381 mm. Mean length, weight, growth, and condition of angler-caught walleye declined. At the same time, an increase in the number of walleye below 381 mm was observed, mainly due to two strong year classes (Serns 1978). In nearby Wolf Lake, with a similar minimum size limit regime, the number of large walleye in the angler catch increased during the study period (Serns 1981). Mean length and weight of legal-sized walleye also increased; however, there was a slight reduction in growth and the condition of walleye below legal size declined.

A minimum size limit set to maximize the yield from a fishery is based in theory on the assumption that rates of growth and natural mortality do not change after the length limit is imposed. However, in reality, when some sizes of walleye are protected in a fishery, the changes in population density can alter rates of growth and natural mortality, sometimes dramatically and in different ways (Colby 1984). If there is high natural reproduction combined with a slow growth rate, a high density of undersized fish can occur, resulting in a decrease in the number of legal-sized fish, as was the case with walleye in Big Crooked Lake, Wisconsin (Serns 1978). This phenomenon has also been reported for largemouth bass (*Micropterus salmoides*) fisheries (Rasmussen and Michaelson 1974). In addition, few of the walleye may survive to legal size since natural mortality of the small fish increases. The use of equilibrium yield modelling to determine maximum yield per recruit and critical size (Ricker 1945) for estimating walleye minimum size limits must recognize that these rates of growth and natural mortality are not fixed (Kempinger and Carline 1978; Schneider 1978).

Minimum size limits should not be used as a broad management technique, since the rates of growth and natural

mortality for walleye may vary considerably from one population to another. Minimum size limits should be lake-specific and be applied only if the walleye population demonstrates the following characteristics (Serns 1978): (1) low reproduction; (2) good growth, especially of small fish; (3) low natural mortality; and (4) high angling mortality.

Under these conditions, a minimum size limit may benefit the walleye fishery. However, it is imperative that after the imposition of the length limit certain life history characteristics (e.g., growth, mortality, reproduction) be monitored, so that changes may be detected and the length limit modified if necessary.

Slot Size Limits

The imposition of slot size limits, which protect fish within a specified length range, is a relatively new concept in fisheries management. Protected slot size limits have been applied to high density, slow-growing largemouth bass populations in several Midwest lakes since the mid-1970s (Anderson 1976; Eder 1984; Sollen 1984). The objectives of these regulations were to increase the number of angler-caught bass above the slot and retain balanced bluegill (*Lepomis macrochirus*) populations (Anderson 1980). In Watkins Mill Lake, Missouri, a 304–378-mm total length slot limit on largemouth bass proved to be an effective management strategy for improving a population under high angling pressure, although bluegill growth rates declined (Eder 1984). In Kansas, however, a 304–381-mm slot size limit on largemouth bass showed mixed results (Gabelhouse 1984a). The harvest of angler-caught bass above 381 mm total length increased in one lake whereas in three other lakes it did not increase significantly due to reduced growth within the protected slot. The slot limits, however, did stabilize widely fluctuating harvest rates. To a large extent, slot limits functioned between what was anticipated and a 381-mm minimum size limit due to low angling harvest of small fish. A voluntary slot size of 304–406 mm total length for rainbow trout (*Salmo gairdneri*) and brown trout (*S. trutta*) in Lake Taneycomo, Missouri, resulted in the average size of trout in the population increasing from 269 to 325 mm, and the number of trout over 406 mm rising by 6.5% in one year (Stephen Weithman, personal communication).

Slot size limits have been suggested by Anderson and Weithman (1978), Serns (1978), and Colby (1984) as means to increase the quality of a walleye fishery with good natural reproduction, but these regulations have only recently been instituted on walleye populations. In Pine Lake, Wisconsin, a slot limit of 356–457 mm total length for walleye was instituted beginning January 1, 1984 (Dennis Scholl, personal communication). Pine Lake had a high density of small, slow-growing walleye, most of which died of natural mortality by the time they reached 381 mm. Those that survived beyond this grew faster and reached 762 mm or larger. The slot size limit, with a higher daily limit of walleye under 356 mm, was intended to encourage the harvest of small walleye. Initially there appeared to be good public support for the regulation but local anglers soon rallied against it. They argued that walleye were food fish and they were not willing to throw back an edible-sized walleye. Without active public support, the Wisconsin Department of Natural Resources rescinded the regulation after only 4 months, rather than let this type of regulation acquire a bad reputation.

