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POTENTIAL EFFECTS OF DELAYING THE OPENING DATE OF FISHING SEASON ON YIELD AND PRODUCTION OF RAINBOW TROUT IN A SMALL MICHIGAN LAKE[1]

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Abstract

The potential effects of delaying the opening of fishing season from the end of April to the beginning of July were studied in a small lake. Fingerling rainbow trout (Salmo gairdneri) were planted each fall for 5 years. No public sportfishing was actually allowed in the lake, but sportfishing was simulated by harvesting a quota of fish with gill nets from July-September of each year. Mortality, growth, and harvest of trout were monitored, and total annual biomass of trout produced in the lake was estimated. In addition, the seasonal growth and natural mortality rates found in the lake were used to estimate what yield and production would have been for two other regulations: (1) a 10-inch minimum size limit with a late April opening date (current statewide regulation), and (2) no size limit with a late April opening date. The weight of trout harvested under the delayed season was 33% higher than that estimated for the present statewide regulation (10-inch size limit) and 24% higher than that estimated for no size limit. Also, the average size of individual trout harvested was larger under the delayed season regulation. Annual biomass production for the delayed season was 7% higher than for the statewide regulation and 19% higher than for an early season opener with no size limit. Delaying the start of fishing season appeared to be a useful management option for diversifying the kinds of trout fishing opportunities available in small lakes. It could also be combined with catch-and-release fishing during the April-July period if the use of artificial lures was required to minimize hooking mortality.

Introduction

Fisheries in most designated trout lakes of Michigan are maintained by annual stockings of hatchery trout. Michigan classifies this type of fishery as "put-grow-take". Various species and ages of hatchery fish are used, but most populations are maintained by plantings of fall fingerling rainbow trout (Salmo gairdneri).

Because rainbow trout in small lakes are relatively easy for anglers to catch, most of the stocked fish are harvested early in the growing season and few survive long enough to grow to a large size. Fisheries managers can reduce the exploitation rate somewhat by planting brown trout (Salmo trutta) which are more difficult to catch or they can accelerate the cropping rate by planting the highly vulnerable brook trout (Salvelinus fontinalis). Also, the effects of exploitation can be altered to some degree by varying the size limit or the creel limit. However, another way to manipulate exploitation would be to delay the fishing season opening date. This would also allow more trout to survive and take advantage of the abundant food supplies and optimal growing temperatures in the spring.

The present study was designed to evaluate the potential of a delayed fishing season from 1 July to 30 September instead of the normal Michigan fishing season which begins the last Saturday in April and ends 30 September.

Information available from past studies of rainbow trout in East Fish Lake, site of the present study, have demonstrated that the spring growth of fish is rapid (Alexander and Shetter 1961, 1969). However, whether or not this rapid growth could be maintained during May and June, with the higher density of fish that would result from a delayed fishing season, was unknown. Further, the magnitude of the natural mortality rate during May and June was unknown. Of course, any gains in standing crop and yield,

due to a delayed cropping scheme, would occur only if the biomass of trout flesh grown during May and June exceeded the biomass lost to natural mortality, and if the fishermen were able to exploit the trout stock efficiently once the season opened.

Methods

Eight hundred fingerling rainbow trout were planted in East Fish Lake in mid-October each year for 5 years (1977-1982). East Fish Lake is 16 acres in area with a maximum depth of 40 feet. It is located at the Hunt Creek Fisheries Research Station, Montmorency County, Michigan, and is closed to public fishing.

Mark-and-recapture estimates of trout abundance were conducted in East Fish Lake in mid-April and again in mid-June of each year. For April estimates, fish were caught and marked by ice fishing in early April. Then ratios of these marked fish in the population from samples of fish taken by gill netting in July through September were used to estimate the mid-April abundance. June population estimates employed electrofishing and fly-fishing to capture trout for marking. A different mark was used in this case, so fish marked in June could be distinguished from those marked in April. Thus, the same July-September gill netting operation could be used as the recapture run for both April and June estimates. The multiple gear sampling method provides a way of obtaining reliable Petersen type estimates of trout in small lakes (Waters 1960; Alexander and Shetter 1961, 1969).

All sampling provided a means for the assessment of mortality, growth, standing crop, and production as outlined by Ricker (1975). Survival and growth rates between the various point estimates were assumed to be constant. Further, average sizes of trout between the point estimates were estimated from curves drawn from the various point estimates.

Three angling regulations were defined and simulated; a July 1 season opening and two normal fishing seasons starting at the end of April, one with a 10-inch size limit and the other with no size limit. The results of the delayed season would be the same under either a 10-inch size limit or no size limit because all trout would be over 10 inches long in the population by the July opening. The data set for the delayed angler cropping was obtained by setting catch quotas for successive bimonthly periods beginning 1 July and ending 30 September. The population on 30 September was set at 13% of the 1 July estimate. This was based on past studies, which found about 13% of trout available to anglers at the beginning of the season survived to its end (Alexander and Shetter 1969). The catch quotas, which represented angler cropping, were filled by catching and removing trout with gill nets. Gill nets were fished during each 2-week period until the quota was attained.

