BEFORE THE MARLBOROUGH SALMON FARM RELOCATION ADVISORY PANEL AT BLENHEIM

UNDER	the Resource Management Act 1991
IN THE MATTER	of Regulations under ss 360A and 360B of the Act
BETWEEN	**THE MINISTRY FOR PRIMARY INDUSTRIES**
	Applicant
AND	**THE MARLBOROUGH DISTRICT COUNCIL**

STATEMENT OF EVIDENCE OF GRANT WAYNE LOVELL IN SUPPORT OF THE NEW ZEALAND KING SALMON CO. LIMITED'S SUBMISSION
Dated this 11th day of April 2017

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New Zealand King Salmon

Introduction

1 My full name is Grant Wayne Lovell, and I have been employed in the Aquaculture industry since 1997. I have held a variety of roles within New Zealand King Salmon (NZKS), through the following career path: Hatchery Technician, Breeding Programme Supervisor, Broodstock and Hatchery Manager, Fish Health and Harvest Operations Management. I then spent a year working in Tasmania as the Technical Account Manager for Ridley Aquafeed, before returning to NZKS as the Production Manager. For the last two years I have been employed as the Seawater and Aquaculture Production Manager for NZKS.

2 My current role involves the oversight of the sea water farms, with the Regional Managers reporting to myself. I also oversee the aquaculture planning including feed ordering, fish numbers and inputs, long term harvest planning, growth and Feed Conversion Ratio (FCR) modelling, and short and long term livestock planning for the company.

Production Cycle and Smolt Inputs

3 Planning lead times are considerable:

(a) Five years from harvest we prepare the required number of broodstock to meet future production volumes.

(b) At 30 months from harvest we need to know the number of smolt we intend to put to sea.

(c) The juvenile salmon will be in freshwater for 8 - 12 months before transfer.

(d) After transfer to seawater the salmon will grow for an average of 16 months.

4 The key goal is to produce salmon of a reasonably consistent average size 12 months of the year. This is not a simple task with a species that naturally will reproduce over a very short timeframe, so we must manage the process to create the year round supply.

5 This starts in the hatchery with “photoperiod” broodstock. By altering the perceived daylength we are able to alter the natural spawning time of the salmon, and bring this forward a few months or delay by a few months.

A covered pond at Takaka hatchery to allow photoperiod manipulation.

6 Once spawned, we can slow development by reducing the ambient water temperature. Early salmon development is linked to the water temperature, therefore reducing the temperature slows the development of the salmon. Incubating the eggs at 12°C will take half as long as incubating the eggs at 6°C, without impacting the development of the salmon at all.

7 These actions enable smolt to be transferred to the sea over a wide timeframe. NZKS currently transfers fish to the sea between September and June, with an average transfer size a little over 100g. The view is to harvest a Brood year between November and November, at an average live weight of approximately 4.5 - 4.9kg.

8 Smolt transfer timing and location is not as simple as just transferring fish to the sea, as location is crucial to smolt inputs. NZKS smolt are split into two main transfer groups: early and late. Early fish are transferred to the sea before summer peaks, and late transfer fish are transferred to the sea post summer temperature peaks.

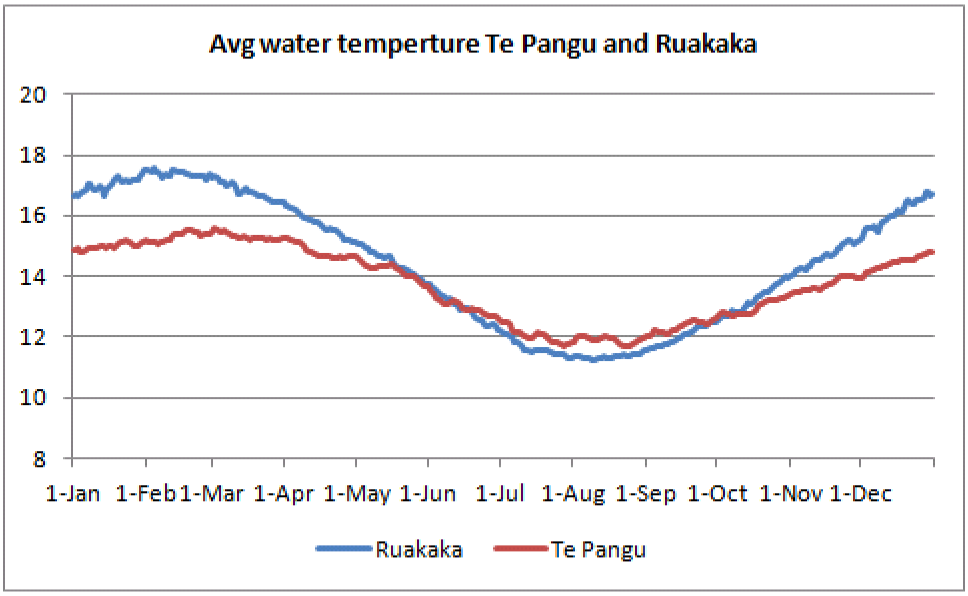
9 Early fish are limited in site selection, and history has proven that smolt transferred to warmer water sites (Ruakaka, Otanerau, and Pelorus) are at risk of suffering very poor performance in terms of increased mortality, and reduced growth over the crucial early growing period. The Tory Channel is currently the key region receiving these early fish, receiving all smolt transferred from September to March. Once summer is over (April onwards) and water temperatures cool, other sites are able to receive smolt for grow out. Although these fish will go through a summer at these sites, the larger fish appear to better suited or acclimatised than the smolt over this period.

