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 MARK ANTHONY PREECE 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 Mark Anthony Preece. I am the Fish Health Manager for The New Zealand King Salmon Co. Ltd ("NZ King Salmon") and have held that role for 4 years. I have been employed by NZ King Salmon since 1994, a total of 22 years. I have worked and lived on salmon farms in the Marlborough Sounds.

2 I studied Marine Science at the University of Otago where I gained a Masters of Science. I also hold a Graduate Diploma in Business Studies from Massey University and am currently sitting for a Master of Manufacturing Leadership.

3 My first introduction to NZ King Salmon was as a shiftworker at the Forsyth and Waihinau farms, later being promoted to a Supervisor at the Otanerau and Ruakaka farms (1994 – 1997), before turning to work as a Farm Manager at Forsyth and Ruakaka farms (1998 – 2000), the Seafarms Operations Manager (2000 – 2010), Aquaculture General Manager (2011 – 2013) and Fish Health Manager from 2014 to the present day. As a result of this experience I have a good overview of farming operations from a practical "hands on" and management perspective. I have worked in all parts of NZ King Salmon's operations as a general hand, participating in tasks such as net cleaning, fish handling, harvesting and fish health. I have worked on both low flow and high flow sites.

4 I was awarded the "National Conservator of the Year" award in 1989, an award, at the time, administered by the Department of Conservation. This recognised work carried out on several critically endangered species (including the Chatham Island black robin and Chatham Island Taiko), marine mammal stranding management and pest eradication from Department of Conservation reserves.

5 I was instrumental in the formation of the Elizabeth Ellen Preece Covenant which assists management of several critically endangered species as described by the International Union for Conservation of Nature and Natural Resources (IUCN)[1] – a family owned predator free reserve slightly larger than the Kaipupu Point Reserve in Picton.

[1] Refer to: http://www.iucnredlist.org/search.

6 I am a keen and experienced kayaker having completed some significant coastal journeys around New Zealand. A significant amount of my recreational time is spent on my surf ski in the Marlborough Sounds.

7 I am a keen sailor who participates in the local sailing regattas. I also spend weekends sailing and recreating with friends in the Marlborough Sounds.

8 I am a WorkSafe registered commercial diver (>500 logged commercial dives) as well as a recreational diver for scallops and crayfish.

9 I hold a Maritime New Zealand Commercial Launchmaster Certificate, which enables me to skipper any vessel up to 24m within the coastal limits of New Zealand. I also have the following privileges:

(a) high speed ship endorsement;

(b) second class diesel trawler engineer; and

(c) master of vessels in extreme limits (as listed in the Shipping Restricted Limits Notice 1980) where those limits fall outside of the current inshore areas

10 In my evidence I will give a high level overview of salmon farming before addressing fish health and biosecurity matters.

SALMON FARMING 101

Oncorhynchus tshawytscha

11 Salmon is the common name for several species of fish in the family Salmonidae. Species of salmon are generally divided into two main groups: the single Atlantic Ocean species and a number of Pacific Ocean species. The King salmon is the largest of the Pacific salmon which may reach 44.11kg[2]. *Oncorhynchus tshawytscha* is the scientific name for King salmon. The distinction is important. The animal husbandry, biology, physiology and other characteristics of King salmon as compared with Atlantic salmon differ, in some cases drastically.

12 King salmon is the major species farmed in New Zealand. However, it is Atlantic salmon which is almost without exception farmed internationally.

[2] Refer to: http://wrec.igfa.org/WRecordsList.aspx?lc=AllTackle&cn=Salmon,%20Chinook.

There are a number of differences in techniques and processes used when farming Atlantic as opposed to King salmon. The two cannot be automatically compared. Atlantic and sockeye salmon have both been farmed in New Zealand. Early forays into farming Atlantic and Sockeye salmon failed serendipitously resulting in King salmon becoming the major species being farmed in New Zealand.

13 NZ King Salmon has developed significant intellectual property in farming this species. This has been a process which started some 30 years ago. A combination of scientific input and kiwi ingenuity has resulted in the King salmon being where it is today. NZ King Salmon is the largest grower of king salmon worldwide and the only producer who can supply to the market year-round.

14 A key breakthrough was the ability to harvest fish 52 weeks a year. Continuity of supply was a significant technological breakthrough. Working at the forefront of a developing industry is a particularly satisfying part of my work.

