

THE RISING TIDE

*A Review of the Bottom Grown (BG)
Mussel Sector on the Island of Ireland*



Chairman's Foreword and Acknowledgments

The process of compiling the 'Rising Tide' Review was deliberately designed to involve the widest possible consultation and I am pleased to say that the bulk of the recommendations, which the Review Group ultimately settled upon, came from the industry consultation sessions. Our approach was to accept that the industry practitioners were best placed to know what was required and to formulate our recommendations using their views as our guide. I would like to thank all of the people who shared their knowledge so generously and freely with us, and I am confident that they will be able to see their views reflected in the text of the final Review document.

Working within the Terms of Reference we were given, what we set out to achieve was to craft a series of recommendations that would address the shortcomings in the current arrangements through science based data and the introduction of best practice. Just as importantly, the recommendations are also designed to progressively hand over more and more management responsibility to the producers. The pace at which this will occur is up to the mussel farmers themselves. It will be determined by the ability of the growers to achieve day-to-day working consensus across a wide range of management issues. By learning to trust each other through working together, the producers will eventually come to control most of what happens in their own sector.

Over time and if fully implemented, the recommendations contained in the 'Rising Tide' Review will also protect the industry in terms of it being able to demonstrate strong environmental sustainability credentials. This is a crucial issue and a failure by the sector to take the necessary steps in this regard will undoubtedly lead to limitations and constraints being imposed from outside. If that were to happen, the true potential of the BG mussel industry on the island of Ireland will not be realised.

I would like to acknowledge the cooperation and hard work put into the Review by my colleagues on the Review Group: Mr Kenny Parker and Mr Greg Griffiths of DARD, Mr John Kelly, Ms Jill Dunlea and Ms Deirdre Kelleher of DAFF and Mr Barry Fox of the Loughs Agency. My thanks also to Ms Josephine Kelly of DAFF, Ms Averil Gaw of DARD and Mr Andrew Kineen of the SFFPA for their expert advice and input.

On behalf of the Review Group I would like to thank Ms Lucy Watson, Mr Nicolas Ranninger and Ms Grainne O'Brien, all of BIM, for preparing the marketing module and overseeing the environmental report respectively. Mr Ben Dallaghan, Mr Ciaran Caulfield, Ms Dee Moore and Mr Bill Hollywood also gave valuable assistance in the preparation of maps and statistics and in organising the logistics of the consultative meetings.

Finally I wish to acknowledge the sterling work done by Mr Mike Murphy and most especially by Ms Joanne Gaffney, both of the Aquaculture Initiative EEIG, in providing the secretariat function to the group and facilitating this complex tripartite undertaking.

Donal Maguire

Chairman of the Bottom Grown Mussel Review Group

Executive Summary

The BG mussel sector, on all parts of the island of Ireland, has undergone many changes over the last ten years. Overall it has been a successful period, characterised by strong market demand for the product and significant inflows of investment both from within the island and from international sources, most notably from the Netherlands. In many ways the sector has been the powerhouse of Irish aquaculture, forging ahead while other types of fish farming have struggled to make progress. It is now a valuable industry generating significant value from an indigenous resource that undoubtedly has scope for further positive development.

The picture however has not been uniformly positive. A rapid expansion in output has been experienced in some areas, whilst other, longer established locations, have struggled to cope with the introduction of mandatory vessel safety legislation. At the same time the EU has barred member states from granting financial assistance for fishing vessel purchase or renewal and this set of twin circumstances has driven ownership change amongst the established operators in the sector. Against this backdrop the other overriding characteristic of the period has been an intense and unprecedented competition amongst the producers for access to the wild seed mussel resource.

All of these changes have created pressures on the regulatory arrangements and on the infrastructure supporting the sector. These pressures, largely generated by the industry's own success in expanding its output and range, has led to demand from producers for a wide ranging review in clear recognition that reform of many aspects of the administration and regulation of the sector was urgently needed. The challenge for the BG mussel industry now is to effectively manage all of this change and success so as to permanently capture the progress that has been made and to ensure that the further potential of the sector is unlocked in a way that is economically, socially and environmentally sustainable.

This Review, carried out by a working group drawn from DARD, DAFF and the Loughs Agency, under a Terms of Reference set by the ministers in the two jurisdictions and supported by a Secretariat provided by the Aquaculture Initiative EEIG, sets out a series of analyses and recommendations to address the key deficiencies in the current arrangements. A guiding policy statement was used to underpin the Review and to form the basis for the subsequent recommendations.

