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CHANGING CONCEPTS IN FISH MANAGEMENT

by

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NOTE: The following facts and conclusions have been assembled from various Institute reports, most of which have already been submitted to the Department, although a few are still in preparation.

The recommendations made are based upon the accumulating mass of evidence from research in Michigan and other states and are believed to be generally sound. Further work on some phases is called for or is actually in progress and some of the present conclusions may be modified somewhat as additional data become available.

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Michigan pioneered in the early development of fish culture in the United States both of trout and of pondfish such as black bass and bluegills. Probably this state has always had as good or better fish rearing and fish planting facilities and methods than any other. Michigan's present system of hatcheries and rearing stations is in most respects comparable to those of other states. The number and size of fish planted compare favorably with those reported by any of our neighbors.

Fish culture has made some real contributions to fishing in Michigan by introducing and establishing desirable game fish. According to early settlers and explorers, brook trout were not found in many Lower Peninsula streams until after they were planted. Rainbows and browns were also fortunate introductions in most waters where they were stocked. The widespread planting of bluegills, bass, perch and pikeperch (walleyes) in recent years has also resulted in establishing these species in many lakes to which they were not originally native.

The harm done by fish plantings is generally overlooked or has not been widely publicized but should be weighed against the benefits in any fair appraisal.

The spread of carp has generally been recognized as detrimental to game fish production mainly by roiling the water and by interfering with

fish food production in other ways. The widespread planting of perch has established them in certain trout waters generally to the detriment of trout. Plantings of bluegills, bass and pikeperch have also been made in actual or potential trout waters generally by or at the behest of uninformed sportsmen or resort owners. The addition of new species in order to "add variety" to the fishing is believed to have upset the natural balance in many waters resulting in generally poor fishing for both the native and the introduced forms. The widespread planting of crappies in northern Wisconsin waters has been blamed for the decline in bass fishing which has generally resulted. The introduction or the natural spread of brown trout is thought to have damaged brook trout fishing in many Michigan streams. Whether the resulting fishing for this European species more than makes up for this real or fancies damage is the subject of debate, but all evidence indicates that in most waters brook trout fishing declines once brown trout become established.

Probably the most serious charge which can be made against fish planting is that it has spread objectionable parasites and diseases. The gill louse of brook trout and the tapeworm of brook trout were found in few if any Michigan waters before plantings of infested stock. All private hatcheries known to be selling this species in Michigan at present have stock infested with gill lice, and a number of our own state hatcheries and rearing stations plant out brook trout which carry gill lice and in some cases tapeworms. Conscientious efforts have been made to eliminate the gill louse at several stations, but at other locations it would be very difficult or perhaps impossible. Since only brook trout carry this gill louse and the brook trout tapeworm, the further spread of these parasites could be stopped by raising browns and rainbows only at stations where the water supply is contaminated and cannot be cleaned up. Brook trout planting would have to be curtailed or stock would have to be transported for greater distances if this plan were adopted. Another alternative would be to provide in these districts new rearing facilities for brook trout where the water supply is free of these parasites.

While plantings have doubtless spread the "black spot" and "yellow grub" and other parasites having part of their life cycles in birds, this is not so serious since these parasites were probably widespread originally and since water birds act as carriers. Fish cultural operations are directly responsible, however, for the spread of the highly objectionable "bass tapeworm" since it can only be introduced by the planting of infected fish or infected water fleas as the life cycle is confined to these two animals. Because of its restricted life cycle, the original distribution of the bass tapeworm is thought to have been extremely limited prior to fish planting. Young bass, bluegills and perch can carry this parasite and most of our hatcheries and rearing ponds have been found to be infected or subject to infection. A high percentage of the adult bass taken in the Great Lakes for transfer to inland waters is also infected. Although many lakes examined have been found to have the bass tapeworm, this should be no excuse for continuing to plant parasitized fish. Strenuous efforts have been made by our fish culturists to eliminate this parasite as its presence has been brought to their attention and good progress in developing tapeworm-free brood stock has been made at most hatcheries, but there is the constant danger of re-infection from water supplies or by the transfer of infected stock.

Lymphocystis, a virus disease causing ugly, gelationous growths on

the body and fins of the pikeperch, has been introduced into Gogebic and Houghton and possibly other lakes by plantings of infected fry produced from fish from Saginaw Bay, where the disease is common. Further plantings from this source to inland lakes should be discontinued.

