



marineharvest

Deenish 13S1 Stock Report

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MARINE HARVEST ASA

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Introduction

On October 31st 2012, Marine Harvest Ireland was granted a 2 year amendment to Aquaculture licence No. AQ199 which was assigned to Silverking Seafoods Ltd., permitting the cultivation of salmon at Deenish Island, Ballinskelligs Bay, co. Kerry, subject to the enforcement of special conditions.

Under the terms of this amended licence a crop of Fanad/Mowi strain of salmon smolts was moved from Altan Smolt Unit, Co. Donegal to Deenish in April 2013 and moved from the Deenish site for harvest by November 30th 2014.

This report summarises the Key performance indicators of this crop in addition to the assessed impact on the local marine benthos.

Site Natural Features:

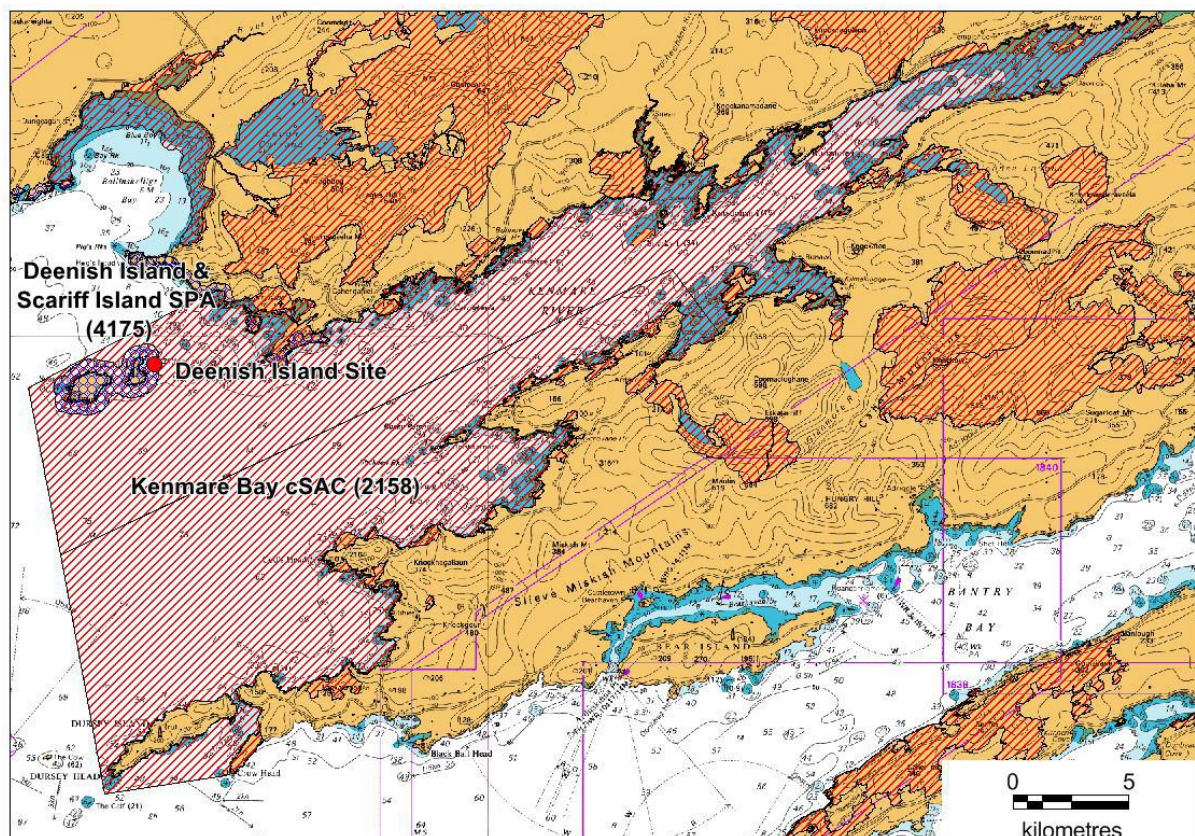


Figure 1:

Kenmare Bay, Co. Kerry, is a long and narrow, south-west facing bay. It is a deep, drowned glacial valley and the bedrock is mainly Old Red Sandstone which forms reefs along the middle of the bay throughout its length. Exposure to prevailing winds and swells at the mouth diminishes towards the head of the bay. Numerous islands and inlets along the length of the bay provide further areas of additional shelter in which a variety of habitats and unusual communities occur.

