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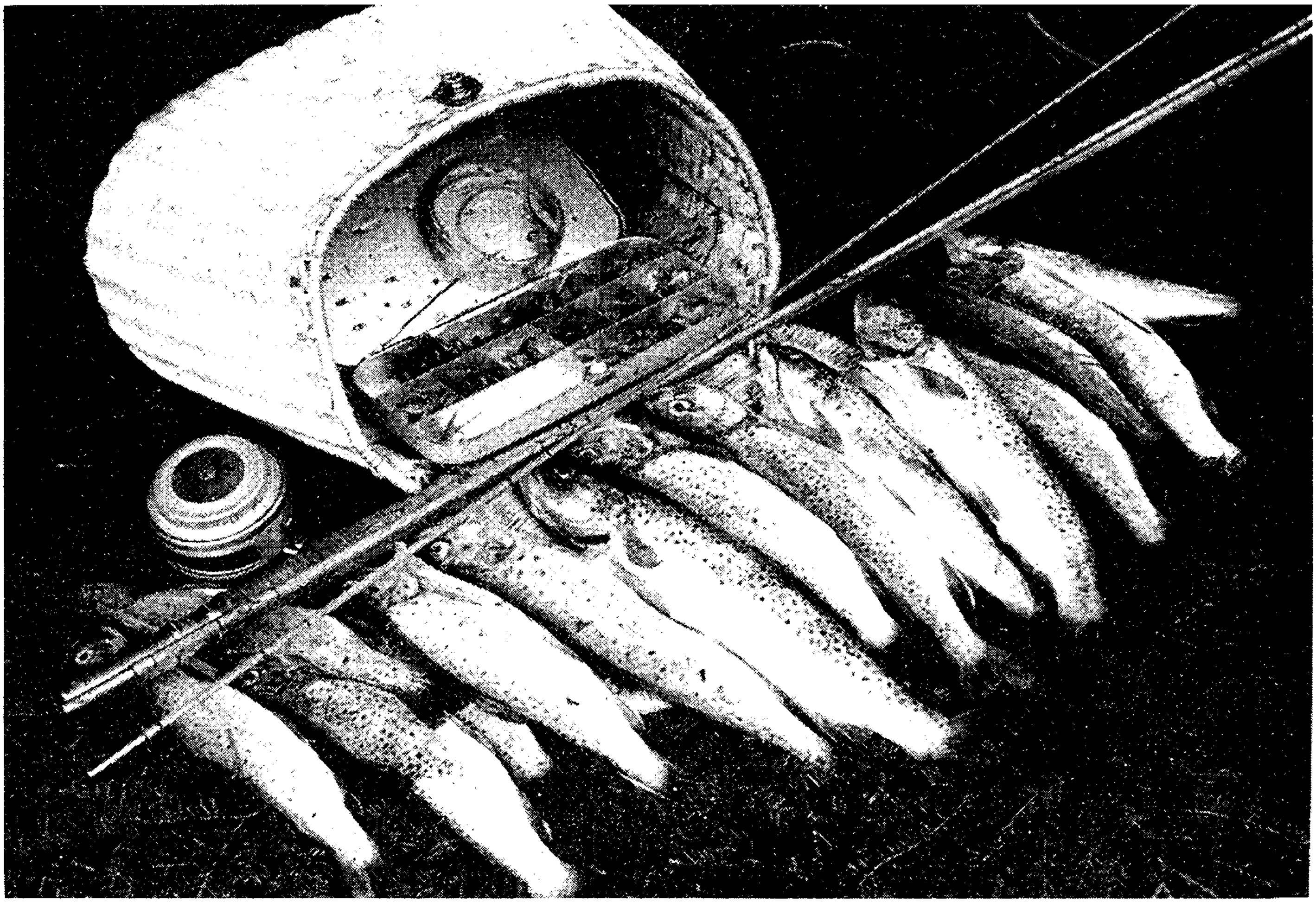

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES

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Comparative Catchability, Growth, and Survival of Two Wild Stocks of Brown Trout