Smolt production and transfers

15 NZ King Salmon uses a selective breeding process which looks for performance and marketing qualities of the fish. The breeding programme is located at the freshwater Takaka hatchery near Te Waikoropupu Springs in Takaka. Salmon are selected based on parentage, spawned and the eggs transferred to our production hatcheries. These production hatcheries are located in Tentburn and Waiau and are used to rear the smolt. Various controls, such as the use of lights to advance broodstock spawning or increase the growth rates of smolt, and grading out small fish, enable staff at the hatchery to regulate the size and maturation rate of the juvenile salmon. This enables NZ King Salmon to stagger entry of the fish into the sea pens, allowing NZ King Salmon to produce fish which are consistent and predictable in size, and able to be farmed year round.

16 Smolt transferred to the seafarms occurs from August to December and from April to June. Carbon dioxide and oxygen levels are monitored and computer controlled through the transfer process. During the journey seawater from a deck hose is flushed through the tanks to help the smolt acclimatise to the seawater environment.

Seafarm overview

17 NZ King Salmon currently utilises eight consented farms in Marlborough to on-grow the fish from smolt to a harvestable size of approximately 4kg.

18 NZ King Salmon farms are categorised as one of two types:

(a) Higher flow sites (i.e. Kopaua, Waitata, Clay Point, Ngamahau and Te Pangu farms); and

(b) Lower flow sites (i.e. Ruakaka, Otanerau, Forsyth Bay, Waihinau and the two Crail Bay farms).

19 Fish are transferred from the Tory Channel sites (Clay Point, Te Pangu and Ngamahau) to Otanerau by counting them across from the grower nets at the farm they are being transferred from, into another sea pen that is moored alongside the farm. That sea pen unit is then very carefully manoeuvred by a tug and tidal flows to propel them to Otanerau.

The on-site barge

General Overview

20 NZ King Salmon services each of its farms from an on-site barge. NZ King Salmon's existing barge structures are two-storey and have a footprint of approximately 260m². Each barge has its own set of moorings and is connected to the farm by a secure bridge which allows staff to move safely between the barge and farm. In the case where the site is exposed to inclement weather a vessel is used to transport staff from the barge to the sea pens.

21 The barges need to accommodate shift staff living quarters, offices, sufficient feed storage, the generator room, feed distribution systems, mortality ensilage systems and workshop facilities.

22 The barges are essential in order to allow NZ King Salmon to address issues should they arise. For example, feed delivery to NZ King Salmon farms is not guaranteed every day (due to weather conditions etc). Having onsite crew and contingency feed allows NZ King Salmon to continue fish feeding during these times and avoid animal welfare issues. It also allows issues such as seals entering the farms, net rips and storm damage to be dealt with in a timely manner. In addition, the presence of shift workers on the farm 24-hours a

day, seven days a week provides an added security function, protecting both the site and the fish.

23 Barge structure is very site specific in relation to the proposed farms. Due to cost, the barges are kept as small as reasonably possible.

Discharge of greywater and sewage

24 NZ King Salmon discharges less than or equal to 500 litres of greywater from showers, basins, food preparation areas and clothes washing directly to the Marlborough Sounds per day. A specific grey water assessment report undertaken as part of the EPA process details those discharges and their effects[3].

25 Black water or sewage is contained in tanks on the barge, regularly collected by Marlborough Waste Collection on the servicing barge and disposed of in the Picton or Havelock sewerage system.

Storage of hazardous substances

26 NZ King Salmon complies all with Hazardous Substances and New Organisms Act 1996 (HSNO) regulations in respect of storage of hazardous substances. In accordance with those regulations petrol and diesel are stored in tanks below barge decks or in Dangerous Goods Cabinets and Sheds. The tanks below barge decks are subject to HSNO Stationary Tank Certification where required. The barge hulls provide bunding to contain any potential leak or spill from these tanks.

27 Dangerous Goods Sheds and Cabinets in which petrol is stored all must meet HSNO standards in order to gain a 'Location Test Certificate' where required. NZ King Salmon applies this standard of storage to all sites even when volumes are below HSNO trigger levels and they do not require certification.

28 LPG is stored on the barges in an outside vented area and away from ignition sources. The cylinders are secured to prevent them moving and are stored in accordance with HSNO requirements.

