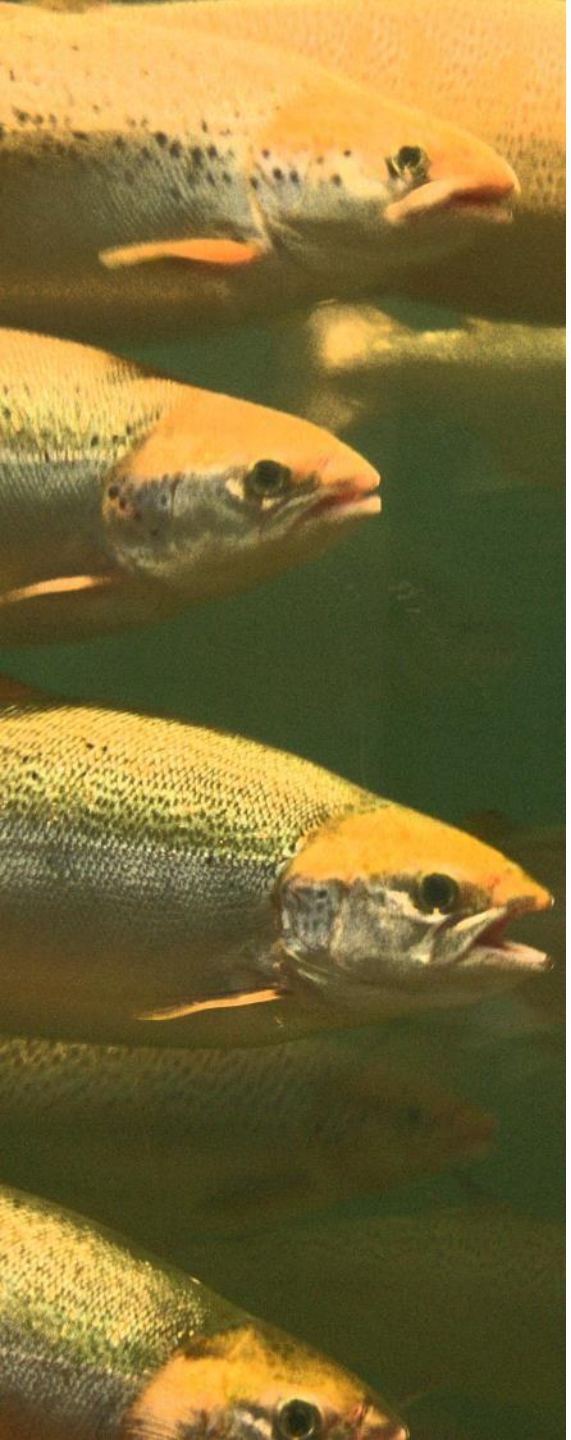

The effects of photoperiod on Atlantic salmon post-smolt in freshwater closed-containment systems

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RESEARCH TEAM

Christopher Good
Steven Summerfelt
Travis May
Curtis Crouse

Lars Ebbesson
Sigurd Handeland
Sigurd Stefansson
Tom Nilsen
Bendik Terjesen
Frode Mathisen

THE CONSERVATION FUND

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PHOTO

- **Objective: To examine the effects of different photoperiod regimes on the quality and robustness of Atlantic salmon post-smolts raised to 1,000g, and to market size, in freshwater RAS**
  - There is significant industry interest in raising larger smolts (up to 1kg) in land-based freshwater RAS
  - This new variation on smolt production is largely untested, and optimum environmental conditions need to be established to ensure salmon quality prior to sea cage transfer
  - Photoperiod regimes need assessment for their influence on growth performance, maturation, smoltification, and immunocompetence.

PHASE I: TREATMENT SUMMARY

	Early Rearing Fry system (12-13C)			Transfer to partial reuse @ ~13C	Either:	A) **remain** in partial reuse under original photoperiod regime, then transfer at 1000g B) **transfer** to growout RAS w/ LD24:0 @ ~15C	Growout RAS under LD24:0 @ ~15C		
Initial									*Final*
Treatment Group	10g	40g		~100g	500g		1000g	4-6kg	Treatment Group
1	LD24:0	LD12:12	LD24:0		A				1A
					B				1B
2	LD24:0			LD12:12	A				2A
					B				2B
3	LDN				A				3A
					B				3B

Partial reuse system
(covered for PHOTO)

Flow-through fry system

Full reuse growout system with 150m^3 tank

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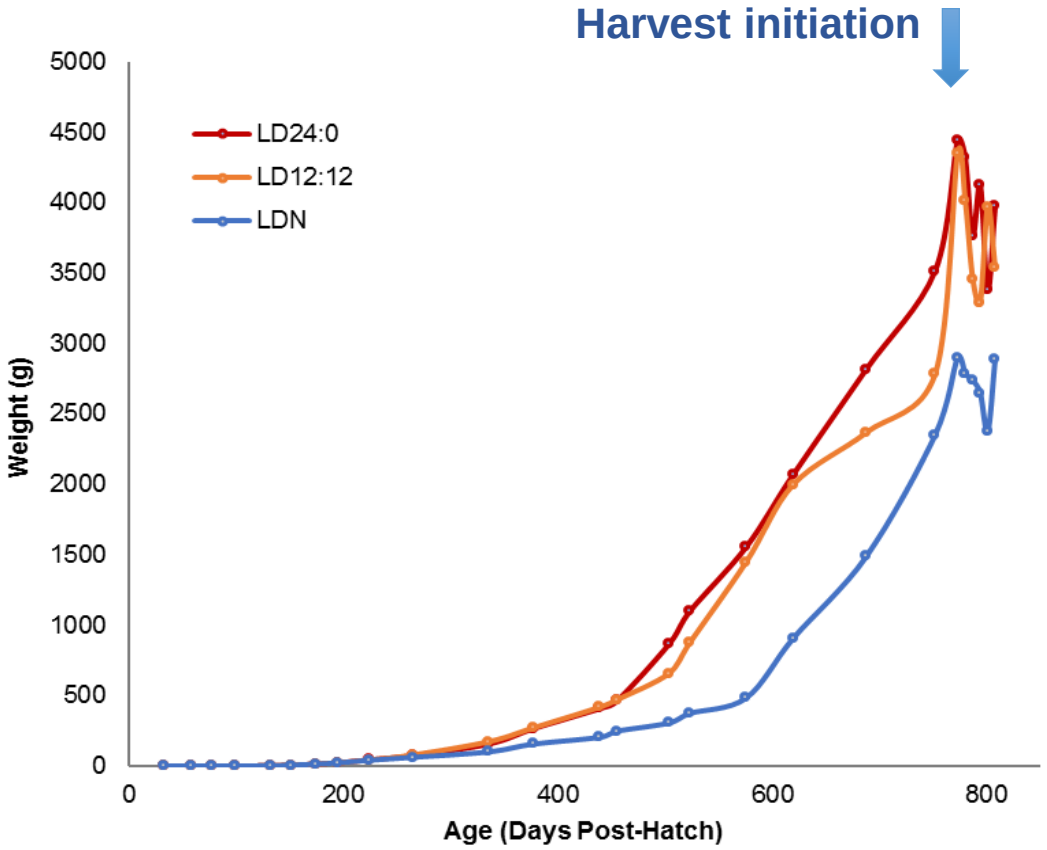
PHOTO – PHASE I