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Abstract. –The catchability and genetic growth potential of trout may be changed, over time, by differential angler harvest of more catchable and faster-growing fish from each cohort. To test this hypothesis, yearling brown trout *Salmo trutta* from the Au Sable River and Gilchrist Creek were stocked into Fuller Pond. Brown trout populations from the Au Sable River were believed to have been historically exploited more intensively than those in Gilchrist Creek. We compared their vulnerability to capture by angling, relative growth, and survival over a 2.5 year period. Using artificial flies and lures, Gilchrist fish were approximately four times easier to catch at age 2, and three times easier to catch at age 3 than Au Sable fish. Vulnerability to angling was not correlated with growth rates, as few significant differences occurred in growth. There was also no difference in survival of the two strains during the study period. Differential angler exploitation over time may have altered catchability of these wild trout stocks. Other factors that could account for observed differences in catchability include genetic dissimilarity of founder stocks, genetic differences due to differences in natural selection between the rivers, or unknown factors. By selection of appropriate brood stocks, fishery managers could double or quadruple brown trout catch rates for some catch-and-release fisheries that are established or maintained by stocking. Conversely, managers could reduce angler exploitation rate, thus permitting trout to grow for a greater length of time in harvested fisheries, by stocking strains that are less catchable.

The genetic potential for growth may become degraded by differential angler harvest, over time, of the more catchable and faster-growing fish from each cohort, thus leaving the slower growers to reproduce the stock. Alexander (1987) reported that wild brown trout *Salmo trutta* populations that were believed to have been exposed to high levels of size-selective exploitation grew more slowly than lightly exploited stocks. Cooper (1952) showed that anglers differentially exploited faster-growing brook trout *Salvelinus fontinalis* in the Pigeon River. Brauhn and Kincaid (1982) and Dwyer and Piper (1984) found that rainbow trout *Oncorhynchus mykiss* strains which were genetically selected for faster growth were more vulnerable to angling than slower-growing domestic or wild strains. Catchability may also vary between stocks for reasons other than growth rate. Dwyer (1990) reported that catchability of three strains of cutthroat trout *Oncorhynchus clarki* appeared to be directly related to their degree of domestication. Nuhfer and Alexander (1991) found that wild brook trout stocks from two branches of the Au Sable River were harder to catch than wild stock from the

East Branch Fox River that had been harvested less intensively over time.

Fishery managers usually consider only stock performance characteristics such as expected growth and survival in making decisions on which strain of a particular species to stock. However, catchability of stocks is another performance factor that can be used to increase fishing quality. Michigan is presently considering changes in regulations that will result in more catch-and-release trout fishing. Because any given water body has a finite carrying capacity for fish, it follows that more catchable stocks having suitable survival and growth should yield higher catch rates in catch-and-release waters. Conversely, some fish populations are intensively harvested before many individuals reach desirable or trophy size. Some of these fisheries could be improved by introducing stocks having lower catchabilities.

The primary objectives of the present study were to determine if wild brown trout from Gilchrist Creek, Michigan, which have been exposed to relatively low angling exploitation over time, differ in catchability, growth, or survival compared to brown trout from the Au Sable River that have been subjected to more intense exploitation. We hypothesized that growth rates and the historical harvest intensity of different stocks might be correlated with catchability.

Study Area

Yearling brown trout were collected from the Mainstream Au Sable River (T26N, R2W, Sections 4 and 5, T26N, R3W, Section 12), and Gilchrist Creek (T28N, R3E, Sections 3 and 10). The Mainstream Au Sable River has a mean width of approximately 28.8 m, a mean annual discharge of 5.27 m^3/s, and water velocities that generally range from 0.3 to 0.9 m/s in the areas where trout were collected (Coopes 1974; Hendrickson and Doonan 1974; Nuhfer 1979). Substrate in the river is predominantly sand, gravel and small cobble. Maximum water depth rarely exceeds 2 m. The trout collection area in Gilchrist Creek had a mean width of approximately 5 m. No gauging station exists on this river, but discharge measured on 5 August 1993 was 0.53 m^3/s. Maximum pool depth in this area is approximately 1.1 m. The primary substrates are sand and gravel.

Brown trout from the Au Sable River have been subject to more intensive harvest over the past 100 years than trout in Gilchrist Creek. The estimated annual fishing pressure from 1958-76 for the North Branch and Mainstream Au Sable rivers ranged from 371 to 1065 hours per hectare (Alexander et al. 1979). Fishing pressure prior to this time was probably also high due to the river's long-standing reputation as a good trout stream and its accessibility to anglers from Michigan's population centers. No creel surveys have been conducted on Gilchrist Creek, but fishing pressure appears to be relatively low because it is more distant from population centers and has not been widely publicized. Gilchrist Creek has been fished primarily by bait anglers, rather than fly or lure anglers, due to its narrower width and the dense growth of tag alders along its banks that make fly and lure casting difficult. Anglers in the section of the Au Sable River where trout were collected have been required to only use artificial flies since 1950.