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[3] Barter, P. 2011. The New Zealand King Salmon Company Limited: Assessment of Environmental Effects – Greywater. Prepared for New Zealand King Salmon Ltd. Cawthron Report No. 2021. 19 p. plus appendices. A copy is available here: http://www.epa.govt.nz/Publications/Appendix%2022%20Greywater%20Report.pdf.

29 Other hazardous goods are stored in Dangerous Goods Cabinets and Sheds. The Seafarm Hazard Register contains hazards and controls associated with the storage and transfer of hazardous goods. In the event of a spill NZ King Salmon farms have Oil Spill Kits onsite. These kits have a capacity of approximately 150 litres. We have an oil spill policy which has been approved by the Marlborough District Council.

Seapens

30 Currently the majority of NZ King Salmon's fish are grown using steel sea pens of a range of different sizes. Sizes vary from 20 X 20m to 40m x 40m and mirror the development of the industry. Grower nets are attached to each sea pen to enclose an area of sea; these nets prevent the fish from escaping.

31 Circular plastic sea pens (also called Polar circles) have been used at the Crail Bay farms. These pens have the ability to flex and withstand larger swells. Where applicable, NZ King Salmon will use these on more exposed sites.

Mooring systems

32 Ensuring the structural integrity of the farm means that the moorings need to be located a sufficient distance from the structures so as to provide adequate lateral forces to hold the farm securely in place.

33 Each farm mooring line and mooring layout is designed by a qualified engineer. An agreed mooring maintenance programme forms part of the consent conditions and operating policy of each farm.

Lighting

Navigation lighting

34 The Harbourmaster will determine what the appropriate lighting is for the proposed salmon farms prior to them being installed.

35 In relation to already established finfish farms the Harbourmaster has required four lights to be located on the corners of the pen structure and two additional lights to be in the centre of the longest side of the pen structure. The lights flash five times every 20 seconds with the interval between flashes being no more than one second. The lights are more than one metre above the surface of the water and are designed to have a visible range of at least one nautical mile.

36 The Clay Point farm is located outside the shipping lane in the Tory Channel and is fitted with an Automatic Identification System to aid navigation. The Ngamahau farm is located outside the shipping lane in the Tory Channel and is fitted with a Global Positioning System which alerts NZ King Salmon employees and the Marlborough Harbourmaster should the farm move greater than 20m in any direction.

Barge lighting

37 The barges at the farms will contain standard internal lights, similar to a dwelling. The entrance to the barges (from the farm side) will have floodlights fitted which are switched on if staff are required to enter the pen area at night. This usually occurs about once a night. Windows are fitted with blackout curtains to eliminate light escaping the barge.

Underwater lighting

38 The use of underwater lighting in salmon farms is common practice as it increases production and reduces the risk of maturation of the salmon prior to harvest. These provide a soft green hue.

39 The lights are switched on in December and off in October. They run for 14 hours per day over darkness.

40 In the wild, the King salmon life cycle is such that it grows through to maturity in 3 or 5 years, then spawns and dies. It does not recover as does Atlantic salmon or trout. When these fish approach maturation they cease feeding and begin to change physiologically. Their skin begins to darken and thicken and give off additional mucous. The fins become fleshier, but more importantly the flesh loses its colour and the fat is directed towards the gonads. The drive by the fish is for a successful spawning.

41 Maturation is a major concern for NZ King Salmon. It results in fish that have to be harvested before they show the obvious signs and thus achieve lower value in the market place. Many maturing fish, depending on the degree of maturation, are diverted from prime supply channels. Some fish cannot reasonably be harvested in time due to the logistics of harvesting and processing. Fish within a group that is by majority non-maturing may be harvested too late to be economically viable.

Predator nets

42 Predators, and in particular the New Zealand fur seal, are problematic for NZ King Salmon. Fur seals are clever opportunistic animals for which salmon farms present a major supplementary feeding opportunity if they can gain access to the salmon pens. They are not readily deterred by floating farm structures, lights, noise or human presence.

43 To catch salmon, seals will patrol cages to try to find a weakness or hole in the pen netting. If they can find access they will clamber up onto the pen superstructure and dive in amongst the fish. Alternatively they will harass fish in pens causing them to school up and swim rapidly around the pens. The seals will then push slack pen netting inward, biting fish as they swim past. Fish which are not bitten can remain stressed, potentially causing reduced growth, inferior quality and/or death, resulting in large financial losses for NZ King Salmon.