Table 1. Percentage of fish and eggs protected by slot in three Ontario lakes, based on samples collected with gill and trap nets.

Lake	Numbers (%)	Eggs (%)
George	10	57
Upper Kesagami	40	100
Tweed	55	95

In Cochrane, Ontario, an experimental slot size program for walleye was initiated in 1984 on three lakes that were recently made accessible by road (Table 1). Anglers must return to the water, unharmed, all walleye from 430 to 600 mm in total length. Anglers can keep the fish above or below this limit up to their normal possession limit of six.

Initial results indicate that fishing success and the density of the brood stock are remaining stable in two of the slot limit lakes, but have declined rapidly in one of the control lakes without a slot limit (Dave Payne, personal communication). Public acceptance and compliance with the regulation have been generally good.

In Savanne Lake, Ontario, a controlled angling research fishery which returns most walleye from 500–700 mm total length has maintained a yield of 1.7 kg/ha over 6 years (Peter Colby, personal communication). This is higher than the predicted long-term, sustainable commercial yield of 1.00–1.25 kg/ha from similar lakes in the region (Adams and Olver 1977).

In theory, a protected length range for walleye should sustain angling yields and allow increases in fishing effort without adversely affecting the quality in terms of catch rates and size of fish. As long as reproduction and recruitment are satisfactory, young fish can satisfy the angler fishing mainly for food. Harvesting walleye smaller than the slot "thins out" large year classes at relatively small sizes, reducing intraspecific competition for food. This maintains growth and recruitment into and through the protected slot, and should sustain the availability of some large fish above the slot.

Slot size limits should be appropriate for walleye populations exhibiting the following characteristics: (1) good natural reproduction; (2) slow growth, especially of small fish; (3) high natural mortality of small fish; and (4) high angling effort.

Colby (1984) has also suggested liberalizing creel limits below the slot to improve the size and quality of walleye fishing where high density and slow growth of the small fish occur. This may be used where stunting has occurred under the conditions of a minimum length limit, or food has limited the growth of fish after they have reached a certain length. Encouraging anglers to harvest fish below the slot should reduce their density and increase growth. The slot limit could then be adjusted to maximize yields, fishing quality, effort, or benefits depending on management objectives, lake status, or user groups. More experimental management is needed to determine the types of walleye populations and fish communities where slot limits

can be most effective. It is a technique that should be used under controlled conditions until more is known about its effects on fish and fishing, and on yield and benefits.

Maximum Size Limits

Maximum size limits, whereby all fish caught above a specified length are returned to the water, are not widely used. This is due largely to social rather than biological reasons. The opportunity to keep large walleye appeals to anglers even if they have difficulty in catching them. However, the quality of the trip and the fishing experience may be reduced if anglers know they cannot keep any large fish that they catch.

Maximum size limits for walleye may be useful where it is necessary to protect the brood stock, such as in highly exploited populations with a low density of mature fish, and where recruitment may be low. In this case, a maximum size limit designed to protect the brood stock, combined with a low daily bag limit, may aid in rehabilitating the fishery.

Some anglers prefer to have a high catch rate for small fish as opposed to catching fewer large fish. In this situation, a maximum size limit would protect the brood stock and provide benefits similar to those under a slot size limit regulation. Maximum size limits have been introduced for several fish species in Manitoba (Don Toews, personal communication). In 1982, after extensive consultation between fisheries managers and lodge owners, a walleye size limit, which allowed only one fish longer than 600 mm total length, was instituted. The regulation was first introduced in the northern part of the province, even though it was recognized that the initial size limit was liberal and would not affect many anglers. However, the regulation was viewed as a first step in creating angler awareness about resource limitations in terms of trophy fish and the need for conservation. In 1983, the maximum size limits were extended throughout the province to reinforce the idea that trophy fish are a finite resource which require special protection to maintain their numbers. After reviewing the angler acceptance of the regulation, the province reduced the maximum size limit on walleye to 550 mm. The reduced length limit will protect large fish more effectively and better reflect the slow growth rates of walleye in northern Manitoba. Maximum size limits may also be easier to institute in newly opened fisheries before anglers have had the chance to fish under conventional regulations.

