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DAERA AWP

Aquaculture

Adele Boyd and Heather Moore

April 2021

afbini.gov.uk

44991: Seed mussel stock assessment surveys

The bottom cultivation of the blue mussel *Mytilus edulis* within Northern Ireland and Ireland is currently reliant on natural settlements of wild seed mussel beds.

AFBI undertake routine stock assessment surveys on behalf of the DAERA to identify and then quantify seed mussel beds within the Irish Sea. These beds are then dredged and the seed mussels relaid onto licensed aquaculture plots for ongrowing to marketable size.

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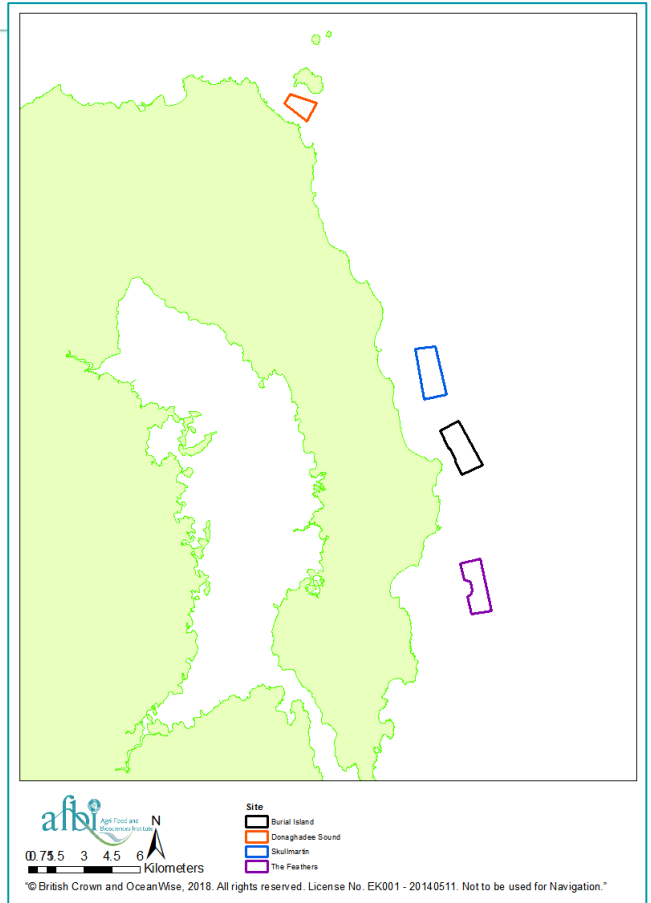

44991: Seed mussel stock assessment surveys

The current seed mussel stock assessment methodology has **two stages**. The first stage uses **acoustic RoxAnn surveys** followed by **targeted dredge tows**. Both of these surveys were undertaken utilising the DAERA FPV the Queen of Ulster.

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44991: Seed mussel stock assessment surveys

If there are any significant amounts of juvenile *Mytilus edulis* present, a second **towed camera stage** is undertaken to build on the initial ground truthing and provide a total area required for accurate stock assessment calculations using Optimal Allocation Analysis (OAA) (Strong and Service, 2011).

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Strong, J.A. and Service, M. (2011) Using Optimum Allocation Analysis to Improve Seed Mussel Stock Assessments. *Journal of Shellfish Research* 30 (1): 1-6.

44991: Seed mussel stock assessment surveys

Summer 2020 Surveys

- Four survey areas
- Craigbrain – no seed mussel found
- Skullmartin
  - Patchy seed bed found
  - Opening to fishing not recommended
- Burial Island
  - Seed mussel bed found
  - < 400 Tonnes
  - Seed bed <80m from *Modiolus*
- The Feathers
  - Fishable seed mussel bed found
  - Seed small <20mm
  - Tonnage estimated at approximately 800 Tonnes

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42098: Habitats Regulations Assessment

- European Council Directive 92/43/EEC (**Habitats Directive**) and European Council Directive 2009/147/EC (**Birds Directives**) were developed with the aims of **protecting habitats and species** considered to be of European interest.

- Member states designate sites as Special Areas of Conservation (**SAC**) for the protection of **habitats and species** and Special Protection Areas (**SPA**) for the protection of **wild birds.**

- Under The Environment (Northern Ireland) Order 2002 sites are designated as Areas of Special Scientific Interest (**ASSI**) for the protection of **flora, fauna, or geological, physiographical or other features**.

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42098: Habitats Regulations Assessment

- Work is ongoing on the development of a Habitat Regulations Assessment for proposed amendments to a Freshwater finfish farm near Cookstown.
- A site visit has been undertaken and a meeting held with the applicant.
- A draft document has been drawn up and it hoped to be completed by the end of April 2021.
- Work is ongoing on the development of Habitat Regulations Assessments for two new shellfish aquaculture sites within the Mill Bay are of Carlingford Lough.
    - Reports have been sent to DAERA for review
    - work undertaken on the review of the indicative Chlorophyll a standard recommended within these reports.

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42098: Habitats Regulations Assessment

- ICES working group for Environmental Interactions of Aquaculture.
  - The group had its 3rd annual meeting virtually via Webex from the 5th to the 7th of May 2020.
  - Lead the Shellfish subgroup and coordinated the production of chapter 4 Environmental impacts and recommendations for prioritized research – bivalve aquaculture, of the final report (http://ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/ASG/2020/WGEIA%20Report%202020.pdf).