44 Underwater predator nets are used by NZ King Salmon to help keep predators such as seals away from the pen nets and salmon inside the pens. This is generally effective, although several seals may often be seen at our farms looking for any opportunities.

45 Historically the nets have been antifouled to reduce biofouling on the netting. NZ King Salmon has embraced the recent advent of in water netcleaning and now maintains our predator nets using these machines. An in water netcleaner is a remotely operated underwater machine fitted with high pressure water jets which remove the biofouling from the net. Predator nets are cleaned approximately every 4-6 weeks.

46 All interactions with marine mammals are reported to the Department of Conservation. NZ King Salmon has a permit to handle marine mammals.

Bird nets

47 Salmon farms tend to be attractive structures for birds. Fish feed is appealing to gulls and a range of shag species use the sea pens for drying, roosting and as a base from which to catch fish in the surrounding waters.

48 Currently, predator nets keep species such as shags from spearing the fish through the grower net and overhead bird nets exclude birds from the sea pen structure. Birds also consume the wild fish around the salmon farm.

49 Bird nets are used to keep birds from accessing the feed on the surface of the pens. An area of dark shade cloth is attached to the bird net over the fish feeding zone to prevent pellets from going through the bird net, where birds can feed on them.

Net cleaning

50 Salmon nets suspended in the marine environment provide an ideal growing structure for biofouling. Biofouling refers to the collective growth of small marine organisms on the salmon nets which reduce water flow through the nets and as a result have a negative impact on dissolved oxygen in the farms.

51 Because of their smaller mesh size the grower nets are cleaned approximately once a fortnight, which is done either by a net cleaner which cleans the nets in-situ or the nets are lifted clear of the water and waterblasted.

52 When the predator nets are due for replacement they are cut away and brought to the surface. The nets are contained (as per our biosecurity policy), and brought to shore and disposed of in landfill.

Feed

53 Feeding the salmon is one of the most important operations on a salmon farm, with the main objective being to achieve maximum growth of the salmon while minimising feed wastage. NZ King Salmon uses the principle of satiation feeding to ensure that the fish are fed an amount that matches their appetite, which varies throughout the salmon life cycle.

54 Feeding rate is monitored by an underwater video-camera (5m deep) which is watched constantly during feeding. As soon as feed passes by the camera, feeding stops.

55 When the fish reach the required harvest weight feeding is stopped for approximately three days to ensure their stomachs are empty prior to harvest.

Reducing waste feed

56 Feed costs are the most expensive component of producing salmon and salmon feed can have a negative impact on the benthic environment. The

minimisation of waste feed is therefore both a commercial and environmental objective of NZ King Salmon.

57 NZ King Salmon utilises a number of methods to reduce feed wastage, such as camera monitoring and specialised feed distribution systems. From time to time we audit the process by placing a tarpaulin at the bottom of the pen and checking how much feed is caught. A NIWA report (2011) indicated 0.1% feed lost through the bottom of the net.

58 NZ King Salmon farms use waste feed detection systems to avoid all but on average 0.1% uneaten pellet loss.

Feed-faeces relationship

59 The majority of benthic nutrient enrichment around a well-managed salmon farm derives from faeces excreted by the salmon. With poor feed management, uneaten feed pellets can also contribute to benthic enrichment.

60 It is expected that, for NZ King Salmon's current feed range, about 20% of the dry matter consumed is excreted as faeces.

Managing mortalities

61 Mortalities ("morts") are a fact of life when raising salmon. All types of farming have mortality. Farming systems improve mortality compared with wild stocks.

62 Salmon deaths occur for a number of reasons including age, predator damage, congenital defects, runting and natural attrition. Morts at NZ King Salmon farms are collected and stored in designated sealed 'mort bins'. They are counted and classified to ensure early detection of problems with fish mainly related to farm operation induced mortality but also disease. Morts are regularly disposed of at the landfill in Blenheim or they are rendered at Kakariki Proteins in the North Island.

