Informational Leaflet 4

THE EFFECT OF TRICAINE METHANESULPHONATE (MS 222) AND/OR CHILLED WATER ON OXYGEN CONSUMPTION OF SOCKEYE SALMON (*Oncorhynchus nerka*) FRY

By:

William R. Meehan
and
Leonard Revet
Division of Biological Research

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STATE OF ALASKA
WILLIAM A. EGAN - GOVERNOR

DEPARTMENT OF
FISH AND GAME
WALTER KIRKNESS - COMMISSIONER
SUBPORT BUILDING, JUNEAU

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William R. Meehan and L. Revet

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INTRODUCTION

In conjunction with a research program involving the transportation of sockeye salmon *(Oncorhynchus nerka)* fry for stocking purposes, three series of laboratory tests were run to determine the oxygen consumption of the fry and their apparent condition using tricaine methanesulphonate (MS 222) and/or cold water to decrease the rate of respiration. The final objective of these experiments were (1) to determine whether or not the use of anesthetic would increase the number of fish which could be carried in a given volume of water, (2) to determine whether or not the anesthetic could be used successfully to increase the length of time a given number of fish could be carried in a given volume of water, and (3) to determine whether or not colder water would be of more value in obtaining these desired results either alone or in conjunction with the anesthetic.

METHODS

Three separate series of tests were run on sockeye fry averaging 1700 to the pound. Seven plexiglass cylinders, each 17 inches high with a diameter of 6 inches, were used as containers. Four thousand ml of water were placed in each container; water temperature and dissolved oxygen content of each were determined, and then a given number of fry or fry plus a given amount of MS 222 were added to each container. Containers E, F, G, and H were each supplied with 4000 ml of chilled water (8° colder than the water in containers A through D and the controls, at the start of each test). At the conclusion of the two hour test period the temperature and dissolved oxygen content of the water were again determined. During the time that each test was under way, observations were made on the apparent condition of the fish.

RESULTS AND DISCUSSION

Results of the dissolved oxygen consumption of fry in these tests are given in Table I and Figure I.

Results of observations on the condition of the fry can be expressed as follows:

1. Where 100 fry were placed in 4000 ml of regular hatchery water of approximately 60°F without anesthetic, fish at the end of the 2-hour test period were all alive but appeared to be under stress. Most of them were at the surface of the water and gulping air.

2. Where 100 fry were placed in the same volume of 60° water with MS 222 (0.1 gm per 4000 ml water) the fish were slowed down considerably in movements, a few of them at the bottom of the container, but none showed signs of suffering from lack of oxygen.

3. Two hundred fry per 4000 ml 60° hatchery water resulted in complete mortality by the end of the 2-hour test period. Within 15 minutes

Table I. Dissolved oxygen consumption of sockeye salmon fry during three tests using MS 222 and/or chilled water to reduce rate of respiration.

Container	A	B	C	D	E	F	G	H	Controls (1)	Controls (2)
Water temp.	60° F.				52° F.				60° F.	
Contents	100 fry	100 fry MS 222	200 fry	200 fry MS 222	100 fry	100 fry MS 222	200 fry	200 fry MS 222	MS 222 water only	
Dissolved oxygen consumption in ppm: Test No. 1	7.20	4.56	-	-	-	-	-	-	0.64	0.00
Test No. 2	7.36	7.60	8.00	7.84	5.36	-	-	-	0.00	0.48
Test No. 3	7.28	6.56	-	-	7.04	5.76	8.24	9.28	0.06	0.00

