

HSRG Funded
WDFW
Hatchery Research

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WDFW

1. Survival Studies
2. Diet Studies
3. Miscellaneous Studies

Survival Studies

Size Sorting of Juveniles to Increase Post-release Survival

1. Do small fish in a hatchery population in fall have similar post-release survival as their larger counterparts?

Minter Hatchery coho (Hager and Noble 1976)

<u>Smolt length</u>	<u>Survival(%)</u>
93.1 mm	1.55
109.6	2.06
122.9	2.15
133.9	2.19

Cowlitz Hatchery sea-run cutthroat (Tipping 1986)

<u>Smolt length</u>	<u>Survival(%)</u>
180-189 mm	1.4
190-199	3.5
200-209	5.3
210-219	9.5
220-229	14.0
230-239	14.5
240-249	14.0

Cowlitz Hatchery winter steelhead (Tipping 1997)

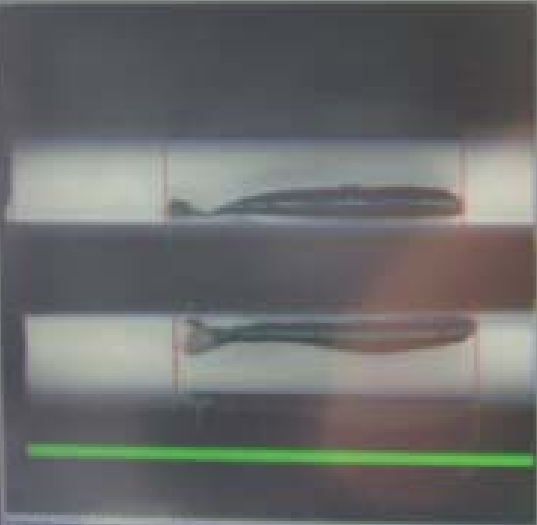
<u>Smolt length</u>	<u>Survival(%)</u>
160-169 mm	0.0
170-179	0.8
180-189	0.2
190-199	1.4
200-209	2.3
210-219	1.3
220-229	2.2

2. Do small fish in a hatchery population that have been accelerated in size have similar survival as their larger counterparts?

WorldMark/WDFW Trailer







Calculated Statistics

Fish Length: 11.0 cm
 Fish Weight: 1.00 g
 Calculated Error: 0.5 mm

Statistics

Number: 10
 Min: 0.0
 Max: 1.0
 Mean: 0.5
 Std Dev: 0.3

Counts by Port

Port: 100, 200
 Port: 300, 400
 Port: 500, 600
 Port: 700, 800
 Port: 900, 1000
 Port: 1100, 1200
 Port: 1300, 1400
 Port: 1500, 1600
 Port: 1700, 1800
 Port: 1900, 2000

Counts by Size

Size	Count	Weight	Length
1000	100	0.10	1.00
1100	200	0.20	1.10
1200	300	0.30	1.20
1300	400	0.40	1.30
1400	500	0.50	1.40
1500	600	0.60	1.50
1600	700	0.70	1.60
1700	800	0.80	1.70
1800	900	0.90	1.80
1900	1000	1.00	1.90
2000	1100	1.10	2.00

Total Count: 1000
 Total Weight: 1.00 g
 Total Length: 11.0 cm

Print Results to Disk: 8/10/00 Aug 10, 2000

Fish Name: Fish
 Fish Length: 11.0 cm
 Fish Weight: 1.00 g

Print Results

Print Results

Print Results

Print Results

Print Results

Print Results

Print Results

Size 1: 1000
 Count: 100
 Weight: 0.10
 Length: 1.00

Size 2: 1100
 Count: 200
 Weight: 0.20
 Length: 1.10

Size 3: 1200
 Count: 300
 Weight: 0.30
 Length: 1.20

Size 4: 1300
 Count: 400
 Weight: 0.40
 Length: 1.30

Size 5: 1400
 Count: 500
 Weight: 0.50
 Length: 1.40

Size 6: 1500
 Count: 600
 Weight: 0.60
 Length: 1.50

Size 7: 1600
 Count: 700
 Weight: 0.70
 Length: 1.60

Size 8: 1700
 Count: 800
 Weight: 0.80
 Length: 1.70

Size 9: 1800
 Count: 900
 Weight: 0.90
 Length: 1.80

Size 10: 1900
 Count: 1000
 Weight: 1.00
 Length: 1.90

Size 11: 2000
 Count: 1100
 Weight: 1.10
 Length: 2.00

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Different wire codes for different
length groups within population
(2-4 codes).

1. Toutle coho
2. Marblemount coho
3. Kalama Falls spring chinook
4. Percival Cove fall chinook
5. Washougal fall chinook

Kalama Falls Hatchery spring chinook

<u>Sort Length</u>	<u>X-Length</u>	<u>CV</u>
85-107 mm	93.5 mm	3.0
107-118	102.3	3.1
118-141	<u>115.9</u>	<u>6.2</u>
AVG	103.9	10.2

Acceleration of Small Fish

Post-release survival

Marblemount Hatchery- coho 2001-02

	<u>Large fish</u>	<u>Small fish</u>
At tagging	43.2/lb	55.4/lb
At release	17.7	18.7

Results

Early results with Cowlitz Trout Hatchery summer steelhead show no difference in adult survivals for accelerated fish.