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42098: Decision Support Tools

INTERREG VA funded SWELL project

Swell
SHARED WATERS ENHANCEMENT & LOUGHS LEGACY

Interreg
EUROPEAN UNION
Northern Ireland - Ireland - Scotland
European Regional Development Fund

MATCH FUNDERS

Department of Agriculture, Environment and Rural Affairs
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Department for Infrastructure
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An Roinn Tithíochta, Pleanála, Pobail agus Rialtais Áitiúil
Department of Housing, Planning, Community and Local Government

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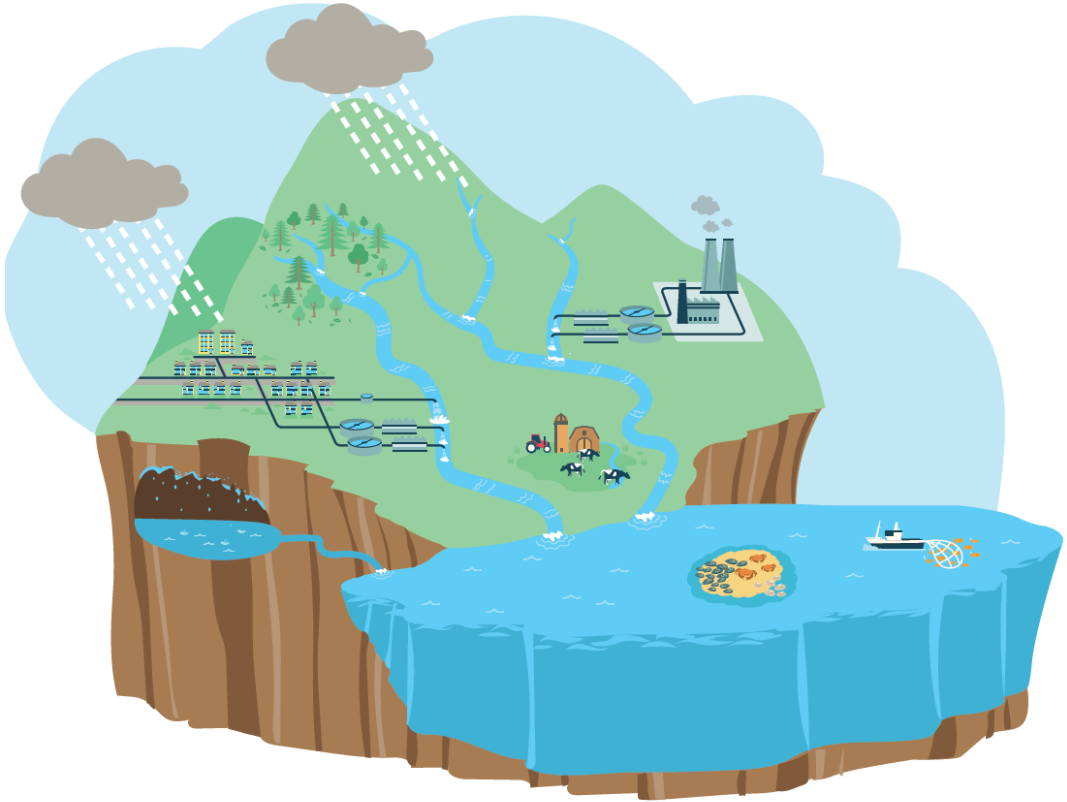
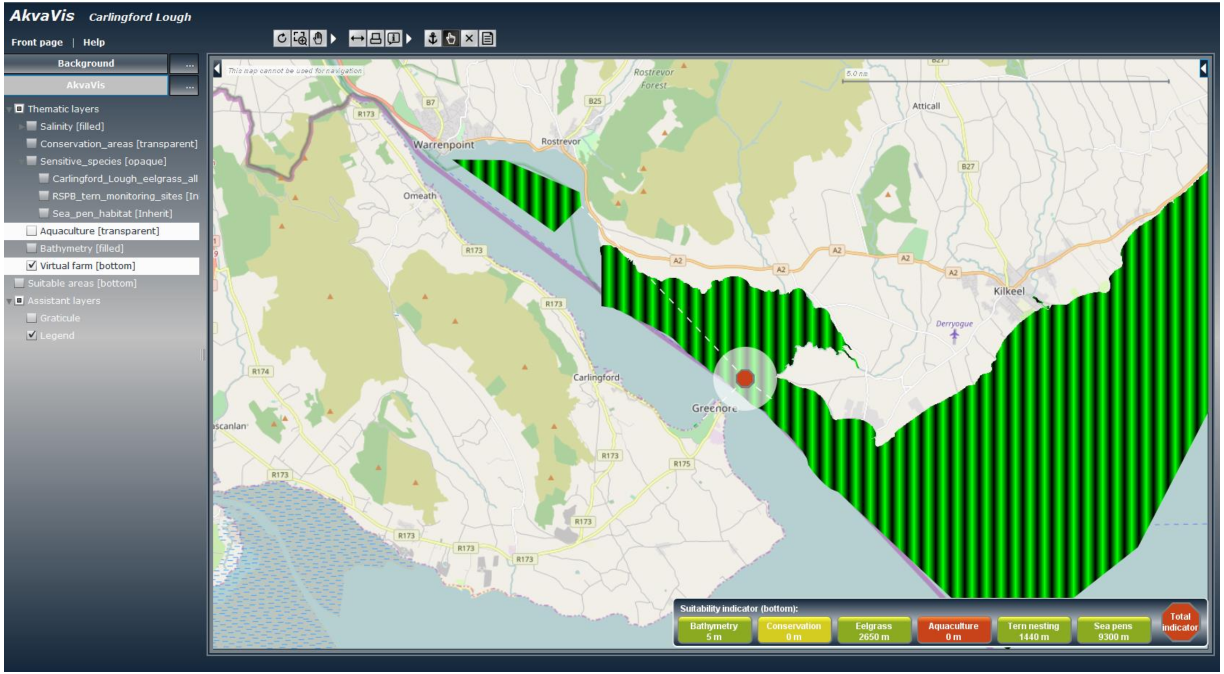
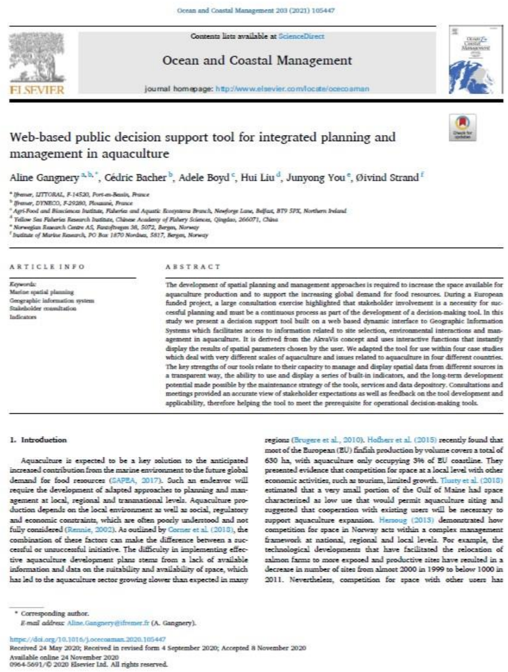


