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Fish Conservation Fundamentals...series

(January 1955 To July 1957)

By R.W. Eschmeyer, Sport Fishing Institute

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Fish Conservation Fundamentals

By R. W. ESCHMEYER, Sport Fishing Institute

Stocking—

First in a Series

There is one basic fact that needs to be understood if we are to properly determine the role of stocking. Fish are prolific—much more prolific than most animals we deal with.

We can't give accurate figures on egg production because a big female lays far more eggs than a small female of the same species. However, in general, a trout may lay 1,000 eggs, a bass 10,000, a bluegill 20,000, a walleye 50,000, and a big carp might lay a million. Under suitable conditions, a big percentage of these eggs hatch. One study on a fourteen-acre lake showed that the number of fry produced naturally by four species (large-mouth bass, bluegill, common sunfish, rock bass) was slightly over 500,000 per acre. The water would support only a few hundred adult fish per acre.

We have had instances where the limited brood stock present in the original river was more than adequate to provide all the young fish needed to stock big impoundments.

A big female bass in a one-acre farm pond could produce enough progeny so that if all eggs hatched and all fish survived for three generations, there would be enough fish, at one pound each to replace the water in the pond, and to make a heap, one acre in area, extending over 700 feet above the pond.

Obviously, fish are prolific. We can understand the picture if we will think of cows each having thousands of calves per year. If each cow had only 10,000 calves, adding a truck load of calves wouldn't increase the cattle population of a pasture very appreciably.

There's an added item. Fish need food—lots of it. Their food chain tends to be long. The average acre of water in the United States probably supports not more than a hundred pounds per acre. This may range all the way from a very few pounds in some waters to a thousand pounds or more in some small highly productive waters.

It is easy to see why, during the days of the hatchery "craze," many of our hopes were unrealized. We can understand, now, why much of the stocking was ineffective or even harmful. During those days the public was quite willing to accept the belief that stocking was the panacea to all our fishing ills. We fishery workers believed it, too, and advocated it. The job of selling the stocking idea was an effective one. It

was later that we learned more about fish being prolific and about the food needs.

The job of "unselling" has not been an easy one. For instance, a year or two ago we talked with a farmer about his farm pond. He had decided to start fishing it but then he observed an immense crop of bluegill fry—"millions of 'em." "We decided to wait until they grow up before starting the fishing," said the farmer. The man had a well-managed farm. He had only a limited number of cows in his pasture. He understood about carrying capacity and overgrazing on the land. But to him the farm pond was quite different.

There's the case, too, of sportsmen being delighted when a federal or state fish truck delivered bass fry for distribution in the rather extensive bass waters of one county. The supply consisted of 5,000 fry, less than half the potential output of one female!

Though there are still exceptions, more and more sportsmen recognize the fact that stocking has limitations. In general, the public still looks on stocking as a cure-all only in those states where the top fishery people (some ex-hatchery men or politicians) have been disinterested in public enlightenment, for obvious reasons.

Stocking does have major limitations. But, it's one of our important fish conservation tools. Properly used, stocking plays an important role in improving our fishing.

WARMWATER FISH

For warm waters we must rely in planting small fish. Raising game fish to adult size in hatcheries costs a fortune. Rearing a bass to twelve inches would cost an estimated two to four dollars. Not over half the planted fish can be expected to be recaptured. This raises the average price of each bass creel to four to eight dollars—more than the average price of a fishing license. So far as we know, only Virginia still carries on this expensive practice.

Planting warmwater fingerlings serves a good purpose in a number of instances:

1. To stock new waters, especially farm ponds and new public fishing lakes.
2. Reintroduction of fish in lakes depleted by winterkill.
3. Introducing species not already present, where such introduction is desirable.

4. Restocking of waters from which existing fish populations were removed through use of chemicals or by draining.

5. In some instances stocking will help fishing in waters where the fish are already present, but where conditions for spawning are inadequate. For example, Minnesota has been able to provide walleye fishing in some kinds of waters by stocking them heavily with walleye fingerlings. The situations where stocking of this kind is helpful seems to be rather limited; the need for the stocking should be determined by the professional fishery worker.

COLDWATER FISH

The stocking picture for warmwater fish and coldwater fish differs rather decidedly. Trout can be raised to catchable size at a much lower cost than would be needed to raise bass or other game fish to a size where they would be attractive to anglers.

In numerous waters we can now have good trout fishing only by planting catchable-size fish. The cost is high. A single legal limit costs more than the price

of a license. But, such stocking is justified if the trout fisherman is willing to pay the bill. In many trout waters, the question is one of having put-and-take stocking, or having no fishing at all. Of course, such stocking is justified only on heavily fished waters where a big percentage of the planted fish will be re-taken by the angler.

Since Kansas has no coldwater fishing, there is no need to go further into the subject of coldwater fish.

INTRODUCTIONS

Introductions have been both beneficial and harmful. For example, trout fishing has been created in many waters by introducing trout; fishing in some waters has been destroyed by introducing carp.

Often sportsmen tend to want those species introduced which are not already present. If these succeed, they must generally do so at the expense of native species. Carrying capacity is limited. If we add horses, sheep and mules to a pasture, the pasture will necessarily support fewer cows than it could support before the other species were added.

IN GENERAL

Stocking isn't a cure-all. For a while its value was greatly overemphasized. It's only one of the various fish management tools. However, it is still a very important tool. Its value will depend on how intelligently the tool is used. The need for stocking should be definitely established before we stock. It should be established not by the man who raises fish or by the sportsmen, but by competent trained fishery personnel through a study of the habitat and fish populations already present.

(Next: REGULATIONS.)



Late fall fishing is profitable for those "hardy" fishermen, who fish regardless of the time of the year. Roy Lumpkin, on the right in the above picture, caught this 35-pounder while fishing at Shady Bend, near Lincoln.

Channel Catfish May Become State's Official Fish

Kansas' famed channel catfish would be named the state's official fish if recommendations of the fish and game commission are carried out.

In connection with a move by each state to select an official state fish, as they have designated state birds and flowers, Governor Edward F. Arn asked the commission for its recommendations. The commission favored the channel cat because it is undoubtedly the state's most popular fish and thrives well in Kansas waters.

The official designation would have to be approved by the Kansas legislature, according to Dave Leahy, director of the commission. Kansas now has the sunflower as the state flower, the meadowlark as the state bird, and "Home on the Range" as the state song.

Fish Conservation Fundamentals

By R. W. ESCHMEYER, Sport Fishing Institute

Regulations—

Second in a Series

In times past, fish laws were made with very little factual evidence to back them. We tended to put more and more restrictions on the fishing, and to increase the warden staff with the expectation of having better enforcement as a result.

The regulations usually involved size limits, closed seasons, and creel limits, though many other types of restrictions were also imposed. Some states still pass arbitrarily-made regulations, others now tend to base their laws on proven need.

BASIC CONSIDERATION

Here are a few basic statements which should be carefully considered in the question of fish regulations. We're referring here to hook-and-line fishing only. Commercial fishing will be discussed separately in a later article.

1. Regulations should be aimed at providing a maximum number of successful fishing trips, and a fair distribution of the fish resources.

2. The fish in public waters belong to the people. Regulations should be aimed at giving the public maximum use of the fish resources.

3. Fish are a crop, and a renewable one. They should be used. If not caught within a reasonable number of years after birth, they die of natural causes. The average fish has a relatively short life span.

4. An acre of water will support only a limited poundage of fish. Regulations will not increase the potential standing crop.

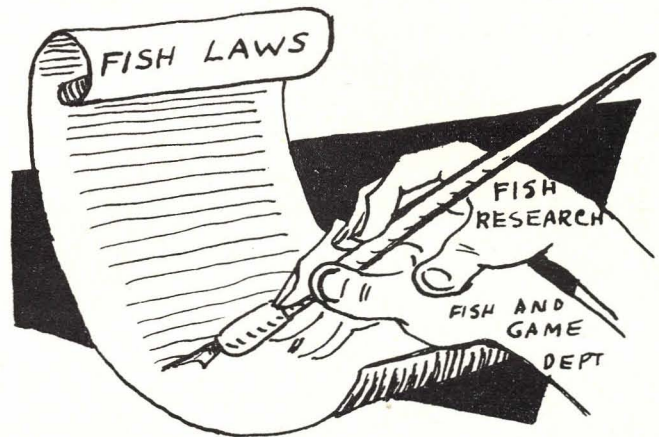
5. A lake or stream which is closed to fishing furnishes no angling recreation. Waters should be kept closed only when there is definite proof that this is necessary.

6. We should have only those laws for which there is proven need. If regulations have been imposed without proof or specific need, the situation should be studied to decide what action is proper. Proof that a law is needed should be provided by the state fishery authorities. The proof should be obtained through research conducted by competent investigators.

7. The hook and line is ineffective "harvesting equipment." Our lure must compete with the natural foods. You can get a good picture of the effectiveness of the hook and line if you will "fish" for

pheasants, putting a grain of corn (in pheasant country) and waiting (hidden) for a pheasant to take it!

8. Regulations imposed to preserve the brood stock are generally not needed. A few brood fish



can furnish a lot of young. Furthermore, even when a lake is "fished out" from an angler's standpoint, it usually still has a good population of brood fish left. We could understand this if we tried "fishing" for cattle in a big pasture. If the pasture were grazed to capacity, a handful of grass would soon attract a cow. But, as the caught cows were removed gradually, there would be less demand on the pasture. The grass would grow. Soon, taking a cow on a handful of grass would become more difficult. Finally, it would be a rare experience because of the greater availability of natural food.

9. We fish to relax. When regulations are highly complicated, there is the constant fear that we may be breaking some laws unintentionally. Having too many laws spoils our sport.

10. Conditions change. To meet this change, the regulations should be made by the fish and game (or conservation) department. Legislatures lack flexibility, and often tend to give undue consideration to politics.

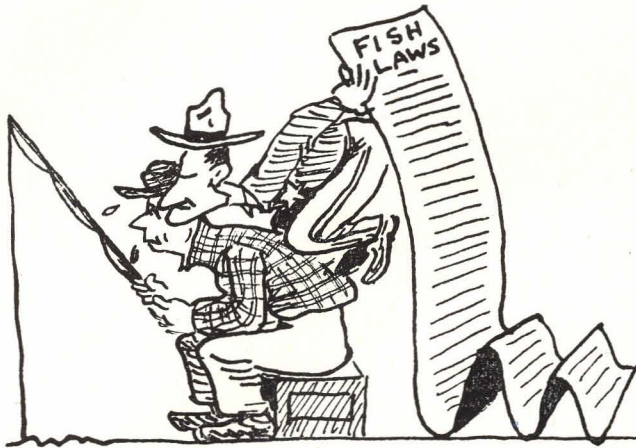
11. In the past we have tended to regulate only the fishermen. More attention should be given to regulating fish populations.

Other points might be listed, but we'll stop with the eleven mentioned above.

THE HOOK AND LINE

Sport fishing is generally limited to use of hook and line. Most other kinds of equipment may be too effec-

tive unless properly controlled. Too, it is generally assumed that hook-and-line fishing provides greater enjoyment than other kinds of equipment. Most regulations limit fishing to "hook-and-line." This is generally desirable for game fish species.



SIZE LIMITS

There is no evidence that a size limit on pan fish is desirable, and considerable evidence to suggest that such limits are undesirable. These species tend to become over-abundant. If your state has size limits on sunfishes, crappie, yellow perch, white perch, bullheads, and similar pan fish, chances are that the laws are unnecessary or are doing more harm than good.

Size limits on bass and trout, and on the big predator game fish such as pickerel, pike, and muskellunge are probably beneficial in some areas and unnecessary in others. This question needs further study.

CREEL LIMITS

Creel limits have a psychological value. A person would be more satisfied with catching a limit of five fish than with catching eight fish, if the limit were ten. Saying that we caught the limit implies that we could have taken more if the law had allowed.

