‘Namgis Land-Based Atlantic Salmon Recirculating Aquaculture System Pilot Project
Update re Completion of Cohort #4

July 1, 2015 to September 30, 2015

For Tides Canada
Grant #GF03625

KUTERRA

SUSTAINABILITY HAS LANDED

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Executive Summary

The following report summarizes the performance of Cohort 4 of Atlantic salmon in the 'Namgis Land-Based Atlantic Salmon Recirculating Aquaculture System (RAS) Project and spans the period July 1, 2015 to September 30, 2015. The report also includes updates on the three succeeding cohorts, Cohorts 5-7, which were in the system during this period. This is an addendum to the "Milestone #7 Performance Metrics Report." The new information contained here adds to the understanding of the Project commissioning process, and the two reports are to be read together. The Milestone #7 report can be found on the Tides Canada website at www.tidescanada.org/programs/salmon-aquaculture-innovation-fund.

The first phase of the project, commissioning the system, is, for the most part, complete. The focus now is on improving fish performance and determining the economic potential of RAS for growing Atlantic salmon under optimal, steady state conditions, at scale.

The negative impacts of changing photoperiods during the production cycle are now better understood, as are the positive benefits from transfer diets, salinity during smolt intakes, and improved water quality.

Biological and technological metrics continue to improve. These include product downgrades, feed conversion, mortality, and the facility's energy efficiency, water use, and water clarity. Remaining challenges are early maturation, slow growth, and cataracts. These remaining factors continue to affect product quality, harvest size, and smolt costs. Various strategies are being implemented to address these challenges, including adding two more harvest tanks and converting the existing harvest tank to a production/growout tank.

Prices for Cohort 4 premium fish remained steady, but 36% of the harvest was non-premium due to early maturation, which significantly decreased revenue. This revenue decrease was offset by continued improvements in production costs. As a result, the business is close to breaking even. It is expected that continuing improvements will result in more stable and positive cash flows. In particular, the following measures are expected to contribute significantly to improving profitability in 2016:

- Increased revenue and reduced smolt costs through improved survival;
- Increased production through attainment of maximum, steady state, biomass;
- Increased revenue and reduced market risk through additional harvest tanks; and
- Increased revenue through increased harvest size, reduced size downgrades and reduced smolt costs through an additional growout tank.

Also under consideration is the addition of a new, more saline well to help maintain higher in-tank salinity that may improve growth and reduce early maturation. The addition of a hatchery would also significantly improve the facility's ability to optimize results and to establish the key business elements for a larger facility (1500-3000MT), which would benefit from economies of scale. Funding has not yet been secured for these two improvements.

Production Results

Cohort #4 (0514)

Summary of Cohort 0514 to Completion, Week 71

Production		
FCRb	1.03	
FCRe	1.15	
TGC (lifecycle)	1.72	
SGR (lifecycle)	0.76%	
Average Condition	1.25	
Current Biomass (mt)	0.0	
Total Production (mt)	101.7	harvested+ current- smolt biomass
Smolts stocked (#)	41,387	
Current Inventory (#)	0	
Current/ Max Size (kg live)	4.3	
Smolt Size (gm)	101	

Mortality & Fish Health				
	#	%		Percent of start number
Fungus	7,242	17.5%		
Other	739	1.8%		* See note below
Culls	498	1.2%		
NVM	826	2.0%		No Visible Marks
Adjust.	728	1.8%		Count adjustments
Pre	25	0.1%		Precocial
Total #	10,052	24.3%		
Total Losses		6.1%	6173 kg	Percent of total production
Treatments				No antibiotics, salt, formalin

Weekly Average Water Quality		Max	Min	Average	
Temperature	C	16.4	12.0	13.7	
TAN	mg/l	5.88	0.07	0.80	
Nitrite	mg/l	1.47	0.01	0.15	
Nitrate	mg/l	266	8	125	
Oxygen	mg/l	12	7	9	
CO2	mg/l	28	3	15	
Salinity		6.8	1.3	3.7	
Alkalinity		145	30	67	
Hardness					No samples
Density (kg/m3)		96		55	
Water Velocity (cm/s)					No samples
TSS					No samples
NTU		2.9	0.03	0.6	
ORP (mv)				15	One sample

Feed			
Skretting			
	Max	Min	Average
Pigment	80	80	80
Fat	25	25	25
Protein	45	45	45

Smolts	
Vaccines	Forte Micro, APEX IHN, Ermogen Vibrogen II
Source	Mainstream, Ocean Farms
Genetics	Mowi

Harvest			
	kg live	kg HOG	
Total	105,837	89,961	Harvesting not started
Average Size	3.4	2.9	
% Complete	100%		

* Other mortalities includes everything that does not fit into the main mortality categories including, for example: Fish that have jumped out of the tank, fish sucked into the bottom drain, fish removed for tissue samples, inventory adjustments when a tank is emptied.

Growth

Cohort #4 was delivered at 101g average weight on May 12, 2014 and was the first group to be grown at 13C (versus 15C) from the start in order to test the impact this lower temperature would have on reducing maturation rates. It can be seen from the "Growth Curve" (under "General Production Information") that they have exhibited better growth to 500g than all previous cohorts. This is despite being grown at the lower temperature from stocking. They had demonstrated a growth rate of 1.45%/day to 500g, which is well ahead of all the others, which grew in the range of 1.28-1.38%/day to a similar size. This enhanced growth reflects a gradual improvement in growing conditions as many of the commissioning problems have been systematically resolved or improved, in particular, the murky water issue which was more recurrent in the Quarantine (Q1) system than in the Growout (GO). Although conditions in Q1 at this time were not ideal they were far better than in the past with an average for this group of 0.98 NTU while in Q1 (compared to 4.27 NTU for Cohort #3). The fish remained for over 4 months in Q1 reaching a stocking density in excess of 80kg/m3. Note that the design specification for both the quarantine and growout tanks was 75kg/m3 density.

The table below shows that once the fish were on a full ration in Q1 their appetite continued to increase and they exceeded the ration recommended by the table. Once densities approached 40kg/m3 in the Q1 tank the feed response started to slow down and the ration fed was gradually decreased and beyond 60kg/m3 the ration fed was consistently lower than that recommended by the table. However, as mentioned in Milestone Report #7, we had been consistently experiencing problems in Q1 with murky water conditions, which were eventually narrowed down to a problem with the biofilter (see "Growth" discussion for Cohort #7) and these kind of deleterious water quality conditions are without doubt important parameters influencing appetite and growth.

In fact, it is important to note that as a result of strategies implemented in Q1 to mitigate the poor water quality conditions for the next cohort, Cohort #7, we were able to maintain a much better environment in the system for longer and attained a density of 90kg/m3 with that particular cohort before the appetite of the fish declined below that of the table. This reinforces the belief that the reduction in growth that has been experienced as the density increases may be more a function of the performance of the systems and of the commissioning problems rather than a result or function of the increased densities themselves. In other words, if the system can deliver or maintain consistently good rearing conditions, increased densities may not have an impact on fish performance.

We have also observed that the size of the fish when they approach upper stocking densities is also an important consideration and that big fish (>2.5kg) are far more tolerant of high densities than small fish. For example, following grading of this cohort the large grade eventually attained a new maximum stocking density of 96kg/m3 prior to harvest with little apparent impact on the growth of these larger fish as apart from the last week (at which point they matched the recommended feed rate) they actually exceeded the recommended ration at the higher stocking levels. But it is important to also point out that as the stocking density lowered following each harvest we did observe that the appetite of the fish did increase with this cohort and others (increasing to 110-120% ration). However, similar to above and as discussed later in this report, there is the question as to whether these observations were a result of limitations in the larger GO tanks to consistently provide optimal rearing conditions for the fish at high stocking levels rather than being a biological limitation of the fish at the densities achieved.

Feed Response

Days	Temp (C^o)	Ration (Actual)	Ration (Table @ 13C)	Max Density (kg/m3)	Max Feed Load (kg/d)	Average Feed Load
17	13.7	1.30%	1.30%	16	54.0	30
33	13.4	1.60%	1.30%	27	103.0	83
15	13.6	1.30%	1.19%	41	136.0	117
26	13.1	1.10%	1.08%	60	199.0	140
36	13.1	0.80%	1.00%	80	175.0	146
12	13.5	0.70%	0.96%	88	163.0	156

Another factor that reduced growth and caused this cohort to stray from their growth curve is the change in photoperiod. We have seen with all cohorts that soon after the light regime is changed the feed rate is adversely affected for a period afterwards. From what we have seen up to this point, the duration of the response seems to be fairly consistent in that we see 3 weeks of much reduced rations with recovery starting in the 4^{th} week and generally returning to 100% ration by the end of the 4^{th} week or the start of the 5^{th} week. The severity of the response observed to date, however, would appear to be size related to some extent with the associated feeding crash being more pronounced with smaller fish (2-300g) than with larger fish (1-1.5kg).

Cohort #4 slowed down in Dec/Jan due to the change from SNP to LL on Dec 22^{nd} which caused the ration to reduce and become erratic. If their feed rate had remained consistent during the time period taken to acclimatize to the change in photoperiod, the small grade would have been 1370g. Instead they were 1134g (a drop in TGC from 2.2 to 1.7). The large grade should have been 1836g but were instead 1561g (a drop in TGC from 2.1 to 1.9). Clearly the change of light regimes was having a substantial detrimental impact on growth and for some cohorts (Oct. entry) the lights are changed twice during the production cycle.

Feeds and Feeding

An important factor that appeared to improve growth early on with Cohort #4 is the use of a transfer diet before and after entry to Q1. Following transfer to seawater there is always a critical period before the fish reach full appetite. The length of this period has a significant impact on the end result and typically varies from 8-15 weeks in the ocean net-pens. The transfer diet concept, Nutra Supreme and Spirit Supreme, are claimed to give seawater fish farms faster growing fish and more kilos of fish to harvest. Feeding salmon Nutra Supreme in the last five to six weeks before transferring the smolt to sea, and Spirit Supreme in the first five to six weeks in the sea is reported to help salmon reach full appetite much faster. In our case we have found that the time to full ration was only 17 days with Cohort #4 when fed a transfer diet whereas it was an average of 30 days with previous cohorts fed a standard diet and was 28 days for Cohort #3 grown at the same temperature (13.7C) but fed a standard diet.

Despite the challenges mentioned above which negatively impacted growth, the FCR has continued to improve with each subsequent cohort and Cohort #4 achieved the best feed conversion rate to date with an exceptional FCR of 1.03 when harvest of the cohort was complete. This is the result of optimized feeding strategies and continued efforts to improve the operating parameters.

Fish Health

These fish were delivered from the same site that usually results in severe fungal outbreaks soon after transfer. In fact these fish were visibly suffering from a chronic fungal infection pre-delivery and the day following delivery we had >500 mortalities all due to fungus. The daily mortalities continued at this rate until treatments brought it under control three weeks later. By the time the outbreak had subsided we had lost 6835 fish (16.5%). Clearly, fungal related mortalities combined with low salinity (2ppt average) represent our greatest health threat and there appears to be enormous variability in the fungus challenge and response to treatment experienced with each cohort. A new strategy was developed based on lessons learnt with various treatment protocols to date and this was successfully trialed with subsequent cohorts. Thereafter with this cohort mortalities were relatively low and included culls, fish damaged from jumping and samples taken for GSI testing. See Milestone Report #7 for information on the mortality reduction strategies.

Cataracts

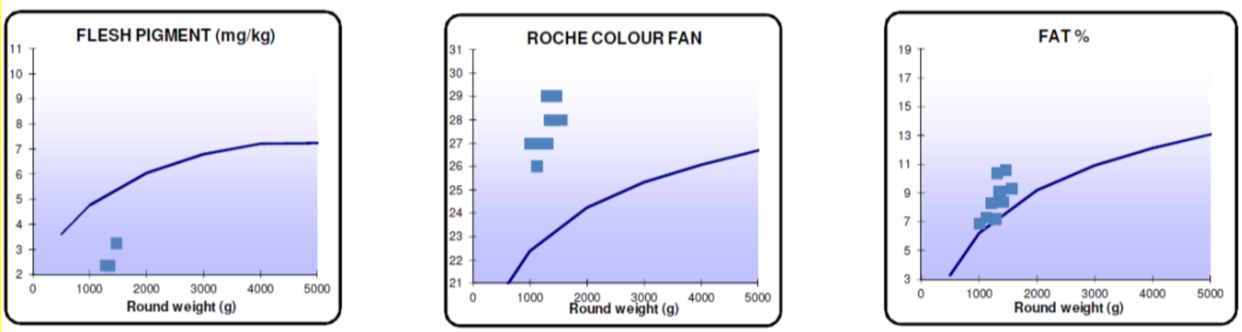
As noted earlier, data on cataracts up to this point is limited but now that it is emerging as an issue with significant apparent impacts on growth, the prevalence and progression are being monitored more closely going forward. The tank with the large grade (2437g) had 38.2% of the sample showing signs of cataracts and the average weight of the fish with cataracts was 18% smaller than the average weight of the fish without. In the final sample (2899g) before commencement of harvesting of the large grade the prevalence had increased to 59% and the average of those with cataracts was 20% smaller than those without. Harvesting of this tank began thereafter so no more data is available beyond this date for the large grade.

