ADAPTIVE BROODSTOCK MANAGEMENT

Snake River Fall Chinook

by

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ACKNOWLEDGEMENTS

Past and Present staff working with WDFW, NPT, IPC, ODFW, IDFG, and NMFS.

ENDEMIC STOCK BEFORE LFH ONLINE

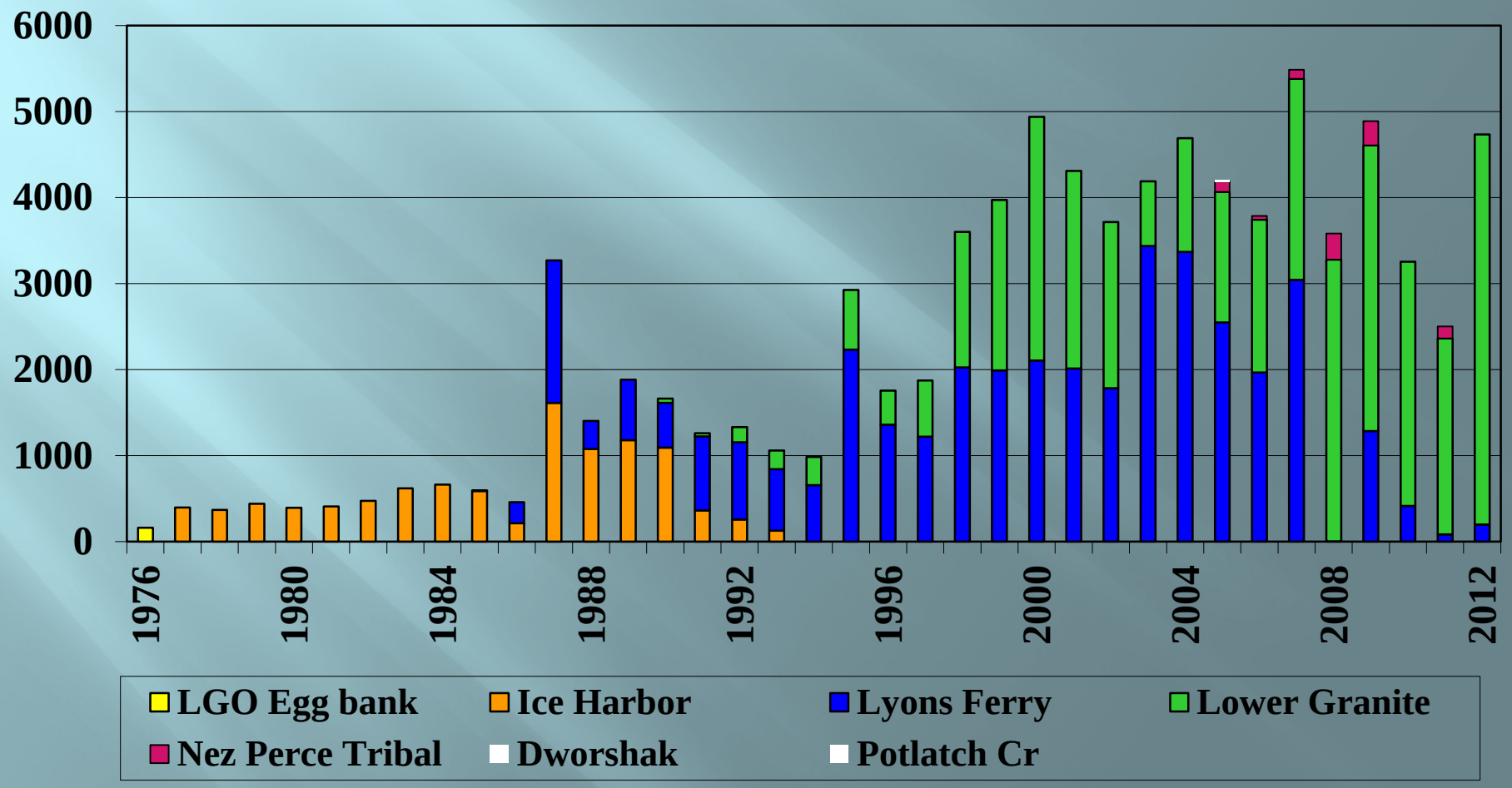
Trapped in the Snake River

- Little Goose Dam (1976-NMFS)
- Ice Harbor (Kalama & Hagerman)