This leads to complications, because there is usually no justification for creel limits on pan fish, except the psychological one.

On game fish we should have creel limits on some waters, though fishing has deteriorated in Ohio as a result of removing all creel limits some few years ago.

On very heavily fished trout waters, a very low creel limit seems desirable.

In general, the question of creel limits needs further study.

CLOSED SEASONS

We have no evidence that a closed season is needed on pan fish. Year-around fishing for these species seems desirable.

A number of states have discarded the closed season on all warm-water fish, thereby greatly increasing the fishing without adverse results.

Where we rely on put-and-take trout stocking, the number of fish available is determined by the number planted. Here, there is little need for a closed season for that reason.

There are undoubtedly instances where a closed season is desirable. However, at times past, we have often had closed seasons where they were not needed.

IN GENERAL

For a while we imposed more and more restrictive legislation. Then, when we realized that in many waters most fish were uncaught, that fish were prolific, that waters have a definite carrying capacity, that the hook and line is usually too inefficient to remove all the broodstock, and that fish have a relatively short life span, we moved in the other direction. The tendency today is to liberalize—to have fewer restrictive laws. There is ample evidence to show that this tendency is in the right direction, though there will probably be exceptions. There are instances where we may need even more rigid restrictions. For example, in some states the creel limit on trout will undoubtedly need to be reduced.

ENFORCEMENT

Laws are of little value unless folks obey them. The presence of an enforcement officer in a general area does not prevent violation if people tend to ignore the laws. This point has been well demonstrated in the southern Appalachians where I lived for a dozen years. Here, there have been enforcement officers (revenooers) for several generations, but moonshining is still a big (though admittedly hidden) industry.

The mere fact that a state has wardens (conservation agents, game protectors, rangers) offers no assurance that violations will decrease. Even a doubling of the warden force will not prevent violations from taking place.

We do obey those laws which we respect. There are few people who would knowingly drive through a red traffic light, even though there was no traffic, and even though it was obvious that there was no traffic cop in the vicinity.

Not long ago we witnessed a case where a drunken driver crashed into a car and then sped away from the scene of the accident. Folks who saw the accident

immediately pursued the hit-and-run driver and caught him, holding him until the state police arrived. They didn't wait for the enforcement officers to do the job—they took action immediately. The public will not tolerate hit-and-run driving.

It all adds up to one thing. We obey a law if we believe in it. If we don't believe in a law, we tend to ignore it even though an enforcement officer might be somewhere in the county (though obviously not in sight at the time of the violation).

We want to be well thought of, that's human nature. If it's unpopular to violate, we'll tend not to do so. If we want less violation, we sportsmen can bring it about; the warden alone, without our active support, can do very little.

For years we felt that the answer lay in employing more and more fish and game "cops," whose sole duty was to detect violation of the fish and game laws and to make arrests. We now realize that this system is of limited value, and that the number

of arrests made by the warden is of secondary importance.

In the more progressive states, emphasis now is on prevention of violation, rather than on detection. Prevention is brought about mainly through these two activities:

1. A sound, practical fact-finding program to determine which laws are really needed. (A great many people have been arrested at times past for doing the right thing conservation-wise.)

2. A sound, effective education program aimed at enlightening the public on the need for the regulations. Once the public recognizes the need, violations will decrease.

The change in concept, from emphasis on detection to emphasis on PREVENTION, imposes one basic problem. The old-time fish and game "cop" who enjoys making arrests is necessarily anti-social. There is serious question as to his effectiveness as an educator.



A solution for fish conservation seems to be in sight if more gals enter the field dressed in this attire. Despite their hardy reputation it would take a hide-bound angler to pay much attention to the fish.—Richard Matt, Inc., Photo.

The modern warden must be able to educate the public effectively, arresting only the habitual violator who can't be educated. Too, he can do a good job only if the laws are sensible. In some states, the intelligent warden knows that some regulations do more harm than good. He can't sell, effectively, something which he knows is wrong.

The warden is an important figure in fish and game conservation. He will be an even more valuable figure when he has only properly tested regulations to enforce, and when he directs most of his activities toward prevention, less toward detection. In some instances, this change in program may call for a change in personnel because the temperaments of "cops" and of "preventers" and "educators" may differ somewhat.

THE IDEAL SITUATION

Ideally, a state should have only those sport fishing regulations for which there is a proven need. We may need to impose emergency regulations at times, without proof of the need for them, but in those instances we should immediately institute a fact-finding program which will demonstrate whether or not the regulation is proper.

Ideally, too, we should have an effective educational program which will generate respect for regulations. Enforcement men should play an important role in this educational program.

Interestingly enough, in those states where these methods (fact-finding and education) are used, the laws are being simplified and reduced in number, and the amount of violation seems to be decreasing rather decidedly. In general, we're much more rational about the regulation question than we were twenty years ago. As a result, in some areas, we now have more and improved fishing, and a growing respect for the regulations.

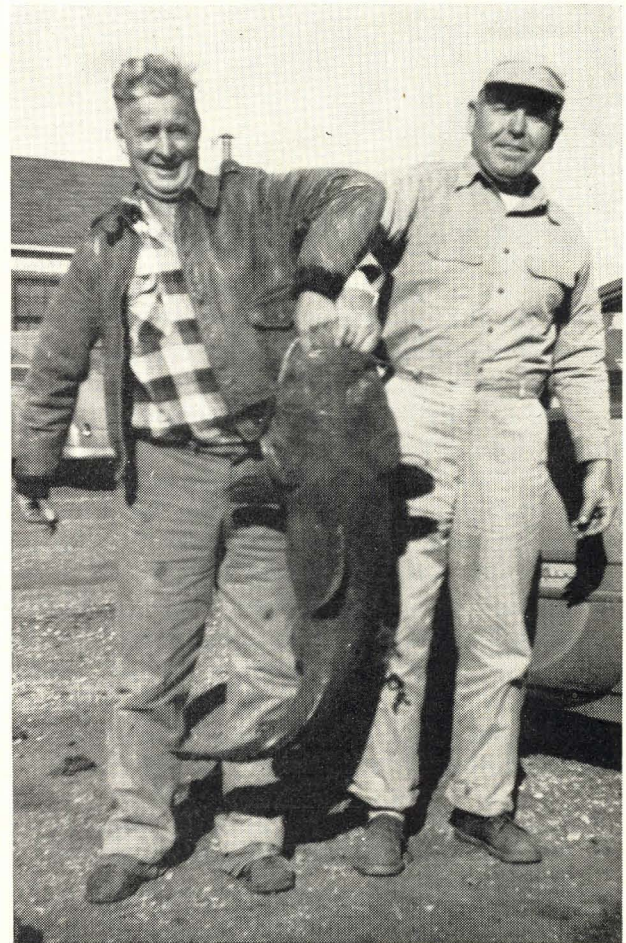
One of the most encouraging features in modern fish conservation has been the change in the warden. In the more progressive states, these men are now carefully selected on the basis of qualifications for the job. In these states the political warden has disappeared. Here, the modern enforcement man is a highly respected individual and is well versed in conservation problems generally. He attends special schools at regular intervals, so that he can keep up on modern developments, and can compare experiences with the other wardens. He's basically an educator. There is a growing, and proper, tendency to refer to him as a ranger or as a conservation or fish and game "officer," not as a "warden." He's a far different individual from the old-time fish and game "cop." He plays an extremely important role in promoting improved fishing and hunting. He's interested basically in preventing violation of the regulations, but

his field of active interest extends far beyond mere enforcement.

One state, Pennsylvania, has separate fish wardens and game wardens. A patronage dispenser could see plenty of merit in having separate wardens for fish and for game; it creates more jobs. But, most people who are genuinely interested in conservation would probably regard such duplication as an unnecessary extravagance.

Though there are exceptions, the regulation picture has been improving immensely—with greatly improved laws, with emphasis on prevention of violation, and with high caliber officers on the job. The regulation picture is a very encouraging one.

NOTE: The articles in this series are so brief and condensed that Dr. Eschmeyer cannot possibly make the many qualifying statements which would ordinarily be made. Nor can he indicate, repeatedly, that there are numerous exceptions to the observations presented, and that what is good conservation practice in one area may be unsuitable elsewhere. The reader should recognize these limitations.



January fishing paid off for these two Wichita fishermen! Tom Penrose (left) and L. C. Bjork (right) are holding a 40-pound flathead catfish which they caught January 9, while fishing the Cottonwood river near Emporia. They were using a chub minnow for bait. Penrose is an electrical appliance repairman at Southwestern Electrical Co. in Wichita; Mr. Bjork is an instructor of Electronics at Wichita East high school.

Fish Conservation Fundamentals

By R. W. ESCHMEYER, *Sport Fishing Institute*

Habitat Improvement

(Third of a Series)

To thrive, fish need water.

This was the extent of our thinking some decades ago insofar as habitat is concerned. Now we fully realize that there are other habitat needs. The fish must have proper water temperatures and the waters must be suitable chemically. Food must be available in suitable amounts. Spawning facilities must be present if we expect to have natural propagation. Some species do not remain in an area unless they have places where they can hide.

Each species has its own environmental needs. These must be recognized if our habitat programs are to be effective. Unfortunately, for many species, we still don't have as complete a picture of these needs as we should have.

In laying out our streams and lakes, Mother Nature showed no particular interest in supplying all the needs of the creatures which would inhabit the waters. But the species themselves, over long periods of time, became adjusted to the situation, or disappeared. Consequently, most of our waters were suitable for desirable species of one kind or another when settlement began. Though there are instances where we can improve on the habitat which Nature provided, most of our environmental improvement work is really restoration—correcting deficiencies which we, ourselves, have created in the fish habitat.



HABITAT DESTRUCTION

The extensive destruction of fish habitat by man's activities need hardly be mentioned—we're all aware of it.

As an example, a survey made by the Soil Conservation Service in Whitewater River Watershed in Min-

nesota indicates that originally this watershed had 150 miles of good trout stream. By 1941, as a result of erosion, the watershed had only 60 miles of trout streams and this mileage was in poor condition.

Pollution, as well as siltation, is a major destroyer of fish habitat. Many a stream or lake is no longer suitable for fishing because of the discharge of untreated or inadequately treated domestic or industrial wastes.

RESTORATION IS POSSIBLE

We now have good examples of habitat restoration. An excellent one is in the Clark National Forest in Missouri, where the Forest Service is gradually converting the watersheds back to their original conditions insofar as siltation and in-soak are concerned. According to a report in the Forest Service files, here's what's happening in the Clark Forest:

A half of this forest area can now take heavy rains up to two inches directly into the soil, without run-off. In this area many streams and springs have returned to permanent flow, instead of being intermittent. The streams are now referred to as "milky," not "muddy," following heavy rains. During a recent dry summer the flow at one point in the Current River was 1,600 feet per second, as compared to 1,250 feet per second in the less severe droughts of 1934 and 1936. Plant and animal life in the stream is in much greater evidence now than in 1936. Fishing has improved, and on several of the waters is reported as the best in the memory of the present generation of anglers.

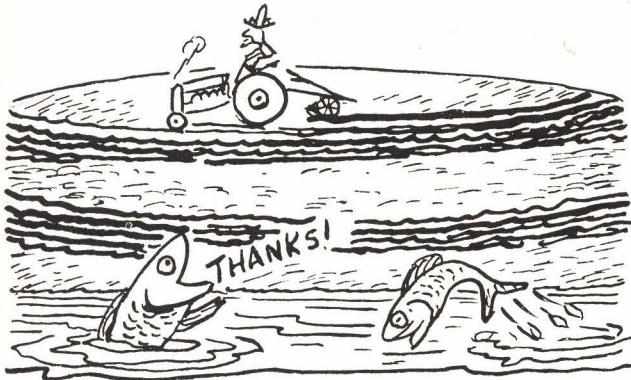
STREAM IMPROVEMENT

In those remaining instances where man has not tinkered with the watersheds, habitat improvement usually is not needed. Here, except in arid and semi-arid regions, the stream flow tends to be relatively constant, because of permanent flow of the springs. Gravel riffles and deep pools are generally available, and there are plenty of hiding places for fish.

