PENNSYLVANIA ANGLER

NEWS BULLETIN FOR FISHERMEN

APRIL, 1933
BOARD OF FISH COMMISSIONERS

O. M. Deibler, Commissioner of Fisheries

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“Want Good Fishing?
—Obey the Law”

Alex P. Sweigart,
Editor,
Harrisburg.
TROUT FISHING AND THE BARBLESS

The fisherman's red letter days are here. Trout fishing, a sport linked with swift cold streams, and the soft green of grass and foliage in early spring, holds a dominant place in the affections of thousands of Pennsylvania's anglers. It calls to the finest instincts of sportsmanship and fair play in those who fish our trout streams. Its future as one of our greatest outdoor sports rests, in major part, with the fishermen.

Opening of the trout season on April 15 invariably is heralded by a rush of anglers to the haunts of brook, brown, and rainbow trout. Streams open to the public, many of them smaller waters in mountain and meadowland, are crowded with sportsmen who have in their keeping the responsibility for good fishing in years to come.

That responsibility must necessarily be assumed by fishermen who look to the future of trout fishing in Pennsylvania, and who want to keep our streams at a production peak. Our anglers should be conservationists, interested not only in heavy catches but improving trout waters and fishing with the idea of sport predominant.

On many of our streams a great number of undersize trout are killed annually. By the next season, these fish, or at least a fair portion of them, would have provided abundant sport for fishermen. If these small fish were returned to the stream alive, nature would be enabled, in a far more efficient manner, to restock waters depleted by heavy catches.

Consideration for undersize trout is the angler's most effective method of assuring good trout fishing for years to come.

I heartily advocate use of the barbless hook in effecting this great saving of undersize fish. A barbed hook, embedded deep in a small trout, may not be extracted without tearing the little fellow beyond hope of survival. To see a four or five inch trout drifting with the current, its last feeble efforts to live tingeing the water with blood, is a miserable sight for the true sportsman. It is pathetic, and often inexcusable as well.

Any hook can be converted into a barbless by bending the barb flat with a sharp-nosed pair of pliers, or snapping it off. Small pliers may be carried in the creel or the pocket.

When a small trout is brought to the surface, it may be released with the same pliers without being taken from the stream. A twitch of the wrist, with the pliers at the base of the hook, is usually sufficient to turn the little fellow loose unhurt.
Our sportsmen this summer will undertake an intensive campaign of stream improvement, according to many reports received at the Fish Commission. Their efforts to improve trout fishing by bettering stream conditions will be made doubly effective if more anglers use the barbless hook. In brief, improved trout waters need trout, and the barbless hook will go far toward supplying that need.

Every true sportsman admires a fighting fish, whether it be trout or bass, pike perch or pickerel. The barbless hook gives these fighting fish a real chance to display their game qualities to the utmost.

From every angle - conservation, fair play, and gameness in fish - the barbless hook is worth while.

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THE FISH COMMISSION
IN PENNSYLVANIA
(Part Four)
by
OLIVER M. DEIBLER,
Commissioner of Fisheries.

LAKE ERIE
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A study of psychology of fishes is an essential feature of the fish culturist's work. The education of young bass to feed upon particles of ground food clearly illustrates this fact. Teaching bass to feed in this manner is a difficult task, requiring the utmost in patience on the part of attendants.

During the feeding, it was observed that where certain individuals had a home or hiding place, they would dart from this cover, capture the particle of ground food and return to the protected area. After a careful study of the actions of the fish in taking food, observers were convinced that the bass could be more easily taught to feed if they were provided with a home or protection.

This protection apparently gave them a sense of security and more courage to venture forth and capture food. In consequence, at the present time the shores of the bass nursery ponds are covered with a net of submerged logs and brush for this purpose. This apparently insignificant detail has been a major contributing factor to our success in feeding and holding bass at the hatchery.
Few people realize the task involved in attempting to provide
worth while* fishing for the many types comprising our half million anglers, taking
into consideration their constantly increasing number, and the checks civilization
has put upon our fish life. Of these checks, probably the indiscriminate cutting of
the timber has been most detrimental. It has caused the waters to become very
fluctuating, subject to wide temperature ranges, and has greatly increased their
turbidity. These factors as well as being detrimental to reproduction of fish, have
been just as detrimental to the production of natural food for baby fish. As a result,
from year to year, the Board was compelled to increase constantly the size of fish
liberated, and today, many of them are being held at the hatcheries until they have at
least passed through their first two feeding stages. The detrimental factors are
shown in a more marked degree on our trout streams than on our larger bodies of water.
In fact, to such an extent is this true that we look upon natural reproduction of
tout as a thing of the past and the holding capacity for small fish so limited that
in order to provide fishing, the trout are retained at the hatcheries until they are
from six to twelve inches or of a size ready to be caught. But in spite of these
handicaps, taking Pennsylvania as a whole, with our present methods of massed pro-
duction and distribution, we are providing better brook trout fishing than any other
state in the Union.