NMFS captive brood program 1980-85

- Supplement eggbank

TRAPPING LOCATIONS SNAKE RIVER BROODSTOCK



PRIMARY SOURCES OF BROODSTOCK AT LFH

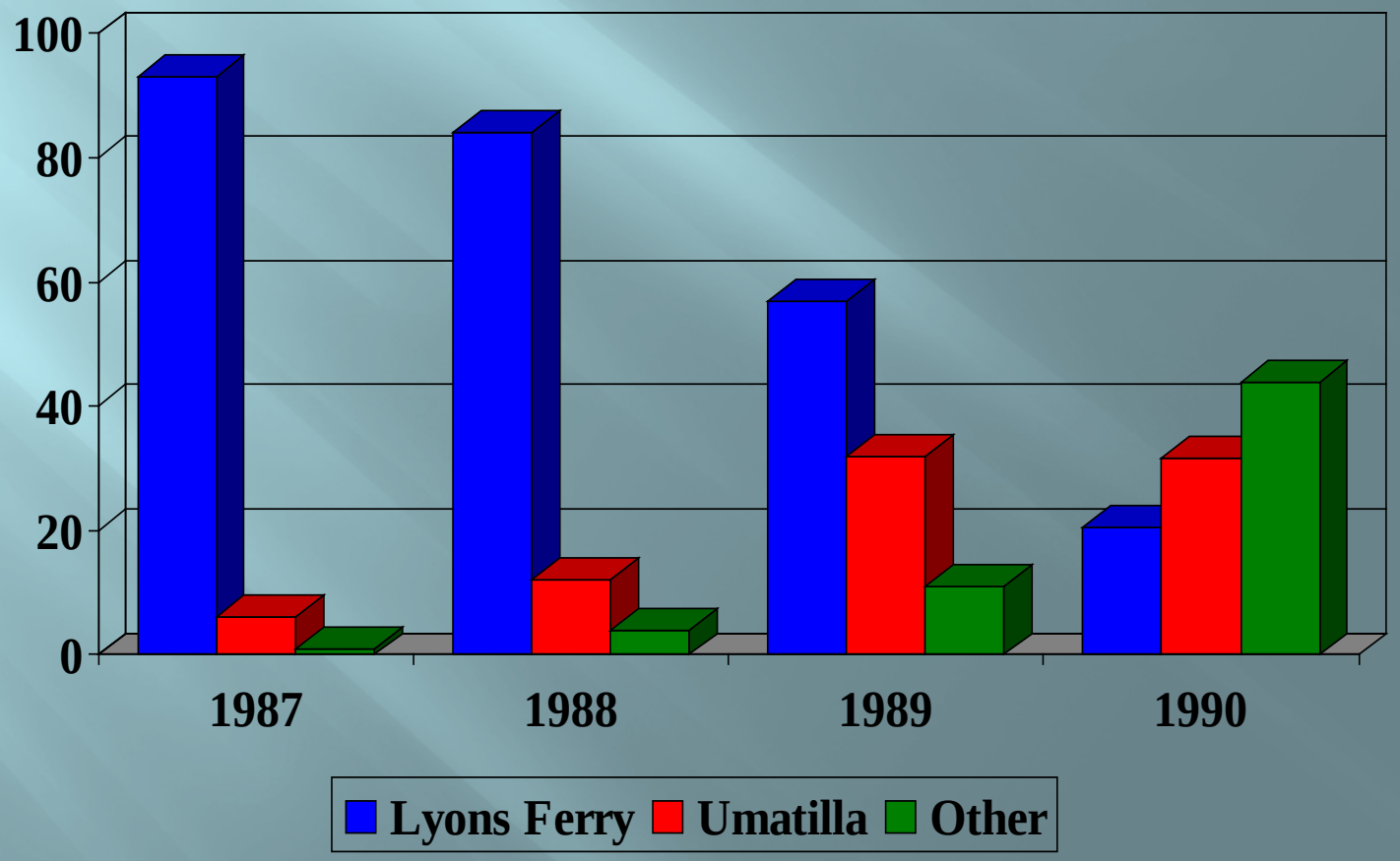
Kalama Fish Hatchery and Ice Harbor Dam (1984 & 1985)