This observation gives us an important clue with respect to proper stream management. It's pretty much a matter of watershed use. Where the soil is kept on the land, through proper land use, and where a substantial part of the rainfall soaks into the ground to appear later as cool spring water, a stream will usually restore itself—provided livestock is fenced out.

Where we have heavy siltation because of poor farming, improper forest use, over-grazing or faulty road building, and where we have excessive run-off,

resulting in high waters at times and little or no flow at other times, the use of stream improvement structures is of little or no value.



There are numerous instances where stream improvement structures such as V-dams, covers, deflectors, etc., are helpful. There are also many instances where these artificial improvements don't justify the costs involved, either because they are not needed or because they do nothing to correct the basic problem of siltation or highly irregular stream fluctuation. Too, some amateur attempts at stream improvement may actually do more harm than good.

Before stream improvement (by installing devices) is attempted, the situation should preferably be studied carefully by someone familiar with fish needs and with water-flow and siltation problems.

We are not trying to minimize the value of stream improvement devices. We are implying that where such devices seem to be badly needed, the basic trouble usually lies in the watershed, not in the stream bed itself. We can channel silt downstream, but this is not a good substitute for preventing its entrance into the stream in the first place. We can create pools in streams which have very low water stages, but that's no substitute for the rapid and constant flow of springs resulting from having much of our rain soak into the soil. We can remove obstructions to migrations of anadromous fishes, but no amount of "improvement" will restore good habitat so long as the water is polluted by industrial or domestic wastes.

LAKE IMPROVEMENT

Numerous attempts have been made to improve habitats in lakes, by use of such "devices" as brush shelters, spawning beds, planting of aquatic weed beds, fertilizing, etc. Some have been helpful; some haven't.

Brush shelters do attract young fish. But, all too often, the fish which find shelter there are species such as sunfishes and perch, which tend to be over abun-

dant and stunted. The value of sheltering young fish is subject to question. But, the shelters do attract big fish of some species (such as black crappie) to the vicinity and permit a greater harvest of these fish. In big waters particularly, only a small percentage of these fish is harvested. Here, concentrating them to simplify the catching of these fish is a good conservation measure.

We once believed that weed beds in lakes and ponds were vital to fish life. This observation was erroneous. Today, farm pond specialists don't want coarse aquatic vegetation in ponds. Too, large TVA storage reservoirs have produced good supplies of fish without aquatic "weeds."

From the standpoint of fish production, weed beds in general may do more harm than good. They protect the young pan fish from their predators and thereby cause overpopulation. But, in all except small lakes, weed beds (unless too abundant) help decidedly in harvesting the adult fish. The weed beds tend to concentrate the catchable fish, so that anglers can take more of them.

Over-abundance of vegetation is a major problem in some waters. Fertilizer has been used effectively for weed control in some instances, and certain herbicides have also been used extensively. There's still no simple, universal method for control of overabundant aquatic vegetation.

Gravel spawning beds for bass have been placed in some waters. There's proof that fish use them, but we still know of no concrete evidence to prove that introduction of spawning beds has increased the bass population.

Fertilizing with commercial fertilizer has greatly increased the fish crop in ponds in some areas, especially in Alabama. Elsewhere it has been of questionable value. For example, here's a paragraph from an article (by Rod Cochran) in a recent issue of the Ohio Conservation Bulletin:

You hear a lot today about adding commercial fertilizer to farm ponds. As far as fish production is concerned in Ohio, you can forget about it at present. As already stated, the main problem with most ponds is that they are overpopulated. This is an indication that the ponds are already fertile enough to produce more fish than are harvested.

Water-level management offers a number of possibilities, such as raising the level to provide better marshy border for northern pike spawning; or lowering the level for a period to permit land vegetation to grow on the temporarily exposed shoal.

There are other lake improvement possibilities, such as adding lime to over-acid waters, or pumping nutrient materials from the deep bottom (where they are of little value) onto the unproductive shoal areas

(where they are valuable), or removing ice cover to prevent winter-kill.

Like stream improvement, lake improvement offers definite possibilities. And, like stream improvement, it has definite limitations.



IN GENERAL

Various habitat improvement devices and manipulations have a definite place in fish management, but the important fish habitat improvement problem is one of general land use. With the limited funds available for fish work, the fishery workers can't begin to restore the watersheds. The problem is far too big, and too costly.

But, watershed improvement is progressing rapidly. The improvement is needed for other reasons.

Farmers must keep their all-important topsoil on their land. It's their life-blood. Too, they must manage their land to permit a considerable amount of rain-water in-soak, so the plants will have water in the long periods between rains.

Over-grazing hurts the range—land and pasture—it reduces future carrying capacity.

Forest fires destroy future timber values—as well as harming fishing.

Pollution abatement is needed because of other water uses—recreation, drinking water, and the growing need for large amounts of clean water for certain industries.

Because of the increasing improvement in the use of our soil, water, and forest resources, we can expect a gradual improvement in our fish habitat. There's another relationship between wise use of these resources and fishing. Without our high standard of living, maintainable only by the future wise use of these resources, there wouldn't be sport fishing. Hungry people don't fish for fun. They seek food, not relaxation.

In general, the use of artificial devices in the water will benefit the fish habitat in some instances. Better

use of the watershed and its resources will benefit the fish habitat in most instances. Though it might seem far-fetched at first thought, our soil conservation programs, forest fire prevention programs, etc., are all-important to the quality of your fishing.

(Next: Population Manipulation)

Worms Without Soil

The best way to raise worms is not in manure and compost as has been believed for a long time, but in materials rich in proteins, fats, and carbohydrates. "Worms without Soil," in the April issue of *The Fisherman* magazine, by Earl Franklin Kenamer, gives the formula and method for raising worms.

The worm beds should be located in a well-drained area, sloping slightly, if possible, near a hydrant or other water source. The pits should be dug 12 to 15 inches deep and about four feet in width—so that you can reach the center of the bed easily. The sides and ends of the pits should be lined with rot-proofed boards and a simple shed roof constructed over the pits to protect the worms.

The bedding material must serve two purposes: Food and filler. One bed formula which has given excellent results is: 75 parts cottonseed meal "fine" bran, 10 parts soybean meal, 10 parts steamed bone meal, and five parts wheat shorts. Another mixture that is similar is five pounds cottonseed meal, five pounds peanut meal, one pound cornmeal, and two pounds wheat shorts.

The bedding material should be allowed to rot by wetting it down—wet but not soggy—and turning it daily. No worms should be stocked in the bed mixture until it has ripened sufficiently and all of the heat is gone. This procedure sometimes takes five or six weeks.

The English redworm is best for stocking because it is more prolific and adaptable to artificial production methods. The beds should be stocked with 20 to 30 worms per square foot of bed surface. Within three or four months you will be growing the maximum number of worms the bed will support.

To remove fish odor, rinse hands in vinegar; to deodorize a skillet after frying fish, boil a little vinegar in it.

The pronghorn, commonly called an antelope, is not an antelope. It belongs to a separate family and has no relations. It is the most truly American mammal known.

Fish Conservation Fundamentals

By R. W. ESCHMEYER

Population Manipulation

(Fourth in a Series.)

We don't like the term "population manipulation" but use it for want of something better. It involves managing fish populations in such ways as to provide optimum numbers of catchable-size fish. It may involve playing predatory game fish species against their prey (the pan fishes), or controlling the less desirable species, preventing overpopulation; and, in some instances, eradicating entire fish populations and starting over by restocking with more desirable species.

Obviously, we can't manipulate fish populations intelligently unless we know what species are present and the relative abundance, size-classes, and rates of growth of these species. We also need to know what species can contribute the most fishing under various amounts of fishing pressure.

We need to know, too, what species are desired by the angler. Often, a fish which is a "weed" species in one area is a highly-prized species in some other region. There's the question, too, of the relative "catchability" of a species. For example, the bluegill is more catchable than the bass. We also need to know the individual habitat needs of the various species.

Population manipulation hasn't progressed far, except in a few aspects, because we still don't know enough to handle it intelligently. But it has a big future.

We also don't know enough about the subject to give a brief, concise over-all picture of it. So, the comments here are limited to a few aspects.

THE FARM POND

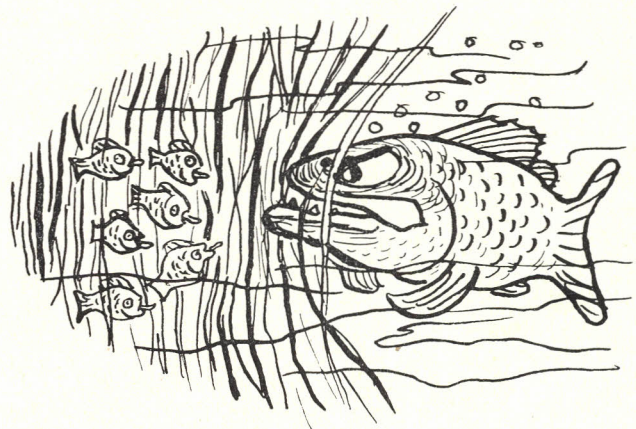
The farm pond, with largemouth bass and bluegills (other combinations of predators and prey species also are used) is probably the simplest habitat with which fishery workers deal. Yet, fishery workers disagree rather decidedly on how it should be managed. This disagreement can be attributed mainly to the fact that conditions differ, and that management methods which are successful in one area often don't pan out in another area.

The objective, in the farm pond, is to produce continuing supplies of both catchable-size bass and bluegills in reasonable numbers. This can be done only if the bass keep the bluegill population reduced in numbers (by eating them) to where there's adequate food for the bluegills which survive—and only if enough

young bluegills are produced to give the bass enough food to permit rapid growth.

The "balance" between predator and prey is a rather delicate one. Usually, after a few years, the bluegills become overabundant and stunted—regardless of the stocking ratio used at the start. The stunted bluegills make serious inroads on the supply of bass eggs and fry, reducing the future "predator" population effectively. It's a one-way affair, and is unlikely to correct itself. Only about one pond in a thousand gets any kind of management—including nearly enough fishing.

The other extreme—overpopulation and stunting of bass—is much less likely; it can often correct itself because bass can keep their own populations down effectively (when food is in short supply) by eating their own young.



Knowing that the tendency is toward too many bluegills, the pond owner can use various population manipulation "devices" to maintain balance or to restore it. Those which come to mind are:

1. Fish the pond hard and often. Remove all bluegills caught, regardless of size, but return a reasonable number of the bass caught.
2. Keep the pond free of aquatic vegetation. The small bluegills find excellent protection in dense weed beds and are less available to the bass.
3. Destroy most of the bluegill beds. A few nests can produce a lot of young. Destruction of most of the beds by mechanical disturbance or chemical poisoning—when the eggs have been laid—will reduce bluegill production.
4. Partial poisoning. Studies on partial "poisoning" with rotenone made at Auburn, Alabama, indicated that, at mid-day, use of rotenone along the mar-

gin would take mostly bluegills, few bass. The same procedure, used early or late in the day, would destroy large numbers of bass as well. The fact that small bluegills are inshore in mid-day, when bass are in deeper water, permits destruction of bluegills without serious harm to the bass.

5. Where ponds are seinable, excess bluegills can be removed by seining. Or, they may be removed by trapping.

6. Where conditions permit, the pond can be drained and the desired number of fish can be returned. Or, the population can be removed by use of rotenone. However, the fish are killed by this process and the pond will not provide fishing until new stocks have grown to catchable size.

