

Marking and Tagging Fishes

by Albert C. Jensen

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MARKING AND TAGGING FISHES

by

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The biologist studying marine and fresh-water fishes is concerned with learning as much as he possibly can about their life histories. He is interested in how fast they grow, how long they live, where they travel, how many there are in a particular area, and how many are caught by fishermen. Many of the things he learns are of importance in the conservation and management of fishes to assure the greatest possible continuing yield to both sport and commercial fishermen.

To help him learn these things, the biologist uses many different methods of study. One of the most frequently used methods is marking and tagging. Briefly, this consists of catching a number of the fish being studied, marking each with a tag or other means of identification, and releasing them. When the marked fish are caught again, either by a commercial fisherman or by an angler, the biologist gains valuable information about some phase of the fish's life.

The first recorded fish tagging was done over 100 years ago by wealthy landholders in Scotland who were simply interested in what happened to the salmon and trout in the streams they owned. In the United States, the earliest successful tagging took place in 1873 when Atlantic salmon in the Penobscot River, Maine, were tagged and a fair number of these tagged fish were caught again.

The practice of marking fishes merely to find out what happens to them is almost past now. Today thousands of fish of many species are marked by biologists who have set up well-planned experiments designed to yield definite information. Within the last 20 years marking and recovery of fishes

has come to be recognized as a powerful tool for studying fish populations.

MARKS USED

Several different ways of marking fishes have been tried over the years. Branding (as cattle are branded), tattooing, and injecting colored dyes under the fish's skin have been used, but usually with only limited success. The two most common techniques of marking fish are fin clipping and tagging.

Fin Clipping

In fin clipping, one or two fins are removed from the fish. Usually two fins are clipped because one of them may grow back, and occasionally there is the natural occurrence of a fish with one fin missing.

Fin clipping is inexpensive and can be done rapidly, as many as 300 fish per hour. Large numbers of young salmon or trout are marked this way in hatcheries before they are released. The method is best suited to fish that are individually handled and examined when they are caught. The chief disadvantage to fin clipping is that individual fish cannot be identified when they are caught again.

Tagging

Tagging, in which some device is attached to the fish, is probably the most common way of marking fish for future identification. The first tags were simply lengths of copper or silver wire, but as tagging experiments became more refined many different kinds of tags were developed. A book on fishery science (listed in the references section of

this leaflet) describes 21 different kinds of fish tags, and some of the tags have as many as 8 variations of design. The reason for such a variety of tags is that, while one kind of tag will work well on several different kinds of fish, other tags work well on only one kind of fish. Some of the different kinds of tags and the fishes they are used on are described below. All these fish tags have one thing in common, regardless of the shape or kind of tag; each is stamped or printed with a serial number and the name of the laboratory or agency that is conducting the tagging study.

Petersen tag. -- Perhaps the most widely used and most generally successful of all tags in present use is the Petersen tag, named for the Danish biologist who invented it in 1894. The tag consists of two Celluloid or plastic discs, about one-half inch in diameter, attached with a pin or wire to some part of the fish. The tag can be attached to the gill covers (fig. 1), through the back muscles (fig. 2), or through the

fleshy part of the tail. It has been used successfully on striped bass, flounders, shad, cod, haddock, salmon, trout, shrimp, and lobsters.

Atkins tag. -- This tag is extremely simple, consisting of a disc or flat plate attached by a thread or wire that pierces the tissues. It was first used in 1873 by Charles G. Atkins who tagged Atlantic salmon on the Penobscot River, Maine. There have been many variations in this tag, particularly in the size and shape of the plate and the materials used. The most recent variation is the use of vinyl plastic for the plate and vinyl plastic tubing for the wire (fig. 3).

In addition to salmon, the Atkins tag has also been used on scup (porgy), silver hake, yellow perch, and others.