Lyons Ferry Hatchery (1987)

BROODSTOCK INTEGRITY

Challenge: high numbers of strays (non-Snake)

(7%, 16% and 43% in 1987, 1988, and 1989)



BROODSTOCK INTEGRITY

Adaptation: Added upstream trapping site (LGR, 1990)

Only trapped AD clipped fish

(1991-1993 at IHR and LFH)

Excluded unmarked fish from broodstock

Begin fully tagging all LFH releases

Exclude broodyear 1989 from broodstock

BROODSTOCK INTEGRITY

Challenge: not allowed to cull strays

Adaptation: Modify spawning protocol

Decode CWTs before spawn

LFH x LFH

strays x unknown or strays

Ship progeny to out-of-basin area

Require all fish are marked

BROODSTOCK INTEGRITY

Adaptation: reduce strays in broodstock

Return year	% Strays in Run at LGR	% Strays included in broodstock
2004	**5.4**	**0.0**
2005	**4.0**	**0.0**
2006	**1.5**	**0.4**
2007	**1.5**	**0.0**
2008	**2.8**	**0.1**
2009	**1.7**	**0.1**
2010	**3.5**	**0.3**
2011	**1.2**	**1.2**
2012	**0.3**	**<0.1**

BROODSTOCK INTEGRITY

- Adaptation: Cease trapping at IHR 1993
- Shared broodstock collected at LGR with NPTH (1994)
  - 70% haul to LFH, 30% haul to NPTH
  - NPTH similar protocols to LFH except use gonadotropin to assist gonad development
    - Fish do not ripen as soon as LFH fish

INCLUSION OF WILD STOCK

Began including unmarked/untagged fish again in broodstock in 2003

Questions regarding accuracy of scales to discern hatchery from wild origin (2008)

Focus on trapping broodstock at LGR (2008)

- Only trap at hatcheries to backfill broodstock needs if fall short at LGR

Jacks in the Hatchery

- Removing spawning competition between males
  - Increasing the contribution to spawning
- Increased the reproductive success of jacks
  - Better survival in hatchery than in nature

INCLUSION OF JACKS

- Jacks have always been present. In 1975 NMFS counts at LGR noted that 42% of the run counted from Aug to Dec were jacks
- Protocols in place to have up to 15% jacks in broodstock
  - Jacks were originally estimated by fork length criteria used at the dams
  - Challenge: Subyearling and Yearling jacks overlap in fork lengths
  - 2009 evaluated returns based on age estimated
    - Return year-Broodyear-rearing age