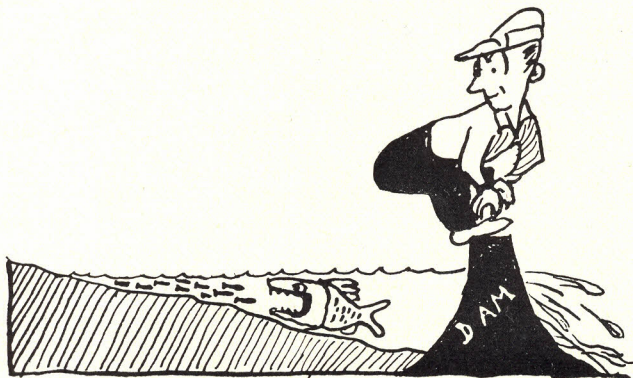
7. A fellow we had lunch with recently had his own simple answer to the bluegill overpopulation problem in his 1½-acre pond. He bought several hundred dollars' worth of adult bass and hoped to add several hundred more dollars' worth in a few months. This method is effective, but we don't advocate it for general use for obvious reasons. The method is too costly, except in isolated instances on private waters, regardless of effectiveness.

LAKE REHABILITATION

Often—where the fish populations are made up largely of numerous stunted fish or undesirable species—the easiest way to restore good fishing is to drain out the water (if possible), or to exterminate the population by chemical means, and then restocking to start over.

There are limitations, of course. Most waters can't be drained. Use of rotenone is expensive, it rarely results in a complete kill of all fish, and it will kill fish in the outlet stream.

Despite the limitations, rehabilitation has become an important tool. By 1954, the state of Washington, alone had treated 210 lakes (17,783 acres), destroying the fish populations and, by subsequent stocking, created excellent trout fishing where angling was poor prior to rehabilitation.



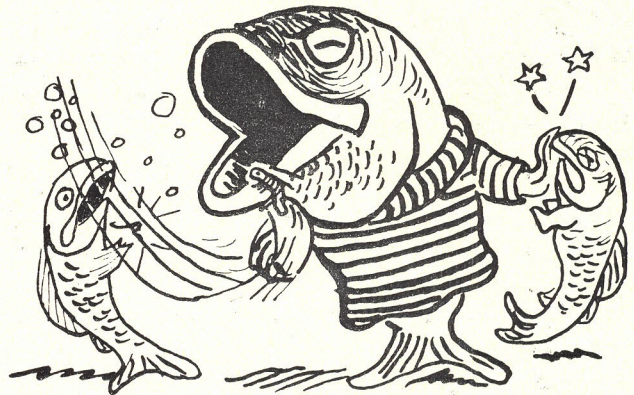
Partial "poisoning" is effective where certain fish concentrate, usually at spawning time. Such fish as adult carp, suckers, and some pan fish species, can be reduced very decidedly by this method.

Rehabilitation of streams has also been tried recently, in a few instances, to reduce the rough fish. In one major attempt, rough fish from downstream soon repopulated the treated areas. Its value in stream management is still not determined.

ROUGH FISH CONTROL

In waters which are well suited to rough fish, control measures often help fishing for the more desirable species. Experience shows that control of rough fish must be substantial and persistent if it is to be effective. Otherwise, recovery to their original abundance is apt to be rapid.

Some years ago big Mattamuskeet Lake in North Carolina was taken over by the U. S. Fish and Wildlife Service and made into a national wildlife refuge. Carp interfered with the success of the refuge. They



became extremely abundant. Much of the food for waterfowl disappeared in Mattamuskeet. The bass and crappie mostly disappeared, too.

A seining area was baited with grain to attract the carp. In 1949, when bait was first used, the take of carp rose to 110,000 pounds. In 1950 it jumped to 360,000 pounds, and in 1951 to 745,000 pounds.

As a result, the water in this shallow 30,000-acre lake became much clearer. Waterfowl food plants increased greatly. Bass and crappie increased quite decidedly. Fishing has improved as a result of the carp control program.

Extensive study in Iowa brought this conclusion from two fisheries workers in an article in the Transactions of the American Fisheries Society:

The Iowa Conservation Commission's policy on rough-fish removal has been based for many years

on the theory that these fish are detrimental to and competitive with the more desirable species of fish. Rough-fish control has been vigorously carried on year after year in several Iowa lakes. In these lakes game fish populations have been large and angling in general has been good. On the other hand, in several lakes with large populations of rough fish that have not been seined so intensively, game-fish populations have remained at consistently low levels.

There are other examples to demonstrate the importance of vigorous rough fish control on some waters. Such control can be exercised in a number of ways, including use of commercial gear, local "poisoning," and possible innovations in electrical shocking devices.

In some areas the problem is being partially solved by liberalizing regulations, and by creating a greater demand for rough-fish fishing. Some of these fish are excellent fighters; and some, from unpolluted waters, have good food qualities. In this connection, two personal experiences come to mind. On more than one occasion persons have commented on the excellent taste of the "walleye" fillets they were eating, not knowing that carp fillets had been substituted. Too, the "fights" which we recall most vividly were with big carp on light tackle. We didn't know that carp weren't fit to eat or fit to catch until we left home and brushed up against "sophistication!"

WATER LEVEL FLUCTUATION

For many years fishery workers and sportsmen believed that a permanent water level was essential to good fishing. We now know that fluctuating levels, properly manipulated, can greatly benefit angling by influencing the fish population favorably.

To cite a single example, a biologist of the Illinois Natural History Survey experimented with summer drawdown on Ridge Lake in Illinois. He found that extensive late-summer drawdown keeps the abundance of small bluegills under control. Large numbers of them are eliminated by stranding as the water recedes or by being eaten more readily by bass when they become exposed and concentrated in a smaller area. This results in increased success of bass spawning the following spring when the lake approaches its normal area again.

PROVIDING FORAGE

To have reasonable supplies of catchable-size fish, all steps in the food chain must be well represented. Fishing can sometimes be improved decidedly by finding the weak link in the chain and strengthening it.

In one such case, a southern reservoir of about two thousand acres had very poor fishing. Sampling in a bay of several acres produced a few catchable-length,

but thin, bass and some numbers of badly stunted bluegills. Because of extensive winter drawdown, there was little insect life on the bottom. The only available basic food was the plankton—microscopic plants and animals. This food in the amounts present would raise the bluegills and young bass to sizes of a few inches; thereafter, they needed bigger food organisms. The big bass had little fish as food. But the stunted bluegills tended to take advantage of the very shallow water. The most readily available food for big bass was little bass, and the supply of these was limited.

Gizzard shad, plankton-eaters, were introduced. After they were established a bay was sampled again. Now there were more big bass and they were in better condition. Young-of-the-year bass were well represented, too; many had survived because predation on them had lessened. There were many young-of-the-year shad, just the right size to serve as food for the big bass. As expected, there were also numerous small bluegills as stunted as ever.

The game fish population had changed decidedly and fishing had improved. The weakest link in the food chain had been strengthened. Perhaps we should add that there are places where shad should not be planted; this should not be construed as an endorsement for the indiscriminate introduction of these fish.

IN GENERAL

This is admittedly an unsatisfactory discussion of population manipulation. But, it does indicate clearly, we hope, that this management tool has a big future. In general, we're still too short on factual information to apply it effectively.

As may have been observed, it isn't easy, at times, to draw the line between habitat improvement and population manipulation. But, the point is of academic interest only.

In the past our efforts have been aimed mainly at managing fishing by placing various and sundry restrictions on the angler. Some of these are needed. However, prior consideration should be given to managing the fish populations themselves. On many waters the angling affects the actual fish populations only to a limited degree.

Next Issue: "Creating More Fishing Waters."

Bears often select a prominent tree for rubbing, gnawing and clawing. They mark these "bear trees" to show their size as a challenge to other bruins.

A praying mantis is said to be the only insect that can turn its head.

Fish Conservation Fundamentals

By R. W. ESCHMEYER

CREATING MORE FISHING WATERS

(Fifth in a Series)

If there is a big demand for a farm crop, that demand can be met partly by increasing the yield per acre through fertilizing, use of better seed, better cultivation, or by some other method or combination of methods. However, if the demand is great, it can be met mainly by putting more acres into the production of this particular crop.

In areas where fishing waters are few, we can help the fishing somewhat by managing these limited waters as wisely as possible. But, on even the best-managed waters, the production of fish is limited. The answer to heavy fishing demand, in areas with few fishing waters, is a simple one. The demand can be met properly by putting more acres into fishing waters. Fortunately, this fish conservation "tool" is getting more and more use.

The only alternative to creating more water would be to stock the limited waters heavily and repeatedly with catchable-size fish. While undoubtedly effective, it is a method which would be financially impracticable for warm-water species; and, it would be highly costly for trout.

The new waters fall into three major groups: farm ponds, public fishing lakes, and reservoirs built mainly for purposes other than fishing. Getting access to existing waters, too, can be regarded as a part of the "creating-more-fishing-water" program. The several kinds of waters will be discussed separately.

THE FARM POND

So far as we know, there is no exact information on the number of fish-producing farm ponds in the United States. The best estimate seems to be that this number now exceeds a million, and probably approaches two million.

Any one of these ponds supports only a limited amount of fishing, but the fishing potential on the ponds, collectively, is immense.

If we had only a million ponds, averaging a half-acre in size, and they were managed to yield a hundred pounds of fish per acre to the angler, the catch would add up to 50 million pounds of fish.

If each pond provided only ten days of angling recreation, it would add up to one fishing day for each sixteen people in the United States.

A single pond may seem insignificant from the standpoint of national fishing, but the ponds, collectively,

can and do contribute very decidedly to our angling.

There are still many problems; some ponds aren't built properly, some aren't managed intelligently, some are unproductive because of poor watershed management. But, these limitations are gradually being overcome by research and education.

Some farm pond advocates put heavy stress on the pond as a source of meat for the farmer. If our own rural background was typical, this argument has limitations. After a hard day of physical work, the farmer may enjoy catching fish, but cleaning them is another matter. There was a time when this created no problem—when men caught the fish and the women folk cleaned them—but that day seems to be past. Chances are that the average farmer will take care of his meat problem by butchering a cow or hog at intervals.

The big future for the farm fish pond, as we see it, lies in its furnishing a cash income, by allowing others to fish the pond, for a fee. This will be true particularly during periods of low income from the regular farm products. The pond, admittedly, wouldn't be a big source of income, but such income would be an added value, with stock watering, recreation for the farmer's family, etc., as the major values.

THE CLUB POND

Many sportsmen's clubs have built fishing lakes, usually for use by club members. These are excellent projects. As a rule, they are bigger than farm ponds, though the problems are similar. The tendency is to expect too much from these ponds. An annual take of 100 pounds per acre would be well above average, because club ponds tend to be built on relatively unproductive (less costly) lands. For a club with a hundred members, this would represent one pound per member per acre per year. Of course, the pond could provide an endless amount of badly needed relaxation, even though the yield in "meat" is limited.

PUBLIC FISHING LAKES

A number of states are now using some of their fishing license and Dingell-Johnson (federal aid) money to build public fishing lakes, usually ranging in size from fifty to several hundred acres. A survey made by the Sport Fishing Institute in 1953 showed that some 163 such lakes had been built in the preceding five years, and that 70 more, averaging 120 acres, were under construction or in advanced planning stages.

The Alabama conservation department has demonstrated what can be expected from such a program, by keeping a record on its state-built fishing waters. In

1953 the state's eleven such waters (total acreage 591) attracted 100,183 fishermen (fisherman-days), and yielded 357,714 fish, weighing 99,871 pounds. This averaged out to 170 fisherman-days and 605 fish weighing 169 pounds for each acre of water. These lakes, built since 1947, are located in areas with insufficient fishing water, are fertilized, and are located in watersheds where they are relatively free from erosion.

In a number of states the lake-building programs should have high priority. Of course, they will have continued good fishing only if properly managed. Since we still don't know, in many areas, what constitutes proper management, it's essential that a good, down-to-earth fact-finding program accompany the lake building projects.

