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Fisheries Division

AN EVALUATION OF BROOD STOCK IMPROVEMENT VIA TAGGING OF INDIVIDUAL FEMALES

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SUMMARY

A program to improve the quality of rainbow trout egg production via the identification and elimination of poor quality females was conducted at Harrietta Brood Stock Hatchery.

The cost was 96 cents per female tagged, or $2.21 per female retained for brood stock.

Results indicated that acceptable spawners could be identified and that poor spawners could be eliminated from a brood stock population.

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INTRODUCTION

The quality of egg produced by rainbow trout brood stock at Harrietta Hatchery has been less than desirable for several years. During the fall spawning of 1970, data was collected to assess the severity of the problem.

Analysis revealed that less than sixty two percent of the eggs progressed to the eyed stage. The incubation of the eggs of individual females further indicated that over 40 percent produced eggs which were below acceptable standards. The problem therefore appeared to be one of genetic infertility of females rather than of spawning techniques.

A genetic selection program was accepted as the best long range solution of the problem, however, a short range program was also desired. The short range program evaluated here was an attempt to improve the quality of egg production via identification and elimination of poor quality females. The acceptable females would be selected and kept for three more years of production spawning.

METHODS

In the fall of 1971, one thousand two hundred and eighty six females of the same age class spawner matured for their first egg production. Each female was spawned individually and was identified by a numbered floy spaghetti tag. The tags were inserted through the epaxial muscle and twisted so as to anchor between the pterygiophores of the dorsal fin. The eggs of each female were numbered to coincide with her tag and were fertilized with 1ml of sperm taken from a single sperm pool. The eggs of each female were incubated individually.

The eggs of the first eighty eight females to be spawned were individually hand picked and counted at eye-up. Hand picking, however, proved very time consuming and was replaced by a system of visual selection in which the eggs were visually placed in one of the four categories given in Table I. The two methods gave comparable results in the relationship of percent of fish retained.

TABLE I

COMPARISON OF METHODS OF FEMALE SELECTION

Method	Number of Females	0-10% Eye-up	10-50% Eye-up	50-80% Eye-up	80-100% Eye-up	Percent of Lot Kept
Hand Picked	88	34.1 %	18.2 %	28.4 %	19.3 %	47.7 %
Visual Selection	1197	22.4 %	30.8 %	31.2 %	15.1 %	46.3 %

Females yielding less than a 50% eye-up were identified as rejects, removed from the brood stock program, and planted into Michigan's inland waters. Five hundred fifty six females yielding above a 50% eye-up were retained for brood stock.

RESULTS

Analysis of the data from the 88 hand picked females indicated that 52.3 percent of the population could be eliminated with a loss of only 4.2 percent of the eyed eggs (see Table II). The anticipated result would be a 50 percent reduction in the numbers of brood stock required for any given level of program.

TABLE II

DATA OF 88 FEMALES WHOSE EGGS WERE HAND PICKED

	% of Population	% of Eye-up	% of Total Eyed Eggs
Selected Females	47.7 %	75.8 %	95.8 %
Rejected Females	52.3 %	3.3 %	4.2 %

Four hundred eighty three of the select females retained in 1971 spawned again in 1972. Forty of these were individually spawned and incubated, as were thirty two of the rejected females from 1971. Comparative data is summarized in Table III.

TABLE III

EGG QUALITY CONSISTANCY 1971 - 1972

	Number Females Sampled	Percent within the same parameters	Eye-up 1971	Predicted Eye-up 1972	Actual Eye-up 1972
Hand Picked Select 1971	40	92.5 %	75.8 %	75.8 %	78.6 %
Visual Select 1971	443	--	--	75.8 %	79.7 %
Reject 1971	32	68.8 %	3.3 %	3.3 %	27.7 %
Non-Select 1971	1227	--	61.8 %	61.8 %	76.3 %

The eye-up of the eggs spawned from the selected hand picked females was 75.8 percent in 1971. Therefore, approximately the same eye-up was expected from the entire select population in 1972. The eye-up actually achieved was 70.7 percent. This improvement in quality was somewhat nulified by the fact that the non-selected population improved from 61.8 percent to 76.3 percent. In other words, the selection program increased eye-up by 17.9 percent, while the eye-up of non-selected females increased by 14.5 percent. The large increase in eye-up from non-selected females was most likely due to changes in spawning techniques. Although the increase in eye-up contributed to the selection program (3.4 percent) was less than expected, the female quality consistancy from year to year was significant. Ninety two percent of the select females produced eggs of comparable quality in 1972. Sixty nine percent of the rejected females were still rejects in 1972. It is possible that the rejected females which showed improvement were females whose eggs were injured during the spawning of 1971. The females would therefore have been incorrectly classed as rejects.

DISCUSSION

Results indicate that Harrietta's problem may have been due as mcuh to spawning technique as to genetic abnormalities. Further indications are that acceptable spawners can be identified and that poor spawners can be eliminated from a brood stock population.

The total cost of the program as applied at Harrietta was 96 cents per female tagged, or $2.21 per female kept for future brood stock. The feasibility of this program must be determined by each station on the basis of the dollar cost per female kept versus dollars saved by elimination of surplus females.