An Bord Achomhairc Um Cheadúnais Dobharshaothraithe
Aquaculture Licences Appeals Board

North West Shell Fish Ltd

Site T12/ 203E

Appeal

Cúirt Choill Mhinsí, Bóthar Bhaile Átha Cliath, Port Laoise, Contae Laoise, R32 DTW5
Kilminchy Court, Dublin Road, Portlaoise, County Laois, R32 DTW5

Guthán/Telephone: 057 8631912 R-phost/Email: info@alab.ie Láithreán Gréasáin/Website: www.alab.ie

NOTICE OF APPEAL UNDER SECTION 40(1) OF FISHERIES (AMENDMENT) ACT 1997 (NO. 23)

Appeal Form

Please note that this form will only be accepted by REGISTERED POST or handed in to the ALAB offices			
Name of Appellant (block letters)	NORTH WEST SHELL FISH LTD		
Address of Appellant			
Upper carrick			
Carrigart			
Letterkenny			
Co Donegal			
Phone:		Email:	northwestshellfish@eircom.net
Mobile:		Fax:	

Fees

Fees must be received by the closing date for receipt of appeals	Amount	Tick
Appeal by licence applicant	€380.92	X
Appeal by any other individual or organisation	€152.37	
Request for an Oral Hearing * (fee payable in addition to appeal fee) * In the event that the Board decides not to hold an Oral Hearing the fee will not be refunded.	€76.18	X
(Cheques Payable to the Aquaculture Licences Appeals Board in accordance with the Aquaculture Licensing Appeals (Fees) Regulations, 1998 (S.I. No. 449 of 1998))		
Electronic Funds Transfer Details	IBAN: IE89AIBK93104704051067	BIC: AIBKIE2D

Subject Matter of the Appeal

The licence granted by the minister for site T12/203E in Mulroy Bay, to North West Shellfish Ltd. is of no use for all the reasons given in attached documents.

AQUACULTURE LICENCES APPEALS BOARD
29 NOV 2018
RECEIVED

RL 6975 7016 1IE

Please forward completed form to: Aquaculture Licences Appeals Board, Kilminchy Court, Dublin Road, Portlaoise, Co. Laois. Tel: (057) 8631912 Email: info@alab.ie

Site Reference Number:- (as allocated by the Department of Agriculture, Food and the Marine)	T12/203E

Appellant's particular interest in the outcome of the appeal:

It is our site but the license granted by the Minister has no practical use.

Outline the grounds of appeal (and, if necessary, on additional page(s) give full grounds of the appeal and the reasons, considerations and arguments on which they are based):

See attached.

Signed by appellant: [signature] Date: 26/11/18

Please note that this form will only be accepted by REGISTERED POST or handed in to the ALAB offices

Fees must be received by the closing date for receipt of appeals

This notice should be completed under each heading and duly signed by the appellant and be accompanied by such documents, particulars or information relating to the appeal as the appellant considers necessary or appropriate and specifies in the Notice.

DATA PROTECTION – the data collected for this purpose will be held by ALAB only as long as there is a business need to do so and may include publication on the ALAB website

Please forward completed form to: Aquaculture Licences Appeals Board, Kilminchy Court, Dublin Road, Portlaoise, Co. Laois. Tel: (057) 8631912 Email: info@alab.ie

Appeal to ALAB regarding the Ministers decision to grant an aquaculture license to North West Shellfish for site T12/203E in Mulroy Bay County Donegal.

Subject matter of the appeal.

The licence granted is of no use to us or anyone else as an aquaculture site for suspended culture of any species, because the flotation devices described are only the size of a football and spaced at 20 metre intervals are only good as marker buoys.
The lack of licensed area to cultivate all the species we have applied for, and intend producing or purchasing from a marine hatchery, will severely restrict our plans for expansion which in turn will hamper growth in the aquaculture and fisheries sectors in Ireland because seed supply is the main restriction to the development and expansion of numerous species, eg. Clams, Native Oyster, Scallops and many other shellfish and seaweed species. There are no hatcheries in Ireland producing any of the high end shellfish or seaweed species and we have some of the leading experts in both fields willing to become partners in a hatchery operation if conditions are right, that means having adequate nursery and grow-out sites to maximise production. (see annex 1)

Appellant's interest in the outcome of the appeal.

We are the applicant and are depending on this site to support the operation of a marine hatchery by being able to nurse seed produced in a hatchery and from wild collection.
We have disease free status in Mulroy bay, and are Class A waters for Scallops and Mussels, therefor, we can export seed or mature stock to anywhere in the world which we have being doing with scallop of all sizes this past >20 years.
Although we respect the Ministers decision we feel it is based on poor advice and is at odds with good planning and forward thinking which is something that we in NWS have always focused on.
Indeed the state through its many agencies have highlighted the need for good planning and forward thinking in the food production sector to capitalise on the many opportunities that the global market has and will present to us in the future. (see annex 2)

As is evident in all of our aquaculture licence applications we are focusing on developing a marine hatchery and multitrophic aquaculture in our sites and it seems that that approach has been acknowledged by the fact that the Minister has granted all the species applied for, (except mussels), in site T12/203K .(see annex 3)
The reason given for not granting mussels on site T12/203K was that it is North of an historic line for which mussels were not to be licensed, so we will accept that decision.
For us to seek investors, and invest in a marine hatchery ourselves, we need to be able to grow, at sea, whatever seed we produce in the hatchery, so licensed sites in Mulroy Bay for the species applied for is a prerequisite to any hatchery proposal, nobody will support a proposal to produce seed in a hatchery unless there is a plan to bring them to the market and that requires nursery sites at sea.
Apart from all the other species we are planning to produce, mussels are to the fore now for hatchery production and there are always research projects associated with every species. (google, scottish mussel hatchery project receives international boost).
Site T12/203E is within the mussel production area and adjacent to numerous longline mussel production sites and salmon production sites, so we are requesting that all the species applied for on this site be licensed in accordance with our application so that best practices can be employed in the production of all species and maintain a healthy environment in the bay.

The grounds of appeal.

Only one out of the eight reasons given by the Minister for granting an aquaculture license for this site express a negative view, all the other seven are positive. (see, determination of aquaculture/foreshore licensing application-T12/203E @ DAFM Donegal).
Reason, H) outlines how aquaculture activities in this SAC , including this site , are being licensed and managed so as not to significantly and adversely affect the integrity of the Mulroy Bay SAC.
This site has been in production this past > 20 years, growing scallops, using the same system as on all our sites, longlines and mussel barrels for flotation.
We were only informed when the Minister was due to make a determination on our license applications that the Departments Marine Engineer, Paul O'Sullivan had recommended changes to this site.
We had liaised with him throughout the application process and had met twice in the past few years to plan ahead and to mitigate against issues that might cause problems, he never expressed concern about any sites.
It became obvious through written correspondents and discussions between ourselves and Department staff, including the marine engineer, that the minister would be advised to refuse the application if we didn't make the changes proposed. (see annex 4).
We drew up, and submitted new drawings and plans for this site, we also went to Clonakilty to meet with Eileen Maher and Gerry Foley in the Departments offices to make sure that what we had proposed was in accordance with the Departments instructions and we also explained the rational for including a practical solution for buoyancy. (see annex 5)
It now looks like, the Minister determined on our original application, and not our revised one, by stating that if "the site were to be developed in full in accordance with the application, utilising 10 longlines and heavy utilisation, there would be substantial scale visual impact both in stand alone and cumulative impact terms".

The application before him should have had no mention of ten longlines or substantial scale visual impact because the revised version which was agreed between us and his Department officials is exactly what he has licenced except he has excluded any buoyancy other than buoys used for marker buoys and has also excluded all the species applied for on the grounds that, "keeping the development to a lower level of intensity, mitigates visual impact".
Having one, or all the species we applied for included will make "no difference" to the level of intensity on the site or the visual impact, because we will be using the same structures/systems and buoyancy as described in our application, irrespective of what we are growing.
There were no objections to the renewal of any of our licenced sites in the bay during the consultation period, including from Donegal Co Co who's county development plan covers the visual aspect of licensing, (see annex 6), so we are not sure how all this has come about, however we did all that was asked of us to mitigate against any negative impact that might occur on this and every other site.
If you require further information on this matter, please ask, and we look forward to further engagement with you if that is necessary

Jerry Gallagher.
MD. North West Shellfish Ltd.

Regards

Jerry
North West Shellfish
T:

Mevagh FRC Administrator

From: Northwest Shellfish <northwestshellfish@eircom.net>
Sent: 27 November 2018 12:57
To: Mevagh FRC Administrator
Subject: Fw: Letter of Support
Attachments: SCAN_0236.jpg

Categories: Dealt with by Gráinne

Can you also print this one.

Regards

Jerry
North West Shellfish
T: [redacted]

From: Northwest Shellfish
Sent: Wednesday, September 19, 2018 7:57 AM
To: EileenM Maher
Cc: Gerry Foley
Subject: Fw: Letter of Support

Hi Eileen.
See attached letter from Acadian Seaplants committing to working with us on our seaweed cultivation business.

Regards

Jerry
North West Shellfish
T: -

From: Jim Keogh
Sent: Tuesday, September 18, 2018 5:27 PM
To: northwestshellfish@eircom.net
Cc: Daniel Parker
Subject: Letter of Support

Jerry,
Please find attached the letter of support you have discussed with Daniel. If I can be of any further assistance , please do not hesitate to ask .
Regards,
Jim

Jim Keogh | Europe Director -Strategic Affairs |
Arramara Teoranta.
Tel: +353 91 577885 **Mob:**
Email: jfk@arramara.ie www.arramara.ie

Arramara Teoranta, Gorlann Gnó na bhForbacha,
Na Forbacha, Gaillimh.

Acadian Seaplants
Algues Acadiennes

BEST MANAGED COMPANIES

September 18, 2018

Jerry Gallagher

North West Shellfish Limited

Upper Carrick, Carrick, Carrigart,

County Donegal,

Ireland

Dear Mr. Gallagher,

Acadian Seaplants Limited has appreciated the opportunities for knowledge transfer with you in the past.

We understand that you are progressing toward possible licensing for the sound, environmentally responsible operation of aquaculture facility in Donegal.

When North West Shellfish Limited receives the appropriate licenses, we are interested in possible collaborations with you.

We look forward to further discussions regarding hatchery production, markets and other aspects of collaboration potential.

If you or any other stakeholders require further information I look forward to speaking with you.

Sincerely,

Jim Keogh

Director of European Strategic Affairs

c.c. Jean-Paul Deveau, President & CEO, Acadian Seaplants Limited

Tel: +1 902 468 2840 Fax: +1 902 468 3474 **Email: info@acadian.ca** www.acadianseaplants.com
30 Brown Avenue, Dartmouth, Nova Scotia, Canada B3B 1X8

Mevagh FRC Administrator

From: Northwest Shellfish <northwestshellfish@eircom.net>
Sent: 27 November 2018 12:56
To: Mevagh FRC Administrator
Subject: Fw: hatchery

Hi Pauline?.
Can you please print all of this mail, I will be sending others so keep them for me.

Regards

Jerry
North West Shellfish
T: +
-----Original Message-----
From: Northwest Shellfish
Sent: Wednesday, September 19, 2018 8:05 AM
To: EileenM Maher
Cc: Gerry Foley
Subject: Fw: hatchery

Hi Eileen.
See attached mail from Thorolf Magnesen MD of Scalpro AS stating his desire to be partners with us in a marine hatchery venture.

-----Original Message-----
From: Thorolf Magnesen
Sent: Thursday, September 13, 2018 10:07 PM
To: Northwest Shellfish
Subject: Re: hatchery

Ho Jerry
Sure we still are interested in participating in establishing a functinal scallop hatchery in Ireland!

PS Presently in Dublin!!!

Thorolf

Sendt fra min iPhone

12. sep. 2018 kl. 12:08 skrev Northwest Shellfish <northwestshellfish@eircom.net<mailto:northwestshellfish@eircom.net>>:

Hi Thorolf.

I hope all is well with you and your crew.
The Dept are just now dealing with our aquaculture licence applications and are enquiring as to the source of seed etc.
I have explained that we investigated setting up a marine hatchery in

partnership with Scalpro AS however due to the restriction on grants etc. associated with us not having a current aquaculture licence we put it on hold.
I have informed them that there is no hatchery in Ireland able to produce scallop spat and that Scalpro was the best prospect for collaboration when we were develop a hatchery.
Can you explain that you are still interested in our hatchery plan and that you will bring your expertise to the table.
Regards

Jerry
North West Shellfish
T: ·

Mevagh FRC Administrator

From: Northwest Shellfish <northwestshellfish@eircom.net>
Sent: 27 November 2018 12:58
To: Mevagh FRC Administrator
Subject: Fw: Visit to Carrigart

Print please.

Regards

Jerry
North West Shellfish
T: ·

From: Northwest Shellfish
Sent: Wednesday, September 19, 2018 7:54 AM
To: EileenM Maher
Cc: Gerry Foley ; northwestshellfish@eircom.net
Subject: Fw: Visit to Carrigart

Hi Eileen.
See attached some correspondents we have had with Acadian Seaplants one of the leading authorities in their field.
We have met with their senior people on several occasions this past few years and their technology is second to none.
We have put a lot of thought and effort into this process as we aim to succeed in whatever we do.

Regards

Jerry
North West Shellfish
T: ·

From: Daniel Parker
Sent: Tuesday, September 18, 2018 5:42 PM
To: Northwest Shellfish

Subject: RE: Visit to Carrigart

Good evening Jerry,
All best with the meeting tomorrow.
Is the letter acceptable?
Regards,
Daniel

From: Northwest Shellfish <northwestshellfish@eircom.net>
Sent: Monday, September 17, 2018 4:40 PM
To: Daniel Parker
Subject: Re: Visit to Carrigart

Perfect Daniel, I am meeting with our licensing Dept officials on Wed morning so it would be great to have some correspondents by then to show them.
If and when we get our licences we will be more than happy to work with Acadian Seaplants on any project we decide on.
I will keep you informed.

Regards

Jerry
North West Shellfish
T: -

From: Daniel Parker
Sent: Monday, September 17, 2018 8:14 PM
To: Northwest Shellfish
Subject: RE: Visit to Carrigart

Good evening Jerry,
Sorry for the delay.
I have been trouncing around.

I hope you and others are well.
I've spoken with JP Deveau of Acadian Seaplants and he will be honored to have a letter prepared and sent.

I will follow up tomorrow and assure it is sent to you.

Regards,
Daniel

From: Northwest Shellfish <northwestshellfish@eircom.net>
Sent: Sunday, September 9, 2018 5:27 AM
To: Daniel Parker
Subject: Re: Visit to Carrigart

Hi Daniel.

I hope all is well with you.
The Dept are soon to determine on our aquaculture licence applications and are enquiring as to where we will source our seeded string.
We had previously discussed with you that we intended developing a marine hatchery and that seaweed cultivation was incorporated into the plan.
To that end could you send me a mail which i could forward to the Dept explaining that if we get our licences Acedian Seaplants would be interested in collaborating with us in the hatchery production of seaweeds and markets?, if that is an option.
We will discuss further what, if any collaboration we might have but in the meantime an expression of interest would help us get the licences.

Regards

Jerry
North West Shellfish
T:

From: Daniel Parker
Sent: Thursday, June 15, 2017 10:21 PM
To: Noel McBride
Cc: Jerry Gallagher ; Dan Parker ; Ann and Myles Gallagher ; Jeff Hafting ; sean@muintearas.com
Subject: Re: Visit to Carrigart

Jerry, Noel and Myles,

Thank you for your time, discussion and like mindedness.
I know each of you and Sean sacrificed from other pursuits to be there today.

I remain at your disposal and look forward to next steps.

Regards
Daniel

On Jun 15, 2017, at 10:15 PM, Noel McBride < > wrote:

Hi All

It was a pleasure meeting you all to day in Carrigart. I do believe there is the making of a viable project here with everyone going forward with their expertise.
We will keep in contact and talk to the various potential funders and interested parties .

Regards for now

Noel

On Thu, Jun 15, 2017 at 7:37 PM, <northwestshellfish@eircom.net> wrote:

Hi all.

It was great to meet with you all today and hear Jeff's presentation and catch up on mutual interests.
I will be making contact with people I know in BIM and let you know what is happening on the seaweed front in Ireland from their perspective.
I hope you have a fruitful visit to Ireland and that Jeff also enjoys France.
Regards,
Jerry

Mr Jerry Gallagher
Northwest Shellfish
Tel:

On 14 Jun 2017, at 7:04 a.m., Daniel Parker < > wrote:

Grand

Thanks all
See you there
Daniel

On Jun 14, 2017, at 6:50 AM, "northwestshellfish@eircom.net" <northwestshellfish@eircom.net> wrote:

> Noon is fine at the Carrigart hotel.
>
> Regards,
> Jerry
>
> Mr Jerry Gallagher
> Northwest Shellfish
> Tel:
>
> On 13 Jun 2017, at 11:21 a.m., Daniel Parker < > wrote:
>
> > Wonderful
> > I will assure we head toward Carrigart for arrival around noon.
> > If someone can suggest a restaurant we will make our way there.
> >
> > This is really just an information sharing opportunity as Dr Jeff is a cultivation scientist
> >
> > Regards
> > Daniel
> >
> > On Jun 13, 2017, at 6:53 AM, Noel McBride < > wrote:
> >
> > > Hi Dan
> > > I look forward to meeting you on Thursday. Around noon would suit me if that is ok with everyone.
> > > Regards

Noel

Sent from my iPhone

On 12 Jun 2017, at 21:53, Dan Parker < > wrote:

> Good evening Noel,
> Daniel Parker here.
> I am traveling toward the West of Ireland.
> I had spoken with Jerry last week arranging a lunch meeting that I hope you, Jerry and his brother can make with me on Thursday June 15th in Donegal.
> Is there a preferred location where we could share a lunch and Dr. Jeff Hafting can present information on seaweed cultivation and seed stock?
> Regards,
> Daniel

> On Thu, Feb 23, 2017 at 8:58 AM, Noel McBride < > wrote:
>
> > Hi Danial
> > I would be delighted to meet him. Perhaps a meeting including Sean and Gerry would be appropriate.
> > Regards
> > Noel
> >
> > Sent from my iPhone
> >
> > On 23 Feb 2017, at 12:45, Dan Parker < > wrote:
> >
> > > Hello Noel,
> > > This is Daniel Parker.

We spent a wonderful day together with Sean O Coistealbha, Jerry and his brother with you including a great tour of the lighthouse.

I did receive the spam email but did not open the attachment.

Thanks for the warning and no worries. These things happen.

I hope to see you again soon.
In fact, I have a man coming to Ireland who is an expert in cultivation and seed stock.
Would you like to meet him?

Regards and Thanks,
Daniel

On Thu, Feb 23, 2017 at 7:50 AM, Noel McBride <[redacted]> wrote:

Hi,

My email was hacked a few days ago and spam email was sent to all in my contacts list . Please ignore all emails with links that you may have received from this account in the last few days. I have recovered the account now and taken the appropriate measures. My sincerest apologies for the inconvenience.

Noel

Mevagh FRC Administrator

From: Northwest Shellfish <northwestshellfish@eircom.net>
Sent: 27 November 2018 13:03
To: Mevagh FRC Administrator
Subject: Fw: seaweed string

Print please.

Regards

Jerry
North West Shellfish
T

From: Northwest Shellfish
Sent: Wednesday, September 12, 2018 8:41 AM
To: EileenM Maher
Cc: northwestshellfish@eircom.net
Subject: Fw: seaweed string

Hi Eileen.
Some info to add.

Regards

Jerry
North West Shellfish
T: +

From: kate burns
Sent: Friday, September 7, 2018 5:31 PM
To: NWS
Subject: Re: seaweed string

Hi Jerry
Yes we would be interested in supplying you with seeded string for kelp cultivation.
Please note that we would not use string seeded with sorus from Rathlin, we would want to use ripe kelp from Mulroy only. My thoughts are that saccharina latissima is probably the best species for your waters.
In terms of supplying kelp spools, we may want to have a discussion about a commercial arrangement that works for us both. We have interest from new potential buyers, and it may be worthwhile exploring these opportunities.

Kind regards

Kate

On Fri, 7 Sep 2018, 16:41 Northwest Shellfish, <northwestshellfish@eircom.net> wrote:
Hi Kate.
The Dept are currently working on our aquaculture licence applications and have requested information on who will supply the seed for production of numerous species.

We had originally informed them that we could collect from the wild in mulroy bay and that you would supply seeded string for seaweed production, they now want confirmation of this.
When and if we get a licence to cultivate seaweeds in mulroy bay, will you be able to supply seeded string to us for on growing.
If the answer is yes we will enter into a contract with you which will suit both parties when licences are secured.
Regards

Jerry
North West Shellfish
T:

Mevagh FRC Administrator

From: Northwest Shellfish <northwestshellfish@eircom.net>
Sent: 27 November 2018 13:02
To: Mevagh FRC Administrator
Subject: Fw: seeded seaweed string

Print please.

Regards

Jerry
North West Shellfish
T: ·

From: Northwest Shellfish
Sent: Wednesday, September 12, 2018 8:48 AM
To: EileenM Maher
Cc: northwestshellfish@eircom.net
Subject: Fw: seeded seaweed string

More info Eileen.

Regards

Jerry
North West Shellfish
T: +

From: Freddie O Mahony
Sent: Friday, September 7, 2018 9:13 AM
To: 'Northwest Shellfish'
Subject: RE: seeded seaweed string

Hi Jerry,

Thank you for your enquiry regarding seeded algal string.
I would just like to confirm we will be in a position to supply you with seeded string when your license has been issued. We are planning to increase our annual output to accommodate new licenses issued this year.
You can contact BIM if you have any questions regarding the necessary infrastructure required.

Regards,

Freddie

From: Northwest Shellfish <northwestshellfish@eircom.net>
Sent: 07 September 2018 05:15
To: Freddie O Mahony · >
Cc: northwestshellfish@eircom.net
Subject: seeded seaweed string

Hi Freddie.
We are currently having our aquaculture licence applications finalised and the Dept are enquiring as to where we will source our seaweed for cultivation.
We have informed them that your facility can be a source along with collection in the wild in mulroy bay.
Can you therefor let me know if you can supply us with seeded string when and if we get a licence to cultivate.
Regards

Jerry
North West Shellfish
T:

Mevagh FRC Administrator

From: Northwest Shellfish <northwestshellfish@eircom.net>
Sent: 27 November 2018 13:01
To: Mevagh FRC Administrator
Subject: Fw: Re Additional information
Attachments: Seaweed2 2018.JPG; Seaweed3 2018.jpg; Seaweed 2018.JPG; Seaweed video 2018.mp4

Print please.