GROWTH PERFORMANCE

	LDN		LD24:0		LD12:12	
Mature ♂ at ~2kg	364	(22.0%)	462	(23.8%)	637	(32.6%)
Mature ♀ at ~2kg	59	(3.6%)	45	(2.3%)	49	(2.5%)
Mature ♂ at harvest	168	(10.2%)	56	(2.9%)	115	(5.9%)
Mature ♀ at harvest	194	(11.7%)	107	(5.5%)	287	(14.7%)
Mortalities, culls, and other fish removed	145	(8.8%)	230	(11.9%)	194	(9.9%)
Premium salmon harvested	724	(43.8%)	1,039	(53.6%)	670	(34.3%)

MATURATION DURING GROWOUT

PHOTO – PHASE I

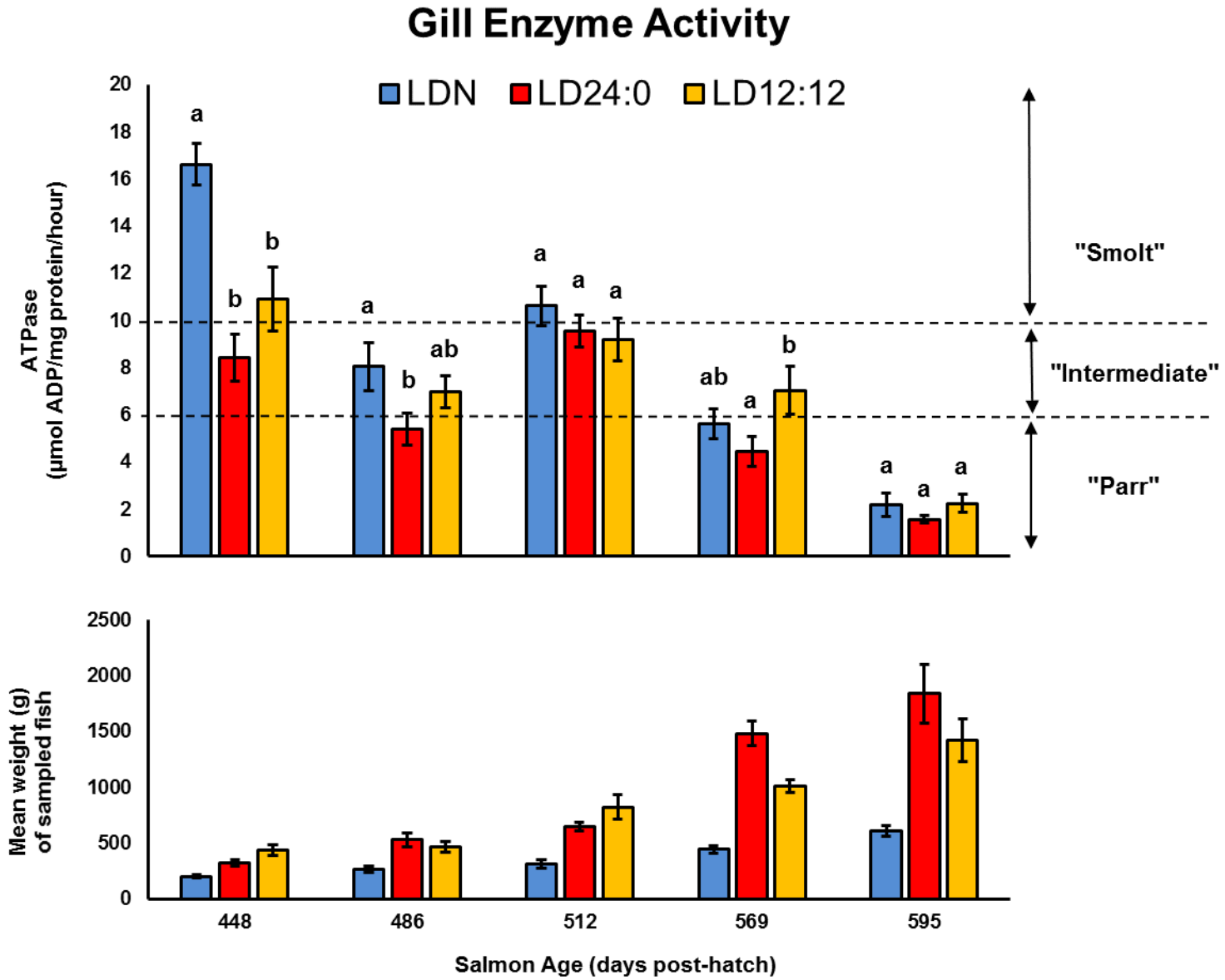
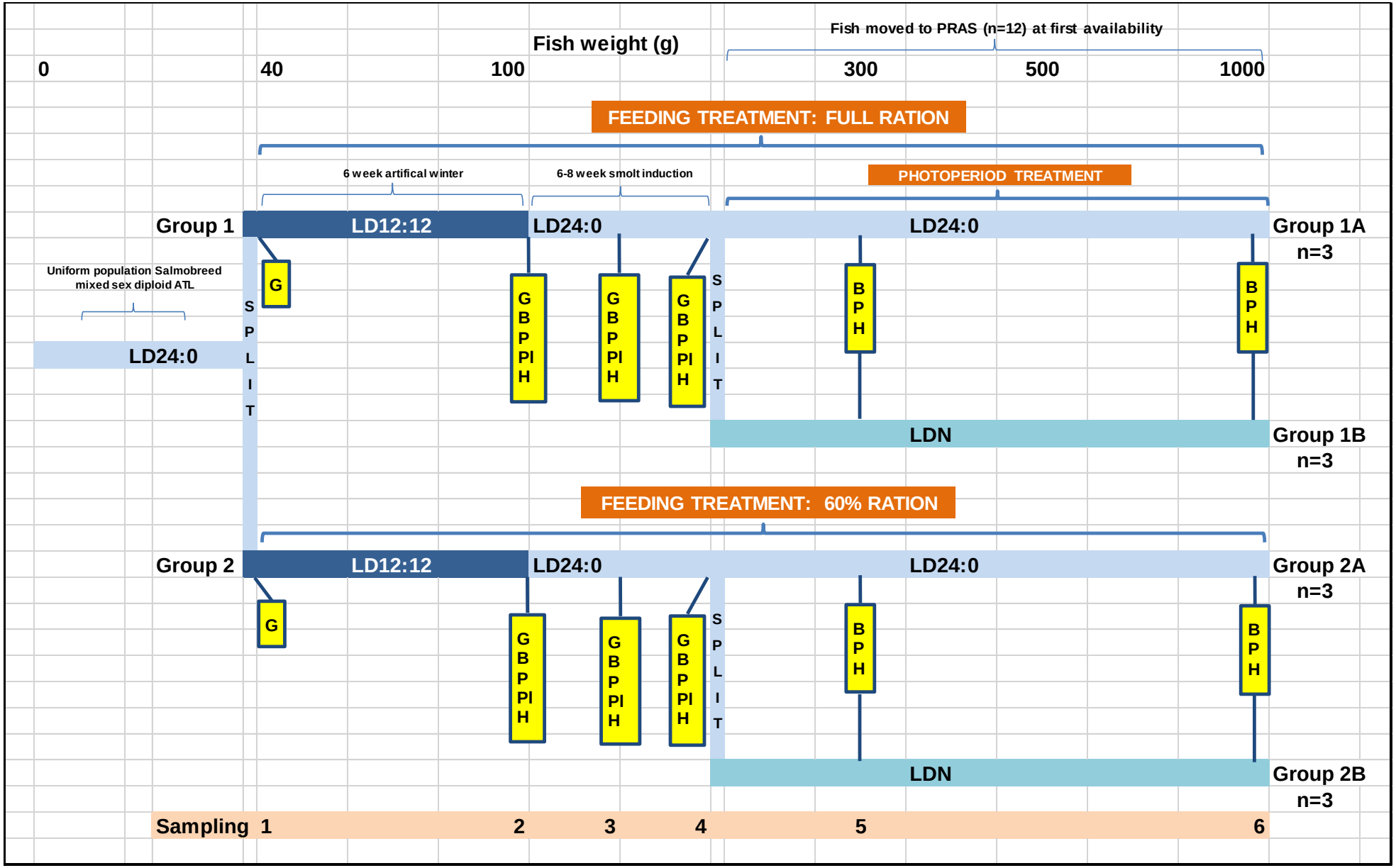