The tank with the small grade was sampled in April (2064g) and at that time 35.5% of the sample had cataracts and the average weight of the fish with cataracts was 11% smaller than the average weight of the fish without. The last samples taken in July (2730g) recorded prevalence of 37.5% with the afflicted fish being 12.2% smaller than the average (29.3% smaller in the case of fish with cataracts in both eyes versus 7% smaller with cataracts in one eye only). This has an obvious impact on growth and hence mitigating strategies have been implemented to attempt to alleviate the problem (see Report #7).

Flesh Quality Analysis

The results of NIR pigment analysis are shown below. Note that there is a consistent trend developing whereby the pigment NIR (NQC mg/kg) consistently reads lower than the historical results while the Roche score tends to read high. This difference has become even more pronounced since switching to Panaferd in Sept. 2014.

Fish no.	Round Weight (g)	Fish Length (cm)	Slaughter Loss %	Cond. factor (round)	Sex	Gonad Weight (g)	GSI %	Roche Colourfan score	Pigment NIR (NQC mg/kg)	EPA DHA (Total %)	Fat NIR (NQC %)
1*	1120	45.0		1.23				26.0	1.5	1.2	7.3
2	1280	49.5		1.06				29.0	2.4	1.0	7.2
3*	1560	50.5		1.21				28.0	1.6	1.4	9.3
4*	1000	45.0		1.10				27.0	1.3	1.0	6.9
5	1340	49.0		1.14				28.0	2.3	1.3	9.1
6	1460	50.0		1.17				29.0	3.3	1.5	10.6
7*	1360	47.5		1.27				28.0	1.5	1.4	9.1
8*	1210	48.5		1.06				27.0	1.6	1.3	8.3
9*	1410	47.0		1.36				28.0	1.7	1.3	8.4
10*	1310	47.5		1.22				27.0	1.4	1.6	10.4
Average	**1305.0**	**48.0**		**1.18**				**27.7**	**1.8**	**1.3**	**8.7**
St.dev.	163.7	1.9		0.10				0.9	0.6	0.2	1.3



Flesh pigment levels are compared to historical results when feeding a 75, 65, 50, 40, 30 pigment regime.

Note: * These fish read as outliers on the NIR

Maturation

Even though we used specific photoperiods aimed at reducing maturation as well as growing these fish at 13C for the same reason, this cohort demonstrated high rates of maturation with a GSI of 56% (compared to 45% experienced with the last cohort). At the time the samples were taken the validity of the GSI testing was being brought in to question since the results had been indicating that the rate of maturation was increasing with each cohort whereas evidence from observations in the tanks, grilse grading and downgrades at harvest have shown the opposite to be true. When the large and small grade were approximately 2200g and 1900g average weight respectively, visual inspection during sampling indicated that 2% and 9% were maturing whereas our previous best (Cohort #3) showed rates of 8% and

13% at the same size and this remained relatively stable right up to the grilse grade. So Cohort #4 appeared on course for exhibiting the lowest rate of maturation to date. Very soon afterwards, however, a rapid acceleration in the maturation rate was observed prompting a grilse grade at 2.9kg and 2.5kg. At that time approximately 20% of the large grade and 22% of the small grade were removed (compared to 7% for both the large and small grade of Cohort #3) which supported, on this occasion, the increase indicated by the GSI testing.

From the beginning of May and throughout the summer it became evident that we did not have the cooling capacity to maintain 13C (as the system was designed to operate at 15C) and so temperatures in the system increased and averaged 14.9C for the final 4 months of their production cycle at Kuterra. The rapid increase in visibly evident maturing individuals in the final months of this cohort can be correlated with the timing of increasing temperatures and there is the suggestion that the increase in the temperature may have acted as a trigger causing this increase in the rate of maturation. It may be therefore, that the introduction of a change in temperature may be a critical factor effecting the onset of maturation, and perhaps, could even be more influential than the temperature chosen to grow the fish. This, however, will need to be confirmed with subsequent cohorts and it should also be noted that the GSI testing indicated that the degree of maturation in this cohort was high (56%) 1 month before the temperatures started to increase in the system.

This high rate of maturation would undoubtedly have also impacted growth rates as would the fact that these fish were grown at 13C instead of 15C which has been observed to greatly impact appetite.

In contrast to previous cohorts, the maturing fish for this cohort were larger than the average population indicating that there is likely to be variability in this outcome from one population stocked to the next. Cohort 4 harvesting commenced June 15/15 and ended September 28th.

Manual Grilse Grade (Visibly Maturing)

	Date	Size (grilse)	Size (total)	Removed
Large Grade	1.6.15	3258	2931	20%
Small Grade	16.6.15	2640	2496	21.6%

Cohort #5 (1014)

Summary of Cohort 1014 to week 56

Production		
FCRb	1.19	
FCRe	1.42	
TGC (lifecycle)	1.35	
SGR (lifecycle)	0.73%	
Average Condition	1.27	
Current Biomass (mt)	26.3	
Total Production (mt)	68.1	harvested+ current- smolt biomass
Smolts stocked (#)	45,163	
Current Inventory (#)	14,302	
Current Size (kg live)	1.8	
Smolt Size (gm)	101	

Mortality & Fish Health				
	#	%		Percent of start number
Fungus	1,878	4.2%		
Other	456	1.0%		* See note below
Culls	106	0.2%		
NVM	542	1.2%		No Visible Marks
Adjust.	863	1.9%		Count adjustments
Total #	3,842	8.5%		
Total Losses		2.4%	1666 kg	Percent of total production
Treatments				No antibiotics, salt

Weekly Average Water Quality		Max	Min	Average	
Temperature	C	16.4	12.3	14.1	
TAN	mg/l	1.93	0.10	0.87	
Nitrite	mg/l	1.47	0.01	0.15	
Nitrate	mg/l	227	11	73	
Oxygen	mg/l	12	7	9	
CO2	mg/l	28	4	14	
Salinity		7.1	1.4	4.5	
Alkalinity		145	30	83	
Hardness					No samples
Density (kg/m3)		81		36	peak daily was 22kg/m3
Water Velocity (cm/s)					No samples
TSS					No samples
NTU		2.2	0.01	0.5	
ORP (mv)					No samples

Feed			
Skretting			
	Max	Min	Average
Pigment	80	80	80
Fat	25	25	25
Protein	45	45	45

Smolts	
Vaccines	Forte Micro, APEX IHN, Ermogen Vibrogen II
Source	Mainstream, Ocean Farms
Genetics	Mowi

* Other mortalities includes everything that does not fit into the main mortality categories including, for example: Fish that have jumped out of the tank, fish sucked into the bottom drain, fish removed for tissue samples, inventory adjustments when a tank is emptied.

Harvest			
	kg live	kg HOG	
Total	46,220	39,287	Harvesting not started
Average Size	1.7	1.5	

Growth

Cohort #5 was delivered at 98g average weight on October 27, 2014 from the same hatchery as Cohort #2. As experienced before with fish from this site, they tend to have excellent fin condition with few signs of fin erosion and low size disparity and this, when combined with the seasonal peak salinities in the source water at the time of entry (>6ppt), meant we had negligible mortalities (0.5%) for the entire period in Quarantine.

This cohort has experienced less commissioning issues so far than the previous cohorts but has not been able to avoid them entirely – the conditions experienced by this cohort in the quarantine system were the best of all the cohorts to date with an average turbidity in Q1 of 0.34 NTU but we did still have periods of murky water with turbidity elevated and peaking at 0.88 NTU. This was due to waste accumulating on the tank floor and also in the sump in the centre of the tank (confirmed by surges of extremely dirty water when the mort removal mechanism was activated and by operating a remotely operated vehicle in the tank with a camera attached) as well as problems with fluidization in the biofilter. Some of the impacts associated with this were reduced in the short term by using more exchange in the system as well as by removing the centre drain standpipe and by vigorous agitation of the sump in the tank until it was clear using the air from the mort removal mechanism. Despite these issues we were able to manage the situation such that these fish experienced good overall conditions for the majority of their time in Q1 which was helped further by the fact that this cohort spent a short duration in the quarantine system as they were delivered on October 27th but had to be removed again soon after to make way for the January entry.

Cohort #5 showed very good appetite and feed response in Q1 up until they reached a density of 40-50kg/m3 and a peak feed load of 170kg/day at which point feeding reduced and became more erratic. The change in the feeding behavior in Q1 was correlated with a change to 24 hour lighting. As mentioned earlier, typically after the light regime is changed the feeding is impacted for 3-4 weeks afterwards. In the case of this cohort, the change in photoperiod seemed to have a more severe response than we had experienced before resulting in the ration dropping from a peak of 170kg/day to an average of 60kg/day for three weeks before rapidly picking up again. This, of course, will affect the growth curve for this cohort. This cohort was subjected to another photoperiod change from the 8^{th} of June using a newly devised strategy. This strategy took approximately 4 weeks to complete and involved 15 min incremental changes each day until the desired photoperiod duration was attained. While the level of feeding actually increased throughout the implementation period, approximately two weeks after the changes were complete the feeding did reduce in both grades of this cohort.

The magnitude of the feed reduction showed a correlation with density – the most heavily stocked tank subjected to a change in photoperiod (>90kg/m3, Cohort #6) saw a reduction to about 40% ration as a result of the light regime change while the large grade of this cohort (65kg/m3) saw a drop in feeding to about 60% ration. In the small grade (stocked at 50kg/m3) the reduction was much lower initially (only a 7% reduction in feeding). However, the appetite for the small grade did continue to reduce over several weeks and eventually fell to a low of about 60% ration. Unlike that observed previously, the reduction in appetite in this case lasted for an extended period of 7-8 weeks in the two heavier stocked tanks before it began to pick up again. This decline in feed rate combined with the reduction resulting from the first photoperiod change with this cohort has greatly impacted the growth performance (by up to 40%). As a result, we have decided to discontinue this particular approach to photoperiod manipulation for the time being but will continue to test the impacts of different regimes on our fish going forward but not to change the regime midstream.

The timing of the crash in feeding levels is synchronized quite consistently only across the tanks affected by the light regime changes while those tanks where the photoperiod was not changed were unaffected. This has been observed quite consistently to date with all cohorts put through the system and would suggest that the change in photoperiod instigated the crash in feeding observed in this and preceding cohorts. However, there does appear to be some interplay with density. As mentioned above, the severity of the initial crash in feeding appears to be correlated with density but all the cohorts up to this point did eventually show an improvement in feeding and an eventual return to 100% ration despite the densities continuing to increase in the tanks as the fish continued to grow. This would almost seem to diminish the role that increasing densities plays in hindering appetite or at least points to some degree of acclimatization since one would expect to see the feeding reduce further if increasing densities were adversely impacting the fish. However, we have also observed with this cohort that the return to full appetite may, in fact, also be influenced by density or some environmental parameters associated with density - the large grade of this cohort had to be harvested early as a result of space constraints due largely to the increase in survival rates at Kuterra and we noticed that the increase in appetite accelerated as fish were removed from the tank following each harvest period.

Feeds and Feeding

These fish were fed a transfer diet before and after entry and they achieved 100% appetite in less than 19 days post-delivery.

Fish Health

As indicated above, the only significant losses to date were experienced over 8 weeks which coincided with falling salinities. Fungus mortalities started to appear at ≤ 3.7ppt and this was exacerbated by a 3 week shut down of our higher salinity 6" well due to a mechanical failure. In fact, the majority of mortalities (2.3%) in this cohort to date occurred throughout this 8 week period during which time the fish were acclimatizing to a change in the photoperiod regime, the density had increased beyond 45kg/m3 and the salinity dropped to as low as 1.4ppt. While the density cannot be ruled out as a stressor especially for this size range of fish (350-600g), it is unlikely to be the main one or at the very least the fish may have the ability to acclimatize to such conditions. This is because approximately two weeks after the higher salinity 6" well was brought back online the salinity had increased from 1.2 to 5.4ppt and within three weeks the mortalities declined to very low numbers and the appetite of the fish improved despite the densities continuing to increase and eventually reaching 80kg/m3 prior to grading. It is likely that the change in photoperiod was the biggest stressor and if salinity could be maintained at >4.5ppt, then opportunistic fungal outbreaks would likely have not occurred to anywhere near the same extent.