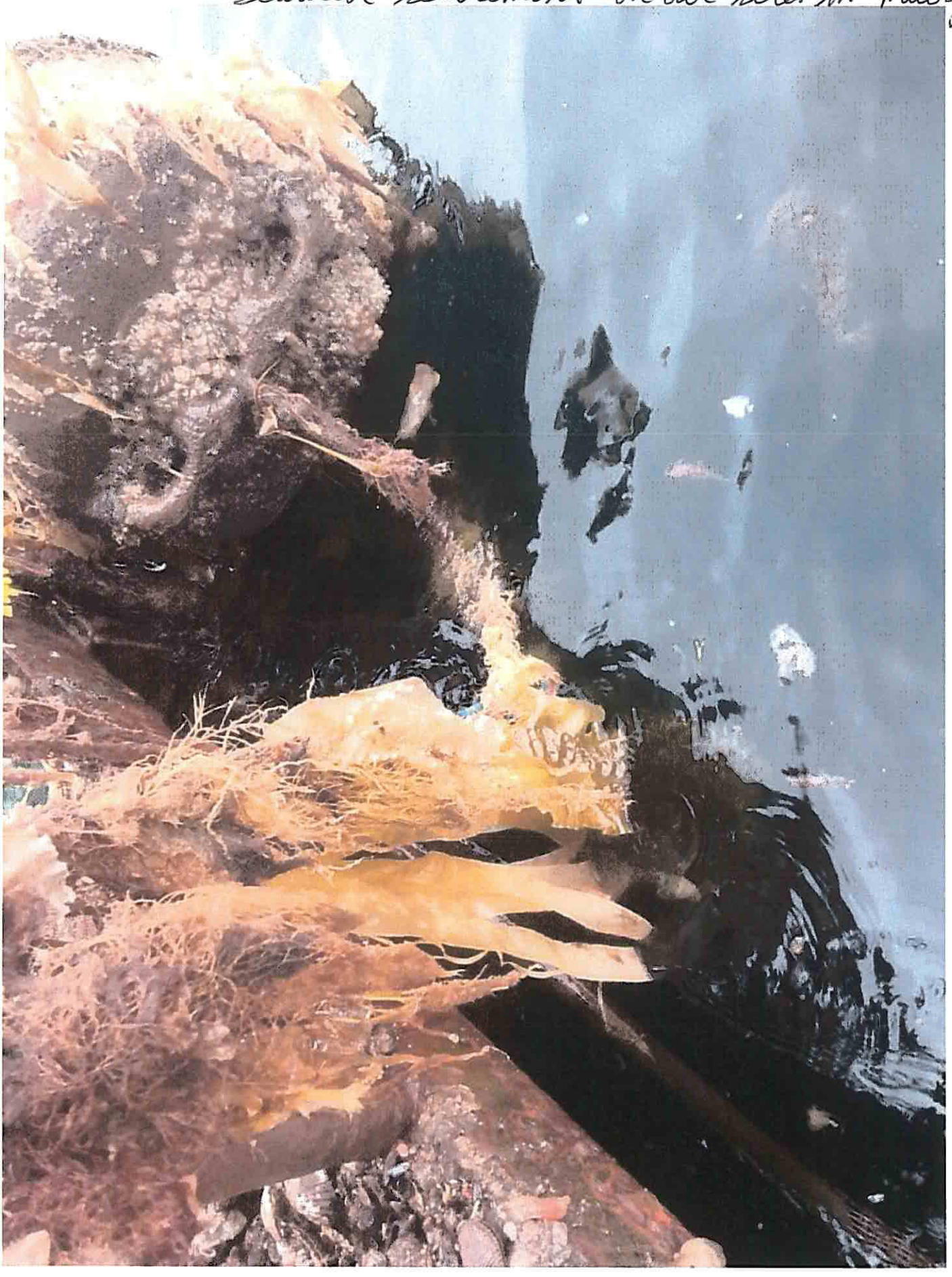
Regards

Jerry
North West Shellfish
T: +353 868092246
-----Original Message-----
From: Jerry Gallagher
Sent: Thursday, September 13, 2018 9:14 AM
To: EileenM, Maher,
Cc: Jerry Gallagher
Subject: Re Additional information

Please see attached photographic and video evidence

Mr Jerry Gallagher
North West Shell Fish Ltd
Upper Carrick
Carrigart
Co. Donegal
Tel:
www.scallops.ie

Seaweed settlement on our piles in Malbay



Seaweed settlement on our previously licenced sites in Malay Bay

Scallop nursery lines
with seaweed settlement
on the headrope

Annex 1

HARNESSING OUR OCEAN WEALTH

An Integrated Marine Plan for Ireland

Review of Progress 2017

Published June 2018

Fish Stocks in Irish Waters

In November 2017, the Marine Institute's fisheries Stock Book was presented to the Minister for Agriculture, Food and the Marine. The Stock Book provides a summary of the latest scientific advice on the status of 74 fish stocks which are exploited by the Irish fleet in the waters around Ireland. It provides a summary on the status, scientific advice and proposed fishing opportunities for 2018, which is used to brief the Department of Agriculture, Food and the Marine, industry and the NGOs on the latest scientific advice.

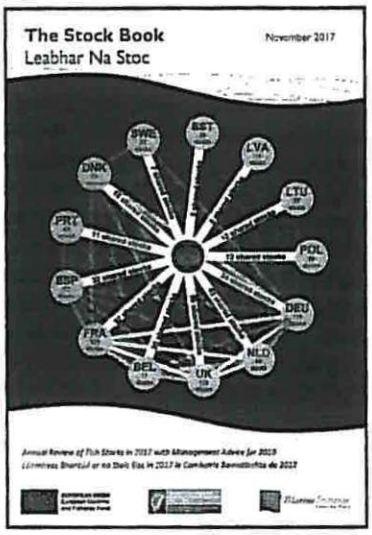


Figure 17.
The Stock Book, 2017

The Stock Book is the primary reference during the EU negotiations that determine Ireland's fishing opportunities for 2018. This resource is worth over €200 million to the Irish fleet. The information in the Stock Book was a key component of the Minister's sustainability assessment which was presented to the Oireachtas in November 2017. The Stock Book also includes information on the state of fish stocks in relation to Ireland's obligations under the Marine Strategy Framework Directive.

Throughout the year the Stock Book also serves as a valuable reference to a wide audience, including the fishing industry, managers, marine scientists, environmental NGOs, third level institutes, financial institutions and those with an interest in the status and management of marine fisheries resources in the waters around Ireland.

The Stock Book highlights how the number of sustainably fished stocks has increased to 29 out of 74 or 39% which is the highest since 2012. The number of stocks with biomasses higher than sustainable reference levels has also increased to 27 or 36% which is also the highest since 2012. There is gradual progress towards long-term sustainable utilisation of the resource base.

Further information found in The Stock Book 2017 includes:

- General statistics on the fisheries resource, fish production, the fishing fleets and employment for the EU and for Ireland
- The ICES ecosystem overview for the Celtic Sea ecoregion, which ranges from the north of Shetland to Brittany in the south. It includes an ecosystem description, the main human activities, regional pressures on the ecosystem and the state of the ecosystem components
- The Sustainability Assessment, which provides information on the state of the resource base in relation to pressure and state indicators
- A preliminary assessment of Good Environmental Status (GES) in relation to Descriptor D3 (Commercial Fish Stocks) as defined by ICES for the Marine Strategy Framework Directive (MSFD)
- A summary of the long-term management strategies used as a basis for advice
- Mixed Fisheries scenarios for the Celtic Sea in relation to cod, haddock and whiting
- Species information and the individual stock advice. The format is organised by species and then stocks rather than on an area based approach (e.g. Irish Sea). The species overview provides information on the general biology, national and international landings distributions, Irish landings and values.
- A summary of the individual stock advice for 2018 and key points in relation to the stock. The current management of the stock is also summarised and any important additional information is given. The complete ICES advice for the stock is also given.

- Advice principally based on MSY (Maximum Sustainable Yield) considerations or agreed Management Plan considerations. The status of the stock in relation to the landing obligation and management plans are also given. The long term management strategies in place for stocks of Irish interest are shown.

- Information on the past TAC, the match between assessment area and management area and quota allocations by country.

The Stock Book has been published by the Marine Institute since 1993 and has evolved considerably over time. It continues to evolve in a changing fisheries advisory environment. The Stock Book is available from the Marine Institute's website on www.marine.ie.

Inshore Shellfisheries

The Marine Institute conducted a broad range of data collection programmes on inshore shellfisheries in 2017. This provided the raw material to deliver stock assessments and advice for the Department of Agriculture, Food and the Marine (DAFM). An Atlas of Commercial Fisheries for Shellfish around Ireland inside 6nm was published and contains the latest scientific advice on the state of these resources.

2017 activities included expanding the shellfish survey programme to include a significant new survey of razor clams in the north Irish Sea (with over 70 vessels now involved in this fishery). Assessment methods for survey data were developed and automated.

A new EMFF funded project on restoration of the valuable spiny lobster commenced. The project involves mapping of inshore reefs, tag and release programmes with the commercial fleet and larval dispersal modelling.

A review of the technical conservation measures, including the 20-year v-notch programme implemented by BIM, that are used to manage the important lobster fishery (>900 vessels involved) was completed and presented to industry groups.

Fair Regulation for a Sustainable Future

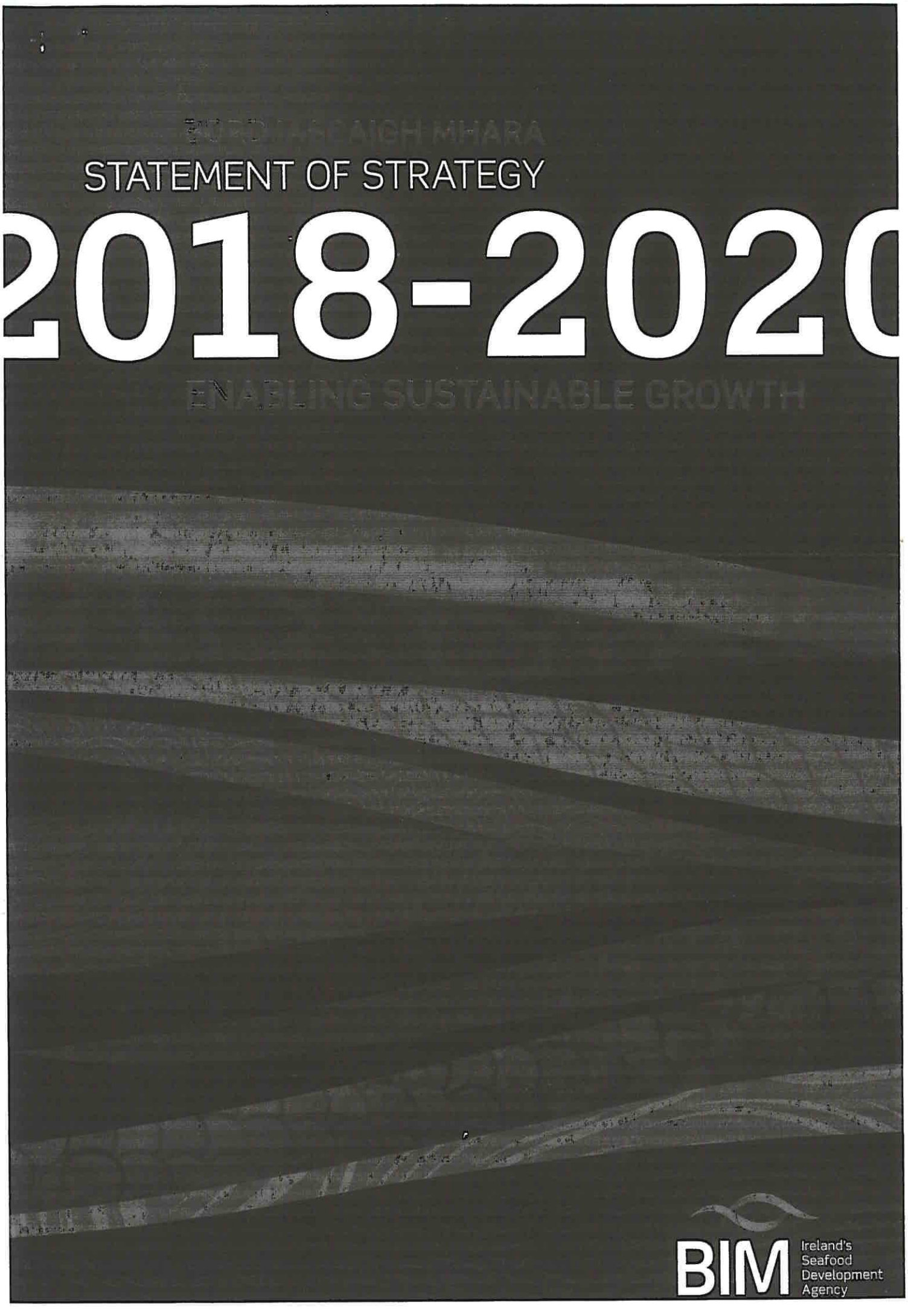
Good regulation is essential to the achievement of the collective ambitions for the development of Ireland's seafood industry. It ensures that Ireland's shared marine resources are sustainable for future generations, and that consumers at home and abroad can consume Ireland's seafood safely. Consumer trust in the quality, provenance and safety of our seafood produce is vital to safeguarding the growing reputation it enjoys across the world.

As the regulator for the sea-fisheries and seafood sectors, the Sea-Fisheries Protection Authority (SFPA) plays a key role. It is dedicated to promoting compliance, verifying it and, where necessary, enforcing sea-fisheries and seafood safety laws for all areas under its remit. This includes all fishing vessels operating within Ireland's 200-mile limit, over 2,000 Irish registered fishing vessels, wherever they operate, and all seafood produced in Ireland's 170 seafood-processing companies.

STATEMENT OF STRATEGY

2018-2020

ENABLING SUSTAINABLE GROWTH



BIM Ireland's Seafood Development Agency

1

SUSTAINABILITY

Establish and drive a range of effective approaches to differentiate Irish seafood products, based on demonstrating their environmental credentials and provenance.

INITIATIVES

- Set and implement relevant standards across all sectors based on internationally-recognised schemes, including Marine Stewardship Council, Global Seafood Sustainability Initiative, Organic Certification, Fisheries Improvement Plans and BIM's own suite of Assurance Schemes.
- Embrace Origin Green and drive sustainability standards to underpin the Irish seafood sector.
- Actively showcase the actions being taken by the sector on sustainability and build societal support for increased seafood production, especially aquaculture.
- Provide the sector with effective technical programmes that reduce environmental impact and increase competitiveness.

RATIONALE

- There is a growing demand within the seafood marketplace globally to be able to demonstrate responsible and sustainable practices.
- As the focus shifts to concentrate on higher value market segments, more sophisticated consumer expectations will have to be met.
- These initiatives create an opportunity to differentiate Irish seafood in high-margin international markets.

BENEFITS

- BIM will have established environmental sustainability practices centred on creating value.
- Irish seafood products will be better able to differentiate themselves from their international counterparts, to enable them to achieve access to higher margin segments in international markets.
- The Irish seafood sector further builds on Ireland's positive image.

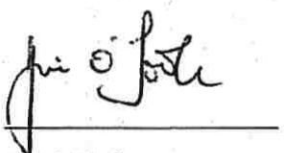
consideration of a number of potentially highly disruptive external factors, such as Brexit and climate change, have all informed, shaped and influenced the development of this strategy for BIM.

BIM, working closely with the Department of Agriculture, Food and the Marine and our industry partners, is determined to make the best possible use of this unprecedented level of funding so as to assist the sector to make the necessary changes to allow it to compete and win into the future.

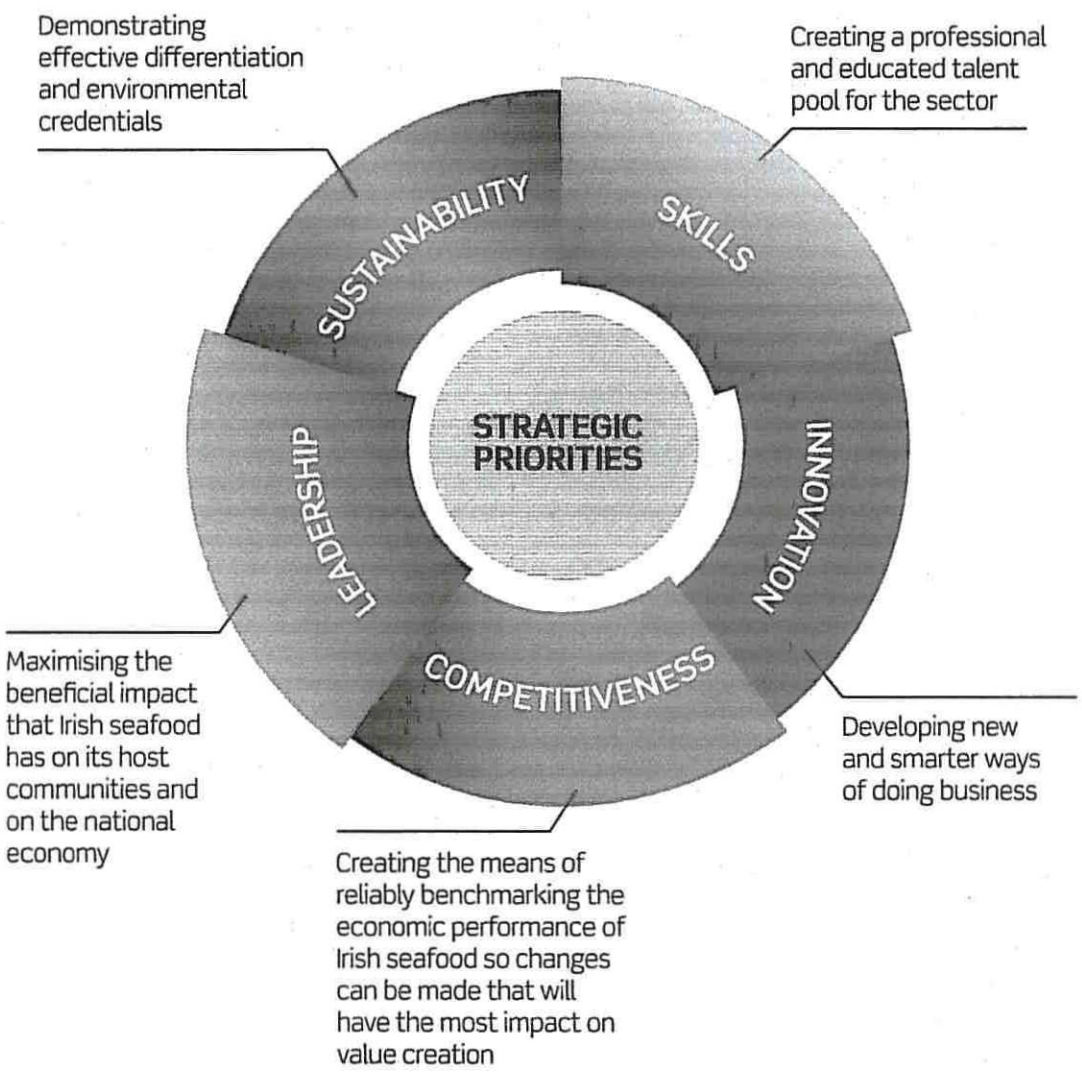
As the agency charged with the task of leading the future development of Irish seafood, we believe that we can proceed with confidence basing our plans on the substantive building blocks set out above.

BIM's new strategy, which has a strong emphasis on delivering value-for-money in our services to our stakeholders, aims to concentrate our range of supports on key areas. For clarity, and as a means of explaining what we intend to do, the new BIM service offering is grouped under five strategic headings as per the graphic below.

Ireland has the ambition to position itself as an international leader in the global seafood industry. BIM's strategy is designed to enable industry to channel resources that will deliver optimum results for the sector, the economy and the coastal communities that rely on this industry for revenue and employment.



Jim O'Toole
Chief Executive Officer



Annex 2

Ministers acknowledgement of our plan.
But no mussels

T12/203K

AQUACULTURE LICENCE NO XXXX

GRANTED UNDER THE FISHERIES (AMENDMENT) ACT, 1997 (NO. 23 of 1997)

The Minister for Agriculture, Food and the Marine (hereinafter referred to as the "Minister"), in exercise of the powers conferred on him by the Fisheries (Amendment) Act, 1997 (No. 23 of 1997) (hereinafter referred to as the "Act"), grants an Aquaculture Licence to:

North West Shell Fish Ltd
Upper Carrig
Carrigart
Letterkenny
Co.Donegal

(hereinafter referred to as the "Licensee") for the cultivation of Scallops (Pectin Maximus); Native Oyster (Ostrea Edilus); Pacific Oyster (Crossostrea Gigas); Soft Shell Clam (Mya Arenaria); Native Clam (Tapes Decussates); Prairie Clams (Venus Verrucosa); Periwinkle (Littotina Littorea); Common Cockle (Cardium/Cerastoderma Edule); Sea Urchin (Paracentrotus Lividus); Channelled Wrack (Pelvetia Canaliculata); Carageen Moss (Chondrus Crispus); Dabberlocks or Badderlocks or Winged Kelp or Atlantic Wakame (Alaria Esculenta); Oarweed (Laminaria Digitata); Sea Belt and Devils Apron (Saccharina Latissima); Nori, Laver, Sloke (Porphyra Sp); Dulse or Dilisk (Palmaria Palmate); Sea Lettuce (Ulva Lactuca); Sea Spaghetti (Himanthalia Elongate); Serrated Wrack (Fucus Serratus); Bladder Wrack (Focus Vesiculosus); Knotted Wrack (Ascophyllum Nodosum); Oarweed (Laminaria Hyperborean); Seabelt, Sweet Kombu (Laminaria Saccharina); Carrageen Moss, Irish Moss (Mastocarpus Stellatus); Gutweed, Grass Kelp (Ulva Intestinalis Linnaeus). on a site in Mulroy Bay, Co. Donegal as specified in Schedule 1 attached (numbered T12/203K) and indicated by a red line on the attached map in accordance with the

Interreg Atlantic Area
European Regional Development Fund
integrate
Integrate Aquaculture an eco-innovative solution to foster sustainability in the Atlantic Area

EU-funded project investigates the commercialisation of Integrated Multi-Trophic Aquaculture (IMTA) in the Atlantic Area

Jessica Ratcliff, Irish Seaweed Research Group, Ryan Institute, NUI Galway
Anna Soler Vila, Irish Seaweed Consultancy Ltd.

Integrated Multi-Trophic Aquaculture (IMTA) is a concept developed in the early 1990's, as a variation on the concept of polyculture.

IMTA differs from polyculture by specifying that co-cultivated species must be from different trophic levels. This means that energy supplied to the highest trophic level - often a carnivorous finfish - spills over to species lower down the food chain. For example, fish (salmon) are fed a formulated feed, particulate waste in the form of uneaten feed and faeces is taken up by filter and/or deposit feeders (mussels), and dissolved waste produced by animal species is used by algae to improve growth and composition.

It is essentially a simplified and artificially constructed ecosystem which very carefully manages inputs in order to be more efficient; in other words this is a farm with its own built in fertilization system.