Brown trout performance tests were conducted in Fuller Pond, a shallow 6.1 hectare impoundment created by an earthen dike at the site of an old beaver dam located within the Hunt Creek Fisheries Research Area in Montmorency County. Methyl orange alkalinity ranges from 140-175 ppm, and pH averages about 8.0 (Alexander et al. 1991). Temperature and oxygen conditions are suitable for salmonid survival at all times of the year. Fuller Pond contained populations of brook trout, fathead minnows *Pimephales promelas*, northern redbelly dace *Phoxinus eos*, brook stickleback *Culaea inconstans*, central mudminnows *Umbra limi*, and a few Arctic grayling *Thymallus arcticus* (introduced by stocking).

Methods

Yearling brown trout from each stock were collected by continuous current 230-volt DC electrofishing gear during the first two weeks of May 1990. Based on our knowledge of growth for these stocks, we assumed that all brown trout from 70-170 mm in length were age 1. Trout were stocked into Fuller Pond on the same day they were captured. No sorting or selection of trout was done prior to transplanting. Thus, trout caught and transplanted were as close as possible to a random sample of yearling cohorts. Upon capture, all trout were measured and fin clipped for permanent identification. Stresses due to collection, holding, transporting, fin clipping, and stocking were believed to be similar for both groups of trout, and no mortalities occurred before they were stocked into Fuller Pond. Mean total lengths and weights of Mainstream Au Sable River brown trout (henceforth called Au Sable stock) were 119 mm and 18 g. Mean lengths and weights of Gilchrist Creek brown trout (henceforth called Gilchrist stock) were 126 mm and 20 g. We stocked 543 Au Sable brown trout, and 542 Gilchrist stock into the lake. Fuller Pond was closed to fishing and patrolled at random times to assess and deter poaching. No evidence of poaching was detected.

After stocking, trout were allowed to grow for two and one-half years, during which their incremental growth and survival were estimated periodically. Sampling began in late April 1991 to obtain population estimates using mark-recapture techniques. Populations of each stock were estimated on 26 April 1991, 25 October 1991, 7 May 1992, and 1 November 1992. The sparse populations of brook trout and Arctic grayling were also estimated. A final sample was obtained by gill netting and by trapping at the outlet when the pond was drained during November 1992. Total length (mm) and weight (g) was measured for each fish caught during the above sampling dates.

Fish were caught by angling using artificial flies and lures during 1991 and 1992. Fishing effort with flies or lures was distributed nearly uniformly over both the 1991 and 1992 fishing periods. The 1991 fishing period began on 9 May, and ceased on 27 September. Fishing in 1992 began on 5 May, and ended on 29 September. Complete records of catch and effort were recorded for each tackle type (flies or lures). Catches were also recorded for brook trout and Arctic grayling. Fly fishing was conducted using both wet and dry flies and streamers. The most common lures used were Mepps spinners, Cleo and Daredevil spoons, Flatfish, and Rapalas. Total hours of angling effort were 152 during 1991 and 122 during 1992. Angler-caught trout were held in fine-mesh nylon nets for 24 hours after capture to determine if there was any short-term hooking mortality. Living fish were anaesthetized, measured, fitted with numbered metal jaw tags, and released. Jaw tags were also applied to untagged brown and brook trout captured by electrofishing during fall 1991 and spring 1992. All Arctic grayling had been tagged with Floy anchor tags during a previous study.

Population estimates and variances were computed using the Bailey modification of the Petersen mark-and-recapture method (Bailey 1951). Fish were marked with either fin clips or jaw tags depending upon sampling date. Mean lengths, weights, and incremental growth in length and weight were compared for each strain between sampling dates using analysis of variance. Stock means were judged to be significantly different if $P \leq 0.05$. The assumption of homogeneity of variance was tested using the Bartlett test (Neter and Wasserman 1974). Relationships between total length and weight for the two brown trout stocks were compared by analysis of covariance. All statistical analyses were done using procedures in the SPSS/PC+ software package (Norusis 1988, 1990). Percent survival was computed based on known or estimated populations for various time periods between the time trout were stocked and removed. The average number of fish in each group that was available to be caught during each fishing period (season) was estimated by assuming a constant survival rate between spring and fall population estimates. Catch rates were computed for each stock as catch per hour per 100 fish available.