It has also been suggested that fish planting may have caused or may have aggravated the overpopulation and stunting found in a number of lakes in recent years. While a few instances have been cited in which extremely large numbers of young fish have been planted (mostly perch transferred by local sportsmen's groups), ordinarily the small fish stocked in any lake or stream have been too few to have affected the population appreciably. A few pair of breeders would in most cases have provided more bluegill or bass fingerlings through natural reporduction than the few thousand planted in the average lake.

There is no evidence that plantings of trout or warm-water fish are needed to "bring in new blood" to prevent stunting or otherwise improve the stock of fish already present. Many of the lakes where stocking has been most consistent now contain stunted bluegills. While the number planted was probably not sufficient to cause the stunting, obviously the introduced fish did not prevent it. On the other hand, the transfer of stunted bluegills to lakes from which all fish had been removed resulted in rapid resumption of growth, proving that the slow growth was due to the environment rather than to heredity.

The findings of research indicate that further changes may be needed in the propagation and planting of trout and that plantings of warm-water fish should be largely discontinued.

Likewise in protective and restrictive legislation Michigan has led the way or has kept pace with other progressive states. True we lost the grayling, but ichthyologists question whether this was due to overfishing and lack of or disregard of laws so much as to the changes in the character of the watersheds as a result of lumbering and agriculture and the competition which followed the introduction of trout. Possibly all three factors may have been responsible in causing the extinction of a fish which was in the extreme southern limit of its range and which was a relic of the ice age. Current research indicates that Michigan as well as most other states has gone too far in making regulations, some of which now seem to be unnecessary or actually harmful. On the other hand, in the case of trout possibly even further restrictions are required in order to maintain satisfactory fishing. The evidence secured concerning present methods employed to maintain fishing are discussed for trout and for warm-water fish separately although the findings are parallel in certain respects.

PLANTING, HABITAT IMPROVEMENT AND POPULATION CONTROL IN TROUT WATERS

Trout planting. Planting of fingerling trout at any season of the year does not add to the trout catch in streams having suitable spawning habitat. From ten plantings of marked fingerling brook trout on seven different streams, the average return to the fisherman was only 0.42 per cent. One experiment involving rainbow fingerlings yielded 1.07 and one experiment with brown trout fingerlings 0.0. These results have been confirmed and supplemented by experiments in three other states. Averaged together, the published returns to the angler from fingerling brook trout

plantings amount to about 1 per cent; for rainbows 2 per cent, and for browns 3 per cent. The Department's Hunt Creek Fisheries Experiment Station has reported figures on the anglers' catch following two years of heavy marked fingerling brook trout planting followed by four additional years of no planting whatsoever. It was found that the plantings contributed little to the catch (0.07 per cent of 35,109 for the 1939 planting and 0.28 per cent of 17,635 planted in 1940 came into the catch in subsequent years). The quality of fishing (catch per fisherman-hour) has not been adversely affected by discontinuing fingerling planting. While a few fingerlings from plantings do survive to the angler's creel and, unless marked cannot be distinguished from wild fish, it is our belief that those that do survive do so at the expense of an equal number of wild fingerlings so that nothing is gained by planting fingerling trout in the great majority of our streams. Surveys of many trout streams have shown abundant evidence of highly successful natural reproduction in spite of heavy fishing which apparently cannot reduce the breeding stock to the point where not enough young are produced to fully seed the waters with all the fish they can feed and "house" in streams having suitable trout habitat.

In smaller lakes found suitable for trout except for lack of spawning places (brook, brown and rainbow trout generally require inlet or outlet streams with gravel bottom) the planting of fingerling trout in the fall appears to be an economical and satisfactory method of maintaining trout fishing.

Michigan has experimented considerably in learning the results from planting legal-sized trout (7 inches and larger). Our findings have generally been confirmed by the results of experiments in other states. The facts secured from 1937 to 1942 come from about 15 important trout streams in different parts of the state where some fifty different plantings of marked trout of all three species were made and where records of the subsequent catch were secured by creel census. Boiled down these are the approximate results:

(1) Spring and open season releases compared with fall plantings yielded 6 times better returns for brook trout, 4 times better for rainbow trout, and 2 times better for brown trout. With a few exceptions, which apparently represent conditions not commonly found in Michigan, the results of similar experiments in nine other states confirm our findings.