While very intuitive and appealing in theory, and with the potential for economic (greater total productivity), environmental (reduction of nutrient pollution) and social (job provision and better utilization of space in the coastal zone) advantages, the implementation of IMTA is complex in practice. This is especially true under a monoculture paradigm, which focuses on production of a single, high-value species, while IMTA tends to maximise the productivity of the system as a whole.

Maximising Productivity

In many parts of Asia IMTA occurs by default; the huge scale of aquaculture has resulted in pressure for space within the coastal zone, resulting in many cultivated species all tightly packed together. The interactions between those species are being studied with the idea of taking advantage of their natural interactions to improve both growth and water quality. In Europe and the Americas, this is also starting to happen – individual farms are in close proximity to one another, and although not managed as a single unit, practices at one may affect the other. What we are now trying to do is better understand the systems – this means more research into the transfer of energy and pathogens between species, how to maximise productivity, and the regulatory framework that governs it all.

There are already examples where IMTA has proved beneficial. The abalone industry in South Africa benefited economically from incorporating macroalgae into their farms, with wider benefits to the environment (Nobre et al.

Cultivation *Alaria esculenta (Photo: Ben Quéuineur)*

Workshop IMTA technical best-practices in Ireland, NUI Galway

Partners meeting in Olhão, Portugal, April 2018

Measuring and checking the quality of kelp (Laminaria digitata) *grown alongside Atlantic salmon.*

2010). In Denmark stricter regulatory hurdles meant finfish production capacity could only be increased if the nutrient inputs were lessened – i.e. more fish with less waste. It was recognised that cultivating seaweeds and/or mussels alongside the fish was the "best available technique" to balance the system (Holdt & Edwards 2014). In both cases, as in many others, IMTA seems to need an external driver to get it started.

In Europe, drivers might similarly be emissions, (e.g. the Water Framework Directive), or space related. In the future, we anticipate that IMTA might be applied in remediation of high-volume, low-concentration effluent as produced in land-based flow-through systems; in management of 'unintentional IMTA' where co-cultivation occurs as a result of farm proximity at sea, rather than planned integration; and, perhaps, in more technologically advanced recirculating systems (RAS) as a biofilter that is also a crop.

Knowledge Transfer

Following on from IDREEM (EU FP7), INTEGRATE is a new project investigating the next steps in research and commercialisation of IMTA to work towards these goals. It is funded under the Interreg Atlantic Area Programme – Resource Efficiency priority. Running from 2017 to 2020 it consists of eight partner organisations from Spain, Portugal, France, UK and Ireland. The Irish partners are the Irish Seaweed Consultancy and NUI Galway, with BIM and the Bantry Marine Research Station as Associated Partners. Aiming to foster cooperation for industrial transition towards IMTA, the project will provide tools to increase competitiveness and contribute to removing barriers for growth within the eco-aquaculture sector, while improving the quality and public image of aquatic products.

During the project workshops, training events and networking events will focus on transferring knowledge within and between the wider partnership. Educational and training materials, scientific papers and networks through websites and social media platforms will be created alongside production of policy briefing documents that will support development of the regulatory framework. In Ireland, the first workshop took place in Galway on April 13 (Picture 1). The workshop, on IMTA Technical best practices, put together 18 aquaculture experts from different sectors to discuss priority areas and bottle necks for IMTA development in Ireland. Three more workshops will follow, on Social and Regulatory (Autumn 2018), Environmental (Spring 2019) and Economic (Autumn 2019) aspects.

You can follow the project on www.integrate-imta.eu, also in Linkedin Group: Integrate Imta, and if you have an account in Twitter: @Integrate_Imta

Ready to check the biomass of the huge pseudo-kelp (Saccorhiza polyschides) *that was grown next to Atlantic salmon*

References:

Holdt SL, Edwards MD (2014) Cost-effective IMTA: a comparison of the production efficiencies of mussels and seaweed. J Appl Phycol 26, 933-945.

Nobre AM, Robertson-Andersson D, Neori A, Sankar K (2010) Ecological-economic assessment of aquaculture options: Comparison between abalone monoculture and integrated multi-trophic aquaculture of abalone and seaweeds. Aquaculture 306, 116-126.

The Fanad Lighthouse to Horn Head Fishery Enhancement and Management Project

A Report for Donegal County Council
funded by the EU European Fisheries Fund
September 2015

Contents

Section 1 Introduction

The Fanad Lighthouse to Horn Head Fishery Enhancement and Management Project is an 'action research' project which aim is to demonstrate the potential of an industry led management approach to enhancing and sustainably exploiting a designated area, using a shellfish hatchery, nursery, reinstatement of wild brood stock, and kelp mariculture. Intrinsic to the proposed model would be collaborative practices by the inshore fleet of the area to include trial zoning, collaborative marketing and a 'who sews reaps' approach to management which would necessitate a series of discrete control and fishery access arrangements being put in place for the pilot area. The project also provides opportunities to utilize fishing activities as tourism attractions, particularly with the nursery and marketing components.

This feasibility study firstly sets out the policy context for the project, particularly in light of obligations on the government for the management of species for which Ireland has an important role to play at an international level. It also puts this in the context of local community and environmental sustainability and economic well being. Thirdly, it gives an overview of the species in question, and what the key considerations are for each.

The project will only fulfill its potential if it also provides leadership on sustainable fishing practices. A series of maps presents the geographical conditions of the area, and proposed management arrangements that capture conservation, enhancement and harvesting techniques and arrangements for control of fishing.

The study provides a description of the life cycle of the species in question and then describes the technical components and requirements for a Fishery Enhancement Centre – an on shore hatchery, nursery and storage facility in Downings and this is followed by sections on adding value, accreditation, training and tourism opportunities relating to the centre and related fishing activities and produce.

A governance section explores what models would best service such a complex project, ensuring the project would be viable, market focused, operate to high standards and be a flagship for the rest of the country.

Added value activities – training, tourism and seafood branding are briefly explored then a set of potential costs, and options gives some insight into the costs of the enhancement facility.

Executive Summary

POLICY ISSUES

- The species at the core of this project are priorities for enhancement and management at the local, national and european level
- Policies recommend a six year approach to enhancement work
- A multi trophic/multi species approach is viewed as an essential model for the future
- The new EU fisheries programme, the European Maritime and Fisheries Fund for 2014-2021 will include funding that supports muti-species enhancement work, coupled with good fishery practice and environmental management.
- The aquaculture licensing problem in Ireland represents a huge challenge for both the industry and relevant agencies, and the opportunity to utilize the EMFF in addressing the issues of good fisheries and inshore management may be lost – and with it livelihoods, species survival and Irelands credibility at an international level.
- As Inland Fisheries Ireland carries responsibility for native oysters, there is a disconnect between areas of responsibility at agency level and the opportunity to take a more integrated approach to bay management and fishery enhancement of target species on a multi species basis.
- This project provides a visionary and industry led approach which fits with national and EU thinking around fisheries enhancement and sustainability. It can provide a demonstration for other areas and a local industry governance model that can be replicated.
- The project will necessitate a local management arrangement for the pilot area to control opportunistic fishing activities, while the local project focuses on building and enhancing the fishery of the area.

Seafood Enhancement Centre

Analysis of the life cycle, environmental considerations, economics, policy and stakeholder issues has determined that the following functions have potential within the framework of a 'Seafood Enhancement Centre'.

The Seafood Enhancement Centre is the provisional name given to a centre which could include some or all of the following elements:

- Ostrea Edulis (flat Oyster) hatchery and nursery
- Pecten maximus (Scallop) hatchery and nursery
- Kelp nursery
- Lobster hatchery
- Gigas nursery
- Lobster storage
- Crab holding facility

- Visitor and Education Centre

Analysis on the requirements for enhancement of the target species resulted in the following conclusions:

Ostrea Edulis – Native Oyster

Reinstating Ostrea Edulis – native oyster is a complex and long term project with a high risk of failure.

It is essential to combine good genetic diversity along with disease resistant strains of native oyster is the goal is to reinstate the species in Sheephaven Bay.

There are multiple environmental benefits to the presence of a functioning native oyster reefs, combined with their function as a filter bi-valve. Their presence in Sheephaven and Mulroy could assist with biodiversity and contribute to greater protection from opportunistic fishermen visiting the area.

Native oysters are relatively easy to spat and cultivate in a farming environment using bespoke equipment.

Equipment does not have to be costly – using 'pop up' hatcheries are an option.

Mulroy Bay has a tidal pond, with a very narrow entry – the Back Lough, which would be extremely easy to adapt for a spatting pond, and likely to be more effective than an artificial one.

The area all comes under Natura 2000 designation, and so the adaptation of a tidal pond for a hatchery would require an Environmental Assessment.

The general view amongst the fishing community in the area was that this is a project worth pursuing.

The project will require on going engagement of research institutions.

The project will require support for at least six years, and possibly longer.

Pecten Maximus – Scallop

There is a good existing foundation on which to build scallop enhancement work.

The project should focus on reinstatement of former breeding/spat fall areas.

Research into potential habitat loss and requirements for the target areas is required.

Genetic profiling of scallop, and ensuring a healthy brood stock, would be an important element to the project.

Growing algae for food in the seafood enhancement centre is likely to be a cost effective solution.

The project will require on going engagement of research institutions.

The project will require support for at least six years.

It will be essential to protect potential areas for brood stock reinstatement from fishing activities that may damage the benthic habitat.

Kelp

Kelp nurseries can be expensive to run, but the costs will be reduced when running it within a multispecies facility, particularly bi-valve species.

Local project promoters should do the BIM algae growing course to get an insight into what is required. This would in turn inform the size/nature and purpose or the kelp nursery in the Seafood Enhancement Centre.

Market research for the sale of seeded spools is needed - including asking other people, who have submitted license applications to grow kelp, if they would consider buying spools of seeded string, should none be available from BIM.

Stakeholders involved in this project should prepare a license application for kelp mariculture in areas agreed at local meetings of stakeholders and the fishing industry.

Lobster

Lobster hatcheries and nurseries require bespoke set up in terms of larval rearing cones and individual growing environments.

Lobster hatcheries have historically been difficult to justify from an economics perspective.

Improvements in storage techniques have made the nursery phase more cost effective.

The Orkney hatchery has demonstrated a viable business model, which is industry run and operated. It is worth looking to this model for a potential project for Fanad Lighthouse to Horn Head.

Lobster hatcheries make an attractive visitor experience.

The target for cost per lobster needs to be no more than 40cents, with at least a 13% capture rate when fishing.

The costs of setting up and running the facility will be reduced when combined with other hatchery and nursery activities.

The time lag between release and potential commercial capture is at least six years, and so some support would be needed for this period, after which there is the potential for the facility to be self sustaining.

Gigas Oyster

Although gigas oysters are relatively easy to cultivate there are increasing problems with disease throughout Europe and a need to establish high grade and disease free gigas for sale.

Gigas are an important and current part of the seafood industry in Mulroy Bay and as such an enhancement project that focuses on the quality of product and offers an opportunity to sell young oysters to other gigas growers.

Visitor Centre

The Seafood Enhancement Centre has all the components to make an excellent and educational visitor experience and a great addition to the tourism infrastructure in the area.

Models from other places would indicate that a visitor centre running costs could be self sustaining.

Other Considerations

The facility could include (space dependent):

Lobster storage, to assist wild capture 'small boat' fishermen, to increase their income.

Crab holding – to lesson mortality between landing and transfer to vivier lorries.

The ideal site for the Seafood Enhancement Centre needs to be large – 500 sq metres, beside the sea, with good access to vehicles, and good public access.

The facility would benefit from a renewable power supply, and a wind turbine is suggested.

LYIT have expressed an interest in the project from a research and student study area perspective. This includes the potential for research into the health and nutritional benefits of kelp. It is suggested that project work on this front could proceed in advance of a facility being established and start to illustrate the added value of the project, as well as potentially help with market identification for kelp.

Licensing

Applying for relevant licenses for the Seafood Enhancement Centre should be progressed as soon as it is likely the project will go ahead.

Funding should be sought to assist with the license application requirements, including carrying out EIAs.

The industry should seek support from BIM and the Marine Institute in asking the department to expedite the license application process, to allow the project to maximise the project time scale and make use of the EMFF six year financing.

Piloting Area Based and Industry Operated fisheries Management

Seek funding to research and develop a community based detailed fishery management approach, that integrates fishery enhancement, and ecosystem approach (including the community), a system for local regulation, checks, balances, and reporting.

Project stakeholders and BIM/Marine Institute could look to an academic institution and possibly a marine resource economist, to devise a model for an area community based management approach for the Horn Head to Fanad Lighthouse area.

Identify a graduate interested in taking on the project for PhD study.

Open discussions with the Department of the Marine, and others, when the proposal starts to take shape and is both forward looking and robust.

Adding Value and Brand Identity for Local Seafood

Recommendation – approach BIM and Bord Bia to look for advice or suggestions on the benefits, opportunities and suggestions for the establishment of shell fish processing in the area.

Larger shellfish operators have a round table meeting to share to what extent they may be interested in a joint venture.

Research and pursue accreditation that assists with brand identity and market return for seafood products and rewards sustainable practice by the industry.

Governance and Skills

The project will require good governance and models for potential governance arrangements as set out in section 10.

The stakeholders should seek support from an experienced and independent person when crafting arrangements for management of the initiative.

The key stakeholders, and the industry in the area, should take advantage of training and networking opportunities to enhance their skills in line with what will be required for delivery of the project.

The Options

Four options have been extracted from the feasibility analysis and recommendations. The options were weighted against the following criteria:

- Short term financial benefit to industry
- Long term financial benefit to industry
- Policy fishery management potential
- Environmental benefits/impact
- Community benefit
- Cost and viability (see analysis in section 11)

Option 3 scored the highest. The options are listed as follows:

Option 1	Rationale
Nursery for scallop, gigas oyster, kelp nursery, crab and lobster storage (space dependent) (private sector model).	Option I is based on what is happening in the area already, is proven and viable apart from the kelp nursery. The interest in the kelp nursery, and the functional fit to the scallop nursery, makes it a feasible addition. The crab and lobster storage would work on a pay per use basis (after purchase of infrastructure) and therefore are also a low risk component. The addition of crab holding and lobster storage would be dependent on space, and for lobster, assistance to put in place and quality storage system.

Option 2	Rationale
Scallop, including wild brood stock/spatting area reinstatement, gigas and native oyster, kelp nursery, crab and lobster storage – (optional and space dependent), training and research are important components of option 2.	This option includes work on brood stock enhancement for scallop, and efforts to reinstate spatting areas, and to pilot native oyster farming, and potentially reinstatements as well. This is in response to national and international concern about the future of scallop and native oyster, and in response to local potential and commitment, particularly for scallop. Oyster is included as there is the potential to work in a disease free area. The scientific and national perspective is that any viable options to assist protect and reinstate native oyster breeding is a priority. As in option 1, the addition of kelp reflects local commitement and the opportunity to build on BIM recommendations in terms of doubling up – scallop and kelp nursery functions. As with option 1, this also includes a pay per use crab holding and lobster storage option. Option 2 requires a research element, with the pilot work to reinstate fisheries. As such it also necessitates management arrangements, to monitor results, protect investment and the value of the reinstatement work being done.

Option 3	Rationale
Scallop, gigas and native oyster, kelp, lobster hatchery/nursery. Brood stock reinstatement for scallop, optional for native oyster Education/visitor centre Research and training	Option 3 includes the full scope of species work included in the study. The key difference between option 2 and option 3 is the lobster hatchery, and with this, the visitor / education facility. The rationale for lobster only stacks up if the cost of running the hatchery is offset by other activities, and the success in breeding is below the 40cent per lobster mark. The visitor facility could also operate without the lobster hatchery, but the hatchery would add considerably to the attraction of the facility.

Option 4	Rationale
Do nothing	Evaluating the value of establishing a Seafood Enhancement Centre should also look at the impacts/benefits of doing nothing. While it is difficult to put a cost on this, it does include taking into account the human resource burden, the financial requirements, and the risk of a lack of success, weighted against the ongoing decline of fishery incomes, further loss/risk of species decline, and lack of adding value to incomes and the future of the seafood industry in the area.

Section 2 Methodology

The project is led by Donegal County Council in response to a request by some from the industry in the target area.

It is unusual as there is no specific stakeholder organization leading the project. The 'need' for the project has been expressed by some 'leaders' within the fishing community, but given the scale and scope of the project, the view was that at this stage is should be taken forward as an independent piece of scoping work with assistance of the council. The project was also backed by the North Fishery Local Action Group, as it is very much in line with emerging national policy in respect of inshore fisheries management.

The study has been written to include enough technical information to support the validity if what is being proposed, however, it is has not been written by a scientist, for a scientific audience, but for the key stakeholders in the project area, the Council and relevant agency personnel.

An open public meeting in Carrigart on the 25th June 2015 focused on what direction the feasibility study should take. As the project is conceptually sophisticated, the local stakeholders needed to grasp the concepts and opportunities that the project could offer. The meeting concluded that there was interest amongst all those present for the idea, with the concept of a 'fishery enhancement centre' – hatchery, and nursery, very much welcomed as the lynch pin in any project involving the seafood community. The meeting also defined the geographical area for the project being Horn Head to Fanad Lighthouse, including Mulroy Bay, Sheephaven Bay, and as such, being fully inclusive of the wild capture fisheries in the area.

A second phase of stakeholder meetings took place the first week in September when the outcome of the scoping work and the potential projects were discussed.

Desk based research and multiple telephone conversations extracted information pertinent to the study. The feasibility study explores the conceptual, technical and broadly economic issues that relate to the project. Under each species it sets out the potential operational costs and some information on market returns. It does not analyse the economics at a detailed operational level as firstly, it is too soon to carry out this piece of work, as any resulting project will take time to flesh out in details and secondly, the technical side of establishing a multi species hatchery will require technical expertise from an organization which has carried out that work, it being beyond the scope of the terms of reference for this project.

Importantly, the feasibility work included an analysis on the extent of stakeholder buy in and potential to establish a governance structure capable of driving forward and managing a landmark initiative of this nature.

Section 3 The Policy Context

A fundamental foundation for the proposed project is current and developing EU and National policy. Over the past decades, most EU and national fisheries management policies has focused on the off-shore fleet, the sector with the capacity to seriously impact biomass. Now marine innovation, sustainable seafood and fishery practices as well as the integration of wider community regeneration connected to fishing communities has been given a much higher profile. Integral to this is the development of models to sustainably manage the inshore and small boat sector and also to develop aquaculture practices that can assist with the sustainability of native fisheries as well as provide quality protein source to feed a hungry world.

Some species have come under increased pressure as fishing effort shifts from other species where the limitations on the Total Allowable Catch (TAC) causes displacement. At the same time the costs of fishing coupled with poor market access, and low seasonal prices continuing to impact on the viability of fisheries such as lobster, is making the inshore sector increasingly unsustainable. Such vulnerability is impacting at community level and in remote areas such as the Fanad Peninsula, access to other work opportunities are not always available.

As such, projects that explore and develop ways to enhance sustainable fisheries, add value and use innovative and sustainable practices are of fundamental importance for the future of the industry. The Fanad Lighthouse to Horn Head fits within this bracket, providing a route forward, not just to sustain, but to grow the local industry, based on an integrated, sustainable, commercial and innovative model.

The EU is expressly looking to government agencies to devise and implement programmes that couple environmental management with aquaculture to assist with fishery enhancement. The emergence of a more integrated approach to fisheries, environmental management and local economic development by coastal communities is a lynch pin within the new European Maritime and Fisheries Fund (EMFF). The challenge for governments is following through on this policy, when frequently the environmental and fisheries management arrangements are cross departmental, and the need to think outside the box may not come easy, particularly at times of austerity. In addition, and this is key, fishery enhancement areas must have local industry engagement and buy-in. The management of fishing effort and responsibility for further enhancement will be most successful if fishermen are benefiting and contributing to it. This represents a *sea* change for the industry and will need considerable leadership from the industry, and responsive, efficient and leadership from government agencies responsible for fishery and environmental management. As the project will include extensive local investment of time, money, resources and commitment to fishery enhancement, including wild fisheries (lobster, native oyster and scallop), the focus area will need to be closed to opportunistic fishermen from other areas. This would represent a very new pilot management approach, although good examples do exist in other places such as Sweden, France and Japan.

This is a key project for the North Fishery Local Action Group, demonstrating the kind of strategy that can establish a cohesive and sustainable inshore fishery enhancement and management approach for the future. The project also fits with Minister Coveney's Programme for Inshore Fisheries, part of which is being taken forward through the 6 regional inshore Fisheries Forum which he set up last year to address the lack of cohesion and representation from that sector. Furthermore as national and EU policy is focused on concentrating managed and productive fishing effort into smaller areas, therefore protecting the marine environment. The timing is also good in respect of SAC and Natura 2000 sites in Ireland, with mitigation currently being planned. This project provides a road map for the management of a fishery which also enables compliance and good practice in respect of environmental management.

Ostrea *edulis* and Pecten *maximus*

Aquaculture is seen as a key component for future sustainable seafood production, as it robust management of stocks and environmental management of fishing areas. The challenge in taking forward management aims is addressing historical problems caused by poor past practices in fishing generally. Throughout Europe past practice led to dramatic decline of native European shell fish, and specifically Pecten maximus - scallop and Ostrea edulis – flat (European) oyster.

Overharvesting and lack of inshore management of bi-valve species in the 1970's, 80's and early 90's had a major impact on the biomass and brood stock of Ostrea *edulis* - native oyster and Pecten *maximus* – (king) scallop around much of the European coastline. Ireland was historically a major producer of spat of these two fisheries and there is evidence that the decline of native oyster dates back to the 19th century. The introduction of some management measures in the 1980's and 1990's was further hampered by the introduction of diseases in introduced spat from other countries and the impact of the spread of bonemia. Bonemia stops native oysters from reaching maturity. It has been gradually spread into native oyster areas, largely through the seeding/farming of mussels and gigas oysters, the latter which are immune to the disease.

The situation is challenging, with algael blooms and disease coupled with other unknowns about what impacts brood stock, spatting variations and changing environmental conditions - such as salinity and water quality. Scientists need specific facts to inform specific remedial strategies. At the same time, these bi-valve species are vitally important in terms of the benthic habitat and the filtration they carry out – with oysters filtering up to 5 litres an hour.

The current management arrangements are further complicated by the responsibility for native oyster coming under the jurisdiction of Inland Fisheries Ireland. There are currently some discussions at a senior level around where management of oyster should lie, as it can be argued that having one species, outside of the management of BIM doesn't make a lot of sense. Secondly, on-going pressures from the fishing industry to maximize production in the short term – risks the introduction of spat which may carry disease, and this continues to have impact on the survival of brood stock. A short term (one year) contract was taken forward by BIM this year (2015) for

both Pecten *maximus* and Ostrea *edulis* for hatchery production in Tralee. The timeline may be a reflection of the current funding cycle, as the BIM and industry view would be that the reinstatement of brood stock will take at least five years.

Although the minister's policy around inshore fisheries management provides clear policy and strategic direction, there is no specific operational 'plan' for this kind of project in Ireland. There is support, and work being done with industry in Tralee and Galway Bay, but no national implementation plan to address the specific and critical problems.

