Question: Should the opening day limit be reduced?
Answer: No, the effect would only be delayed one or two days and spread among more people.
Question: Was the 70% return you mentioned tagged fish?
Answer: Yes, but they were native fish tagged during the closed season.
Question: Was the data obtained where size limits were in effect?
Answer: Yes. Ten inch minimum.

WHAT SIGNIFICANT INFORMATION CAN BE GAINED FROM ROTENONE POPULATION STUDIES IN IMPOUNDMENTS

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The term, population study, as most often used, denotes certain field activities from which data are gathered regarding the kinds of fishes present in a body of water, or a section thereof, and the relationship and/or interrelationship of these fishes one to the other. This definition is rather broad and all encompassing and is given as such because in the past most studies have been conducted with these broad objectives in mind. However, it is believed that the attainment of such overall objectives is not possible using the procedures and methods most commonly used in the Southeast.

The most widely used method for conducting population studies in impounded waters has been to select a cove area or mid-lake area of one acre or more in size, treat the area with rotenone, recover all fishes possible, and make whatever counts, measurements and collections the investigator deems essential.

If all the interrelated complexities of population dynamics cannot be determined from more or less routine population studies what can the fishery investigator determine from these operations and of what value will the findings be to his understanding of the population?

Assume that a population study or a series of studies is made in an impoundment using the method described above and also, and most pertinent, that these studies are conducted during the warmer months, May through October. The following is a listing of at least most of the information which could be secured.

1. *Success and Survival of Reproduction.*

Cove studies made monthly from May through October will furnish a relative approximation of the number of fingerling fishes present per acre immediately after the spawning season and a continuing inventory of the mortality of these fingerlings. The studies conducted in May the following year will furnish information on relative survival of young-of-year fishes throughout their first year of life. Additionally, the monthly growth of these fishes can be charted and compared to previous years' growth rates if these data are available.

By knowing the strength of each year class and the growth and survival of these year classes it is possible to predict with some accuracy the immediate future of the fishery and to help the investigator to better plan for future regulation and management.

2. *Material for Age and Growth Studies.*

Scale samples collected from fishes taken in population studies can be used to determine the growth rates of the fishes. Knowledge of the age and rate of growth of the different fishes will help predict the time when a particular year class will enter the fishery, the age at which they will reproduce, the approximate age and size when mortality is greatest in the adult fishes and will help in the evaluation of the effects of experimental management programs as reflected in growth changes. Studies of the effects of selective poisoning are known to be in progress in Texas, Virginia and Kentucky.

3. *Success of the Introduction of New Species.*

A large number of states are now in the process of introducing various new species into their lakes and impoundments. In the South most waters are supporting an overabundance of forage fishes, of which, only a small portion is being utilized by the resident piscivorous fishes. It is now believed that it will be more desirous and more economical to add predation artifically rather than to subtract forage artifically.

Population studies will reveal the relative success of introductions and whether or not these new fishes have established themselves or whether they will require continued annual restocking.

4. *Species Present and Relative Abundance.*

From a group of studies conducted in varying sections of an impoundment the kinds of fishes present and their relative abundance can be determined. These studies should be made throughout the different seasons as fish distribution, especially depth distribution, is continually changing. The conducting of year-round studies will only furnish a rough approximation of relative species abundance; however, this approximation may be sufficient for the purposes for which the individual study was designed.

Although there may be some disagreement with the above, an attempt was made to include those population study values which the writer has found usable and/or significant.

Assuming there is a limit to which the data gathered from population studies can be used, what information cannot accurately be secured from these studies? The following is a listing of those data which cannot be expected to result from routine rotenone samples:

1. *Accurate Quantitative Measurement of Species Composition.*

The inability to recover all of the fishes, movement of fishes into and out of the sample area, the absence of certain size groups due to depth distribution, etc., and the varying degree of susceptibility of the different fishes to rotenone are factors which prevent quantitative measurement.

2. *Accurate Determination of Standing Crop.*

The reasons given in item 1 for the inability to correctly determine species composition of the lake or impoundment are also pertinent to this item. However, it is believed that relative values for different impoundments or even different sections of an impoundment can be effectively approximated.

