

Salmon Proof of Concept Trial

28 April 2016



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WORLD CLASS FISH FEED

Introduction

- Following on from screening trials
- Used a wet processing technique
- Final product was a 77% protein product
- Trial conducted in sea loch cages in Lochailort, Scotland (semi-commercial scale)
- Fish grown from 200 g to >3 kg
- Final product quality assessed at harvest

Initial Period: 200 g to 500 g



- Four Diets:

	Fish meal	SPC	BPC
FM Control	40	0	0
SPC Control	21	24	0
Low BPC	21	12	7*
High BPC	21	4	14*

*7% BPC inclusion provides 13% of the dietary protein (14% brings 26%)

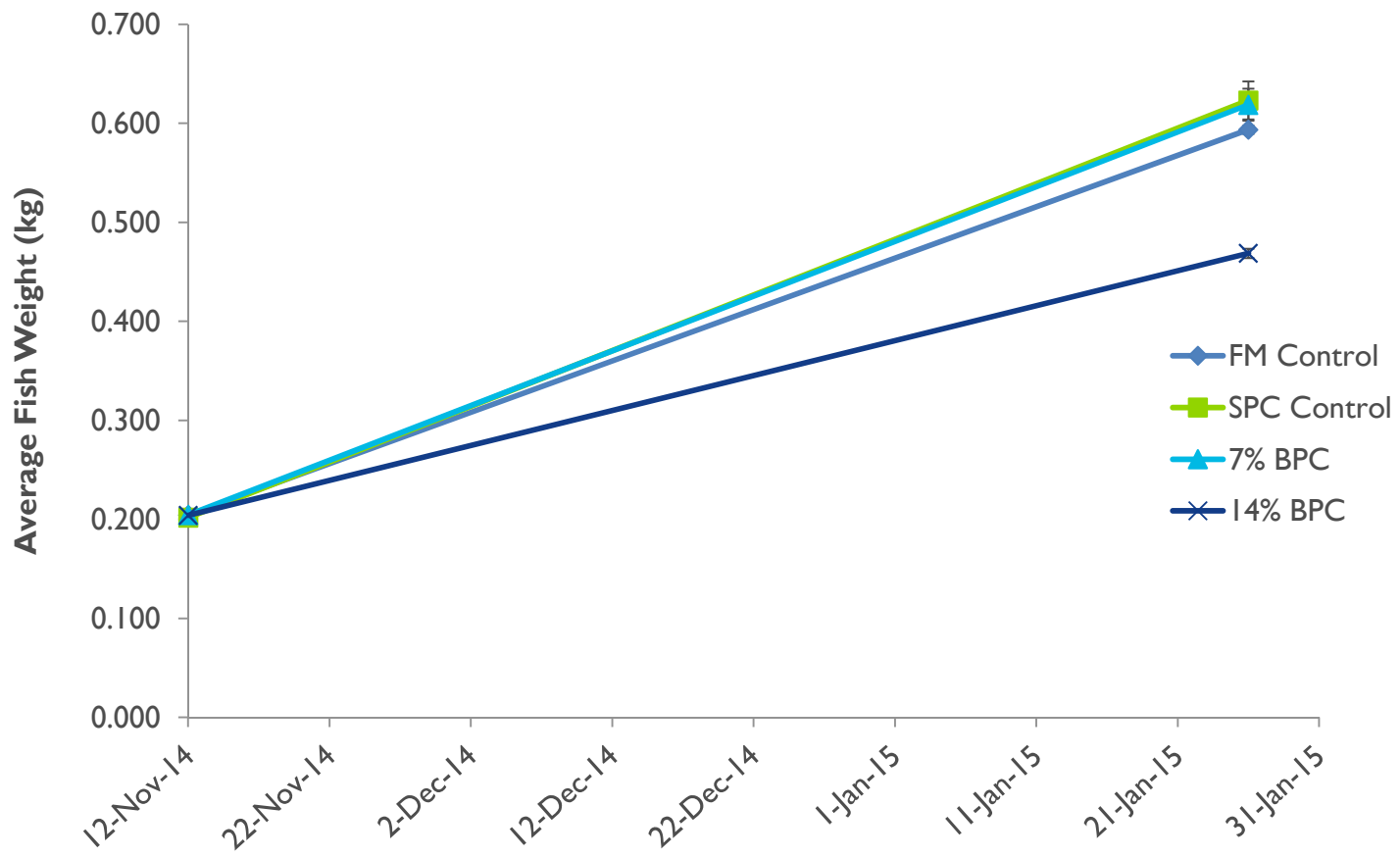
- Triplicated Design
- 5 x 5 x 5 m pens
- 250 fish per pen



Initial Period



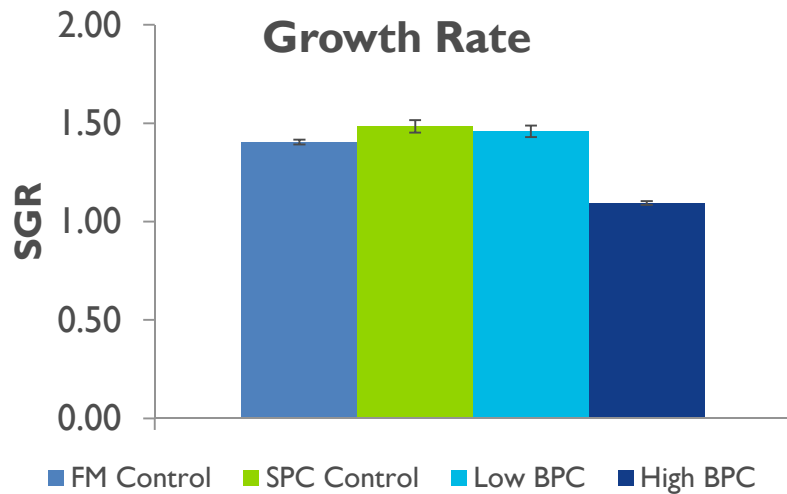
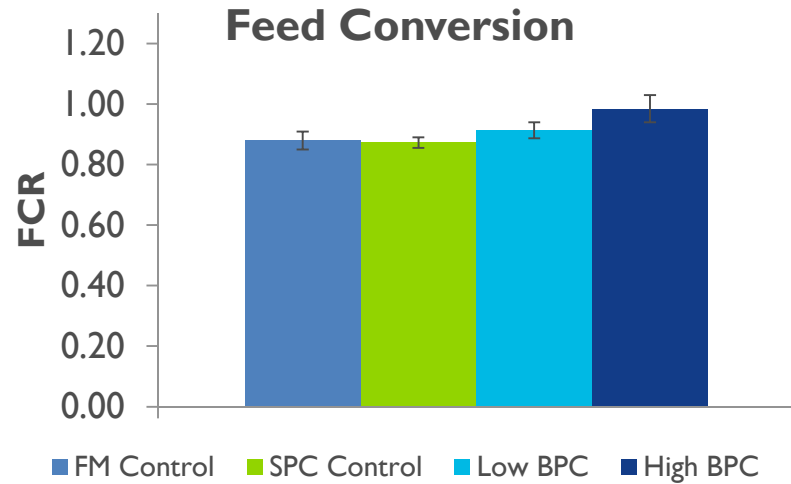
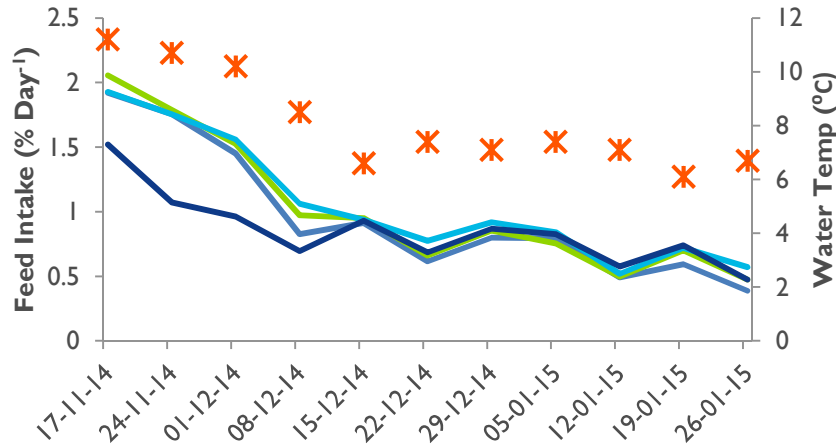
Growth