(2) When planted during the open season or a few weeks before, the average percentage of a legal-sized trout planting caught by anglers was about 25 per cent for brook and for rainbow trout and about 12 1/2 per cent for brown trout. If a cost to rear and plant of $0.20 per trout is used, the actual cost to the Department will be $0.80 each for brook or rainbow, and $1.60 each for brown trout which reaches the anglers creel.

(3) The few trout which survive from fall plantings were caught out as fast or faster than those planted in the spring or open season.

(4) Fall plantings did not migrate appreciably more than spring and open season plantings and were generally caught close to where they were released.

(5) Even where heavy plantings of trout were made in the spring and during the open season, the percentage of the anglers' catch made up of such fish varied from 5 to 47 per cent with an average of 27 per cent. In other words, about 3 out of 4 were wild fish. Put another way, heavier planting than would be economically possible on most trout streams improved the fishing by only 27 per cent on the average. Actually the "improvement" may have been less than this since the natural production of trout was no doubt affected to some extent.

(6) Even when these heavy plantings were made, the percentage of anglers catching any of the hatchery trout was only 11.5 per cent or one in nine.

(7) The significant effect of plantings on the catch lasted about two weeks for brooks and four weeks for browns and rainbows.

(8) Heavy plantings of legal-sized trout cause competition with wild trout, forcing them to bite more readily and thereby possibly depleting the waters of the longer-lived native stock. Probably any legal-sized plantings interfere with the natural production because of the temporary competition for food and pools.

(9) Less than 1 per cent of the trout not caught in the season planted contributed to the catch in subsequent years.

(10) Hatchery trout are inferior in coloration and in eating quality to wild fish and are believed to be poorer fighters.

(11) Legal-sized trout plantings cheapen the sport of fishing as little skill is required to catch these fish and "meat fishing" is encouraged rather than recreation.

Results of legal-sized trout plantings in lakes lacking spawning facilities are better. Recoveries of from 20 to 70 per cent of fall planted brooks or rainbows can be expected. Growth, condition, color, and fighting quality of the fish are also better and there is an appreciable carryover to later years in the larger lakes. In smaller lakes (up to 50 acres) trout are concentrated and are caught out too fast. From 80 to 94 per cent of the survivors of fall or early spring plantings of brook trout are taken out the opening day, leaving very few fish for the rest of the season.

Stocking legal-sized trout in suitable lakes (generally the larger lakes) containing warm-water fish, such as bass, perch, rock bass, bluegills, etc. where fingerling plantings may not be successful, can be justified if the growth and survival are satisfactory and if the fishing in such lakes (which generally provide poor or mediocre warm-water fishing because of lack of habitat for these species) is sufficiently improved.

Stocking legal-sized trout in limited areas of streams to meet the demands of inexpert fishermen or the fish hungry expert may be justified if those benefited are charged for the cost of such a special program. The trout so planted should be marked so as to be readily recognized as hatchery-reared fish. Demonstration areas have been proposed for a number of representative trout streams where the cost and value of such a program can be determined. Although these have been set up as postwar projects, perhaps the urgency of the problem requires that at least a few of them be established immediately.

Trout habitat improvement. While less spectacular, a more natural and a more permanent though costly way to better trout fishing would appear to be offered by habitat improvement. Experiments in this field--popularly known as "stream improvement"--were first initiated on public waters in Michigan in 1930 and followed earlier studies which indicated that many streams were not yielding as many trout as they should or could because they lacked sufficient food, pools, or spawning grounds. Tests on five different Michigan streams showed that proper placement of deflectors and covers resulted in an average increase in depth of pools of 13.7 inches and marked increase in the number of pools, amount of gravel bottom, and area of weed beds. Studies of trout populations in a number of important streams have shown that the deeper the pools in a stream the more legal-sized trout they support. Investigations in Michigan and elsewhere have proven that stream weed beds and gravel bottom are highly productive of fish foods. Whenever shifting sand can be replaced by these bottom types, food production will be greatly increased. Before and after improvement figures for food counts in sections of one stream showed increases of from 124 to 453 per cent. The catch per hour of trout on one censused stream increased from 0.9 to 1.5. Recently more exact and more extended (three years before and three years after) studies were made on a section of stream at the Hunt Creek Fisheries Experiment Station. The complete anglers' catch for three years before pool-forming structures were installed were secured and can now be compared with similar records for three years after. The catch per hour improved 53 per cent in spite of more fishing (increase of 81 per cent in hours fished) and the total number of legal trout caught increased by 138 per cent. The cost of installation of the 24 structures was $382.16 and the average annual maintenance $38.00. The average annual difference in the yield of legal trout before and after was 40.3 fish. If figured on the basis of 20 years, the average cost of each additional wild trout produced would be $1.43. This cost might be lowered materially by the use of power equipment and more efficient structures. It is also possible that less intensive improvement would produce as great an increase at less cost. Further, the yield curve has apparently not reached its peak after three years, so that the average cost per additional trout may be less at the end of the 20-year period while it seems likely that the maintenance cost will decrease as the structures become stabilized. However, these cost studies show that environmental improvement is expensive.