42098: Decision Support Tools





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Web-based public decision support tool for integrated planning and management in aquaculture

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ARTICLE INFO

Keywords:
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Stakeholder consultation
Indicators

ABSTRACT

The development of spatial planning and management approaches is required to increase the space available for aquaculture production and to support the increasing global demand for food resources. During a European funded project, a large consultation exercise highlighted that stakeholder involvement is a necessity for successful planning and must be a continuous process as part of the development of a decision-making tool. In this study we present a decision support tool built on a web based dynamic interface to Geographic Information Systems which facilitates access to information related to site selection, environmental interactions and management in aquaculture. It is derived from the AkvaVis concept and uses interactive functions that instantly display the results of spatial parameters chosen by the user. We adapted the tool for use within four case studies which deal with very different scales of aquaculture and issues related to aquaculture in four different countries. The key strengths of our tools relate to their capacity to manage and display spatial data from different sources in a transparent way, the ability to use and display a series of built-in indicators, and the long-term development potential made possible by the maintenance strategy of the tools, services and data depository. Consultations and meetings provided an accurate view of stakeholder expectations as well as feedback on the tool development and applicability, therefore helping the tool to meet the prerequisite for operational decision-making tools.

1. Introduction

Aquaculture is expected to be a key solution to the anticipated increased contribution from the marine environment to the future global demand for food resources (SAPEA, 2017). Such an endeavor will require the development of adapted approaches to planning and management at local, regional and transnational levels. Aquaculture production depends on the local environment as well as social, regulatory and economic constraints, which are often poorly understood and not fully considered (Rennie, 2002). As outlined by Corner et al. (2018), the combination of these factors can make the difference between a successful or unsuccessful initiative. The difficulty in implementing effective aquaculture development plans stems from a lack of available information and data on the suitability and availability of space, which has led to the aquaculture sector growing slower than expected in many regions (Brugere et al., 2010). Hofherr et al. (2015) recently found that most of the European (EU) finfish production by volume covers a total of 630 ha, with aquaculture only occupying 3% of EU coastline. They presented evidence that competition for space at a local level with other economic activities, such as tourism, limited growth. Tlusty et al. (2018) estimated that a very small portion of the Gulf of Maine had space characterized as low use that would permit aquaculture siting and suggested that cooperation with existing users will be necessary to support aquaculture expansion. Hersoug (2015) demonstrated how competition for space in Norway acts within a complex management framework at national, regional and local levels. For example, the technological developments that have facilitated the relocation of salmon farms to more exposed and productive sites have resulted in a decrease in number of sites from almost 2000 in 1999 to below 1000 in 2011. Nevertheless, competition for space with other users has

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42098: Carlingford Aquaculture Review

- AFBI are currently involved in the EASME/EMFF funded, Supporting Implementation of Maritime Spatial Planning in the Atlantic region (SIMAtlantic) project.
- AFBI are leading a Case study on the Management of marine activities in a transboundary ecosystem, using Carlingford Lough as our example.
- This work will culminate in a practical guidance document to assist both regulators, developers and those working in the coastal region.
- This work is being undertaken in conjunction with UCC, DAERA and DHPLG.

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42098: Aquaculture site monitoring

- Currently monitoring 3 sites within Carlingford Lough (C15, C16 and C17). Sediment samples are collected for Particle Size Analysis (PSA) at 10 locations across these three licensed aquaculture sites within the Mill Bay area of Carlingford Lough.

- Currently monitoring sediment samples for PSA at 10 locations within the licensed aquaculture site in Dundrum Bay and at 5 locations within one licensed aquaculture site in Larne Lough (L3).

- Where possible all sites are sampled monthly, however some of this year's sampling has been interrupted due to COVID-19 restrictions.

- Sediment samples are sent to a subcontractor for analysis. Documents are currently in draft for each sea Lough assessing the potential impacts of aquaculture activities on the sediment composition within the vicinity of the proposed activity.

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42098: Aquaculture Science Strategy

- A draft proposal has been written for a project to develop "**A Sustainable Development Strategy for Northern Irelands Aquaculture Industry**".
- This has been forwarded to the HOB for comment.
- Hope to review the possibility of taking this forward within the 2021/2022 financial year.

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Carrying capacity models

- AFBI Activity code: 42127
- Focus on Small Bays; Dundrum and Larne
- Dundrum Ecosystem Model complete
- Similar to the catchment model developed during the Enhanced SMILE for Lough Foyle Ecosystem (EASE), enhanced to couple drainage area models to the SWAT model.