PHOTO – PHASE II: examing the effects of photoperiod & feeding rate



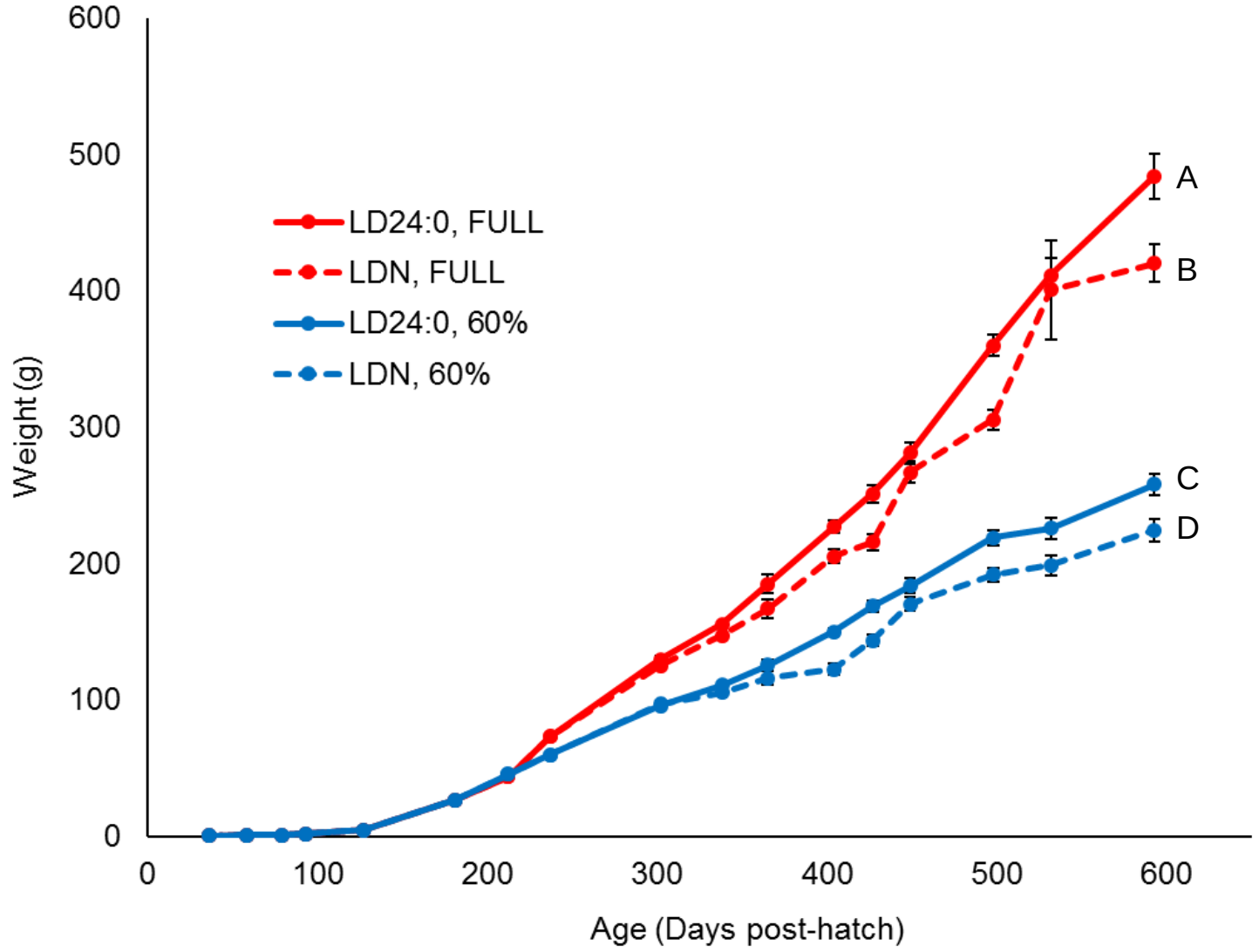
2x2 factorial study design incorporating:

(i) **photoperiod** (constant, i.e. LD24:0 vs. natural, i.e. LDN) and

(ii) **feeding regime** (full ration vs. 60% ration)

from smolt to 1,000g in freshwater aquaculture systems

PHOTO – PHASE II: examing the effects of photoperiod & feeding rate

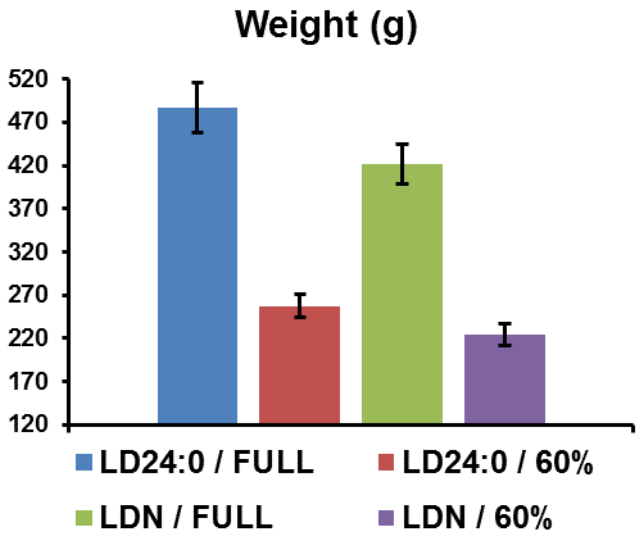


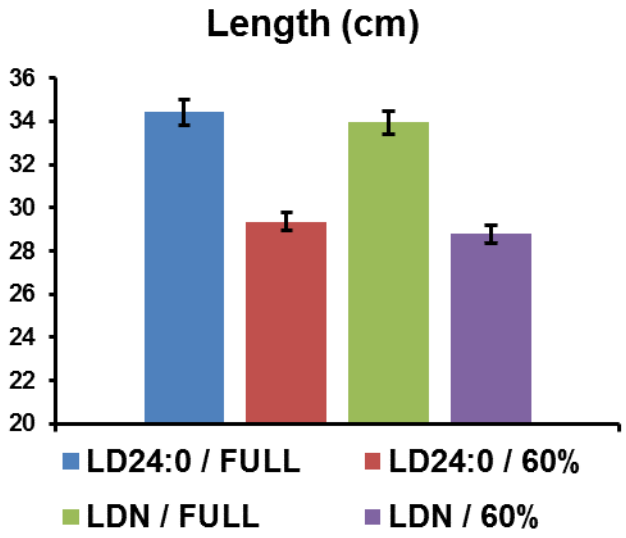
ANOVA	
Treatment	p-value
Photoperiod	0.0002
Diet	<0.0001
Photoperiod x Diet	0.3239

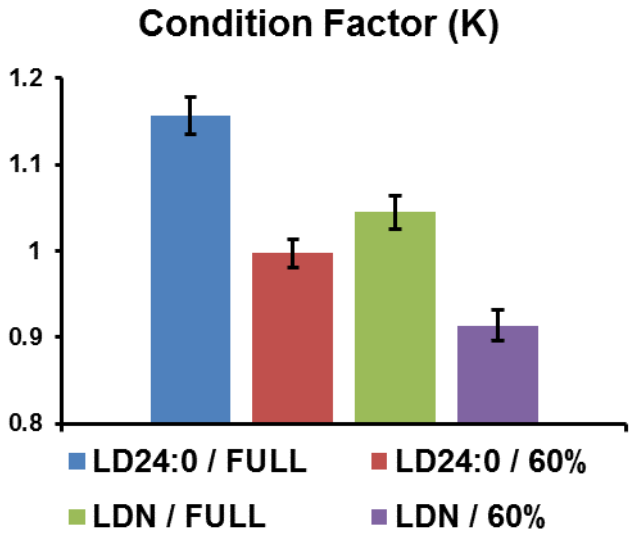
PHOTO – PHASE II: examing the effects of photoperiod & feeding rate