Cataracts

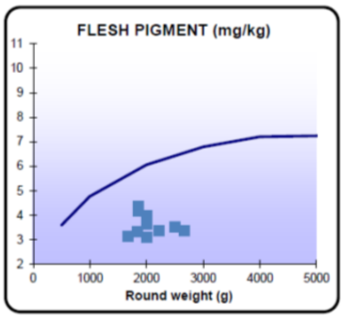
Final sampling of these fish indicated that 52.7% of the population in the large grade (1547g approx.) were recorded as having cataracts and these fish were 4.8% smaller than the average. Those with cataracts in both eyes (rather than just one eye) were 8.1% smaller than the average whereas those with cataracts in one eye only were 2.6% smaller. The small grade (1468g) had 26% with cataracts and they were 6.3% smaller than the average. Those with cataracts in both eyes were 8.3% smaller than the average whereas those with cataracts in one eye only were 5.9% smaller.

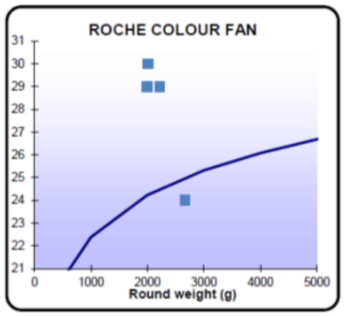
Flesh Quality Analysis

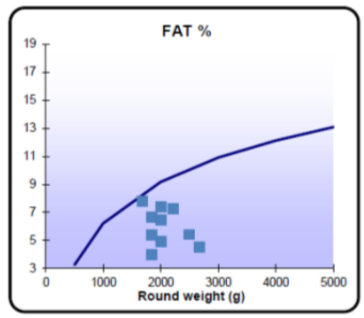
The results of NIR pigment analysis are shown below.

1014 – Large Grade

Fish no.	Round Weight (g)	Fish Length (cm)	Slaughter Loss %	Cond. factor (round)	Sex	Gonad Weight (g)	GSI %	Roche Colourfan score	Pigment NIR (NQC mg/kg)	EPA DHA (Total %)	Fat NIR (NQC %)
1	2000	51.0		1.51				29.0	3.1	5.1	4.92
2	2220	54.0		1.41				29.0	3.4	7.6	7.25
3	2010	53.0		1.35				30.0	4.0	6.8	6.45
4	1850	52.0		1.32				34.0	4.4	5.6	5.35
5*	1840	50.0		1.47				33.0	3.3	4.1	3.95
6	2670	60.0		1.24				24.0	3.4	4.7	4.54
7	2500	59.0		1.22				32.0	3.5	5.7	5.41
8	1680	50.0		1.34				32.0	3.1	8.1	7.81
9	1850	50.0		1.48				33.0	4.2	6.9	6.67
10	2000	53.0		1.34				32.0	3.6	7.7	7.41
Average	**2062.0**	**53.2**		**1.37**				**30.8**	**3.6**	**6.2**	**6.0**
St.dev.	313.0	3.6		0.10				2.9	0.4	1.4	1.3





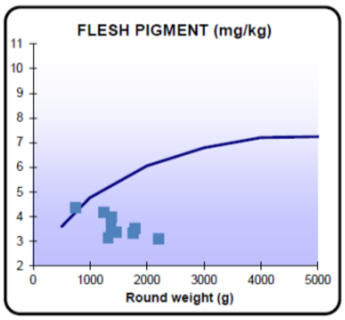


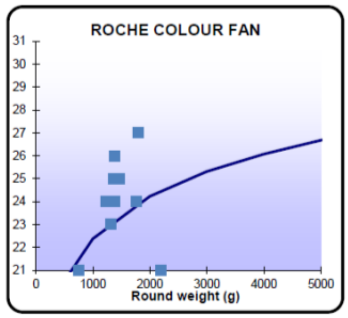
Flesh pigment levels are compared to historical results when feeding a 75, 65, 50, 40, 30 pigment regime.

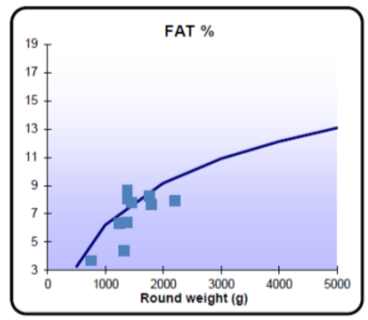
Note: Fish 5 was flagged as an outlier by the NIR. The result is included in the above table but should be read with caution.

1014 – Small Grade

Fish no.	Round Weight (g)	Fish Length (cm)	Slaughter Loss %	Cond. factor (round)	Sex	Gonad Weight (g)	GSI %	Roche Colourfan score	Pigment NIR (NQC mg/kg)	EPA DHA (Total %)	Fat NIR (NQC %)
1	2200	53.0		1.48				21.0	3.1	8.3	7.94
2	1460	46.0		1.50				25.0	3.4	8.1	7.76
3	1380	46.0		1.42				26.0	4.0	8.4	8.07
4*	750	43.0		0.94				21.0	4.4	3.7	3.67
5	1760	48.0		1.59				24.0	3.3	8.6	8.23
6	1380	45.0		1.51				24.0	3.4	9.0	8.67
7	1800	51.0		1.36				27.0	3.5	7.9	7.63
8	1320	45.0		1.45				23.0	3.1	4.6	4.39
9	1240	44.0		1.46				24.0	4.2	6.6	6.31
10	1370	45.0		1.50				25.0	3.6	6.7	6.38
Average	**1466.0**	**46.6**		**1.42**				**24.0**	**3.6**	**7.2**	**6.9**
St.dev.	386.7	3.2		0.18				1.9	0.4	1.8	1.7







Flesh pigment levels are compared to historical results when feeding a 75, 65, 50, 40, 30 pigment regime.

Note: Fish 4 was flagged as an outlier by the NIR. The result is included in the above table but should be read with caution.

Maturation

GSI testing indicated that 12% of the population was maturing. This low number was supported by observations made during average weight sampling which on the most recent sample recorded only about 6% of the population as showing visible signs of maturation. Cohort #3 (0114) also displayed a relatively low rate of maturation (approximately 11% removed during a grilse harvest) and they were also subjected to the same photoperiod regime (which for both cohorts involved changing twice during the production cycle at Kuterra). It is possible, therefore, that the regime used may have contributed to the low rate of maturation.

Several more replicates (cohorts grown under the same conditions) would be needed to confirm this theory, however, but due to the detrimental impacts this regime had on growth of the fish it is unlikely to be tested again in the future. It should also be noted that we started harvesting these fish at a small size (1700g approx.) due to space constraints so it is unknown whether the maturation rate would have accelerated in the final stages of the production cycle which has often been the case with the other cohorts. No data is available on a grilse harvest on this cohort for the same reason - they had to be harvested early.

Cohort #6 (0115)

Summary of Cohort 0115 to week 45

Production		
FCRb	0.92	
FCRe	0.95	
TGC (lifecycle)	1.72	
SGR (lifecycle)	0.92%	
Average Condition		no samples
Current Biomass (mt)	88.4	
Total Production (mt)	83.6	harvested+ current- smolt biomass
Smolts stocked (#)	45,340	
Current Inventory (#)	43,713	
Current Size (kg live)	2.02	
Smolt Size (gm)	106	

Mortality & Fish Health				
	#	%		Percent of start number
Fungus	151	0.3%		
Other	604	1.3%		* See note below
Culls	449	1.0%		
NVM	389	0.9%		No Visible Marks
Adjust.	0	0.0%		Count adjustments
Pre	1	0.0%		
Total #	1,627	3.6%		
Total Losses		1.3%	1057 kg	Percent of total production
Treatments				No antibiotics, salt

Weekly Average Water Quality		Max	Min	Average	
Temperature	C	16.4	11.8	14.4	
TAN	mg/l	1.93	0.10	0.92	
Nitrite	mg/l	1.47	0.02	0.19	
Nitrate	mg/l	201	18	70	
Oxygen	mg/l	11	7	9	
CO2	mg/l	28	7	15	Peak daily was 10mg/l
Salinity		9.7	1.4	4.1	
Alkalinity		120	30	81	
Hardness					No samples
Density (kg/m3)		114	19	30	peak daily was 22kg/m3
Water Velocity (cm/s)					No samples
TSS					No samples
NTU		1.8	0.12	0.5	
ORP (mv)					No samples

Feed			
Skretting			
	Max	Min	Average
Pigment	80	80	80
Fat	25	25	25
Protein	45	45	45

Smolts	
Vaccines	Forte Micro, APEX IHN, Ermogen Vibrogen II
Source	Mainstream, Ocean Farms
Genetics	Mowi

Harvest	kg live	kg HOG	
Total	0	0	Harvesting not started
Average Size			
% Complete	0%		

* Other mortalities includes everything that does not fit into the main mortality categories including, for example: Fish that have jumped out of the tank, fish sucked into the bottom drain, fish removed for tissue samples, inventory adjustments when a tank is emptied.

Growth

Cohort 0115 was transferred to the facility at 106g average weight on January 16, 2015. This cohort experienced generally good water quality conditions during their time in Q1. At the start, however, we were still experiencing problems with waste accumulation in the tank and in the tank sump which caused turbidity to rise at times peaking at 1.20 NTU. After approximately 5 weeks, we were largely able to eliminate the problem of waste collecting in the sump. This was achieved by increasing the flow to the tank, by diverting it from the biofilter, and by installing a modified inlet manifold in the tank that directed more flow towards the centre. These changes, combined with ozone injection, allowed us to achieve an average turbidity of about 0.43 NTU (for comparison, Cohort #3 experienced an average of 4.37 NTU during it’s time spent in Q1). Note, however, that just like all the other cohorts in the Q1 system these fish also hit a bottleneck where the feeding crashed, in this case when the fish were at a density of 42kg/m3 and a feed load of 168kg feed/day. At that point it was becoming increasingly difficult to maintain the desired turbidity levels (peaking at 1.79 NTU) despite using increasing volumes of ozone and exchange and this reduction in feeding would have undoubtedly impacted the growth performance of the fish.

The water quality started to deteriorate at about the same time as the reduction in feeding which was traced, at least in part, to insufficient fluidization in the biofilter. It was believed at the time that this was a result of the flow being diverted to the tank to improve its self-cleaning capacity. This tactic was reversed to some extent by returning the flow back to the biofilter and attempting to find a balance whereby waste does not accumulate in the tank sump as it did previously and at the same time the biofilter is sufficiently fluidized. This approach did not result in improved turbidity during the remainder of their time in Q1 and it was confirmed later that the biofilter in Q1 was not fluidizing properly as a result of insufficient holes in the desired locations on the biofilter manifold (established when the biofilter was completely emptied of sand – this issue was resolved for Cohort #8).

It should also be noted that a problem with solid waste accumulation in the CO2 stripper sump was discovered a few months earlier when Cohort #5 was removed and we emptied the system of water to do a repair. It was thereby felt that this particular issue may have been contributing to the murky water (e.g. a leachate or solids emanating from the material collecting in the CO2 stripper sump at a certain feed load or bacterial proliferation as a result of the waste accumulation). As such, once we had sufficient time to carry out modifications (when Cohort #6 was removed), the water in the sump was drained to carry out these changes to the manifolds in the base of the sump to try and prevent this waste from accumulating.

Another potential factor we considered is that there may be significant volumes of waste sitting on the floor of the tank despite increasing the flow and changing the inlet manifold. This would result in nutrients dissolving into the water and can contribute to bacterial propagation. To minimize this risk the mort screen in the base of the tank was removed and additional holes drilled to facilitate movement of waste solids toward the sump and effluent. Subsequent filming with a submerged camera indicated that this approach along with the changes mentioned above were successful in preventing this buildup of solids on the floor of the quarantine tank.

Similar to Cohort #5, these fish were subjected to a photoperiod change from the 8th of June using a newly devised strategy explained in the Early Maturation Strategy section of this document. This strategy took approximately 4 weeks to complete and while the level of feeding actually increased throughout the implementation period, approximately two weeks after the changes were complete the feeding did crash in this tank. The severity of the change on fish appetite was greater in this tank than that of the other tanks which, as indicated earlier, could be correlated with density and the fact that this tank was more heavily stocked than the others (>90kg/m3 versus 65 & 50kg/m3 in the other two tanks subjected to the same photoperiod change).

A final point to mention in relation to growth is that it took more than twice as long to get these fish on to a full ration (see notes below on "Feed and Feeding") than previous cohorts. Any growth gains or losses with small fish are important as they tend to be maintained throughout the production cycle so taking longer to get to 100% ration will have some negative impact on their growth curve.