Grading /shifting to other farms

63 Approximately 4 months after smolt transfer to seawater fish are pumped and size graded into their final grow out densities. The size grades permits us to target big fish first followed by smaller fish. At this point some groups of fish may be relocated to other farms for on growing – this occurs seasonally

between Te Pangu/Clay Point/Ngamahau (Tory Channel sites) and Otanerau/Ruakaka.

Harvesting

64 NZ King Salmon has a specialist harvesting team who commute on a dedicated vessel to the farm they are harvesting from. In order to collect the fish for harvest, the harvest team drop a 'sweep' net into the sea pen that the fish are to be harvested from and a proportion of the fish in that sea pen are corralled. The net then holds these fish at the surface and is used to guide them to a floating pontoon which has been placed in the sea pen by the harvest team.

65 The floating pontoon houses a pump intake which pumps the fish onto the harvest vessel. The fish fall down a chute where an automatic stunner kills the fish by a concussive blow to the head. The main artery in the throat of the fish is then cut by hand and they are placed into an insulated tanker filled with ice slurry. The harvested fish are driven by a motorised barge, transported back to the closest port and trucked to the NZ King Salmon factory for immediate processing the same day.

Processing and distribution

66 NZ King Salmon's newly harvested fish are processed at the primary processing plant in Nelson. There is a potential option of a Marlborough primary processing factory, should it make economic sense.

67 Following processing and packaging, the salmon products are distributed to both domestic and export markets via truck to Christchurch or the North Island. Some fresh gilled and gutted salmon are air freighted from Nelson direct to Auckland or Christchurch and on to the export markets.

Operational vessels

68 NZ King Salmon currently utilises three distinct types of vessel, as follows:

(a) Farm tenders (vessels less than 6 metres in length) for use in the enclosed water limits of the Marlborough Sounds.

(b) Water taxis for use by daily commuting staff in the enclosed water limits of the Marlborough Sounds.

(c) Larger work vessels, also for use within the enclosed water limits of the Marlborough Sounds.

69 Vessel activity varies seasonally. In addition to the vessels owned by NZ King Salmon, a number of other specialist vessels are utilised during salmon farming operations, these include:

(a) Large barges to transport the truck and trailer units carrying smolt for the farms, bulk bags of feed, harvested fish and other large freight (usually happens twice a year around smolt hauling);

(b) A 'dumb' barge may be used by the harvest team two months per year per site;

(c) Barges for special activities such as predator net changes once per year per site; and

(d) Bi-annual use of tugboats used for towing the sea pens between sites.

FISH HEALTH AND BIOSECURITY

Fish welfare

70 Every fish in the farm is valuable to NZ King Salmon, and fish welfare is therefore very important. King salmon are naturally shoaling animals, and as such being contained in a sea pen is not contrary to their natural instinct. The shoaling response helps confuse predators in the wild.

71 In order to comply with the Animal Welfare Act 1999 (and subsequent amendments), NZ King Salmon has an Animal Welfare Policy which overarches all operating policies. This means that all policies within NZ King Salmon must take into account animal welfare.

72 NZ King Salmon sits on an Animal Ethics Committee so where applicable production trials involving fish are independently reviewed and approved prior to a trial commencing.

Biosecurity

73 Unlike most NZ primary industries we do not permit the importation of live salmon. There is only one other salmon producing country that does this – Australia. By eliminating this vector, this significantly reduces the chance of accidental introduction of a serious salmon pathogen.

74 NZ King Salmon wants to protect the salmon industry. NZ King Salmon has a Biosecurity Policy, which is linked to the management plans we abide by on our sites. Having an effective biosecurity plan helps reduce the spread of pathogens.

75 NZ King Salmon, as one of New Zealand's salmon farming companies, has given mandate to Aquaculture New Zealand to sign the Government Industry Agreement, which states the aquaculture industry will work with the Ministry of Primary Industries to develop and implement successful biosecurity strategies to protect New Zealand's industry.

76 A disease situation is the result of the interaction between three components: environment, host and a pathogen.

77 This proposal will improve the environment component of the disease equation. The proposed sites have higher water flow (which result in more stable temperatures and higher oxygen replacement and nitrogenous waste removal), which reduces stress and stress-related immunosuppression making fish less susceptible to pathogens.

