

SECOND SEMI-ANNUAL REPORT RELATED TO THE
FEASIBILITY STUDY FOR SPAWNING, HATCHING AND
STOCKING STRIPED BASS IN THE HUDSON RIVER

NOVEMBER 1974

Prepared for
**CONSOLIDATED EDISON COMPANY
OF NEW YORK, INC.**

4 Irving Place
New York, New York 10003

Rec'd w/ Mr. Dad

2-21-75

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by



TEXAS INSTRUMENTS INCORPORATED
ECOLOGICAL SERVICES

P.O. Box 5621
Dallas, Texas 75222

8110240579 741130
PDR ADOCK 05000286
R PDR

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November 1974



FOREWORD

This semi-annual report, which has been prepared for Consolidated Edison Company of New York, Inc. (Con Ed), by the Ecological Services Group of Texas Instruments Incorporated (TI), contains propagation, stocking, and recapture data for the Hatchery Program during the period from January 1974 through October 1974.



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I. INTRODUCTION

Artificial propagation has been proposed as a mitigative measure to offset losses in the natural Hudson River striped bass population due to power plant operation. The success of this program will depend upon the development of culture techniques to insure efficient production of stockable fingerlings and to determine their impact on the ecosystem. After two years of experimentations at the Verplanck, New York hatchery, Texas Instruments Incorporated (TI) has demonstrated success in artificial spawning, culture and stocking procedures. Continued research is required to refine these techniques of artificial propagation and to determine the effect these stocked striped bass will have on the natural Hudson River population by assessing their survivability.

II. GENERAL SCOPE OF PROGRAM

The 1974 hatchery program consisted of a coordinated effort of four (4) components; (1) brood fish collection and induced spawning, (2) hatchery rearing, (3) marking and stocking, and (4) field sampling. Brood fish were acquired from commercial fishermen and with a scientific collector's permit by TI personnel. The spawning and hatching program was aimed at determining techniques to increase the efficiency of fry production at the Verplanck hatchery. The fry were then reared to fingerling size (2 to 4 inches in length) by two agencies experienced in striped bass culture, The Edenton National Fish Hatchery, in North Carolina and The Durant State Fish Hatchery, in Oklahoma. Experimentation with shipping methods and stocking periods was conducted to determine the most efficient means of stocking the Hudson River.



An on-going field sampling program was designed to recover marked hatchery reared striped bass for an extended period of time after stocking to assess their survivability.

III. OBJECTIVES

The primary objective of the program was to assess the potential for augmenting the Hudson River striped bass population by artificial propagation, utilizing adult Hudson River bass as brood stock. Subsidiary objectives included:

- a. Evaluating techniques of striped bass culture and stocking at other hatchery installations for their application to the Hudson River fishery
- b. Comparing the survival, movement and vulnerability to fishing gear of hatchery reared striped bass fingerlings to their wild counter parts
- c. literature review (expanded and updated)

IV. PROGRAM SUMMARY AND STATUS

A. Propagation

Thirty-six female and thirty-five male brood fish were captured from the Hudson River and transported to the Verplanck holding facilities. Twenty-five of the female striped bass were successfully ovulated at the Verplanck hatchery producing 31 million eggs. Fifty-one percent of the eggs hatched, providing approximately 16 million larvae (Table 1).



B. Larvae Utilization

Approximately 8,440,000 larvae were sent to the rearing facilities listed below for fingerling production.

1. Welaka National Fish Hatchery in Florida	3,100,000
2. Edenton National Fish Hatchery	1,400,000
3. Durant Fish Hatchery in Oklahoma	3,940,000

In addition, 4,946,000 larvae were utilized for experimental work by the agencies listed below.

1. University of Southern Illinois	3,240,000
2. University of Rhode Island	100,000
3. Auburn University	500,000
4. New York University	576,000
5. Quirk, Lawler, and Matusky Engineers	200,000
6. Texas Instruments	330,000

Additional information is contained in Table 1.

C. Stocking and Distribution of Fingerlings

During late August, 32,000 fingerlings (2 to 2.5 inches) were marked with second dorsal fin clips and flown from the Edenton National Fish Hatchery, North Carolina, to the Westchester County Airport, New York. The fingerlings were then trucked to the Verplanck hatchery and loaded aboard boats. A total of 28,611 (89%) were stocked into the Hudson River. The stocking distribution was determined from August 1973 Beach Seine Survey catch-per-unit-effort data for wild Hudson River young-of-the-year striped bass.