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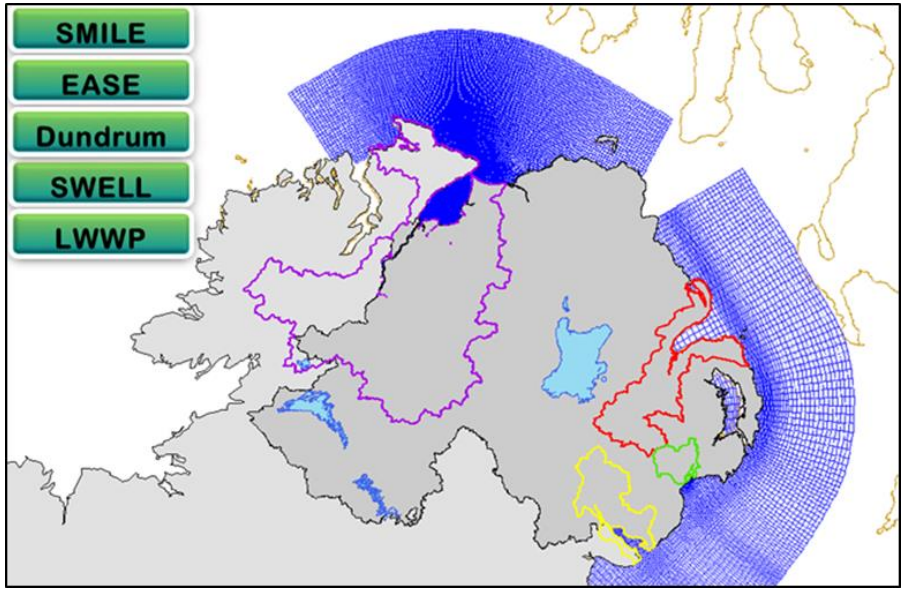
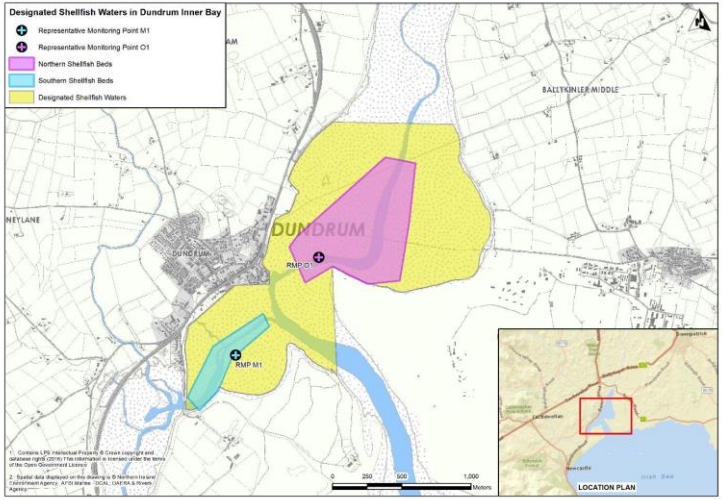
Integrated environmental monitoring modelling catchment loads to coastal systems



- Decline in WQ and shellfish classification
- To understand current sources /pathways Bacteria and nutrients



Integrated catchment management is required to properly manage resources

The multi-model cascade

Waste Water

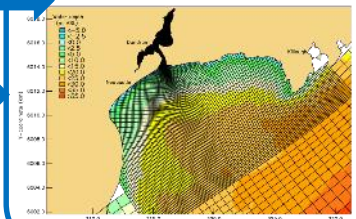
Point & diffuse

SWAT

Terrestrial eco-hydrology

Flow

Delft3D



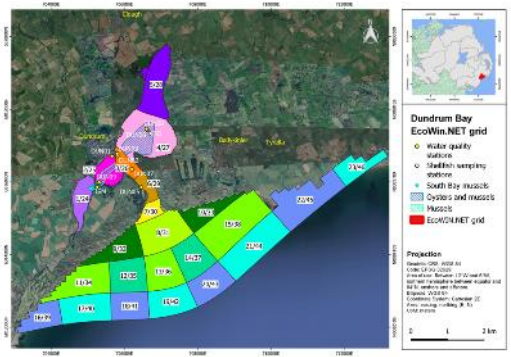
Coastal hydrodynamics

AquaShell

Individual growth

Individual & farm-scale popn

EcoWin



Coastal biogeochemistry

Nutrients: Dissolved Inorganic N and P
Sediments and Particulate Organic Matter

SUCCESS Framework: System for Understanding Carrying Capacity, Ecological, and Social Sustainability

Nutrient and substance balance
Primary production
Aquaculture yield

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Dundrum Ecosystem model - outputs

Bacteria

Table showing Relative contributions of individual sources to the total E. coli exports (sources contributing to less than 1% are not indicated).

Source	Name	Contribution to total E. coli exports
Urban	Annsborough Park WwTW CSO	28%
	Clough CSO	15%
	Annsborough WwTW FE	6%
	Septic tanks 7	3%
	Main Street Three CSO	1%
	Urban Total	**54%**
Diffuse	Subbasin 1	11%
	Subbasin 3	8%
	Subbasin 9	7%
	Subbasin 6	6%
	Subbasin 7	4%
	Subbasin 4	4%
	Subbasin 10	2%
	Subbasin 8	1%
	Subbasin 2	1%
	Subbasin 11	1%
	Diffuse Total	**46%**

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Dundrum Ecosystem model - outputs

Nutrients

Table showing Relative contributions of individual sources to total TON, NH4 and TP entering Dundrum Bay (sources contributing to less than 1% are not displayed).