In our stocking program, all fish are stocked by our own per-
sonnel, and taken to streams in the Fish Commission's trucks. Interested sportsmen
often aid in stocking and we welcome their cooperation at all times in this work.
Before the shipment is to go forward, the Hatchery Superintendent notifies sportsmen,
who assist in distributing the fish, of the time of arrival of the truck at a de-
signated point.

The Fish Commission has made a careful investigation of most of
our waters with reference to their adaptability for certain kinds of fish, forage
conditions, and the extent to which they are being fished. In our ponds and lakes,
special study has been made in reference to the food competition of various species,
care being taken not to introduce a combination where two or more kinds would be in
competition for the same source of food supply. The stream survey completed recently
has proved of great value in this program.

The Fish Commission is one of the few state agencies that is
on a productive basis and in making our annual distribution, a value of the amount
that would have to be paid, if purchased from a commercial hatchery, is placed on
each fish. In 1932, the income from all sources was $419,438.03 and fish were pro-
duced having a value if purchased of $791,170.88.

The Filed Service consists of a group of men especially trained
for this type of fish cultural work, which takes in the collection of the eggs, pond
and stream surveys and commercial hatchery work. There is scarcely a month in the
year when these men are not actively engaged in harvesting the crop of one or more
species of fish eggs. With their progress in this work rests much of the success of
distribution from the hatcheries, as the annual crop of fish cannot be produced if the
hatcheries are not provided with the all important egg supply.

One branch of our fish cultural activities not heretofore men-
tioned, and coming under the field service, consists of the work carried on at Lake
Erie in conjunction with the commercial fishing industry. Pennsylvania has a shore
line on Lake Erie of approximately only forty-five miles, yet the fishing industry
in this area grew from a few hook and line fishermen, who sold their catches to the
early settlers, to an average annual catch of 18,000,000 pounds of fish. As a result
the city of Erie is looked upon as the largest fresh water fishing port in the world,
and the maintenance of this great industry is only made possible by the work of the
various Fish Commissions of the States bordering Lake Erie, and Canada.
Civilization has placed serious checks upon the production of fish in this large body of water as well as on the smaller lakes and streams. The great demand for fish brought about chiefly by the modern methods of storing, packing, transporting and advertising, have led to a vast investment in fishing equipment, including the most modern tackle known for the capture of fish. This area, with the check civilization has put upon the growth and natural reproduction, could not possibly stand the drain put upon it, was it not for fish conservation brought about by artificial propagation and protection. For example, in 1925, there was operating, out of the port of Erie alone, a fleet of seventy-five boats, using daily approximately three hundred miles of nets having an average depth of seventy-two inches.

The worth while catches of fish take place as the fish are moving about in vast schools, seeking likely places for reproduction. They are caught before they are given a chance to deposit their eggs, with a result that in the days before the practice of fish conservation, the unfertile eggs were thrown away with the waste portions of the fish when they were dressed for market. This waste has been changed to a gain. During the spawning season of the many species sought, trained spawn takers or field men are placed on each boat. As the catches are lifted and while the fish are yet alive, the eggs and milt is artificially extruded, fertilized and cared for until the boat reaches the port in the evening. The eggs are then transferred to the State Fish Hatchery at Erie, artificially hatched in glass jars of running water on what is known as a hatching battery and after hatching, the baby fish are returned to the Lake. This is a great measure in fish conservation and turns millions of little fish back into the lake to grow into an investment having a tremendous food value.

The lake and stream survey includes investigations made of our waters in order that an intelligent stocking program can be carried out. The information most sought in these surveys is what kind of fish certain areas are best suited for, growth and reproduction of fish in such waters, and how many should be planted in order to utilize fully the food resources and maintain a dense population consistent with normal growth. Other factors considered are what size fish should be planted to give the desired results and what, if anything, can be done to make the waters more productive. In addition to this, for a number of years the Board has been encouraging land owners to construct ponds where facilities are available, not for the purpose of growing and marketing fish, but chiefly to provide a recreational center for themselves and their friends. In order to assist those interested, representatives, upon request, view the proposed sites for the purpose of advising them how to proceed with the construction and to outline an intelligent fish stocking program.

(To be continued)

THREE AT A TIME

Three calico bass, of exactly the same size, were taken simultaneously by William Troster, Kingston angler, while fishing on the North Branch of the Susquehanna River, near Meshoppen, last season. The fact that calico bass are rarely caught in this section of the river makes the catch still more unusual, according to Warden Russell J. Womelsdorf, who reported the catch.

Troster was fishing from a boat, using two rods, and two lines, with two hooks attached to each line when he made the catch. The calico bass struck at the same time on minnows that he was using for bait. They were identical in size, each measuring 11 inches.

The Kingston angler also caught a 22-inch salamander on the same day. The waterdog was retained alive, and later presented to the Kingston High School, where it was placed on exhibition.