A well balanced trout habitat improvement program will consider restoration of vegetative cover on watersheds and checking of bank erosion as well as improving food, shelter, and spawning conditions in the streams themselves. Thus this program has other values in addition to making better fishing.

Warm-water fish planting. Planting bass, bluegills, walleyes and other desirable game fish to establish them in waters for which they are suited and where they are now lacking is highly desirable. Such introductions should be made only after proper surveys which show that these new species are needed to balance existing pan fish populations or to occupy habitats not now fully utilized by the fish present. Example: A lake contains only stunted perch and is not suitable for trout. It has marshy shores for northern pike spawning. Establishing pike should reduce the number of perch so that their growth rate is better and so that the survivors will furnish good fishing. Pike will add to the variety of the catch.

The number of lakes in Michigan which could be benefited by such

introductions is not believed to be large. The distribution of warm-water fish in the past has been so general that nearly all accessible waters have probably been stocked at least once with most species propagated and if conditions for the fish planted were suitable they have become established. In a recent review of the experimental management recommendations for 255 lakes, the introduction of a new warm-water species was recommended in the case of 25 lakes (10 per cent). For all other species in these lakes and for all species in the remaining 90 per cent, natural spawning was believed to be adequate. These were not superficial studies but detailed surveys in which the physical, chemical, and biological data were collected and carefully analyzed. The recommendations for no further planting have been followed in most instances and checks in subsequent years on a few of these lakes have shown no lack of adult breeding stock or of young game fish nor any decline in fishing which could properly be attributed to a lack of planting. The introductions recommended could in many cases be made by the transfer of young or adult fish from nearby lakes.

Annual plantings of fingerling walleyes or northern pike in lakes suitable for them except for the lack of spawning facilities for these fish but which contain oversupplies of stunted pan fish may be justified if it is proven by experiments that annual plantings of such fish will balance the population.

For lakes where infrequent "winter kill" or "pollution kill" of a valuable species is complete, restocking may be desirable. Transfer of a few adults from a nearby lake may be easier and cheaper than rearing.

Planting of fingerling bass, bluegills, perch, walleyes and other fish in waters now containing them and having adequate spawning grounds are believed to be valueless or actually harmful. This statement is based upon the results of many years of research both in Michigan and elsewhere. The principal facts upon which these conclusions are based are outline below:

(1) Enormous reproductive potential. That a large number of eggs are deposited and hatch is indicated by the following counts of the average number of fry per pair of adults produced in a Michigan lake: largemouth bass 6,022; rock bass 1,466; pumpkinseed sunfish 6,012; bluegill 16,227.

Survival to the adult stage of any but a small fraction of the above numbers would be obviously impossible. In northern pike the average survival to the size at which migration from the marsh occurred was estimated to be only 0.23 per cent.

Counts of the total number of bluegill, largemouth bass, pumpkinseed sunfish and rock bass nests were made each year in a Michigan lake and counts of the number of fry produced by each species were made from examining a series of sample nests. The total number of fry produced each year for each species was determined by multiplying the average number of fry produced per nest by the total number of nests counted. The lake was poisoned out at the end of the fourth summer; the fish were recovered as completely as possible, and the number surviving from each spawning year determined by aging the fish from scale samples. The percentage survival of young bluegills produced each year which were found when the lake was poisoned was as follows: fish spawned the year of poisoning 0.1 per cent; one year before poisoning 0.042; two years before poisoning 0.007; three years before poisoning 0.003. It will be noted that the young bluegills produced

the second year before poisoning did not survive as well as those which resulted from the spawning three years before the lake was poisoned. Other workers have noted that some seasons produce a larger crop of young fish than others, but the reasons have not always been determined.