Feeds and Feeding

We have noticed that the prophylactic treatment used for this cohort to prevent fungal mortalities appeared to impact the time taken to get the smolts to 100% ration. For example, it can be seen from the table below that it took this cohort 40 days to reach 100% ration when operating in the range of 9.7ppt to 3.7ppt (average 7.5ppt & 13.1C) whereas with Cohort #5 they were on 100% ration in just 19 days when operating in the range of 6.6ppt to 5.8ppt (average 6.3ppt & 12.9C).

Time Taken to Reach 100% Ration Following Delivery to Site

Cohort	Days	Temp (C°)	Average Salinity (ppt)	Min Salinity (ppt)	Max Salinity (ppt)	Standard Deviation	Diet
0313	25	11.1	5	3.1	8.4	3.7	Standard
1013	38	11	3.8	2.9	4.9	1.4	Standard
0114	28	13.7	5.5	5	5.8	0.6	Standard
0514	17	13.7	2.2	2	2.4	0.3	Supreme
1014	19	12.9	6.3	5.8	6.6	0.6	Supreme
0115	40	13.1	7.5	3.7	9.7	4.2	Supreme

Both cohorts received the Skretting Supreme transfer diet before and after transfer and so it is speculated that the higher salinity at the start may have been the cause for the delay. There could also be a correlation with how stable the salinity is during this time period. So operating at a reduced salinity of 6ppt and maintaining that salinity as consistently as possible may both be important factors in influencing the time to 100% ration. We tested this approach with Cohort #7 (0415).

Fish Health

As indicated above, fungal outbreaks with fish from one supplier during the first 6-8 weeks in Q1 resulted in heavy mortalities especially when the salinity levels in the production wells are low (<4.5ppt). For this cohort we implemented a new strategy whereby we raised the salinity of the Q1 system to 9.5ppt and allowed it to fall very gradually to 3.7ppt over 5 weeks (average of 7.5ppt over that period). This prophylactic treatment has proven extremely successful as instead of experiencing up to 17% mortalities in the first 6 weeks, this cohort went through this high risk period and with just 1% total mortalities - 0.3% due to fungus.

Cataracts

The last samples taken indicated that 39.3% of the population have cataracts and those fish with cataracts are 7.8% smaller than those without. Those with cataracts in two eyes were 11.6% smaller than the average while those that had cataracts in one eye only were 6.1% smaller than the average.

Maturation

N/A – not yet sampled.

Cohort #7 (0415)

Summary of Cohort 0415 to week 32

Production		
FCRb	1.04	
FCRe	1.87	
TGC (lifecycle)	2.01	
SGR (lifecycle)	1.14%	
Average Condition		no samples
Current Biomass (mt)	29.5	
Total Production (mt)	24.5	harvested+ current- smolt biomass
Smolts stocked (#)	39,840	
Current Inventory (#)	17,654	
Current Size (kg live)	1.67	
Smolt Size (gm)	125	

Mortality & Fish Health	#	%		
				Percent of start number
Fungus	579	1.5%		
Other	333	0.8%		* See note below
Culls	937	2.4%		
NVM	512	1.3%		No Visible Marks
Adjust.	2,512	6.3%		Count adjustments
Pre	2	0.0%		
Total #	4,875	12.2%		
Total Losses		6.2%	1516 kg	Percent of total production
Treatments				No antibiotics, salt

Weekly Average Water Quality		Max	Min	Average	
Temperature	C	16.4	12.0	15.0	
TAN	mg/l	7.34	0.26	1.37	
Nitrite	mg/l	1.47	0.03	0.35	
Nitrate	mg/l	202	1	68	
Oxygen	mg/l	11	7	9	
CO2	mg/l	23	8	13	Peak daily was 10mg/l
Salinity		7.3	1.4	4.5	
Alkalinity		145	80	113	
Hardness					No samples
Density (kg/m3)		102	20	46	
Water Velocity (cm/s)					No samples
TSS					No samples
NTU					
ORP (mv)					No samples

Feed	Max	Min	Average
Skretting			
Pigment	80	80	80
Fat	25	25	25
Protein	45	45	45

Smolts	
Vaccines	Forte Micro, APEX IHN, Renogen
Source	Marine Harvest, Big Tree Creek
Genetics	Mowi

Harvest	kg live	kg HOG	
Total	0	0	Harvesting not started
Average Size			
% Complete	0%		

* Other

Growth

Cohort #7 was transferred to the facility from a new source on April 20, 2015 at an average weight of 125g. Work had been carried out on the CO2 stripper sump in Q1 prior to the delivery in an attempt to reduce the accumulation of sludge previously observed in this part of the system. This involved strategically drilling holes in the pipe manifold at the bottom of the CO2 stripper sump and required that the biofilter be taken off line (no fluidization) for approximately 8 hours. This was not the first time we had completely emptied the sump to carry out maintenance but the extended period of downtime on this occasion meant that when we brought the biofilter back online that biofloc persistently emanated from the biofilter. This continued for many weeks afterwards causing murky water conditions (max of 4.1NTU).

Upon closer examination of the biofilter in Q1 we found that there were a number of areas at the bottom where sand was not fluidized and was gathering in mounds rising toward the walls to a depth of approximately 2 feet. An analysis of the flow rates on each of the biofilter laterals (all valves 100% open) using a flow meter found that the laterals where sand was most inclined to accumulate had an average flow rate of only 284lpm compared to an average of 475lpm for the others. Several attempts were made to correct this using the valves as well as by diverting flow from the tank to the biofilter to increase fluidization but there was a limit to how much could be diverted from the tank due to the accumulation of waste in the Q1 tank sump as previously noted.

Each time we made an adjustment or change like this we noticed that the quantity of biofloc leaving the biofilter increased, almost certainly due to the change in the flow dynamics of the fluidized sand created each time we made a change in flow to the biofilter cell. Repeated failed attempts to prevent dead areas of sand using the flow from the tank led to the decision to increase the overall flow to the system by bringing online a centrifugal pump that had been installed in Q1 in the beginning of the project when we were contending with faulty pumps in the quarantine system. We also directed all of our surplus heat from the mechanical room into the Q1 unit and vented a greater proportion of the CO2 stripped air back inside the Q1 building in order to maximize the heat load such that the maximum possible water exchange (which, at 10C, would strive to lower the system temperature) could be used to alleviate the murky conditions without lowering the temperature below the 15C optimum (maximized feeding at this temperature was also contributing to the heat load).

These tactics along with the use of increased flow capacity, the install of drop-down pipes to the remaining trouble areas in the biofilter (1" pipes directing flow toward the remaining areas of dead sand), a lengthening of the siphon pipe to improve removal efficiency of old biofloc, an increase in the depth of the Q1 tank to reduce waste accumulation in the tank sump, increased tank turnover and the use of higher ozone flows, over a period of weeks contributed to the stabilization of the biofilter and a gradual improvement to excellent water quality conditions. The consequent optimization of the fishes rearing environment for a longer period than achieved previously in Q1 and the fact that we decided not to change the photoperiod (continuous light) meant that we were able to attain record feed loads (272kg/day when previously 160-170kg feed/day was the max we could achieve in Q1 before a marked slowdown in performance) and record stocking densities.

Indeed, even beyond a density of 80kg/m3 the water clarity continued to improve (0.4NTU @ 250kg/day) as did the appetite of the fish and it is only when the density approached 90kg/m3, the turbidity started to increase again, ammonia and nitrite levels were increasing and it was getting increasingly difficult to maintain steady oxygen levels across the tank, that we saw a reduction in the appetite of the fish. This observation and the fact that better water quality conditions this time in Q1 meant that we were able to attain much higher densities before we detected any adverse effects would suggest that the density that you can grow the fish at (within reason) in this system is largely determined by how efficient the system is at removing metabolites, removing suspended solids, adding oxygen, etc., and maintaining optimal stable conditions across the tank.

Further to this we also observed that when this cohort of fish was moved from Q1 to one 500m3 GO tank they were only able to achieve a density of 75kg/m3 before the appetite started to reduce. This was surprising considering that these were the very same fish except that they were even bigger (950g approx. versus 500g when we grew them to 90kg/m3) which from previous experience at Kuterra one would expect them to be even more tolerant of density than at a smaller size. But upon reflection we can point to some fundamental differences between the GO tank and the Q1 tank which may explain this discrepancy - the install of the centrifugal pump on Q1 to boost the flow meant that the turnover rate in that tank was only 23 minutes in comparison to 45 minutes in the GO tank. Also, the aeration device installed in Q1 was the same size unit as on the GO tanks even though the Q1 tank is half the volume. Consequently the Q1 tank environment was more homogenous due to better mixing of the water, had lower CO2 levels (10mg/l versus > 20mg/l in the GO tank) and higher and more stable oxygen levels across the tank than the GO tank experienced. As such, this would seem to support the finding above that having the ability to create consistent and optimal conditions across the rearing environment will likely have a large bearing on the threshold densities that can be achieved with Atlantic salmon grown in these kinds of systems and this may become an increasingly important consideration as the size of the rearing tanks continues to increase markedly.

Feeds and Feeding

As noted above, these fish were transferred from a new location and the husbandry conditions experienced by the fish were, in some respects, quite different to what they experienced when they arrived at Kuterra. For example, the source hatchery used a stationary feeder that dropped the feed in one location of the tank whereas at Kuterra we use a spreader which spins and distributes feed over the entire circumference of the tank. This was observed to startle the fish for the first couple of weeks until they got used to it.

Another example is that the lights used at Kuterra are submerged lights whereas the source hatchery used overhead lights. They are also coming from a tank where the fish are very much sheltered from surrounding activity by a canopy that completely encloses the tank, plus there is virtually no noise. In the Q1 system the fish are more exposed to activities outside the tank and noise levels from the pumps, blowers and other equipment are higher than they were accustomed to at the source site. All of these are just some examples of conditions the fish need to acclimatize to when they are first delivered to the Kuterra site and thereby influence the time to 100% ration.

Despite these challenges, it can be seen from the table below that it took this cohort just 25 days to reach 100% ration. This was achieved while operating in a narrow salinity range (6.5 ± 0.6 ppt) and average temperature of 13.2C. This is a vast improvement on Cohort #6 which took 40 days to get to 100% ration at the same temperature (and also using a transfer diet) but with a much greater salinity range (±4.2ppt). This would suggest that, along with the use of the transfer diet, maintaining stable salinity conditions during the first 3-4 weeks is an important factor in reducing the time to 100% ration. This, in turn, has positively impacted the growth curve of this cohort and helped to put them on a trajectory that far surpasses all of the other cohorts put through the quarantine system to date. This can be further improved upon in the future once the facility has an onsite hatchery linked to the smolt tank such that the smolts are exposed to the same conditions they have experienced all their lives while providing the operator with the ability to gradually change key parameters in that tank as appropriate (e.g. salinity).

Time Taken to 100% Ration Following Delivery to the Site

Cohort	Days	Temp (C^{o})	Average Salinity (ppt)	Min Salinity (ppt)	Max Salinity (ppt)	Standard Deviation	Diet
0313	25	11.1	5	3.1	8.4	3.7	Standard
1013	38	11	3.8	2.9	4.9	1.4	Standard
0114	28	13.7	5.5	5	5.8	0.6	Standard
0514	17	13.7	2.2	2	2.4	0.3	Supreme
1014	19	12.9	6.3	5.8	6.6	0.6	Supreme
0115	40	13.1	7.5	3.7	9.7	4.2	Supreme
0415	25	13.2	6.5	5.9	6.8	0.6	Supreme

It is also expected that operating at 15C with future cohorts in Q1 rather than 13C as soon as possible after delivery of the smolts (while carefully monitoring fungus which is more prolific at higher temperatures) should significantly reduce this time and so maximize growth performance further. In fact, following the first three weeks, and with clear indications that the strategies undertaken to attain higher salinities were successful at subduing fungus, it was decided to take the temperature from its average up to that point of 13C and increase it such that they would be grown at 15C thereafter. This significantly enhanced the appetite of the fish and this combined with the improvements made to optimize water quality conditions and the fact that we did not change the photoperiod, have all contributed to the far superior growth shown by this cohort compared to all the cohorts put through the system to date.