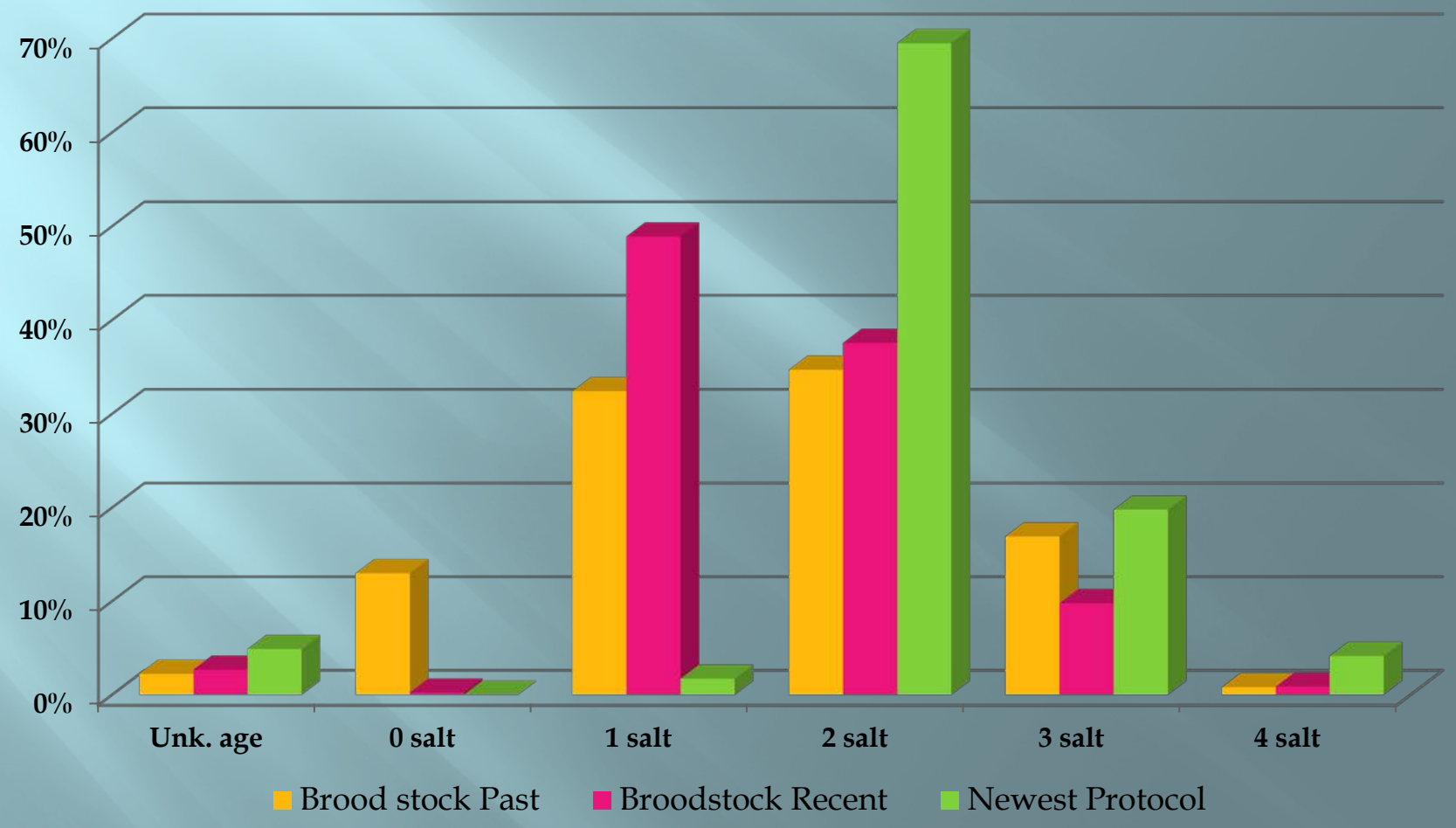
Adaptive management

- To reduce chances of mating jacks with jills
  - Mate small females with larger males
  - If culling of jills is to occur
    - Any male used on a jill will also be used on a larger female
      - This assures if the progeny are culled, the gametes of the male will still contribute to production