The normal fishing season was simulated mathematically by assuming that 86% of the mid-April population would be caught annually. Catches were computed and subtracted monthly based on the catch distribution measured from past angling (Alexander and Shetter 1969). A hooking mortality rate for sublegal trout caught and released under a 10-inch size limit was assumed to be 30%. Natural mortality was assumed to be negligible during the cropping season.

Average lengths and weights of trout were calculated every 2 weeks from samples taken for mark-and-recapture estimates and catch quotas. Growth rates for the normal and delayed opening seasons were assumed to be the same.

Results

Delaying the fishing season until 1 July had a beneficial effect on trout yield (Table 1). Under this scheme, the anglers average catch was 21.1 lbs/acre compared to 15.8 for the normal season with a 10-inch minimum. Also,

the delayed season had a 24% greater yield on the average than the normal season with no minimum size. The delayed season resulted in a 33% increase in weight harvested over the present Michigan fishing regulations. In addition, trout harvested under a delayed season would be larger on the average, measuring 12.5 inches and 0.78 pounds versus 12.2 inches and 0.68 pounds for a normal season with a 10-inch size limit, and 11.2 inches and 0.54 pounds for a normal season with no minimum size (Table 2, 3, and 4).

The number of trout creeled was greater under a delayed season than the normal season with a 10-inch size limit -- 26.4 trout/acre compared to 22.8 trout/acre. However, greater numbers of fish, 30.4 trout/acre would be creeled during a normal season with no minimum size limit. The lower number of trout creeled under the normal season with a 10-inch minimum limit occurred because of hooking mortality of sublegal fish during April, May, and June.

Average annual production of trout was 21.6 pounds/acre for the delayed season with either size limit (Table 1). By contrast, the production for the normal season with a 10-inch minimum size was 20.2 lbs/acre and for the normal season with no minimum size 18.1 lbs/acre.

Except for the 1979 plant, survival of trout between mid-April and mid-June was relatively high, ranging between 77% and 89%. In the case of the 1979 plant, survival was only 50%. This lower survival was probably due to predation from loons (Gavia immer) which were present on the lake during May and June 1980. No loons were observed during the other years of the study. Loons and other avian predators can be significant predators of trout (Alexander 1977, 1979; Fraser 1978; Johnson 1978; Flick 1983).

Discussion

This study indicated that angler harvest of trout can be increased by delaying the trout season opening date until 1 July. Larger, heavier trout would be creeled because they would be able to take advantage of good growing conditions in early spring. However, to attain this harvest, anglers would lose over 2 months of fishing and many anglers may not wish to give up this early season fishing. One possible way to partially mitigate the loss would be to allow a catch-and-release fishery in the spring (April-June). A similar fishery has proven successful in a marginal trout stream in an urban area (Carl et al. 1977). However, fishing lures would have to be restricted to artificial flies and lures, at least during the early catch-and-release period to minimize hooking mortality. Shetter and Allison (1955, 1958) have shown hooking mortality rates with artificial flies to be only 2% compared to 5% for other artificial lures such as spoons and spinners, and 40% for natural bait. The success of this regulation, as with any other regulation, would depend on good public compliance.

Rainbow trout were selected for use in this experiment, but regardless of species used, delaying the opening of the fishing season would provide similar benefits. However, the greater the growth and the lower the natural mortality of the species in the April-July period, the greater will be those benefits.

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Table 1. Trout yield and production (pounds per acre) in East Fish Lake under three different fishing regulations.

Year class	Yield			Production		
	Normal season		Delayed season	Normal season		Delayed season
	10-inch size limit	No size limit	Either size limit	10-inch size limit	No size limit	Either size limit
1977	23.6	24.7	30.3	27.6	24.8	27.4
1978	20.5	21.5	34.4	24.6	21.9	32.6
1979	21.5	23.0	21.6	25.5	22.4	24.5
1980	6.3	7.2	7.6	11.2	10.1	11.1
1981	7.1	8.3	11.4	12.2	11.2	12.2
Average	15.8	16.9	21.1	20.2	18.1	21.6

Table 2. Number, weight, and average size of trout in the catch under a delayed fishing season either with a 10-inch size limit or no size limit.

Year class	Number	Total weight (pounds)	Average size of individuals	
			Weight (pounds)	Length (inches)
1977	569	484.9	0.85	12.8
1978	686	550.4	0.80	12.5
1979	439	346.0	0.79	12.4
1980	178	121.0	0.68	11.9
1981	238	182.1	0.76	12.7
Average	422	336.9	0.78	12.5

Table 3. Number, weight, and average size of trout in the catch under a normal fishing season with a 10-inch size limit.

Year class	Number	Total weight (pounds)	Average size of individuals	
			Weight (pounds)	Length (inches)
1977	502	377.3	0.75	12.6
1978	473	328.6	0.69	12.3
1979	513	344.7	0.68	12.3
1980	156	101.2	0.65	11.9
1981	174	112.2	0.64	11.9
Average	364	252.8	0.68	12.2

Table 4. Number, weight, and average size of trout in the catch under a normal fishing season with no size limit.

Year class	Number	Total weight (pounds)	Average size of individuals	
			Weight (pounds)	Length (inches)
1977	646	395.6	0.61	11.7
1978	606	343.6	0.57	11.4
1979	689	368.9	0.54	11.2
1980	233	115.1	0.49	10.7
1981	263	132.5	0.50	10.8
Average	487	271.1	0.54	11.2

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