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FROM PLANKTON TO BLACK BASS -

THE LIFE CYCLE IN A LAKE

by

C. R. BULLER,
Deputy Commissioner of Fisheries

In every body of water nature has created a wonderful balance of existence, or cycle of life. Every sphere of aquatic plant life, every microscopic insect, and every species of fish in an area of water, have a direct bearing upon one another. In other words, the life and growth of one depends upon the life and growth of the other. As an illustration of the cycle of life in a water community, we will take one of our numerous inland lakes in Pennsylvania. In this lake will be the average growth of aquatic plant life. It will be full of the minute water organisms, snails, mussels, and crayfish. The fish life will consist of the black bass, yellow perch, catfish, sunfish, and shiner, a species of minnow.

The plant life not only absorbs the impurities from the water but in turn throws off oxygen, and makes a spawning place for certain kinds of fishes and for various insects which go through the period of transformation in the water. These in turn furnish food for fish and other animal life. It also makes conditions favorable for growth and reproduction of the micro-organisms.

We will class the minute organisms present in the water in two groups, namely: the net plankton and the dwarf plankton. The net plankton are organisms large enough to be caught in a net made of fine silk bolting cloth, while the dwarf plankton are too small to be caught in this manner. These dwarf plankton are the food of the net plankton. Decomposition of vegetable matter or plant life makes conditions favorable for growth of the dwarf plankton. During the decomposition a mineral substance is thrown off. This in turn is taken up by the dwarf plankton, and helps to develop the limy shell on some of the net plankton. Net plankton, particularly the ones having the limy shell, furnish food for almost all the young fish for the first few weeks of their life.

The mineral in this shell is highly essential to the health and growth of baby black bass in particular. Thus can be seen the bearing that aquatic plant life has on fish life. These plankton are always present in the water but as the temperature rises in the spring of the year and before the baby perch are hatched, will start to reproduce very rapidly. The yellow perch being the first fish to hatch in the spring, and its growth being slow for the first eight weeks, as compared with that of the bass, it will food chiefly upon the plankton. The next to hatch will be the baby bass. After reaching the stage where they must have some fish life for food, they will prey upon the baby perch. The young of the shiner will next appear. The shiner, intended as food for other fish, is very attractive in appearance, a non-competitor for fish life as food, and very fuscous or fruitful. It follows that those little fish will be preyed upon by the baby bass and baby perch. As the bass increases rapidly in size, they will continue to prey upon the perch to a certain extent during the summer months.
The last fishes to spawn in the pond will be the sunfish and catfish. Their chief food will be small snails, mussels and insects clinging to the aquatic plant life. Nature has placed each creature in the water to live upon the other. Each day the life of an individual is given to maintain the life of the species. Capacity for reproduction in a species is in proportion to the demand on it as food for other creatures.

If a strange species of fish is introduced, it will at once destroy this balance. Every aquatic animal performs certain types of food. The stranger or new kind of fish will prey upon the kind of food it desires, making the native in the pond, whose food requirements may be similar, seek elsewhere for its food. If the stranger introduced be a pike, for instance, the bass will have to seek elsewhere for its food, which perhaps will be the small sunfish and catfish. Decrease in their number would follow naturally.

As the sunfish and catfish feed largely upon bottom insects, their drain upon these animals would not be so great, resulting in an increase in the insect population. Since bottom insects feed largely upon the plankton of both kinds, this would result in a decrease of the plankton. The plankton, above all things, is essential to health and growth of most of the young fish. Therefore, the decrease in plankton caused by increase of the bottom insects which food upon them, would retard the health and growth of the next season's hatch of baby fish. If the young fish cannot secure sufficient plankton, they will take the next best thing, which is their brother and sister or the young of another kind of fish.

After introduction of a new species of fish in a body of water, no doubt in time a new balance between the supply and demand will be created. But in almost every instance, the number in the pond will not be so great as before.

While the Board of Fish Commissioners is making every effort to maintain good bass fishing in Pennsylvania, it requests the fisherman not to introduce bass into waters where they do not already exist, particularly in small inland lakes. When black bass are introduced into a small inland lake, it is at the sacrifice of the rest of the fish in a small water community.

When the bass is first introduced, on account of the amount and kind of food it requires, it interferes with the natural balance more than any other fish propagated by the Board for distribution. If the history of the black bass is carefully studied, it will be seen that its introduction into the small inland lakes has invariably resulted in a decrease in number of the other species in those waters.

Poor fishing in a body of water can be caused by many things, but the most important are lack of food supply, interference with spawning habits and over-fishing. The simplest remedy in most cases is to restock the body of water, but before doing so, a study should be made of the conditions to determine why fishing in this particular water is on the decline.

Fishermen may occasionally make the remark that fish in certain bodies of water have too much food and will not bite. Fish life, like all other animal life, cannot exist without food. A body of water will support fish life in proportion to the amount of food therein. If a body of water contains an abundance of minnow life as food, the angler should use some other lure to capture the fish. In some instances they may readily strike at the strange bait as they are quick to respond to a change in diet.
Bodies of water barren of aquatic plant life, brush, old stumps, and other cover, usually contain few fish in proportion to their size. This is chiefly owing to a poor food supply. In a body of water of this kind, conditions may be improved by introduction of plant life and minnow life. Plant life in a body of water serves as natural spawning ground for many insects, whose larvae go through the period of transformation in the water and are favorite food for many fishes. It also provides the growth of minute water insects that the baby fish feed upon, and provides a place of concealment for young fish.