- 14 % BPC diet has negative effect on growth

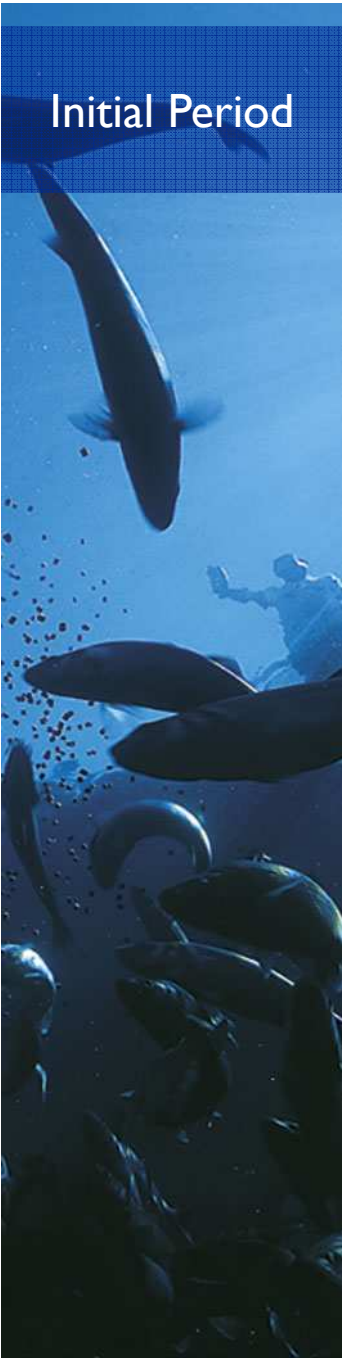


Initial Period - Performance

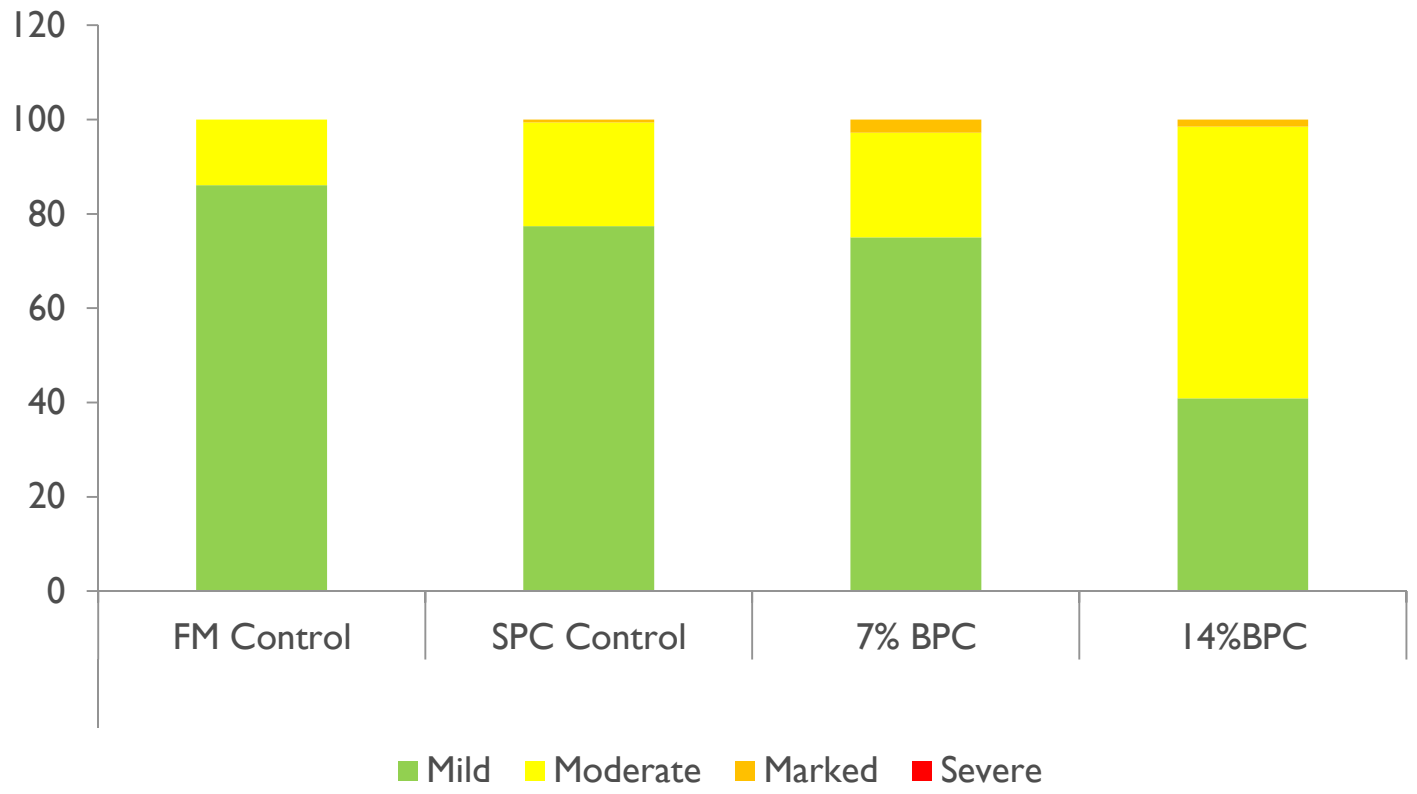


Reduced Feed Intake
+
Higher FCR
=
Very Poor Growth Rate

WHY? – Not burnt and no anti-nutritionals.
Could be residues from wet processing?