In late September and October, 58,511 fingerlings (3 to 5 inches) were marked with first dorsal fin clips, as well as, micro-magnetic nose tags and sent from the Edenton Hatchery to New York in a similar manner to those shipped in August. A total of 57,474 (98%) were stocked following a regime based on October 1973 beach seine catch-per-unit-effort data.

An additional 15,777 fingerlings marked with both left and right pelvic fin clips and different color coded micro-magnetic nose tags were shipped by tank truck from the Edenton hatchery to the Verplanck hatchery. On 3 October, 15,439 (98%) of these fish were stocked into the Hudson River (Tables 2 and 3).

Hatchery reared striped bass fingerlings were also supplied and shipped to other projects for experimental purposes. An intensive culture experiment at the Verplanck hatchery produced approximately 6,000 fingerlings which were utilized in a cage culture experiment, thermal plume and holding experiments, and in the synoptic subpopulation study (Table 4). In addition, approximately 1,500 fingerlings from Edenton were given to the New York Ocean Science Lab's second cage culture experiment; 4,700 fingerlings were shipped from the Durant State Fish Hatchery in Oklahoma, for utilization in TI thermal tolerance experiments, Stone & Webster holding experiments and the New York University (NYU) hatchery striped bass pressure studies.

D. Recapture

The field sampling program has provided fifty-eight(58) hatchery



STOCKING DATA FOR 1974 HATCHERY REARED FISH

DATE	NUMBER OF FISH SHIPPED	NUMBER STOCKED	NUMBER OF STOCKING SITES	RANGE OF STOCKING SITES (RIVER MILES)	SHIPPING MORTALITIES	%	OTHER MORTALITIES	%	TOTAL MORTALITIES	%	NUMBER OF FISH USED FOR SURVIVAL TESTS	%
8/7 - 8	15061	14654	12	40-60	7	.05	0	0	7	.05	400	2.66
8/9 -10	16939	13957	18	25-41	2544	15.02	0	0	2544	15.02	438	2.58
9/25-26	3296	3096	4	49-54	0	0	0	0	0	0	200	6.06
9/28-29	8246	7989	9	37-54	54	.65	3	.03	57	.69	200	2.42
10/2-3	9322	9293	4	35-37	4	.04	25	.27	29	.31	0	0
10/5-6	5953	5754	5	33-36	0	0	0	0	0	0	199	3.34
10/9-10	6585	6573	4	32-35	0	0	12	.18	12	.18	0	0
10/12-13	8725	8711	5	29-33	3	.03	11	.12	14	.16	0	0
10/16-17	9470	9162	4	26-30	93	.98	15	.16	108	1.10	200	2.11
10/19-20	6914	6896	4	25-28	0	0	18	.26	18	.26	0	0
10/30	Tank Truck 15777	15439	5	35-39	UNKNOWN		UNKNOWN		125	.08	213	1.35
Grand Total	106288	101524	59	25- 60	approx. 2705	2.54	approx. 84	.08	2914	2.74	1850	1.74

Table 2. Stocking Data for 1974 Hatchery Reared Fish.