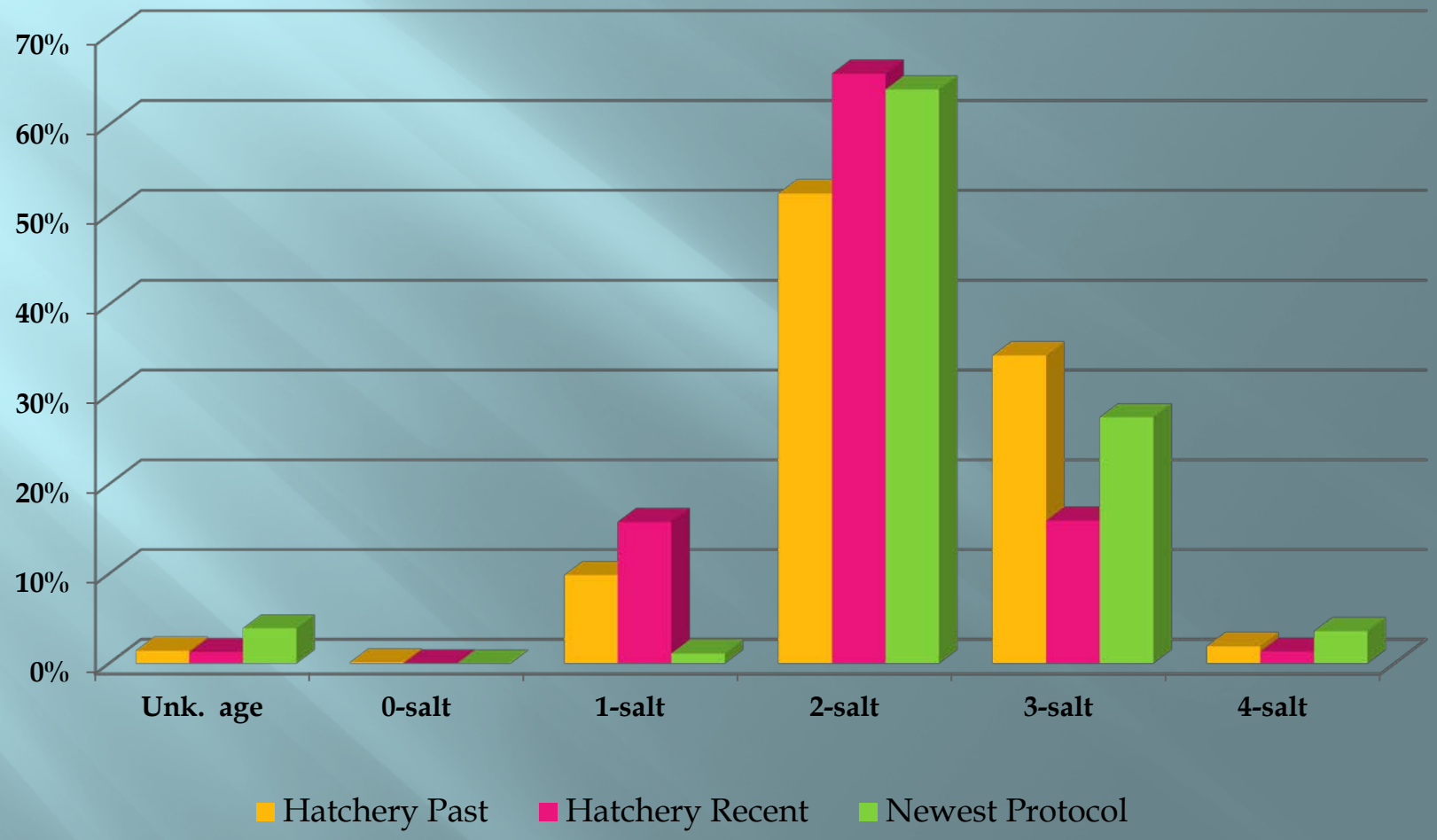
Adaptive management

- Maximize the use of older aged males
  - Use older aged males multiple times
  - Change trapping protocols to target larger, older aged males
- Eliminate the use of “jacks” and “minijacks”