Visual Gut Health



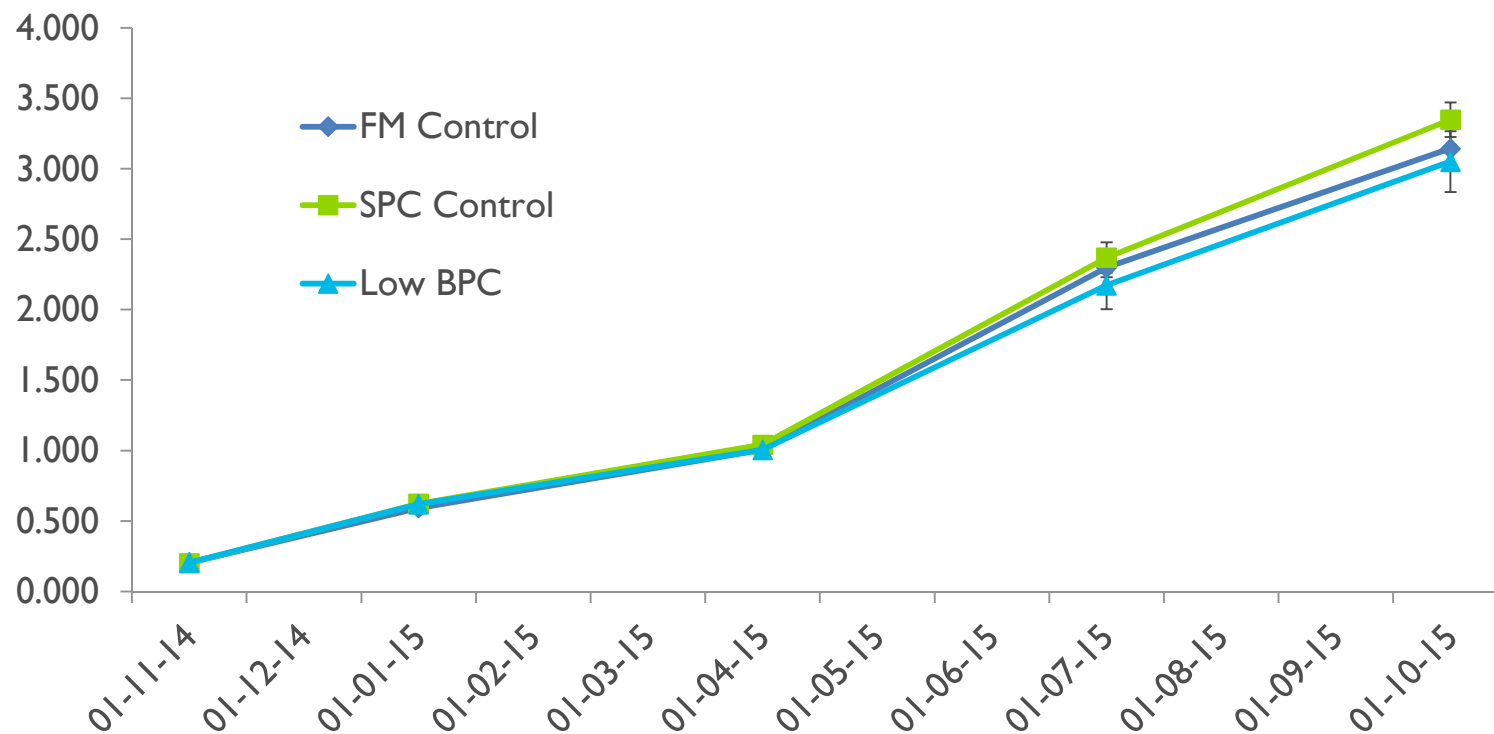
- Based on assessment of liver, pyloric caeca, stomach, mid and distal intestine
- 14 % BPC diet caused significant damage to the gut

Whole Production



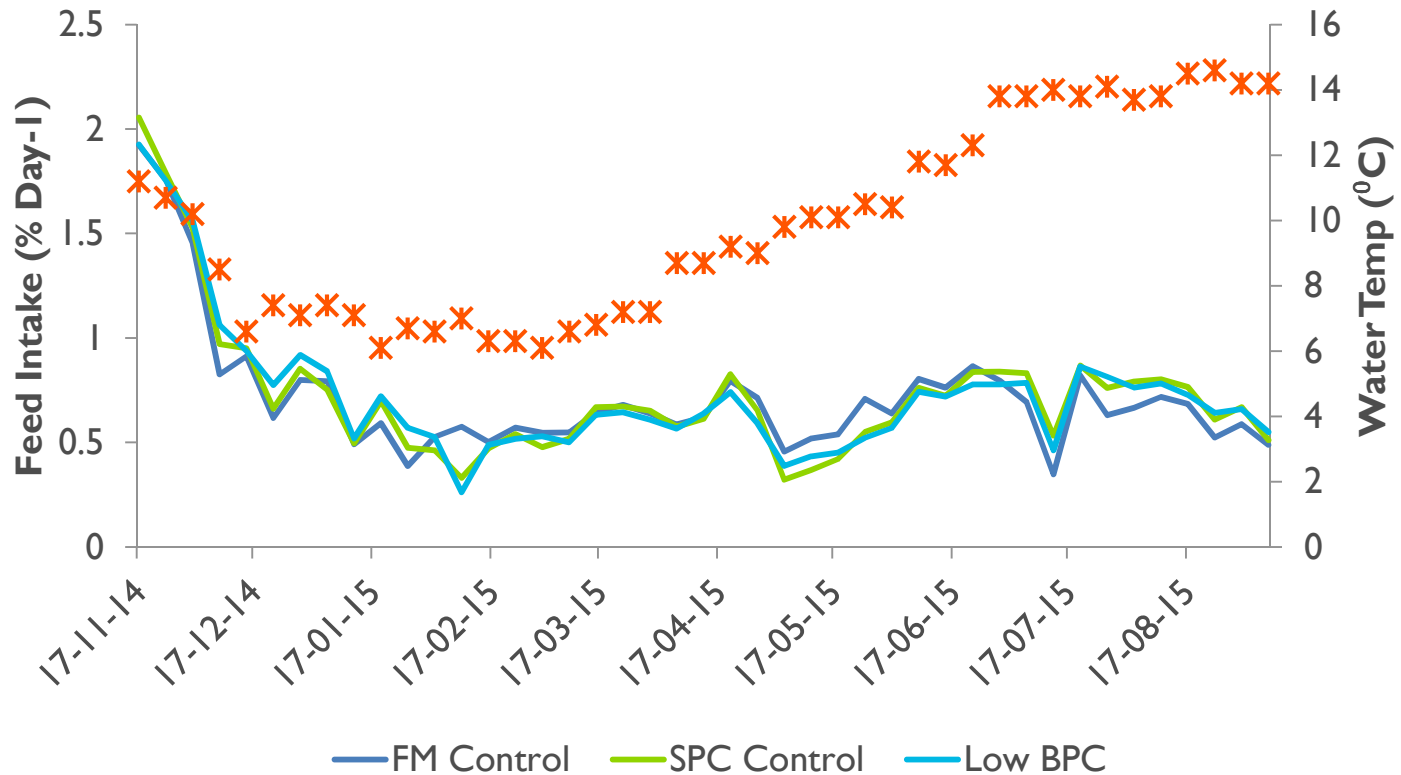
- 14 % BPC diet removed from the trail
- Fish grown from 200 g to >3 kg
- Assessed at approx.
 - 500g
 - 1 kg
 - 2 kg
 - Harvest
- Final fillet quality assessed:
 - Composition
 - Pigmentation
 - Firmness
 - Muscle block stability