Relative Survival of Pond-Sedentary Steelhead

1. Aberdeen Hatchery – steelhead.
2. All fish ventral fin-clipped before release.
3. Volitional migration allowed April 1-May 15.
4. Fish remaining after May 15 wire-tagged and forced from raceway on May 16.

Results (3 releases):

Volitional - 0.27% adult returns

Pond sedentary- 1.10%

2002 was last release (n=5).

Rearing Density Effects on Steelhead

1. Merwin Hatchery – steelhead
2. 60,000 vs 90,000 fish per $\frac{1}{4}$ acre pond
3. Lbs/gpm similar (19)
4. Lbs/ cubic foot (0.40 vs 0.27)

Adult Recoveries (%)

Density

High

Low

1998 Release:

1.44%

1.33%

1999 Release:

2.10%

2.20%

Effect of Pond Bottom Type on Post-release Survival

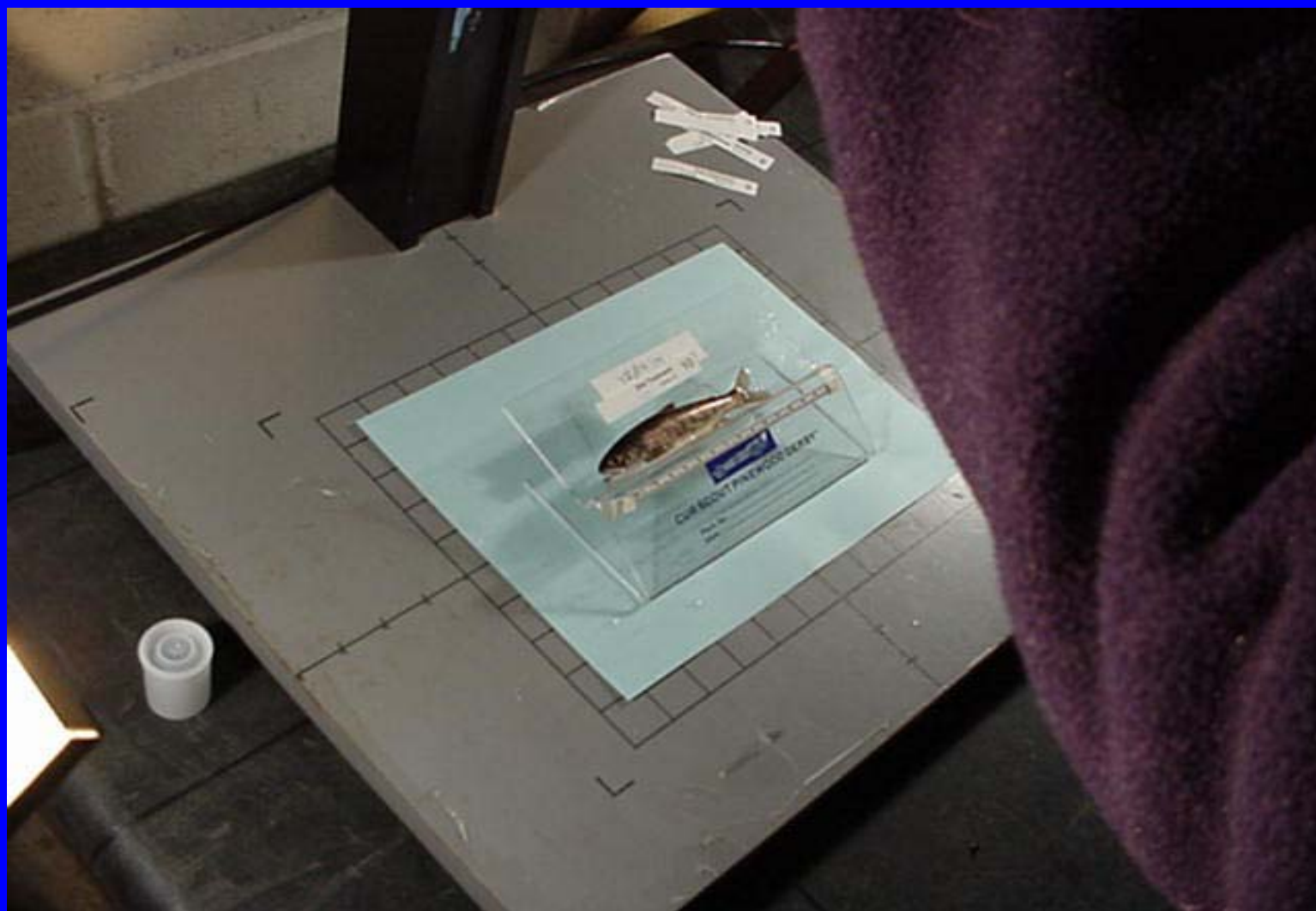
Sea-run cutthroat reared in semi-natural pond had 2x better survival than raceway reared fish. (Tipping 1998; 2001).