Body-cavity tag. -- The body-cavity tag was developed by Robert A. Nesbit for marking squeteague (weakfish) in Chesapeake Bay in 1931. It was simply a Celluloid tab about 1 - 1/2 inches long, one-fourth inch wide, and about one-tenth inch thick, and was attached

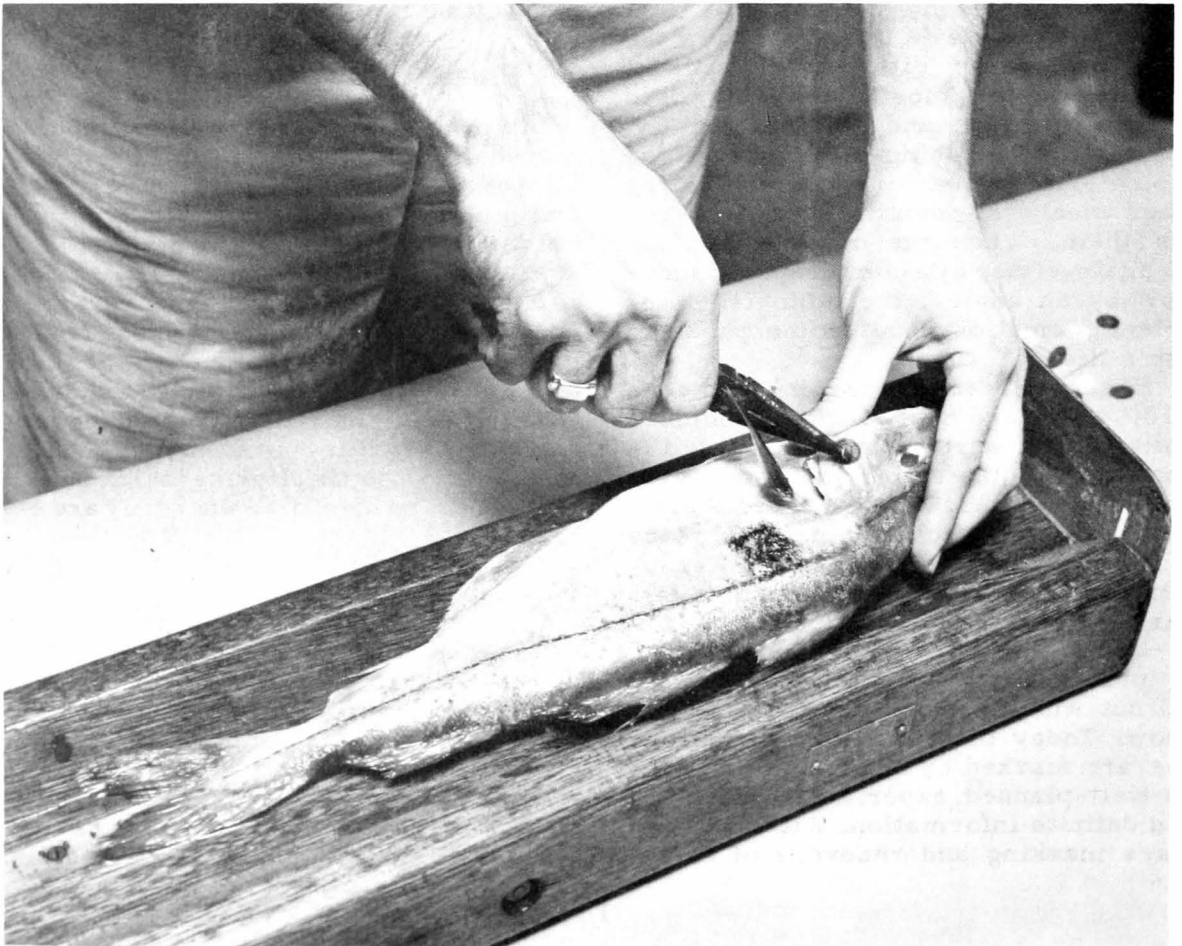


Figure 1.--Attaching a Petersen disc tag to the gill cover of a haddock.



Figure 2.--Attaching a Petersen tag through the back muscles of a salmon.

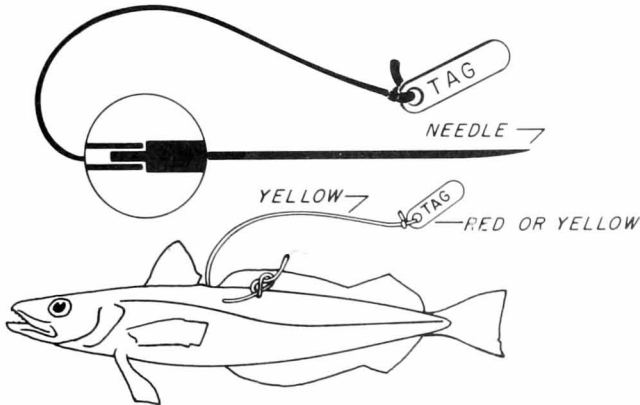


Figure 3.--A vinyl plastic Atkins tag used on silver hake. The needle is used to thread the tubing through the dorsal muscles of the fish.

by making a small vertical incision in the body wall, usually with a scalpel, and inserting the tag in the body cavity. The wound healed rapidly leaving only a small, inconspicuous scar.