Current status: Recent completion of 500g sampling event (September 25, 2017)

RESULTS







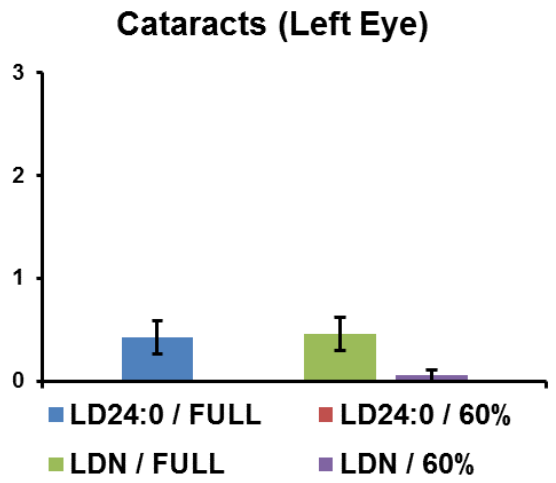
Performance

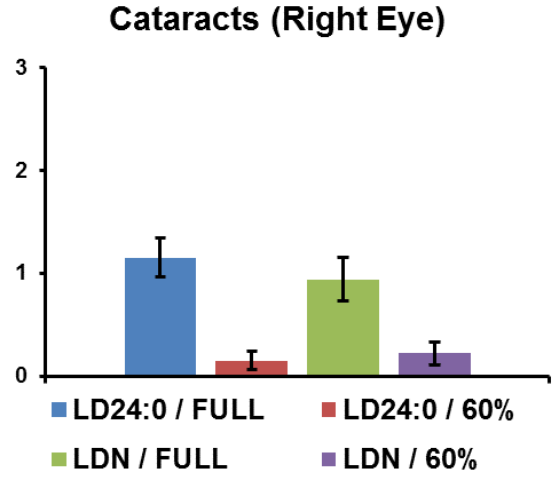
- Best growth performance in the full ration treatment groups
- Best condition factor in LD24:0 / full ration group
- Poor condition factor in 60% ration groups

No observable signs of maturation in any treatment group

PHOTO – PHASE II: examing the effects of photoperiod & feeding rate

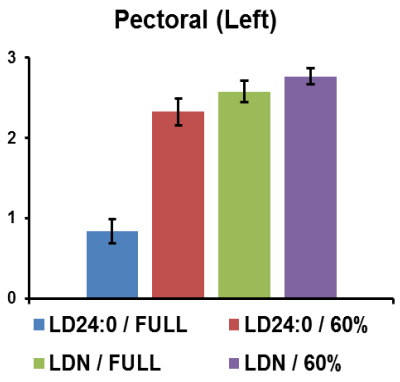
Welfare

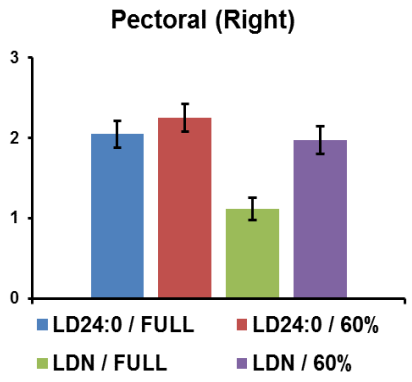


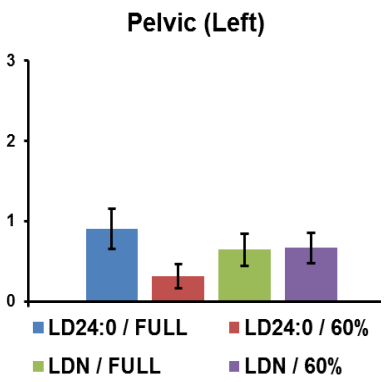


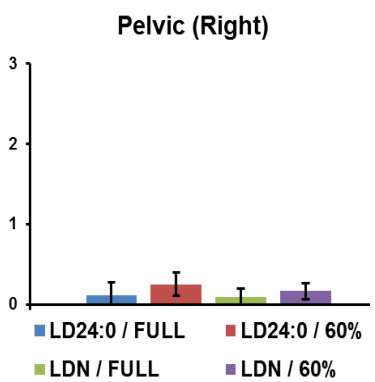
Cataract and fin damage scores (0-3; 3 = most severe) indicate:

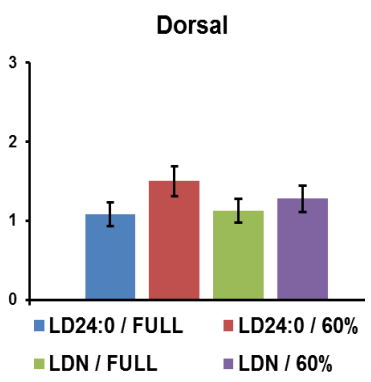
- Generally worse cataracts in full ration groups (density?)
- No clear pattern in overall fin damage

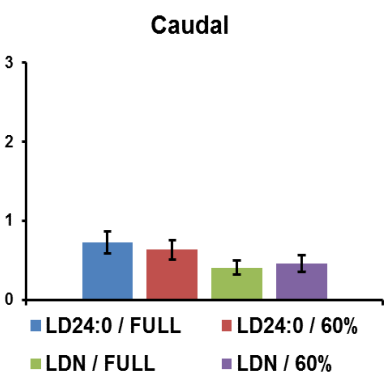












Incoming data: Gene expression (NKAα1a and 1b, NKCC, DIO2a); Plasma 11-KT; Brain DIO2b mRNA; Pituitary gene expression (ROBUST); SIQ microarray to assess immunocompetence