The purpose of the regulation and management regime for the seed mussel resource shall be to ensure the sustainable exploitation of the wild mussel seed resource and to maximise the benefits derived from that resource in terms of volume and value of the mussel crop subsequently grown, harvested and processed with the objective of generating sustainable economic activity and employment in coastal communities.

Marketing

Effective marketing and market-led development has to be the cornerstone of any progressive industry. Evidence from the Food and Agriculture Organization (FAO) and other sources shows that the demand for seafood is increasing the world over, and this clear and growing demand represents an opportunity for the BG mussel sector on the island of Ireland. The projections reliably predict that there is significant opportunity for future growth in the seafood market both at home and abroad. Mussels are an almost ideal form of seafood in marketing terms as they encompass within their product range the key characteristics of health, indulgence and convenience.

From a marketing perspective, most of the output of BG mussels from the island of Ireland is exported in an undifferentiated bulk form and it is evident that there is scope to add significant value. Therefore, key objectives for the coming years should be to:

- Improve and diversify the product offering.
- Develop a distinct and 'valorised' identity for BG mussels from the island of Ireland.
- Improve supplier/buyer relations, thus securing the key relationships in the existing market.
- Take advantage of growing consumer demand for seafood, by positioning BG mussels correctly in the market.

Summary of marketing recommendations

1. The development agencies to actively work with BG mussel operators on the island of Ireland on the promotion of labelled IQM quality assured mussels into the Dutch-supplied marketplace.
2. The development agencies to engage in a market development programme for BG mussels from the island of Ireland in the French market place, including an awareness campaign and inward journalist visits.
3. That further investment is made in market research and intelligence.
4. That improved services for commercially focused Research and Development/New Product Development (NPD) be provided by the relevant agencies.

Environment

An environmental assessment of the BG mussel culture industry throughout the island of Ireland was carried out by Poseidon-Aquatic Resource Management Ltd, the full text of the environmental assessment is included in Appendix 3. The environmental assessment was conducted within the context of the existing series of agreements and cross-border mechanisms for the management of the sector, in particular the seed fishery.

Given that a number of the recommendations made by the independent review of the environmental sustainability of the BG grown mussel sector are already underway, it is clear that the industry is well aware of its interaction with the natural environment and that it is being proactive in continually improving its environmental performance.

Overall the sector has a low environmental impact, especially in the areas of visual impact, noise, odour, water, landscape and material assets. Resource use (seed allocation) and ecological impacts (benthic impacts) require a greater level of understanding, and this will be progressively addressed by the recommended research priorities, proposed stock tracking system and fishing schedules. The more structured approach to the management of licensed areas and to seed allocations as laid out in the main recommendations of the Review will enhance the effectiveness of existing and new environmental management mechanisms, thereby contributing to the sustainable development of the sector.

Summary of environmental recommendations

1. That the competent authorities continue the appropriate assessment process where aquaculture sites for BG cultivation lie within or adjacent to NATURA 2000 sites.
2. That the Commencement Orders be introduced in 2008 to implement the new regime in Lough Foyle.
3. That the existing range of safeguards regarding management of pest species is maintained.
4. That science-based planning and management of the decision-making processes is improved.
5. Research projects should be brought forward using a coordinated approach with a greater emphasis on industry engagement.
6. The ongoing development of the ECOPACT, CLAMS and ICZM processes.
7. Further consideration and investigation into using intertidal areas to boost seed mussel productivity should be undertaken by the BGMCF in conjunction with the relevant authorities.
8. That existing and emerging issues in individual growing areas be addressed through the work of the proposed BGMCF.

Administrative arrangements

Arising from the consultative process and learning from the experiences of the long established Dutch industry, there is a strong consensus that the administrative arrangements employed to support the BG mussel sector require a radical restructuring. The clear conclusion of the SWOT analysis is that the current set of arrangements is not satisfactory. The sector is fragmented and there is a requirement for a higher level of administrative resource than is currently available. This set of circumstances is not surprising, given the complex inter-jurisdictional nature of the industry and its recent rapid expansion.