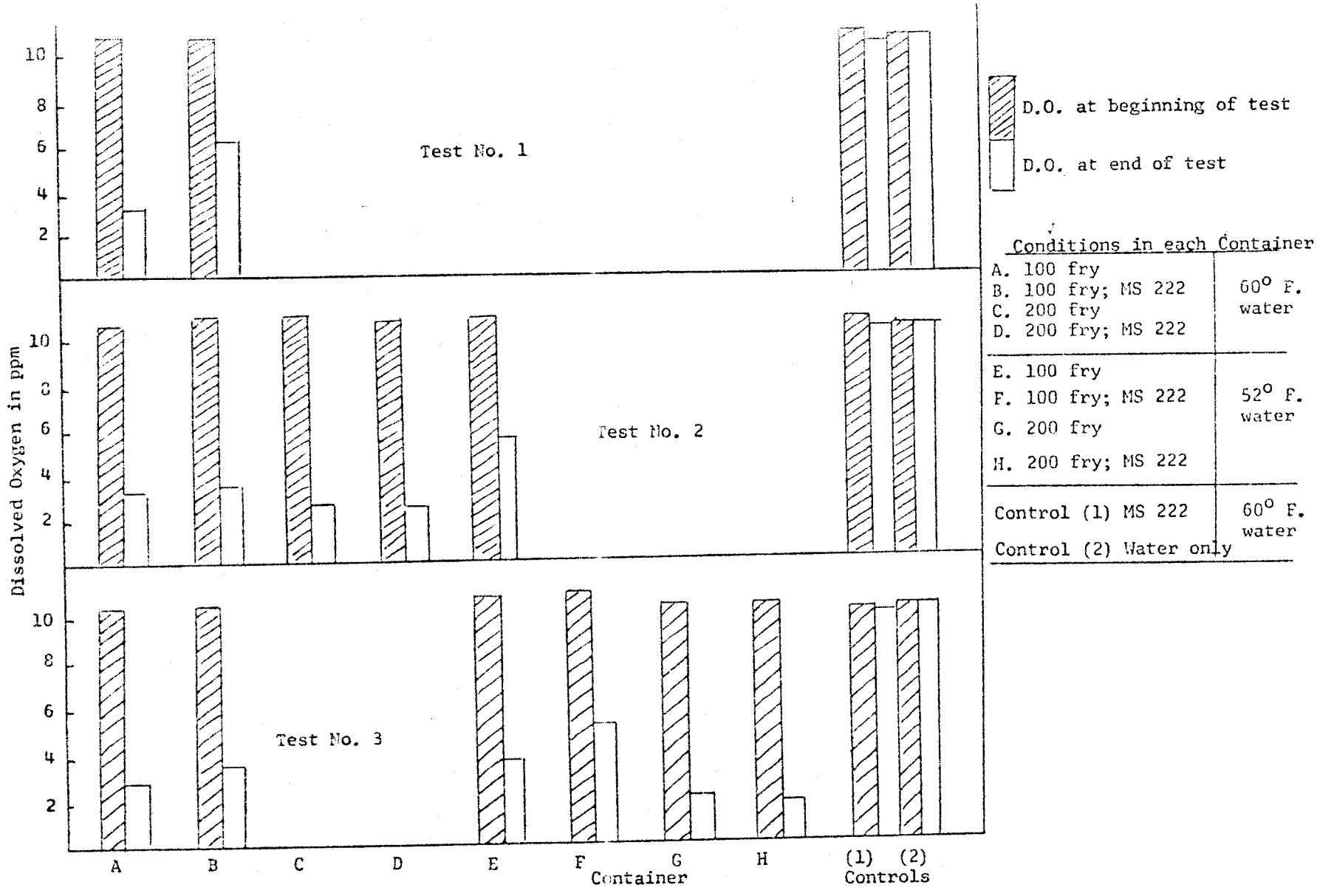

Figure I. Dissolved oxygen at the beginning and at the end of each test.

after the beginning of each test under these conditions, fry began to suffer from lack of oxygen.

4. Where 200 fry were placed into 60° water in conjunction with the use of MS 222, there was approximately a 95% mortality at the end of the test period.

5. Where 100 fry were placed in 52° water, there was complete survival and no stress was observed.

6. One hundred fry in 52° water with MS 222 resulted in a mortality of about 20%, and survivors appeared to be in poor condition.

7. Two hundred fish in 52° water without anesthetic resulted in a mortality of approximately 80% with survivors in very poor condition.

8. Two hundred fish in 52° water with MS 222 resulted in complete and rapid mortality.

In general then, results show that the best conditions for good survival are uncrowded numbers of fish in water colder than that from which they were removed, or in their normal environmental water to which MS 222 has been added in predetermined amounts. These amounts will vary according to the water temperature, size, and species of fish, etc.

Crowding the fish was not desirable under any of the conditions tested, although the best survival of crowded numbers was with colder water and no anesthetic.

The use of MS 222 in water colder than that from which the fry were removed, whether the fish were crowded or not, seemed to have a lethal effect. This might possibly be due to a cumulative slowing-down of metabolic processes from which the fry could not revive.

In this limited series of experiments no attempt was made to determine the amounts or effects of waste products in the form of ammonia, or other nitrogen compounds, which are given off during the tests.

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