Source	Name	Contribution to TON	Contribution to NH4	Contribution to TP
Urban	Annsborough WwTW FE	2%	5%	34%
	Clough FE	1%	1%	6%
	Dundrum WwTW	1%	9%	5%
	Maghera	0%	1%	2%
	Drumaroad	0%	0%	1%
	Clough CSO	0%	6%	1%
	Leitrim	0%	0%	1%
	LoughinIsland	0%	1%	1%
	Annsborough Park WwTW CSO	0%	6%	7%
	Mourneview Newcastle WwPS ERO	0%	1%	0%
	Septic tanks 7	0%	4%	1%
	Urban Total	**5%**	**39%**	**60%**
Diffuse	Subbasin 6	16%	17%	5%
	Subbasin 7	14%	8%	4%
	Subbasin 2	13%	4%	1%
	Subbasin 1	11%	11%	10%
	Subbasin 9	11%	3%	3%
	Subbasin 3	9%	9%	9%
	Subbasin 4	8%	2%	4%
	Subbasin 10	5%	3%	1%
	Subbasin 8	4%	1%	1%
	Subbasin 11	2%	1%	1%
	Diffuse Total	**95%**	**61%**	**40%**

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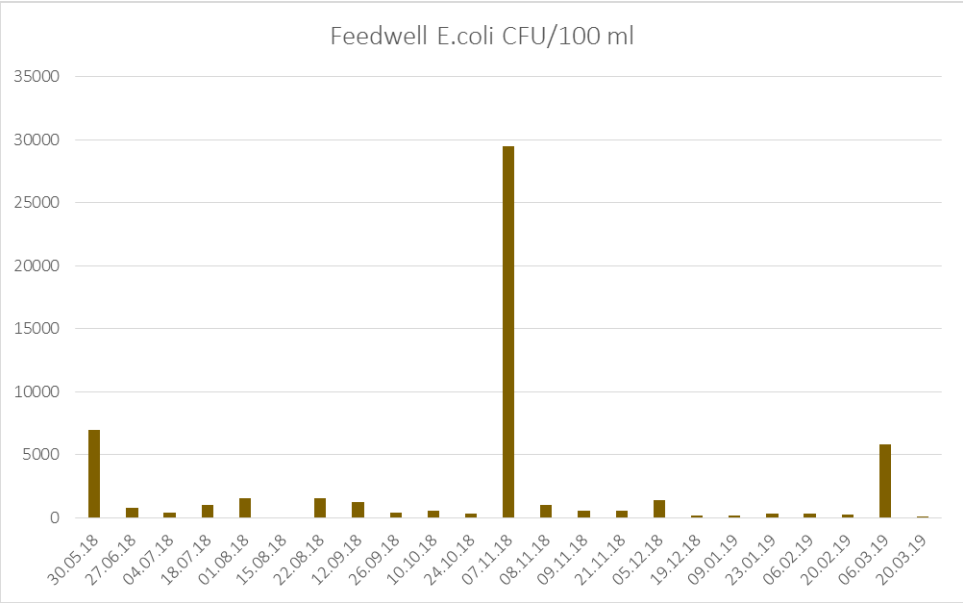
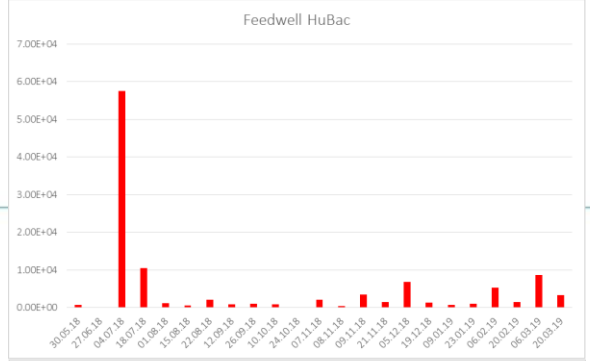
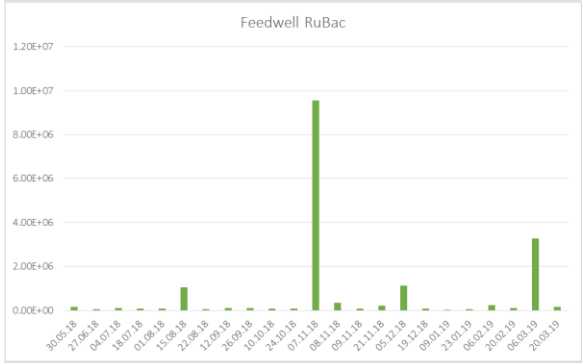
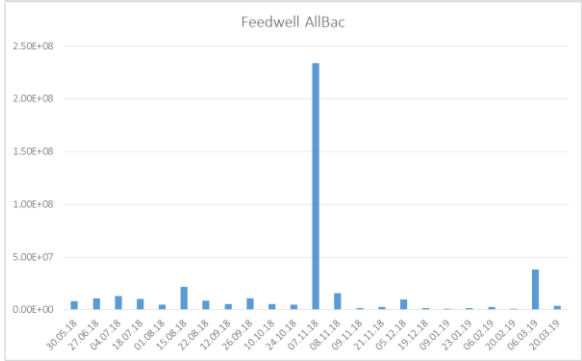
Feedwell, Carrigs River – *E.coli* CFU/100ml water plus