Aquatic plant life in a body of water plays such an important part on the fish life, that men are making a business of growing the plants and selling them in the market for introduction into barren waters. If care is taken in planting such vegetation, and the proper varieties secured, it may be induced to grow in almost any body of water.

Again, from unknown causes, the minnow population in a body of water may become scarce. This may not be noticed until the number of the other species begin to decrease. Now this condition will not be bettered very much by stocking the water with more fish, until the minnow life or food supply is increased. This can be done by restocking with minnows. After they have a chance to reproduce and the pond is inoculated with a new food supply, it may be stocked with other fish.

In many instances, small inland lakes and ponds are used as a source of water supply for manufacturing plants in the rural communities. Many of the natural lakes cannot be drained below a certain level, and occasionally artificial dams are constructed at the outlets of the lakes. Consequently, in the spring of the year a new water level is established. Most of the fishes in our inland lakes spawn in spring, and seek shallow water in which to deposit their eggs. In many instances, before the eggs are hatched or young fish are old enough to leave the nest, the water level is lowered with a result that thousands of eggs and young fish are left on the shores to die. This also means the death of eggs and young of the water insects that spawn in a shallow depth of water. These conditions are hard to overcome, but in any body of water, where a constant level can be maintained, conditions will be more favorable for the reproduction of aquatic life.

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"OLD JONAH"

Two unusual factors combine to make the life of "Old Jonah," the big lake trout retained at the Fish Commission's hatchery at Corry, unusual. He was forty years old when he died, and he was placed on exhibition at the World Fair in St. Louis, Mo.

When Corry hatchery, in Erie county, was purchased from Seth Weeks in 1882, "Old Jonah" was being retained at the ponds. A male trout, with a pronounced undershot jaw, he attracted a great deal of attention when visitors came to the hatchery. At the time of the World Fair, the trout was 35 inches long, and because of his extreme age, he was one of the fish returned to the hatchery.

Time brought strange changes to the appearance of "Old Jonah." When he died, he was only 15 inches long, and had lost weight. His skin was black in color and wrinkled, and he was totally blind. A badly deformed spinal column and head and jaw that had not diminished in size as did the rest of his body, made his appearance grotesque.

Naturally, he created a lasting impression on people who saw him, and today visitors at Corry occasionally ask concerning "Old Jonah."
The rainbow trout is native only to the waters of western America from the crest of the Sierras and Cascades ranges to the Pacific Ocean. There are several different species of the parent form, Salmo Irideus, including the golden trout in the vicinity of Mount Whitney and southern California, and the McCloud River rainbow, Salmo Shasta - the rainbow of the fish culturists, and the one that has been stocked widely, not only in the United States but in many foreign countries in both hemispheres. Notably in New Zealand these introduced rainbows have attained an average size considerably greater than their parents in the native habitat. The largest rainbow reported on rod and line in the United States was 22\frac{1}{2} pounds. While this is, of course, exceptional, fish of from 2 to 6 pounds are not at all uncommon in many of the waters of the Pacific states and many of the rivers of the Rocky Mountain region where they have been introduced.

In Pennsylvania, the rainbow caught by John Bicton from Lick Run, Clearfield County, as reported in the PENNSYLVANIA ANGLER, January 1932, was likely a record. This fish was 27 inches long and weighed 8\frac{1}{2} pounds. It was a perfect specimen and was caught on a cricket.

The far famed steelhead trout is, according to the late Dr. David Starr Jordan, merely a sea-run rainbow which spends part of its time in the Pacific and ascends coastwise streams from Cape Mendocino northward for the purpose of spawning. Unlike the Pacific salmon, the steelhead does not die after spawning. In this respect, as in fact in many others, he has many points in common with the Atlantic salmon, Salmo Salar.

The rainbow trout is a black spotted species in which the characteristic marking is a rainbow stripe along the lateral line. In immature fish, which would normally include those up to 10 or 11 inches in length, this rainbow stripe is not present. The markings on the small rainbow are dark vertical parr markings along the sides with delicate pink shading between. Likewise, the immature fish have a marked fork in their tails and a comparatively blunt and rounded nose and prominent eyes quite unlike the mature specimens with their well shaped bodies and almost square tails.

The rainbow is a lover of fast water. He prefers streams of good size where the current is heavy and the bed of the stream obstructed by boulders which alternately form rapids and deep pools. Where he is found in streams that also contain brook trout and brown trout, the larger rainbow will frequent the swiftest currents, provided they have sufficient depth. They do not, ordinarily, show good results when planted in small streams or those where the current is slow or the beds wide and shallow. Occasionally where slow streams flow into a lake or reservoir, the rainbow will thrive by spending a part of the year, usually during the winter, in the lake. They are more migratory than either the brook trout or the brown trout and unless big water that is unpolluted is available to them, the results from stocking are apt to be disappointing.
Unlike the brook trout and the brown trout, the rainbow spawns in the early spring and streams in which they predominate should not be fished in April.