WATER QUALITY DATA FOR 1974 HATCHERY STOCKING PROGRAM																	
DATE	AIR TEMPERATURE (MEAN) °C	CONDUCTIVITY AT STOCKING SITES umhos/cm ²		WATER TEMPERATURE AT STOCKING SITES °C		pH AT STOCKING SITES		DO AT STOCKING SITES mg/l		CONDUCTIVITY SHIPPING BOXES umhos/cm ²		WATER TEMPERATURE SHIPPING BOXES °C		pH SHIPPING BOXES		DO SHIPPING BOXES mg/l	
		RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN
8/7-8	18.5	251-4550	1322	24.0-25.5	24.4	7.20-8.30	7.40	6.7-10.6	8.1	8000-9000	8500	20.8-25.5	24.4	6.70-6.90	6.80	10.1-15+	approx. 13.1
8/9-10	21.2	3100-10060	6448	24.5-26.5	25.4	7.20-7.73	7.44	3.2-7.2	5.6	5500-9950	8386	20.0-24.0	21.4	6.75-7.10	6.91	5.8-15+	approx. 10.3
9/25-26	UNKNOWN	180-255	212	19.5-19.8	19.6	7.19-7.60	7.39	7.6-9.6	8.1	7000-9100	8367	17.0-17.8	17.4	7.20-7.30	7.23	15+	15+
9/28-29	21.8	268-4750	2280	20.0-21.2	20.6	7.30-8.20	7.49	7.2-8.9	7.7	ONE SAMPLE - 14100		ONE SAMPLE - 20.4		ONE SAMPLE - 6.80		ONE SAMPLE - 2.6	
10/2-3	7.5	3300-3850	3690	17.0-19.0	17.9	6.71-7.40	7.17	6.4-8.5	7.3	5199-7100	6279	15.1-16.5	15.8	6.70-7.10	6.98	11.6-20+	15+
10/5-6	16.3	1950-3100	2462	17.8-18.4	18.1	6.91-7.33	7.23	7.9-8.4	8.1	1900-6230	4543	17.6-18.9	18.2	6.80-7.25	7.01	14.4-19.8	17.1
10/9-10	12.5	2090-3500	2810	16.0-18.4	17.3	7.40-7.50	7.48	7.2-9.1	8.4	6030-6940	6485	17.0-17.3	17.2	6.90-7.05	6.98	11.2-11.8	11.5
10/12-13	18.1	3590-6050	4932	16.5-18.0	17.4	7.28-7.60	7.45	7.3-8.8	8.2	7500-8000	7750	19.0-19.3	19.2	6.90-6.93	6.92	8.8-9.2	9.0
10/16-17	10.6	4950-6230	5545	14.5-16.0	15.4	7.21-7.51	7.41	8.5-9.3	8.8	5090-7030	5480	14.5-18.0	16.0	6.61-6.92	6.79	3.4-15.0	9.2
10/19-20	5.7	3900-5230	4534	10.0-14.9	12.5	6.99-7.40	7.25	9.8-11.6	10.7	5998-6350	6127	10.0-16.0	13.5	6.79-7.05	6.96	15+	15+
TANK TRUCK										FIBERGLASS MINNOW TANK							
10/30	18.0	3440-4500	4180	13.8-14.7	14.2	7.22-7.59	7.40	8.6-9.5	9.0	3310-3900	3544	14.5-15.5	15.1	6.99-7.50	7.19	11.5-14.3	12.9
Total Through Stocking Period	15.0	180-10060	3492	10.0-26.5	18.4	6.71-8.30	7.37	3.2-11.6	8.2	5090-14100	7233	10.0-25.5	18.1	6.61-7.30	6.96	3.4-20+	approx. 11.9

Table 3. Water Quality Data for 1974 Hatchery Stocking Program.



<u>SOURCE</u>	<u>RECIPIENT</u>	<u>NUMBER</u>	<u>SIZE</u>	<u>USE</u>
TI Verplanck Hatchery	N.Y.Ocean Science Lab	3,000	1 -1.5"	Cage culture experiment
TI Verplanck Hatchery	NYU	925	1.5-2.5"	Indian Point thermal plume studies
TI Verplanck Hatchery	Stone & Webster	1,900	2 -2.5"	Holding experiments
TI Verplanck Hatchery	TI	200	3"	Synoptic sub-population study
	SUB TOTAL, TI FISH	6,025		
Edenton National Fish Hatchery	N.Y. Ocean Science Lab	1,595	3 -4"	2nd cage culture experiment
Durant State Fish Hatchery, Oklahoma	TI	2,115		Active respiration and impingement experiments
	Stone & Webster	2,090		Holding experiments
	NYU	500		Pressure studies
	SUB TOTAL, DURANT FISH	4,705		
TOTAL FINGERLINGS SUPPLIED AND SHIPPED FOR EXPERIMENTAL WORK		12,325		

Table 4. Striped Bass Fingerlings Supplied and Shipped for Experimental Work.



striped bass recaptures from January through October 1974. Three (3) recaptures were stocked in fall 1973, and the remaining fifty-five (55) fish were stocked in summer and fall 1974 (Table 5). With the exception of one fingerling captured at river mile 15, the recaptures were all collected within the stocking range of river miles 25 through 60.

E. Program Interchange

Hatchery personnel have established and renewed contacts with experienced individuals who are involved in the culture and marking of striped bass. This has been accomplished by attending the August striped bass committee meeting and by visiting the Edenton National Fish Hatchery in North Carolina, the Durant State Fish Hatchery in Oklahoma, the Moncks Corners Fish Hatchery in South Carolina, and The Gulf Coast Research Lab in Mississippi.