Hu Bac
RuBac
All Bac









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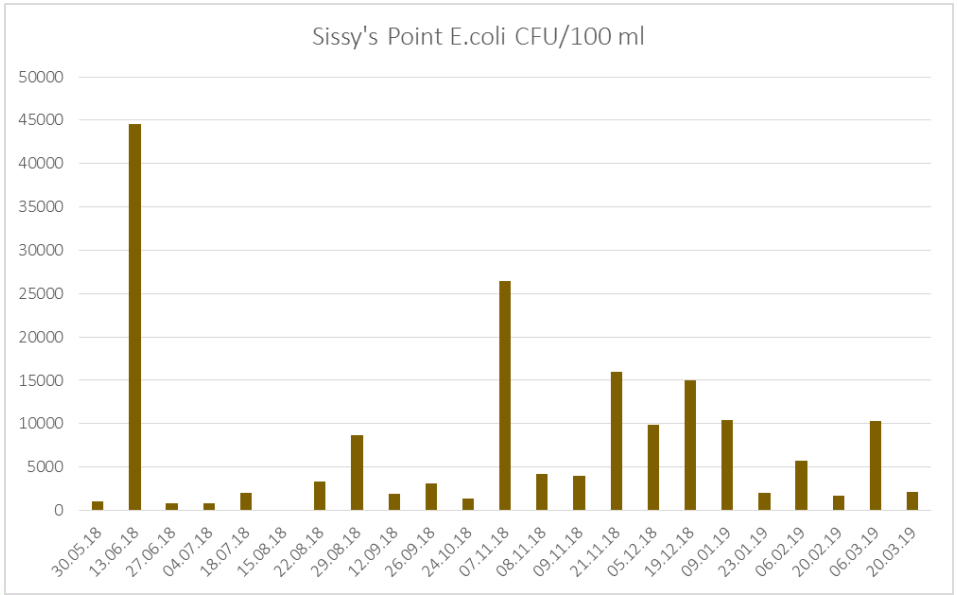
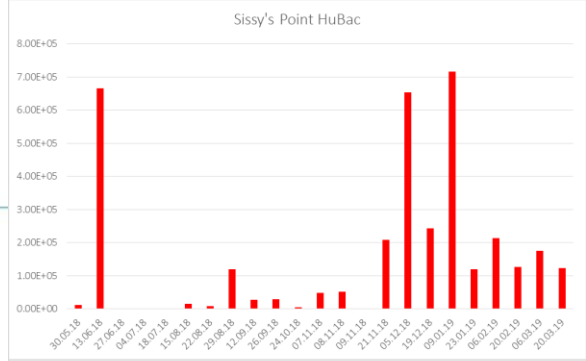
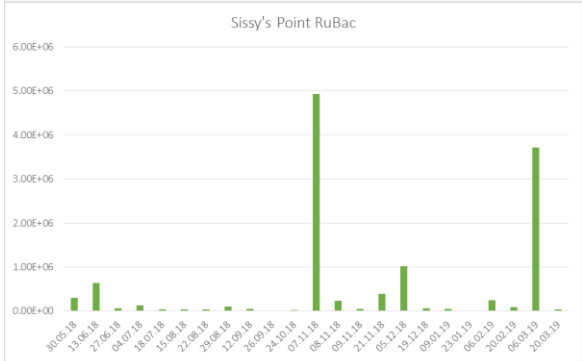
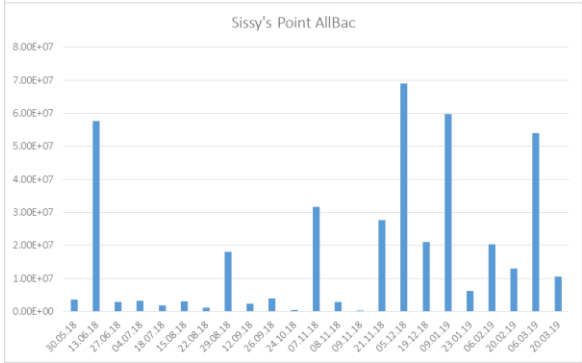
Sissy's Point,Carrigs River – *E.coli* CFU/100ml water plus

Hu Bac
RuBac
All Bac









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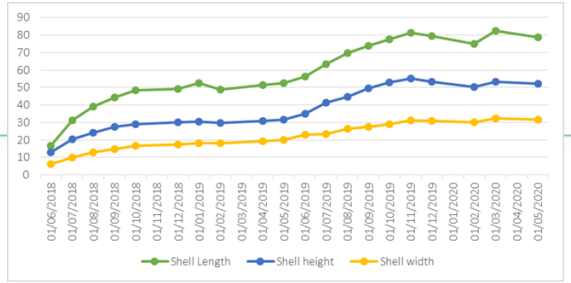
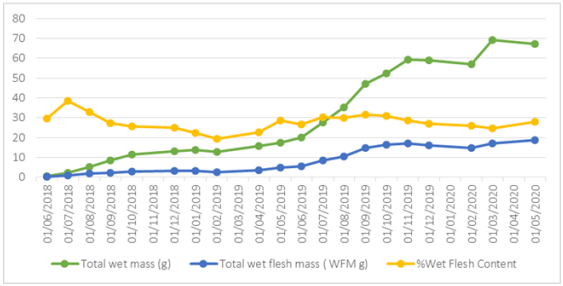
Larne shellfish growth trials