PHOTO – PHASE II: examing the effects of photoperiod & feeding rate

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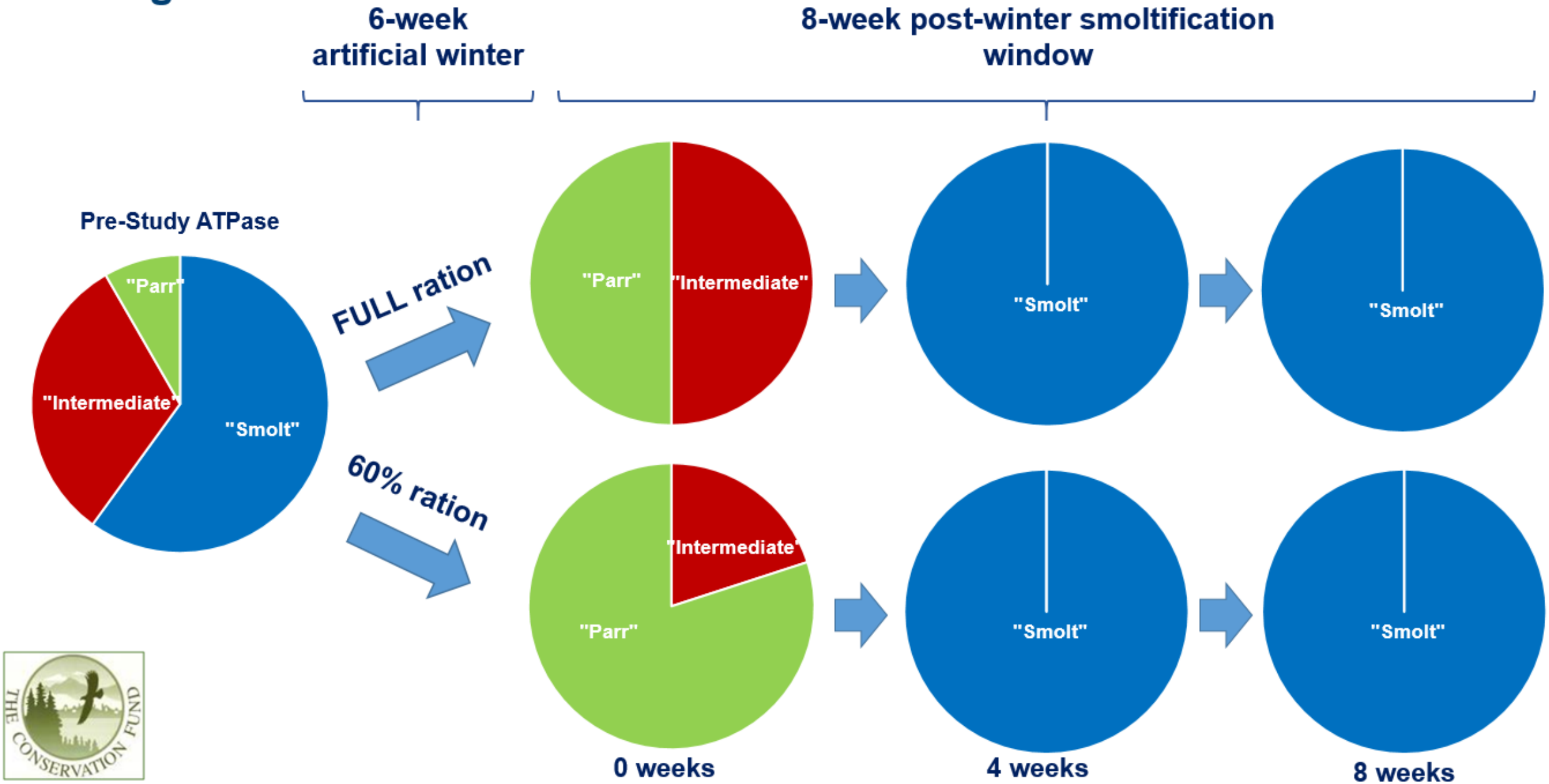