The literature survey has continued to keep the hatchery personnel abreast with progress in striped bass culture. A search for an efficient method of marking 2-inch fingerlings lead to the collection of literature concerned with various internal and external marking methods, including tetracycline lead versinate, scale morphology in addition to, magnetic nose and body cavity tags.

V. REMAINING 1974 PROGRAM

The hatchery program for the remainder of the year will include, continued recapture of hatchery striped bass, subsequent analysis of the data for determining mark and tag retention and survivability, and continued literature research. The final hatchery report will be submitted on 30 April 1975.



HATCHERY RECAPTURE DATA - JANUARY, 1974 THROUGH OCTOBER, 1974

	DATE	CLIP	STOCKING SEASON	RIVER MILE	GEAR	LENGTH(mm)	WEIGHT (g)
1	4-2-74	2nd dorsal	Fall 1973	42	SCREENS	146	33.1
2	4-6-74	2nd dorsal	Fall 1973	42	SCREENS	138	26.6
3	4-8-74	2nd dorsal	Fall 1973	42	SCREENS	148	---
4	8-20-74	2nd dorsal	Summer 1974	38	BEACH SEINE	68	4.1
5	8-21-74	2nd dorsal	Summer 1974	42	SCREENS	48	1.2
6	8-27-74	2nd dorsal	Summer 1974	--	BEACH SEINE	62	2.7
7	8-27-74	2nd dorsal	Summer 1974	--	BEACH SEINE	67	3.8
8	8-27-74	2nd dorsal	Summer 1974	--	BEACH SEINE	61	2.4
9	8-28-74	2nd dorsal	Summer 1974	42	BOX TRAP	80	5.9
10	8-30-74	2nd dorsal	Summer 1974	42	BEACH SEINE	64	3.0
11	10-2-74	1st dorsal	Fall 1974	39	BEACH SEINE	100	11.2
12	10-6-74	1st dorsal	Fall 1974	42	BEACH SEINE	125	22.6
13	10-7-74	1st dorsal	Fall 1974	35	BEACH SEINE	117	19.3
14	10-9-74	1st dorsal	Fall 1974	40	BEACH SEINE	109	14.4
15	10-9-74	1st dorsal	Fall 1974	40	BEACH SEINE	108	14.4
16	10-10-74	1st dorsal	Fall 1974	38	BEACH SEINE	131	21.6
17	10-10-74	1st dorsal	Fall 1974	40	BEACH SEINE	121	20.2
18	10-14-74	1st dorsal	Fall 1974	38	BEACH SEINE	100	10.5
19	10-14-74	1st dorsal	Fall 1974	38	BEACH SEINE	84	6.0
20	10-14-74	1st dorsal	Fall 1974	36	BEACH SEINE	115	17.2
21	10-15-74	2nd dorsal	Summer 1974	40	BEACH SEINE	83	5.8
22	10-15-74	1st dorsal	Fall 1974	42	BEACH SEINE	125	18.5
23	10-15-74	1st dorsal	Fall 1974	42	BEACH SEINE	112	14.1
24	10-16-74	1st dorsal	Fall 1974	40	BEACH SEINE	114	16.5
25	10-16-74	1st dorsal	Fall 1974	37	BEACH SEINE	134	27.5
26	10-17-74	1st dorsal	Fall 1974	43	BEACH SEINE	134	23.1
27	10-21-74	1st dorsal	Fall 1974	40	BEACH SEINE	123	19.8