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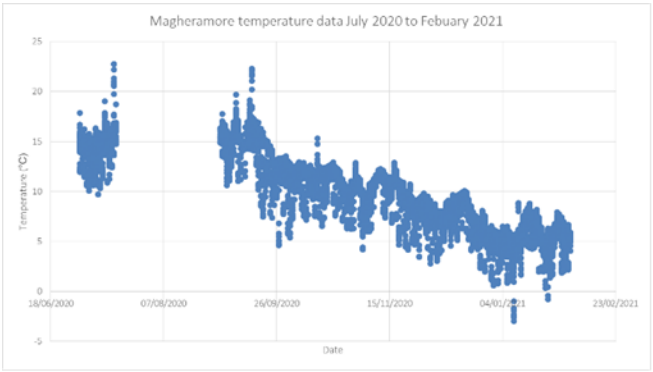
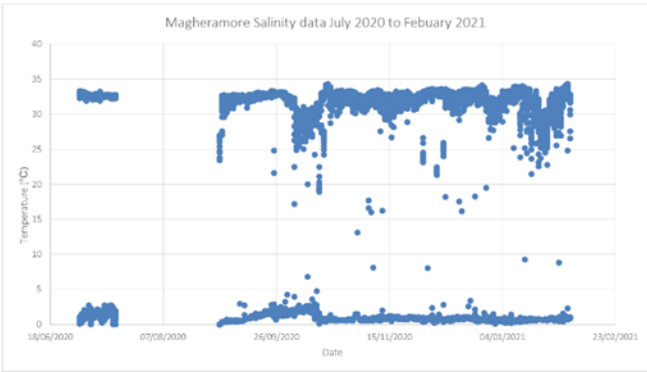
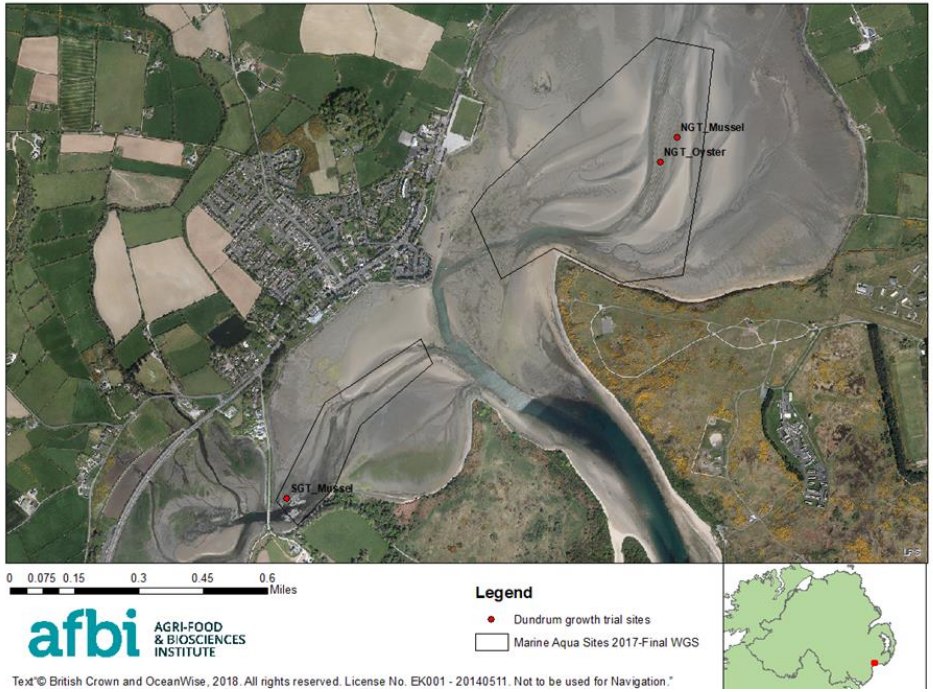


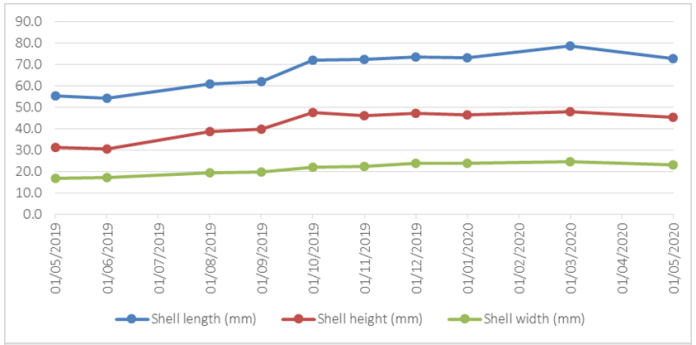


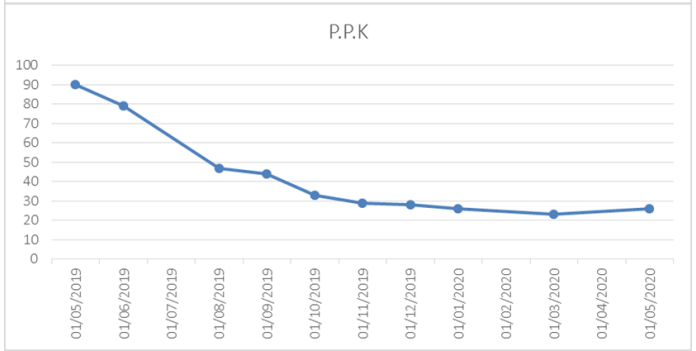
Dundrum shellfish growth trials plus – novel methods



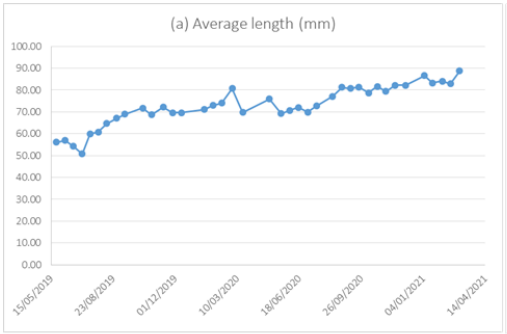
Dundrum shellfish growth trials plus – novel methods