As a game fish, the rainbow is second to none of the trout found in Pennsylvania. He rises well to the artificial fly, both wet and dry, and after the hook is set, he frequently leaps repeatedly high above the water and has remarkable endurance. One habit that is very disconcerting to the fisherman is his frequent custom of turning at the end of a long run and making a bee-line for the feet of the angler with such speed that it is next to impossible to recover the line fast enough to avoid slack.

While the rainbow trout is second to none as a game fish amongst the fresh water species, his application to Pennsylvania streams is not as wide as that of the brown trout. His nomadic habits make the results from plantings very much of a gamble, and quite often those stocked in a certain stream may later turn up in another stream miles away, necessitating the fish traveling through some of our larger bass waters to reach the second stream. For instance, occasionally a large rainbow is caught in the Allegheny River and it seems almost certain that at times they migrate through this river.

Due to his rather limited application to Pennsylvania streams, the Board of Fish Commissioners does not propagate the rainbow trout. Quite a few are planted in Pennsylvania streams each year by sportsmen who procure them from the United States Bureau of Fisheries, and, in a few streams they have held forth year after year and furnished good fishing.

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WATERSNAKES ACTIVE

Anglers who invade the trout streams early this season will have an opportunity to benefit trout fishing by killing watersnakes, judging by recent reports that these reptiles have emerged from hibernation.

J. Herbert Walkor, of Montgomery, vice-president of the Lycoming County Sportsmen's Association, recently killed a watersnake measuring three feet six inches. Examination of the snake revealed that it had swallowed four trout, one of eight inches, the others about five inches in length on an average.

While patrolling Liberty Valley Run, in Perry County, Warden C. V. Long, of East Waterford, reports that he killed one of these enemies to fish life a short time ago, as the snake was swallowing a trout.

By way of reminder - dead watersnakes mean more fish for the fishermen.

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The ideal trout stream combines three vital factors - food abundance, proper water temperature, and good shelter. Lacking in any one of these essentials, the capacity of a stream to produce trout of maximum number and size is necessarily limited. A brief consideration of these factors shows their relationship to stream improvement.

Food abundance is governed by various factors. Classified as trout food are many forms of aquatic and insect life. The crayfish and cold water species of minnows constitute an important feature in the diet of larger trout. But growing trout, fingerlings, require much more food, tiny forms of aquatic organisms that cling to growth on the stream bed, to brush and rocks. Included in this group is the larvae of insects that have developed in the water; for example, the larvae of the caddis fly. From brush and growth on the shorelines comes another important class of trout food - insects that may drop into the water. Earthworms washed into a stream from the banks also provide forage. Forage and shelter, it is to be observed in this checkup, hinge upon each other.

The water temperature of a trout stream should be low, that is, having a summer temperature range not over 70° or 72° in midsummer. In former issues of the ANGLER, the temperature factor was stressed in improvement work. Governing the temperature range are small spring tributaries and the speed of the current. Deflectors in slower streams serve an admirable purpose by accelerating the current and forcing it to create pools adaptable to trout, while the spring feeders may be easily cleared of muck and brush in a manner that will assure a constant supply of low temperature water. Here again shelter plays its part, for the spring feeders, in as many instances as possible, should have abundant shade as an aid to low water temperature.

In providing additional trout cover on a stream, the first consideration should be introduction of it at points where it will serve a dual purpose of protection and the creation of additional growth for food. Certain areas of a stream may be without growth of trees and brush on the shores. Planting of willow slips at these locations, and the introduction of additional brush may aid in reclaiming such waters.

The stream bed itself offers an ideal opportunity for introduction of additional shelter. Fallen trees with their branches intact may be placed counter to the current, and firmly staked in place. Drift carried by the current lodges against these branches and forms additional shelter. In line with this increase of cover in the stream itself is the introduction of loosely woven bundles of brush, anchored securely near shore. Brush bundles furnish a breeding place for aquatic organisms and a hiding place for young trout from their natural enemies.

Logs properly placed in shallows and pools provide good cover for trout. Another idea that has gained headway in improvement of this type is the weighting down of small trees and bushes on the shoreline in such a manner that they will project over the water. The advantages of this system may readily be seen. Overhanging foliage provides a resting place for insects and assures additional shade. Heavy rocks will serve as anchors in this type of improvement.

On any trout stream, the presence of areas too dense to fish is of definite advantage. These areas, with their dense brush and tangles of logs and other cover in the water serve as natural feeders to heavily fished portions of the stream. Trout lurking in inaccessible pools aid in natural restocking at spawning.
time and dropping down into accessible areas provide additional sport. Densely covered areas also aid in keeping the water temperature at low level, and serve as breeding grounds for much natural forage.

For better trout fishing, consider this vital factor of shelter on our trout streams.

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A FATAL "RESCUE"

Casting should be limited to game fish, and certainly woodchucks should be excluded from the picture, according to H. P. Shawkey, of Warren.