These figures indicate that although the loss is heavy at the end of the first summer (at which time fingerling bluegills and bass are usually planted), there are other heavy losses which occur each subsequent year. At the end of the fourth summer only 3 bluegills, 5 pumpkinseeds, 30 rock bass and 13 largemouth bass of each one hundred thousand fry produced in the first year of the study had survived. It is known that there are natural limitations to the number of fish of various sizes which a body of water can support. It therefore seems logical to assume that if more than enough young are produced naturally, plantings of hatchery fish would merely increase the competition and that any survival of planted fish would therefore be at the expense of naturally spawned young.

Counts of the number of youn of-the-year and adult fish in lakes poisoned out indicate that plantings of bass and perch fingerlings would have to be at the rate of about 2,000 to the acre in order to increase the number of legal-sized bass and perch by one fish per acre--assuming that the waters could support the additional fish (which assumption we do not believe is true).

Commercial catches of pikeperch in Lakes Huron and Michigan could not be correlated with fry plantings of that species.

Workers in other states also cite poor results from planting: (Ohio) less than 0.03 per cent of the number of game fish planted are caught and only 0.5 of one per cent of anglers caught planted fish; (Oklahoma) catch of fish has not been in proportion to number planted--stocking at the rate of 300 fish per acre produced no noticeable increase in catch. General statements in the same vein have come from other states.

(2) Large number of breeders present even in heavily fished lakes. Winter kill on 6 southern Michigan lakes this past year (1945) showed an average of 150 adult game fish per acre, and subsequent checks have proven that the kill was not complete. Poisoning of 18 lakes to restock with more desirable species yielded an average of 69 legal-sized game fish per acre (in most of these lakes the fish were stunted and many under legal length were mature), enough breeders to more than stock the lake with young.

Creel census on a number of Michigan lakes reveal an average of 36 adult game fish caught per acre per year. These fish were present as breeders during the preceding spawning season and alone would have more than restocked the lakes. Heavy fishing with no restrictions takes only 50 per cent of the adult fish (Alabama workers).

(3) Ability to spawn in varied habitat. Largemouth bass have been found to reproduce successfully over gravel or any bottom types where roots of water plants furnish support for eggs. The same is true for bluegills and pumpkinseeds. No lake has ever been found in Michigan where bluegills cannot spawn. Their spawning season extends from about mid-May into August, so that if eggs of first spawning fail to develop for any reason, the later spawning will maintain the stock.

Perch reproduce well in any type of lake whether weeds are present or not. Successful northern pike spawning appears to be limited to flooded, marshy shores and successful pikeperch spawning to streams or to wave-washed rubble shores. Smallmouth bass require gravel, but this can be added readily if this species is required in place of largemouth.

(4) Growth rate studies show stunted fish present in many lakes. Perch, bluegills, sunfish, rock bass or bass are too abundant in a number of lakes and this is caused by too efficient natural spawning. Reducing the population of rock bass 50 per cent in one lake increased the growth rate markedly, which increase has persisted for four years, resulting in fishing where before nearly all fish were undersize. Other reductions in population due to partial winter kill, poisoning or loss from disease have resulted in improved growth rate and better fishing at least temporarily, i.e. until natural reproduction increased the number of small fish too greatly.

While the evidence against restocking is mostly indirect, it is believed to be so convincing that long and costly planting experiments should be unnecessary to establish the futility of stocking for maintenance.

Habitat improvement and population control on warm-water lakes and streams. Control of populations, especially of the number of young produced, and improvement of the habitat (by supplying shelter when deficient, regulating water levels to improve spawning grounds for pike and other fish, and possibly fertilizing to increase the food) appear to be better methods of fish management than annual planting of fish already present.