Results

Vulnerability to angling

Gilchrist Creek brown trout were 2.7 times easier to catch in Fuller Pond with artificial flies and lures than were Au Sable River brown trout

(Table 1). Pooled data (1991-92 seasons) for once-caught brown trout revealed a catch per hour per 100 fish of 0.1521 for the Gilchrist stock compared to 0.0572 for the Au Sable stock. Catch rates including fish caught multiple times indicated that the Gilchrist stock was 2.8 times easier to catch (Table 2).

Differences in catchability between the Gilchrist and Au Sable stocks declined with age. During the 1991 angling season (when all brown trout were age 2) the Gilchrist stock was 3.7 times easier to catch, whereas during 1992 it was 2.1 times easier (based on fish caught only once). When multiple captures were considered, the Gilchrist stock was 4.1 times easier to catch at age 2 and 2.2 times easier at age 3.

Consistently greater differences in catchability between stocks were observed for fish caught on artificial flies. The Au Sable stock, whose ancestors have historically been more intensively harvested by fly anglers, was relatively harder to capture with artificial flies than the Gilchrist stock.

Brook trout and Arctic grayling were consistently caught at much higher rates than either brown trout stock (Tables 1 and 2). Brook trout were approximately 5 times easier to catch than Gilchrist brown trout during both the 1991 and 1992 seasons, based on fish caught 1 or more times (Table 2). They were approximately 20 times easier to catch than age-2 Au Sable brown trout and 11 times easier to catch than age-3 Au Sable brown trout. Brook trout caught ranged from 178 to 550 mm in length. Catch rates for Arctic grayling presented in this report are similar to native brook trout catch rates. However, their sparse and uneven distribution made them invulnerable to much of the angling effort. Grayling caught ranged from 335 to 366 mm in length.

If experimental anglers had not released all fish, they could have harvested 22% of the 198 Gilchrist stock available in 1991, but only 6% of the 194 Au Sable stock present. Similarly, during 1992 they could have harvested 19% of the Gilchrist stock and 9% of the Au Sable stock. By comparison, they could have harvested 89% of the native brook trout population in 1991 and 79% in 1992. All Arctic grayling present in Fuller Pond were caught at least once during both 1991 and 1992. Because all fish were released, they were available to be caught multiple times. During 1991 nearly 21% of the Gilchrist stock taken were caught a second time compared to 8% for the Au Sable stock. During 1992, approximately 12% of the brown trout of both stocks taken once were caught a second time. One Gilchrist brown trout was caught three times. The catchability of brown trout that were caught, tagged, and returned to the pond, did not appear to be lower than that of naive fish.

Growth

Growth rates of the Au Sable and Gilchrist stocks were not significantly different over two and one half years (Table 3). Incremental growth in length between stocking and the end of the study was 262 mm for the Au Sable stock and 266 mm for the Gilchrist stock. Incremental growth in weight over this total study period was 593 g for the Au Sable stock and 611 g for the Gilchrist stock (Table 4). Although growth increments (length or weight) of the two stocks over the entire study period were not significantly different, the mean lengths and weights of Gilchrist brown trout were significantly higher than Au Sable brown trout at stocking (Table 3, 4). The Gilchrist stock also grew significantly larger in length and weight increments than the Au Sable stock during the first year after planting. However, after 17 months residence in Fuller Pond, growth increments for the two stocks were equivalent. Statistically significant but minor differences were found for mean lengths and incremental length gains of each stock between various sampling dates throughout the study. However, we believe that incremental weight increases provide the most meaningful comparisons of growth, and these increments were not significantly different after April 1991 (before angling began). Moreover, mean total weights of the two stocks were not significantly different when the trout were removed from the pond. Analysis of covariance indicated that the relationship between total length and weight was not significantly different between the Gilchrist and Au Sable stocks, although there were minor differences in slopes and intercepts of the length/weight regressions.

Survival

There was no significant difference in the survival of Au Sable and Gilchrist brown trout over two and one half years (Table 5). Survival over this period was 32% for the Au Sable stock and 30% for the Gilchrist stock.