Salt ages of Spawned Males



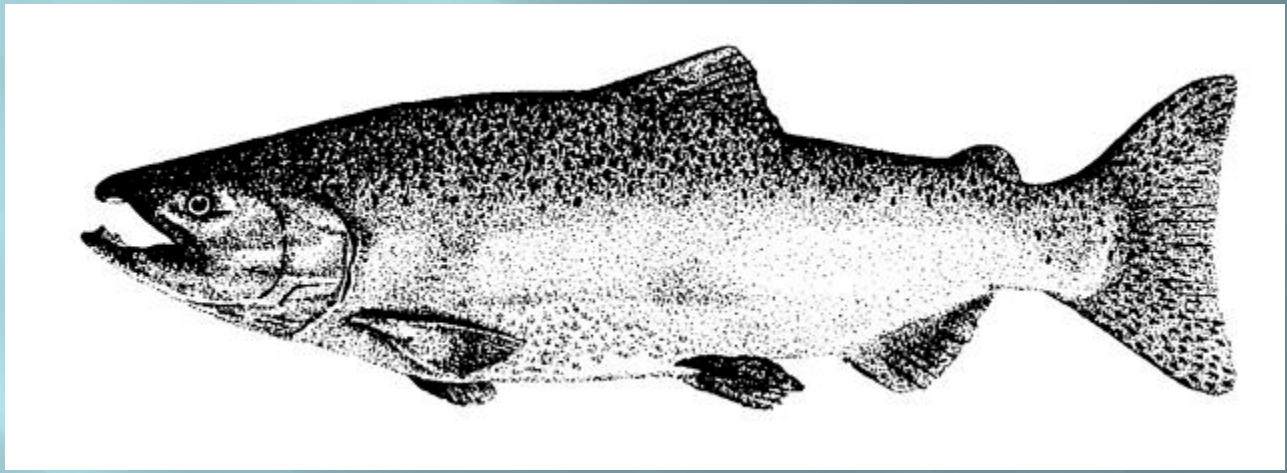
Salt ages of Spawned Females



Future direction

- Continue to minimize the use of jacks and jills
- Continue using larger males multiple times
- In 2017 analyze the return data and compare age composition of the returns to see if there is a shift to older aged fish in the return
- Continue PBT profiling broodstock to assure untagged releases are identifiable at return.

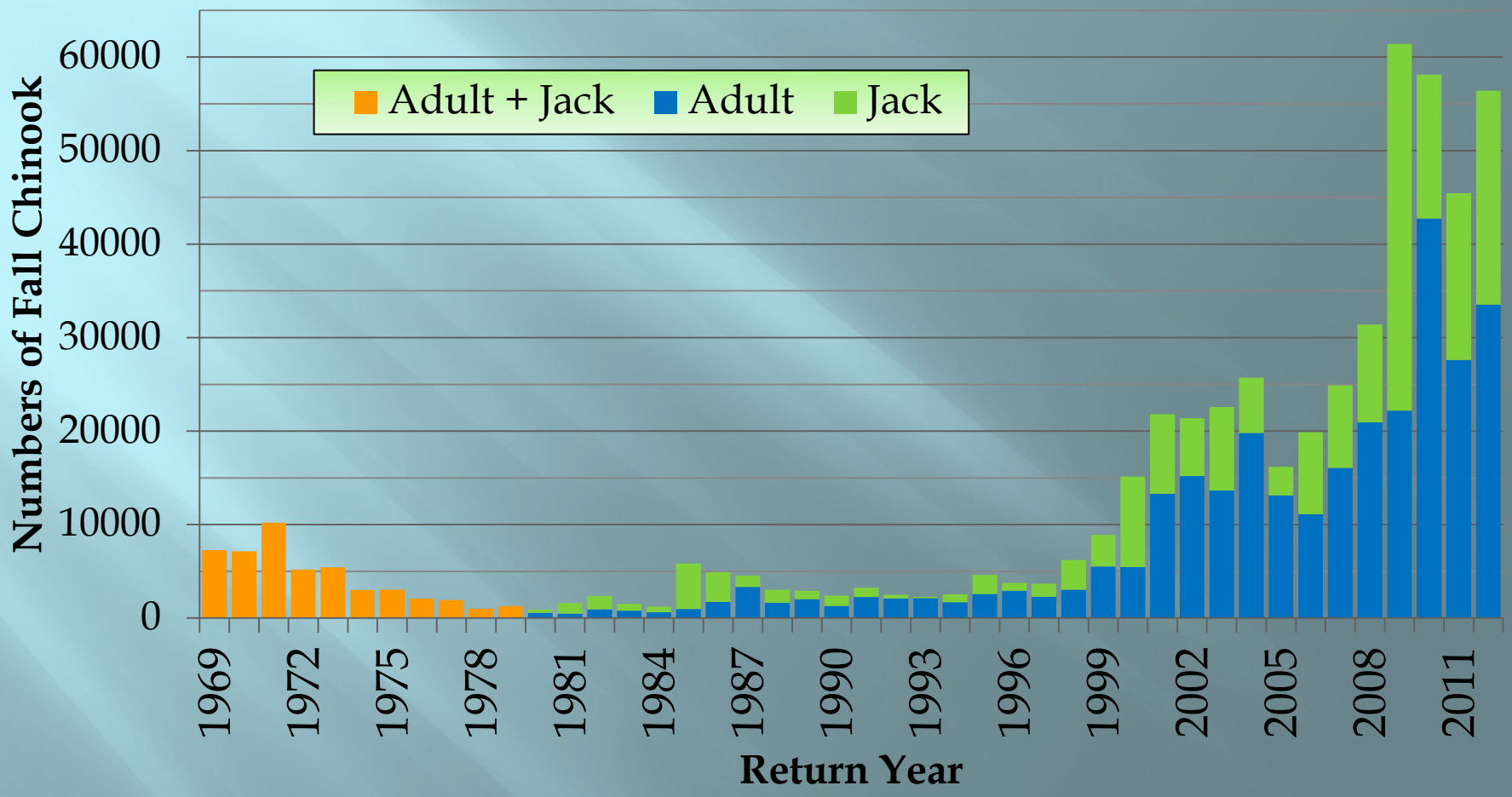
Questions?