BIM and the Marine Institute are enthusiastic about a multi species/multi trophic approach to shell fish management and enhancement, demonstrating an ecosystem based model for aquaculture. They are clear that for such projects to work leadership and commitment from the industry is essential. Such an approach also has potential for added value, from the sale of spat to other countries, to the coupling of aquaculture with kelp growing. It can help with cost cutting and more viable business models and contribute to a profitable future for the seafood industry.

Addressing the challenges is an issue for Ireland. The department needs to be seen on the European stage leading with successful, innovative and sustainable models for fishery enhancement. The current challenge around aquaculture licensing [1] in Ireland is central to the problems. Mulroy Bay has all the key aquaculture licenses in place for scallop, mussel and oyster, but is waiting for licenses to be renewed and they cannot progress with the kelp license, or the enhancement in other areas (such as the north water, potential areas of Sheephaven, or unlicensed areas in Mulroy) that could be strategically important for native oyster reef and settlement work and scallop brood stock development. In addition, the development of a hatchery/nursery will require licenses, - both for infrastructure – such as piping water and for use of water and discharging. This type of license is usually handled quickly, but there may be a much longer waiting time for licenses for at sea activities. It is important that the license issue is sorted with efficiency, to ensure the opportunity to take forward a six year project, fitting under the new EMFF fund, will not be lost, with the critical species in question continuing to decline.

The following quote from Richie Flynn of the IFA summarises the challenges and sets out the policy and strategic issues both for species management and for the Irish seafood industry:

'We in ISA are represent the shellfish industry at government and EU level and we have been calling for more hatchery and nursery facilities to be made available domestically in order that we have better control over stock security both in health terms and also seed supply.

[1]Aquaculture license applications have up to an eight year backlog in Ireland as conservation objectives for coastal areas designated as protected had not been prepared, nor the surveys completed that were necessary to establish the conservation objectives, before the designations were decided. As such the EU determined that licenses could not be issued until such survey work and management objectives had been designed. This work has been ongoing for the past three years. Some expediting of the process by both the Depts. Of Environment Heritage and Local Government (conservation) and The Department of Agriculture, Food and the Marine is taking place however, the back log is having a major impact on Ireland's ability to implement its Marine Innovation Strategy in relation to aquaculture and impacts on our credibility in relation to kelp farming and aquaculture in general in the EU.

As an island nation we should not be exposed to all the problems that other countries have re disease etc however we are because almost all the shellfish seed required for industry has to be imported because it is not available in Ireland.For example well over 90% of gigas oyster seed is imported, all scallop and almost all native oyster seed is imported which are the main species although clams, abalone, sea urchin, seaweed and a few other species are currently at an early stage of development and may be important in the future as alternative species.

We have also been lobbying government for a better and faster aquaculture licencing system in order that industry can try and meet governments own projected plans for expansion so new sites are going to be important in that process.

On the financing issue again we have made the case for a substantial EU fund through the EMMF which is almost in place and will carry through for the next 6 years so that it will make a difference in helping establish new businesses and supporting existing ones.

On markets we keep hearing from everyone involved in promoting Irish produce that there is a growing demand for good food grown from a traceable source and that Ireland is well placed to fill that gap which seems to be the case and I believe that if everything was theway it should be from seed to market with all the associated supports in place then we can have a sustainable and profitable industry in Ireland'.

SUMMARY OF POLICY ISSUES

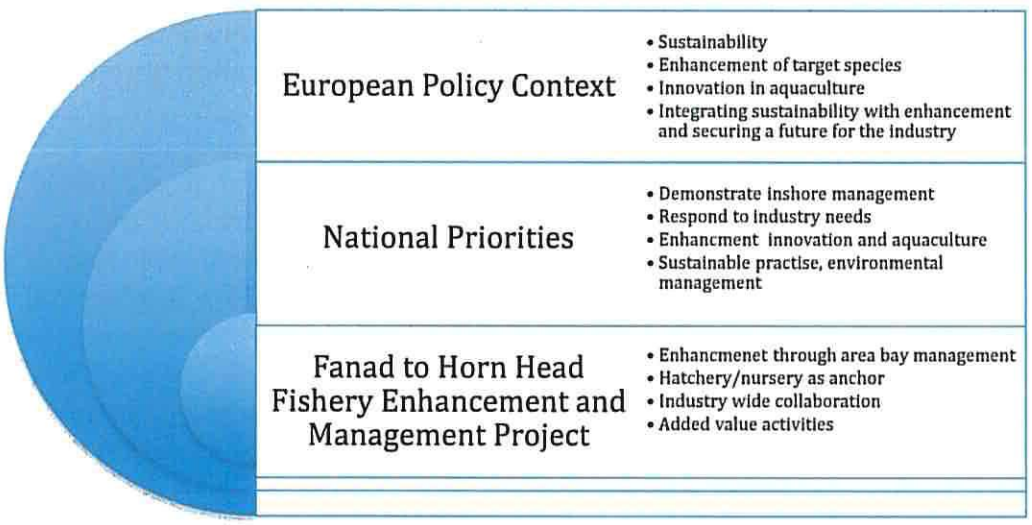
- The species at the core of this project are priorities for enhancement and management at the local, national and european level.
- Policies recommend a six year approach to enhancement work.
- A multi trophic/multi species approach is viewed as an essential model for the future.
- The new EU fisheries programme, the European Maritime and Fisheries Fund for 2014-2021 will include funding that supports muti-species enhancement work, coupled with good fishery practice and environmental management.
- The aquaculture licensing problem in Ireland represents a huge challenge for both the industry and relevant agencies, and the opportunity to utilize the EMFF in addressing the issues of good fisheries and inshore management may be lost – and with it livelihoods, species survival and Irelands credibility at an international level.
- As Inland Fisheries Ireland carries responsibility for native oysters, there is a disconnect between areas of responsibility at agency level and the opportunity to take a more integrated approach to bay management and fishery enhancement of target species on a multi species basis.
- This project provides a visionary and industry led approach which fits with national and EU thinking around fisheries enhancement and sustainability. It

can provide a demonstration for other areas and a local industry governance model that can be replicated.

- The project will necessitate a local management arrangement for the pilot area to control opportunistic fishing activities, while the local project focuses on building and enhancing the fishery of the area.

The following figure places the proposed project within a national and European policy context.

FIGURE 1. POLICY CONTEXT FOR THE PROJECT



Section 4: Inshore Waters from Fanad Lighthouseto HornHead

The project area is a mixture of exposed and rocky headlands, and also extensive tidal fjords and bays. It includes mud flats, large sandy bays, estuarine conditions, strong tides and exposed rocky coasts. This geographical diversity helps explain why there is such a comparatively diverse fishery for a relatively small area, and also provides particular conditions which lend themselves to this project. Scallop, oyster (gigas), mussels and organic salmon are all farmed and fished in Mulroy Bay. The A class quality of the water and strong tidal conditions ensures product quality. In addition, there has been no dragging in Mulroy Bay for a long time, the scallop habitat is good and it provides a good foundation to do more work to enhance the scallop brood stock, introduce native oyster and kelp farming.

The Lackagh was a prolific salmon river in the past, currently catch and release only, the population appears to fluctuate and Inland Fisheries Ireland are installing a fish counter on it. There appears to have been an increase in the population, although local perspectives also suggest that poaching, angling and seals are impacting on the recovery.

The area is important for crab, and is the base for two export crab businesses, both whom buy from local fishermen, both inside and beyond the project area.

The following maps present the area concerned, and the current designations, aquaculture license areas, and fishing areas. A further set of maps in section 7 sets out proposed activities in the area, as an integral part of this project.

Maps to be inserted

North Atlantic Ocean
55.251088, -7.972712
Explore

Maps to be added – waiting for them from the MI

Section 5 Target Species

5.1 **King Scallop**Pecten Maximus

Scallop Life Cycle

Scallop are a very fecund species, each one releasing up to 270 million eggs. The release phase from scallops hatching to being spent takes about a week.

Heavier than sea water, when they hatch they become pelagic and are in a planktonic state for about a month and this is when they become visible and are collected for growing on under controlled conditions. The extent to which they are pelagic does vary, some settle earlier in the process, probably adapting to particular tidal conditions. In Mulroy Bay they are pelagic and drift with currents and settle on the bottom (benthic stage) when they reach about .25mm and they usually settle to depths between 12 and 25 metres. They are very delicate and there is large mortality at this stage and this has probably been a major cause of the loss of brood stock in areas where the habitat has been affected by dragging or changes to water quality. They do not survive on shifting sand and do better on hard surfaces, solid sand and gravels, under shells or perhaps on other plants – such as eel grass. When they reach about 4mm they will move to find something to attach to, often another scallop, and they stay at this 'byssal' attached stage until they are 8mm when they start to swim to avoid predation etc.

Sea scallops are suspension filter feeders, using currents created by cilia on the gills to move and filter water containing suspended particulate material. Their diet primarily consists of phytoplankton and microzooplankton.

The spring bloom helps the development of gonads and by late spring or early summer they become fertile. The release of seed (eggs and sperm) by scallop does vary from place to place, affected by latitude and sea temperature. In Ireland it usually occurs around July.

Mulroy Bay in Ireland has been designated as a Class A area, with the bay having the largest natural scallop spat fall in Western Europe (AFBI 2012). Spat falls also occur in Valentia, Bantry, Tralee, Galway Bay, and the north Irish Sea.

Scallop farming is still limited in much of the European coast because of poor spat falls. Spat is imported into Ireland from other countries, which have disease issues, and as such Ireland is exposed to the importation of disease because of lack of its own spat management system and loss of brood stock areas. Mulroy Bay, is considered the most prolific scallop spat area around the UK and Ireland, and possibly Europe, and has considerable competitive opportunities, and has already demonstrated a sustainable and viable approach by the development of scallop aquaculture in the bay. However the spat falls occur mainly in the north waters of the bay (see chart). Other areas have lost their brood stock and so work done by North West Shellfish every year – collecting spat in the north water, to release as young scallop in the bay, has been the only real management of the species over the past number of years.

The loss of brood stock in Mulroy Bay has been researched, and while no definitive answers have been determined it is probably due to a mix of over fishing in the 1980s,

dragging, diving by clubs and individuals for scallop, and to possible contaminants in the substrate from poor salmon farming practices in the 1980s and early 1990s (past use of PCBs[2] for disease control). In the later 1980's (no specific date), the Department placed a moratorium on any scallop fishing in the north water to protect the brood stock that was left. The loss of broodstock in other parts of Ireland was more devastating. As well as the issues that are listed above, the poling technique of fishing for scallop, was unmanaged and examples of catches include 1200 in just one day in Valentia. This was then followed by dredging, resulting in the total collapse of the species in those areas.

This does not seem to have helped the situation and spat that is collected in the north waters is both local to that area, and probably brought in by tide from waters further out to sea. The tidal gyre in the north waters keeps the spat in the area and provides a good flow of phytoplankton for nutrition for young scallop.

The north water in Mulroy Bay has such a prolific spat release and good retention, waters reach 50metres in depth and also has strong tidal flow. Most of the spat collection bags are set between 3 to 7 metres.

Northwest Shellfish were the first organization to successfully cultivate spat to harvest in licensed aquaculture sites in Ireland. Spat is scraped of spat collectors (the spat collected in mussel bags with monofilament net fixed, which is fixed vertically in the spat collecting areas) and placed in develop into young scallop are placed in trays when during the first winter, when they are around 4mm. and released when about 20mms in size. The Mulroy bay scallop are released when mature enough to survive and grow in the wild. Capture for the market is by diving in a licensed aquaculture area[3].They are approximately 4 years old when they are the right size for the market. In Mulroy Bay they are fished by diving, in a licensed aquaculture area. As such they are managed and fished in the most sustainable way possible.

The current management has ensured the fishery there could continue without further aquaculture development in it's current sustainable form, however, this is not addressing the problem of a lack of native brood stock and absence of spat falls in other areas, both in Mulroy and other locations in Ireland (Galway Bay, Kerry and the Irish Sea) where the species has also been impacted through overfishing, dragging damaging the benthic habitat, or due to changes in water quality (Galway Bay).As such the need to increase spat survival and the development of young scallop for release has become increasingly important and it is a core component of the proposed enhancement project.
Mulroy Bay has the capacity to hold increased biomass of Pecten *maximus,* and given the importance of the area, on an international level, for spatting, this forms a core component of the feasibility study.

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[2]Polychlorinated biphenyls were widely used as dielectric and coolant fluids in electrical apparatus, cutting fluids for machining operations, carbonless copy paper and in heat transfer fluids.[2] Due to PCBs' environmental toxicity and classification as a persistent organic pollutant it is banned in Europe and north America.

[3]Diving for scallops, or any other seafood, is illegal in Ireland other than in a licensed aquaculture site where it is part of the fishery process. The loss of brood stock for Pecten maximus in much of Mulroy Bay area may in part be due to leisure diving.

5.2 Native European(flat) Oysters (O. *Edulis*)

Life Cycle

Ostrea edulis is a protandric hermaphrodite, changing sexes generally twice during a single season. Oysters function as males early in the spawning season and later change to females and *vice versa*. The flat oyster is usually male in the fall following its settlement. Female gametes are liberated into the palleal cavity where they are fertilized by externally released sperm. Flat oyster produce between 500 000 and 1 million eggs per spawning. Following an incubation period of 8-10 days, depending on temperature, final release into environment occurs. Then larvae spend 8 to 10 days as a pelagic stage before settlement. As oysters remain attached to shells in the benthic zone, a healthy oyster reef requires a good depth of cultch (shells of osyters) on which to settle. It also makes them vulnerable to dragging. This plus overfishing in the past and vulnerability to disease, means they are under conservation measures in the EU.

Flat oysters have been in decline over the past one hundred years. The reasons are not confirmed, but certainly pressure from coastal development such as drainage from development, other fishing and non fishing based marine activities, and also the growth in numbers of pacific (gigas) oysters, which carry the Bonemia parasite has created a situation where the declining population poses a significant concern.

The importance of oysters for bay and habitat management has afforded them some protection. They provide an important ecological function in filtering the water. The filtering removes organic and inorganic particles from the water column resulting in cleaner water which positively impacts other species. As they have selective feeding, they filter out microscopic phytoplankton, removing the algal biomass from the water as well as other suspended solids from the water column and package them into bundles which they release as pseudofeces. This bundle is then utilized by other organisms on the oyster reef for food. Oyster shells create a hard bottom described as a reef, which creates a hard bottom substrate that provides habitat for other organisms. Barnacles, mussels, and anemones all require a hard bottom on which to attach and to grow. The gaping oyster shell provides a substrate for eggs to be attached to, while offering protection from predators at the same time. The nooks and crannies of the reef formation offer habitat to different species of worms, mollusks, fish, and crabs. The presence of these organisms attracts larger predators which in turn attracts even larger predators. The existence of an oyster reef truly creates a dynamic environment.

Oyster stocks are, known to have declined significantly in Ireland compared to historic highs of the 19th century. The species is listed by OSPAR as threatened or declining and a number of pressures from coastal development, disease and alien species continue in many areas (OSPAR 2009). All commercially fished oyster beds in Ireland occur in Special Areas of Conservation (SAC) designated under the Habitats Directive (Council Directive 92/43/EC). While Mulroy Bay is an SAC, it does not now have a viable oyster habitat and so would not come under management requirements for the 'favourable conservation status' (FCS) for the species (Tully O and Clarke S 2012).

Limitations
The two main limitations to flat oyster enhancement are access to seed and, if developing a wild fishery, the establishment of habitat which they require to settle and release spat.

Seed
In relation to seed, the shortage (only 75 million was available in Europe in 2013) is a reflection of the fact that the species has been in serious decline for decades and underpins the need for a proactive approach in disease free areas in Ireland, where, if still not present, there are historical records of the species being present.There are differences of opinion on what it would take to enhance the seed production potential of an oyster nursery, from buying in seed to creating low cost spatting ponds. Section 6 explores both approaches.

Habitat
The reef habitat should be formed with large volumes of oyster or mussel shells - cultch, and where this no longer exist it has to be created with shells that are clean, from a disease free area.

Today the benthic zone would not have adequate cultch for a brood stock of oyster, and some gigas farming may mean that the risk of disease is present. It is worth exploring the potential for oyster within Sheephaven although this would require more work to deposit enough cultch to establish a suitable reef for oyster. Oyster larval spread works well in areas where there is tidal gyre – so it is carried, but kept within the area and the tidal conditions need to be carefully examined in Sheephaven.

So if the decision is to go down the creating a local flat oyster wild fishery, cultch will need to be brought in, and this is expensive. There is plenty in the Swilly, but the presence of the Bonemia parasite in most of Ireland, where there is gigas aquaculture, means sourcing clean cultch will be challenging, and likely costly. A strategy to establish a wild fishery in the area would require a reef development and young oyster (minimum 10ml) release scheme with some calculation as to the potential for the area in terms of a target biomass, and understanding of growth rates, size and age composition etc. It is possible to use scallop and mussel, and while not as good as oyster, may be most cost effective.

The area marked xxxx on the map shows where native oysters were traditionally recorded in Mulroy.

Raising flat oysters in trays or plastic micro-reefs can be successful and it may be advisable to grow for commercial sale as well as releasing brood stock and reef development,to maximise financial returns.

5.3 Homarus Gammarus - European Lobster

Life Cycle
The female *H. gammarus* – european lobster are slow growing and reach sexual maturity after about 4 years, when they have grown to a carapace length of 80–85 millimetres (3.1–3.3 in), although males mature are a slightly smaller size. Lobsters cast their shell as the grow bigger, and mating typically occurs in summer between a

recently moulted female, whose shell is therefore soft, and a hard-shelled male.The female carries the eggs for up to 12 months, with them attached to her pleopods – under the tail. Egg carrying females are described as 'berried' and can be found throughout the year.

When ready the eggs hatch at night and the larvae swim to thesurface where they drift with ocean currents, and consume zooplankton. This drifting stage lasts between 15 and 35 days, during which they moult three times, after which the creature takes on an appearance of an adult lobster and relocates to the bottom and adopts a benthic existence including the digging of extensive burrows. After the third moult, the juvenile takes on a form closer to the adult, and adopts a benthic lifestyle. Mortality at this stage is high with around1 larva in every 20,000 surviving. When the carapace becomes 15mm long the juveniles leave the burrows and start their adult lives. They are seven years old before they reach the legal catch size.

Given the prolonged larval stage, and the need to keep lobsters separate until they enter their adult phase because they are cannibalistic, means that lobster hatchery work is complex and expensive.

Lobster fishing remains an important part of the inshore and small boat fishing industry in Ireland. For many fishing communities, lobster and crab are the mainstay, although with the costs of fishing increasing, and the value of lobsters comparatively decreasing for the past 30 years[4]. To make a living as a full time fisherman now, you need to fish at least 600 lobster traps, and this in turn requires a big enough boat, well maintained, and adequate gear to fish all year round. The lobster population has been impacted by generations of fishing, and some overfishing. Some twenty years ago Ireland adopted the v-notching of berried females, where you must cut a notch in a berried female's tail, and it is illegal then to land a lobster with a notch in its tail, which was initially pioneered in Maine. However unlike their US counterparts, this has never become mandatory in Ireland and although there is a compensation programme, many fishermen are known to either sell berried females, un-notched, which is not illegal, or even to 'scrub' the berries of the females. Such poor practice reflects badly on the industry. As such, there has been reluctance to endorse the idea of a hatchery, as known effective and cheaper conservation methods are already on offer. Yet many fishermen do v-notch, and the prices being poor (lobster prices in the summer months can drop below £5 a kg), the survival and income levels for lobster fishermen just gets tougher. So while one argument might be purely in favour of a v-notching solution, you can also argue that the population has already been impacted because of pre v-notching fishing effort, that the costs and prices are driving poor practice, and that if lobster were more plentiful, there could be an opportunity to increase consumption in Europe, so while the prices may not improve, more volume at the same prices could make a substantial difference. This only stacks up if one assumes that the consumer – and retailer, would prefer European lobster, if offered it, so marketing and branding would also have to accompany an increase in supply, or else it would just add to the general flooding of the market in the summer months.

[4] The price of European lobster is affected by the market being flooded in the summer and early autumn, as catching lobster becomes easier. The state of Maine has 2 million lobster traps in the water by the end of August, and with no natural preditors (cod, haddock and saithe) present, and large quantities of bait in traps making feeding easier with up to 50% of diet bait, (Grabowski, 2010 GMRI), and strictly enforced conservation measures, the huge numbers of lobster coming on to the market drives down prices world wide. Although Maine lobsters stay soft shelled for a long time, as there is less necessity to hide from predators, they do suffer up to 20% mortality after catch. Nevertheless, they continue to impact on global prices and this situation is unlikely to change unless the lobster population decreases.

It is worth noting here that Minister Coveney has stated his interest in seeing a lobster hatchery established as part of the Inshore Fisheries Forum policy. To establish a lobster hatchery within a 'multi trophic' nursery/hatchery facility may be a particularly cost effective way of providing this service.

Lobster hatchery success is also mixed. The Orkney hatchery was established by industry, and has reported a capture rate of 13%, which is high, when you also consider the likely contribution the un-caught lobsters are making to the overall population. Padstow in Cornwall records a catch rate of under 10%. Mortality of hatchery bred lobsters is likely to be high as well. The Orkney hatchery has also achieved some success in selling young lobsters to the fishing industry in other places, and fishermen (cooperatives) in west Donegal and Kerry have purchased lobster from Orkney in the past.

There were two lobster hatcheries in Ireland, one in Carna in Galway and the other in the south east, at Kilmore Quay. Both closed over eight years ago.

The current departmental policy is quietly supportive of the idea of a hatchery, but one led by industry, and accompanied by other good robust conservation practices.

The other opportunity related to lobster is storage from the summer months through to winter, and particularly Christmas, when the price can at least double. Storage requires two things, facilities that can ensure very limited mortality, and secondly, the fishermen having the cash flow ability to sit out sales price of their catch until it goes in the winter. This project could provide an interim sales arrangement if that was considered in the interests of the overall business model. The project could also provide crab holding. Crabs cannot be stored at all, but they do require short term holding, from catch to dispatch, perhaps up to 48 hours. The benefit of the lobster and crab holding, is that this project could have a benefit to the wild capture inshore fishermen in the area, and also bring them into industry led good practice and conservation measures that could make this project a landmark demonstration initiative.

5.4 Kelp Farming - Laminaria Digitata, Saccharina Latissima and Alaria Esculanta

The Smart Ocean Strategy for Ireland includes algae production as a strategic and innovative opportunity on which to build a marine resource based economy and engine for growth.