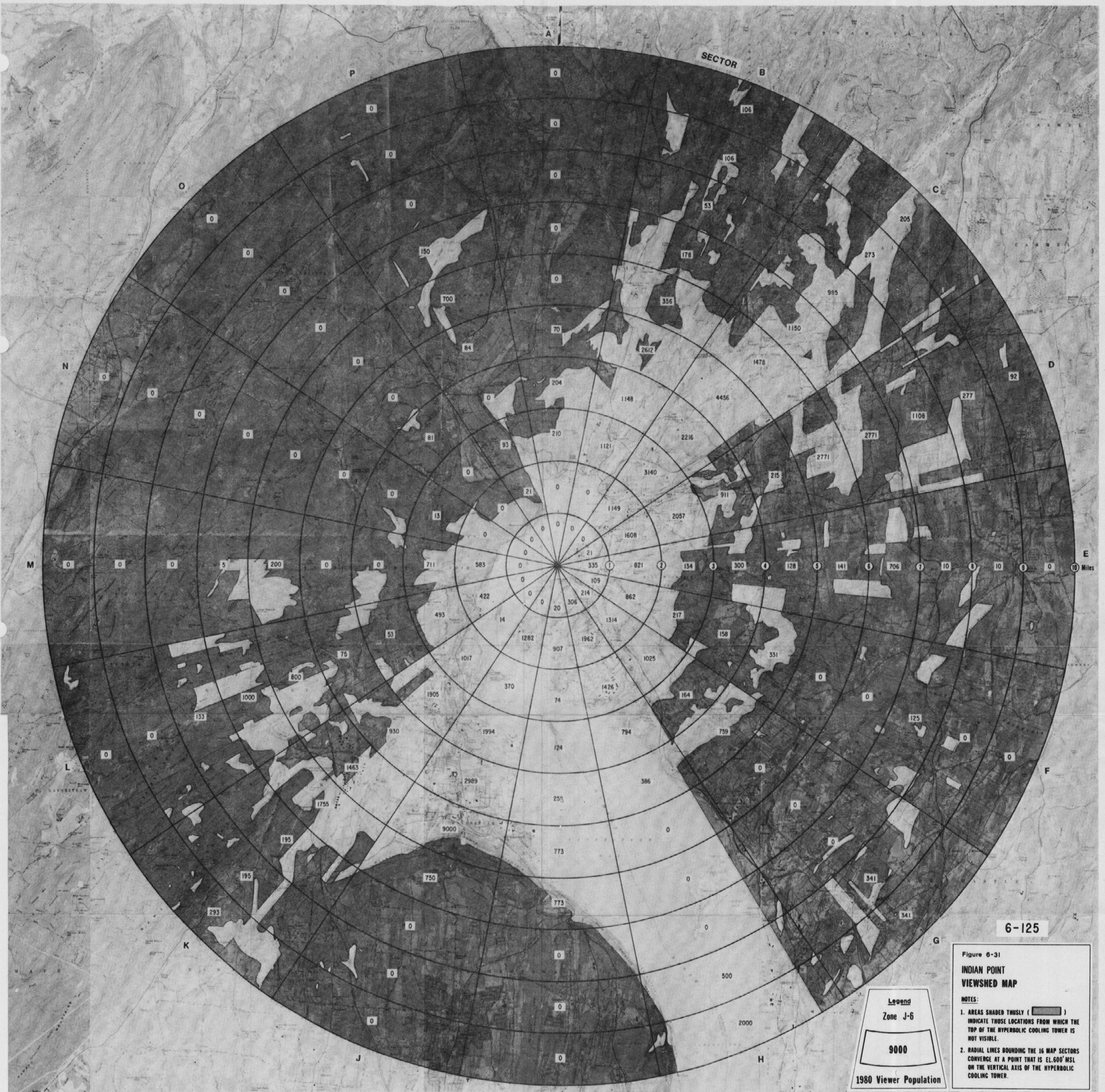
Table 5. Hatchery Recapture Data - January, 1974 through October 1974.

HATCHERY RECAPTURE DATA - JANUARY, 1974 THROUGH OCTOBER, 1974 (CONT'D)