Lengths of Jacks and jills used in production at LFH in 2010

	Number of matings	Average fork length (cm)	Median fork length (cm)	SD of fork length (cm)	Min fork length (cm)	Max fork length (cm)
Jacks 1-salt						
H yearling	18	68	68	4.7	61	77
H reservoir reared	10	71	69	4.8	66	77
Unk reservoir reared	8	71	70	3.0	67	75
H subyearling	1	59	-	-	-	-
Unk subyearling	1	66	-	-	-	-
Jills 1-salt						
Unk subyearling reservoir reared	1	70	-	-	-	-
Unk reservoir reared	1	81	-	-	-	-

FISH COUNTS AT LMO



Columbia River DART, Columbia Basin Research, University of Washington. (2013). Adult Passage Annual Counts. http://www.cbr.washington.edu/dart/query/adult_annual_sum.

Historical uses of jacks and jills at LFH

Year	% of total matings	0-salt	1-salt jack	1-salt jill	Number of matings jack x jill
2000	80.4	195	609	157	127
2001	67.6	9	875	67	47
2002	31.8	5	348	6	4
2003	74.5	3	527	78	63
2004	77.6	34	941	254	204
2005	45.3	13	610	58	26
2006	70.6	1	525	123	94
2007	82.9	0	1136	477	405
2008	30.2	0	348	78	31
2009	70.3	1	547	513	152
Average	**63.1**	**26**	**647**	**181**	**115**

Broodstock protocol modified

Year	% of total matings	0-salt	1-salt jack	1-salt jill	Number of matings jack x jill
2010	3.2	0	38	2	0
2011	4.6	0	23	36	2
Average	**3.9**	**0**	**31**	**19**	**1**

Jacks in nature

- Chinook jack male breeding/reproductive success

Study	Breeding groups	Life stage	Jacks in population	% of total offspring produced		Relative success Jack/male	
	n		range	mean	range	mean	range
Berntson et al. unpbl.	5	Rs	10-14%	7%	2-13%	0.61	.22-1.09
Williamson et al 2010	2	Rs	10-61%	27%	8-47%	0.45	.18-.71
Schroder et al 2011	7	Bs	7-13%	3%	1-5%	0.25	.14-.47
Berejikian et al 2010	4	Bs	25-50%	20%	9-33%	0.56	.15-1.0
Overall	**18**		**7-50%**	**14%**	**1-47%**	**0.50**	**0.14-1.09**

Slide provided by Dr. Barry Berejikian NOAA, Seattle.