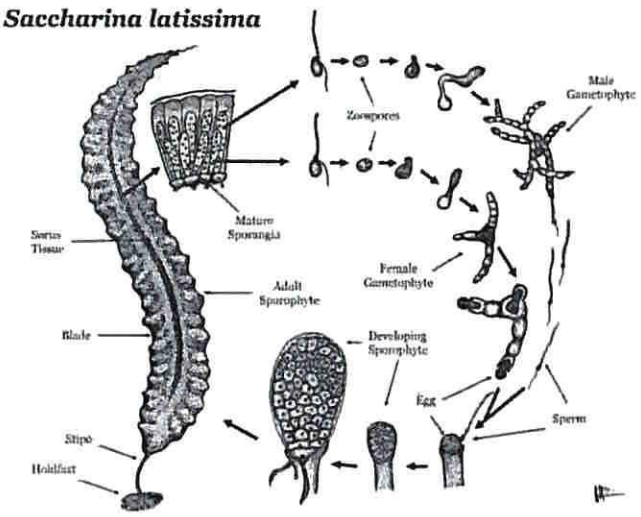
Kelp can be used for biomass (it is 3 times more effective than other land based crops – Enalgae 2014), for animal feeds (in Norway nearly all production is used for animal feed although research has also achieved 79% recovery for bio oil), for extracts to be added to foods, animal feed and health supplements, for cosmetics, as fertiliser and as a human food stuff. There is a market for every part of kelp plants although processing it and getting it to market is challenging.

Currently there are three kelp nurseries in Ireland, the BIM facility in Cork, one at the Ryan Institute (attached to NUIG) in Galway and Carna, and a small private facility on Rathlin Island, off the coast of Antrim. The BIM facility has been supplying two small scale kelp enterprises in Kerry and Cork, both used for pet food, while the Rathlin Island facility is a start-up kelp growing enterprise targeting the high end food market.

The three main types of kelp grown in these facilities are: Laminaria *digitata,* Saccharina *latissima* and Alaria *esculanta.*

The first typically spores from May through to the end of August, while Alaria and Saccharina release from January through to April. Alaria is a sub arctic species, and likes cold and turbulent waters while Saccharina prefers less wave movement. Laminaria can thrive in either situation, but is harder to cultivate.

The zoospores release and for 24 hours are male and female, swim, and are described as zooplankton. After 24 hours they need to have attached to something or they die.



Life Cycle of Saccharina

Kelp loves day light and temperatures between 7 and 13 degrees, making Ireland an ideal location for kelp growth. At peak conditions it can grow 3 metres in 15 weeks. After the end of June, kelp is increasingly host to a range of other species, referred to as biofoul. This makes it more challenging to work with and less appealing to buyers, although it is less of an issue the more 'down market' the use of the kelp is.
In kelp nurseries, the kelp zoospores are released into tanks of sterile seawater, between 10 and 12 degrees, and fed with nutrient mix to replicate that from the sea. Light levels are increased over that period, with the brightest light coming at the end of the nursery period. Keeping biofoul out of the system is a demanding and necessary part of a kelp nursery. After around 37 days the spools with the average 2mm long young kelp plants are transplanted to ropes at sea, and set to lie about one fathom below the surface with the use of small weights and buoys. Laminaria is usually planted in the Autumn. As Saccharina and Alaria spore in the spring, and it is difficult to set the ropes in the summer without the young kelp plants being consumed or affected by bio foul, the sporophytes are kept in a fridge under a red light, under which conditions they will clone, and can be kept for up to six months.

Currently there are 23 license applications in Ireland for kelp farms, covering 240 hectares of ocean. There are no applications for kelp nurseries. This is probably a reflection of the naivety of would be kelp farmers, or perhaps an expectation that BIM is likely to supply kelp farmers with spools of string to set at sea. It certainly presents an opportunity for any would be kelp farmers who want to establish a nursery.

Section 6 A Seafood Enhancement Centre

The Seafood Enhancement Centre is the provisional name given to a centre which could include some or all of the following elements:

- Ostrea Edulis (flat Oyster) hatchery and nursery
- Pecten maximus (Scallop) hatchery and nursery
- Kelp nursery
- Lobster hatchery
- Gigas nursery
- Lobster storage
- Crab holding facility
- Visitor and Education Centre

Hatchery Concepts

The principle aim of the project is the establishment and operation of a multi functional aquaculture facility, where diverse use, maximizing use across the calendar year, and operating a facility according to 'multi trophic[5]' type conditions, using recirculation and aquaponics where possible, reduces costs, adds value, spreads the benefits and is a landmark demonstration project on an international level.

Aquaculture is the rearing of aquatic species under controlled conditions. These include finfish, shellfish, algae and crustaceans. The rearing of the species is normally spilt into two distinct activities; the hatchery stage where the species produce eggs/seed which are grown out into juveniles and two, a nursery stage where juveniles develop.

Aquaculture can use tanks/ponds, running water, a closed recirculating system. Increasingly aquaculture is looking to maximise potential through a multi species approach, so the equipment and facility use is maximised through the year, overheads and staff costs are contributing to more than one 'product'. In addition an 'aquaponics approach' where the waste stream of one biological system contributes to food stuff for another (Diver, 2006) can reduce costs through a multi-trophic approach where a complementary relationship between species reduces the need for production of/purchase of food. It does depend on the species as the purification required for most hatchery operations also involves filtering out of many nutrients.

[5] Multi trophic describes the interdependent existence of a number of species together in an aquaculture environment, where the coexistence helps with the ecological balance and management of the system. The classic example is where mussels, kelp and salmon farming would be managed, with the mussels filtering salmon waste and kelp absorbing other nutrients.

Hatchery Seed

The word "spat" is an old English term applied to the early juvenile stage of bivalve development and is perhaps the most commonly used term applied to juveniles in hatcheries. It relates to bivalve larvae that have set and undergone metamorphosis.

The size that spat is supplied is largely dictated by the requirements and maturity of the growout industry. Hatcheries prefer to deliver them at the smallest size possible because the economic implications of growing them further within closely controlled conditions are significant. It takes only a relatively small tank volume and a comparatively small quantity of algae to grow larvae and set a million spat but once they are set costs associated with growing them escalate rapidly.

The selection of brood stock is an essential component for the rearing of hatchery seed. It can be collected from the wild, or purchased. For lobster, collection from the wild is the norm, but for oyster, avoiding disease, as well as ensuring good genetic diversity – over a number of hatchery events, means that 'brood' oysters would need to be secured from other disease free locations, and perhaps several different locations over a number of years, to build a better genetic profile of species.

Oyster brood-stock are fed nutrient rich micro algae to assist with good quality egg production, so high levels of fatty acids are important determinants in terms of larval metamorphisis.

Larvae are transferred to larval rearing vessels after successful spawning and fertilization has taken place and here they are fed microalgae until they undergo metamorphosis and settlement. The rearing vessels are usually tanks which are kept aerated and with frequent water changes to reduce the risk of microbial contamination such as Vibrio[6].

6.1 Ostrea Edulos - Native Oyster

Native oyster reinstatement is challenging, at a global level and across different species, and particularly for Ostrea Edulis. The reasons for this are not clear. As such, efforts that combine farming and commercial extraction with low cost but on-going efforts to reinstate oysters, in as many suitable places as possible, are suggested as the best way forward.

As hatcheryproduced seed and stock from small numbers of brood-stock can result in a loss of genetic diversity,low recruitmentcan result, and this helps explains the variance in reproductive success among the potential breeders. Pond-cultured oysters have greater genetic diversity and effective population size between hatchery and wild populations, providing the oysters have been carefully selected for release in the pond and as such, a pond based system is preferable, particularly if aiming to establish a disease free wild fishery. However, even if the aim is to farm on an ongoing basis, the benefits of building good genetic profile and a disease free stock, may have wider benefits, including the opportunity to sell seed as well as grow on oyster for sale.

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[6]Vibrio is a genus of Gram-negative bacteria, several species of which can cause foodborne infection, usually associated with eating undercooked seafood and are typically found insea water.

With pond culture providing a good level of genetic diversity and hatchery production helping with control of disease, it is possible to utilize a hatchery model combining both methods.'A mixture of these two approaches is required to ensure a healthy and sustainablerestoration programme for O. edulis in Europe' (Lallius et al.).

Mulroy Bay has one site, which could provide optimal pond based culture, being the Back Lough and an additional hatchery ponds could be created with a shell size of 50m3 (around €3000). Above ground swimming pools can provide a suitable sized shell for this approach. Tiles would be set out in each for the collection of spat and transfer to nursery which could include internal tanks, under controlled conditions, to maximise feed and the best conditions for survival and early stage growth, after which they can be transferred to external tanks. In terms of growing out, the Ortac system (developed by Tony Legg, see http://www.fusionmarine.com/ortac_oyster_farming_system.htm) is considered to be a cost effective and successful growing on system for oysters, and this could be used to bring the oysters to either harvest time, or release into a developed reef system to build brood stock. Lantern nets are also successful.

Developing an oyster reef has been discussed by local fishermen and stakeholders. While there is some skepticism about the feasibility of this, the broad agreement is to consider establishing them where they were in the past and that there is interest in proceeding with this aspect of the project. Oyster beds, shell banks and reefs are complex habitats are made up of live and dead shells which trap sediment and detritus. These habitats provide vital refuges for a diverse range of species and can be hot-spots for marine biodiversity andimportant nursery areas for commercial species including juvenile lobsters. Oyster reefs can have 20 times the species abundance and 5 times the species richness than surrounding habitats with the complex shelly habitats helping to stabilise sediments and reduce erosion in disturbed environments (Ablox, Jersey seafarms). If the decision is to re-establish native oyster, it will require long term commitment – at least five years, and the establishment of the reef well in advance of continued release of oyster for brood stock. The purchase/acquiring of disease free shells, - mussel/scallop and oyster could be done over time, with bleaching in the weather assisting clean the shells and a gradual procurement may be most cost effective than going to buy suitable cultch when approaching a time when release of oysters is being considered.

Conclusions

- Reinstating Ostrea Edulis – native oyster is a complex and long term project with a high risk of failure.

- It is essential to combine good genetic diversity along with disease resistant strains of native oyster is the goal is to reinstate the species in Sheephaven and Mulroy.
- There are multiple environmental benefits to the presence of a functioning native oyster reefs, combined with their function as a filter bi-valve. Their presence in Sheephaven and Mulroy could assist with biodiversity and contribute to greater protection from opportunistic fishermen visiting the area.
- Native oysters are relatively easy to spat and cultivate in a farming environment using bespoke equipment.
- Equipment does not have to be costly – using 'pop up' hatcheries are an option.
- Mulroy Bay has a tidal pond, with a very narrow entry – the Back Lough, which would be extremely easy to adapt for a spatting pond, and likely to be more effective than an artificial one.
- The area all comes under Natura 2000 designation, and so the adaptation of a tidal pond for a hatchery would require an Environmental Assessment.
- While there was some dissenting voices, the general view amongst the fishing community in the area was that this is a project worth pursuing.
- The project will require on going engagement of research institutions
- The project will require support for at least five years, and possibly longer.

Recommendations

- *Initial scoping of the Back Lough should include EI work to assess the impact of a lock system to maintain water depths needed for successful oyster stock.*

- *The engineering requirements of a lock system and any other adaptations to the Back Lough to be assessed along with costings.*

- *Determine what infrastructure is necessary for the seafood enhancement centre in terms of space and food production.*

- *A suitable site, with costings for an above ground 50 mtr3 oyster tank to be established.*

- *Growing out areas to be agreed with the Dept. and BIM.*

- *Secure support for at least 5 years development.*

- *Agreement on what cultch to use, secure costings for both purchase (if necessary) and depositing it in the agreed areas.*

- *Agree terms of reference for ongoing research support from relevant research institutions*

6.2 Pecten Maximus – Scallop

King scallops are a valuable seafood product with large established markets both within Europe and world-wide. In the UK, the majority of king scallops (Pecten maximus) produced for the table market are fished from natural wild stocks. This fishery is extremely valuable, worth about £ 30 million per year from landings of just under 20 000 tonnes. However, the fishery seems to have reached a peak at this level. There remains a significant retail demand for high quality scallops. Any increase in production within Europe to satisfy this demand is likely to come from cultivation.

King scallop (pectin Maximus) is a difficult species to produce in hatchery conditions and also survival post seeding on the seabed varies with almost 100% mortality being the norm, if proper management of the area is not in place examples of this have been documented in almost every EU coast lying country where they are indigenous to, including Ireland. That said, this project has the capacity to bring together the best practices in the whole production cycle from hatchery to market and so it makes it a viable proposition to include this species in the project, and given the success that Mulroy has had cultivating young scallop, at an international level, would make it a good candidate for hatchery research and development work.

As explored in Section 3, the spatting areas have contracted over the last thirty years, and the brood stock has been lost from areas where it was previously healthy. There is a need to increase spat survival and the development of young scallop for release has become increasingly important. As such the hatchery could also supplement wild spat collection, with a nursery providing young scallop for continued release for sustainable harvesting, and also for release to targeted areas over time to build brood stock.

As the nursery component, with wild release and capture, is already a successful operation, the project would be about adding value with the focus on the reinstatement of original spatting areas with brood stock. The project could also establish algae growing for scallop, within its multi-trophic/recirculation model.

As the reasons for the decline in brood stock and spat fall areas is not fully understood, the project will require a research element, that could include both research and improvement to the potential target areas for reinstatement. It could also include some genetic profiling to ensure as much genetic diversity as possible in the brood stock. Letterkenny Institute of Technology has expressed an interest in being involved in such research, although the project would require active support from the Marine Institute and BIM. The ongoing release of selected scallop into the target areas would also require subvention over a number of years – at least four.

The 'Settle Project' was an EU Framework 7 project, aimed at developing hatchery techniques that would support year round production of spat for scallop and native oyster in hatcheries. The Norwegians (University of Bergen) have specialized in a multi species approach, and in particular disease control, see http://settleproject.com/.
North west shellfish have been involved in research and negotiations at an international level on scallop hatchery and brood stock enhancement.

Costs of the Nursery
Scallop nursery costs are not excessive, but kelp nursery costs are considered too prohibitive as a stand alone to be commercially viable.BIM (Lucy Watson) has analysed the requirements and running costs of combining scallop and kelp, and come up with a viable system to do both. This underpins the value in the approach being proposed for the Seafood Enhancement Centre .

Hatchery versus Spat Collection
Scallop are difficult to breed in hatchery conditions. They have a larval period of roughly 21 days, with cultures of larvae very susceptible to losses. They are vulnerable to bacterial contamination and management of feed all contribute to problems in larval cultures. Given that there is good spat fall in Mulroy Bay, the only reason to carry out hatchery work, in addition to spat collection, would be research purposes.

Historically there was almost a total dependence from industry on spat produced in Mulroy Bay however with the decline in brood stock in the North Water (NW) part of the bay from a high of 600,000 in the early eighties to almost zero in 2008, there is no longer a viable spat settlement and therefore hatchery production is the only option to re establish this brood stock to a level where it would again be a viable option to set spat collectors. Ref Aquaculture technical bulleting Number 7 ISSN0332-3475, BIM scallop survey (NW) 2008.

Feed Type
Scallop thrive on algae with a high protein, lipid and carbohydrate profile and microalgal species used in scallop culture usually have high levels of vitamins such as vitamin C. The dietary requirements of scallops differ depending on species and life stage. For example, increased protein content of the microalgal diet of broodstock has been shown to reduce time to spawning maturity and increase fecundity. Similar positive results for growth and survival have been observed in larvae fed with high protein diets. However, speculation remains that lipids are also very important to scallop larvae (https://en.wikipedia.org/wiki/Scallop_aquaculture#Feeding).

Conclusions
- There is a good existing foundation on which to build scallop enhancement work.
- The project should focus on reinstatement of former breeding/spat fall areas.
- Research into potential habitat loss and requirements for the target areas is required.
- Genetic profiling of scallop, and ensuring a healthy brood stock, would be an important element to the project.
- Growing algae for food in the seafood enhancement centre is likely to be a cost effective solution.
- The project will require on going engagement of research institutions.
- The project will require support for at least six years.
- It will be essential to protect potential areas for brood stock reinstatement from fishing activities that may damage the benthic habitat.

Recommendations
- *Agree target areas for reinstatement with BIM and the Marine Institute*

- *Agree terms of reference for ongoing research support from relevant research institutions, including LYIT, the Marine Institute and contacts at the University of Bergen.*

- *Determine infrastructure requirements within the Seafood Enhancement Centre with costs including production of algae.*

6.2.1 Food Requirements for the Bi-Valve Nursery

Food requirements for bivalves increase greatly as they grow. The following table sets out the daily food requirements for oysters and for scallop - where scallop spat are approximately 70% of the weight of oyster spat for a given shell length.

Tank water volume and daily food requirements for bivalve spat of different sizes when grown at a biomass of 200 g live weight per 1 000 l (0.2 kg per m^3).

Length (mm)	Weight (mg per spat)	Number per 200 g	Tank volume (l) per million spat	Daily food (l* per million spat)
0.3	0.01	2.0×10^7	50	2.9
0.5	0.07	2.9×10^6	350	20.0
1.0	0.30	666 700	1 500	85.7
2.0	2.2	90 900	11 000	628.5
3.0	7.0	28 700	34 840	1 999.0
4.0	17.0	11 765	85 000	4 856.0
5.0	32.0	6 270	160 000	9 130.0

Daily food requirement calculated as l of *Tetraselmis* at 1 x 106 cells per ml (Woolmer A.P.)

A million 0.3 mg oyster spat will need a minimum culture tank volume of treated and heated seawater of 1 500 l. By the time they reach 5 mm shell length individual live weight has risen to approximately 32 mg. The biomass of one million 32 mg spat has increased to 32 kg and the volume of treated and heated water required to grow them is now 160 000 l. Food requirements increase proportionately. A 4 mm increase in shell length is associated with more than a 100-fold increase in biomass and the same increase in food is required. Clearly, there is a limit to the size hatcheries can grow the spat in terms of spatial requirements to accommodate them, the need to treat and heat seawater and the volumes of food required to feed them. However, producing food – growing algae, for the hatchery and nursery will be more cost effective than buying it in a multi trophic system.

Recommendation

- The Seafood Enhancement Centre should include algae production for bi-valve feed.

6.3 Kelp Nursery

The kelp species that the nursery is likely to produce are Alaria *esculanta,* (Alaria)Laminaria *digitata* (Laminaria)and Saccharina *latissima* (Saccharina). Although Saccharina *latissima* is the predominant species within Mulroy bay for growing, areas identified as potential kelp farming around the east side of Horn Head would be more suited to Alaria and Laminaria. Alaria and Saccharina both carry spores in the early spring while Laminaria carries spores from May through to September. This means there is the potential to spread the growing of young kelp, however transplanting kelp plants to sea if the early or mid summer runs a greater risk of those plants being eaten, and of other biofoul settling on the ropes, therefore Autumn setting is usually recommended.

A kelp nursery is used to release spores to artificial settling and growing conditions to maximize productivity, ensure species selectivity and provide some ability to plan growth and harvest times. Each of the species requires around 38 days from the seeding of spools of string to transplant to sea. Laminaria, while the most prevalent of the kelps around the Irish coast, is also the most difficult to cultivate in the nursery. As such, the facility may want to concentrate on Alaria and Saccharina in the early years.

Nursery Equipment

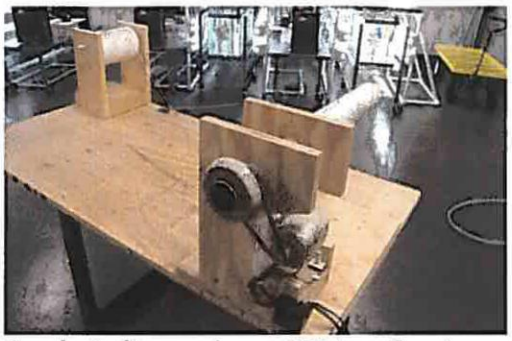
All equipment in a kelp lab must be kept sterile at all times. This is because the risk of biofoul invasion – by other aquactic plant forms, is very high, and can cause problems when they take a hold in the system.

The basic requirements for a kelp nursery are:

- Provision of sterile seawater and ability to keep seawater at temperatures between 8c and 13c.
- Tanks, size around 2000 litres would produce enough spools of string to provide at least 100 tonnes of kelp after setting at sea.
- Circulation to oxygenate the water (part of the recirculation system in the facility)
- Co2 to maintain ph levels between 7.5 and 9
- Nutrients to feed the kelp plants
- Chill facilities to store sorus and culture before setting
- Light system that mimics daylight for the tanks
- System to wind string to spools
- Spools, settling tubes
- Basic lab equipment

BIM has produced a kelp 'manual' which details the requirements for growing kelp. This is in two sections, including technical information, a market analysis and 'Business Plan for the Establishment of a Seaweed
Hatchery and Grow-out Farm'. Watson L and Dring M, BIM and QUB 2015
http://www.bim.ie/media/bim/content/publications/Business%20Plan%20fot%20the%20Establishment%20of%20a%20Seaweed%20Hatchery%20and%20Grow-out%20Farm.pdf

They also run a one week kelp mariculture course costing €200.



Spool winding equipment Picture Courtesy of Ocean Approved

Nursery Techniques

Kelp nursery techniques vary only insofar as the preparation of sorus and gamephyte[7] culture is concerned.

Ripe kelp is gathered during the fertile period and the patches of spores – sorus, is cut out of the kelp and painstakingly cleaned to ensure there are no other species present on the kelp.

Sorus on Saccharina on Rathlin Island. Note the dark
Note the dark patch down the middle of the plant.
(Courtesy of Ocean Veg Ireland)

The cleaned sorus is kept in a chilled dry environment (Ocean Veg Ireland use a fridge) for 24 hours then released into sterile seawater which is 12°c. A successful release can be seen when the water becomes cloudy, although it is important to measure the numbers of live cells to ensure the release is productive enough to warrant the next stage.

The second stage can be carried out in two ways; either direct release of the gamephytes into settling tubes in the nursery tanks, with nutrient feed and light settings established for early stage growth, or through storing the cell culture in a fridge under blue light conditions, during which time the cells will clone and increase the potential productivity of the set up. The culture is then released into tubes holding the spools of string and these are kept covered for 24 hours, then exposed to the

1. [7]A **gametophyte** is the haploid multicellular stage in algae is it develops from a spore cell division - cloning.

sunlight mimicking conditions of the light set up, and fed with nutrients. The water may need changed, depending on the system being used. The spools of string are ready for deployment to see after about 38 days – when the young plants reach about 2 – 3 mms.

BIM estimates for a kelp hatchery

Item	Cost €
1xinsulated room with AC and control panel	8500
Autoclave*	24,000
Microscope	1500
Precision balance	1500
Pipework	2000
Tankage16.2m^3	14,000
UV	1000
Sub total	**71,000**
Consumables p/a	
Glassware 1,500.00	1500
fluorescent tubes 500.00	500
Nutrients 750.00	750
Collectors 480 (240x2 €5/ea)	480
Laminaria 2,400.00	2400
Nets 48 (48x1 @€10/ea) 480.00	480
Sub Total	**48,130**
Electricity per annum 30,000.00	30,000
Labour per annum 60,000.00	60,000
Sub Total	**90,000**

Courtesy Watson and Dring, BIM and QUB
(*cost updated 2015 from €14k in original business plan)

This analysis suggests set up of £71,000 and annual running costs of €138,130. Ocean Veg Ireland on Rathlin Island did not have access to this kind of capital, and did pull together a facility involving solutions such as manufacture of tanks from wood, which were then fibreglassed etc. They still needed expensive sterilization systems and most of the consumables listed above.