One item merits special consideration. There is a tendency to suggest building lakes on relatively unproductive land, because of the higher cost of land in productive watersheds. Despite the lower initial cost this is a poor practice to follow. A study of two state-built lakes in Tennessee, similar in size and construction, showed that one draining productive soil had an excellent fish yield. The other, in a nearby but unproductive watershed, did very poorly. In water, as on land, the amount of nutrient materials available largely determines the potential carrying capacity.

BIG RESERVOIRS

Here we have a controversial subject, mainly because of the tendency to be all for or all against dams. Some have been highly beneficial to fishing; some have been harmful. You can't generalize on the effect of dams on fishing; each dam or potential reservoir must be considered separately, along with the present or proposed operation program for that particular body of water.

For example, dams built for other purposes have greatly increased the fishing in the South, from Texas and Oklahoma to the Carolinas. They have been detrimental to fishing in other areas, particularly in the Northwest. Here, construction of high dams threatens extinction of important anadromous species of salmon and trout.

In the Tennessee Valley, after impoundment, fishing increased 45 to 50-fold on storage waters and 10 to 15-fold on the main stream. This survey was made some years ago; on some waters the fishing intensity has increased rather decidedly since that time. For example, fishing in the TVA tailwaters below the main-stream dams has been rising steadily. Daily counts for the 1954 fiscal year showed 966,334 man-days of fishing immediately below nine main-stream dams. This was nearly three times the 1947 estimate of 339,000.

Because of the dam-building program, fishing in parts of the South is much more extensive, and more successful, than it was twenty years ago. The improvement was by accident, not by design. It happens that here good fishing waters were few in pre-impoundment days. Too, in a normal year, operations do not prevent the development of a fair-sized crop of fish. Major drawdown is in winter, when it interferes little with fish populations. At spawning time the reservoirs are filling, with water levels generally rising slowly. Erosion is limited enough so that the waters are not too muddy over long periods of time for good fish production. In waters where insects are few, good production is possible, nevertheless, because the main food chain (for desired species) is microscopic food to shad to crappie and black bass or white bass.

Despite the constant increase in numbers of reservoirs, insufficient fact-finding effort goes into these waters. Research might well point the way to improved fishing in some reservoirs which now provide poor angling.

Usually, the success of a reservoir for fishing hinges on the condition and fertility of the watershed. If the silt is kept on the land, and out of the water, the chances for having good fishing are greatly increased. Muddy waters don't provide good fish crops.

Where dams are installed and operated for hydro-power, flood control, or irrigation, the over-all management program should give proper consideration to the fishing interest. We know of few instances where such consideration is given. This may be due partly to our lack of knowledge regarding proper reservoir management from a fish production standpoint.

PUBLIC ACCESS

In effect, we are creating more fishing water when we provide access to waters which already exist. A number of states are now giving high priority to the problem of providing public access. This problem will increase as the population grows, and as land values rise.

An owner who might allow limited public use, might install "no trespass" signs when that use increases considerably. Unfortunately, in any sizeable group of anglers, we can expect a small number of them to have little regard for private property. These are the ones who clutter up the landscape with cans, paper containers, and other debris.

The alternative to free access is the buying or leasing of land and water by the state. It's a costly program in areas of high land values, but it will be even more costly as the population increases.

CLOSED WATERS

Some water supply reservoirs are open to public fishing, others are not. San Diego's water supply lakes have been fished for over twenty years, with no indication that the fishing was harmful in any way to the drinking water. The city has regularly charged a small daily fee, which pays for enforcement of the sanitary regulations imposed.

Where water supply lakes are closed to fishing, as many of them are, the cause can generally be regarded merely as stubbornness on the part of the officials. They don't want to be bothered with public fishing. On municipal water supplies, sportsmen can demand that fishing be permitted, with sanitary regulations strictly enforced, and with the charging of a fee, if need be, to pay for the enforcement.

IN GENERAL

Some fishing waters are constantly being lost to the public by drainage, diversion of water, siltation, pollution, and posting. But, others are being created. A number of states now have much more fishing water than they had a few decades ago because of the extensive farm pond and public fishing lake building programs. In some areas, too, fishing has been increased through the building of reservoirs used mainly for other purposes, and through public access programs.

In the face of constantly increasing angling pressure, the "providing-more-fishing-water" program is an extremely important one.



Big carp provide a lot of sport for anglers as these smiling faces attest. They range in weight from 5 to 13½ pounds, and were caught at Rocky Ford north of Manhattan. Dough balls turned the trick for Sam Tate, Dave Bieri and Lynn Northcott, all of Seneca.



A spoon lure was just the ticket to entice this huge western Kansas bass to strike. Meade County State Lake yielded this 7½-pound whopper to Craig A. Ramsey last October. Ramsey lives at Plains, Kan. Shown here with him is his 4-year-old son, Craig Ray. The bass had just swallowed an eight-inch bullhead prior to striking the spoon and three or four inches of the bullhead's tail was still in the fish's mouth when landed.

THINGS YOU MAY NOT KNOW

The Alaskan brown bear is the size of a rat at birth. Cubs usually are born while the mother is denned up for the winter and often she does not even waken.

★

The African ostrich is the largest living bird on the earth today, male sometimes reaching a height of eight feet.

★

The eyes of the cottontail rabbit are placed almost directly opposite one another on the sides of the head. This positioning of the eyes gives the rabbit an extremely wide circle of vision.

★

After hopping off, fleas turn and travel tail first through the air.

★

The jumping mouse is only about three inches long in body, yet it can jump from eight to ten feet.

★

The sloth, one of the slowest of all animals, eats so slowly that before he has finished one meal, it is time for the next.

★

A starfish will eat more than eight oysters in a day.

Fish Conservation Fundamentals

By R. W. ESCHMEYER

USING THE TOOLS

(Sixth in a series)

Up to this point we have discussed, briefly, the general fish conservation picture, and the use of the five major fish management tools. In those states where these tools are used wisely, fishing appears to be improving instead of continuing down-hill as pressure increases. The problem seems to be one of being able to use the tools effectively and of making them constantly more useful.

INCREASED KNOWLEDGE

A look at these five management methods tells an interesting story. We were frequently off base on stocking—until research brought us to our senses. Even then, we still had the problem of bringing about a change in public concepts, an admittedly difficult problem.

Many of our regulation practices were ineffective or did more harm than good—until fact-finding came along to point out our errors and put the regulation matter on a sounder basis. Then came the problem of educating the public to realize that more and more restrictive regulations and ever-increasing numbers of wardens might not be the answer.

Habitat improvement and population manipulation have both developed as usable tools because of research.

In the extremely important activity of creating more fishing water, we were faced with the problem of learning how to manage small ponds and lakes, and the very complicated problem of learning something about fish management in big reservoirs. Here, too, education enters into the picture. For example, farmers needed to learn many things about their newly acquired aquatic pastures before they could learn to handle them intelligently.

SELLING THE FACTS

Basic fish conservation has progressed, then, because of two items—research and education. Its future depends on expansion of these same two items.

This situation is not unique, it parallels development in other fields of science. Medicine has made immense strides; the average life expectancy has been rising constantly and impressively. Why? Because medical research has pointed the way to better diagnosis and more effective remedies, and because our health-education programs have caused public enlightenment. The change in farming methods and crop

production can be attributed to these same items—research and education. A look at other sciences tells the same story.

There's a third item in all instances—professional standards. The specialists must know how to use the tools, how to get the proper facts, and how to educate the public in sound programs. The best of medical research would do us little good if we were to have a "quack" treat our ailment.

Research and education will be discussed separately, later, but a few points which concern both will be mentioned here very briefly.

In both these important matters, progress depends partly on the amount of money available for the programs. But it depends very much, too, on the caliber of the people who handle those programs.

It might be indicated, too, that in one respect the two activities, research and education, are inseparable; the one can't be effective without the other. Facts are of little value until the public accepts them; education, without basic facts provided by sound research, may be miseducation and may do more harm than good.

DILEMMA

One extremely important question is this: If these two items will determine the future of our fishing, why don't they receive high priority, if not top priority, in some of our states? Why are there still states which do little research or conservation education, or none at all?

We don't know the complete answer, but that shouldn't prevent speculation on the matter. And, it should be stated, first, that a considerable number of states now have big and growing research and education programs. We've made decided progress in both, especially in research because of the availability of Dingell-Johnson (federal aid) funds.

Several groups enter the picture: (1) the researchers and educators themselves; (2) the administrators; (3) the commissions; (4) the legislatures and, in some instances, the governors; (5) the sportsmen; (6) the colleges and universities; (7) the press. There are probably others, but these seven stand out.

Where rapid progress is made we can sometimes attribute it to one of these groups, sometimes to a number of them. Likewise, where the state is not progressive in fish conservation, one or more of these groups is usually responsible.

There was the fishery administration, for example, which had no use for researchers. Its interest seemed

to be centered on building more and more hatcheries. A student took graduate work in this state, and took it in fisheries even though this was unusual at the institute in question. His doctorate problem led him in contact with a number of sportsmen's organizations in the general area. The sportsmen not only co-operated, they learned to recognize the importance of research. The biologist was put on the state fishery staff—perhaps because this had become the proper thing to do from a public relations standpoint. This state administration has tolerated a trained fish man ever since. Here, the campus, the local sportsmen, and the biologist, collectively, paved the way to progress.

Of course, there are instances, too, where biologists have had ample opportunity to do a good job, but where they muffed that opportunity for one reason or another.

There are a few instances where the administrator is the key bottleneck, and in a few instances the commission is the damper to progress. But, we also know of many administrators and commission members who have pushed for fact-finding and education, even though this made their own jobs more difficult and more precarious.

Most interesting has been the impact of organized sportsmen on the matter. We know of several instances where they, through wise leadership, took extremely backward situations, conservation-wise, and modernized them. This was done simply by effective, specific, and organized demand to the state legislatures and the governors. The groups made it politically unwise for the elected public servants to do other than pave the way for improvement. We had an opportunity to watch one of the developments at close range over a period of several years; it was an interesting observation.

Of course, we have organized sportsmen in our least progressive states as well as in the most progressive ones. The mere presence of such a group, even a big one, does not necessarily assure progress.

As for the campus, it has greatly aided conservation research and education in some states. It has been of little or no value to these programs in others.

In some states, an individual far-sighted outdoor writer may have been the key figure to progress. And, we still have a very few writers who display a strong dislike for any program involving professionally trained conservationists, regardless of the merits of the program.

FUTURE PROGRESS

Most progress is made where all or nearly all of the above-mentioned groups work for improvement. The states least likely to progress would be those with

few research and education men (and with these few poorly qualified for the job), with administrators who don't want progress, with commissioners whose main interests may be political, with a legislature which exercises complete control over the fish (and game) program, with organized sportsmen having a weak or self-seeking leadership, and with the campuses of the state uninterested in fishery research or conservation education. Fortunately, you can count the states which are in this completely unprogressive situation on the fingers of one hand—even after cutting off some of the fingers.

Actually, interest in research and education has been growing rapidly and more funds are becoming available. In fact, there are instances where this rapid change has created an interesting problem—where the biologists or educators, after long periods of crying for more funds, were not prepared to use these added funds as intelligently as they might have, once the money became available. This was especially true when Dingell-Johnson (federal aid) money rather suddenly made greatly enlarged research programs possible.

Though the research and education picture is a bright one, an important aspect of it is not encouraging. As mentioned earlier, the caliber of the personnel is extremely important. This, in turn, will generally be determined by such factors as salary, opportunity for advancement, and security. But, in research, after about five years of college training, the fishery biologists can expect only a low salary. Annual pay for these men on federal aid programs, as of 1953, averaged only \$3,900. Too, the work has its unpleasant moments from a public relations standpoint, though in many states this aspect is improving.

If our all-important activities of research and education are to improve constantly, such matters as improved salaries must have serious consideration.