Shawkey was casting for bass on the Allegheny River last season. While retrieving his cast, he saw a baby ground hog swimming the stream, and thought that a helping hand might save the little fellow from drowning. Accordingly, the next cast landed squarely in front of the amateur swimmer.

In an incredibly short time, the woodchuck became so entangled in hook and line that it was drowned before Shawkey could release it.

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STREAM IMPROVEMENT WORK BRINGS RESULTS

Favorable results from improvement projects on Tioga county trout waters have been reported to the Fish Commission by Warden Horace P. Boyden, of Wellsboro. While streams in that territory were at low water levels last season, deflectors and dams were constructed.

On Long Run, a large meadow stream, the deflectors, logs fastened in the banks at the base and extending quartering downstream, were particularly effective. In checking on results, Boyden found that these deflectors had formed fine natural pools and cover through the digging action of the increased current.

Another method that produced good results, he reported, was the weighting down of willow clumps on the shores and fastening them at the tips with heavy rocks. The natural dam formed by these clumps created a double pool below, while good shelter was formed, through action of the deflected current, beneath the stream bank.

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BUILD 170 DAMS

Members of the North Western Berks Rod and Gun Club of Bethel are ardent advocates of stream improvement, according to Special Warden Howard Ebling, who is secretary of the club. Last summer the Berks county club members decided that a favorite trout stream in their section, the North Kill Creek, should be improved. During the summer, 170 miniature dams were built. These dams provided excellent cover for eighty cans of trout released in the stream later by the Fish Commission. After aiding in distributing the fish, the North Western members assisted in patrolling the North Kill to assure good trout fishing this season.

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THE TIMBER RATTLESNAKE

Editor's Note: Paul L. Swanson, of Polk, has written the following article on the timber rattler for the ANGLER. A knowledge of the habits of this reptile is important for trout fishermen who invade the mountain streams in May and June.

The Timber or Banded Rattlesnake (Crotalus Horridus) is the common rattlesnake of the eastern states. It is sometimes erroneously called the Diamondback. There are two species of Diamondbacks, but neither is found in Pennsylvania. One is found in the southeastern states, and is frequently termed the Eastern or Florida Diamondback to distinguish it from the other slightly smaller Western or Texas Diamondback, which is found farther west, although neither is confined to the state from which it derives its name. The former is the largest and most dangerous poisonous snake in North America. Specimens sometimes reach a length of eight feet or more, and six foot examples are not uncommon. Besides the aforementioned snakes, there are more than twenty other species and subspecies of rattlesnakes in the United States. One other is found in Pennsylvania: the Massasauga. It is found only west of the Allegheny River and is readily distinguished from the Timber Rattlesnake by its smaller size, its different coloration and the fact that its head is covered by plates (as is the Copperhead's) instead of small scales.

The Timber Rattler ranges from the central New England states to Georgia, and westward to the Great Plains. It is probably more plentiful in Pennsylvania than in any other state. It has been definitely recorded from 36 counties, where it is usually found in the mountainous and timbered regions.

The typical color is yellow or tan, with wavy cross bands of dark brown or black, and a black tail. However the color varies considerably, some specimens being almost entirely black. The cross bands are usually bordered with a lighter color, and are sometimes broken so as to form rather rhomb-like markings. The darker specimens are generally males, though not always, and bright yellow examples are practically always females. In Pennsylvania the average specimen seems to be about three feet in length, although much larger specimens may be found.

Dr. Raymond L. Ditmars of the New York Zoological Society measured a timber rattlesnake which was six feet two inches in length and almost three inches in diameter, which seems to be the record size.

The rattle is made up of hollow segments of horny skin, through which the terminal bones of the tail form a hard rod. A rapid vibration of the tail with this appendage produces the rattling. It is interesting to note that many other snakes including the copperhead and various harmless species, sometimes vibrate their tails when excited. If in dry leaves it makes a sound not unlike that of a rattler. Rattlesnakes are born with a "button" at the end of the tail and the segments grow out from the base; usually a new segment is uncovered at each shedding of the skin. The skin is shed on the average of three times a year, so an estimate of the snake's age may be made by figuring three rattles per year, providing the terminal button is still present. The button and the end segments are usually lost before the rattle reaches any great length. It is the size of the snake rather than the number of rattles that is important, as large snakes secrete more venom, and the venom of old specimens is not more toxic than that of the younger.

Rattlesnakes mate soon after emerging from hibernation in the spring, which is generally in May. About September from six to fifteen young are born alive. This is a small number of young when compared with some of our harmless species which may have fifty or more. The babies are immediately able to shift for themselves, and the mother does not make it a point to stay with them.
Many people claim to have seen snakes swallow their young for protection. This seems to be a physical impossibility, as the young would have to find refuge in the regular alimentary tract, and the presence of the digestive juices might kill them. No one who has spent a lot of time studying snakes and their habits has ever witnessed such a procedure. The fangs of the newborn snakes, which remain soft until birth or shortly after, soon harden and the snake is capable of ejecting small amounts of venom.