	DATE	CLIP	STOCKING SEASON	RIVER MILE	GEAR	LENGTH(mm)	WEIGHT (g)	
	28	10-21-74	1st dorsal	Fall 1974	40	BEACH SEINE	111	16.9
	29	10-21-74	1st dorsal	Fall 1974	39	BEACH SEINE	118	18.0
	30	10-21-74	1st dorsal	Fall 1974	39	BEACH SEINE	109	12.1
	31	10-23-74	1st dorsal	Fall 1974	39	BEACH SEINE	89	6.3
	32	10-23-74	1st dorsal	Fall 1974	39	BEACH SEINE	85	6.0
	33	10-23-74	1st dorsal	Fall 1974	39	BEACH SEINE	93	7.1
	34	10-23-74	1st dorsal	Fall 1974	39	BEACH SEINE	92	7.1
	35	10-23-74	1st dorsal	Fall 1974	41	BEACH SEINE	95	9.2
	36	10-23-74	1st dorsal	Fall 1974	41	BEACH SEINE	117	17.0
	37	10-23-74	1st dorsal	Fall 1974	41	BEACH SEINE	115	17.5
	38	10-23-74	1st dorsal	Fall 1974	41	BEACH SEINE	113	15.0
	39	10-23-74	1st dorsal	Fall 1974	41	BEACH SEINE	114	14.9
	40	10-23-74	1st dorsal	Fall 1974	41	BEACH SEINE	131	22.7
	41	10-23-74	1st dorsal	Fall 1974	41	BEACH SEINE	97	9.3
	42	10-24-74	1st dorsal	Fall 1974	40	BEACH SEINE	108	16.5
	43	10-24-74	1st dorsal	Fall 1974	40	BEACH SEINE	121	20.1
	44	10-24-74	1st dorsal	Fall 1974	36	BEACH SEINE	124	19.6
	45	10-24-74	1st dorsal	Fall 1974	39	BEACH SEINE	105	12.6
	46	10-24-74	1st dorsal	Fall 1974	41	BEACH SEINE	120	20.0
	47	10-25-74	1st dorsal	Fall 1974	34	BEACH SEINE	120	19.7
	48	10-25-74	1st dorsal	Fall 1974	34	BEACH SEINE	103	11.2
	49	10-25-74	1st dorsal	Fall 1974	34	BEACH SEINE	95	---
	50	10-29-74	1st dorsal	Fall 1974	40	BEACH SEINE	79	5.4
	51	10-29-74	1st dorsal	Fall 1974	37	BEACH SEINE	82	5.6
	52	10-30-74	1st dorsal	Fall 1974	42	BEACH SEINE	119	---
	53	10-31-74	1st dorsal	Fall 1974	40	BEACH SEINE	124	18.0
	54	10-31-74	1st dorsal	Fall 1974	40	BEACH SEINE	120	16.5
	55	10-31-74	1st dorsal	Fall 1974	40	BEACH SEINE	99	8.7
	56	10-31-74	1st dorsal	Fall 1974	15	BEACH SEINE	85	6.2
	57	10-00-74	1st dorsal	Fall 1974	--	BEACH SEINE	78	3.9
	58	10-00-74	1st dorsal	Fall 1974	--	BEACH SEINE	82	4.8

Table 5 Hatchery Recapture Data - January, 1974 through October, 1974 (Cont'd).



6-125

Figure 6-31
**INDIAN POINT
 VIEWSHED MAP**
 NOTES:
 1. AREAS SHADED THUSLY ([shaded box])
 INDICATE THOSE LOCATIONS FROM WHICH THE
 TOP OF THE HYPERBOLIC COOLING TOWER IS
 NOT VISIBLE.
 2. RADIAL LINES BOUNDING THE 16 MAP SECTORS
 CONVERGE AT A POINT THAT IS EL. 600' MSL
 ON THE VERTICAL AXIS OF THE HYPERBOLIC
 COOLING TOWER.

Legend
 Zone J-6
 9000
 1980 Viewer Population

TABLE 1

PROPAGATION OF HUDSON RIVER STRIPED BASS AT VERPLANCK, N.Y., 1974, TEXAS INSTRUMENTS ECOLOGICAL SERVICES, CON. EDISON CORNWALL PROJECT