Growth Progression – Final weight approx. 3 Kg



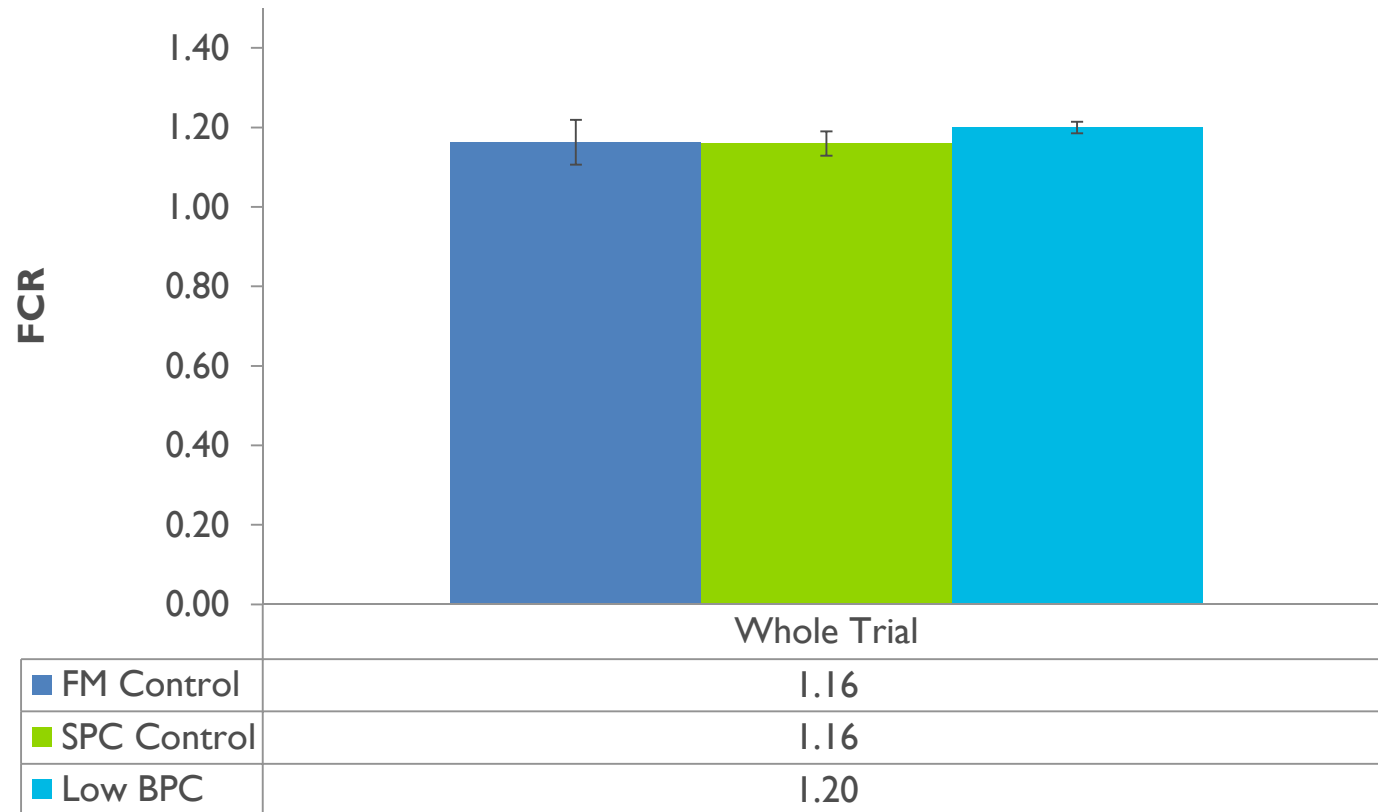
- No difference between diet.
- Final period of growth effected by environmental conditions during September and October – fish should have been >4kg