Two Natura 2000 sites are of relevance for the Deenish site (see Figure 2.2). Deenish Island is located in the outer reaches of the Kenmare River cSAC (Site code: 002158) and the island forms part of the Deenish Island and Scariff Island SPA (Site code: 004175).

Kenmare River cSAC has a very wide range of marine communities from exposed coast to ultra-sheltered areas. The site contains three marine habitats listed on Annex I of the EU Habitats Directive, namely reefs, large shallow bay and caves. There is also an extremely high number of rare and notable marine species present (24) and some uncommon communities. Kenmare River is the only known site in Ireland for the northern sea-fan, *Swiftia pallida* and is the only known area where this species and the southern sea-fan *Eunicella verrucosa* co-occur. Midway along the south coast of Kenmare River, a series of sea caves stretch back into the cliff. They typically support encrusting sponges, ascidians and bryozoans.

Deenish Island and Scariff Island are small- to medium-sized islands situated between 5 and 7 km west of Lamb's Head off the Co. Kerry coast; they are thus very exposed to the force of the Atlantic Ocean. The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Fulmar, Manx Shearwater, Storm Petrel, Lesser Black-backed Gull and Arctic Tern. Scariff is the larger of the two. It is steep-sided all the way around and rises to a peak of 252m. The highest cliffs are on the south side. The island vegetation is a mix of maritime grassland, areas dominated by Bracken and heathy areas with Ling Heather. There are the ruins of a monastic settlement and a cottage in the north-east sector of the island. Deenish is less rugged than Scariff, and rises to 144m in its southern half; the northern half is lower and flatter. The vegetation is mostly grassland, with some heath occurring on the higher ground. Old fields are now overgrown with Bracken and brambles. The sea areas to 500m around the islands are included inside the SPA boundary to provide a 'rafting' area for shearwaters.

Site Layout and equipment:

A total of 14 Aqualine plastic pens along with associated grid frame and moorings were laid out in a 3 x 5 grid pattern, within the licenced area. One pen was not stocked. A feed barge which also houses a small canteen and office was moored on the western site of the grid layout and in the lee of Deenish Island. Refer to the following sketch map. Fig. 2