Survival for the first and second year after stocking into Fuller Pond was the same for both brown trout stocks. First-year survival after planting in May 1990 was 40% for both stocks. Second-year survival was 80% for the Au Sable stock and 74% for the Gilchrist stock, and this difference was not statistically significant. Small differences in survival between the two brown trout stocks estimated over the first and second fishing seasons (summers of 1991-92) were not significantly different. During the first fishing season survival was 83% for the Au Sable stock and 77% for the Gilchrist stock. During the 1992 fishing season survival of the Au Sable stock was 96% compared to 99% for the Gilchrist stock. Over-winter survival (1991-92) was 98% for the Au Sable stock and 95% for the Gilchrist stock. Survival over winter of 1990-91 was not determined.

Discussion

Vulnerability to angling

The hypothesis that growth rate and angling vulnerability are positively correlated was not supported by the findings of this study. Gilchrist brown trout were approximately three times easier to catch than Au Sable fish, although both stocks were about the same size and both grew at the same rate over the fishing period. Similarly, wild brook trout stocks from two branches of the Au Sable River were harder to catch than a faster-growing stock from the East Branch of the Fox River (Nuhfer and Alexander 1991). Thus, the lower catchability of both brook and brown trout from the Au Sable River may be unrelated to growth rate.

Our findings support the hypothesis that catchability of Au Sable fish may have been reduced by high angler exploitation of the parental stock. This hypothesis was further supported by the Au Sable brown trout being relatively harder to catch on artificial flies than on lures. Very few fish harvested from Gilchrist Creek have been exposed to artificial flies, whereas the Au Sable River stock has been heavily harvested by fly angling for many years. Because our sample sizes were small for different tackle types, the hypothesis that trout catchability by different tackle types has been influenced by selective angler harvest should be viewed with caution. However, differences in catchability between rainbow trout strains using different tackle types have also been reported (Fay and Pardue 1986). Trojnar and Behnke (1974) reported that Snake River cutthroat trout were more catchable by flies than Pikes Peak cutthroat trout, and this was partly due to the surface feeding behavior of the former group that made it relatively more vulnerable to anglers fishing on or near the surface of the lake. Differences in catch-ability by different tackle types observed in our study are probably not the result of spatial segregation of the brown trout stocks tested. Angling and electrofishing samples suggested that both stocks were distributed throughout the pond during the 1991 and 1992 fishing periods. Moreover, the shallow average depth of the pond (0.7 m) would not have prevented any fish from seeing either artificial flies or lures.

Evidence for changes in vulnerability with fish size was contradictory. Catchability of age-2 and -3 Gilchrist fish was about the same whereas the Au Sable stock was nearly 2 times more catchable at age 3 than at age 2. The probability of angler capture appears to increase with fish size for brown trout, brook trout, largemouth bass *Micropterus salmoides,* and smallmouth bass *Micropterus dolomieui* (Favro et al. 1986; Burkett et al. 1986; Clapp and Clark 1989; Nuhfer and Alexander 1991).

Differences in the degree of domestication of past parental Au Sable and Gilchrist stocks probably do not account for the differences in catchability observed. Dwyer and Piper (1984) found that domesticated rainbow trout were much easier to catch than wild strains. Dwyer (1990) reported that more domesticated strains of cutthroat trout appeared to be more easily caught by anglers. It is very unlikely that the genetic character of more catchable Gilchrist stock evaluated in our study has been recently affected by stocked domestic brown trout. We could find no record of brown trout ever being stocked in Gilchrist Creek. Presumably this stock originated from brown trout that migrated from stocking sites elsewhere in the Thunder Bay River system, probably early in this century. It is known that brown trout were established in Gilchrist Creek by 1940. Brown trout were first stocked in the Au Sable River during the 1890's (Westerman 1961), however since 1954 no brown trout have been stocked into the river section where we collected trout for this study.

Another possible interpretation of catchability differences is that natural selection related to other sources of mortality has resulted in a divergence in vulnerability to angling as well. Presumably, mortality due to predacious fish and birds would represent selection for wariness, and less wary trout would be more vulnerable to predation. The high and insignificantly different survival rates exhibited by both stocks during this study suggests that both were either quite wary of natural predators or predation risk was low.