Feed Intake



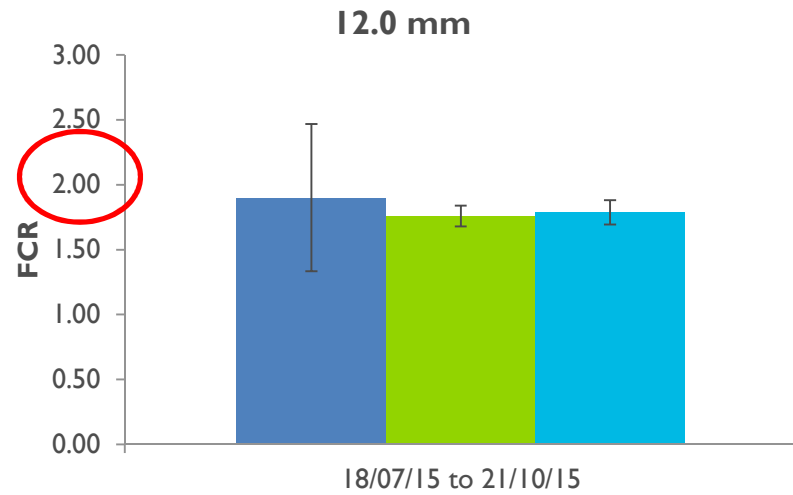
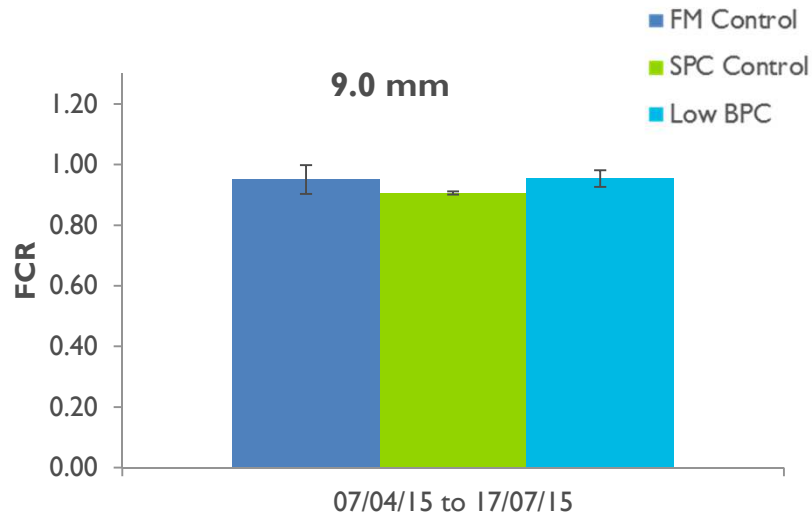
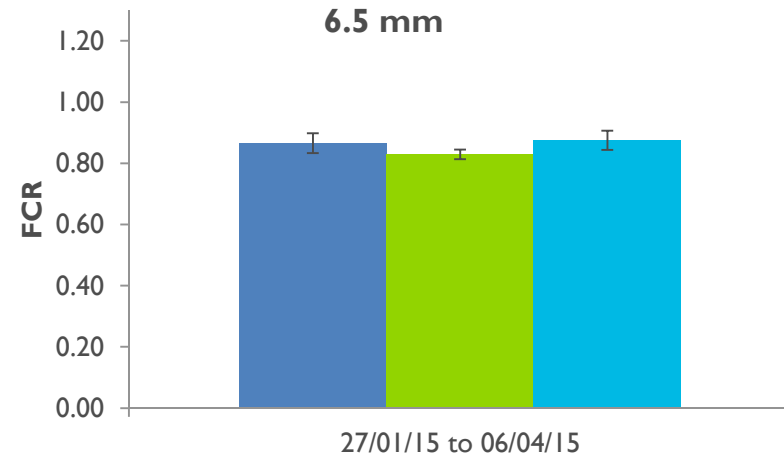
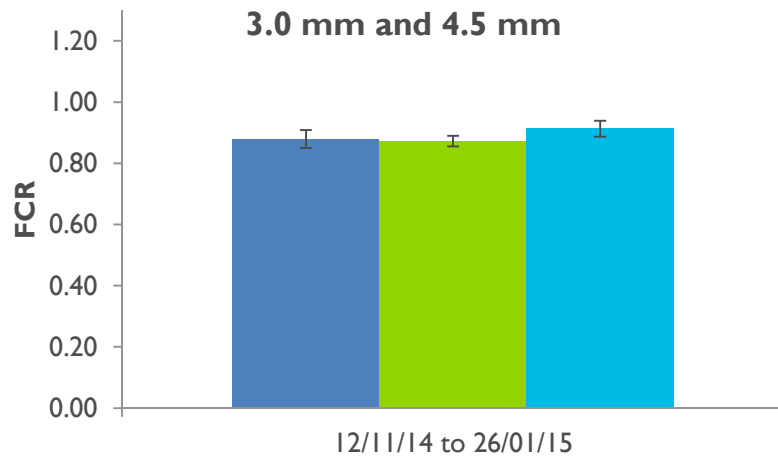
- Feed intake follows water temperature (X)
- As fish increase in size feed intake as a % body weight decrease
- No difference between the diets