Fish Health

For this cohort we were again able to maintain salinity at a level that gave excellent control over fungal mortalities (1.3% fungal mortalities by the time they were through the high risk period in Q1). We also had the use on this occasion of well water from the higher salinity 6" well rather than continually adding industrial salt to artificially raise the salinity. This has obvious cost saving implications but more importantly for Kuterra, which has a generally soft water supply, raising the salinity in this way allows for an increase in key minerals and trace elements that play an important role in fish physiology (e.g. calcium) and which may be low under very low salinity conditions at the Kuterra site or not present to the same extent when using industrial salt. This could also be playing an important role allowing us to sustain a strong appetite in Q1 with this cohort and thereby feeding at record levels. This strategy of managing salinity and applying higher levels where needed has proven highly successful with both cohort 6 & 7 (and also cohort #8) so it is expected that fungal mortalities will represent a greatly diminished challenge for the Kuterra facility going forward.

As noted above, salinity plays several roles regarding fish health. Recent studies both at UBC's INseas project and at NOFIMA indicate that optimal salinity for fish growth is likely around 14ppt. It may also play a significant role in reducing early maturation, although the evidence to date is strictly anecdotal. For all of these reasons, the addition of a saltier well is being evaluated.

Cataracts

Final sampling of these fish indicated that 17.3% of the population (ungraded average of 1131g approx.) were recorded as having cataracts and these fish were 16.6% smaller than the average. Those with cataracts in both eyes (rather than just one eye) were 24.8% smaller than the average whereas those with cataracts in one eye only were 9.6% smaller. While all the other cohorts monitored have generally shown a marked increase in the prevalence of cataracts over time, the last two data sets for this cohort have shown fairly stable values (16% prevalence recorded in the previous sample for this cohort). The incidence of cataracts is also low by comparison to others e.g. Cohort #6 had 39% cataracts at a similar size, which may be an indication that the strategies implemented to mitigate the condition (reduced CO_2 levels, higher salinity improving the availability of key minerals and trace elements and the inclusion of a supplementary mineral pack in the diet) may be having a positive impact. But it is too early at this point and the fish too small to speculate on the final outcome of this cohort and several replicates will be required thereafter to confirm the consistency of any significant improvements achieved as a result of these strategies.

Maturation

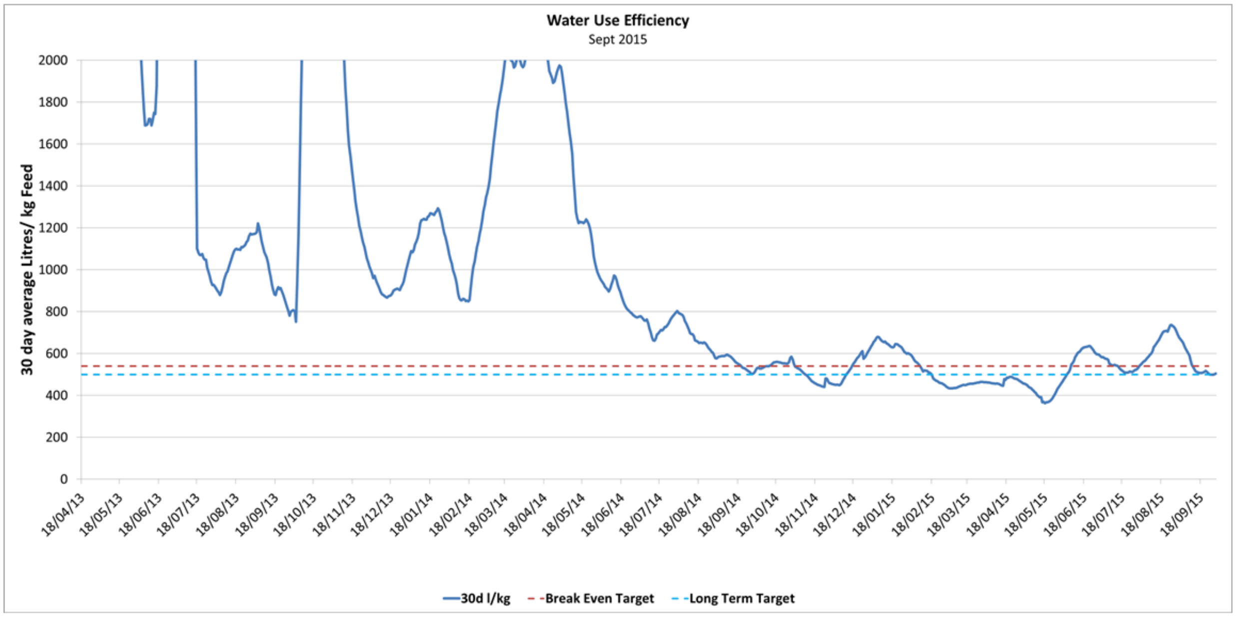
N/A – not yet large enough to sample.

Production Summary

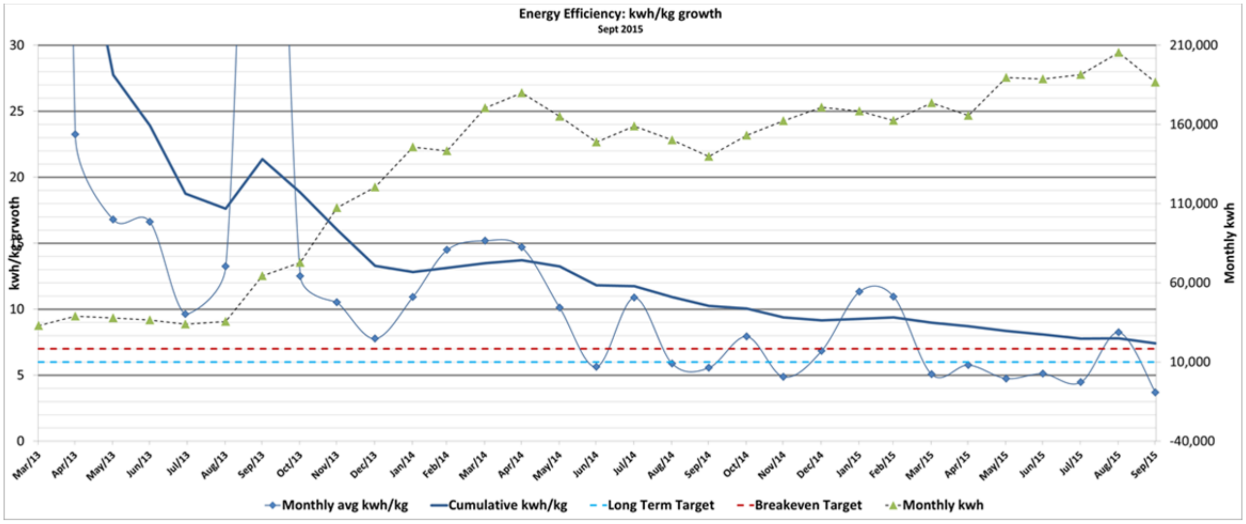
Cohort (month/Year) =>	0313	1013	0114	0514	1014	0115	0415	1045	Totals/Averages		Budget
									Completed Cohorts	All Groups	
Production											
FCRb	1.25	1.12	1.08	1.03	1.19	0.92	1.04	0.90	1.12	1.07	1.05
FCRe	1.43	1.17	1.32	1.15	1.42	0.95	1.87	0.90	1.27	1.28	1.08
TGC (lifecycle)	1.5	1.5	1.6	1.7	1.4	1.7	2.0	0.8	1.57	1.52	2.50
SGR (lifecycle, %bw/d)	0.7%	0.7%	0.7%	0.8%	0.7%	0.9%	1.1%	0.7%	0.01	0.8%	
Average Condition	1.23	1.18	1.20	1.25	1.27				1.22	1.23	
Current Biomass (mt live)	0	0	0	0	26	88	30	5	0	149	
Total Production (mt live)	58	72	80	102	68	84	25	1	313	490	
Smolts stocked (#)	23,503	33,723	40,210	41,387	45,163	45,340	39,840	40,136	34,706	44,186	
Current Inventory (#)	0	0	0	0	14,302	43,713	17,654	40,117	0	115,786	
Mortality & Fish Health (% of start number)											
Fungus	9.7%	2.6%	18.5%	17.5%	4.2%	0.3%	1.5%	0.0%	12.1%	6.8%	
Other	6.2%	1.1%	2.4%	1.8%	1.0%	1.3%	0.8%	0.0%	2.9%	1.8%	
Culls	3.3%	3.0%	1.5%	1.2%	0.2%	1.0%	2.4%	0.0%	2.2%	1.6%	
NVM	3.9%	3.1%	4.2%	2.0%	1.2%	0.9%	1.3%	0.0%	3.3%	2.1%	
Adjust.	1.2%	2.9%	1.9%	1.8%	1.9%	0.0%	6.3%	0.0%	1.9%	2.0%	
Total Number	24.1%	12.7%	28.5%	24.3%	8.5%	3.6%	12.2%	0.0%	22.4%	14.2%	7.0%
Mort Biomass (mt)	8.8	4.7	14.7	6.2	1.7	1.1	1.5	0.0	34.5	38.7	
(% of prod.)	15%	7%	18%	6%	2%	1%	6%	0%	11%	8%	3.0%
Early Maturation	100%	41%	*42%*								
Harvest											
Total (kg HOG)	50,071	62,550	71,545	89,961	39,287	0	0	0	274,126	313,413	400,000
Average Size (kg HOG)	2.7	2.1	*2.8*	3.4	1.5	0.0	0.0	0.0	2.8	2.5	3.7
Total Feed (kg)	83,305	84,650	105,777	116,903	96,496	79,200	16,346		390,635	582,677	
Water Quality											
Temperature	14.3	13.9	14.0	13.7	14.1	14.4	15.0	14.3	14.0	14.2	15.0
CO2 (mg/l average)	15	14	16	14	14	11	13	0	15	12	12 -15
Salinity (ppt average))	3	2	4	3.6	2.4	7.4	4.5	4.7	3.2	4.0	6 - 8
Total Ammonia -N (mg/l average)	0.6	0.69	0.75	0.79	0.72	0.39	1.37	3.62	0.7	1.1	2.6
Nitrate-N (mg/l average)	58	115	122	126	75	53	68	0	105	77	75
Nitrite-N (mg/l average)	0.46	0.26	0.21	0.11	0.03	0.06	0.35	0.13	0.3	0.2	0.3
Alkalinity (mg/l average)	29	52	54	64	79	85	113	70	50	68	120

Engineering and Environment

Water Use- Production Facility					
Total (m3/day)	2,385	482	2,014	183,255	Includes purge overflow
Total (lpm)	1,656	335	1,383	127,260	Includes purge overflow
Litres/kg feed- Production Only			559		Excludes purge overflow
Average/day (m3/day)- Production Only			627		Excludes purge overflow
Litres/kg feed- Purge Overflow Only			1234		Excess of culture needs
Average/day (m3/day)- Purge Overflow Only			1386		Excess of culture needs



Energy- Electricity		July 1/2015 - Sept 30/ 2015					
Energy Cost:		**$0.078** /kwh		Blended cost of all charges			
		%	kwh	kwh/kg	kwh/tfp	Cost/kg	kg= biological production (not net prod.)
Growout RAS		45%	266,984	2.3	2,278	$0.18	
Oxygen generation		13%	78,342	0.7	668	$0.05	
Quarantine RAS		9%	54,264	0.5	463	$0.04	
Heat/Cool		7%	41,467	0.4	354	$0.03	Includes geothermal wells
Purge		2%	14,890	0.1	127	$0.01	
Other		24%	141,173	1.2	1,204	$0.09	Supply wells, UV, feeders, general lighting, office heat
Total	Current	**100%**	**597,120**	**5.1**	**5,094**	**$0.40**	



Sales and Revenue

For the period July 1 – Sept 30, 2015 (Q3, 2015) the harvest and processing results were represented by Cohort #4 which has harvested over the period May 31 to Sept 19, 2015. Due to the relatively long cycle time (70 weeks), and slightly improved growth rate, weights were slightly above average and percent of size downgrades lower than average. However, the percent of early maturing fish and degree of maturation was higher in this group and therefore the percent of quality downgrades (due to pale flesh colour) was also high (36%).

Prices for premium products remained stable. A continuing challenge is the single purge tank, which limits the harvest schedule to two weeks. There is a strong market preference by the market, related to shelf life management, for a weekly delivery schedule.