The limited exposure of yearling trout to angling before they were collected was not likely to alter their catchability. The fish were exposed to angling primarily as age-0 fish at sizes less than 102 mm. They could have been exposed to angling for at most two weeks as yearlings when they averaged approximately 123 mm long. Trout of this size are rarely caught, even by fly anglers.

Growth

The minor differences in growth between the Gilchrist and Au Sable stocks were unexpected. Alexander (1987) previously found that the Gilchrist stock grew faster than the Au Sable stock from age 0 through age 2 in 4 study lakes. In the present study, the Gilchrist stock did grow significantly better through age 2, but the difference in growth increment was small (9 mm, and 19 g). After the first years' growth there were essentially no differences between the stocks. Slight differences in specific fish collection sites within the two source rivers could probably not account for the different growth characteristics in these two studies. The lack of growth differences through age 3 are most likely due to environmental differences, such as differing food availability between Fuller Pond and the study lakes used by Alexander (1987). Fuller Pond had much more abundant forage fish populations than any of the lakes used by Alexander (1987).

Survival

There were no significant differences in survival of the two wild brown trout stocks. Similarly, Alexander (1987) found no significant difference in the survival of four wild strains of brown trout transferred from Michigan rivers into experimental lakes.

Management implications

Different wild stocks have attributes that can make them either more or less suited for certain management objectives. Since all water bodies have some maximal fish stock that they can support, the higher catchability of the Gilchrist Creek stock could yield significantly higher catch rates in catch-and-release fisheries. Fishery managers are presently considering changes in trout regulations for Michigan that will result in more fish being released. More catchable stocks could significantly increase the catch of trout in waters managed as harvest-restrictive fisheries. More catchable brown trout stocks may also yield better returns from put-grow-take fisheries established in lakes. Conversely, less catchable stocks may be more suited for fisheries established or maintained by stocking and subjected to high fishing mortality. They may also survive better to produce "naturalized" wild stocks. Michigan is presently planning to establish brown trout brood stocks derived from wild parents. Previous research done in Michigan and the continental U.S. has consistently shown that wild stocks survive better than domesticated stocks (Miller 1953, 1958; Vincent 1960; Flick and Webster 1976; Butler 1980; Alexander and Peterson 1983; Alexander 1987). Both the Gilchrist and Au Sable stocks are probably well adapted to stream environments. Both this study and the study by Alexander (1987) showed that wild brown trout stocks from Michigan rivers have high survival in lakes. In the 1987 study, survival of wild strains was double that of domestic brown trout. Managers should consider relative catchability between strains and between salmonid species, as well as expected survival and growth, when selecting fish to meet specific management objectives.

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Table 1.–Catch per hour per 100 fish available in Fuller Pond, based on fish caught only once a year by artificial flies and lures, 1991-92. Number of hours of angling with each tackle type in parenthesis.

Fish species or stock	Terminal tackle type		
	Lures	Flies	Lures and flies
	1991		
Gilchrist Creek brown trout	0.1718 (72)	0.1224 (80)	0.1458 (152)
Au Sable River brown trout	0.0561 (72)	0.0253 (80)	0.0399 (152)
Brook trout	0.7850 (72)	0.4076 (80)	0.5864 (152)
Arctic grayling	0.4630 (72)	0.8333 (80)	0.6579 (152)
	1992		
Gilchrist Creek brown trout	0.1201 (66)	0.1960 (56)	0.1549 (122)
Au Sable River brown trout	0.0689 (66)	0.0812 (56)	0.0745 (122)
Brook trout	0.7974 (66)	0.4699 (56)	0.6471 (122)
Arctic grayling	1.5152 (66)	0.0 (56)	0.8197 (122)
	Both years combined		
Gilchrist Creek brown trout	0.1460 (138)	0.1592 (136)	0.1504 (274)
Au Sable River brown trout	0.0625 (138)	0.0532 (136)	0.0572 (274)
Brook trout	0.7912 (138)	0.4388 (136)	0.6167 (274)
Arctic grayling	0.9891 (138)	0.4167 (136)	0.7388 (274)

Table 2.–Catch per hour per 100 fish available in Fuller Pond, based on fish caught one or more times a year by artificial flies and lures, 1991-92. Number of hours of angling with each tackle type in parenthesis.