Feed Performance

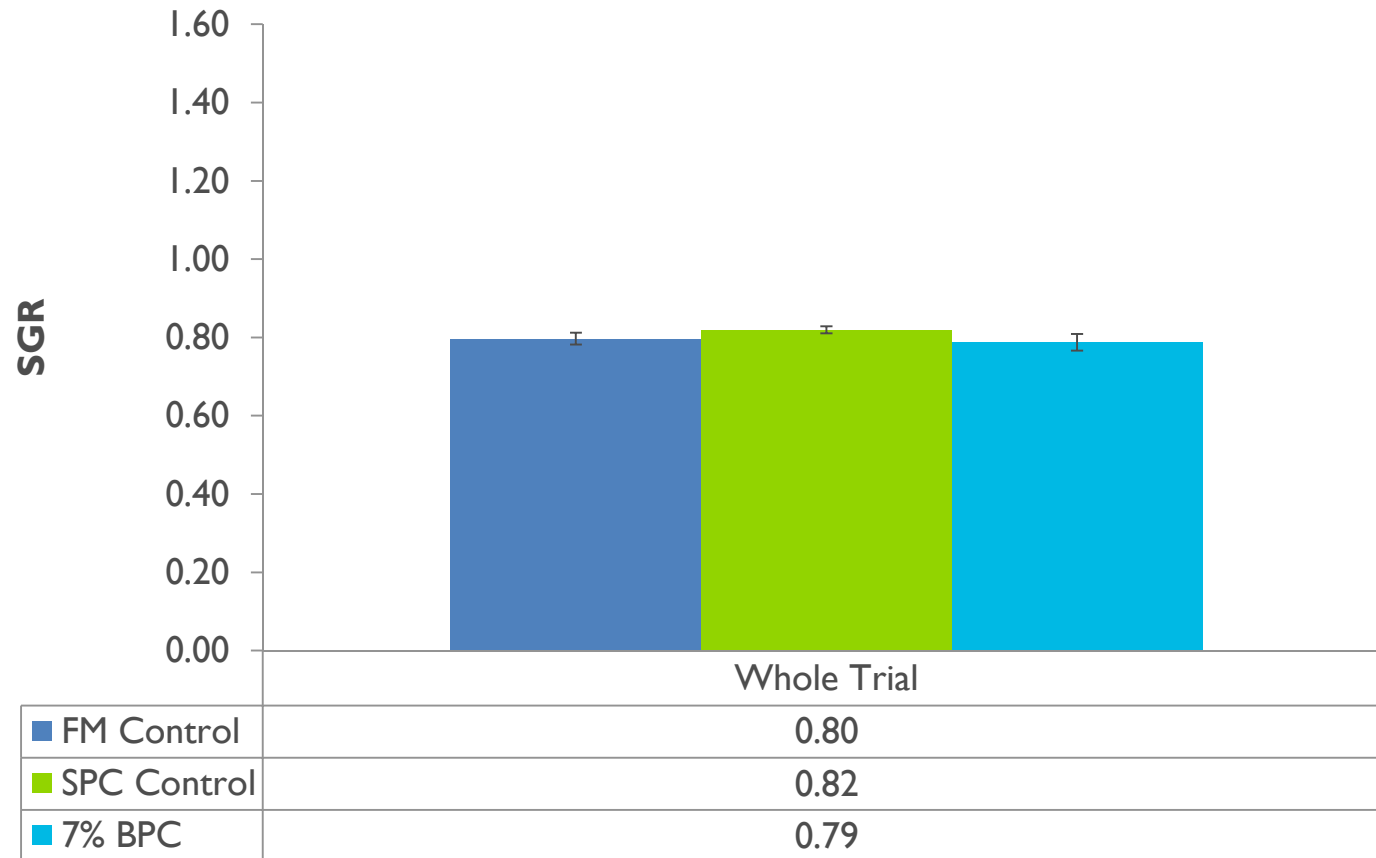


- Good FCRs – slightly high due to final months environmental conditions
- No dietary differences

Feed Performance



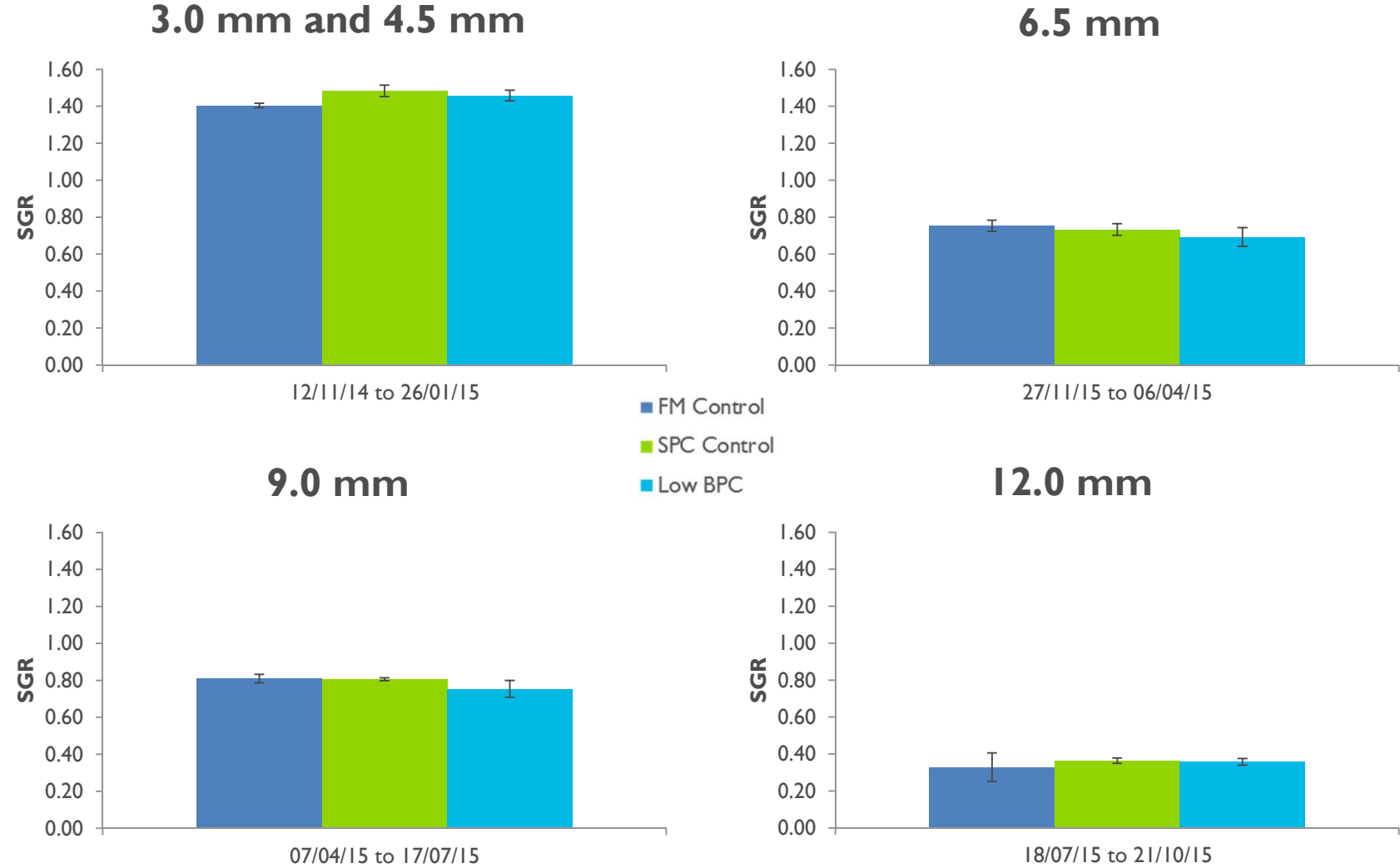
Growth Rate – % body weight gain per day



- Good SGRs – slightly reduced due to final months environmental conditions
- No dietary differences