10 The limitation of freedom in smolt entry can create issues as NZKS plans the requirements for the production year and links this to volume requirements, pen availability and site limitations. As an example, NZKS currently inputs some smolt into the Tory Channel, then tows to Otanerau for grow out from April or May, with harvest in November and December. Most sites currently take more than 1 year class, and so NZKS needs to ensure that the harvest cycle is also linked into planning. This is important to ensure NZKS have enough empty pens, and also the correct pens, as net mesh size is different for a smaller fish compared to a larger harvest fish.

Growth Projections and Variation

11 Some sites will perform better than others, and some groups of fish will perform better than others. This is the nature of a livestock business. There is a significant amount of variability in the system and this can be very difficult to plan for.

12 Temperature profile can play a significant factor, as can genetics and freshwater factors, such as grading strategies.



Average water temperatures for the Ruakaka (low flow) and Te Pangu (high flow) sites.

13 As the above graph demonstrates, the water temperature can vary significantly between farms, even within a small geographic area. These differences can have quite an impact on stock and growth. Additionally, there can be a lot of seasonal variation between years, making planning more difficult.

14 Overall, aquaculture planning is best described as a jigsaw that is constantly having its pieces moved. For example, sales and harvest plans need to align or NZKS may end up in one of two scenarios: over harvesting, which creates an ever decreasing circle, or under harvesting, which creates an ever increasing circle. Both over and under harvesting can have highly detrimental impacts on planning.

15 Over harvesting results in more fish being pulled than planned. As a consequence, the next harvest pen starts harvest earlier, and is smaller, therefore more fish are harvested to meet the biomass demand. This leads to the harvest of ever smaller fish, resulting in a reduction in volume and biomass, underutilisation of sites, and ultimately a reduction in sales.

16 Under harvesting has the exact opposite impact of over harvesting. Fish keep getting bigger, harvest is delayed, and therefore less fish are harvested to meet the biomass demand. This can have an impact on pen availability for smolt inputs and grading events, as well as placing significant pressure on feed discharge limits (fish remain on feed until just before harvest). Ultimately,

under harvesting adds to the cost of fish, and the FCR deteriorates as the fish get larger.

Feed Planning

17 Feed is the single largest expense for NZKS, and is linked directly to many of NZKS's resource consents. For example, feed discharge caps are currently the primary tool for maximum site usage.

18 Feed usage is not an exact science, and there are many variables that can impact the amount of usage, some of these being:

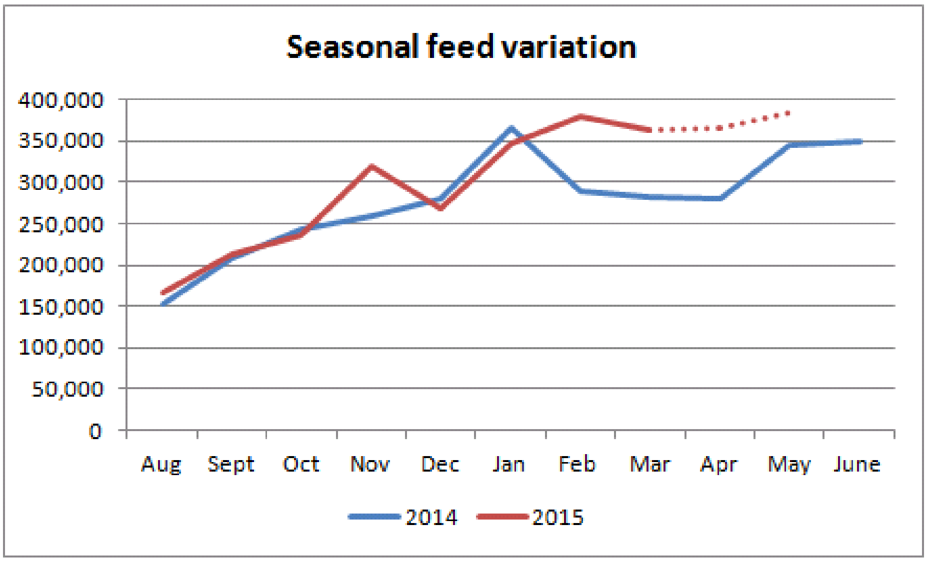
(a) diet quality and composition;

(b) environmental factors such as water temperature, algal concentrations and turbidity;

(c) predator interaction; and

(d) size and growth rate of stock.