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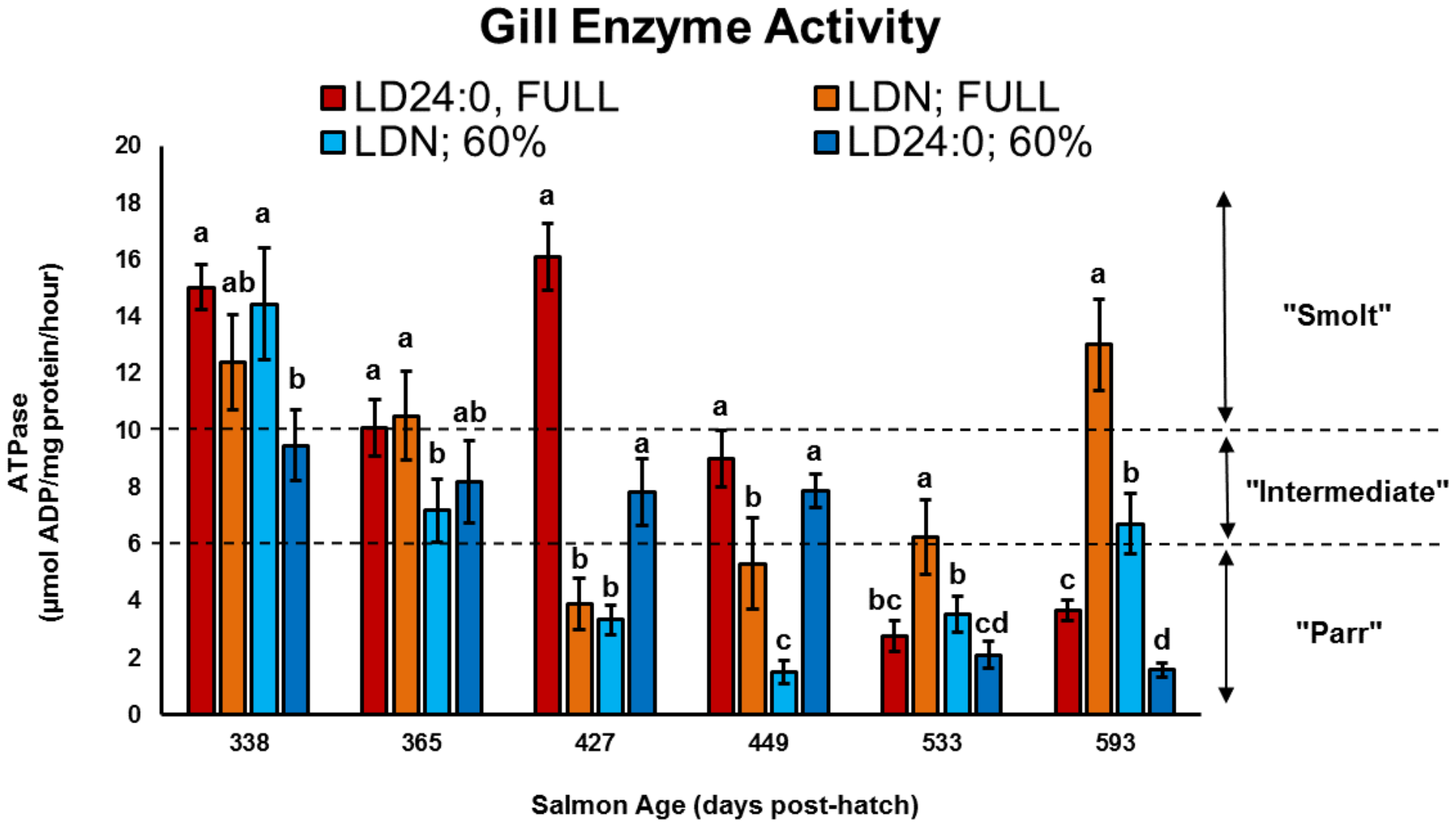

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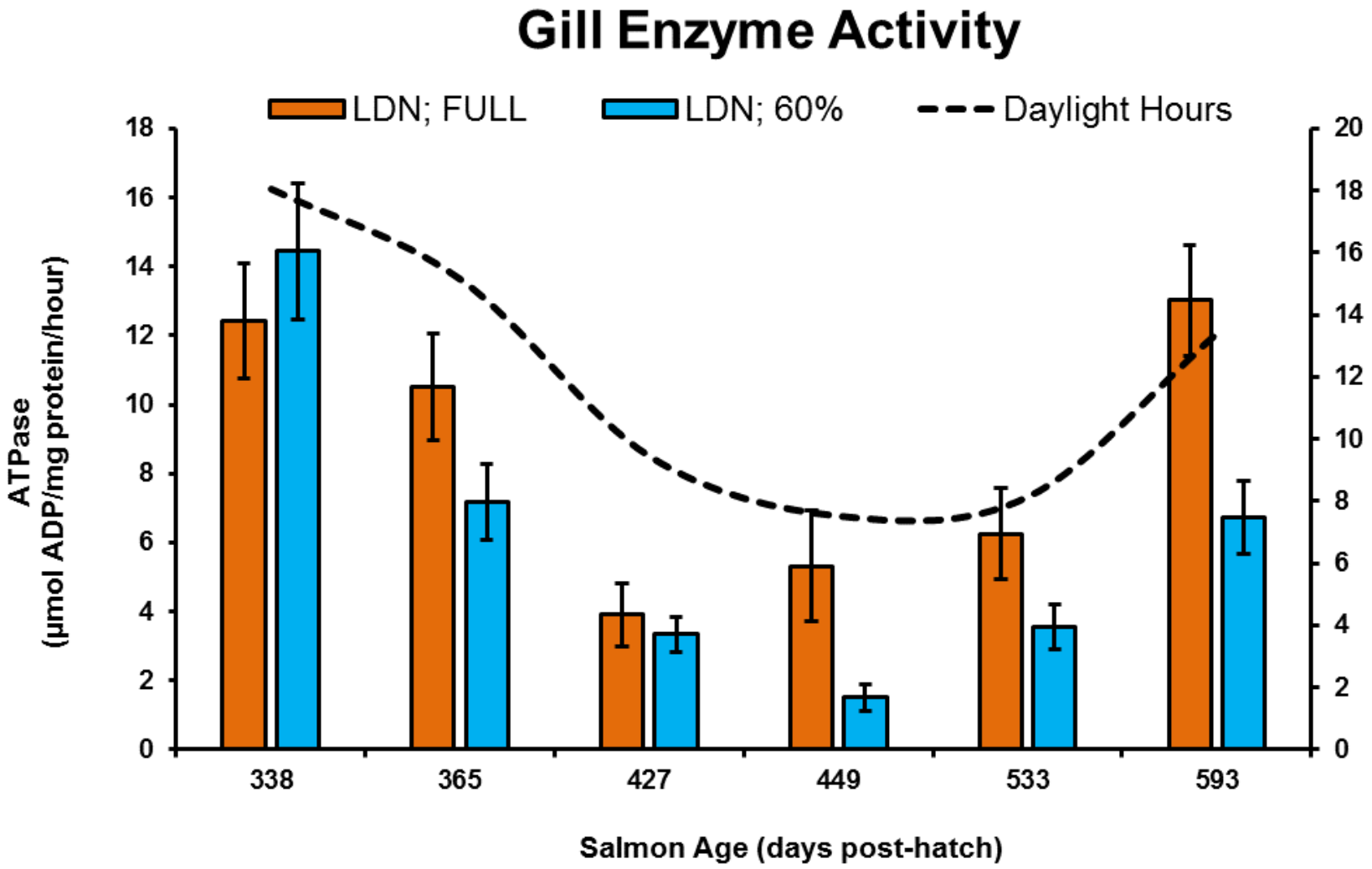