1. Marblemount Hatchery
2. Winter Steelhead
3. Dirt vs Asphalt bottom
4. 100k x 2 released in spring 2002.

Diet Studies

Astaxanthin Diet Supplement to Increase Post-Release Survival

1. Coho at Soos Creek Hatchery.
2. Initial feeding in January 2002.
3. CWT tagged fish released 2002.
4. External pigmentation measured
by Gail McDowell.



Smolt Transfer Diet to Increase Post-release Survival

1. Naselle Hatchery- Coho
2. Moore-Clark donated feed.
3. Feed for 6 weeks prior to release.
4. Feed contains sea-salt, Beta-glucans, nucleotides, etc.
5. Tagged fish released in spring 2002.

Low Phosphorus Diet Study

Smolt-to-Adult Survival

1. Issaquah Hatchery- coho
2. Control = Moore-Clark Fry (1.11% P).
3. Moore-Clark donated feed (0.95% P).
4. Bio-Oregon donated feed (0.77% P).
5. Karl Shearer co-investigator.
6. Released in spring 2002.

<u>Diet</u>	<u>Phosphorous discharged/fish</u>
Control 1	0.14 g/fish
Control 2	0.14
Test 1	0.12
Test 2	0.08

All groups released with CWTs.

Diet Reduction to Enhance Steelhead Post-Release Survival

1. Makah Hatchery- Winter steelhead
2. Diet reduced in last month of rearing.
3. Fish pills w/double vitamin pack.
4. Control.
5. CWT tagged fish released in spring 2002.
6. Co-investigation with Dave Zajac, USFWS

Growth Modulation Study

Coho

Marblemount, Naselle, Wallace R.

1. Test fish receive 50% of control diet from November through February.
2. Then 130% from March until May release.
3. First release in spring 2002, all w/CWTs.

Marblemount Hatchery

	<u>Test fish</u>		<u>Control fish</u>	
<u>Date</u>	<u>Length</u>	<u>K</u>	<u>Length</u>	<u>K</u>
Nov	103.5	1.29	102.7	1.29
Dec	104.5	1.21	105.2	1.20
Jan	106.9	1.18	106.3	1.17
Feb	106.7	1.17	108.7	1.21
Mar	108.8	1.17	111.6	1.19
Apr	116.0	1.20	117.7	1.20
May	125.0	1.10	127.7	1.11

Feed Used

Test = 878 lbs

Control= 883 lbs

Naselle Hatchery

	<u>Test fish</u>		<u>Control fish</u>	
<u>Date</u>	<u>Length</u>	<u>K</u>	<u>Length</u>	<u>K</u>
Nov	97.8	1.16	98.9	1.16
Dec	102.7	1.14	104.0	1.16
Jan	109.4	1.19	110.9	1.19
Feb	114.3	1.19	116.6	1.20
Mar	121.1	1.20	122.7	1.20
Apr	132.6	1.09	134.2	1.09

Feed Used

Test = 788 lbs

Control= 1,137 lbs

Wallace Hatchery

<u>Test fish</u>			<u>Control fish</u>	
<u>Date</u>	<u>Length</u>	<u>K</u>	<u>Length</u>	<u>K</u>
Dec	114.5	1.28	114.5	1.28
Feb	113.8	1.26	117.5	1.32
Mar	118.0	1.25	120.2	1.31
Apr	124.7	1.24	127.9	1.31
May	129.5	1.17	132.9	1.19

Feed Used

Test = 1,586 lbs

Control= 1,664 lbs

Nucleotide Supplemented Feed

1. EWOS Vextra Boost Diet.
2. 2 test + 2 control raceways.
3. 50K CWT tags per raceway.
4. McAllister Hatchery, fall chinook.
4. CWT tagged fish released 2001.
5. EWOS donated feed.

Early Results

<u>Diet</u>	<u>Returns</u>
Control 1	3
Control 2	3
Test 1	3
Test 2	3

Miscellaneous Studies

Sturgeon Polyculture

1. Goal- to help clean raceways.
2. Mossyrock Hatchery, 20 sturgeon x 12"
3. Mixed with rainbow trout.



Results

1. Sturgeon were outcompeted for feed.
2. Sturgeon did not eat live salmonids even while starving.

Steelhead Precocity Studies



1. Abernathy and Merwin Hatcheries
2. Feed levels increased or decreased in late summer.
3. Largest 5-10% wire-tagged to determine if they were destined to become precocious.

Results

1. Growth in late summer had little effect on subsequent precocity levels.

Results

2. Merwin: Largest 5-10% of population was 4x as likely to become precocious (2.49% vs 0.64%).
3. Abernathy: 0.47% vs 0.52%.
4. Maybe related to early rearing temps.

Coho Stock Performance Study

South Sound Netpens

1. Wallace>Marblemount>Skookumchuck>SSNP
2. Minter> Marblemount>Skookumchuck>SSNP
3. Minter>SSNP
4. 1st release spring 2002, groups 1 + 3 (100k/group).
5. Co-op investigation with Squaxin tribe.

The End!!