How-tos

Ever get caught in a sudden downpour and spend miserable hours without heat? If you're in pine country, break dead twigs and branches from standing pine trees, scrape off the bark, and you can start a fire in a hard rain—believe *that* or not!

It's very simple to open a can without a can opener if you have an axe or hatchet. Yet, so many sportsmen adopt that helpless look when caught without an opener. Just cut an X on the top and pry back the four points from the intersecting cuts in the center. Real simple, but effective.

Fish Conservation Fundamentals

By R. W. ESCHMEYER

COMMERCIAL FISHING

(Seventh in a series)

Any discussion of commercial fishing, if it says anything at all, is certain to draw disapproval from one group or another. It's one of the subjects on which people are highly opinionated. Actually, in theory, there seems to be little reason for dispute on the general issue. The arguments center around the desirability of commercial fishing on individual waters or for individual species.

The question of whether sport fishing or commercial fishing should have prior consideration can best be answered by determining which of the two is of greater value to the owners of the fish—the public. This question can be answered very easily from a monetary standpoint, less easily from the standpoint of intangible values.

Insofar as use of the fish for food is concerned, most edible fish are eaten—whether taken by sport fishing or by commercial gear—so this question doesn't enter the picture.

MONETARY VALUE

Monetary values of commercial fish, at retail prices, are easy to get. All you need to do is check the prices at the store or the fish market. The value of fish taken by the sport fishermen is not so easily determined, but a number of figures are now available.

A publication recently received shows values for 119 miles of Madison River in Montana, as determined in a fishermen-expenditure study made by the U. S. Fish and Wildlife Service. Two reservoirs on the river are included. The estimated figures for the period 1950 to 1952, in average expenditures per pound of fish caught by anglers, are: Lower Section \$3.31, Madison Reservoir \$3.47, Middle Section \$3.39, Upper Section \$7.97, Hebgen Reservoir \$8.21.

Other angling figures, reported in past issues of the BULLETIN, are these, all from studies made by the Fish and Wildlife Service: Lake Maloney (Nebraska), \$1.23 per pound; Republican River (Nebraska and Kansas), \$2.42 per pound; Pathfinder Reservoir (Wyoming), \$3.94 per fish; Alcova Reservoir (Wyoming), \$5.39 per fish; Fremont Canyon, \$4.61 per fish. On a section of North Fork Sun River, and several associated waters, expenditures per pound of fish averaged \$7.41; on Deerfield Reservoir in South Dakota the average per pound was \$3.64. On a 5.5-mile stretch of North Platte River in Wyoming, bank fishermen spent \$8.13 per pound of trout, boat fishermen, \$7.83. On West Gallatin River in Montana average fisherman

expenditures amounted to \$5.00 per pound of all fish taken.

The California fish and game department has released figures on the value of fishing for striped bass, salmon, and steelhead in 1953. Average of expenditures by California anglers to catch a striped bass was \$13.65 (average cost per pound, \$3.03). For a salmon it was \$16.85 (average cost per pound, \$1.40). For a steelhead it was \$28.26 (average cost per pound, about \$5.60).

According to a study sponsored by the Sport Fishing Institute and conducted by the Maryland department of research and education, the value of sport fishing in Maryland waters of Chesapeake Bay was \$9,606,000 in 1952. This department has estimated that 3,388,000 pounds of fish were taken in 1952 by hook and line in Maryland waters of the Chesapeake and Atlantic Ocean combined. For the Chesapeake Bay, then, the average value of each pound of fish taken by sport fishermen is something over \$3.00.

It is quite evident that the angler pays far more for the pleasure of catching a fish than the "meat" value of that fish.

INTANGIBLE VALUES

The intangible values of commercial fishing are limited. In sport fishing they are immense, for both adults and young folks. "Keeping up with the Joneses" has become a complicated affair. The need to relax—to get away from it all—grows constantly as our civilized way of life becomes more complex. For millions of Americans, fishing is the favorite form of relaxation. Angling is no longer a dignified way of doing nothing—it's a tonic for frayed nerves.

EMPLOYMENT

Chief argument advanced for commercial fishing is that it furnishes employment. But, here again, sport fishing furnishes immensely more employment, and to people in a wide variety of occupations. Assuming that the average angler spends at least \$50 per year on fishing, the expenditure for boats, motors, transportation, special clothing, bait, tackle, and the other items involved, adds up to well over one billion dollars per year. We don't know how many people are given employment by sport fishing but the number is not small.

The argument that commercial fishing must not be restricted because it will cause unemployment, is hardly worth discussing. We "restricted" market hunting, without regard for the employment question.

Each time we buy a new car we completely ignore the fact that some mighty nice folks were put out of work by shifting from horse and buggy to the horseless carriage. The blacksmiths, buggy-whip makers, harness workers, and wagon builders all took a whipping. Changing conditions call for changes in employment.

ADDING IT UP

The commercial vs. sport fishing question adds up to one answer: *If fish supplies are not adequate for both kinds of fishing, then the sport fishery must have first consideration.* Where the two are in direct conflict, sport fishing must have priority. Basically, the question is no different from the sport hunter vs. the market hunter problem, which was solved some years ago.

With this point firmly established (we hope), where does commercial fishing fit into the picture? It fits in wherever it does not seriously interfere with sport fishing and, of course, in those many instances where it helps sport fishing.

Fish of desirable species for angling are sometimes present in big enough quantities to serve both sport and commercial fishing. A good example was the Ohio fishing during the past year on Lake Erie. Sport fishermen had excellent success on walleyes and perch. Yet the commercial fishermen did so well that they tended to glut the market.

Many fish species are of little interest to sport fishing. Yet, these fish may compete seriously with the more desirable fishes. Removal of the less desired species can be expected to benefit sport fishing.

We discussed the importance of controlling rough fish in an earlier article on population manipulation. There are actually many instances where we couldn't have good sport fishing if rough fish weren't controlled by commercial gear. Moon Lake, in Mississippi, is an excellent example. Here, some few years ago, local sportsmen insisted that the lake be closed to commercial fishing. They were unable to get the support of the fish and game authorities, but they nevertheless were able to get a special bill passed by the legislature outlawing this fishing. Sport fishing soon started to decline, and continued to do so, as had been anticipated by fishery workers. Finally, the law was repealed, the lake was heavily fished with commercial gear, under close supervision of a state fishery worker. Angling improved on Moon Lake as a result of this activity.

We realize now that on some waters certain species must be harvested if we are to have good fishing for other species.

THE PROBLEM

As mentioned earlier, in theory the problem of sport vs. commercial fishing is a fairly simple matter. The fish are worth far more, in both tangible and intangible values, when taken by sport fishing. So, where fish supplies are inadequate for both kinds of fishing, the commercial fishing must give way to angling. To us, that's the answer, theoretically.

In practice, there are complications. Just where shall commercial fishing be permitted? And to what extent? These are questions which must be answered locally—by down-to-earth fact-finding programs. There are no simple, general over-all answers to them.

Outdoor Notes

By JOE AUSTELL SMALL

Cold Jumper

Dr. D. L. Albasio chopped a frozen frog out of Yosemite glacier and has hopes that the croaker is still alive. He named his find "Lazarus." The frog is frozen stiff in a block of ice stored in Dr. Albasio's refrigerator.

Using all available data on the glacier, the doctor figures that Lazarus went into a deep freeze about 1,200 years ago. He is going to thaw the frog out and enter it in a California frog-jumping contest, Dr. Albasio declares. Scientists have taken a dim view on the doctor's aspirations. They say Lazarus is deader'n the well-known mackerel.

Some jerk also entered this thought: If Lazarus couldn't jump far enough to elude a glacier 1,200 years ago, how could he be expected to win a jumping contest against modern-day frogs? This columnist's reaction to the frog story: I tink I go feeshing. . . .

Kids' Answers to Nature Examination

A marsupial is a city government.

Gars are poles to hang the sails on a boat.

Fawn is the eggs of a fish.

The skunk is a little animal that hides in holes and smells.

Game conservation is like canning fruit conserves—only you use wild animals.

Bobcats are male wild cats and lynxes are the females. A cross between them is called the bobolinks.

A flicker is when your eye winks.

Terrapins is like delirium which men have that drink too much.

Fish Conservation Fundamentals

By R. W. ESCHMEYER

THE VALUE OF ANGLING

(Eighth in a series)

There are no really reliable figures on the monetary value of angling in the United States as a whole. And, of course, we can't ascribe monetary values to the intangible side of fishing—the value of angling to our general health and well-being. Our own guess has been that there are more than 25 million anglers in the United States (perhaps 30 million, or over), and that the "average" angler spends about \$50 yearly for his sport, bringing the annual total monetary value of fishing to well over one billion dollars.

Our estimate was recognized as an extremely conservative one. We took into account the fact that many anglers, especially the kids, spend very little for their pastime even though they go fishing often. Whatever the actual annual expenditure, we can be certain that fishing is big business.

MONETARY VALUES

The monetary value of fishing, or of fishing and hunting combined, has been calculated for several states. Here are the figures available to us, as reported in earlier issues of the BULLETIN:

Several years ago, a North Carolina survey showed sport fishing in that state to have an annual value of \$22,063,112. Commercial fishing was valued at 5½ million dollars.

A survey in the state of Washington showed that the 400,000 hunting and fishing license holders spent an average of about \$200 on their hunting and fishing in 1950, for a total of \$80,000,000. The commercial fish catch for the state that year was \$20,000,000.

A study in Massachusetts showed hunting and fishing expenditures for 1951 at \$74,000,000. Of this amount, 18 million dollars was for saltwater sport fishing.

A New Hampshire survey for 1952 shows that anglers in the state spent \$13,000,000 for fishing. By contrast, 18 years ago, the estimated value of hunting and fishing combined was \$6,000,000.

A recent survey in Idaho listed the annual value of hunting and fishing activities at \$43,000,000.

Minnesota estimated that the monetary value of its 1953 fishing was \$200,000,000.

California estimates that the value of its sport fishing, hunting, and commercial fishing approaches \$1,000,000,000 annually.

Several years ago, interviews by the Michigan Tourist Council with more than 10,000 tourists showed that,

for 45 percent of Michigan's tourists, fishing was the principal reason for their vacationing in the state.

Obviously, fishing is big business!

INTANGIBLE VALUES

Whatever the monetary value of fishing may be, the intangible values of the sport, though not measurable, are probably much greater.

Within a few short generations, our way of life has changed. Our forefathers used their hands and muscles to make a living. Today, most people earn a living by using their heads, plus machines, push buttons, and swivel-chairs. Despite medical advances, these changes in our way of life, together with the growing complexity of our so-called "civilization," have been taking their toll as a result of constantly increasing nervous strain.

Now, most of us struggle nearly every waking hour—in a mad scramble to "keep up with the Joneses"—in the acquisition of material things aimed at giving us an easier way of life!

Several years ago, the national consumption of aspirin was estimated at 15 tons daily. By now, the daily tonnage has undoubtedly increased considerably.

A growing number of people need help from the prescription counter to fall asleep.

Juvenile delinquency is a big and growing problem.

A study of the physical fitness of our youth, compared to that of youth from southern Europe, shows an impressive result. American youths failed 78.3 percent of the tests; the Europeans failed 8.3 percent of them.

Brigadier General Louis H. Renfrow, deputy director of Selective Service, has said that easy living habits are steadily reducing America's stamina to the danger point. General Renfrow said:

"Civilizations have disappeared when they lost the central core: strength, incentive, vitality, and the stamina necessary to withstand strain and extreme shock in emergencies.

"No one can estimate what the automobile has cost the American people in muscle, or the radio, television and motion picture in active participation in recreation."