78 Single year fallowing refers to the practice of only farming one year class on a site and allowing a fallow period between year classes which is sufficiently long enough to kill or reduce pathogen numbers prior to re-stocking the site. Single year class fallowing is an important management tool should a pathogen be present. The new sites with improved production potential will permit NZ King Salmon, should the need arise, to use single year fallowing without materially affecting the annual production of the company.

79 Area management refers to a practice whereby hosts (in this case salmon) are removed from an area in order to reduce or eliminate a pathogen. Should the situation present itself NZ King Salmon may wish to carry this out in the future and for this reason MPI should consider making more geographically isolated areas available for salmon production.

NZRLO and *Tenacibaculum maritimum* – Summer Mortalities

80 In March 2012 NZ King Salmon reported higher than usual mortalities to MPI at its Waihinau Bay farm. Subsequent summers to 2015 had higher than normal mortalities.

81 Over the course of a series of investigations and diagnostic techniques, Brightwater Consulting Ltd and NZ King Salmon determined a significant portion of the summer mortalities were due to a range of other factors:

(a) Enteritis: a condition where severe inflammation of the intestine causes fish to go off their feed, lose protein through their intestine and tends to increase permeability of the intestinal wall to bacteria and bacterial toxins all of which are a direct cause of fish mortality.

(b) Gastric dilation and air sacculitus: a condition where the physical properties of the salmon food result in abnormal function of the stomach that the salmon cannot cope with. The salmon drinks water, it's stomach distends, without absorbing water from the intestine it suffers from an osmotic imbalance i.e. it dehydrates. In mild cases, it places a physiological pressure on the fish and makes it more likely to die from other causes, but the condition can also be severe which directly results in mortality.

(c) Late runting: a behavioural condition where fish choose not to feed on pellets, and due to their weakened health status they die when faced with an environmental challenge.

82 A new method of detecting organisms by quantitative polymerase chain reaction (qPCR), resulted in the Animal Health Laboratory (Wallaceville, Wellington) being able to detect three strains of New Zealand Rickettsia like organisms (NZ-RLO) and *Tenacibaculum maritimum* (a ubiquitous marine bacteria) in a portion of the mortalities. The new technology enabled the detection of these organisms, so it is impossible to determine whether they are recent introductions or not and despite investigations, causality with fish losses has not been demonstrated.

83 These are not the Rickettsiae reported in shellfish.

84 Further testing of salmon carried out by MPI showed NZ-RLO and *T. maritimum* to be detected on multiple salmon farms in both the Marlborough Sounds and Akaroa Harbour. Only the Waihinau farm showed unusual mortalities.

85 *T. maritimum* is a gram negative filamentous bacterium that is ubiquitous in the marine environment. It is a secondary pathogen and can infect fish wounds.

86 Rickettsiae species of bacteria are on the Schedule of Notifiable Organisms 2015. On 19 Oct 2015, using section 122 of the Biosecurity Act, MPI directed NZ King Salmon to implement their status red in NZ King Salmon's Biosecurity Policy (this had been in place since February 2015, but the direction meant NZ King Salmon were now legally required to implement status red in its biosecurity policy).

87 On 20th April 2016 MPI issued a controlled area notice to NZ King Salmon in order to restrict the spread of NZ-RLO. This required NZ King Salmon to apply to MPI in order to move equipment associated with the propagation of king salmon.

88 On 18th July 2016 MPI served another notice of direction to NZ King Salmon to cease distribution of bait and berley products derived from farmed salmon from with the controlled area. On the 1st Nov 2016 MPI altered the direction to permit the production and distribution of berley subject to treatment by heating or freezing.