Underlying Considerations

A number of underlying considerations are common to most types of size limit regulations. The primary consideration is the need for the regulation in the first place. This must be based on biological data such as fish community and dynamics, and sociological information such as user demands and expectations. Size limits, and slot size limits in particular, are ideally geared towards lake-specific management that takes into consideration varying growth rates, size specific fecundity, and so on. A problem with these regulations is that, historically, they have been applied broadly where they were not equally effective or appropriate on all lakes.

A positive, intensive, and well-conducted public information program, directed at specific user groups, is probably the most critical factor in the success of a new size limit program. This is particularly true if the program is innovative or experimental in nature. Lack of understanding of the reason for a minimum length limit appeared to be the main reason for the high degree of noncompliance among anglers in an Oklahoma study (Glass and Maughan 1984). Common themes to successful size limit education programs have included public contact through conservation officers, preparation of pamphlets and signs, and media newsletters and advertisements (Paragamian 1984; Sollen 1984). In the Ontario study, we found angler awareness of the slot size regulation was good, due to the combination of on-lake signs, development of a brochure, and an extensive news release campaign.

New size limit programs require a more intensive enforcement effort to increase angler compliance especially if the size limit regulation is lake specific. Enforcement efforts should emphasize public contacts and education early in the implementation of size limit regulations.

A high degree of voluntary angler compliance is extremely important (Novinger 1984). Although difficult to measure, noncompliance can be high. The overall violation rate of anglers fishing for largemouth bass under a slot size regulation was 2%; yet for those anglers who actually caught a fish within the protected range, it was 30% (Eder 1984). A voluntary slot size limit for trout in Lake Taneycomo, Missouri, resulted in 13% of the fish caught in the desired protected slot size range being released voluntarily (Weithman 1980). In our Ontario study, observed angler noncompliance existed only near the lower limit of the slot size range. Given variation in measuring technique, legal prosecutions are more difficult near the limits of the protected slot size. It is essential that a supporting regulation be in place to ensure that anglers retain fish intact so that total length can be measured, at least while they are fishing on the lake.

The reluctance of anglers to keep small fish is another obstacle to successful implementation of slot size or maximum size limits (Anderson 1984; Eder 1984). The attractiveness of large fish is one of the main reasons why maximum size limits are unpopular with anglers. Slot size limits allow anglers to try for and keep large fish, even though there may be few in the lake.

It is public support or opposition that will determine the success of any regulation. In Wisconsin, a slot size limit on one lake was rescinded because of angler opposition (Dennis Scholl, personal communication). Anglers were unwilling to release walleye that were of an edible size. In our Ontario study, a survey during the initial year of the slot limit regulation indicated that most anglers supported the regulation on specific lakes to control effects of exploitation, but were unwilling to see such a technique applied on a large scale. The imposition of slot size limits on the three lakes appeared to deflect some fishing pressure to adjacent lakes without such controls. It is important that public follow up, via opinion surveys and creel surveys, be used to gauge public response to the regulation.

Mortality of released fish is another consideration for size limit regulations, as some fish must be released by law. If

significant mortality occurs among the released fish, the population may not respond as expected, and public support may be eroded. Evaluation of hooking mortality is complex and can vary with species, age, gear type, bait, and fishing method. Hooking mortality is also a factor in fisheries without size limits, as anglers release fish regularly. It is important to emphasize proper handling and release techniques during the public information program.

Management Challenges

This paper was prepared to aid the manager in examining the use of length limits for walleye and to point out some of the basic considerations that must be incorporated into size limit regulations. There are, however, several other questions and challenges facing the manager. It may be relatively easy to initiate a research program on a few lakes to evaluate the responses of fish populations and people to experimental regulations, such as we have done in Ontario. But, if the responses prove to be favorable, how many lakes in a province, state, or district can be managed with specific regulations? What is the minimum amount and what type of information is needed for managers to make informed decisions that are likely to be correct or proper? What diversity of slots or size limits are feasible or practical in a management program? How will the users respond? These are important questions to answer.

A solution must be found to the problem of maintaining an inventory of stock assessment on a large number of managed populations in order to evaluate responses to regulations, health, or quality of fish. Since size is a key attribute of quality as perceived by anglers, some description of length-frequency distribution (Gabelhouse 1984b) or quality fishing index (Colby 1984) could be employed. The numbers and sizes of fish caught by anglers is an important part of data collection for stock assessment. Finally, there is a need to develop methods of data collection, reporting, and sharing by interested user groups.

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