For the BG mussel sector on the island of Ireland to be competitive and sustainable there is general agreement that the end product of any restructuring should result in a set of arrangements and practices with the following characteristics:

- An all-island management regime (for both seed mussel fishing and the subsequent on-growing) that tracks the fate and performance of all stocks from the point of seed collection to sale of the end product.
- Over time, the system should give preferential access to the wild seed mussel resource to those operators who are shown to make best use of it, as defined by the guiding policy set out in the terms of reference of this Review. Thus, the annual allocation of seed mussel fishing permissions will need to be influenced by an incentive based system that rewards good practice and high productivity in the on-growing of seed mussel on licensed aquaculture plots.
- The terms and conditions of the management regime together with its operation should be transparent and enforced consistently and predictably across the whole island, notwithstanding the fact that there is more than one legal jurisdiction in operation.
- The management regime's decision-making processes should involve all the key industry stakeholders in an appropriate way; be knowledge based and market-led; commercially aware and environmentally sustainable.

- The revised arrangements should be in line with modern regulatory best practice and involve self-declaration by the operators underpinned by appropriate surveillance and audit with commensurate incentives and penalties that are clear, proportionate and consistently applied.

Summary of administrative recommendations

1. Immediately form the *All-island BG Mussel Consultative Forum (BGMCF)* (The recommended timeline and approach for the formation of the BGMCF is set out in Section 7).
2. That a dedicated Secretariat be formed immediately to service the sector and the BGMCF.
3. That the feasibility of the introduction of a cost recovery scheme be investigated by the government departments, in the context of issuing seed mussel fishing permits and that any revenue generated be deployed to fund the activities of the BGMCF and its secretariat.
4. That the Aquaculture Initiative EEIG in the first instance be tasked with providing the Secretariat function under the terms of an explicit service contract negotiated with both Departments and the Loughs Agency.
5. That an appropriate and mandatory stock tracking system be developed introduced and administered under the aegis of the BGMCF. The responsibility for commissioning this task is to lie with the Secretariat.
6. That the BGMCF Secretariat be tasked with providing a confidential reporting service, consistent with FOI and data protection requirements to the Departments and the Loughs Agency in the context of seed mussel allocation, based on the data collected by the stock tracking system.
7. The BGMCF to prioritise the implementation of a new mandatory stock tracking system, with a view to having the key elements in place and functioning prior to the start of the 2008 season.
8. The seed mussel allocations are left static until the dataset from the stock tracking system is available.
9. That 'local' seed settlements within the confines of a particular Lough should, as a general rule, be fished and relayed in that Lough. Nevertheless, the operators benefiting from that spat fall should have their Irish Sea allocation reduced by the amount they gained locally, either in the same season if possible, or the following season.
10. To restrict any further net increase in the square area of licensed aquaculture plots for BG mussel cultivation until the end of 2009 at the earliest.
11. The Review Group recommended that DAFF, DARD, SFPA and the Loughs Agency meet on a regular basis with a view to harmonising policy and enforcement arrangements.

12. That the control and enforcement authorities afford the BG mussel sector a high priority in their resource planning and allocation.
13. That the BGMCF be tasked, via an appropriate sub-committee, to design and coordinate the operation of an annual large-scale seed mussel spat fall survey, together with a possible secondary targeted survey for confirmatory purposes later in the season.
14. That the 'fishing schedule' approach be adopted as the appropriate model to underpin the management of the seed mussel fisheries across the jurisdictions. The Secretariat of the BGMCF would be tasked with drawing up the template and the first draft of the protocol for agreement by the BGMCF.
15. That there is a discount and a surcharge element to the cost recovery scheme, which will be determined by the survey sub-committee.
16. That the BGMCF Secretariat be given read-only access to the 'black box' data, subject to data protection legislation and that it be tasked with systematically archiving the data.
17. That the BGMCF Secretariat be tasked with commissioning a suitable secure web based view-only interface to enable the operators, (subject to compliance with the data protection legislation and other legal considerations) in the sector to electronically observe activity in the sector.
18. That the regulatory authorities should explore the possibility of extending the black box system to all vessels involved in fishing for mussels.
19. That all seed mussel dredgers fishing around the island of Ireland be required to carry aboard a suitably graduated sounding rod allowing for an accurate calculation of their cargo on a volume-per-unit-of-depth basis. At the completion of each fishing operation and prior to departure from the grounds, the vessel skipper would be required to perform a sounding of the holds and enter a catch figure in the record following a standard calculation protocol. This estimate would be subject to verification on inspection by duly authorised enforcement officers.
20. That the BGMSCF should form a 'technical sub-committee' which would have a remit to draw up detailed specifications for technical applied research tasks (desk based and field as appropriate) required to be done to support increased efficiency in the sector. The sub-committee would seek to have these tasks carried out in collaboration with the appropriate research service providers.