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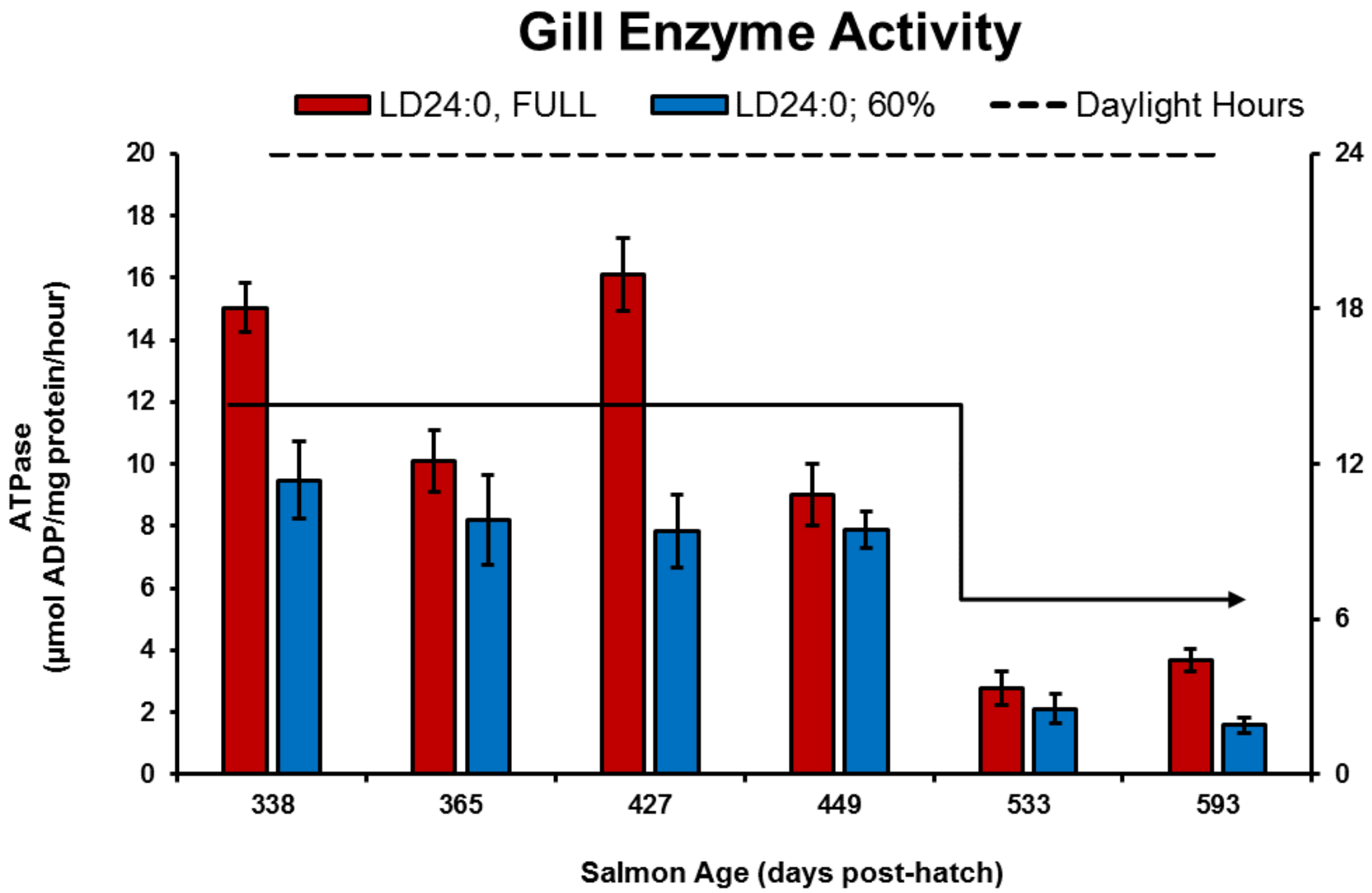
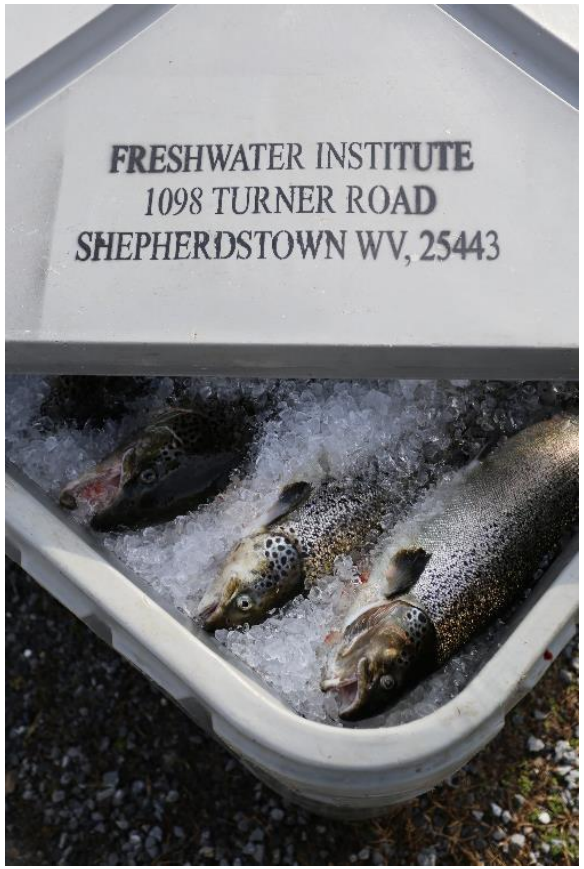


PHOTO – PHASE II: examing the effects of photoperiod & feeding rate

Next Steps:

- Mark salmon by treatment group and comingle in a single partial reuse system up to market size (~4kg)
- Additional tissues analyses for immunocompetence and maturation



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