Fish species or stock	Terminal tackle type		
	Lures	Flies	Lures and Flies
	1991		
Gilchrist Creek brown trout	0.2148 (72)	0.1418 (80)	0.1763 (152)
Au Sable River brown trout	0.0631 (72)	0.0253 (80)	0.0432 (152)
Brook trout	0.8454 (72)	0.8967 (80)	0.8724 (152)
Arctic grayling	1.3889 (72)	1.2500 (80)	1.3158 (152)
	1992		
Gilchrist Creek brown trout	0.1201 (66)	0.2504 (56)	0.1799 (122)
Au Sable River brown trout	0.0755 (66)	0.0913 (56)	0.0838 (122)
Brook trout	1.1962 (66)	0.6579 (56)	0.9491 (122)
Arctic grayling	1.5152 (66)	0.0 (56)	0.8197 (122)
	Both years combined		
Gilchrist Creek brown trout	0.1674 (138)	0.1961 (136)	0.1781 (274)
Au Sable River brown trout	0.0703 (138)	0.0583 (136)	0.0635 (274)
Brook trout	1.0208 (138)	0.7773 (136)	0.9108 (274)
Arctic grayling	1.4520 (138)	0.6250 (136)	1.0677 (274)

Table 3.–Mean total lengths (mm) of Gilchrist Creek and Au Sable River brown trout in Fuller Pond at 5 dates from stocking in 1990 to removal in 1992. Two standard errors in parenthesis.

Stock	Sample size	Total length	Growth Increments: From planting date	Growth Increments: Between sampling dates
		15 May 1990		
Gilchrist	542	126[1]	–	–
		(1.2)	–	–
Au Sable	543	119[1]	–	–
		(1.4)	–	–
		26 April 1991		
Gilchrist	112	264[1]	138[1]	138[1]
		(5.4)	(5.4)	(5.4)
Au Sable	87	249[1]	129[1]	129[1]
		(7.0)	(7.0)	(7.0)
		24 October 1991		
Gilchrist	40	321[1]	195	56
		(9.2)	(9.2)	(9.2)
Au Sable	47	304[1]	185	55
		(9.6)	(9.6)	(9.6)
		7 May 1992		
Gilchrist	60	336	210	15[1]
		(7.4)	(7.4)	(7.4)
Au Sable	63	331	211	27[1]
		(7.6)	(7.6)	(7.6)
		1 November 1992		
Gilchrist	146	391[1]	266	55
		(7.0)	(7.0)	(7.0)
Au Sable	170	381[1]	262	51
		(6.0)	(6.0)	(6.0)

[1] Stock means significantly different, ANOVA, $P < 0.05$.

Table 4.–Mean weight (g) of Gilchrist Creek and Au Sable River brown trout in Fuller Pond at 5 dates from stocking in 1990 to removal in 1992. Two standard errors in parenthesis.

Stock	Sample size	Total weight	Growth Increments: From planting date	Growth Increments: Between sample dates
		15 May 1990		
Gilchrist	542	20[1]	–	–
		(0.52)	–	–
Au Sable	543	18[1]	–	–
		(0.66)	–	–
		26 April 1991		
Gilchrist	112	172[1]	152[1]	152[1]
		(10.6)	(10.6)	(10.6)
Au Sable	87	151[1]	133[1]	133[1]
		(13.6)	(13.6)	(13.6)
		24 October 1991		
Gilchrist	40	311	291	141
		(29.9)	(29.9)	(29.9)
Au Sable	47	281	263	131
		(24.8)	(24.8)	(24.8)
		7 May 1992		
Gilchrist	60	374	354	63
		(27.8)	(27.8)	(27.8)
Au Sable	63	364	346	83
		(22.4)	(22.4)	(22.4)
		1 November 1992		
Gilchrist	146	631	611	257
		(39.0)	(39.0)	(39.0)
Au Sable	170	610	593	247
		(28.1)	(28.1)	(28.1)

[1] Stock means significantly different, ANOVA, $P < 0.05$.

Table 5.–Population estimates with two standard errors for Gilchrist Creek and Au Sable River brown trout in Fuller Pond between May 1990 and November 1992.

Date	Population of each stock	
	Gilchrist Creek	Au Sable River
15 May 1990	542 ± 0	543 ± 0
26 April 1991	222 ± 47	218 ± 70
24 October 1991	173 ± 76	182 ± 74
7 May 1992	165 ± 37	180 ± 50
1 November 1992	164 ± 29	174 ± 35

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