Regardless of where costs can be cut, the viability of a kelp nursery only stacks up if a very good market exists for the product to be grown, by the nursery operators themselves, or if combined with other activities – such as scallop and oyster nursery. Kelp has a very short shelf life from harvest to processing, maximum 36 hours, so the market needs to be secured, and the processing system set up accordingly. This can also be expensive.

Conclusions:

- Kelp nurseries can be expensive to run, but the costs will be reduced when running it within a multispecies facility, particularly bi-valve species.

Recommendations:

- *Local project promoters should do the BIM algae growing course to get an insight into what is required. This would in turn inform the size/nature and purpose or the kelp nursery in the Seafood Enhancment Centre*

- *Market research for the sale of seeded spools is needed - including asking other people, who have submitted license applications to grow kelp, if they would consider buying spools of seeded string, should non be available from BIM.*

- *Stakeholders involved in this project should prepare a license application for kelp mariculture in areas agreed at local meetings of stakeholders and the fishing industry.*

- *For kelp which is grown to maturity at sea, it is important to determine what market it is being grown for, and as such how to process it when it is harvested.*

6.4 A Lobster Hatchery

The lobster hatchery consists of four rearing systems (Burton, 2003; Rodmell and Todd, 2008): Broodstock, holding and manipulation tanks to house mature females; larval rearing tanks; juvenile on-growing tanks, and live food stock production.

The brood stock would be supplied by local fishermen, and as these berried females should normally be v-notched and returned to the sea, permission from BIM will be required to take them to the hatchery should a facility be established in the project area. The females are in kept in uncrowded conditions, with water clean, and temperatures around 7°c. Hatching takes place overnight over a three day period, with around 10,000 eggs being released. The larvae are then collected with rigid plastic mesh strainers and transferred to larval rearing cones, where a flow of water through the cones (the Kreisel system) keeps the larvae in conditions similar to the water column. Stocking density is around 24 larvae per cone as cannibalism is prevalent through all stages and an on-going challenge for lobster hatchery systems.

This phase lasts around three weeks, until the planktonic phase is over and the lobster have gone through three phases of metamorphoses.

Feed at the larval stage includes live shrimp nauplii (*Artemia*) which is also produced in a hatchery. It is possible to enrich the *Artemia* with essential nutrients. During the second and third weeks are also fed frozen copepods, krill and mysid shrimp.
Stage IV of their lifecycle sees lobster move from the planktonic stage to a benthic lifestyle, and at this point they were traditionally moved to on-growing containers in long tank systems with re-circulated seawater.

A large scale hatchery, such as in Orkney, with a cost of around €200,000 would require the following space:
Larval system: $30m^2$
Juvenile system: $100m^2$
Broodstock (Berried Hens): $20m^2$
Storage Tank and Plant room: $40m^2$
Live food production (Artemia only): $12m^2$

Aquahives (http://aquahive.co.uk/Aquahive.html)
The traditional method of growing on lobster were in single tray systems. These take up a lot of space and so the aquahive 'stacking' system was devised by North Bay Shellfish in Orkney, as part of their work with the Orkney Hatchery. This can enable at

least six times as many young lobsters to be grown on in the same area, cuts down feeding and maintenance time. The Aquahive website states that the costs of lobster hatchery operations are reduced by 40%[8] using the system with the upward flow of water through the hives ensuring a continual flow of clean water and feed.

As lobster are so cannibalistic, and need to be reared in isolation, the aquahive cuts down on mortality, while taking up much less space for the rearing process.


The Aquahive System

The young lobsters stay in containers or aquahive systems for around three months, and are then ready for release. Total time in the hatchery/nursery is about four months, but can be longer.

Lobster Hatchery Economics

Lobster hatcheries are generally considered an expensive solution to enhancing lobster stocking levels. As such, they are few in number and not to be compared to other shell fish nursery costs.

Costs of lobster hatcheries have been analysed by various academics and consultants – largely in connection with proposals for new hatcheries such as for Amble, Padstow in Cornwall (described as the national lobster hatchery), the Firth of Forth and Orkney. BIM also ran successful lobster hatcheries in Wexford and at Carna in Galway, although both are closed, largely because the economic argument to continuing with subvention in the running or them could not be made.

The Orkney Lobster Hatchery is the oldest hatchery in the UK. It began in 1985 and now releases 60,000juveniles per year. It has sold lobsters to the industry throughout Scotland, NE England, Cornwall and to several buyers around the coast of Ireland.The facility was remodeled in 2006. It does access EU funds, largely for research, but is largely funded through sales, a levy on fishermen, sponsorship and is probably the best model for a viable project in Europe.

The estimates of cost per lobster from operations in GB varies between 30p (40cents) and £1 per lobster (€1.30). With a capture recovery rate of 13% in Orkney, and production costs there below the 40p mark per lobster (not using Aquahives – see below).

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[8]following quote is from the Orkney Lobster *Hatchery 'The three 'Aquahive' units (with a floor space of less than 1 sq metre) will rear as many stage 6-7 juveniles as the rest of the current post-larval rearing room. Thus capacity will rise from 13,600 spaces to 28,000 spaces. As each space can be used up to 4 times in a season (May – November) the total production capacity will rise from 55,000 to 112,000.The annual capacity of the hatchery would be expected to rise to 1.2 million juveniles (stage 7) if the prototype 'Aquahives' are successful and fitted in place of the existing system'.*

At a very simplistic level, for 100 lobsters, 13 are caught, and if we give an average market value of £6 each, the total catch value is £78. If using the 40p figure, the cost to produce 100 is £40, so in this scenario, it is a viable business – as long as the nursery is getting the £40 back from the fisherman. In this case the fisherman is only making £38 per hundred lobsters – being around £3 per lobster. It could be argued that if enough are being caught, then the effort and costs of fishing make it feasible. It also demonstrates the importance of keeping costs below the 40p mark – and the need to ensure a capture rate of at least 10%, and the need for the fishermen to catch a lot without excessive costs. If the hatchery is producing 60,000 lobsters per year, this will have increased fishermen's total income by £180,000, and provided £240,000 towards the running costs of the hatchery. The Orkney hatchery plans to increase production to a million. While this may really drive down costs, and make it more attractive to fishermen, it also has the potential to add to an already flooded market in the summer and early autumn.

An addition challenge is the length of time from release from the nursery until they reach maturity – and legal catch size. This can be anywhere from four to seven years. As such, the lead in time for the industry to contribute to the project may be prohibitive and some subvention would be necessary to help cover this phase.

The Padstow Lobster hatchery is a successful tourism attraction and has built much of its economic model around this. They produce 40,000 lobsters per year. Cornwall is a popular tourism destination in England, and as the hatchery attracted 249,000 visitors in 2012. These figures would be unlikely in the Fanad Lighthouse to Horn Head area for a similar facility.

Set Up Costs of a Lobster Hatchery

Estimated costs for a large scale lobster hatchery System Insulated /Un-insulated Larval system
(from Jessica Duffill Telsnig Produced for the Amble Development Trust 2012)

16 Larval Cones	**€4400**
Fiberglass Framework supports	€4200
ABS Pipework	€3000
Filtration	€8560
Juvenile system 24 juvenile trays (3m*0.6m*0.3m)*	€21000
Fiberglass Framework supports	€30000
ABS Pipework	€5400
Filtration	€52000
Broodstock system 6 tanks (1.6m*1m*0.3m)	€5100
Fiberglass Framework supports	€3000
ABS Pipework	€2000
Filtration	€8500
Live food 4 conical bins	€3200
Pipework	€1200
Refigeration Condensing unit and pipework	€18500
Intake system Intake pump and system	€14000
Storage tank filtration	€16200
Storage tank	€1450
Sub totals	€201,710

Installation and delivery would also warrant additional costs. However, much of the expenditure listed above – the pipe work, filtration, pumps, systems and tanks, would also

serve other species being grown, and as such should not be considered as the potential cost of having a lobster hatchery within the facility.

Conclusions

- Lobster hatcheries and nurseries require bespoke set up in terms of larval rearing cones and individual growing environments.
- Lobster hatcheries have historically been difficult to justify from an economics perspective.
- Improvements in storage techniques have made the nursery phase more cost effective.
- The Orkney hatchery has demonstrated a viable business model, which is industry run and operated. It is worth looking to this model for a potential project for Fanad Lighthouse to Horn Head.
- Lobster hatcheries make an attractive visitor experience
- The target for cost per lobster needs to be no more than 40cents, with at least a 13% capture rate when fishing.
- The costs of setting up and running the facility will be reduced when combined with other hatchery and nursery activities.
- The time lag between release and potential commercial capture is at least six years, and so some support would be needed for this period, after which there is the potential for the facility to be self sustaining.

Recommendations

- *Cost out the infrastructure requirements which are specific only to lobster rearing, cones and Aquahives.*
- *Price the cost of feed versus producing own feed*
- *Discuss the potential for the project with local fishermen, including the potential for raising funds through a levy*
- *Take local fishermen to visit the Orkney facility.*

6.5 Crassostrea Gigas - Gigas Oyster

Gigas oysters are much easier to breed and nurture than the native variety, that is why it is prevalent across Europe. Gigas oysters also carry or contract disease and the view is that most of the gigas oysters across Europe stems from a small supply, and so limited gene pool. Disease in Gigas oysters across Europe includes Bonemia Ostreae and increasingly the herpes virus OsHV-1, which has had a serious impact on gigas farming in France over the past few years.

The need to establish disease free gigas oysters, develop an Irish gigas seed supply, and supply the gigas oyster fishery in Mulroy provide the rationale to include gigas within the seafood enhancement facility.

Work will be required to refine gigas seed, and build up disease free stock. As such, some scientific research will be a necessary part of the gigas hatchery.
Care will be taken not to release gigas into the wild, as they can become established (Swilly), and have impact on other in the same locality.

Spatting ponds would be established on land for the gigas oyster, and the seed collected on tiles and managed as per the native oysters. The sale of gigas seed could be an important contribution to the economic model for the project. It would also assist the gigas oyster fishery in Mulroy Bay.

Although no suitable site for gigas farming has been put forward for Sheephaven, it is suggested that gigas farming be constrained to Mulroy Bay only, and that any attempts to establish native oyster would concentrate on the Ards area of Sheephaven.

Conclusions
Although gigas oysters are relatively easy to cultivate there are increasing problems with disease throughout Europe and a need to establish high grade and disease free gigas for sale.

Gigas are an important and current part of the seafood industry in Mulroy Bay and as such an enhancement project that focuses on the quality of product and offers an opportunity to sell young oysters to other gigas growers.

6.6 Storing Lobsters

The logic in including a lobster storage facility in the project is based on two things:

- The project aims to enhance all the sustainable fisheries in the target area, and while this is easier on the aquaculture side, it is equally important to maximize the market value of the species being caught.

-The project will bring in the smaller boat pot men, and make it more inclusive for all the industry in the area.

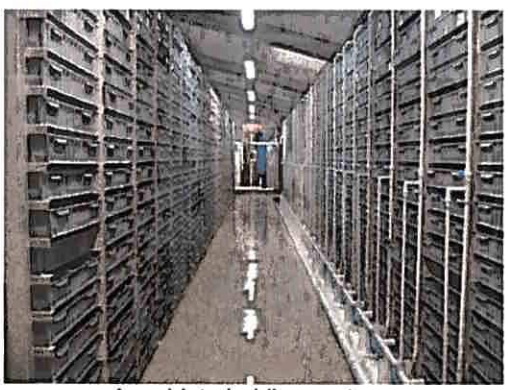
Currently lobster storage is an important part of the business model for lobster buyers and dealers. Lobsters are stored in Burtonport, Islay and Cushendall – by just one company.

It is expensive to set up and do well. Attempts in the past by the industry to store or pound lobsters resulted in both high rates of mortality, as well as a rush to do it at the same time and resulting reduction in the market prices.

The concept of including lobster storage in this project is to provide the market return, normally only available to bigger operators, to the small boat industry.

Modern Storage Techniques

There is a growing trend to store lobsters in trays, sprayed with chilled seawater. An examples is Aquabiota(http://www.aquabiota.com/) in Canada manufacture lobster storage systems that minimize mortality. Individual trays, in stacking systems with lobsters sprayed with well oxygenated water at around 5°c can enable lobsters to survive for up to 6 months.



Aquabiota holding systems

The Economics

There are two downsides to lobster storage. Firstly the set up costs of a sophisticated system like Aquabiota and secondly the impact on day to day cash flow of storing lobsters for the small operator.

In respect of the first issue, the infrastructure – sea water pumping and depuration, necessary for the facility would reduce that aspect of the set up costs. However building expensive storage systems may be costly and a model to recover those costs needs to be determined. The cost of a one tonne storage facility, transported and installed in Donegal would be (waiting price).

In respect of the second issue it is suggested that the industry should allocate a small percentage of their healthiest catch to the storage system, and so it would impact on cash flow, but at an incremental level, with the bonus of a larger payment coming in the winter months. BIM (Tully O) has calculated the threshold cost for holding lobster to be €4 per kg, ie. If the change in value of the lobster between August and December is greater that €4, then it is financially worthwhile to store them.

6.7 Crab Holding

Mortality rates for crab are generally high when they are stored for any length of time, or transported in less than optimum conditions.
Fishermen crab dealers in the project area have markets in Europe and Asia for Donegal crab, and this includes some holding facilities and lorries with vivier tanks.

There can still be a time lag, and less than optimum storage for crab arriving at the dock from smaller boats, and as such a short term holding facility would increase the survivability of the catch. As the facility would have sea water pumping facilities, the additional cost of crab holding may be of modest cost for good return.

7.7 The Fishery Enhancement Visitor Centre

A core feature of the lobster hatchery at Padstow in Cornwall is the visitor and education centre. As the facility will already have the infrastructure, and be staffed, the cost of adding visitor information and tour facilities is much reduced.
Display facilities, an interactive facility, a video and some hands on activities could tell an interesting story, let people see things at first hand, carry out some basic experiments and take away information and knowledge that would be of value from both a tourist and educational perspective. For a comparison see the National Lobster Hatchery at Padstow in Cornwall
http://www.nationallobsterhatchery.co.uk/visit-us/visitor-centre/

The area is a popular tourist destination, although relies heavily on domestic tourism – including those from Northern Ireland. There are limited wet weather attractions and this facility is close to the tourism centre and is on the Wild Atlantic Way (and North Atlantic Drive), making it accessible. If it had 50 visitors per day, for 160 days (April to end Sept), at €5 per head, this would create income of €40,000 – the cost of employing a full time person for the year, plus some running costs.

The infrastructure costs of adding visitor facilities could be around the following:

- IT/interactive facilities €13,000
- Displays €14000
- Materials €6,000
- Hands-on set up €4,000
  Total €33,000

Recommendation: ***Establish an integrated visitor and educational facility and programme within the Seafood Enhancement Facility.***

Section 7 Facilities and Operations

The terms of reference for this feasibility study did not specify planning/ engineering/costings around the development of the Seafood Enhancement Centre. The project has been developed on the basis that there is likely to be a facility available in the area, which is large enough to accommodate multiple aquaculture/hatchery activities, and is beside the sea, for access to sea water.

A detailed business model will be needed, to include the capital costs, running costs, working capital and probable income. It will be at least a year before the specifics of a site and activities is set out in more detail.

The urgency of producing this business model cannot be overstated as we are now entering into the new EMFF OP which is designed to assist such projects as this

What can be specified at this stage is the following:

- To accommodate all the activities in this plan, a facility is required that would be at least 500 sq mtrs.
- It will avoid foreshore license complications if water can be pumped direct from the sea to the building without foreshore impact.
- As the proposal includes a public area, the design of the building needs to make careful consideration of safety for the public, maximizing the potential visitor experience while not interfering with day to day running. In addition, the building will be open to the industry, who may be using it for lobster storage etc. as such it will be important to manage the space in a way that divides the public from working areas.
- If the facility cannot accommodate everything which is suggested, the decision on what to change needs to be made on the basis of what the industry needs, is most viable and can have the longest term impact.
- It may be possible to have activities in artificial ponds outside the facility.

It may be useful to have a formal research facility within the centre, one that would be used by research institutes, and potentially provide a catalyst for the growth of fisheries research at the Seafood Enhancement Centre. A laboratory needs to be accredited if it is to provide researchers with a base with which to carry out robust and publishable research. Such a facility could be on a rent out basis – to be hired out to agencies and researchers on demand.

Discussions with LYIT have confirmed their interest in the facility. They are gradually building their study and research interest in marine biology, life sciences and fisheries. The new joint BIM and LYIT centre in Killybegs is focusing on renewables and adding value to seafood. At the same time LYIT has been doing work on the biomed potential of marine resources – and particularly scallop. They would be interested in carrying this work further, and in also carrying out research into the health benefits of kelp, and in what form etc. it could be processed and utilized. They are interested in exploring the use of Laminaria as a replacement for Thyroxin for those with thyroid gland problems. This is the kind of project which could start in advance of the facility being developed, and create energy and added value.

7.1. Renewable Energy

Donegal County Council, along with strategic partners in the private sector, and LYIT, have made the development of renewable energy a cornerstone of their planning and economic development policies.

At the heart of this is marine renewables. In addition to offshore wind, which is largely being progressed by big multinationals, they have continued with efforts to lead on innovative, near shore tidal energy for which there are several opportune locations in the county.

A major plan is to establish a tidal array at the mouth of Mulroy Bay. Discussions with the council and LYIT have demonstrated an interest in the Seafood Enhancement Centre using renewables. The costs of pumping, chilling and heating seawater is likely to be considerable.

The estimates for a lobster hatchery in the previous section price filtration at €50,000 per year, while the BIM Kelp Business Plan put the electricity costs of a nursery at €30,000. In both cases they are the single biggest area of expenditure after wages.

Any facility which is more than a few miles away from the Mulroy Tidal array probably could not have direct access to the energy generated, given the current barrier to energy distribution in Ireland through any sources other than the ESB. The view of LYIT expert John Doran and Donegal Co Council is that a wind turbine to offset energy costs and develop the facility with as low a carbon footprint is possible. A wind turbine would need to be 100 kws. There may be some challenges with planning, given the areas status as a tourism destination, so a facility which is out of view to some extent would be helpful.

7.2 Licensing, Legislation

The core component of the project - the 'Fishery Enhancement Centre' will require shore based licenses for removal of water and discharge back into the sea. It may also require a foreshore license if any infrastructure is needed to be put in place. The license application will be made under Section 22 of the Fisheries (Amendment) Act, 1997.

A license for pumping and seawater discharge is given more quickly than licenses for at sea activities, nevertheless, it is suggested that the Department is approached directly to see if matters could be expedited on the basis that the project is in the national interest, and largely non profit taking.

Some components of this project could go ahead within existing aquaculture license permissions, such as the release of scallop to build brood stock in areas of Mulroy where it has been lost over the years. Native oyster hatchery and growing on in micro reef systems, but this would not enable the enhancement of the species concerned in a strategic way, nor allow for establishment of reef systems needed for native oyster habitat.

Oyster stocks and their fisheries are managed under Aquaculture licences issued by the Department of Agriculture, Food and Marine. These licences are renewed every 10 years and part of the renewal condition is that a production and management plan for

the relevant oyster bed be developed. Therefore a license application for oyster beds should be prepared early in the process.

Vessels operating in Aquaculture areas do not require tonnage and can be registered in the Aquaculture Segment of the Irish fishing fleet. (Tully et al. 2012).There are separate arrangements for wild harvesting of native oysters. This project does not include wild capture native oyster fishery, but an aquaculture based system which might ultimately reinstate the species in the area, and contribute to it's regeneration in other places.

The growing of kelp requires a license. Before applying it is helpful to explore how well kelp grows in different locations. This creates a problem in that a license could be given for a location which is less than optimal. Applying for a pilot license can assist, but as these cannot be reviewed, if refused, the industry is often reluctant to go the pilot license route, but in this case it is recommended. In the case of Mulroy, the infrastructure used in mussel and scallop aquaculture has shown that Saccharina *latissima* is the predominant species, and other species may not thrive so well. If there is an interest in growing Alaria and Laminaria, then some work may be needed to explore alternative growing locations.

Applying for a license is expensive and time consuming. They require Environmental Impact Assessment (EIA), navigational risk assessment, and mitigation, as well as detailed technical information on the aquaculture infrastructure and activities. Funding applications to progress the project could start with technical assistance to include license application process and EIAs.

Recommendations

- The ideal site for the Seafood Enhancement Centre needs to be large – 500 sq metres, beside the sea, with good access to vehicles, and good public access.
- The facility would benefit from a renewable power supply, and a wind turbine is suggested.
- LYIT have expressed an interest in the project from a research and student study area perspective. This includes the potential for research into the health and nutritional benefits of kelp. It is suggested that project work on this front could proceed in advance of a facility being established and start to illustrate the added value of the project, as well as potentially help with market identification for kelp.
- Applying for relevant licenses for the Seafood Enhancement Centre should be progressed as soon as it is likely the project will go ahead.
- Funding should be sought to assist with the license application requirements, including carrying out EIAs.
- The industry should seek support from BIM and the Marine Institute in asking the department to expedite the license application process, to allow the project to maximise the project time scale and make use of the EMFF six year financing.

Section 8 A Community Based Fishery

This project is based on an industry led model to enhance and sustain fisheries between Horn Head and Fanad Lighthouse. It will require a great amount of community effort, planning, establishing organisational and governance arrangements, raising funds, capital, working capital, carrying out technical work, and investing in enhancement of the fisheries (continuous release of scallop brood stock, lobster stocking and potentially native oyster).

As the legislation stands, an opportunistic fisherman could enter the bays, with a dredger, and wipe out the efforts of those involved in a short period. A fisherman could set 000's of pots, and take all lobsters, and v-notch none of them.

As discussed in section 3, this project includes a strong element of community based fishery management with a community ecosystem fisheries approach. The project brings with it necessary protection for work carried out at community level for the enhancement and management of a fishery area. This industry led management scenario is an important component given both the 'who sews reaps' context, and the opportunity to both demonstrate fishing industry management of an inshore resource under a community ecosystem fisheries management approach - to include the protection ofareas with reinstated for scallop spat, and potentially native oyster.

As such it is a core component that the closure of the area to speculative fishing, that could negatively impact on either the enhancement work, or negatively impact on the viability of the project, and the investment by the local industry, would be essential.

The Fanad Lighthouse to Horn Head area comes under Natura 2000 and SAC conservation management requirements. Conservation designations are a potentially powerful tool with both biodiversity conservation and fisheries management outcomes, and to maximize benefits, this project does present an opportunity to bring together the conservation and fishery take and management responsibilities under a single conceptual plan. This project provides an opportunity to specify environmental and fisheries management goals, zones and activities for the project area. It would allow for the testing of new models of management, by government, in partnership with local communities. Such an approach would be of interest at an international level.