Total Processing and Sales Summary

Calendar Years >>	2014				2015			Total/	Budget
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Average	
Average Size (kg HOG)	**1.6**	**2.2**	**2.8**	**2.0**	**2.4**	**2.7**	**3.1**	**2.4**	**3.7**
Harvest Volume (kg HOG)	792	28,847	19,831	40,698	63,848	47,335	74,346	274,122	
Sales Volume (Kg HOG equiv.)		21,147	16,496	17,711	58,054	47,002	62,126	221,034	
Sales Volume (kg)		12,684	8,894	10,891	32,703	27,306	36,341	128,818	
Unsold Inventory (kg HOG equiv*)		7,847	13,729	29,542	36,979	38,450	49,488	29,339	
Quality (% Premium)		**85%**	**66%**	**77%**	**81%**	**85%**	**64%**	**76%**	**90%**
Processing Yields									
Round to HOG		88%	87%	89%	90%	90%	91%	89%	89%
HOG to Fillet (all trims)		65%	57%	64%	63%	64%	64%	63%	65%
Round to Fillet		57%	51%	61%	57%	58%	58%	57%	58%
Fillet to Portion (all sizes)					74%	59%	78%	70%	
Live to Round (estimated)		94%	94%	94%	94%	94%	94%	94%	93%

* Fresh and Frozen

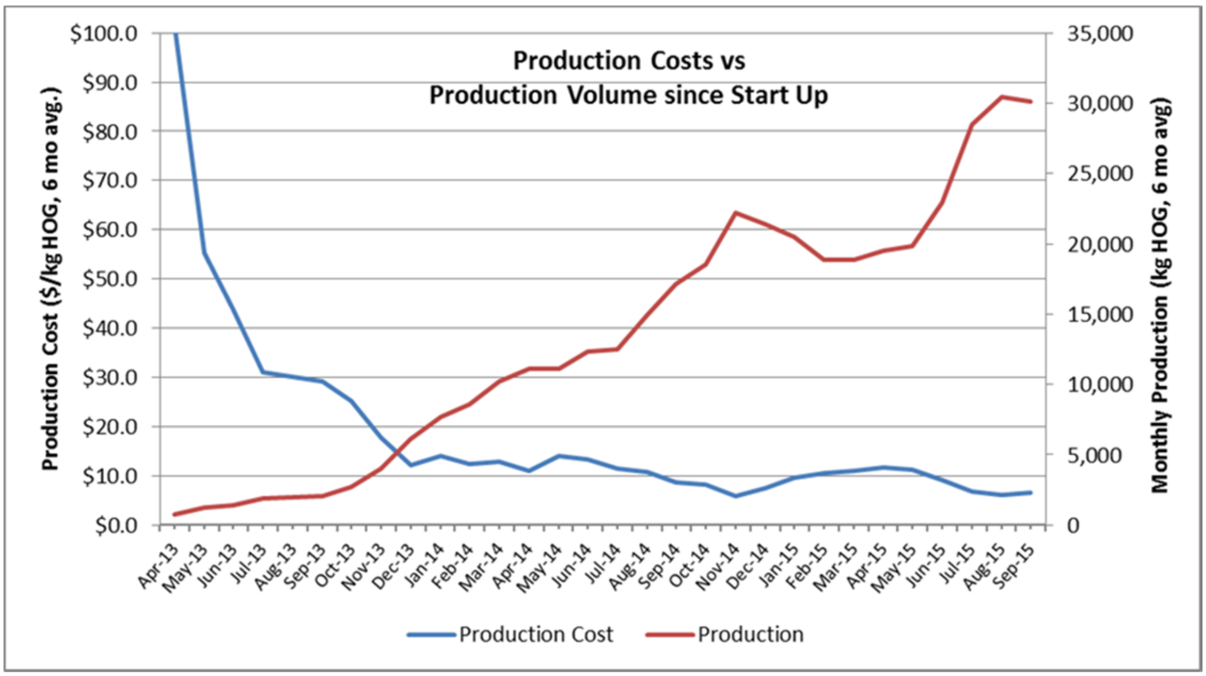
Financial Update

The following financial summaries have been updated based on the information provided by the growout, harvest, and sale of Cohorts 1 - 4.

Overall, the business is almost at the breakeven level. As improvements continue to be made it is expected that more stable and positive cash flows will result. Early maturation and slow growth continue to be the major impediments to improving financial success.

At time of writing, a new, two tank purge facility is in the process of being developed. This, with the resulting move to weekly harvesting, will greatly improve marketing options for all products and reduce market risk. In addition, it will allow the existing 250m3 purge tank to be used for production. This in turn will allow for a lengthening of the overall production cycle and an increase in average fish size at harvest.

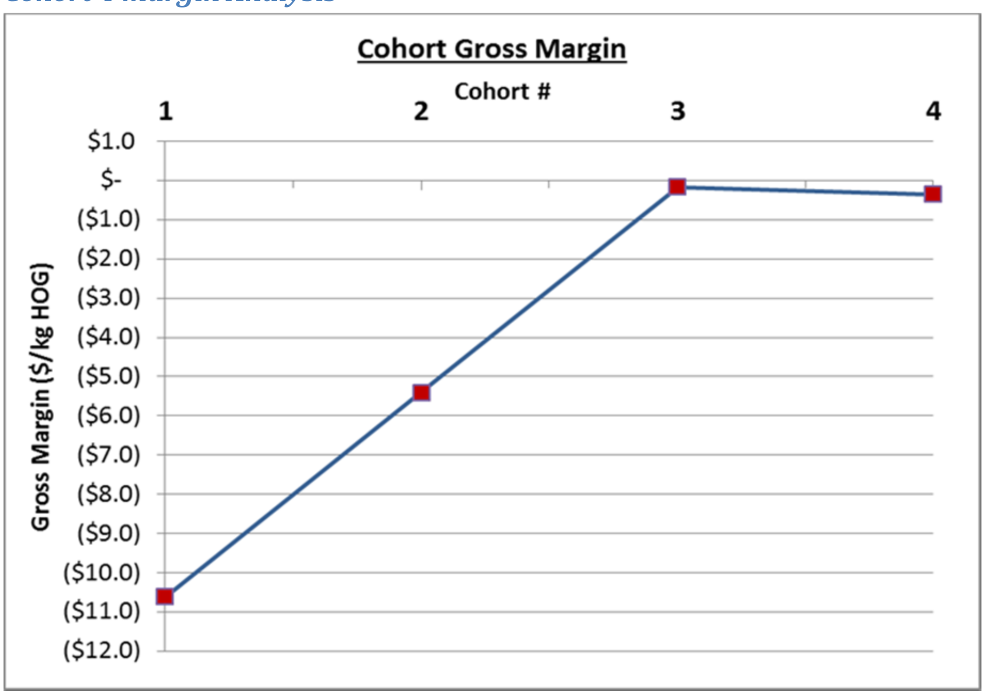
Production costs should continue to decrease as more attention is focused on refinement of the existing system and processes rather than addressing what are essentially commissioning, start up issues.



Production Costs and Returns Summary

Production Costs and Returns									
	2014 Actual				2015 Actual			Totals / Avg.	ST Targets
	Q1	Q2	Q3	Q4	Q1	Q2	Q3		
Production (kg HOG)	26,681	36,446	51,065	58,165	38,000	79,116	74,481	289,472	292,000
Current Production Costs ($/kg HOG)									
(Marginal cost of biomass added *)									
Feed	$2.67	$3.13	$2.41	$2.36	$3.81	$2.59	$2.87	$2.75	$2.69
Smolts	$5.22	$3.80	$0.00	$2.63	$3.80	$1.68	$0.00	$2.44	$1.28
Labour	$3.35	$3.50	$1.32	$1.59	$3.28	$1.12	$1.45	$2.04	$1.48
Power	$2.17	$0.83	$0.93	$0.94	$1.79	$0.42	$0.74	$1.01	$0.45
Water Treatment	$0.38	$0.58	$0.21	$0.57	$0.26	$0.34	$0.25	$0.39	$0.17
Insurance	$0.55	$0.46	$0.32	$0.29	$0.29	$0.22	$0.23	$0.32	$0.09
Maintenance	$0.44	$0.26	$0.10	$0.37	$1.20	$0.22	$0.33	$0.38	$0.27
Other- Variable	$1.27	$0.46	$0.72	$0.55	$0.95	$0.31	$0.67	$0.63	$0.25
- Fixed	$2.36	$0.86	$1.34	$1.03	$1.38	$0.79	$1.37	$1.17	$1.17
Total	$18.42	$13.88	$7.36	$10.34	$16.76	$7.68	$7.92	**$11.12**	**$7.85**
Sales									
Harvest volume (kg HOG)	803	29,268	20,355	40,514	64,022	47,523	74,265	276,751	
Sales volume (kg HOG)	17	21,215	16,742	17,631	58,212	47,002	62,126	222,945	
Net back to farm revenue($/kg HOG)	-$1.94	$9.41	$6.69	$9.66	$8.87	$10.00	$8.05	**$9.13**	**$8.59**
Gross Margins*									
On Production Costs	-$20.4	-$4.5	-$0.7	-$0.7	-$7.9	$2.3	$0.1	**-$2.0**	**$0.7**
On Variable Production Costs	-$18.0	-$3.6	$0.7	$0.4	-$6.5	$3.1	$1.5	-$0.8	
Farm Gate Returns*	-$1.9	$9.4	$6.7	$9.7	$8.9	$10.0	$8.1	$8.8	

Cohort 4 margin Analysis



Kuterra Cohort Margin Analysis

Cohort	0313	1013	0114	0514
	1	2	3	4
Production				
Size/ harvest size (kg HOG)	2.8	2.1	2.4	2.9
Harvest to date (kg HOG)	50,341	51,954	81,336	86,331
Total Projected Harvest (kg HOG)	50,341	51,954	81,336	86,331
Cost ($'000)				
Value of fish harvested	952	626	797	821
Total- All	952	626	797	821
Total- Fixed	106	77	85	83
Total- Variable (direct)	846	549	712	738
Revenue ($'000)				
Total	312	269	699	708
Margins ($'000)				
On Total Costs	(640.9)	(357.4)	(98.5)	(112.8)
On Variable Costs	(534.4)	(280.7)	(13.4)	(29.9)
Unit Returns ($/kg HOG)				
Total Cost	$ 18.92	$ 12.05	$ 9.80	$ 9.51
Total Revenue	$ 6.19	$ 5.17	$ 8.59	$ 8.20
Gross Margin on Total Cost	($ 12.73)	($ 6.88)	($ 1.21)	($ 1.31)
Margin on Variable Costs	($ 10.62)	($ 5.40)	($ 0.16)	($ 0.35)

Notes:

- Costs do not include: Interest, Depreciation or Corporate Overheads .
- Revenue does not include the value of harvested but unsold fish (eg frozen inventory).
- Costs were allocated to each cohort on the basis of relative biomass except for smolts which were allocated based on actual costs.

Summary of Problems Encountered & Lessons Learned (July 1, 2015 to September 30, 2015)

- The biofilters not fluidizing properly required flow to be diverted from the tanks to the biofilters. This reduced tank flow reduced tank self-cleaning action. This problem was particularly acute in Q1 and eventually (Sept/Oct, 2015) to improve the issue lead to the use of increased flow capacity in Q1, the install of drop-down pipes to the trouble areas in the biofilter cell (1" pipes directing flow toward the remaining areas of dead sand) and a lengthening of the siphon pipe to improve removal efficiency of old biofloc. In light of this persistent problem with the Q1 biofilter, when the system was emptied of fish in October 2015, the decision was made to completely empty the biofilter cell of sand to allow a close inspection of the pipe manifolds at the bottom. Upon examination it was discovered that a large number of holes were missing or obstructed (by cross members) in key locations. These were subsequently drilled out and resulted in a marked improvement in fluidization once the biofilter was brought back online again.

- The screen covering the tank sump in the Quarantine had no holes drilled in the outer perimeter and was not flush with the floor which contributed to solids collecting. In April 2015 the screen was removed and additional holes were drilled in the periphery of the screen to prevent solids from collecting at those points. We also increased the depth of the Q1 tank to reduce waste accumulation in the tank sump, increased tank turnover and used higher ozone flows to improve water clarity.

- The negative impact of changing the photoperiod during a cohort's production cycle was confirmed and will not be done again.

- The benefits of using a transfer diet and of raising the salinity when bringing in smolts were confirmed.

- The benefits to fish growth and their resilience regarding densities by creating optimal conditions across the growout tanks were confirmed. Improved water clarity from resolving the biofilter problems and lowered CO_2 levels from the installation of the in-tank aeration units both had positive impacts.