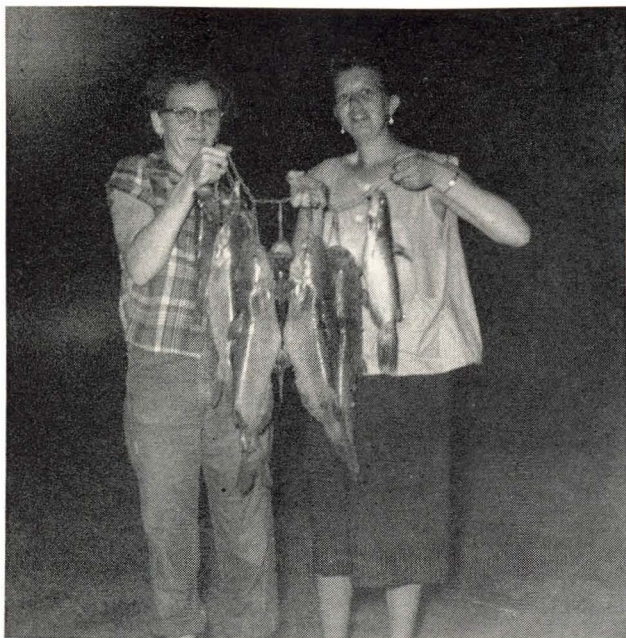
Significant was the observation made some months ago by Judge William G. Long of Seattle. He observed that in over twenty years he had handled some forty-five thousand juvenile cases, and that he recalled no case of serious juvenile misconduct involving a youngster whose hobby and recreational outlet was fishing.

The therapeutic values of angling for adults are also recognized. Obviously, fishing is good for people. For

the adult, it's a tonic for frayed nerves and an opportunity to gain a better perspective. For the kid, it contributes to physical and mental well-being, and toward a better future.

ADDING IT UP

We included this brief comment on the values of fishing to demonstrate that angling is an extremely important aspect of the American scene. It has now been shown, repeatedly, that modern fish conservation can help angling, can contribute toward "shortening the time between bites." Because of the significance of fishing, fish conservation is far too important to be a mere political football, or to be handled by incompetents. Our favorite form of outdoor relaxation must be preserved.



These two ladies take a back seat to no one when it comes to the art of angling and here you see the proof. This fine string of channels were caught by Mrs. Lee Mills and her sister while fishing at Woodson County State Lake in September.

Smartest Animal

The four men were talking about relative intelligence of animals as a whole. They were in a Bangkok bar, sipping lime squashes. The group consisted of George Emerson, MGM animal trainer, David L. Mobley, bird expert, Noel Rosefelt, Far East collector, and Mahout Sawart, a Siamese elephant boy. The quartet are collecting a boatload of animals to be sent to the U. S. According to the four experts, here are the most intelligent animals, in order of their listing: (1) The elephant. (2) The great ape family (gorilla, chimpanzee, orang-utang and gibbon). (3) The dog. (4) The horse.

Bee-Havior

Drone bees in a hive won't work—but it's not because they're lazy as is commonly believed. Drones are born with weak jaws and are not equipped to work with honey and wax. Other bees have to feed them. They are the males, or breeder bees.

The ant family also has an excellent plan—the males do not work. The ant colony is well organized. Some act as housekeepers, others are gardeners, nursemaids, policemen and herders. They even keep servants. Every colony keeps a herd of aphids, or plant lice, which serve as "cows."

With reference to the males not working, we sure could learn something from ants and bees, eh, boys?

Greenback

Only the male frog is a musician. Each has his own sort of thrilling grunt, groan, whistle or burp. Just why frogs prefer to sing at night is not known. But night or day, they always make the most music just before a rain. Old-timers call it the best sign of rain that a man can find. "They're celebratin'!" the old boys will tell you.

The tree toad, which prefers wood to water, can change its color almost as readily as the chameleon. It can become the color of tree bark, or the delicate shade of a new, green leaf—an excellent protective measure.

What's Cookin', Doc?

Ever barbecue venison? No? Brother, you've missed a real treat! If you're lucky enough to have a deer in your locker, here is a recipe you won't forget:

One cup catsup; one tablespoon salt; two tablespoons Worcestershire sauce; one-quarter cup vinegar; one tablespoon butter; one-eighth teaspoon cinnamon; three slices lemon; one onion, sliced thin; one-eighth teaspoon allspice.

Sear three pounds of venison (or any like meat) in a frying pan. Mix above ingredients in saucepan and bring mixture to boil. Stir to avoid burning. Simmer ten minutes. Cover venison with the sauce and roast in moderate oven (350° F.). Cook one and one-half to two hours, turning occasionally. Man, it's good!

Beaver in captivity have been known to live nineteen years.

Most wild elk live to be about ten years old, but captives have lived to be twenty-five.

Fish Conservation Fundamentals

By R. W. ESCHMEYER

THE MODERN PROGRAM

(NINTH IN A SERIES)

There is no uniformity among our various state fish set-ups and programs. Nor could there be. The problems in one state differ decidedly from problems elsewhere. Insofar as organizational set-ups are concerned, there is no close relationship between the kind of organization and the quality of the program. In some states, the fish program is under a conservation department; elsewhere, it is in the fish and game department. In some instances, there is a single commissioner; more commonly, we have commissions with a number of members.

The tendency is to have commissions made up of an uneven number of members and to have fish, game, forestry, etc., under one department. Actually, the effectiveness of the fishery program depends on the caliber and ability of the personnel, rather than on the nature of the organizational set-up.

Listed here are some of the observations which, in our opinion, will help determine whether your state has a modern fish conservation set-up. Because of the differences in organizational make-up, and differences in local problems, some statements do not apply to some states. Too, we may be wrong in some of our observations. The statements which follow should be considered "food for thought," not "gospel."

THE COMMISSION

The character of the commission, itself, will determine whether a modern program is possible. In a progressive organization, the commission members work together as a team. Where we have dissension at commission level, there is certain to be indecision and low morale among the personnel. Feuding, common in some commissions, can be expected to result in an ineffective program.

The commission members should have a broad viewpoint. A provincial attitude, with each member concerned mainly with his own area, can only be expected to hamper the program.

The commission members should not think of their membership as a means of realizing personal ambitions, political or otherwise. If their membership is aimed mainly at promoting themselves, they can be expected to contribute little or nothing toward improvement of fishing or hunting.

The chief functions of a commission are to select highly competent personnel, to establish policy based on the recommendations of that personnel, and to act

as a "buffer" between the personnel and pressure groups. Actual administration of the program should be left to the personnel selected.

THE PERSONNEL

Where the commission does its job well, progressiveness in fish conservation seems to depend largely on the caliber of the men in the top fishery swivel-chairs. But, we're still a little in the dark as to the proper background for these individuals. My own feeling is that things move along best where one of the two top men is a competent administrator who understands business management and people, and who also appreciates the importance of the technical aspect. The other should be a trained fish man who has a good understanding of the fish conservation problems. So long as these two work as a team, it doesn't matter much which one holds down the top swivel-chair.

To have an efficient fishery program the various "specialists" must work as a team. There is a tendency to have friction among enforcement men, hatchery men, and the professionally-trained fish men, and to have an ineffective program as a result. The enforcement man is a specialist in enforcing laws and preventing violation. The hatchery man is a specialist in raising fish in hatcheries and rearing ponds. The researcher is a specialist in fact-finding. In comparison, the trained fish manager should be best equipped to plan and supervise the over-all fisheries program.

In a field as new as fish conservation, some professional fishery workers are far better qualified, by way of native ability and training, than others. The salaries paid to highly qualified workers and to poorly qualified workers do not differ greatly. A state set-up which pays top salaries can get "the cream of the crop" by spending only a few thousand dollars more than the average. Good salaries attract competent people. An investment in good salaries is the best investment that a fish and game commission can make. In some states, the fishery jobs are not attractive to competent personnel because the pay is too low.

In a progressive organization, the workers must have a certain amount of job security. In a few states, this is lacking. Of course, there are instances, too, where jobs are too secure. Where there is complete assurance that the job will continue, regardless of the individual's performance, there is little incentive to do outstanding work, and there may be a tendency merely to "coast along." Both too little security and too much security may lead to mediocre performance.

THE PROGRAM

The modern fish conservation set-up has a well balanced program. It places proper emphasis on such aspects as fish management, research, and education.

A survey made by the Sport Fishing Institute late in 1953 showed the average budget breakdown for 15 states to be (a number of states were unable to present a breakdown of expenditures):

Administration	8%
Information-Education	3%
Law Enforcement	21%
Stocking	30%
Management	28%
Research	10%

As expected, individual percentages for the various budget items differed decidedly from state to state.

Our own feeling is that the three percent for information-education is highly inadequate.

STOCKING

The modern set-up has a set stocking policy, copies of which are made available to the public. If your state has not released such a policy, you should insist that it do so, and that it abide fully by that policy. We still have instances of "public relations stocking"—planting of fish in certain waters regardless of the biological merits of the plantings—because of political pressure. The modern set-up does not make such plantings.

Stocking should be based on demonstrated need. Where the fish are to go and what species are to be planted (and in what numbers) should be determined by a study of the habitat, fishing pressure, and the stocks already available. Such studies should be made by trained fishery workers.

In some states, a big part of the license dollar is wasted on unjustified, unnecessary, or even harmful stocking.

REGULATIONS

In a progressive fish and game organization, the fishing regulations tend to be few in number. Here, regulations are based on demonstrated need. An active research program to determine which laws are needed is in constant progress.

The regulations should be made by the commission, itself, not by the state legislature. Legislatures may be slow in making needed changes, and may tend to bow to political pressures instead of basing the laws on facts.

Enforcement should be by well-trained wardens (preferably called fish and game or conservation officers), selected on the basis of qualification for the job, and with major emphasis placed on *prevention* of violation rather than on *detection*.

MANAGEMENT

The state should be using a fair amount of its budget on fish management (other than stocking and regulation). The program will differ widely from state to state because the situations differ. In states with limited fishing water, major emphasis may be on building public fishing lakes. Or, emphasis may be on securing access to existing waters. In some states, the emphasis may be on rehabilitation, on rough fish control, on habitat improvement, or on any of a number of other management methods. In some states, this important fish conservation activity receives far too little attention.

RESEARCH

The modern program is guided by facts, produced by a competent research unit. The unit should concern itself with important problems that can be expected to produce usable answers. And, of course, research is of little value if the results are not used.

The fact-finding program should be in the hands of competent, well-trained researchers who operate with a maximum of freedom to do their job and with both a minimum of bias and a minimum of red tape.

Through basic fact-finding programs, some fishery organizations have already been able to greatly improve angling, and to use the license dollar wisely and effectively. All states now have some research in progress. However, in a few of them, "research" is barely tolerated and the findings of the investigators are still largely ignored. This is true in those few states where one or both of these conditions exist: (1) the fish (or fish and game) administrators are poorly qualified for their jobs; and (2) the administrators don't want the facts known, because the facts might demonstrate to the public that their programs are unprogressive.

The administrators who don't want sound fact-finding programs (there are very few of them left) can be compared to the physician who objects to medical research, or to the head of an engineering firm who opposes engineering research!

In those states where fact finding is secondary or is barely tolerated, we can be sure that the fishery program is a backward one.

EDUCATION

The up-to-date fish and game commission has an active and effective educational program. Concepts in fish conservation have been changing rapidly. Fact finding is pointing the way to "shortening the time between bites." But, we can have modern, scientific fish conservation only if we have an informed and enlightened public. The education program is an extremely important one for bringing about this needed condition for progress.