LEGAL RESTRICTIONS

Based on the findings already quoted and others to be given below, it would appear that some radical changes in Michigan's fishing laws would be desirable. Most of our present season, size and bag limits are based on two of the same assumptions as for fish planting--plus a third which may be valid. These are: (1) that the number of breeding game fish is limited (hence the catch per man and the fishing season should be limited and fish should be protected during the spawning season and a size limit is needed to protect them "until they have reproduced at least once"), and (2) that even though enough breeders are present, insufficient young survive from natural spawning (therefore a size limit is necessary to protect the young till they reach larger size), and (3) that unless restricted as to methods, season, size, and creel limit, anglers would deplete the waters to the point where fishing would be unattractive.

Conservationists generally agree that a minimum of restrictions are desirable to assure: (1) that the greatest possible annual crop of game fish be taken consistent with maintaining the future supply, (2) that the crop be harvested in such a manner as to assure the greatest possible recreation to the public (if meat alone is the goal we should allow the crop to be taken by the most efficient commercial means, as has long been the practice in much of Europe). Conservation administrators should keep in mind that they are trying to provide recreation

not meat and that the food value should be considered secondary, and (3) that the catch (which is the great incentive to fishing as a recreation) be distributed as equably as possible.

While the same general principles apply to trout and non-trout waters, it is believed that since trout waters are limited (by temperature and oxygen supply) and fishing pressure is heavier on trout waters (creel census shows it is about three times as heavy as on warm-water lakes in spite of a shorter season), restrictive legislation is more important and more needed to maintain trout fishing than other types of fishing. Also trout are less prolific and are more vulnerable since their habitat is limited, especially during hot weather, and except in the case of large lakes and streams is generally more accessible to the fisherman. The present regulations on trout fishing will first be discussed and changes suggested.

Trout regulations

1) Open season

a) "Trout lake and stream" classification (last Saturday in April to Labor Day with some exceptions for taking rainbow in the fall) is designed to protect trout in waters dominated by these species during the closed season. This is a proper regulation in such waters providing the open season assures adequate protection to the breeding stock (or reserve stock in lakes where there is no spawning) and if it allows taking the fish when they are in prime condition (the present last Saturday in April to Labor Day does not meet this requirement for rainbow trout for most years as they are spawning or in poor condition in early spring). Evidence is accumulating that the April opening in a normal year is also too early for brook and brown trout to be in good condition (except possibly in lakes). The fish are thin and inactive, especially in streams, until after heavy feeding for several weeks in the spring. Water temperatures in streams do not usually reach this stage in the Lower Peninsula till about the first week in May and probably not till the second or third week in May in the Upper Peninsula in the average year. May 10 in the Lower and May 20 in the Upper might be good average opening dates. Fly fishermen are discriminated against by the present opening as few trout can be taken on flies till the second or third week of May.

b) "Pike lake" classification (as it affects trout fishing). Present open season (May 15-Labor Day) for taking trout in these lakes is considered proper for opening date, but the closing date prevents the taking of rainbow trout in the fall when they are prime unless their capture is permitted by special legislative act. (See recommendation in connection with lake classification under warm-water fish.)

c) "All other lakes" (as it affects trout fishing) (June 25 to Labor Day). Season opens too late for trout

when surface waters are cool enough for fly fishing and has the same objection as the Pike Lake classification to the closing date for rainbow.

d) "Non-trout streams" and certain lakes connected with Great Lakes (last Saturday in April to Labor Day except for designated waters where fall rainbow fishing is permitted). Proper regulation except too early for rainbow fishing unless runs of fish from Great Lakes cannot otherwise be harvested. Streams open for fall rainbow fishing must be designated by the legislature.

2) Minimum size limit (7 inches). This limit probably permits most brook and brown trout to spawn at least once before reaching legal size but although most male rainbows ripen before this size, few females mature until at least ten inches in length. The value of any size limit is debatable and should be tested experimentally. In waters where trout below 7 inches are common, natural overpopulation probably exists and these waters might benefit by a reduction in the number of small trout providing that the excess is not needed to stock connecting waters where spawning is not so efficient. The value of headwaters and tributaries in this connection and the extent of natural reproduction and migration in stream systems should be determined more exactly before the size limit on trout is changed or discarded.

3) Daily and possession limit. Present daily and possession limit (15 but not more than 10 pounds and one fish except on certain designated waters) is believed to be too high except possibly for brook trout from streams. The recent Conservation Commission order limiting the catch to ten trout of all species in designated trout lakes is a step in the right direction but further reductions on lakes should be made as the public becomes educated. It is questionable if most streams were overfished before the war (creel census shows no decline in catch per hour in streams as season progresses) but small lakes definitely are.