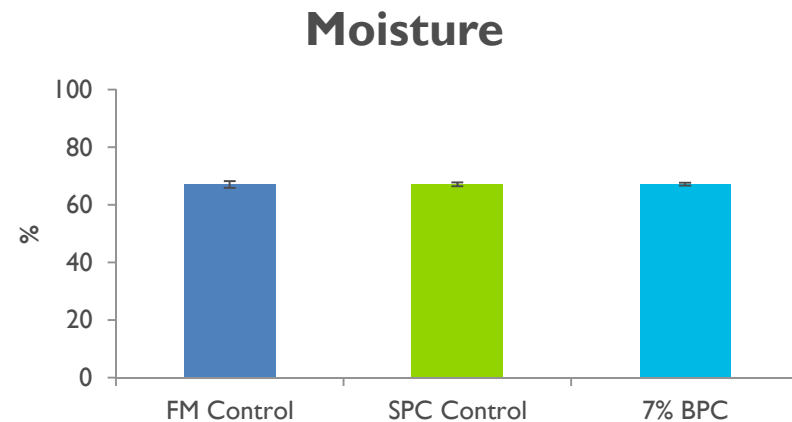
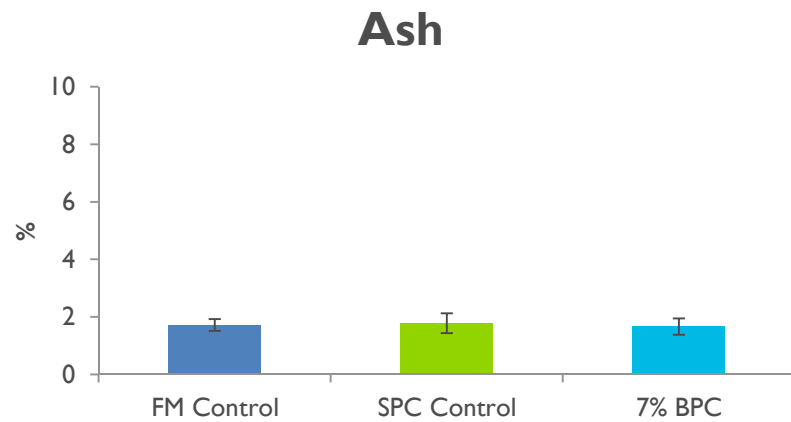
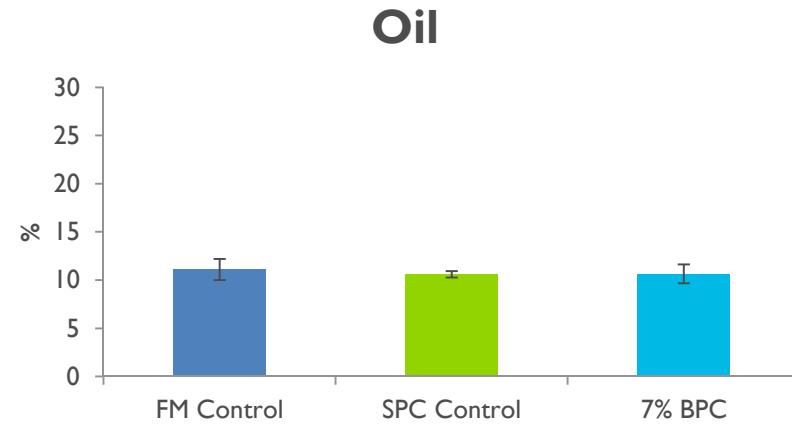
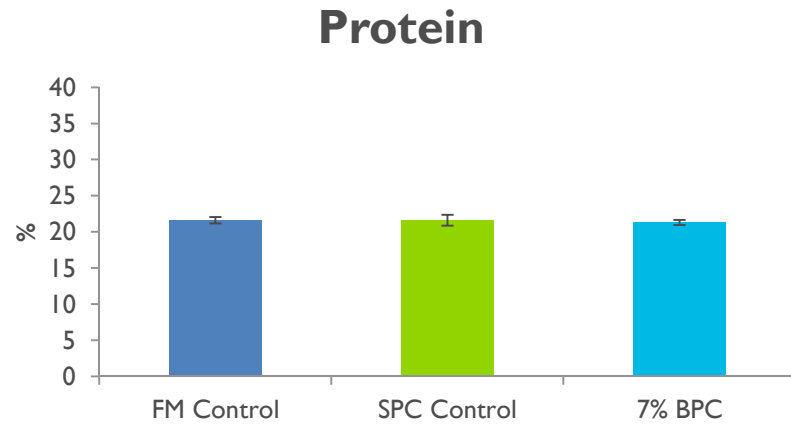