Meetings with the industry in the area have shown they are interested and willing to engage in planning and managing effort on a spatial and technological basis, and to protect the marine habitat, as part of the enhancement and management process.

The potential of this project will require innovation at the management side of things, and the project presents Ireland with an opportunity to pilot a community ecosystem based agreement to protect the project area from the industry who do not fish it or will not be contributing to its enhancement and management. Other models that could be drawn on include the TURF (Territorial User Rights Fishery) in Sweden – for oyster fishing, (Grafton et al),or some of the community based management plans in France – also typically used to manage oyster. Some of the ecosystem based community management plans, being promoted through MPA's may also be worth consideration. A model of this kind would also be subject to monitoring, scrutiny and evaluation. It's potential for replication may be quite specific to community and fishery conditions,

but it may also provide important insights, learning, and transferability that could assist with inshore fisheries management in the future.

Advancing this component will require preparation of a proposal which would include:

- specifics on how the area would be fished and managed,
- how 'rights' would be dealt with at community level during a pilot period,
- how 'rights' would be transferred in the future,
- a system for monitoring and evaluating the impacts
- proposals for adding value – such as facilitating marine and coastal innovation into local economic development efforts at the micro enterprise and tourism level (seaweed baths/foods/products, aquaculture tourism attractions, renewable energy models, product manufacture from shells etc. etc.).

Two things would assist progress this concept, firstly, the terms, requirements and regulations for a pilot management model. This could also include a marine resource economics analysis of the ecosystem based services costs and benefits of the approach, with monitoring and measuring of the activities and outputs. Such analysis would be of considerable academic interest. Along side this there needs to be structured engagement with the Department, the Minister and relevant personal at both BIM and the Marine Institute on the proposed management arrangement.

Recommendations

- Seek funding to research and develop a community based detailed fishery management approach, that integrates fishery enhancement, and ecosystem approach (including the community), a system for local regulation, checks, balances, and reporting.

- Project stakeholders and BIM/Marine Institute could look to an academic institution and possibly a marine resource economist, to devise a model for an area community based management approach for the Horn Head to Fanad Lighthouse area.

- Identify a graduate interested in taking on the project for PhD study.

- Open discussions with the Department of the Marine, and others, when the proposal starts to take shape and is both forward looking and robust.

8.1 Sustainable Wild Capture Fisheries

This section deals with the wild capture fisheries in the area, with a key aim being the integration of these fishermen into a sustainable fisheries management approach and a market driven (rather than harvest driven) approach.

The wild capture fisheries in question are:

a) Lobster
b) Crab
c) Jig caught – Pollack, Saithe (coalfish) and Mackerel
d) Wild salmon

a) Lobster

As discussed in section 3, the sustainability of lobster stocks can be ensured through a total adoption of v-notching and compliance with size regulations.
The project offers fishermen the opportunity to store lobsters to secure higher prices than through direct sales at the time of catch. In addition, the lobster hatchery would help ensure a vibrant lobster fishery in the area for the future. In return, the beneficiaries would be completely obliged to comply with v-notching, and any participant who 'cheats' would be excluded from the opportunity to store and sell through the programme.

b) Crab

Crab management is less defined, apart from clear ruling on the illegality of the removal of crab toes. The Fishery Enhancement Centre includes a potential crab holding facility to decrease mortality during transportation. Local fishermen could network to utilize this. It is also suggested that the industry look to certification for their fishery to help with standards and market access.

c) Jig Caught Pollack, Saithe and Mackerel

There should be market advantage for jig caught fish as they are subject to less abuse during harvesting, and as caught from small boats, they are not held in large quantities in the fish hold, and so the quality of the meat, and sustainability of the fishing methods are much better.

Despite this, jig caught fish rarely receive a premium price in Ireland. This is largely because the industry cannot provide volume, cannot keep the seafood at the correct temperature between catch and the point of sale, and has not been good and presenting and negotiating their product.

The benefits of this project is that it provides a platform to bring fishermen together within a framework which is both sustainable, and market led. The participants include punt fishermen, and very sophisticated and profitable industry participants. The networking opportunities afforded by the project could assist the sole trade, small boat industry, to explore working on a more collective model, with assistance from others in the industry in terms of market opportunities and supply chain arrangements that assist with quality control.

This does of course necessitate access to ice at more remote locations. With the Harry Blaney bridge linking Fanad Lighthouse to Mulroy, the challenges of seafood transportation have been vastly reduced. There are 'pay per use' ice facilities in the region, which have not always been used. This project could provide the coherence and market focus that would overcome such challenges.

d) Salmon

The wild capture salmon industry in Ireland is, in theory, entitled to 50% of the 'TAC' for salmon, although it is not usually referred to in this way.
The near collapse of salmon between 2000 and 2013 led to closures of the commercial fishery, and this had a catastrophic impact on coastal Donegal.

The salmon biomass has been recovering, and it is estimated that on the Moy in Mayo, surplus[9] fish numbers were over 22,000 in 2013. Salmon have been slower to recover in Donegal, although the Foyle population remains strong. Poaching and excessive angling have both contributed to a decline that is not fully understood. Poaching is rife on the Lackagh, and although locals know who it is, and they are not from the area, there is no incentive and interest to try and stop the poaching.

Currently the law states that 50% allocation of surplus fish – allowable catch, is earmarked to the commercial fishing sector in Ireland, and where a fishery becomes viable for commercial fishing, in theory, a fishery can reopen. The challenge in Ireland is that traditional fishing techniques were too indiscriminate, and that this, coupled with the traditional migration pattern of Atlantic salmon moving from north to south down the Irish coast – and passing through Donegal first, means that the reopening of a commercial fishery, based on past practices is unlikely.

Research by fishermen in Sweden and the US, has shown that a modern weir trap provides an alternative fishing technique, where salmon are caught in a net 'bag' where they can swim, until taken on board for weighing, measuring, and capture – or release.

As Sheephaven is such an enclosed large scale bay, and Lackagh river estuary, it is less likely to hold salmon from rivers from other areas in Ireland, and as such could be a good candidate for a concerted effort to build and manage a local sustainable salmon fishing industry. This could start with agreement to prove that using modern weir technology, fishermen would set a specific number, and weight of salmon they could catch. This might just be 10 in year one. The salmon could be tagged and released again, and in year two, a figure agreed with Inland Fisheries Ireland on the 'allowable catch' in Sheephaven. The installation of a fish counter in 2015 will be a useful tool to monitor stock and return levels.

Courtesy of davis enterprise

A modern weir trap for monitoring and sampling salmon

If former salmon license holders worked together to explore, devise and present a case for a trial and sustainable method of catching salmon which is predetermined, selective, it could be used for research and has the total potential for sustainable

[9] When a salmon population reaches a certain level it can become cannibalistic, as such there are 'optimum levels'. When populations rise above optimum levels, fishing is viewed as a constructive method for population management.

fisheries management. It is likely that if responsibility for fishery effort etc. was managed in this way, salmon poaching would be stopped.

8.2 Adding Value – Processing

Since the closure of Bantry Bay mussels, there has been a shortage of mussel processing capacity in Ireland, forcing producers to export without any added value, with less outlet for below premium product, product at risk of mortality and more at the mercy of international buyers.

The main crab processors in Donegal (Errigal and Atlan) just cook whole crab, and there is limited high end processing in Ireland – most of that is done in the south and south east (Sofomar and Shellfish De La Mer), so there is to add value to crab with quality processing (not using water pressure to pump out meat).

While oysters will always receive premium as a live product, there could be a market for processed product using oysters below premium quality – over sized, poorly shaped etc. and the processing of oyster pate etc. would assist add value to these products.

The need for a processing facility in the area was agreed by all the stakeholders, and given the scale of the industry in the area, could probably work.
The challenge is who and how might this come about. There was no suggestion of a cooperative run facility, but this could be an option. It would be an obvious next step given the potential to take forward a brand identity to accompany the enhancement work. It may be worth conversation with other processors to see if there would be an interest in establishing a facility, for added value products or a few of the larger fishermen/seafood businesses having a discussion about what could work for them, and to what extent they may be interested in going the processing route.

BIM and Bord Bia strategies for the seafood industry are encouraging or adding value, but specifically looking to collaboration, creating scale and impact in the market place.

Recommendations

- Recommendation – approach BIM and Bord Bia to look for advice or suggestions on the benefits, opportunities and suggestions for the establishment of shell fish processing in the area.

- Larger shellfish operators have a round table meeting to share to what extent they may be interested in a joint venture.

Recommendation - *research and pursue accreditation that assists with brand identity and market return for seafood products and rewards sustainable practice by the industry*

9 Adding Value, Tourism, Local Marketing

9.1 Adding Value - Certification

MSC (Marine Stewardship Council) or GAA (Global Aquaculture Alliance), type certification schemes continue to open doors to the seafood industry in terms of market opportunities. For buyers not yet seeking such certification, there is a general acknowledgement that it is just a matter of time.

BIM has been active in developing programmes that can support the raising of standards around sustainability, such as the boat and seafood handling accreditation through Global Trust. They can also provide technical assistance and grant aid to the industry pursuing accreditation.

Given that the nature and activities in this project for this project are based on sustainable management of species including native oyster, crab, scallop and lobster means that certification for one or more species could be achieved.

MSC type accreditation is normally sought for a fishing industry on a large regional or national scale. It also just focuses on the stock management and harvesting methods, rather than the supply chain and enhancement programmes but it can also be pursued on a regional scale as well. A 'Sustainable Seafood Programme' as part of the project could include certification and branding that could assist with the market value – and supply chain opportunities for local products. It would be up to the industry to decide which would be the best for them in terms of cost, fit and benefit.

Origin Green is the national 'Irish Brand' for food products. This is the brand that Bord Bia uses when promoting seafood on the international market. Any accreditation that has a brand identity associated with it would also need to sit within the Origin Green brand.

Recommendation - ***research and pursue accreditation that assists with brand identity and market return for seafood products and rewards sustainable practice by the industry***

9.2 Tourism and the Local Seafood Market

For the inshore sector, the crab, lobster and jig fishing sector, there has traditionally been a shortage of opportunities to add value or market their products at a local level in Ireland.

Local artisanal marketing is unlikely to be a mainstream solution for the local industry overall, but it could provide some added value returns.

Conversations with those involved in tourism in the area has confirmed that **'The Wild Atlantic Way'** has been delivering tangible results, in addition to the strong domestic (northern and ROI) visitors that is the foundation of the tourism industry in the area. Currently seafood does not feature to any extent on most local menus

although there are notable exceptions such as the Bridge Restaurant, which could act as an important catalyst for development of seafood gourmet tourism.

Artisnal smoke house 'The Haven', outside Carrigart, confirms that there is real tourism appetite for seafood based visitor experience and products. There is also an absence of any outlets for the purchase of local seafood, limited amounts in cafes and restaurants, and nothing which celebrates the seafood tradition of the area.

It is suggested that a one off seafood festival could test the market for a more regular event, and be a means to get more local seafood into restaurants and shops. It may also help initiate other innovative artisanal seafood businesses.

To assist with the workload associated with such an event, it is also suggested that LYIT be asked to identify a tourism/marketing grad student who would be interested in taking on such a project, particularly if there were opportunities to pilot new seafood products/approach to selling. The group could also apply for an Innovation Voucher to help with the costs of testing a local supply chain, or processing solution association with such an event.

The project would come under the governance of the project cooperative, and be an important contributor to the buy-in of the wild capture fishery in the area who may not directly benefit to any great extent from the enhancement work.

Recommendation: ***Implement a local seafood development initiative as part of the tourism and visitor offering in the area.***

Section 10 Governance for a Shared Resource

The challenges for management of shared and collaborative seafood extraction are obvious and past examples of cooperative owned aquaculture licenses in Ireland have included plenty of challenges and failures. This project has two components to it - the who sews reaps model, with existing operators at the table, and the cultivation of species that are not likely to return any profits for up to 4 years or more (native oyster and lobster) as well as other tourism, training and local community based activities.

To assist identify the key components of a management model for the project, the following sets out a SWOT of the community, the stakeholders and the area.

Strengths	**Weaknesses**
Good existing fishing community infrastructure and relationships Buy-in to the project by stakeholders The nature of the seafood sector – with the enhancement proposals lending themselves to good cooperative management Fishing numbers are small, there is less risk of fishermen abusing the project The project has been designed to assist all fishermen in the area. Support from BIM for the approach Good local leadership Important tourism economy	The project will benefit those already in shellfish aquaculture more than those involved in purely wild capture. Lack of return from enhancement/storage of some species (eg. lobster)could undermine the project's viability in the long run No association or identity for local seafood, or local seafood cuisine culture Fishermen's work loads makes it hard to commit to new projects
Opportunities	**Threats**
Focusing on more than one species spreads the benefits, will add value, reduce costs, spread the benefits and achieve economies of scale. The project has the potential to put the region on the map as an exemplar. Support from agencies and fit to government policy should assist with funding opportunities The nature of the project (eg. holding lobster), will make it easier to self manage and make sure all participants stick by the rules (eg. essential v-notching) Connections with a 3rd level institution could raise the status of the facility The wider community involved in tourism, and food could be involved through events, festivals and seafood promotion – and create a bigger local community dynamic.	An imbalance in beneficiaries from the project could impact on project commitment and engagement The management arrangements could be undermined by a few fishermen going outside the guidelines Working with multiple species in enhancement work could lead to and imbalance of effort by project participants An imbalance in effort input to the project could impact on its viability

The institutional management of common resources through cooperative structures is seen globally as the fairest way of sharing benefits of such resources and in theory to their sustainable management. The bye-laws of such organisations can spell out the responsibilities, organisational arrangements, functions, and systems for taking and management of the resources (Marothia D K 2002). The challenges of 'the tragedy of the commons' is frequently quoted as the rationale for not going a cooperative route, and fisheries exploitation is one of the best examples of voluntary management not working. However, many of the former cooperative structures in Ireland, which have

not worked, were due to poor governance arrangements from the outset, poor business plans and models and the ability to adjust to change. Nevertheless, there are challenges in managing a 'who sews reaps' cooperative structure where regulations do not exist to underpin the collaborative agreements.

'Management is about bringing together old knowledge, from diverse sources, into new perspectives for practice' (Folke et al.) This means it is essential that in a collaborative arrangement to manage a resource, the stakeholders are informed and engage in a process of learning about the resources that they are managing and using. 'Processes that generate learning, meaning, knowledge, and experience of ecosystem dynamics expressed in management practice are part of the social capacity of responding to environmental change' (Folke et al). Developing the capacity of individuals to learn effectively from their experiences is an important part of building knowledge and skills into organizations and institutions to permit good adaptive management. This is why it is helpful to have experienced and successful business operators providing leadership in the project – but with a mandate to also support the social economy and capacity building dimension of the initiative. This is why piloting a project such as the Marine Resources EducationProgramme[10] may be an important contributor to overall community capacity for the region.

The core operators within this project are established aquaculture businesses in Mulroy Bay – bi-valves - scallop, oyster, mussel as well asorganic salmon, but also include people with exceptionally good models for fishing and getting crab to market. So the cooperative model in this instance should be rooted in the collective knowledge and capacity of this grouping but also needs to be mindful that those participating from the bi-valve industry already have commercial and technical knowledge, infrastructure and market access. Their commercial interests need to be protected within a cooperative structure, however it will only be a valid demonstration model for other areas if it also takes account of the other research work, kelp and lobster hatchery, the native oyster cultivation, the wild capture fisheries– the pot and jig men outside of Mulroy Bay and local community tourism activities. As such, it needs to have a commercial component and a more social economy type structure. So there are two governance options:

- **Model A**

  A double organisational model, with commercial and social economy operating side by side, and the commercial directors would sit on both organisations with additional representatives on the Social Economy Board.

Pros	Cons
- Provides better model for securing grant aid - Cleaner arrangements in terms of profit and non profit. - The commercial component will only be successful if the social economy organisation is well managed, so there are benefits as well as an obligation to committing time and effort to this	- Require commercial operators to come to agreement about rental costs and allocation of facilities - Depends on commercial operators being committed to the social economy organisation - Could be seen as overly complex - May be viewed as overly favouring existing commercial operators

[10]The Marine Resources Education Programme – MREP, was developed in the US, for fishermen, by fishermen, with government and other scientists and policy makers. It provides 3 days fishery science and stock assessment training – designed for non scientists, and 3 days on policy, legislation – and 'how to present your case'. It has made a substantial difference to the capacity of fishermen who engage in fishery management meetings , committees, and organisations, – see section xxx

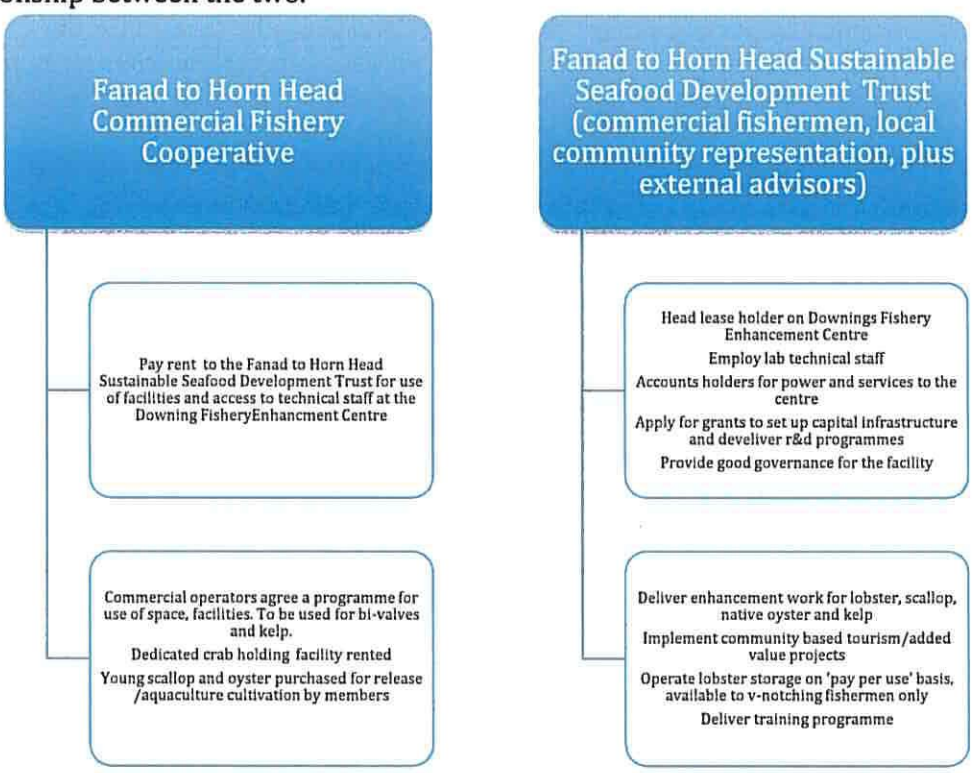
❖ **Model B**

A Social Economy Model where the centre would actually produce young scallop, flat oyster, lobster, kelp, and 'sell' the products to local fishermen and other buyers outside the membership area.

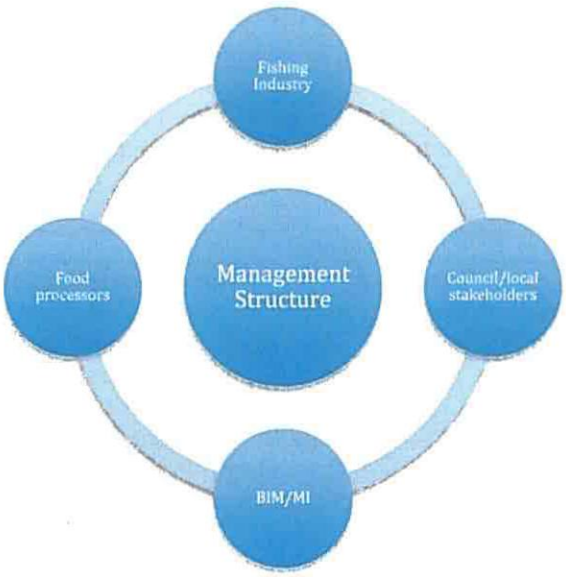
Pros	Cons
- Simpler governance model - Commercial contributions based on sales – cleaner - More community buy-in possible	- Less buy-in from commercial operators, who may chose to go elsewhere or not participate. - Less clarity and opportunities in respect of grant opportunities and management - More potential to run at a loss (sales not achieved or buyers won't pay price) - Less incentive to run at a least cost option – reducing competitiveness

Recommendation

This feasibility study is not expressly recommending Model A, and either would work well, if well designed, however the analysis would suggest that model A may be preferable. In which case the following table sets out the areas of responsibility and relationship between the two.



The project should provide the country with a demonstration model, which could inform, or be replicated elsewhere. In addition, work on species such as native oyster will fit in with current policy and work by BIM and the Marine Institute. Furthermore, the project will require considerable funds, both for set up and for operations. Therefore there will be a degree of scrutiny and engagement by agencies etc., and as such the management structure needs to reflect these relationships and contributors to the initiative. So BIM, the County Council, LYIT and Udaras, may want to have advisors to the Board of the Cooperative, or there should be a feed back loop that would regularly keep these organisations informed.



Investing in the Organisation

It will be of critical importance to get the structure and procedures right for the organization (whether single or double model). Processes, communication, clear areas of responsibility, robust monitoring, financial management and reporting. Really well performing professional organization will make or break the project. It is recommended that time, training, focus group work, possibly with some external assistance, is invested in the governance model to get it as good as it can be.

9.1 Training and Upskilling

It will be important to ensure that people in the area have the skills to benefit from an enhanced fishery and any career opportunities that emerge from the initiative. In addition to potential opportunities for marine science graduates, it will be important for those within the industry to undertake relevant training as well.

BIM runs a range of courses in aquaculture and seaweed cultivation. From Fetac level through through to level 5. Courses are around €200 for two week courses. Details at the following link http://www.bim.ie/training/aquaculture/

Short course training for oyster cultivation is available from a number of sources in the UK which may be useful for those already working full time in the industry; http://www.sams.ac.uk/education/short-courses/oyster-nursery-and-hatchery-techniques (course costs around €750 plus travel and accommodation in England – total estimate around @€850)

The Marine Resources Education Programme
As referenced in section 11, a pilot 'MREP' (Marine Resources Education Programme) could be taken forward by the project team, with BIM, the Marine Institute, LYIT and the Council/DLDC (the latter providing training on presentation, negotiation etc.).http://www.gmri.org/our-work/fisheries-convening/mrep-northeast

Section 11 Options Analysis

It is not possible to make an estimate of capital costs at this stage, until a site/building is identified. The costings in the analysis are based on operational costs on a species by species basis, and they do not take account of the scaled up model proposed for the enhancement centre and it could be assumed that in an integrated model, the costs would be considerably lower.