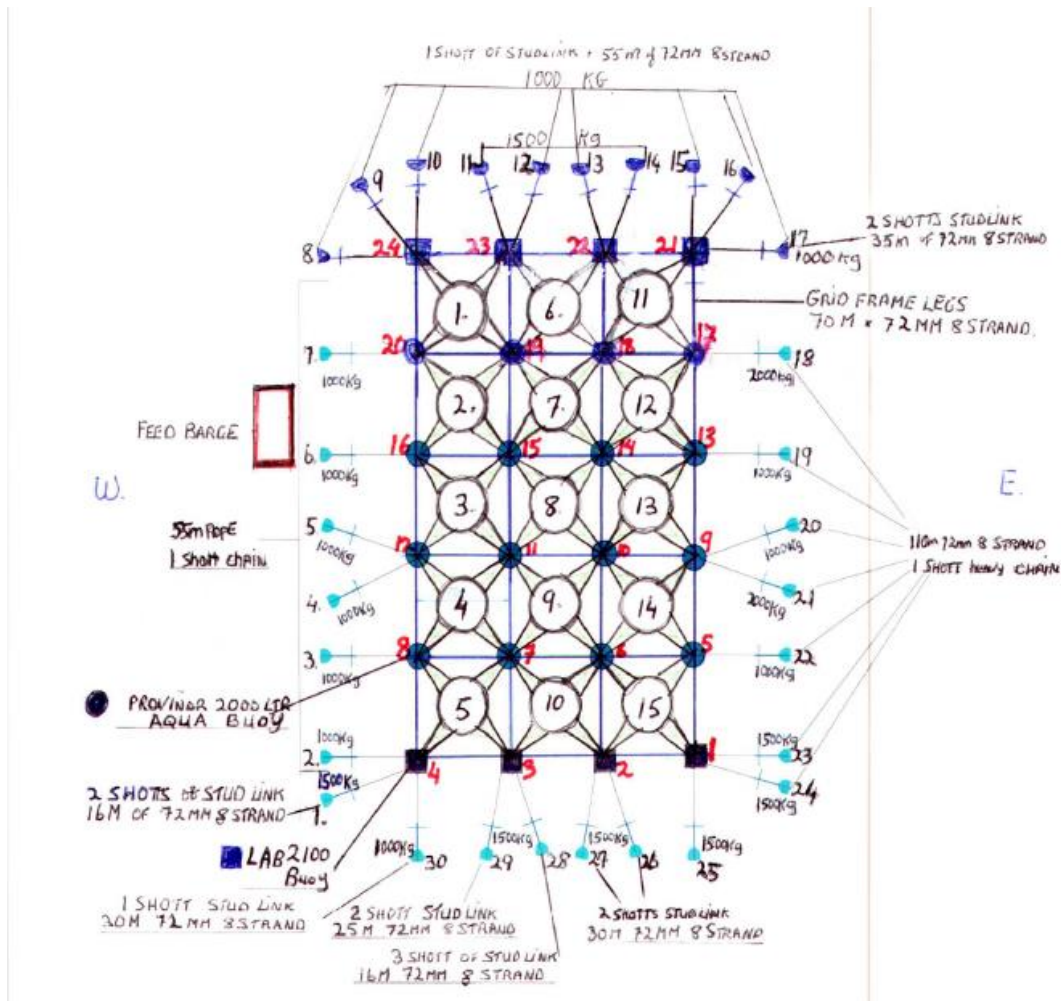


Figure 2
Site Staffing:

The Deenish site was staffed by 8 staff including a site Manager. Additional sub aqua diving and mooring services was provided by an additional 5 staff employed or subcontracted by MHI. In addition, the site was serviced by engineers and electricians based in Castletownbere.

Key Performance Indicators:

Stock Input	834,000 Fanad Mowi smolt
Total input biomass	49 tons
Total Harvest biomass	2,270 tons live weight (1,884 gutted weight)
Economic Feed Conversion Ratio (EFCR)	1.36
Biological Feed Conversion ratio (BFCR)	1.2
Relative Growth Index:	91.2%

Total mortality:	36.4%
Principal causes of mortality:	Jellyfish, harmful algal blooms and Amoebic Gill Damage.
Lice treatments	None
Escaped fish	None
Lost Time Injuries	None
AGD Freshwater baths	3
Superior quality Grade	93.5%
Ordinary Quality Grade	4.29%

Sea Lice monitoring and control:

In accordance with MHI Sealice monitoring and control procedures and when weather conditions allowed, at least 10 fish were sampled weekly from each of a minimum of three pens on site. Sea lice counts were conducted up to the point of commencement of harvest thus counts cover a period of 80 weeks from April 2013 to November 2014. When average numbers of gravid lice reach 0.2 per fish or total lice numbers exceed 5, a treatment is required. For organic production, this is subject to permission from the organic certifying bodies.

However, in the case of Deenish 13S1 crop, sea lice levels remained below treatment trigger levels and thus did not require any lice removal treatments. Sea lice levels for the 13S1 crop are summarised on the following graph.