Timber rattlesnakes are fond of rocky situations. In hot summer weather they avoid the bright sunshine and are apt to be found on the shady side of rocks. During the dry weather they migrate from the ridges and hills to the fields and meadows of the valleys where water is more readily obtainable. As the elliptical eye pupils indicate, rattlesnakes often prowl around after dark. They do not like real hot weather; neither are they fond of the cool weather of early spring and late fall. Most snakes seem to enjoy being out in a warm summer rain.

In the fall they seek out their den, each individual apparently returning to the same den each year. There they hibernate until spring. A snake den is usually located on a rocky ledge where the many crevices offer opportunity for the reptiles to find shelter below the frost line. A den might occupy a considerable amount of space, and is not to be thought of as merely a cave. Considerable numbers of snakes occupy the same den. Hundreds have been killed within a few days time at some dens in Pennsylvania.

The food of the rattlesnake may consist of almost any mammal or bird that is small enough for it to eat. They rarely, if ever, eat cold-blooded prey. They have been known to eat various kinds of mice, shrews, rats, squirrels and young rabbits. Birds are acceptable if they can be caught. The timber rattlesnake almost invariably strikes his victim and allows it to die before starting to engulf it. Strong digestive juices dissolve almost all of the prey except the fur, including the bones. Young rattlers eat flies and insects, but older specimens seem to insist on warmblooded animals. Economically the rattlesnake is beneficial, as over 50% of its food consists of rats and mice.

The popular story of succeeding generations of men meeting death by means of a fang that has remained in a boot makes an entertaining tale if one is gullible enough to believe it. The liquid content of snake venom dries out quickly, and the very minute particles of crystallized venom which would remain in the hollow of the fang would be too small a quantity to cause serious injury to a human, even supposing that these dried particles could find their way to the blood stream.

A rattlesnake does not always rattle before striking. The sounding of the rattle is not so much a sign of warning as it is an indication that the snake is in a disturbed or nervous mood. Many theories have been advanced as to the real purpose of the rattle. The one most likely is that it imitates the sound made by certain grasshoppers and attracts insect eating birds. Before the country was settled, rats and mice were probably much less numerous than at present, and consequently more difficult for the rattler to procure, so birds might have made up a larger part of his diet than they do now.

The supposition that rattlesnakes will not cross a hair rope or a line made of briars is false, and can easily be disproved by placing one in a circle so made.

The fear of snakes is not instinctive in my estimation. At every opportunity I show captive snakes to youngsters, and those who have never before seen a snake are not the least bit afraid of them.

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THE BULLHEAD CATFISH

An old cane pole and a can of worms, water muddy and the shore to match; place in this scene a barefoot boy and you have a typical picture of fishing for the bullhead catfish. There is charm in bullhead fishing that has a strong appeal to thousands of Pennsylvania's fishermen. It typifies old fashioned sport with rod and line. The bullhead bites readily and makes no distinction between crude and fancy tackle.

There is about the blundering, home-loving bullhead a quality that may be termed "personality." Certainly it has little claim to the flashing grace and beauty in coloration of the brook trout, or the pugnacious characteristics of the bass. Ungainly in appearance, head broad and body tapering rather abruptly from gills to tail, this catfish blends in coloration with the mud bottom on which it lives.

Raising bullheads is an important feature in the propagation program of the Fish Commission. Four of the Commission's hatcheries - Pleasant Mount, Union City, Forresdale, and Tionesta, raise bullheads for distribution. Stocking takes place in the autumn, when most of the fish are from three to four inches in length. At this stage of growth, the young have attained sufficient size to forage for themselves, and consequently, when they are distributed in suitable waters, there is little attendant loss.

Raising bullheads has involved careful study of the species at the hatcheries. Of foremost consequence was the matter of diet. In its natural environment, the bullhead is classed as a bottom-feeder, generally taking its food at night or when the water is murky from recent rains. To replace this natural diet of small aquatic life, insects, and worms, a ration containing cereals, meat, and milk was substituted. Nature intended that the catfish take its food from a source that would otherwise go to waste in many of Pennsylvania's streams and lakes. In some instances at the hatcheries, they have been known to relish live bait, eagerly devouring minnows tossed into their ponds, but those occasions are exceptions to the rule.

Ponds devoted to the culture of bullheads at the hatcheries vary from 8 x 20 feet to an acre in extent. Brood fish retained in these ponds are permitted to spawn naturally, caring for the young in their own way. When the fry are about ready to follow their individual existence, they are removed from the brood ponds by hatchery attendants. Bullheads at spawning time seek a small cavity in the clay to deposit their eggs. For this reason, hatchery ponds are provided with excavations to be used by the adult fish in spawning.

The parental instinct of this frequenter of the inland waters is one of steadfast loyalty and unswerving devotion. Slow in instinct and almost devoid of cunning, the bullheads may be under other circumstances, but in June, spawning time, the parental urge transforms them. They are then more than a match for bass or pickerel, carp or eel that may venture near. "A bloodthirsty and bullying set," they have been termed at this period, "with ever a lance at hand, ready to battle with an intruder at a minute's notice."