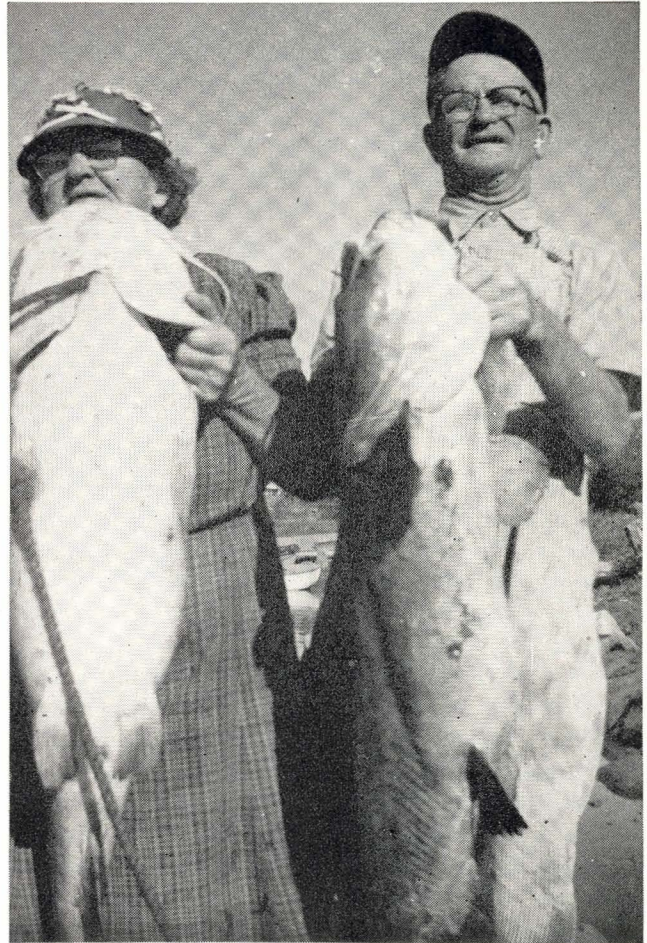
IN GENERAL

The points discussed above are only a few of those which might be made if space permitted. A reading of the other sections of the "Fish Conservation Fundamentals" will suggest additional ones. There is no simple, fool-proof way of determining whether you are getting a good return for your license dollar. However, the suggestions made here may help you to decide if the fish conservation set-up is up to par.

The ling is an extreme example of fertility among fishes. One was found to contain over 28,000,000 eggs.



The Fin and Feather Club of Shawnee Mission high school are once again making news with another wildlife conservation project. Metal woodduck houses were constructed and placed in Unit "B" of the Marais des Cygnes Waterfowl Refuge in Linn county. The predator proof homes for these colorful ducks were installed with the supervision and co-operation of Marvin Schwilling, refuge manager. The picture shows David Hedges, Quivira Lake, Kansas City, Kan., putting the finishing touches on one of the nesting boxes about fifteen feet above water level.



When you mention big flathead catfish in connection with Fall River Reservoir, those in the know immediately think of Bessie and Ora Noakes who live at Rock Ridge Cove on the lake. These flatheads weighing 34 and 40 pounds were taken by the Noakes just a little while before they celebrated their golden wedding anniversary last fall. Mr. and Mrs. Noakes plan to spend the rest of their lives fishing and relaxing at the reservoir.



Spin-casting with a lead head jig paid off in a big way for sportswriter Guy Von Schriltz of Pittsburg. These thirty-three crappie and one black perch fell to his lure at Crawford County State Lake No. 2. Von Schriltz writes a weekly outdoor column for southeast Kansas newspapers and is a well-known sportsman in the midwest.

Fish Conservation Fundamentals

THE SPORTSMAN'S ROLE

(Tenth and Final in a Series)

In the early days, sportsmen were responsible for the beginnings of modern fish conservation. Their early squabbling led to the hiring of biologists to serve as trouble-shooters. This hiring, in some states, led to the change, from indiscriminate stocking and arbitrarily-made regulations, to a more effective fish conservation program.

Today, as in the early days, our progress will be determined mainly by the actions of sportsmen. We can have good fishing only if the anglers, themselves, insist on an up-to-date program; and, only if they, collectively, take a hand in the many aspects of fish conservation which cannot be handled by the fishery authorities alone.

Organization

Individuals carry little weight in an age when group action determines what shall be done. Individual sportsmen can be of only limited help to a fish conservation program; organized sportsmen, working together, can carry enough weight to decidedly influence our fishing future.

We have organized sportsmen's groups in our least progressive states, as well as in those which lead the fish conservation parade. So, the mere fact that a sportsmen's organization exists in a state is of little importance. The strength of that organization, and the ability, progressiveness, and caliber of its leaders are the important items.

Sportsmen's Activities

Here are a dozen specific suggestions for sportsmen's groups:

1. The organized sportsmen should insist that the state have a modern fish (and game) program, handled by well-paid, competent personnel, free from politics.
2. Sportsmen should insist that the regulations be made by the fish and game (or conservation) department, and that they be based on factual information. If made by the legislature, sportsmen should see to it that only the proper laws are enacted.
3. The pollution problem can be solved by an enlightened public opinion. It's too big a program for the fish and game authorities to handle, but pressure from sportsmen's organizations can go far toward forcing pollution abatement.
4. The cluttering of our waters and shorelines with cans, bottles, and other debris is leading to an increase in "keep out" signs. The remedy to this problem must

by R. W. ESCHMEYER

come chiefly from the sportsmen, themselves, through educational programs.

5. In many instances, the quality of our fishing depends on land use in the watershed—on the farming, forestry practices, etc. In some instances, such as preventing silting of fishing waters as a result of improper road building, the sportsmen can be extremely helpful by putting pressure on the road builders to correct the bad practices. In some other aspects of land use, especially on private land, improvement must come through education.

6. Some city water supply reservoirs are open to fishing, others aren't. There is no excuse for not permitting fishing on such waters, provided certain sanitary regulations are enforced. It's another problem for the organized sportsmen.

7. Each sportsmen's organization needs an active and capable education committee. It can be expected to do an effective job in helping out on both adult and juvenile conservation education.

8. Many bills introduced in Congress, if passed, may vitally affect our future fishing—some beneficially, others adversely. Passage of the bills depends to a considerable degree on the expressed views of constituents. Sportsmen can have a decided influence on national legislation as it affects national forests, national parks, and other public domain. State legislation can also greatly influence our fishing. Sportsmen must play an active part in the passing of desirable state and national legislation, and in the defeat of proposals which would harm our favorite form of recreation.

9. Sportsmen must play a vital role in having proper recognition given to fishing values in the building of dams for hydropower, flood control, or irrigation.

10. In areas where fishing waters are scarce, organized sportsmen can take the initiative in the building of fishing lakes, for club use or for public use. In some areas, this is an important club activity.

11. Each sportsmen's group should have an active "junior" program. This might include sponsoring kids for conservation camps, building kid fishing lakes, casting instruction, providing suitable conservation literature for youngsters, and a wide variety of other activities.

12. Assuring public access to existing waters is a big and growing problem. Organized sportsmen can influence it immensely.

Boating Regulations

Since the printing of the article on boating in the last issue of this magazine, many requests have come into this office asking us to print the complete boating regulations for State Lakes in Kansas. We are very happy to comply and the regulations are as follows:

BOATS—USE ON STATE LAKES—RESTRICTIONS AND REGULATIONS. Boats may be used on all lakes under the control of the Forestry, Fish and Game Commission, subject to the restrictions and limitations as follows:

FIRST. Boats propelled by hand and sailboats are permitted on state lakes; inboard motorboats with motor not larger than 10 horsepower and outboard motors of a size not larger than 10 horsepower are permitted on state lakes for fishing purposes only.

SECOND. All boats must be currently registered with the caretaker or concessionaire at the lake, where caretakers or concessionaires are in attendance, and must be identified by numbers attached to the boat; and further, all persons desiring to use an inboard or outboard motorboat on state lakes, *but not including federal water impoundments or Lake McKinney in Kearny County*, must secure a permit from the Director of the Department at Pratt, Kansas, giving such information in the application for the permit as the Director may require. *The holder of a motor permit must report any change in ownership of the motor and surrender his permit for cancellation. The owner of a registered boat must report to the director any change in ownership of the boat, and the new owner must re-register the boat.*

THIRD. Houseboats and cabin boats are not permitted on state lakes.

FOURTH. The Director is authorized to revoke and confiscate the inboard or outboard motor permit of any person who uses said boat or motor on any state lake in any manner which is prohibited by law or regulation of said Commission.

FIFTH. All boats which are left or docked on state lakes must be anchored, properly maintained and cared for; and boats which are permitted to fill with water and remain submerged or are left on the lake shore in unsafe condition are declared to be a nuisance and dangerous to public health and must be removed from the lake or repaired and made useable within thirty (30) days after notice is given, by mail, by the caretaker of the park or the Director. Said notice to be addressed to the owner of the boat as designated in the registration. If such boat is not repaired or removed from the state property within said thirty (30) days, the Director is authorized to have the same removed, and, if the boat remains unclaimed, after holding the same for another thirty (30) days, shall have authority to declare the same unsafe and contraband and dispose of the same by sale, after ten (10) days public notice by posting in three places on the state park property; and if the boat is unsaleable, the same may be destroyed.

SIXTH. No person shall operate a boat within a water area which is marked, by buoys or some other distinguishing device, as a bathing or swimming area.

SEVENTH. No boat shall be loaded with passengers or cargo beyond its safe carrying capacity taking into consideration weather and other normal operating conditions.

EIGHTH. No person shall operate a motor boat on any state lake unless the same is provided with a stock factory muffler,

underwater exhaust or other modern devices capable of adequately muffling the sound of the exhaust of the engine. The phrase "adequately muffling" shall mean that the motor's exhaust at all times be so muffled or suppressed as not to create excessive or unusual noise. The discharge of cooling water through the exhaust of an inboard engine shall be considered an adequate muffling device.

NINTH. All boats when operating underway, or away from the shore or boat docks, between the hours of sunset and sunrise shall carry on board a lantern or flashlight capable of showing a white light visible all around the horizon at a distance of one-half mile or more and the person operating the boat shall display such lantern or light in sufficient time to avoid collision with another boat.

TENTH. No person shall enter on board or use a boat on any state lake without having in possession a Coast Guard or Red Cross approved life preserver, ring buoy or buoyant cushion. There must be such a life preserver for each person in the boat.

ELEVENTH. Traffic Rules:

(A) *Passing:* When two boats are approaching each other "head on" or nearly so (so as to involve risk of collision), it shall be the duty of each boat to bear to the right and pass the other boat on its left side.

(B) *Crossing:* When boats approach each other obliquely or at right angles, the boat approaching on the right side has the right of way.

(C) *Overtaking:* One boat may overtake another on either side but must grant right of way to the overtaken boat.

TWELFTH. It shall be unlawful for any person who is under the influence of intoxicating liquor or narcotic drugs or barbital or any person who is a habitual user of same to operate, propel or be in actual physical control of any boat. It shall be unlawful for the owner of any boat or any person having such in charge or in control to authorize or knowingly permit the same to be propelled or operated by any person who is under the influence of intoxicating liquor, narcotic drugs or barbital or any person who is a habitual user of same.

THIRTEENTH. Special regulations for Lake McKinney, in Kearny County, and federal water impoundment areas under jurisdiction of the Forestry, Fish and Game Commission. All other regulations are applicable and in addition the following shall apply to such water areas.

(A) Every operator of a motorboat shall at all times navigate the same in a careful and prudent manner and at such rate of speed as not to endanger the life, limb or property of any person.

(B) Reckless operation of a motorboat shall include operating the same in a manner which unnecessarily interferes with the free and proper use of the waters of the state or unnecessarily endangers other boats therein, or the life and limb of any person.

(C) No person shall operate any motorboat at a rate of speed greater than will permit him in the exercise of reasonable care to bring the motorboat to a stop within the assured clear distance ahead.

(D) Nothing in the provisions of this section should be construed to mean that the operator of a motorboat actually competing in a race or regatta which is sanctioned by the Commission shall not attempt to attain high speeds on a marked racing course. (Authorized by G. S. 1947 Supp., 32-224, 32-225, 32-226 & 74-3302; compiled December 23, 1947; amended June 21, 1949; amended March 28, 1955; amended June 22, 1956.)