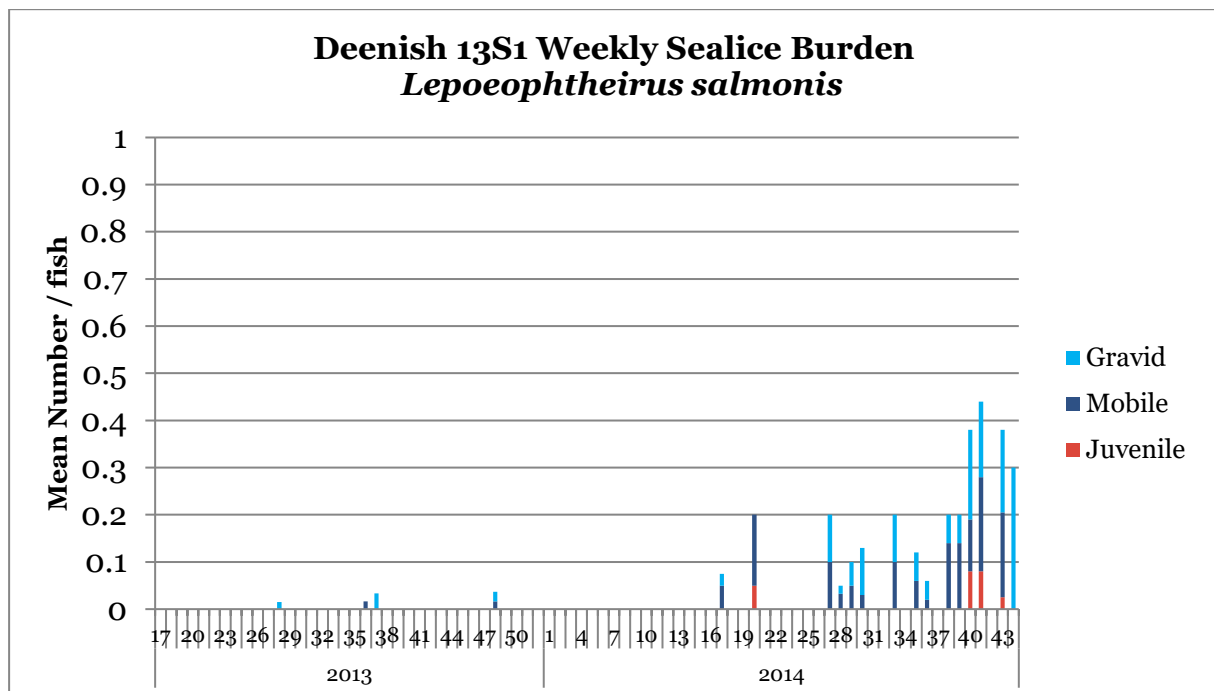


Fig. 3 Deenish Sea lice burden (all stages)

Fish Health Management:

The health of the Deenish 13S1 fish was closely monitored and recorded at four levels:

1. Daily observations by the site manager and feeding operatives of fish behaviour during routine operations such as feeding and net changing. Any unusual behaviour was recorded on the daily feeding sheets and reported immediately to the Operations Manager and the Marine Fish Health Manager.
2. Professional divers examined the behaviour and general health of the fish on a regular basis. Diver observations and a breakdown of mortality numbers by likely cause of death were recorded on the 'Mortality Record' sheets.
3. The company veterinarian (Vet-Aqua International) carried out a total of 16 site visits. In addition to this all sites was visited at least monthly by the South West Fish Health Surveillance biologist. During visits, fish would be clinically examined for general behaviour, body condition and external abnormalities, by anaesthesia. Samples were screened for skin, gill and internal parasites and recent mortalities also post-mortemed for any unusual findings. Full laboratory support was provided by the designated veterinary practice.
4. The stock performance (e.g. feeding rate, mortality rates) were assessed at least once a week by the Production Manager for any indication of disease/abnormalities in the stock

Benthic Monitoring and Impact:

During the 20 month production period, two benthic surveys were carried out on the Deenish site by Environmental consultants, Aquafact Ltd.

On 28th August 2013 a benthic survey was carried out on the Deenish site. The survey followed the DCMNR Level I monitoring protocols. The site was fallow for approximately three weeks before an onsite biomass production of 249.5 tonnes in the four month period prior to the survey. Mean current speed at the site is approximately 0.3ms⁻¹.

The seabed was composed of a mix of sediment types with areas of of fine-medium sand and areas of slightly coarser sand shell gravel mix as can be seen in the following images.



Figure 4: Sea bed images

The composition of sediments at each station can be seen in the sediment profile imagery (SPI) images with fine sand at the under pen station to a coarser shelly gravelly sand at the outer end of the transect. (Fig. 4). ARPD depths ranged from a minimum of 0.2cm (T1 Under, T1 Edge, T1 20m and T1 50m) to a maximum of >6.5cm (T1 100m). (Fig. 5).



Figure 5: ARPD depths

Organic carbon values ranged from 1.88 % (T2 50 m) to 7.08 % (T1 100 m) with the reference station recording a value of 1.56 %

In August 2014 Aquafact Environmental consultants carried out a DCMNR Level 2 survey with the addition of an Aquaculture Stewardship Council (ASC) standard survey as requested by MHI. This additional ASC survey was required in partial fulfilment of the second principle of the ASC Aquaculture Standard which is;

Principle 2: Conserve natural habitat, local biodiversity and ecosystem function

The fulfilment of Criterion 1: of ASC Principle 2 - Benthic biodiversity and benthic effects was the purpose of this assessment.

At the time of the survey, the standing biomass on site was 2,067 tons. A total of 9 sample stations at the Deenish fish farm site on the 7th August 2014 were sampled for faunal and sediment analyses.

Redox potential values met the standard of >0 mV at all stations except stations S5 and S2 (replicate A). Shannon Weiner diversity values met the standard of >3 at 6 of the stations, with stations S1, S4 and S5 returning values below the standard. AMBI scores met the standard of ≤ 3.3 at 6 of the stations, with stations S1, S2 and S4 returning values >3.3 . These 3 stations were closest to the pen and as expected were the most impacted and returned a disturbance classification of 'Moderately Disturbed'. The remaining stations were all classified as 'Slightly Disturbed' with the Reference station classified as 'Undisturbed'. Five of the 9 stations met the standard for numbers of non-pollution indicator species present at frequencies of $\geq 100/m^2$.