Prior to spawning, the male bullhead does the courting, and after mating has taken place, male and female move along the shoreline, seeking a suitable location for the nest. Sometimes an abandoned muskrat hole or other excavation is opportunely found. But frequently the nest building is an arduous task, a task requiring all the patience of the home-makers. They must dig a hole
in the clay bottom, possibly six inches in diameter, twelve to twenty-four inches in depth. The sharp spines of their fins now serve the purpose of shovels, as they toil at the excavation for five or six days. Occasionally these spines are injured in the operation, resulting ultimately in death. Light sediment is washed from the excavation by fin and tail motion, while the heavier material is taken from the cavity by mouth. So ardently do they labor during this period that the water is constantly murky in the immediate vicinity of the home-to-be.

Following completion of the excavation, the eggs are deposited in a jelly-like ball, averaging about three and one-half inches when fully expanded. The eggs, numbering from fifteen hundred to two thousand, are of rich amber color.

"Just why the bullhead in the inland waters goes to all the trouble to prepare the hole in the earth for a home for eggs and young fish, I am unable to say," Deputy Commissioner C. R. Buller said recently, "unless it is for added protection.

"And again it may be from instinct. Many of the common bullheads inhabit the tidal waters of the Delaware River. At spawning time they seek low marshy swamps on which to build the nest or hole. As the tide recedes, leaving the marshes dry, the parent fish, or the young, as the case may be, enter the hole when the tide goes out. The hole contains sufficient water for their needs until the tide comes in again. After the spawning season, the hole is abandoned, and the fish more or less follow the rise and fall of the tide. This instinct for protection from the receding tide may remain in the catfish of the inland waters."

The driving energy of the male subsides with completion of the nest, and both parents now assist in caring for the eggs and the baby fish. They hover constantly over the cavity, aerating the water by a constant motion of the fins. It is necessary that the position of the ball of eggs be changed from time to time. This is accomplished by rolling it about with their snouts. Should sediment settle on the eggs, an adult takes the ball into its mouth, blowing it out again. In this way the eggs are given a new position on top of the sediment.

The catfish fry, when they emerge from the shell, are tiny helpless creatures, pale salmon in color. During the next five to ten days, the young subsist on a yolk sac attached to the lower part of the body. The home now serves as a nursery, and the parents will not permit the fry to leave it during this period. With absorption of the food sac, the young fish take on a darker color. On their first excursion from the "nursery;" the adult catfish hover watchfully about them, stirring the mud to conceal them at approach of an enemy. At first, the young feed on minute organisms, gradually taking heavier food. As they gain confidence, they attempt short excursions from their parents. In three weeks from the time they leave the excavation, they have doubled in size, requiring a great deal more food than their parents can find for a school of such proportions. It is at this stage that they break away in small groups to forage for themselves.

Hardy, adapting itself readily to water conditions in stream and lake, the bullhead occupies an important niche in Pennsylvania's fishing.
A RATTLE EPISODE

The deadly effects of a rattlesnake's bite is clearly illustrated in the following communication from Dr. B. D. Hetrick, County Secretary of the Butler County Sportsmen’s Association.

"Oneida Dam, in Butler county," he writes, "furnishes excellent fishing for large mouth bass, perch, and blue gills. The banks of this water are kept in excellent order and are mowed back for a distance of at least 50 to 100 feet. During the mowing of the south bank in the summer of 1932, a team of mules were used. At the noon hour, the mules were permitted to graze at will. One, grazing near a stump, was seen to suddenly throw its head up and rear back as if hurt or startled. Investigation showed that it had been struck in the fleshy part of the upper lip by what proved to be a rattlesnake of the Massasauga variety.

"In spite of the services of a veterinarian the mule passed on and those who saw it say that its head was nearly as broad as it was long at the time of its death."

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HERE AND THERE WITH OUR ANGLERS

A salamander, or waterdog, caught at Porocky’s Dam on Tuscarora Creek, was found to contain three fish averaging about four inches in length, according to Warden C. V. Long.

Excellent catches of suckers have been made recently in the Frankstown Branch of the Juniata River, according to Warden Lincoln Lender, of Bellwood. Landis Robinson, of Canoe Creek, caught 25 at the juncture of Canoe Creek and the Frankstown Branch on March 30. On that date, a total of 87 suckers were landed where Robinson made his catch.

Gold and the gold standard have been topics of much discussion recently, that the following correction to a recent article in The ANGLER has a modern tinge. H. P. Shawkey, of Warren, while fly fishing for trout pulled in an object that proved to be a clip attached to a coin. The coin, however, was not a silver fifty-cent piece but a gold dollar.

Nine Mile Run, Pine Creek above Galeton, Potter county, Brooklyn Branch of Pine Creek, Phoenix Run, Cedar Run, and Upper Kettle Creek are listed by Warden Horace Boyden as probable heavy producers of early season trout catches in the Tioga-Potter district this year.

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AFTER READING PENNSYLVANIA ANGLER, PLEASE PASS IT ON TO FRIENDS WHO LIKE TO FISH.
Do You Want Good Fishing?

—Obey the Law!