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INSTITUTE FOR FISHERIES RESEARCH
DIVISION OF FISHERIES
MICHIGAN DEPARTMENT OF CONSERVATION
COOPERATING WITH THE
UNIVERSITY OF MICHIGAN

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SECOND REPORT ON TESTS WITH AMYTAL SODIUM AND
SECONAL SODIUM IN TRANSPORTATION OF TROUT

By

Leonard N. Allison and Jack R. Hammond

This report is a summary of further tests made at Grayling in the use of barbituates for transporting trout. Mr. C. Troy Yoder, Regional Fisheries Supervisor, made available two, two-tank transportation units for the tests. The units were placed at Grayling hatchery in the former garage where they were protected from the weather and were reasonably close to the raceways holding fish used for testing. Mr. Hammond assisted in all tests, and two members of the hatchery crew assisted in collecting the fish and loading and unloading the tanks for each test.

Actual transfers

Mr. Hammond accompanied the units on trips from Harrietta, Paris and Oden to Wolf Lake when transfers were made with approximately double the normal load of fish and with 1/4 grain Seconal Sodium per gallon added to the water. All fish were starved for three days prior to transfer. Water temperature was kept below 50° F. by adding ice at intervals. Each time ice was added, water in the tanks was adjusted to its original level and additional drug was added to compensate for dilution by melting of the ice. Upon arrival at Wolf Lake, Mr. Hatt held the fish segregated overnight and

recorded the loss before transferring them to the raceways. The following are his reports to Mr. Hammond:

June 29, 1954:

"As per your instructions of June 25, 1954 the following information is submitted:

Tanks used: Pickup
Front compartment - Loss 71 Sub-legal rainbows
Rear compartment - Loss 138 Sub-legal rainbows

The fish were divided into two concrete tanks on arrival and transferred to an outside raceway the next morning. Five (5) dead fish were picked up that evening. None since then."

(Note: 9700 fish (500 lbs.) carried in two tanks)
209 lost

July 6, 1954:

"As per your instructions of June 28, 1954 the following information is submitted:

Tanks used: 4 compartment planting unit
Right front compartment 45 fish lost, sub-legals
Left front compartment 34 fish " "
Right rear compartment 18 fish " "
Left Rear compartment 27 fish " "
124 fish lost, sub-legals"

(Note: 15,300 fish (1000 lbs.) carried in 4 tanks)

July 14, 1954:

"As per your request the following information is submitted:

Loss on rainbow trout from Oden, July 8, 1954
Right front tank 10
Right rear tank 38
Left front tank 13 (14,300 fish handled,
Left rear tank 14 1,000 lbs.)
Total 75

Loss on rainbow trout via Paris truck from Paris, July 13, 1954:
Right front tank 20 (11,000 fish handled,
Right rear tank 38 800 lbs.)
Left front tank 34
Left rear tank 33
Total 125

All fish were held in hatchery tanks 24 hours and then transferred to concrete raceway."

(Note: Oden - 14,300 fish (1,000 lbs.) carried in 4 tanks)
Paris - 11,000 fish (800 lbs.) carried in 4 tanks)

The loss incurred during these transfers was very small, considering the number and weight of fish carried.

According to Phillips and Brockway,* "Both cold water and the 63-hour period of starvation were effective in reducing the metabolic rate as measured by the accumulation of ammonia and the amount of oxygen remaining in the water." Their tests were made in aquaria with water temperature adjusted to 34° F. They concluded that, "The drug sodium amytal was effective when it was used in combination with the longer period of starvation but had no effect when used with the shorter starvation period (15 hours). The action of the drug was delayed between 4 and 6 hours."

We made three tests to study the effects on sublegal rainbow trout at low temperature (44° F. to 48° F.) in combination with starvation periods of 22 and 70 hours, and with the drug Seconal Sodium. Because of lack of equipment, analyses for ammonia were not made on the first test. Dr. Frank Hooper made the analysis on the second and third tests. By way of explanation, ammonia is a waste product of metabolism, and by analyzing the water at intervals an increase or decrease may be made known. If fish are held in the same water, the ammonia content increases finally to a lethal amount. Since ammonia is a product of metabolism, or the breaking down and use of food in the body of the fish, any method of slowing down metabolism will reduce the production of ammonia thus enabling fish to live longer in a given amount of water, provided, of course, oxygen is sufficient. When food is used in metabolism by a fish, oxygen is also consumed, so slowing down metabolism results in less use of oxygen from the water, thereby allowing the fish to live longer.

*Phillips, Arthur M. and Donald R. Brockway.
1954. Effect of starvation, water temperature, and sodium amytal on the metabolic rate of brook trout.
---Progressive Fish-Culturist, Vol. 16, No. 2, pp. 65-68, April, 1954.

As before, 250 pounds of fingerling rainbows were used in each tank. This represented approximately twice the normal load of fish.

In the first test, the fish were starved 22 hours and no drug was used. Temperature was held between 44° F. and 46° F. by use of ice. After two hours and forty minutes in the units, the fish showed extreme distress and were removed. A count made after all fish had been tempered and returned to the pond totalled a mortality of 466 fish, or 51.26 pounds. At the time the fish were removed from the unit, oxygen was still high (8.4 p.p.m.).

The second test was with the same group of fish, starved for 70 hours. The fish were in the units at temperatures from 44° F. to 50° F. for four hours before it was necessary to remove them. This time the loss was 151 fish, or 10 pounds. Oxygen remained adequate throughout the test. Ammonia increased from 0.72 p.p.m. to 4.3 p.p.m. during the four hours. According to Brockway,* ammonia in the water of raceways containing trout should be kept below 0.3 p.p.m. to prevent a decrease in the ability of the blood of fish to carry oxygen.

The third test was made again with the same group of fish and with low temperatures (44° F.-50° F.), but with the addition of 1/4 grain of Sodium Amytal per gallon of water. The test was run for four hours, the same length of time as the second test. The fish were still in good condition at the end of this test. Unfortunately, due to faulty handling after the test, a loss of 113 fish (13 lbs.) occurred. Oxygen remained high throughout the four hours. There was, however, an increase in ammonia from 0.82 to 4.05 p.p.m., values directly comparable to those in the second test when no drug was used. Because of the loss of fish apparently due to handling, this test will be repeated.

*Brockway, D. R.

1950. Metabolic products and their effects.

---Progressive Fish-Culturist, 12 (3): 127-129, July, 1950.

The results of the above tests demonstrate that starving the fish for about 70 hours increases the length of time they can be carried at lower water temperatures over the time when they are starved for only 22 hours. No doubt this difference would be greater at higher temperatures. The tests also show that low temperatures plus starvation and Sodium Amytal offer the best combination for carrying trout. Further tests are planned in an effort to determine a standard method of handling the barbituate drugs, the importance of ammonia concentrations to fish, and methods of elimination of the ammonia, if it can be shown to be a limiting factor in transporting fish.

INSTITUTE FOR FISHERIES RESEARCH AND FISH DIVISION

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