CAPTURE				OVULATION										HATCHING					DISPOSITION					STOCKING/UTILIZATION																		
Female No.	Catch Location	Date/Time of Catch	Source	Transport/holding ¹ Duration (hr.)	Resulting Condition	Approx. ² Weight	Estimated ³ hours to Ovulation	Units Chorionic Gonadotropin Injected	Actual Ovulation Time After Injection	Temp. at (°F.) Ovulation	Date	Quantity of ⁴ Eggs Stripped	% of Total ⁴ Eggs Unviable	Method of Fertilization Used	No. Males Used	% ⁴ Fert.	Tag # ⁷ Synoptic Subpop. Study	Temp. at (°F.) Hatching	Hatching Time (hrs. after Ovulation)	Date of Hatch	Quantity ⁹ of Larvae	% Hatch ¹⁰ of Stripped Eggs	Quantity Shipped	Date	Age of Larvae (hrs.)	Temp. Shipping Water (°F)	Temp. Shipping Water Arrival (°F)	Acclimation Temp. (°F)	Shipping Mortality	Total Mortality After 24 hours	Recipient	Utilization or Site of Stocking	Date	Number Stocked	Size	% return, fry to Fingerling						
1	RM-44-3	5-16/0630	Commercial fisherman	1/2 / 0	fair	25 lb.	11	2500	34.0	59°	5-17	1,260,000	0	Simultaneous sperm water introduction	1	0	326	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—				
2	RM-42-1	5-18/0300	Scientific Collector's permit	1/12 / 0	good	20	5	2500	6.5	60°	5-18	1,600,000	0	Simultaneous sperm water introduction	1	60	330	63.0°	55.0	5-20	60,000	4	60,000	5-25	111	63.5°	73.0°	73°	10%	15-20%	Welaka, Fla.	Choctawhatchee R., Fla.	July '74	—	—	—	—					
3	RM-42-1	5-20/1320	Collector's permit	1/6 / 0	good	18	10-11	2500	36.6	63°	5-18	1,430,000	0	Simultaneous sperm water introduction	2	83	1664	63.0°	51.0	5-24	1,600,000	64	1,600,000	5-25	27	63.5°	73.0°	73°	10%	15-20%	Welaka, Fla.	Choctawhatchee R., Fla.	July '74	—	—	—	—					
4	RM-42-1	5-17/1200	Collector's permit	1/6 / 0	fair	20	11-12	3000	missing on 5-19, 1200 hrs.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—					
5	RM-42-1	5-20/1200	Collector's permit	1/6 / 0	good	18	10	3000	32.5	63°	5-21	1,300,000	1 unripe	dry	2	74	1661	63.5°	50.0	5-23	1,590,000	69	900,000	5-27	83	63.5°	73.0°	73°	20%	30-35%	Welaka, Fla.	Choctawhatchee R.	July/Sept. '74	—	—	—	—					
6	RM-42-1	5-20/1300	Collector's permit	1/6 / 0	good	15	10-11	2500	32.0	63°	5-21	1,678,000	3 unripe	dry, wet, simultaneous	3	71	1662	63.0°	51.5	5-24	704,000	42	600,000	5-28	103	64.0°	67.0°	64°	5%	25%	Edenton, N. Car.	Hudson River, RM25 to RM61	Aug./Oct. '74	8,300/72,813	2 1/4 - 6	—	—					
7	RM-42-1	5-20/1310	Collector's permit	1/6 / 0	good	22	10	2500	35.0	63°	5-21	1,580,000	1 unripe	dry	2	72	1663	63.0°	51.0	5-24	1,410,000	89	540,000	5-27	80	63.5°	73.0°	73°	20%	30-35%	Welaka, Fla.	Choctawhatchee R.	July '74	534,000	1000/lb.	41	—					
8	RM-42-1	5-22/night	Collector's permit	1/4 / 0	good	15	9	3000	23.0	63°	5-24	1,600,000	2% over-ripe	semi-dry	2	poor	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—					
9	RM-42-1	5-22/0930	Collector's permit	1/16 / 0	good	25	9	4000	19.5	63°	5-23	1,800,000	0	dry	3	88	—	63.5°	48.0	5-25	900,000	50	500,000	5-28	67	64.0°	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
10	RM-42-1	5-22/0945	Collector's permit	1/4 / 0	fair	15	10	2500	28.0	63.5°	5-23	1,800,000	0	dry	3	88	—	63.5°	46.0	5-25	700,000	60	200,000	5-30	104	63.5°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
11	RM-42-1	5-22/1430	Collector's permit	1/4 / 0	fair	15	13-14	2500	40.5	63.5°	5-24	1,000,000	20% over-ripe	dry	2	40	—	63.5°	50.0	5-26	300,000	30	100,000	5-30	104	63.5°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
12	RM-42-1	5-22/1430	Collector's permit	1/4 / 0	fair to poor	20	10	3000	25.5	63.5°	5-23	1,200,000	0	dry + simultaneous	2	72	—	63.5°	46.0	5-25	700,000	60	200,000	5-30	104	63.5°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
13	RM-42-1	5-22/1430	Collector's permit	1/4 / 0	good	18	8-9	2500	spawned in pool	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—				