Body cavity tags made of nickel-plated steel have been used successfully on fish that are processed into meal and oil. Externally attached tags would not be seen because the fish are handled in great masses by machines. The metal tags, however, are recovered by powerful electromagnets set in the processing lines of the fish reduction plants.

Various sizes of body-cavity tags have been used on different species of fish, including herring, halibut, trout, salmon, cod, haddock, and mackerel. It is one of the few kinds of tags that can be used on very small fish and remain with the fish after it has increased in size to adulthood.

Strap tag.--This tag is a flat metal strip in which one pointed end pierces the tissues and is clinched through a hole in the other end with special pliers. The tag was adapted from a cattle ear tag and was first used on salmon in Alaska. The tag may be attached to the gill cover, to the lower jaw (fig. 4), or to the top of the tail fin and has been used on halibut, cod, haddock, pollock, tuna, and in fresh-water fishes, on black bass and walleye pike.

Internal anchor tag.--This tag consists of a flexible chain or thread that pierces the body wall and is held by being anchored internally by a body-cavity tag. The tag was developed in 1936 by George A. Rounsefell for use on salmon. In a test in which the tag was attached to young salmon in aquarium tanks, he found the wound healed completely within a few days.

An adaptation of this tag, the combination internal anchor-hydrostatic capsule tag (frontispiece), has been used successfully on haddock, cod, and halibut. The tag

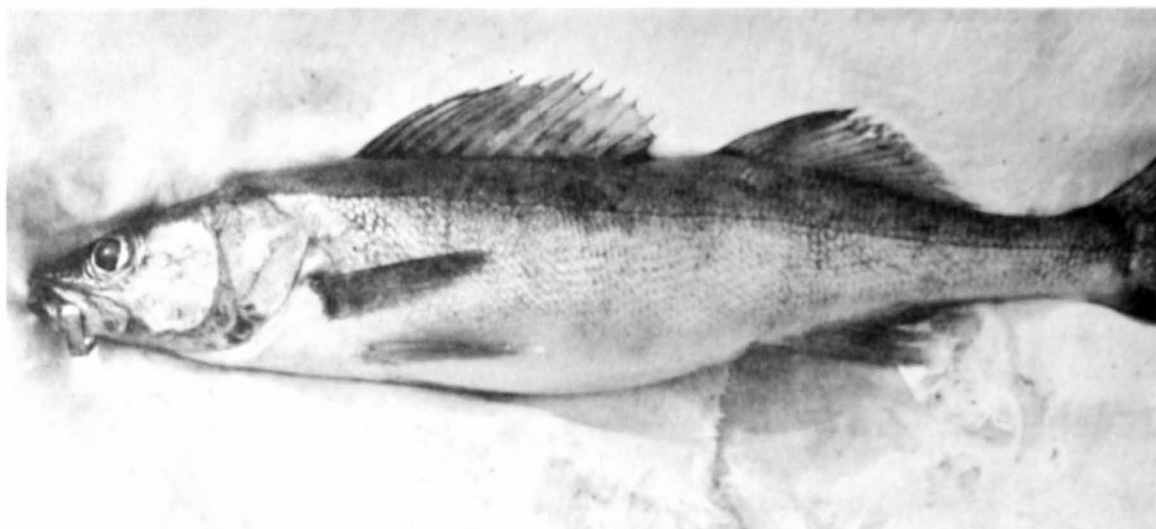


Figure 4.--A strap tag attached to the lower jaw of a walleye pike.

consists of a Celluloid capsule, hollowed so that it is nearly buoyant, containing a serial number and reward message on a rolled strip of paper. The capsule is fastened with a Monel chain to the center of a plastic tab. The tags are attached by making a small incision in the flank of the fish with a scalpel and inserting the tab into the body cavity, where it serves as an internal anchor for the capsule.