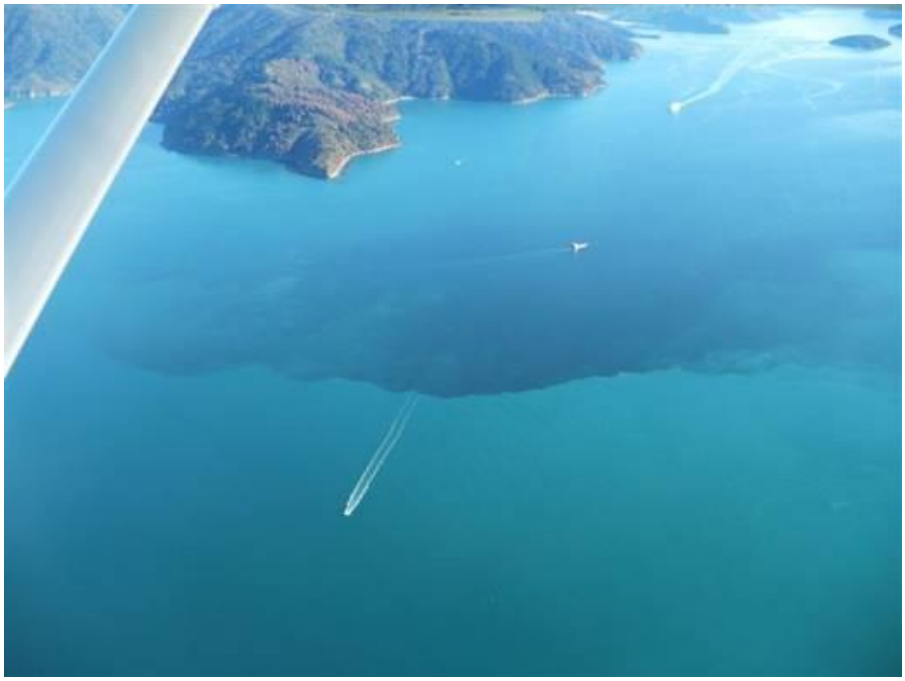
89 At this point in time we cannot define what role, if any, the NZ-RLOs played in the mortalities we observed over the summer periods. NZ King Salmon are working with MPI to develop a challenge testing trial which may shed further light on this organism's role in salmon mortalities.

Ruakaka Algal Bloom

90 Algal blooms are naturally occurring events. During June 2010 an ichthytoxic (fish lethal) bloom (*Pseudochattonella verruculosa*) affected the Ruakaka farm.[4] The bloom originated in the head of the Grove Arm and moved towards the Ruakaka salmon farm.

[4] Refer: https://www.researchgate.net/publication/251694469_Mortalities_of_sea-cage_salmon_Oncorhynchus_tshawytscha_due_to_a_bloom_of_Pseudochattonella_verruculosa_Dictyochophyceae_in_Queen_Charlotte_Sound_New_Zealand.

91 When the bloom was detected at Ruakaka, the farm was successfully relocated to the Otanerau Bay site for several months until the bloom naturally dissipated. The bloom in the inner Sounds can be clearly seen from aerial photos.



Algal bloom in the inner Queen Charlotte Sound – June 2010

92 That experience has resulted in:

(a) Early detection monitoring by sampling for algae at Wedge Point (a point closer to the Grove Arm); and

(b) Training for farm staff to undertake daily plankton monitoring.

93 This improved process permits earlier detection of an algae bloom, allowing NZ King Salmon more time to instigate mitigating action.

Antibiotics

94 NZ King Salmon has on four occasions used antibiotics as a trial (one was a laboratory based trial in Nelson). The first two trials saw use confined to a single trial pen to determine whether oxytetracycline would have a positive effect on gastric dilation and air sacculitus (1999) and enteritis (2000). As it happened, the fish did not respond to antibiotics and the trial has not been repeated. A third seafarm trial was carried out in 2014, whereby selected fish were injected with Engemycin™ to control secondary skin infections – an effect was determined.

95 Due to the lack of salmon diseases in New Zealand coastal waters, antibiotics, lice treatments and anthelmintics (antiparasitic drugs) are not required in the New Zealand salmon industry. Although this is the current enviable situation for New Zealand salmon farmers, there may be a requirement to use antibiotics, lice treatments, animal remedies or anthelmintics at some point in the future should a pathogen suddenly become prevalent.

CONCLUSION

96 Relocating to higher flow sites will result in more stable temperatures and higher oxygen replacement and nitrogenous waste removal. These sites will be better for fish health and will result in improved environmental outcomes. The cooler waters at the high flow sites should result in a reduction in summer mortalities.

97 The relocation proposal is likely to improve biosecurity by enabling NZ King Salmon to farm in environments where fish will be less susceptible to disease. The improved production potential at the higher flow sites will permit NZ King Salmon, should the need arise, to use single year fallowing without materially affecting the annual production of the company.

98 NZ King Salmon requires a better environment for our salmon. A better environment will improve fish health and welfare. Fish health and welfare is fundamental to producing a premium product.

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Mark Anthony Preece