14	RM-43-3	5-22/1930	Collector's permit	1 / 0	fair	30	4-6	3500	20.5	63.5°	5-23	600,000	70% unripe	dry	1	1	—	63.5°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—				
15	RM-42-1	5-23/0400	Collector's permit	1/4 / 0	fair	20	7	2500	10	63.5°	5-23	800,000	0	dry	2	98	—	63.5°	46.0	5-25	784,000	98	700,000	5-30	107	64.0°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
16	RM-42-1	5-23/0300	Collector's permit	1/4 / 0	fair	20	12	2500	missing on 5-24	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—				
17	RM-42-1	5-23/0300	Collector's permit	1/4 / 0	good	30	13	3000	47	63.5°	5-25	1,600,000	5% unripe	dry	3	60	—	63.5°	47.0	5-27	800,000	50	800,000	5-31	—	63.5°	63°	—	35%	80-90%	Univ. S. Illinois	for culture experiments	—	—	—	—	—	—	—			
18	RM-43-3	5-23/0945	Collector's permit	1/5 / 0	fair	20	10	2500	died after 26 hrs. and center ovulating	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—				
19	RM-59-3	5-24/0400	Collector's permit	1 / 3.5	good	20	10	2500	died after 10 hrs.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—				
20	RM-58-1	5-24/0400	Collector's permit	1 / 3.5	good	20	10	2500	died after 16 hrs.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—				
21	RM-42-1	5-24/0400	Collector's permit	1/4 / 5.5	fair to poor	20	10	2500	died 18.5 hrs. after injection	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—				
22	RM-42-1	5-24/0400	Collector's permit	1/4 / 6	fair	20	10-11	2500	28	63.5°	5-25	1,800,000	10% white	dry	3	93	383	63.5°	48.0	5-27	900,000	50	300,000	5-30	60	64.0°	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
23	RM-42-1	5-24/1000	Collector's permit	1/4 / 1/2	fair	20	11-12	2500	35.5	63.5°	5-25	780,000	10 unripe	dry	2	poor	79	63.5°	48.0	5-27	640,000	80	640,000	5-31	—	63.5°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
24	RM-42-1	5-25/2300	Collector's permit	1/4 / 0	good	15	10-13	2500	25.5	64.0°	5-27	800,000	0	dry	1	88	384	64.0°	47.5	5-28	640,000	80	640,000	5-31	—	63.5°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
25	RM-42-1	5-26/0400	Collector's permit	1/4 / 5	fair	10	15+	2000	fish died 38 hrs. after injection	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—				
26	RM-44-3	5-26/2300	Commercial fisherman	1/5 / 0	fair	15	12-13	2500	35.5	64.0°	5-28	1,000,000	5 unripe	dry	1	(#389)	92	387	64.0°	49.0	5-30	877,000	90	300,000	5-31/6-1	27	63.5°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
27	RM-42-1	5-26/2330	Collector's permit	1/4 / 0	good	15-20	9	2500	23.0	64.0°	5-27	800,000	0	dry	2	96	—	64.0°	48.0	5-29	720,000	90	600,000	6-3/6-4	100	64.0°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
28	RM-42-1	5-26/2400	Collector's permit	1/4 / 0	good	12-15	15+	2500	40.0	64.0°	5-28	800,000	5% over-ripe	dry	2	(1 poor)	61	1476	64.0°	48.0	5-30	400,000	50	80,000	6-5	—	64.0°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
29	RM-42-1	5-26/2400	Collector's permit	1/4 / 0	good	12-15	15+	2500	STOLEN 48 hrs. after injection	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—				
30	RM-58-1	—	Collector's permit	2 /	fair	25-30	9-10	3000	28.0	63.5°	5-30	1,400,000	0	dry	1	75	1488	63.5°	49.0	6-1	1,050,000	75	500,000	6-5	—	64.0°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
31	RM-42-1	5-27/0930	Collector's permit	1/6 / 0	fair	23	11-12	2500	33.0	63.5°	5-28	800,000	10 unripe	dry, river water	1	75	—	63.5°	—	6-1	375,000	75	375,000	5-30	—	64.0°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
32	RM-44-3	5-29/0400	Commercial fisherman	1/4 / 9.5	good	25	10	2500	45.0	63.5°	5-31	400,000	80 unripe	dry	1	30	—	63.5°	48.5	6-2	120,000	30	100,000	6-5	—	64.0°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
33	RM-58-1	5-29/0300	Collector's permit	2 / 8.5	fair	15	12-13	2000	33.5	63.5°	5-30	800,000	0	dry	2	65	—	63.5°	50.0	6-2																						