Spaghetti tag. -- A recent development in tags is the use of vinyl plastic tubing, popularly termed "spaghetti." Spaghetti tags are used in various lengths, depending on the size of the fish being tagged, and usually are drawn through the back muscles with a needle and tied in a simple overhand knot (fig. 5).

The spaghetti tag used on haddock, for example, is 14 inches long, about three thirty-seconds of an inch outside diameter, and is bright yellow. A serial number, laboratory address, and notice of reward are imprinted on each tag with water-resistant ink. The spaghetti tag has been used successfully on haddock, striped bass, spiny dogfish, and tuna. It is quickly applied; the plastic material is not injurious to the fish nor is it affected by prolonged immersion in sea water.

Miscellaneous tags. -- Many other tags have been developed for special studies or for use on particular species of fishes. One such tag is the barb tag. The usual design of this tag includes a straight shaft, with or without an attached plate, that is pushed into the tissues and held in place by one or more barbs (fig. 6). Collar tags, that encircle some part of the fish's body with-

out piercing any tissues, have been used, but with little success, on mackerel and tuna. Fish hooks, with a number and message stamped into the metal, have been used on some of the larger fishes such as tuna. The tag was designed so that, when a hooked fish breaks the line and escapes, the fisherman can report the incident, and if the fish is recaptured bearing the hook, its movement can be computed.

One of the newest tags is a miniature sonic device designed to be attached to the dorsal muscles of fish for studying their movements. The sonic tag is a capsule about 2-1/2 inches long and three-fourths of an inch in diameter that transmits a signal to a special receiver. The battery in the capsule lasts for up to 100 hours. The tag is most useful for tracking the movements of individual fish for brief periods of time and in small areas. It was developed primarily for studying the behavior of adult salmon as they locate and ascend fishways built to guide them around hydroelectric dams. The signal receiving equipment is placed in an outboard-motor boat and "homes" on the tag. A biologist in the boat can then follow the fish's movements from as far away as 800 feet.

TAGGING METHODS

Tagging methods are largely determined by the physical circumstances; tagging at sea in rough weather is quite different from tagging on a float anchored in a harbor, from a live car in a stream, or from a hatchery trough. The following description is



Figure 5.-- A plastic tubing, "spaghetti," tag used on a haddock.

representative of the tagging methods used for many species of fish.

As soon as the fish are caught, the desired species are placed in tanks supplied with running water. Sluggish fish are removed and only the liveliest individuals are retained for tagging. Fish to be tagged are dip-netted one at a time from the tank and handed to the tagger who places the fish on a measuring board. The length of the fish

and the number of the tag to be used are noted and written on a tagging data sheet by the person recording the data (fig. 7).

The tag is attached to the fish and, with certain species, a few scales are removed for age determination. The fish then is returned to the water. The time required to tag each fish varies with the tag used--the fish being out of the water usually for about 30 seconds or less.

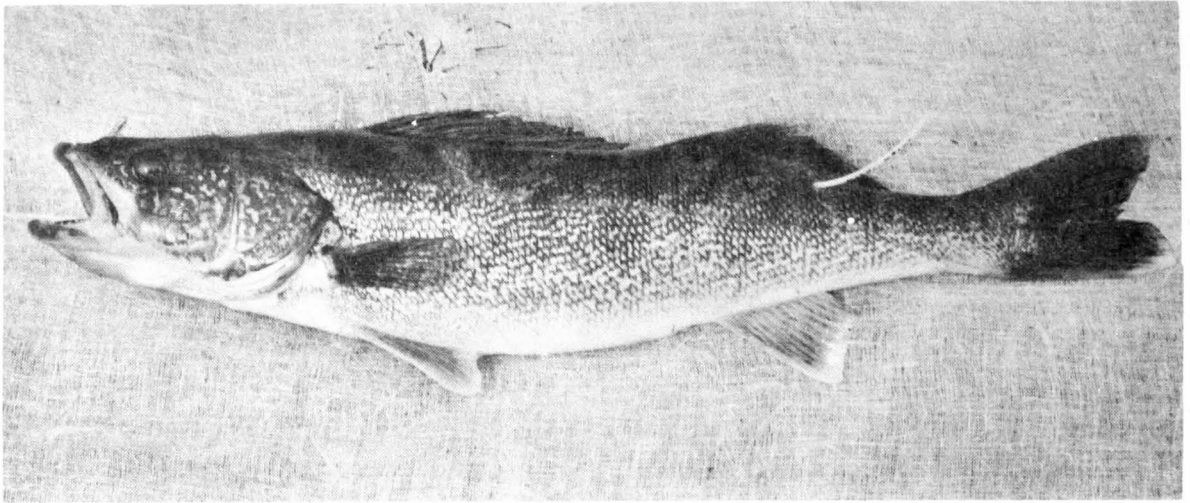


Figure 6.-- A plastic barb tag attached to the back muscles of a walleye pike.