Four options have been extracted from the feasibility analysis and recommendations. These are as follows:

Option 1	Rationale
Nursery for scallop, gigas oyster, kelp nursery, crab and lobster storage (space dependent) (private sector model).	Option I is based on what is happening in the area already, is proven and viable apart from the kelp nursery. The interest in the kelp nursery, and the functional fit to the scallop nursery, makes it a feasible addition. The crab and lobster storage would work on a pay per use basis (after purchase of infrastructure) and therefore are also a low risk component. The addition of crab holding and lobster storage would be dependent on space, and for lobster, assistance to put in place and quality storage system.

Option 2	Rationale
Scallop, including wild brood stock/spatting area reinstatement, gigas and native oyster, kelp nursery, crab and lobster storage –(optional and space dependent), training and research are important components of option 2.	This option includes work on brood stock enhancement for scallop, and efforts to reinstate spatting areas, and to pilot native oyster farming, and potentially reinstatements as well. This is in response to national and international concern about the future of scallop and native oyster, and in response to local potential and commitment, particularly for scallop. Oyster is included as there is the potential to work in a disease free area. The scientific and national perspective is that any viable options to assist protect and reinstate native oyster breeding is a priority. As in option 1, the addition of kelp reflects local commitement and the opportunity to build on BIM recommendations in terms of doubling up – scallop and kelp nursery functions. As with option 1, this also includes a pay per use crab holding and lobster storage option. Option 2 requires a research element, with the pilot work to reinstate fisheries. As such it also necessitates management arrangements, to monitor results, protect investment and the value of the reinstatement work being done.

Option 3	Rationale
Scallop, gigas and native oyster, kelp, lobster hatchery/nursery. Brood stock reinstatement for scallop, optional for native oyster Education/visitor centre Research and training	Option 3 includes the full scope of species work included in the study. The key difference between option 2 and option 3 is the lobster hatchery, and with this, the visitor / education facility. The rationale for lobster only stacks up if the cost of running the hatchery is offset by other activities, and the success in breeding is below the 40cent per lobster mark. The visitor facility could also operate without the lobster hatchery, but the hatchery would add considerably to the attraction of the facility.

Option 4	Rationale
Do nothing	Evaluating the value of establishing a Seafood Enhancement Centre should also look at the impacts/benefits of doing nothing. While it is difficult to put a cost on this, it does include taking into account the human resource burden, the financial requirements, and the risk of a lack of success, weighted against the ongoing decline of fishery incomes, further loss/risk of species decline, and lack of adding value to incomes and the future of the seafood industry in the area.

11.1 Costing the Options

It is very difficult to put accurate figures on the running costs of the various options, as this would require more in-depth business planning, engineering input, decisions on scale by species and up to date market information.

The following figures have been identified from various reports and input from those engaged in the industry.

As the costs are broadly indicative at this stage, they are information, rather than decisive in the options weighting process.

Operating Costs Per Annum	Scallop	Gigas oyster	Native oyster	lobster	kelp	Visitor Centre	Crab holding lobster storag	Pilot 'TURF' management
Hatchery							pay per use	
Collecting brood stock/seed costs	2000	€13,000 (million)	€15,000 (million)	2000	500			0
feed	3600	1000	1000	1000	0			0
staff costs	3000	3000	3000	3000	0			0
running costs	2000	2000	3000	4000	0			0
Nursery								0
Feed	18,000	14000	4000	3000	1200			0
Staff costs	9,000	9000	12000	6000	9000	30000		0
running costs (water/power/	6,000	6000	8000	12000	13000	8000		0
Training/upskilling	0	0						0
Training and skills development	0		2000	2000	600	2000		0
Research								0
eg. genetics and success of reinstatement	6000							25000
adding value					8000			0
SUB TOTAL	**49600**	**35000**	**33000**	**33000**	**32300**	**40000**	**0**	**25000**
INCOME								
sales	200k@2mm €60000	900k@4mm €50,000	500k@4mm €500000	30000*	15000**	40000	0	0
SUB TOTAL	**60000**	**50000**	**50000**	**30000**	15000	40000		0
BALANCE	**10400**	**15000**	**17000**	**-3000**	**-17300**	**0**	**0**	**-25000**
Brood stock / enhancement of biomass - 5 year costs								
5 years brood stock setting	63000	0	63000	40000	0			
Reef development	0	0	18000	0	0			
Total	63000		81000	40000				

Annual shortfall (not including income profits*) and including one fifth of five year brood stock investment** **€ 82,100**

Notes to above

*from year 5 catch locally, and sales in previous years

** at €1000 per kg and 15 tonnes harvest

*** Income profits are not included, as these are likely to be part of private sector operations. The shortfall reflects the r&d and fishery reinstatement work.

11.2 Weighting the Options

	Option 1	Weight Out of 10	Option 2	Weight Out of 10	Option 3	weight Out of 10	Option 4	Weight Out of 10
Short term financial benefit to industry	Little change from current practice for scallop/gigas Returns to crab and lobster industry main benefit	5	Main benefits from lobster and crab storage. New entrance opportunity for native oyster.	6	Main benefits from lobster and crab storage. New entrance opportunity for native oyster.	6	Little change from current practice for scallop/gigas	4
Long term financial benefit to industry	Kelp production has potential, Otherwise little impact	5	Enhanced scallop, gigas and oyster industry	7	Enhanced scallop, gigas, oyster and lobster industry	8	No long term impact, potential long tern decline - loss	0
Policy fishery management potential	None	0	Possible model for fishery renewal and species regeneration	6	Possible model for fishery renewal and species regeneration including lobster	7	No fishery management contribution	0
Environmental benefits/impact	Current practice continues	5	Requires bay management, and consequently, protection with reef development enhancing benthic habitat	7	Requires bay management, and consequently, protection with reef development enhancing benthic habitat. Increased lobster biomass	8	Increased risk to species biomass and future of scallop	0
Community benefit	Just Status quo	3	Opportunity to build tourism seafood link, build brand.	5	Visitor centre provides major addition to tourism infrastructure, plus opportunity to build tourism seafood link, build brand.	8	No community benefit other than current situation	2
Cost and viability	No cost, viability good	7	Net loss around 60k per annum 5 years	6	Net loss around 80k per annum	4	No cost	10
Total		**25**		**37**		**41**		**16**

Conclusion

If it is possible to secure facilities, and infrastructure grant, and ongoing operating support for 5 years, option 3 brings the greatest value.
If operating support is not available, then Option 1 is the most viable.

Appendix 1

Agency personnel consulted in the preparation of this study. Please note that this was in addition to consultation with local fishermen, community and seafood representatives.

Person	Organisation
Oliver Tully	Marine Institute
Charles Sweeny	Donegal CoCo
Terence O'Carroll, Trish Daly, Lucy Watson	BIM – aquaculture
Donal Buckley	BIM marketing
Michael Keating	BIM policy
John Hickey	BIM (lobster)
Gerty Taggart	LYIT Science
John Doran	LYIT – renewables
John Andy Bonner	LYIT Tourism and marketing
Tom Fury	Marine Institute
Myles Gallagher	Moving Mevagh Forward
Thorwold Magnessun	University of Bergen and Managing Director Scalpro
Owen Doyle	BIM
Greg Ford	Inland Fisheries Ireland
Dana Morse	Maine Seagrant

References

AFBI Dredge Fisheries in Northern Ireland 2013

Burton CA and Adamson K, A Preliminary Study of the Costs of Operating a Lobster Hatchery in Orkney and the Development of an Economic Model for Future Hatchery Programmes. Orkney Seafish Assoc 1996

Duffill Telsnig J, Feasibility of aquaponics and a Lobster Hatchery in Amble. Produced for the Amble Development Trust 2012

Grafton R, Hilborn R and Squires D Handbook of Marine Fisheries Conservation and Management

Hat D and Chite A Essential Fish Habitat Source Document: Sea Scallop, Placopecten magellanicus

Laing I, Walker P and Areal F. A feasibility study of native oyster (Ostrea edulis) stock regeneration in the United Kingdom

Lalliasa D; Boudryc P; Lapegued S; King JW Strategies for the retention of high genetic variability in European flatoyster (Ostrea edulis) restoration programmes,

Maguire J and Burnell G The Potential for Scallop Spat Collection in Bantry Bay, Ireland 1999 the Royal Irish Academy

Marothia, D K Institutional Management of Common Resources- 2002 - Commons

Tully O and Clarke S The Status and Management of Oyster (Ostrea edulis) in Ireland, Marine Institute 2012

National Marine Fisheries Service; Life History and Habitat Characteristics., 2004

Woolmer A Syvreti M Native Oyster, Ostrea Edulis – Subtidal Cultivation Handbook For: The Mumbles Oyster Company Ltd.

Woolmer A P., Syvret M & FitzGerald A; Restoration of Native Oyster, Ostrea edulis, in South Wales: Options and Approaches CCW Contract Science Report No. 960

Web based sources

www.abblox.com Jersey Sea Farms A financially positive 'ecosystem services' solution to remove excess nutrient inputs into St.Aubins Bay and beyond, by the sustainable expansion of existing aquaculture operations.
http://www.seafish.org/media/Publications/SCALLOP_HYPERBOOK_SHOW_print_comp.pdf
http://settleproject.com/about/expectedoutcomes

Mevagh FRC Administrator

From: Northwest Shellfish <northwestshellfish@eircom.net>
Sent: 27 November 2018 13:06
To: Mevagh FRC Administrator
Subject: Fw: Mulroy Bay T12/203E
Attachments: amendments Fanad to Horn Head Fishery Enhancement and.docx

Print please.

Regards

Jerry
North West Shellfish
T: +

From: Northwest Shellfish
Sent: Monday, September 3, 2018 7:49 PM
To: Maher, EileenM
Cc: Kelleher, Sheila ; northwestshellfish@eircom.net
Subject: Re: Mulroy Bay T12/203E

Hi Eileen.
I have an architect working on the access routes and the drawings for site T12/203E and will have all that with you asap.
On the matter of only having scallop on that site we disagree with that approach and the reasons given.
First of all our licenced sites are all part of an overall plan and the reasons for the numerous species is to give us scope to diversify in times of scarcity of scallop spat or other species.
This is one of only two sites which are intended for multiple use and are necessary to maintain a workforce and continuity in the supply of shellfish seed and seaweed.
Our long-term plan is to build a hatchery (see attached feasibility study report) and for that to be viable we need to be able to nurse all the species produced on longlines in our sites.
To have numerous species on one site will not increase the level of production on that site because we have outlined exactly how we intend operating our sites and the amount of structures to be used.
We feel it will spoil a good well thought out business plan if we start making unnecessary changes which will have no bearing on what is proposed for the site.
Everything we have planned for in this operation is at a manageable level and our aim is to keep it that way, with >25 years operating in the bay we know what that means.
We are happy to come to Clonakilty and discuss our plans with anyone who has an interest.

Regards

Jerry
North West Shellfish
T: +

From: Maher, EileenM
Sent: Wednesday, August 29, 2018 10:15 AM
To: mailto:northwestshellfish@eircom.net
Cc: Kelleher, Sheila
Subject: Mulroy Bay T12/203E

Hi Jerry,

As discussed in our phone call please see below recommendation from Marine Engineering Division in relation to T12/203E

"If site T12/203E were to be developed in full with 10 longlines and heavy utilisation there would be substantial scale visual impact from certain public views

- Both in stand alone and cumulative impact terms. If however development is pitched at a lower level of intensity, mitigation of visual impact is possible – this achieved by limiting the amount and type of structures permitted on site 203E – broadly in line with past low level usage of scallop nursery sites:
- Submerged longlines only are to be used – no surface lines permitted
- Longline spacing : minimum 80m apart
- Maximum of 5 no 400m longlines permitted on site 203E
- Scallop culture only to be permitted on site 203E (to keep development intensity at a manageable level)
- Surface flotation units no larger than A3 buoys permitted
- Float spacing along longline to be no less than 20m apart
- Float colour battleship grey only"

Can you please forward us a layout for site T12/203E in line with the above recommendations by Marine Engineering Division along with the access routes and seed source requested in my previous email on Monday 27/08/2018.

Kind Regards,

Eileen Maher
Aquaculture and Foreshore Management Division

—
An Roinn Talamhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine

Rannán Riaracháin an Iascaigh Mhara, An Cloichín, Cloch na Coillte, Co. Chorcaí. P85 TX47.
National Seafood Centre, Clogheen, Clonakilty, Cork, P85 TX47.

—
T +353 (0)23 885 9505
www.agriculture.gov.ie

Mevagh FRC Administrator

From: Northwest Shellfish <northwestshellfish@eircom.net>
Sent: 27 November 2018 13:04
To: Mevagh FRC Administrator
Subject: Fw: buoyancy

Print please.

Regards

Jerry
North West Shellfish
T: +

From: OSullivan, Paul
Sent: Tuesday, September 4, 2018 6:04 PM
To: 'Northwest Shellfish'
Cc: Maher, EileenM
Subject: RE: buoyancy

Jerry
We will look at your proposal when forwarded. You need to be careful that the revised proposed structures for 203E does not depart significantly from what was advertised for the site. Otherwise Department may consider that readvertising may be necessary
Regards
Paul O'Sullivan

From: Northwest Shellfish [mailto:northwestshellfish@eircom.net]
Sent: 04 September 2018 13:35
To: OSullivan, Paul
Cc: northwestshellfish@eircom.net
Subject: buoyancy

Hi Paul.

To add to our conversation of yesterday, i wish to make the following observations and requests.
We will just include 2000 metres of longline in site 203E however we will drop the headline down to 5m and buoy it at that level as is done with all submerged longlines.
That means that the surface flotation you have requested will only act as markers and an indicator of when the line needs more buoyancy.
This method is common practice in many countries and i have seen it in operation in open waters where it brings the headline and structures below the surface wave and heavy swell.
In our case it will allow us to farm this site as was intended in our plan with all the species mentioned while fitting with the principles of the county development plan.
All this is being drafted by my architect and will be with you asap, let me know if this meets with your approval.

Regards

Jerry

North West Shellfish
T: -
Disclaimer:

Department of Agriculture, Food and the Marine

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An Roinn Talmhaíochta, Bia agus Mara

Tá an t-eolais san ríomhphost seo, agus in aon ceangláin leis, faoi phribhléid agus faoi rún agus le h-aghaigh an seolaí amháin. D'fhéadfadh ábhar an seoladh seo bheith faoi phribhléid profisiúnta nó dlíthiúil. Mura tusa an seolaí a bhí beartaithe leis an ríomhphost seo a fháil, tá cosc air, nó aon chuid de, a úsáid, a chóipeál, nó a scaoileadh. Má tháinig sé chugat de bharr dearmad, téigh i dteagmháil leis an seoltóir agus scrios an t-ábhar ó do ríomhaire le do thoil.

Mevagh FRC Administrator

From: Northwest Shellfish <northwestshellfish@eircom.net>
Sent: 27 November 2018 13:05
To: Mevagh FRC Administrator
Subject: Fw: licences

Print please.

Regards

Jerry
North West Shellfish
T: -

From: OSullivan, Paul
Sent: Tuesday, September 4, 2018 5:59 PM
To: 'Northwest Shellfish'
Cc: Maher, EileenM
Subject: RE: licences

Jerry
I have looked back through my report assessments on 203E and 203K. Site 203 E is visible in high sensitivity designated views . The LVIA work was done. It remains my recommendation that 203E should be restricted to scallop culture and there should not be a change to past licensed activity on the site. I think in a future scenario where if the Minister did decide that aquaculture on 203E be restricted to scallops only and 203K be licensed for multiple species you will still have about 4800m of licensed longline length on 203K (out of a possible 6800 between the two site) available to you for multi species culture – so more than 2/3rds of that looked for (by likely permitted longline length) with site 203K alone?
I did recommend in my report on 203K that it not be licensed for mussel culture in line with mussel restriction limit line that went from Pan Rock across to Ballymagowan Bridge. I don't know what decision may be taken on that recommendation and I don't advise you remove thm from your application.
In event that mussels were not permitted on 203K and retention of mussels at some site is vital to your plans it might be possible to allow add on of that one species (mussels) to some other site south of the restriction line – but am not sure whether that would be doable at this point. You could explore possibility with AFMD.
Regards
Paul O'Sullivan

From: Northwest Shellfish [mailto:northwestshellfish@eircom.net]
Sent: 03 September 2018 17:23
To: OSullivan, Paul
Cc: northwestshellfish@eircom.net
Subject: licences

Hi Paul.
Further to todays phone conversation i wish to confirm some items discussed.
I have no problem with changing the outlay of lines and flotation in site 203E to correspond with your instructions.
I do however feel that changing the use of the site on our application to single species only, (scallop) is going to be very restrictive on our overall plan which includes a hatchery as it will limit our ability to nurse seed from a hatchery and possibly make that project less attractive to investors.

To operate a hatchery successfully there needs to be a facility to produce numerous species and then nurse them in suspended culture in sea conditions.
Mulroy bay as you know, is ideal for this purpose, being deep and sheltered.
The level of production on that or any other site will not escalate even if it will be licenced for several species because the flotation and amount of structures is outlined on each application and irrespective of whether it is scallops or any other shellfish species that are in the culture system the same level of product and management will be in place, the same applies to seaweeds.
You mentioned that you would prefer if mussels were not included in site 203K so therefor if you request that i will remove them from that application.
We have put a lot of thought and research into this overall proposal/ plan and to chop pieces from it now would not be the best way to proceed, therefor if we can put an agreed proposal to the minister it would be best.
Regards

Jerry
North West Shellfish

Mevagh FRC Administrator

From: Northwest Shellfish <northwestshellfish@eircom.net>
Sent: 27 November 2018 12:58
To: Mevagh FRC Administrator
Subject: Fw:
Attachments: Page0001.pdf

Print please.

Regards

Jerry
North West Shellfish
T:

From: Northwest Shellfish
Sent: Wednesday, September 19, 2018 7:45 AM
To: EileenM Maher
Cc: northwestshellfish@eircom.net ; Gerry Foley
Subject: Fw:

Hi Eileen.
New drawings for site 203E, see you at ten.

Regards

Jerry
North West Shellfish
T:

From: francis mc hugh
Sent: Tuesday, September 18, 2018 12:16 PM
To: Jerry Gallagher

Jerry

Attached is the revised section with buoys added as discussed.

Regards

Francie

--
Mc Hugh Planning and Design,
Aughalatty, Carrigart, Letterkenny, Co. Donegal.
Tel: 074 9155774

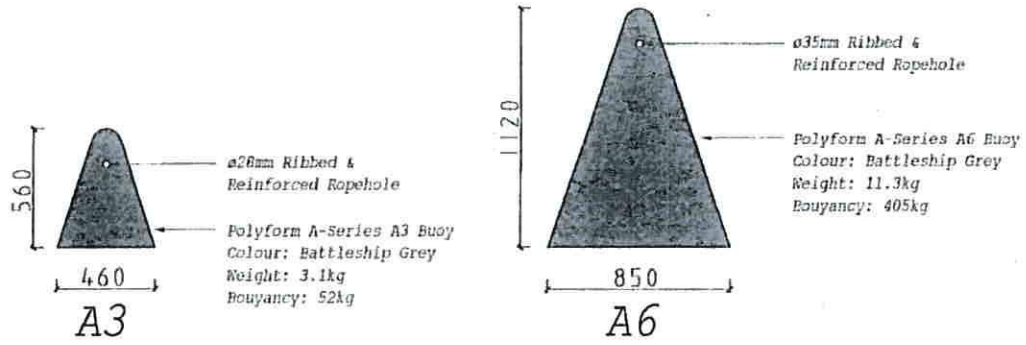
APPLICANT: NORTH WEST SHELL FISH LTD

SITE: T12/203E

LICENCE AREA = 22.0 Hectares

All Dimensions Are In Metres

Scale 1/500

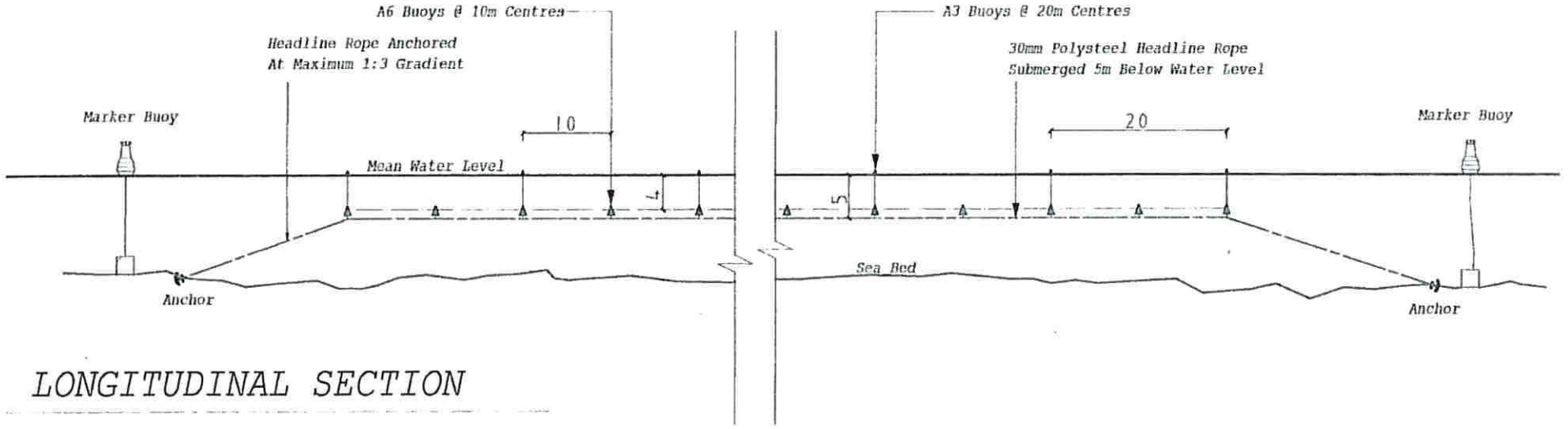


BUOY DETAIL

Dimensions In Millimetres

Scale 1/25

5no. Longlines To Be Spaced
At 80m Intervals Within Site



LONGITUDINAL SECTION

Annex 8

Comhairle Contae
Dhún na nGall
Donegal County Council

www.ccdhunnangall.ie www.donegalcoco.ie

31/05/2018

Ms Eileen Maher
Aquaculture and Foreshore Management Division
National Seafood Centre
Clonakilty
Co. Cork

Re: Applications for Aquaculture Licences in Mulroy Bay

Dear Eileen

I attach hereto Planners report with regard to the Aquaculture Licence applications that were submitted to this office on the 23rd April 2018 for consultation. As you will see from same there is no objection to the renewal of the existing licences, however the planning authority has grave concerns regarding the significant intensification of the proposed new licence applications.

Yours sincerely

A Melley

Anne Melley
Administrative Officer
Planning

Agriculture & Foreshore Management Division
01 JUN 2018
Dept. of Agriculture, Food & the Marine

Cuir freagra chuig: Áras an Chontae, Leifear, Contae Dhún na nGall, Éire F93 Y622
Please reply to: County House, Lifford, Co. Donegal, Ireland F93 Y622

Guthán/Tel: 074 9153900 Facs/Fax: 074 9172812 I Ríomhphost/Email: info@donegalcoco.ie