When compared to the 2012 and 2013 benthic surveys, results for this site indicate little habitat degradation is obvious beyond the edge station on both transects at the Deenish site. Results from previous years surveys of the seafloor beneath the Deenish Island pen blocks indicated little change year on year on and showed few obvious signs of impact. In general the surface appearance of the seafloor was devoid of any indication of the overlying pens beyond the immediate footprint of the pens.

Water Column nutrient monitoring:

In accordance with Monitoring Protocol No. 2. for offshore finfish farms water column monitoring, water samples were collected at three points in the centre of the farm site and one control sample was collected at a distance from the site. Results are summarised in the following table;

Sample point	GPS location	DATE	WEEK	NO ₂ ug/L	NO ₃ ug/L	Phosphorous ug/L	TAN ug/l	Chlorophyll ug/L
1m below surface	Lat. 51-44-18 Long. 10-13-04	17-Dec-13	51	0.89	66.51	24.62	0.45	0.00
		10-Jan-14	2	1.17	85.52	18.33	3.58	0.00
		17-Feb-14	8	0.98	28.63	20.35	17.22	0.00
		06-Mar-14	10	1.56	19.53	20.35	5.71	0.17
Mid depth		17-Dec-13	51	1.74	73.03	24.62	0.0	0.00
		10-Jan-14	2	1.17	62.91	12.66	2.58	0.00
		17-Feb-14	8	1.27	34.63	20.35	5.71	0.00
		06-Mar-14	10	1.86	55.73	29.03	6.75	0.00
1m above seabed		17-Dec-13	51	1.45	66.38	29.95	0.45	0.00
		10-Jan-14	2	0.91	67.45	14.55	1.59	0.00
		17-Feb-14	8	0.98	35.47	18.18	8.84	0.00
		06-Mar-14	10	1.86	63.14	39.88	9.89	0.00
Control	10-Jan-14	2	2.52	95.33	18.33	12.53	0.00	
	17-Feb-14	8	1.06	74.64	12.42	5.82	0.00	
	06-Mar-14	10	0.5	29.45	16.45	3.56	0.00	

Site Inspections and Certifications:

The 13S1 crop was reared under EU Organic rules in accordance with EC 710/2009 in addition to Naturland (German Private Label) and BioSuisse (Swiss) Organic aquaculture standards with certificates awarded after independent audit verification during 2013 and 2014. In addition the site was audited and awarded the Global GAP aquaculture standard.

The integrated Quality, Environmental and HES management systems for the site also audited by the NSAI under ISO 9001, ISO 14001 and OHSAS 18001 standards.

During November 2014, the first Aquaculture Stewardship Council aquaculture audit in the Irish Aquaculture industry was carried out on the Deenish 13S1 crop.

The Aquaculture Stewardship Council (ASC) sets an unprecedented standard for sustainable food production. This Salmon standard provides guidelines for responsible salmon farming which minimises negative impacts on the environment and enhances local communities. The ASC standard includes guidelines for the protection of the health and genetic integrity of wild populations, responsible use of resources, disease management, social responsibility, and community and stakeholder engagement are included to ensure compliance by aquaculture companies worldwide. The ASC certification decision for this site is expected in February 2015.

Conclusions:

Concerning stock husbandry, management of sea lice and benthic impacts this pilot project worked very well. By stocking Deenish with one smolt input to grow out within a 21 month period with no additional stock inputs, this has allowed the effective control of sea lice without the use of any therapeutic interventions.

In addition, the environmental benthic surveys have shown no difference in impact compared to previous inputs and with an increased standing biomass in excess of 2,000 tons.

Appendices:

<O:\Benthic Monitoring Marine\2014\JN1263 Deenish 2014 ASC Audit.pdf>
<O:\Benthic Monitoring Marine\2014\JN1263 Deenish 2014 Audit.pdf>
<O:\Benthic Monitoring Marine\2013\JN1208 Kenmare Bay 2013 Audit.pdf>
<O:\Benthic Monitoring Marine\2012\JN1160 Kenmare Bay 2012 Audit.pdf>
<I:\Aquaculture licenses\Deenish Aquaculture licenses\ALABDeenishDecision311012.pdf>
[Deenish amendment 2011.pdf](#)
<O:\Certifications 2014\Bio Suisse\Bio Suisse 2014 SW.pdf>
<O:\Certifications 2014\CQSORG\CQSORG1029 MHI Deenish Cert 020715.pdf>
<O:\Certifications 2014\Global GAP\GGAP Certificate MH Ireland 110614.pdf>
<O:\Certifications 2014\Naturland\Naturland 2014 2015.pdf>
<O:\Certifications 2014\ISO Certs\ISO 14001 cert exp 110116.pdf>
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