Growth Rate – % body weight gain per day



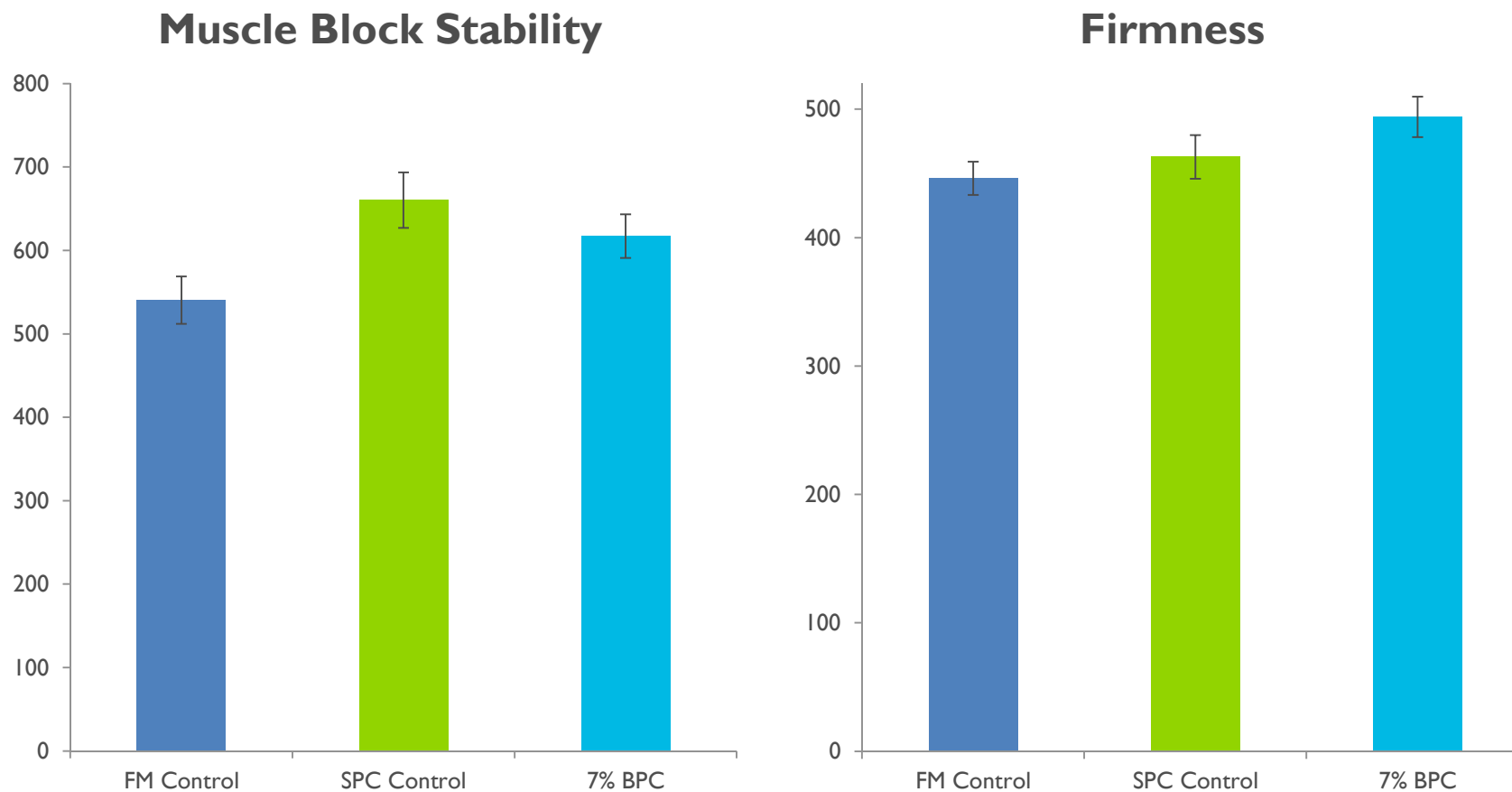


Final Product Quality: Nutritional Composition



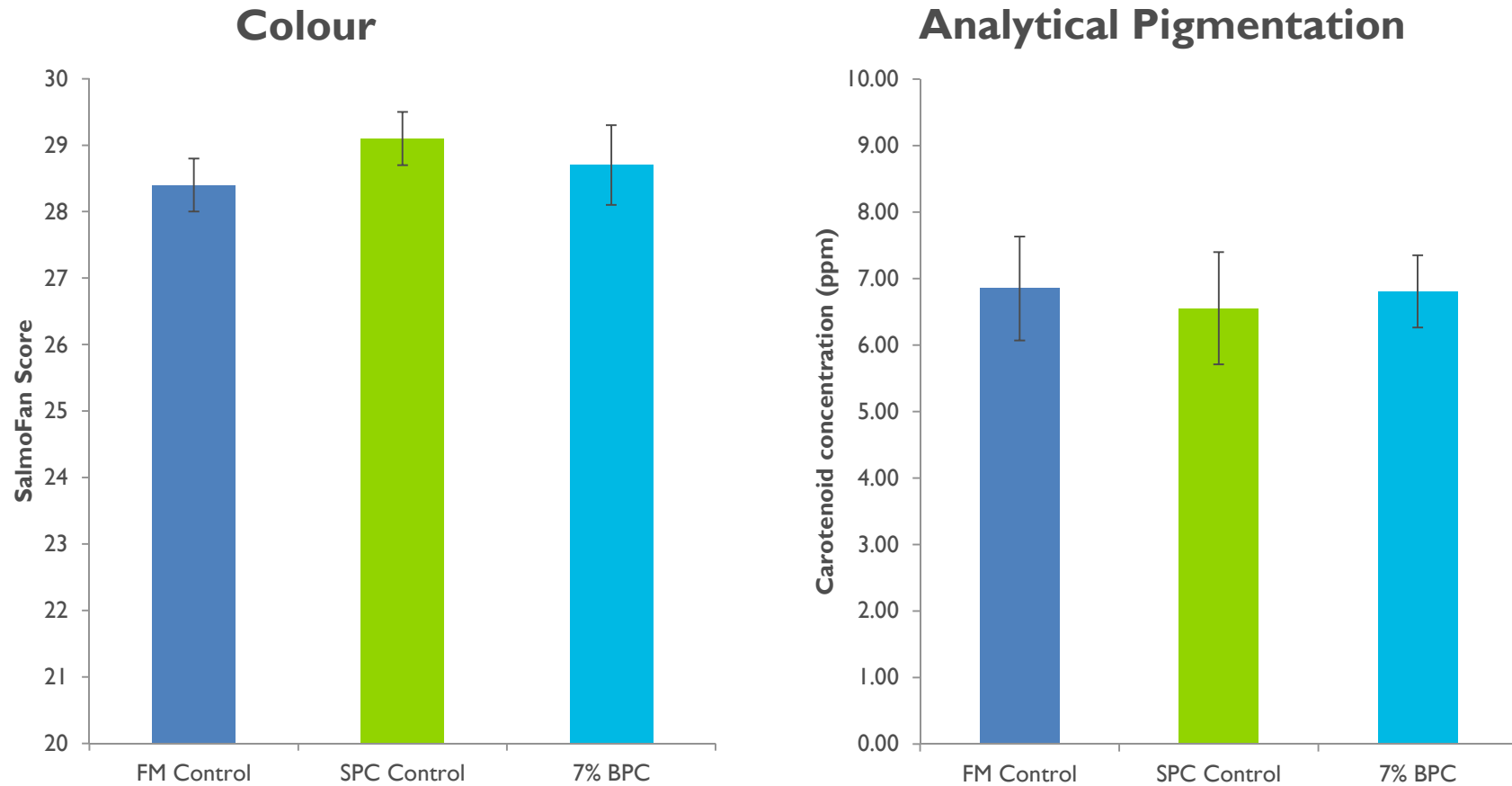
No Dietary differences – indicates nutrient retentions are not effected by BPC

Final Product Quality: Physical Characteristics



- SPC and BPC diets had more preferable physical characteristics
- No difference between SPC and BPC

Final Product Quality: Pigmentation

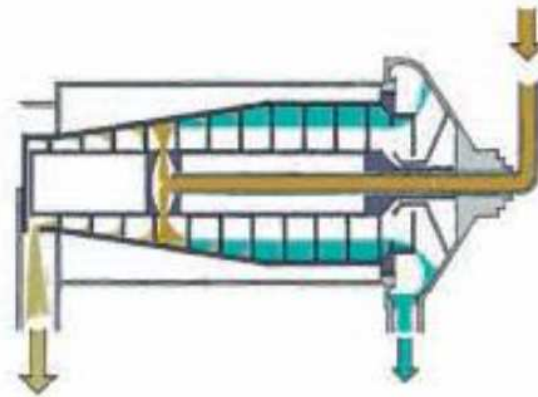


- No dietary differences
- Important due to added expense if additional asta is required

Wet Processing

The Process – Aqueous Alkaline Solubilisation

- Micronized dehulled faba beans soaked in low concentration Sodium Hydroxide – solubilises protein
- Soluble proteins separated from fibres and starch with centrifugal decanters (fibre later separated from starch with centrifugal sieves)



- Soluble protein precipitated out by reduced pH
- Precipitated protein ring dried to low moisture powder (<10 water)



Results

Sub contracted to a potato starch producer (AKM, Denmark)

Laboratory Scale Production

90% protein product with 70% protein yield
(4.7T de-hulled beans required to produce 1T BPC)

Pilot Scale Production

78% protein product with 10% protein yield
(28.8T de-hulled beans required to produce 1T BPC)

“Poor return from pilot scale thought to be due to small particle size of the soluble protein – optimization of process required and probable investment in sedimentation decanters or higher speed centrifugal decanter”





PoC Summary and Market Potential

- BPC can be used to provide up to 13% dietary protein in salmon feed with out negative impact
- Potential UK requirement would be approx. 20,000 T BPC
- If exported to Norway the yearly requirement would be >100,000 T
- Assuming a 75% protein product and a 90% protein yield the annual requirement for the UK could be >66,000 T or up to 330,000 T if exported.

Wet separation process needs to be optimized to achieve high yield