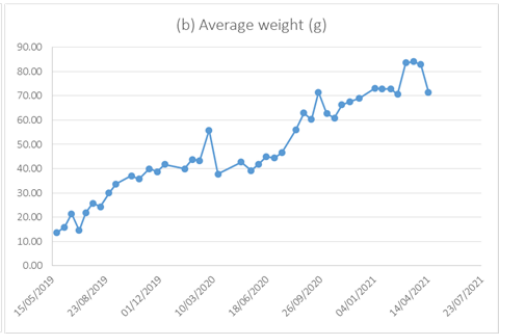
Destructive

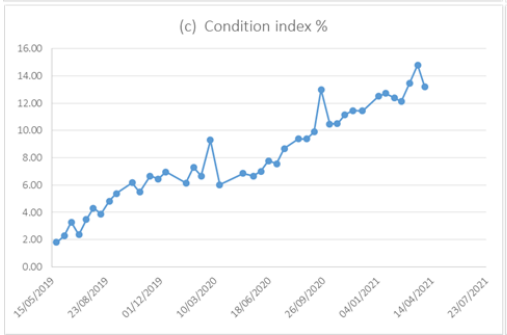


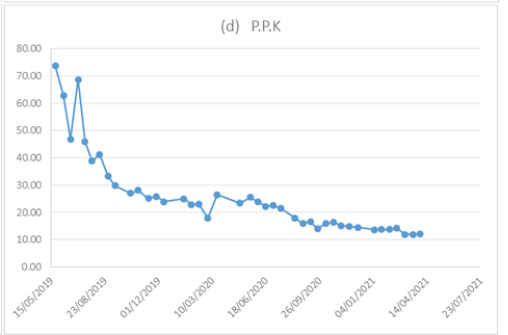


Non-destructive

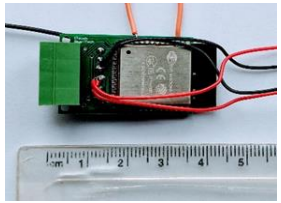








Dundrum – H2020 GAIN



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Shellfish management

- AFBI Activity code: 42098
- Factors affecting *E.coli* concentrations in mussels from Belfast Lough
- Investigating rainfall and tidal state

□ Class A – **80% of sample results ≤230 *E.coli*/100g, no results exceeding 700 *E.coli*/100g – molluscs can be harvested for direct human consumption.**
□ Class B - **90% of sample results must be less than or equal to 4600 *E. Coli*/100g with none exceeding 46000 E. Coli/100g - molluscs can go for human consumption after purification in an approved establishment or after relaying in a classified relaying area or after an EC approved heat treatment process.**
□ Class C - **≤46000 *E. Coli*/100g - molluscs can go for human consumption only after either:** • relaying for at least two months in a classified Class B relaying area followed by purification in an approved establishment, or after an EC approved heat treatment process, or • relaying for at least two months in a classified Class A relaying area, or • an EC approved heat treatment process
□ Prohibited areas[1] (>46000 E. Coli/100g) - **molluscs must not be subject to production or be harvested.**

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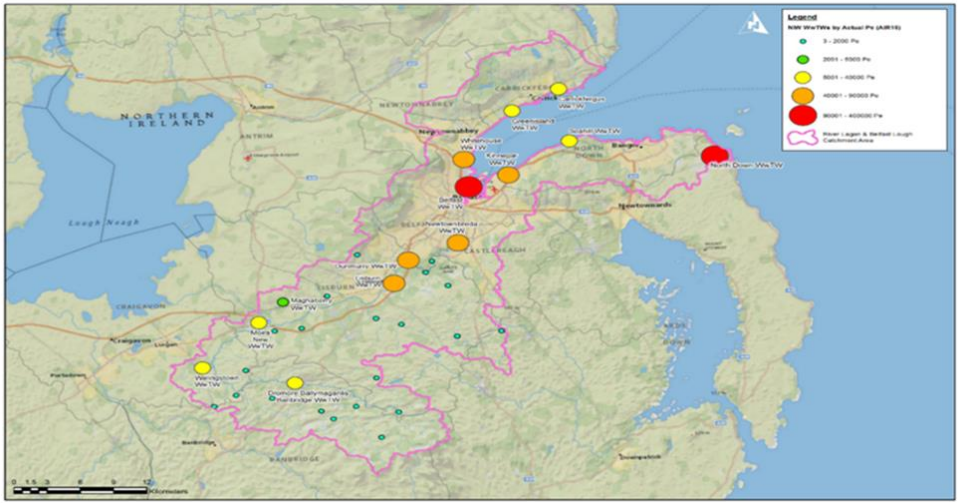
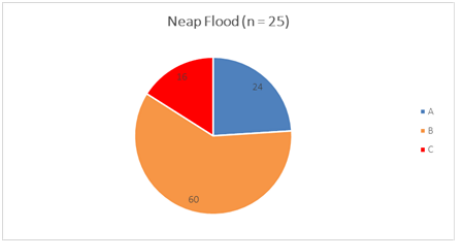
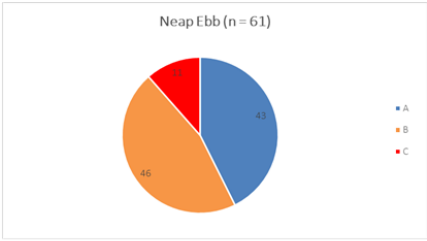
DASSHH

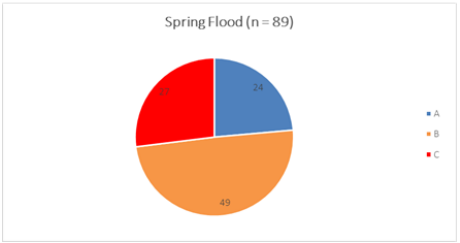
Developing an assurance scheme for shellfish and human health (DASSHH)

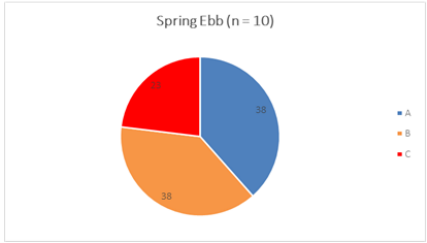


Pie charts showing the % of category A, B and C classification results of mussel flesh sampled on different states of the tide for B4 mussel samples (FBO's own samples).









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