3. *Accurate Determination of the Adult or Large Fish Abundance.*

The inability to accurately measure the adult population is due primarily to two factors, depth distribution and escape phenomenon. The large fishes tend to run or escape from toxic waters more so than do fishes of smaller size. During the warmer months the larger fishes are usually found in greater depths and are usually able to escape the treated water before becoming seriously affected. Also, the rotenone is less well distributed in the deeper water and also may be below lethal concentration in these colder areas. A much more accurate determination of the adult population of a large body of water can be made during the winter or very early spring months.

4. *Fishes Collected During Rotenone Studies Have no Value for Food Habit Studies.*

Affected fishes, especially the larger ones, tend to gorge themselves prior to the time when they themselves become overcome by the rotenone. After gorging, many of the fishes regurgitate. These actions render the stomachs unfit for study.

5. *Accurate Determination of the Abundance of Pelagic and/or School Fishes.*

This is a problem in shallow lakes as well as deep lakes and for cove studies as well as open water studies. Estimates of the numbers and size distribution of crappie, walleye, sauger, and white bass are extremely difficult to make from rotenone studies.

In Kentucky Lake, a relatively shallow lake, the crappie are very abundant, growth is rapid, and the population is composed primarily of large fish. The Kentucky Division of Fisheries has been conducting rotenone studies at this lake since 1948 and as many as eight studies have been made during one year.

In not one study during the past eight years have crappie represented more than a trace percentage of the fishes taken in these samples.

In Cumberland Lake, a deep lake, crappie growth in one section of the lake is slow, the fish are abundant and are taken in rotenone studies to a degree closely approximating their relative abundance. In other sections of Cumberland Lake, crappie growth is more rapid, the population is composed of larger fish, they are quite abundant and the population studies fail to furnish even a close approximation of their relative status in the population.

White bass populations are extremely difficult to determine. In Herrington Lake, one study was made in which white bass were completely absent. The next year in the same area they were quite abundant. In another study, in 1950, 126 pounds of white bass were taken and the following year in the same area only four pounds of this species was recovered. The white bass represented 32 percent of the weight in 1950, and only four percent in 1951.

The populations of walleye and sauger are also difficult to determine from rotenone studies and examples could be cited; however, the pattern is quite similar to that concerning crappie and white bass.

The reasons why rotenone samples are not usually adequate for sampling pelagic and school fish populations are apparent. These fishes are constantly moving from one area of the lake to the other. They may be in the test area or they may not. They may move into the area or they may not. The large fishes of these species seek out the greater depths and are difficult to sample.

In summary, it can be said that rotenone population studies are of great value to our understanding of the population of a body of water. There is a wealth of information to be gained from these studies, if we know what data can be used with validity and what data cannot.

Each study should be conducted with a predetermined knowledge of what information is to be gained. Development and refinement of techniques and methods of conducting these studies should continue. It is believed that in the future studies should be made at all seasons of the year and that individual sample areas should be considerably larger than most study areas have been in the past. Of primary importance, however, is a thorough understanding of objectives.

HOW SHOULD POPULATION SURVEYS BE MADE?

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The panel on "Population Studies" has limited its papers and discussion to "Standing Crop and Its Composition." This paper titled "How Should Population Surveys be Made?" is an attempt to fulfill an assignment on the panel.

Population estimation (*e. g.*, standing crop and its composition) depends upon counts of total populations or samples. Devices used to capture or confine fish for such purposes are largely modifications and applications of devices long used to capture fish for food or sport. With the exception of electro-fishing contrivances many date back to the beginnings of civilization (Cleary and Greenbank, 1954).

Total population enumeration, while perhaps the most accurate and reliable method known, is often impractical or impossible except in small water areas. For large waters like the TVA reservoirs (600-158,000 acres) and for routine evaluation of most smaller impoundments, sampling is the only practical way to acquire the population information that is needed to formulate sound fish conservation practices.

The diverse ways and means of sampling are a matter of record and well known to members of the Southern Division of the American Fisheries Society. I shall limit my discussion to the "rotenone method" as it is applied on TVA