Implementation

In order to ensure the timely implementation of the complex recommendations set out in this Review, it is necessary to have a detailed implementation plan. An appropriate plan, which assigns responsibility for each task together with the necessary timeframe for completion, is presented in Section 7.

It is envisaged that the BGMSCF will become the main implementation body for the recommendations once it is established; however in the interim it is recommended that an interim implementation group (IIG) is established immediately. The IIG should be a small executive grouping of no more than three appropriately experienced individuals, acting in an honorary capacity directly appointed by the Departments and the Loughs Agency. A schedule of immediate priority actions for the IIG is set out in Section 7.

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Glossary

Bord Iascaigh Mhara	BIM
Bottom Grown	BG
Bottom Grown Mussel Consultative Forum	BGMCF
Bottom Grown Mussel Sector Review Group	BGMSRG
Certificate of Compliance	COC
Coordinated Local Aquaculture Management Systems	CLAMS
Centre for Marine Resources and Mariculture	C-Mar
Cross-Border Aquaculture Initiative Team	CBAIT
Department of Agriculture and Rural Development	DARD
Department of Agriculture, Fisheries and Food	DAFF
Economic and Social Research Institute	ESRI
Environmental Code of Practice for Aquaculture Companies and Traders	ECOPACT
European Economic Interest Grouping	EEIG
European Fisheries Fund	EFF
European Union	EU
Freedom of Information	FOI
Full Time Equivalents	FTE
Integrated Coastal Zone Management	ICZM
Interim Implementation Group	IIG
Irish Farmers Association	IFA
Irish Quality Mussels	IQM
Modified Atmospheric Packaging	MAP
National Development Plan	NDP
Northern Ireland	NI
Producer Organisation	PO

Republic of Ireland	RoI
Research and Development	R&D
Sea-Fisheries Protection Authority	SFPA
Special Protection Area	SPA
Strategic Environmental Assessment	SEA
Strengths, Weaknesses, Opportunities and Threats	SWOT
Sustainable Mariculture in Northern Irish Lough Ecosystems	SMILE
Sterling	STG
Total Allowable Catch	TAC
Understanding Irish Shellfish Culture Environments	UISCE
United Kingdom	UK

SECTION 1.0



1.0

INTRODUCTION

1.1 Background to the Review

Despite the significant growth in the BG mussel sector in recent years, the regulation and management of the sector has encountered numerous difficulties. As with any other industry, the significant growth of the sector over such a relatively short period of time has presented a number of challenges, e.g. demand for mussel seed outstripping supply; increased competition; lack of agreed industry quality standards and codes of best practice; fragmented industry structure and ineffective engagement. It has therefore been necessary to introduce a number of new regulatory measures specifically designed for the sector. It has also been a key factor in both Departments initiating this Review in response to a request from the industry.

Large areas of seabed have been granted aquaculture licences in both jurisdictions, and significant investment has been made in the acquisition of vessels and other facilities to fish for seed mussel and to relay and harvest. These factors are driving a heavy demand – far in excess of available supply for seed mussels which are a naturally occurring resource shared by both jurisdictions. In these circumstances a ‘bonanza’ type mentality has crept into the sector, making it very difficult to achieve consensus amongst the competing operators. Thus the regulatory authorities are in a no-win situation being subject to sharp criticism from competing interests within the sector seeking access to the seed mussel fisheries.

In September 2002, DARD introduced a moratorium on the granting of any further bottom mussel aquaculture licences pending a review of the policies on the future exploitation of the seed mussel fisheries and the development of carrying capacity models as a means of helping to predict the ability of NI’s sea loughs to sustain shellfish culture.

It is apparent that there is a pressing need to review how the sector is currently managed and to develop a set of management arrangements that will ensure the sustainable development of the BG mussel industry. In this context, sustainability is taken to encompass an appropriate balance of economic, environmental and socio-economic sustainability. For the purposes of this Review, it is taken as a given that the Voisinage Agreement; the Common Fisheries Policy and associated EU legislation; the Fisheries Amendment Act 1997 (RoI legislation) and the Sea Fisheries & Maritime Jurisdiction Act 2006 as amended (RoI legislation); the Fisheries Act (Northern Ireland) 1966, as amended (NI legislation) Sea Fisheries Act 1968 and the Sea Fish (Conservation) Act 1967, as amended (UK legislation) and the Foyle and Carlingford Fisheries Order 2007, provide the basis for the regulatory framework for the BG mussel sector.