Appendix

Weekly Data Summaries

Cohort #4 (0514)

Week	Size	SGR	Condition	Morts	Feed	Density	TAN	TSS	Nitrite	Nitrate	Ph	CO2	Salinity	Alkalinity	Hardness	Turbidity	Harvest	Biomass	Inventory	Pigment	Fat	Protein	Photo-
1	102	0.5%		326	20	16	0.21					7	2.3			2		4117	40220	80	25	45	16
2	108	0.9%		474	35	16	0.37		0.04	18.5		7	2.1	70		2		3990	36826	80	25	45	16
3	118	1.5%		115	60	16	0.63					8	2.0			2		4132	34908	80	25	45	16
4	134	1.9%		17	84	18	0.46		0.09	59.2		8	2.0	70		2		4630	34567	80	25	45	16
5	155	2.0%		8	93	21						8	1.6			1		5331	34496	80	25	45	16
6	174	1.5%		4	77	24	0.39					10	1.6	38		1		5994	34463	80	25	45	16
7	192	1.5%		3	92	26	0.41		0.14				1.7	37		1		6617	34442				16
8	246	4.2%	1.1	3	110	33			0.07	13.9	7.1	13	1.6	43		1		8472	34419				16
9	284	1.4%		1	123	38						11	1.6			1		9787	34407				16
10	313	1.4%		0	135	42		7				8	1.7			1		10759	34403				16
11	343	1.1%		1	114	46	0.69		0.05	91.9		11	1.7			1		11811	34398	80	29	45	16
12	368	1.1%		0	129	50	0.54					13	1.8			0		12664	34393	80	29	45	15
13	417	2.2%	1.2	1	178	56	0.86					14	1.9			0		14344	34391	80	29	45	15
14	465	1.1%		1	144	63	0.72		0.05	81.6		16	2.1	85		0		15975	34385	80	29	45	14
15	497	0.9%		3	144	67	0.79					15	2.3			0		17085	34376	80	29	45	14
16	528	0.8%		8	154	71	0.80					19	2.6			0		18125	34342	80	29	45	14
17	552	0.47%	1.3	16	130	74	0.62		0	28	7.1	13	2.8	60		0		18894	34248	80	29	45	14
18	578	0.76%		11	151	77	2.45		0.14	63.4	7.1	22	3.4	80		1		19725	34151	80	29	45	13
19	609	0.76%		11	155	81	1.11	5				22	3.9			1		20738	34065	80	29	45	13
20	641	0.74%		8	161	85	0.95		0.07	48.7			4.5	95		1		21786	34001	80	29	45	13
21	662	0.32%		58	46	75	0.70						4.2			0		22380	33802	80	25	50	13
22	686	0.60%		3	138	46	0.79		0.03	50.2			4.6	95		0		23033	33569	80	25	50	13
23	705	0.37%	1.3	3	149	47	1.04					22	4.9			0		23643	33548	80	25	50	13
24	740	0.81%		1	204	50	0.94		0.04	85.2			6.0	115		0		24825	33540	80	25	50	12
25	775	0.58%		1	150	52	0.73		0	161		21	6.4	145		1		25974	33531	80	25	50	11
26	816	0.83%		1	235	55	0.97		0.10	131.2		20	6.6	120		0		27357	33523	80	25	50	11
27	866	0.82%		3	235	58	1.30			223			6.2			1		29028	33515	80	25	50	11
28	916	0.81%		2	252	61	1.51		0.54	153.4		21	5.9	100		0		30683	33499				11
29	1063	2.53%	1.3	2	246	71	1.09		0	182		19	5.4	115		0		35593	33485	80	31	41	11
30	1146	0.53%		3	219	77	1.23		0.45	140.3		20	5.3			0		38339	33465	80	31	41	11
31	1078	-1.00%		56	130	41	0.73			147		15	4.9			0		35811	33293	80	31	41	11
32	1115	0.69%		2	280	37	0.79			102.0	7.2	17	5.0			0		36847	33060	80	31	41	13
33	1169	0.62%		1	248	39	0.63			222		15	4.9			0		38638	33053	80	31	41	24
34	1249	1.39%	1.3	2	281	41	0.73			194.5		18	4.9			0		41277	33042	80	31	41	24
35	1342	0.57%		1	282	44	0.22	5		59			4.9			0		44316	33032	80	31	41	24
36	1388	0.39%		0	171	46	0.54		0.04	119.2	7.1		4.5			0		45840	33029	80	31	41	24
37	1411	0.24%		1	155	47	0.81	6	0	77	7.1	19	3.7	70		0		46607	33022	80	31	41	24
38	1384	-1.11%		1	263	46	0.22		0.02	76.0	7.0	23	3.3	70		1		45703	33017	80	31	41	24
39	1356	0.68%	1.1	2	310	45							3.0			1		44748	33006	80	31	41	24
40	1418	0.63%		1	332	47	0.78						2.6			1		46787	32999	80	31	41	24
41	1478	0.57%		5	325	49	0.80				7.0		2.4			1		48729	32974	80	31	41	24
42	1540	0.59%		2	342	51	0.96		0.06	97.1	7.0					1		50731	32951	80	31	41	24
43	1604	0.60%		2	361	53	0.83		0	139	7.0		1.7	90		1		52834	32939	80	31	41	24
44	1713	0.92%	1.3	3	368	56	1.07			159.8		21	2.5			0		56381	32916	80	31	41	24
45	1785	0.61%		5	423	59	1.09		0	131		20	5.2			0		58706	32884	80	31	41	24
46	1863	0.61%		5	442	61	0.73			145.0		15	4.9			0		61211	32853	80	31	41	24
47	1936	0.41%	1.2	3	450	64	0.77			133	7.2	16	5.0			0		63536	32822	80	31	41	24
48	2008	0.73%		3	458	66	0.66			206.1			4.9			1		65861	32807	80	31	41	24
49	2102	0.57%		3	444	69	0.60	5		127		18	4.8			0		68911	32776	80	31	41	24
50	2188	0.58%		3	521	72	0.45			125.8			4.7			0		71683	32765	80	31	41	24
51	2277	0.55%		3	500	75	0.63		0.04	116	7.1		4.5			0		74535	32741	80	31	41	24
52	2346	0.41%	1.3	6	439	77	0.59		0.02	71.4	7.1	22	3.6	70		1		76762	32715	80	31	41	24
53	2439	0.55%		1	534	80	0.28		0.02	86	7.0	18	3.1	70		1		79733	32694	80	31	41	24
54	2523	0.47%		5	469	83							3.0			1		82459	32678	80	31	41	24
55	2592	0.17%		7	334	83	0.80						2.6			1		83281	32135	80	31	41	24
56	2629	0.51%		5	317	77	0.71				7.0		2.4			1		76853	29238	80	31	41	24
57	2719	0.33%		4	326	79	0.90		0.07	118	7.0		1.8	90		1		79441	29213	80	31	41	24
58	2811	0.46%		19	260	72							1.7			1		72048	25627	80	31	41	24
59	2877	0.35%		8	301	74							1.5			0		73535	25562	80	31	41	24
60	2869	0.00%		1	343	64	0.92		0.07	37.6	7.1		2.3			0		63198	22026	80	31	41	24
61	2960	0.40%	1.3	5	319	65	0.95		0.98		6.9		4.4			0		65120	22001	80	31	41	24
62	3000	0.24%		3	314	60	0.58		0.10	112.8	7.0	21	5.4			0		55167	18390	80	31	41	24
63	3104	0.47%		1	331	63						18	5.2			1		57050	18377				24
64	3122	0.11%		4	276	67	1.10				7.1	20	4.5			0		45101	14446				24
65	3229	0.39%		21	284	69	1.93						5.4			0		46527	14411	80	31	41	24
66	3206	-0.04%		2	147	61	1.19		0.07	163.7	7.0	12	5.0			0		30566	9534				3
67	3304	0.44%		1	166	63	1.47						5.3			0		31471	9526				0
68	3441	0.61%		2	81	38	1.32		1.47	38.8	7.1	11	3.9	83		0		18803	5480				0
69	3556	0.46%		4	99	34	1.15		0.05		7.1		4.0			1		17055	4796				0
70	3704	1.22%		88	105	35	0.91		0.05			9	3.6			1		17304	4678				0
71	4222	1.18%		10	5	0	0.86									1		171	41				0
72	4267	0.00%		4	0	0												33	8				0

Cohort #5 (1014)

Week	Size	TGC	Condition	Morts	Feed	Density	TAN	TSS	Nitrite	Nitrate	Ph	CO2	Salinity	Alkalinity	Hardness	Turbidity	Harvest	Biomass	Inventory	Pigment	Fat	Protein	Photo-
1	99	103		5	14	17	0.38				7		6.2	60		0.4		4450	45139	80	25	45	11
2	103	117		1	37	18	0.48		0.01	63		4	6.5	70		0.4		4655	45121	80	25	45	11
3	111	132		2	58	20	0.62		0.01	11			6.1	60		0.4		4992	45114	80	25	45	11
4	123	147		0	83	22	0.95		0.10	26			5.7	60		0.3		5530	45107	80	25	45	11
5	152	164	1.2	1	105	27	0.94		0.02	102		9	5.5	125		0.4		6863	45101	80	25	45	11
6	182	182		1	99	32	0.93		0.07	113		8	5.2	115		0.3		8186	45095				11
7	198	202		2	109	35	0.88						4.9			0.5		8937	45084				11
8	219	222		3	124	39	0.93			35		15	4.9			0.3		9846	45062				11
9	241	244		3	141	43	0.92			61	7	11	4.9			0.2		10860	45048				24
10	278	268	1.5	6	142	49	0.83			227			4.9			0.3		12513	45009				24
11	374	293		5	127	66	0.34			67		15	4.9			0.3		16833	44969				24
12	338	319		3	41	48	0.24		0.03	84	8		4.6			0.3		15183	44933	80	25	50	21
13	306	346		4	42	28	0.81	5.5	0.02	77	7	19	3.7	70		0.4		13761	44913	80	25	50	24
14	303	375		4	65	27	0.22		0.02	76	7	23	3.3	70		0.8		13604	44886	80	25	50	24
15	285	406	1.1	4	108	26							3.0			0.6		12767	44854	80	25	50	24
16	305	439		5	149	27	0.78	5.3					2.6			0.8		13654	44814	80	25	50	24
17	332	473		4	164	30	0.88						2.5			1.0		14867	44794	80	25	50	24
18	361	508		9	175	32	0.84		0.06	97			2.4			0.7		16169	44753	80	25	50	24
19	392	549		18	183	35	0.83		0.08	139			1.7	90		0.6		17524	44678	80	25	50	24
20	474	592		36	182	42							1.5			0.5		21066	44459	80	25	50	24
21	506	637		82	194	45			0.07	44			1.7			0.3		22297	44050	80	25	50	24
22	538	684		68	210	47	0.92			31			3.6			0.3		23411	43485				24
23	574	734		30	231	50	0.95						5.1			0.3		24763	43169				24
24	627	776		7	232	54	0.58			113		23	5.3			0.2		26988	43053				24
25	685	813		4	253	59	1.10				7	19	4.8			0.4		29485	43015				24
26	726	852		2	259	62	1.93			128			5.1			0.4		31228	42998				24
27	753	892		3	239	65	1.19			164			5.0			0.4		32383	42981				24
28	772	933		3	299	66	1.47			79			5.4			0.3		33177	42962				24
29	824	979		1	346	71	1.32		1.47	39	7	10	4.5	83		0.3		35391	42950				24
30	883	1025		4	342	76	1.15		0.05		7	11	3.8			0.6		37919	42934				24
31	808	1075	1.2	25	139	37							3.7			0.6		34627	42852	80	31	41	24
32	853	1125		2	313	22	0.95		0.08				3.5			0.8		36437	42741	80	31	41	24
33	901	1182		2	353	24	1.14				7		3.6	30		0.7		38488	42725	80	31	41	
34	957	1240		3	381	25	0.98					10	3.5			0.7		40868	42707	80	31	41	
35	1019	1297		2	431	26	1.21		0.33	64			3.8	60		0.4		43506	42692	80	31	41	
36	1088	1357		2	479	28	1.04		0.08	29			3.1			0.4		46437	42684	80	31	41	
37	1168	1416	1.2	1	456	29												49832	42671	80	31	41	
38	1242	1476		3	582	31	0.70						3.1			0.5		52988	42653	80	31	41	
39	1326	1542		7	567	33	1.23						3.0			0.5		56492	42604	80	31	41	
40	1391	1607	1.4	3	369	34							3.0			0.4		59233	42586	80	31	41	
41	1419	1673		5	436	34	1.03		0.07		7		3.2			0.3		60401	42565	80	31	41	
42	1474	1742		2	345	35	0.83		0.06				3.0			0.5		62693	42534	80	31	41	
43	1527	1817		6	406	36							3.3			0.5		64898	42511	80	31	41	
44	1581	1894		3	376	37							3.8			0.5		67138	42469	80	31	41	
45	1581	1968	1.3	7	464	37	1.32		0.07	68	8		4.7	120		0.5		67085	42423	80	31	41	
46	1620	2050		4	398	38	1.84		0.07	29			5.1			0.4		68672	42398	80	31	41	
47	1672	2140		6	301	39							5.8			0.4		70819	42365	80	31	41	
48	1714	2231		5	332	40	1.20		0.07				6.4			0.6		72527	42319	80	31	41	
49	1640	2325		4	283	20	1.24		0.11	31			6.9			0.8		57747	35138	80	31	41	
50	1625	2420	1.3	3	245	17	0.96		0.06	38			6.8			0.8		55114	33919	80	31	41	
51	1645	2517		3	294	17							6.9			0.3		55757	33897	80	31	41	
52	1643	2615		4	241	6	0.94		0.13	31			6.9			0.7		45818	27887	80	31	41	
53	1701	2710		3	269	6	1.43		0.20	116	7		6.6	145		0.6		47397	27857	80	31	41	
54	1716	2811		144	169	2	1.35		0.25	130	7		6.3			0.9		39087	22783				
55	1737	2916	1.3	0	202	0	0.70		0.21				6.6			#DIV/0!		36405	20957				
56	1795	3014		0	203	0	1.05		0.08	120	7					#DIV/0!		30742	17154				
57	1838	3083		0	0	0	1.18		0.09	108	7		6.5	130		0.7		26287	14302				