Figure 7.-- Tagging haddock and cod at sea aboard a Fish and Wildlife Service research vessel.

Many tagged fish (as much as 10 percent, and sometimes more, of those originally marked) are recaptured months and years later by commercial fishermen and sportsmen. When the finder of a tagged fish reports his find and returns the tag, he is paid a reward. The amount of the reward may vary from 50 cents for fish such as herring to as much as 5 dollars for sailfish, marlin, and tuna.

The finder's report is most valuable when it includes an accurate description of the location where the fish was recaptured, an accurate measurement of the fish's length, and a scale sample from the fish.

OBJECTIVES OF MARKING AND TAGGING STUDIES

The primary objective of marking and tagging studies is to make it possible to identify an individual fish, or group of fish, at some later date. The knowledge gained from such studies can then be used to develop a greater understanding of the life history and habits of the fish under study and to apply the knowledge to help in the conservation--the wise use--of the fish. Some of the information sought through marking studies are listed below.

Definition of Stocks

In studies of marine fishes that range over great distances of coast line or are widely distributed among offshore banks, it is important to know whether there is one large population of fish or several separate stocks that remain for the most part on their home grounds. Marking or tagging fish in each of the several areas along the coast or on the various banks, and then obtaining information on the locality of recapture of the marked fish will help supply information about the separation, if any, of the stocks.

Migration of Fishes

Many species of fish make long migrations, particularly to reach spawning grounds. Knowledge of the migration route and of the time and rate of travel is important to help conserve the fishery for many species. This is especially true in the case of salmon most of which are taken by the fishery as they migrate to the spawning areas. Well-planned and properly carried out tagging studies have revealed many of the answers to questions about fish migrations.

Population Estimates

Marking and tagging also provide a way to estimate total number of fish in the population in a lake or pond. After a number of fish are tagged and returned to the water, the proportion of tagged to untagged fish in future catches can be used to determine the size of the population. In studies of salmon, shad, and other fishes that leave the sea to spawn in rivers and streams, individuals captured near the river mouth are marked with conspicuous tags and then released to resume their migration upstream. Observers are assigned to patrol the river bank to determine the ratio of marked to unmarked fish. Knowing this ratio and the number of fish originally marked, it is possible to calculate the total number of fish on the spawning grounds.

Age and Growth Studies

Age determination of the individuals in a population is an important part of most fishery studies. Marking and tagging provides a valuable check on the method of age determination used since the interval between the time of release and the time of recapture is definitely known. Where fish are aged by scale reading, scales collected from the same fish at tagging and at recapture are compared to see if the change in scale age is equivalent to the interval at liberty. Similarly, the growth rate of the marked fish can be established since the fish is measured both at the time of release and the time of recapture.

Stocking of Hatchery Fish

The success of stocking hatchery-reared game fish, such as trout or black bass, can often be determined from marking studies. The fish are marked just before they are released into the stream or lake and the number of marked fish caught by sportsmen gives an index to the success of the stocking program.

REFERENCES

The information contained in this leaflet is necessarily brief. The reader who is interested in further pursuit of this subject may find the items listed below of interest.

- Lagler, Karl F.
1952. Freshwater fishery biology. Wm. C. Brown Co., Dubuque, 360 p. Chapter on studying fish populations using tagging and marking techniques. Bibliography of technical papers on this subject at end of chapter.

Rounsefell, George A., and W. Harry Everhart.

1953. Fishery science, its methods and applications. John Wiley & Sons, Inc., New York, 444 p. Excellent coverage in two chapters on tags and tagging. Extensive bibliography of technical papers at end of each chapter.

Rounsefell, George A., and John Lawrence Kask.

1945. How to mark fish. Transactions of the American Fisheries Society, vol. 73, p. 320-363. Describes and illustrates 50 kinds of tags and discusses how they are made and used. Bibliography includes 232 technical papers

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