A limit of 10 trout (but not more than ten pounds and one fish) for streams (for the psychological value of a more nearly attainable limit), and 5 trout (but not more than ten pounds and one fish) for lakes has been recommended. It is believed that a limit of 5 would be adequate for lake fish which run larger and heavier for their length than stream trout and would spread the fishing over more days and to more fishermen especially on small lakes.

4) Methods. No general changes in the legal methods of taking trout seem called for except that the use of archery tackle might be permitted if is determined by experiment that the method is sportsmanlike and not unduly destructive.

The effect of night fishing has been the subject of much debate recently. As soon as personnel permits, a thorough investigation should be made of this problem but at present

any regulation would appear to be discriminatory and could not be based on facts.

Warm-water fish regulations

1) Lake designation (pike and all other). Should be abolished for the following reasons:

   a) Waters cannot be and are not now accurately classified as "pike" lakes and "all other" lakes. Several lakes have been shifted from one class to another upon request of the currently dominant local group. This causes dissension among local interests, trouble for the Department and confusion for out-of-state fishermen.

   b) Many of the all other lake group contain pike, walleyes, perch, crappies, rock bass, bullheads, carp, suckers, etc., which can be legally taken in other waters during the spring months. Since most of these fish are competitors or predators of bass and bluegills and since they bite best in early spring, bass and bluegills are not being favored by the "all other lakes" classification. (Presumably it was the purpose of this classification to favor these species.)

   c) Some bass and bluegills will be caught prior to June 25 but it is believed that the majority could be and would be returned uninjured. Some poaching of bass is reported in pike lakes but apparently this is not serious. No reports of any number of dead bass killed by hooking in these lakes prior to June 25 have been received. The best evidence that early fishing for pike, walleyes, crappies, etc. would not harm bass and bluegill fishing is found in some of the waters now classed as "pike lakes" such as Hamlin Lake, Mason County, and Houghton Lake, Roscommon County. According to creel census figures these lakes provide excellent bass and bluegill fishing.

It is recommended that classification of waters except trout waters be abolished and that instead protection be granted by closed seasons prior to and during the spawning period to species considered in need of this protection as follows:

Northern pike and muskellunge and pikeperch (walleyes) - March 15 to May 14, inclusive.

Black bass - January 1 to June 24, inclusive.

Bluegills - March 15 to June 24, inclusive.

Under these provisions all waters except designated trout streams and trout lakes would be open throughout the year to the taking of any species not protected by the above seasons. There is considerable doubt as to the need of the closed season suggested for bluegills and even some question as to the need for such protection of the other species, but

until the effect of abolishing these seasons can be tested on a number of representative lakes it is felt that it would be unwise to eliminate them. Authority from the legislature for the complete control by the Conservation Department of not to exceed 20 representative lakes and not to exceed 50 miles of trout stream should be requested.

2) Size limits

Until sufficient evidence is secured to warrant a change, the present minimum size limits should be retained as follows:

Northern pike and pikeperch - 14 inches

Muskellunge - 30 inches

Black bass - 10 inches

Size limits for all other warm-water fish should be abolished. The number of young perch, bluegills, sunfish, etc. produced naturally is so great that there is no need to protect these fish by minimum size limits. It has been invariably found that in lakes containing a great abundance of small pan fish the growth rate of these species is slow so that removal of a part would do no harm and might improve the growth rate by reducing the population. In lakes where growth is good or above average few pan fish smaller than six inches are now caught by anglers so that no harm would result in such lakes by removing the size limit. Research has shown a natural heavy loss in these fish between the four and six inch size, a part of which would be salvaged by fishermen especially on days when the larger fish are difficult to catch.

3) Number and possession limits. The present limits appear to allow for a reasonable number and poundage of fish and should be retained at least until evidence is secured which would warrant a change.

4) Methods of fishing. The present legal methods for the capture of fish appear to be fair and proper except that archery tackle might be permitted. Few fish would be taken by this method but the provision would be unique and might further stimulate this type of recreation.

5) Special provisions. The closing of certain waters to meet the local demands of pressure groups should be discontinued except as sufficient scientific investigations demonstrate the need for such special protection. Such existing laws should be repealed and existing Conservation Commission orders should not be renewed.

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