Cohort #6 (0115)

Week	Size	TGC	Morts	Feed	Density	TAN	TSS	Nitrite	Nitrate	Ph	CO2	Salinity	Alkalinity	Turbidity	Harvest	Biomass	Inventory	Pigment	Fat	Protein
1	107	111	13	12	19	0.22		0.03	50	8	#DIV/0!	8		0.5		4825	45290	80	25	45
2	109	125	9	18	19	0.23	5.0	0.11	30	7	14	9	75	0.9		4937	45204	80	25	45
3	113	141	1	25	20	0.29		0.04	81	7	7	9	95	0.5		5102	45178	80	25	45
4	118	158	3	30	21		7.5					8		0.6		5314	45164	80	25	45
5	122	177	0	37	22	0.49			74			6		0.5		5494	45156	80	25	45
6	130	196	1	74	23					7		4		0.2		5888	45149	80	25	45
7	146	216	2	110	26	0.68		0.09	83	7		3	120	0.3		6600	45141	80	25	45
8	174	238	1	127	31							2		0.2		7866	45130	80	25	45
9	216	262	3	144	38							2		0.2		9750	45117			
10	243	287	3	164	43	0.53	5.3	0.10	46	7	16	2		0.3		10961	45098			
11	271	314	2	161	48	0.93		1.08		7		5		0.4		12218	45082			
12	300	342	1	173	53							8		0.8		13501	45069			
13	295	370	13	107	30	0.81		0.02	77	7		4		0.4		13276	44994	80	25	50
14	315	401	2	160	28	0.22		0.02	76	7	23	3	70	0.8		14155	44967	80	25	50
15	345	433	1	199	31							3		0.6		15505	44961	80	25	50
16	382	467	1	237	34		5.3					3		0.8		17189	44956	80	25	50
17	442	502	0	258	40	0.88						2		1.0		19853	44950	80	25	50
18	489	542	1	294	44	0.84	5.3	0.06	97	7		2		0.7		21994	44945	80	25	50
19	537	585	1	291	48	0.83		0.08	139	7		2	90	0.6		24133	44939	80	25	50
20	579	629	2	269	52							2		0.5		26017	44929	80	25	50
21	637	671	2	293	57			0.07	44	7		2		0.3		28615	44914	80	25	50
22	705	712	3	365	63	0.92			31	7		4		0.3		31634	44897			
23	761	754	4	361	68	0.95		0.98		7	19	5		0.3		34168	44874			
24	818	797	5	380	73							5		0.2		36702	44844			
25	874	840	3	357	78	1.10				7		5		0.4		39187	44814			
26	933	884	3	369	84	1.93		0.20	128			5		0.4		41806	44792			
27	994	931	5	436	89	1.19		0.07	164	7		5		0.4		44507	44759			
28	1047	980	5	268	94							5		0.3		46845	44737			
29	1075	1029	11	147	96	1.32		1.47	39	7	10	4		0.3		48006	44667			
30	1099	1079	6	184	98	1.15		0.05		7	11	4		0.6		49038	44609	80	29	45
31	1158	1133	2	139	103					7	9	4		0.6		51630	44580	80	29	45
32	1203	1192	13	92	107	0.95		0.08	37			4		0.8		53564	44531	80	29	45
33	1216	1249	6	194	108	1.14		0.09	41	7	14	4		0.7		54073	44460	80	29	45
34	1216	1307	6	276	108	0.98					10	4		0.7		54003	44422	80	29	45
35	1254	1366	9	263	111	1.21		0.33	64		8	4		0.4		55621	44370	80	29	45
36	1330	1427	62	98	86	1.04		0.08	29			3		0.4		58775	44189	80	29	45
37	1415	1489	6	327	26			0.09	18			3		0.3		62093	43874	80	29	45
38	1460	1553	3	376	27	0.70						3		0.5		64032	43852	80	29	45
39	1534	1617	4	437	31	1.23						3		0.5		67209	43824	80	29	45
40	1597	1683	5	476	32							3		0.4		69948	43800	80	29	45
41	1668	1753	6	564	34	1.03		0.07		7		3		0.3		73000	43757	80	29	45
42	1744	1824	4	518	35	0.83		0.06				3		0.5		76223	43715	80	29	45
43	1825	1896	0	458	37							3		0.5		79790	43713			
44	1919	1969	0	650	40							4		0.5		83881	43713			
45	2004	2047	0	397	42	1.32		0.07	68	8		5		0.5		87621	43713			
46	2023	#N/A	0	0	30	1.84		0.07	29			5		0.4		88449	43713			

Cohort #7 (0415)

Week	Size	TGC	Morts	Feed	Density	TAN	Nitrite	Nitrate	Ph	CO2	Salinity	Alkalinity	Hardness	Turbidity	TDS	Water	Harvest	Biomass	Inventory	Pigment	Fat	Protein	Photo-
1	126	131	36	11	20	0.3	0.06	42	7.0		5.9			3.9				5012	39718	80	25	45	24
2	128	147	77	14	20		0.04	6	7.0		6.5			2.2				5029	39275	80	25	45	24
3	134	163	19	45	20		0.06	26	7.1	9	6.5			0.6				5216	39016	80	25	45	24
4	145	183	6	74	22		1.22	126	7.0		6.3	140		0.8				5646	38939	80	25	45	24
5	162	204	3	100	25		0.20	1	7.1	9	6.1	130		1.4				6318	38906	80	25	45	24
6	184	226	3	113	28		0.20		7.0		5.7			2.9				7136	38883				24
7	226	250	3	122	34	0.8	0.32			8	5.2			3.6				8764	38863				24
8	275	275	3	133	42	0.9	0.37	23			4.7			2.6				10670	38840				24
9	304	302	6	162	46	1.3	0.45	14	7.2	10	4.0	145		2.4				11801	38818				24
10	337	330	2	163	51	1.1	0.57	32			3.0	120		1.5				13073	38788				24
11	370	359	3	176	56	1.2	0.82	40			3.1			1.2				14357	38763				24
12	411	391	2	192	63													15943	38746				24
13	459	423	1	182	70													17760	38732				24
14	499	458	1	222	76													19317	38725				24
15	540	495	1	223	82						3.6			0.6				20900	38719				24
16	582	536	2	247	88	0.5		74			6.1			0.5				22541	38710				24
17	628	584	5	160	88						4.1			0.4				24282	38683	80	28	46	21
18	652	628	3	185	50	0.8	0.06	97	7.0		2.4			0.7				25200	38657	80	25	50	24
19	689	670	1	255	53	0.8	0.08	139	7.0		1.7	90		0.6				26621	38643				24
20	740	720	5	323	57						1.5			0.5				28564	38623				24
21	854	771	6	364	66		0.07	44	7.1		1.7			0.3				32960	38587				24
22	932	814	2	403	72	0.9		31	7.1		3.6			0.3				35947	38562				10
23	1003	858	1	368	77	1.0	0.98		6.9	19	5.1			0.3				38676	38547				
24	1060	903	2	333	82	0.6	0.10	113	7.0	23	5.3			0.2				40828	38534				
25	1109	950	6	291	85	1.1			7.1	19	4.8			0.4				42695	38505				
26	1159	998	4	356	89	1.9	0.20	128			5.1			0.4				44589	38466				
27	1215	1047	4	355	93	1.2	0.07	164	7.0		5.0			0.4				46718	38445				
28	1271	1100	7	296	98	1.5		79		12	5.4			0.3				48791	38403				
29	1306	1153	0	158	100	1.3	1.47	39	7.1	10	4.5	83		0.3				50118	38381				
30	1304	1208	481	106	70	1.2	0.05		7.1	11	3.8			0.6				47691	36554				
31	1269	1263	0	261	0				7.1	9	3.7			0.6				44875	35357				
32	1320	1321	0	157	0	0.9	0.08	37			3.5			0.8				46668	35357				
33	1328	#N/A	0	0	0	0.9	0.11				3.6			0.5				46962	35357				

9:08 AM
04/11/15
Accrual Basis

Kuterra Limited Partnership
Balance Sheet
As of September 30, 2015

DRAFT UNAUDITED

	Mar 31, 15	Sep 30, 15	
ASSETS			
Current Assets			
Chequing/Savings			
1000 · Cash & Cash Equivalents	-821,345	-927,659	
Total Chequing/Savings	-821,345	-927,659	
Accounts Receivable			
1099 · Accounts Receivables	969,354	1,080,988	(1)
1101 · Write-Down of Albion Sales (AR)	-546,140	-929,052	(2)
1102 · Writedown- frozen Pearl product		-23,000	
Total Accounts Receivable	423,214	128,936	
Other Current Assets			
1050 · Security Deposits	38,400	38,400	
1200 · Prepaid Expenses	8,358	35,622	
1250 · Inventory - Fish < 1 kg(cost)	470,803		
1251 · Inventor - Fish > 1kg (FMV)	537,272	1,239,069	
1260 · Inventory - Feed	106,811	78,281	
1268 · Inventory supplies	5,828	5,828	
Total Other Current Assets	1,167,472	1,397,200	
Total Current Assets	769,341	598,477	
Fixed Assets			
1295 · Work in Progress	49,250	49,250	
1299 · Property and Equipment	8,998,922	8,998,922	
1699 · Accumulated Amortization	-3,285,632	-3,285,632	
Total Fixed Assets	5,762,540	5,762,540	
Other Assets			
1111 · A/R - Warranty Claims-Year-End	1,624	2,044	
Total Other Assets	1,624	2,044	
TOTAL ASSETS	**6,533,505**	**6,363,061**	

9:08 AM
04/11/15
Accrual Basis

Kuterra Limited Partnership
Balance Sheet
As of September 30, 2015

DRAFT UNAUDITED

	Mar 31, 15	Sep 30, 15
LIABILITIES & EQUITY		
Liabilities		
Current Liabilities		
Accounts Payable		
2000 · Accounts Payable	146,167	185,537
Total Accounts Payable	146,167	185,537
Other Current Liabilities		
2005 · Accrued Liabilities	15,000	27,750
2009 · A/P from 2014 Year-End	12,739	
2012 · PST Payable (BC)	-2,394	
2014 · Payroll Deductions Payable	18,453	24,354
2101 · Deferred Government Funding	5,244,070	5,244,219
2200 · Due To / (From) Namgis FN	12,000	
2205 · Due to/(from) Atli Resources	100,000	175,000
Total Other Current Liabilities	5,399,868	5,471,323
Total Current Liabilities	5,546,035	5,656,860
Long Term Liabilities		
2060 · GVCA Foundation Loan	536,041	536,041
2399 · N.E.D.C. Loan	1,679,860	1,634,731
Total Long Term Liabilities	2,215,901	2,170,772
Total Liabilities	7,761,936	7,827,632
Equity		
3900 · Partners Equity	-284,305	-284,305
3999 · Retained Earnings		-944,123
Net Income	-944,123	-236,143
Total Equity	-1,228,428	-1,464,571
TOTAL LIABILITIES & EQUITY	**6,533,508**	**6,363,061**

(1) Accounts Receivable consist of the billings to Albion Fisheries that have not been paid. These billings are based on Kuterra's Deemed costs which are, for the most part, based on Kuterra's actual costs of production.

(2) The Writedown of Albion Sales represents the difference between Kuterra's Deemed Costs and the net revenue from selling the fish. The net revenue from selling the fish is the amount of revenue

that gets paid to Kuterra by Albion, after Albion has deducted their Deemed Costs of processing and distribution from the gross fish sale revenue.

This amount that is written down may be recouped in the future by Kuterra if and when future fish sale revenues exceed Kuterra's Deemed Costs for a given quarter.