19 These variations can lead to some very large variances in feed inputs for groups of fish. The following graph shows the Waiata stock (some of the data is pre tow at Forsyth and Kopaua) over the last years. Last summer was relatively warm, and NZKS saw a significant drop in feed outs over the February to April period. This year has been cooler than last year, and NZKS has not seen any feed drop. Over this three month period alone a difference of around 200T will occur from one year to the next.



Pelorus feedouts comparing 2014 Brood and 2015 Brood - dotted line shows current estimates.

20 It is nearly impossible to plan for all variation. For example, there is no accurate forecast data for the water temperatures in the Marlborough Sounds, and yearly growth and mortality volumes can fluctuate. It is important that NZKS are able to manage the farms to a volume that is both economic and sustainable. Many issues can arise if feed volumes are above what is planned.

21 The current practice of using feed caps as a tool is both unusual in a worldwide sense, and in my opinion, not an appropriate measure. This is using a highly variable input that can create significant issues when factors align that could not be foreseen. As an example, if growth is 5% better, and mortality is 5% better, a 4000T planned discharge could become 4400T or more. This can become a significant issue and cost to mitigate because things have gone well. It is much better to use a true adaptive management approach and make changes based on the benthic and water column results, ensuring the environment is being looked after without negatively impacting potential performance. This method is well described in the Best Management Practice Guidelines that NZKS has agreed to implement.

Feed Management

22 Feed is highly managed due to high costs and volumes. All pens have either one or two camera systems (at least one underwater) monitoring feeding behaviour and looking for feed pellets. Our feeding software systems on all

newer farms also flag feed outs outside of the usual parameters, and have modern feeding systems to deliver and monitor the feed. NZKS are currently trialling software which automatically detects feed pellets, alerts the feeder, and takes a photo of the event. As a further control, NZKS has a small remotely operated underwater vehicle used to run transacts under the farm looking for wasted feed.

23 Previous studies carried out by NIWA have shown that well over 99% of the feed fed out is consumed by the fish, meaning that the main output from the salmon farm is fish faecal matter. The amount of faecal material is primarily influenced by diet, particularly digestibility and energy of the diet. A higher energy and higher digestible diet will result in less faecal material. Modern extruded diets are highly digestible. NZKS is committed to improving in this area, is working with multiple feed companies, and regularly benchmarks diets at a commercial level for improvement. Additionally NZKS operates a small nine pen (6m X 6m) trial system (currently at Ruakaka in a modified commercial pen) to work on diets in the Marlborough Sounds environment. NZKS is not undertaking the work on commercial pens until the trial has first proved successful on a small number of fish.

Potential New Sites

24 Development of the potential new swaps will need to be carefully managed. If NZKS are able to secure all sites, an orderly transition with no overlap of any sites will be able to be achieved. However, an allowance for overlap may well be required if not all sites are secured.

25 The infrastructure of the old sites is unsuitable for the new sites, therefore NZKS cannot simply tow all the infrastructure and fish as all new pens will be required. The old infrastructure will be required to finish off the brood, resulting in an overlap for a short period (6 to 9 months) while the fish are harvested out.

26 The feed tonnage increases proposed for the new sites appear to be very conservative and not overly practical. In some instances feed discharge increases as low as 125T are listed, a level which would be very difficult to manage to (variation can easily be to this level) and appears to be a level that would not result in noticeable change. The timeframes listed to reach full production are also very long. A more preferable and workable option would be to start at 50% or 1000T (for Tio Pont and Horseshoe Bay) and then reach

listed capacity over no more than two increases for the larger sites and one increase for Horseshoe Bay and Tio Point. This would allow more appropriate use of infrastructure as pens are able to be added and utilised (one 40 X 40 pen can use around 600T of feed per annum).

Conclusion

27 The key points that I want to make are the following:

(a) Planning is multifactorial and involves very long lead times.

(b) There is significant natural variability in the processes we undertake.

(c) Feed is highly managed, but highly variable due to many factors.

(d) Feed caps are a poor form of regulation.

(e) New sites need to be implemented carefully and overlap may be required due to infrastructure issues.

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Grant Lovell