1.2 Terms of reference

DAFF and DARD stated policies are to ensure the sustainable exploitation of both the wild seed mussel resource in accordance with environmental best practice and the sustainable development of the mussel sector. A number of statements have been made by both the DAFF and DARD ministers to this effect:

The purpose of the regulation and management regime for the seed mussel resource shall be to ensure the sustainable exploitation of the wild mussel seed resource and to maximise the benefits derived from that resource in terms of volume and value of the mussel crop subsequently grown, harvested and processed with the objective of generating sustainable economic activity and employment in coastal communities.

The scope of the Review is to focus on the BG mussel sector with the aim of producing recommendations in relation to: the exploitation of the wild seed mussel resource; husbandry practices; management and regulation of the sector; marketing of produce; compliance with fish health legislation; environmental sustainability; food safety and economically sustainable returns to producers and coastal communities.

The Review addresses the following:

1. Development of an inclusive consultative process at national, local and bay levels to engender industry understanding, participation and 'buy-in to' the regulation and management arrangements for the wild mussel seed resource and for the BG mussel sector. Industry views will be sought on the current and future management, regulatory practices and industry participation.
2. An assessment of current and prospective national, European and international market trends, threats, opportunities and competition for the live, fresh and added-value products from the BG mussel industry.
3. An assessment of current industry practices in relation to the exploitation of the wild seed mussel resource and husbandry including transportation and supply chain practises.
4. An assessment of the current industry structure from an economic and socio-economic standpoint.
5. To review the environmental sustainability of the sector.

1.3 Approach and methodology

The BGMSRG was established in autumn 2006. The Review Group comprises representatives from DARD, DAFF, the Loughs Agency and BIM. The Aquaculture Initiative EEIG (CBAIT) acts as Secretariat to the Review Group and was given responsibility for conducting the industry consultation process and compilation of the Review report.

The group also identified a need to analyse the national and international market for BG mussels and the environmental sustainability of the sector; it was agreed that BIM would assume the lead on these sections of the review process.

In undertaking the Review, a consultative approach was adopted. This included engaging with BG mussel producers, other branches of the fisheries and aquaculture sector, industry regulators, industry representative organisations and individuals with experience of the industry on mainland Europe. The aim of the consultation process was to gather, insofar as possible, the views of all the interested parties with regard to the future management of the BG mussel industry.

In tandem to these consultative activities, regulatory authorities, interest groups and the scientific community were interviewed as part of the marketing and environmental modules.

A: Consultation with producers

The section of the consultation process consisted of three strands:

1. The Secretariat of the Review Group organised a series of industry meetings around the coast.
2. Written submissions were requested from both industry and interested stakeholders.
3. The Secretariat of the Review Group also organised one-to-one meetings with producers who wished to express their views on a private basis.

Industry meetings were structured to solicit comment on all aspects of the BG mussel industry. A PowerPoint presentation was shown at all meetings and opinions were sought on issues raised. All meetings were opened with a description of the current review process and an explanation that the chairman and secretariat were not currently in a position to comment or answer questions but were there exclusively to gather information.

The responses received are discussed in Section 5 of this report and the full consultative report is found in Appendix 1. It is important to note that the opinions expressed within the summary are those of the consultees and not those of the Review Group or the secretariat, which remained neutral at all times during the process.

Responses received are organised under the broad headings of infrastructure, regulation, husbandry and management of the seed resource. It is important to note that the ordering of points does not reflect any hierarchy. Comments relating to marketing and environmental issues were fed into the preparation of the separate modules, which are being prepared in parallel, to cover those issues. The marketing and environmental reports are discussed in Sections 3 and 4 of this report and the full text of the reports are included in Appendices 2 and 3.

Given the nature of the process and the broad range of opinion encountered, the views presented in Sections 3, 4 and 5 are not all consistent with one another; however in Section 6 we have attempted in to address the key comments made to the Group.

B: Consultation with other branches of the fisheries sector

Given that the BG mussel industry operates in areas shared with other fishery activities, the Review Group consulted representatives from fisheries organisations, individuals from the wild mussel fishery in Foyle and Carlingford and representatives of the native oyster fishery in Lough Foyle and Lough Swilly.

C: Consultation with aquaculture industry representative bodies

Responses were invited from the Irish Shellfish Association.

D: Consultation with industry regulators

The Review Group met with representatives of SFPA and DARD Fisheries Inspectorate to discuss current regulation of the industry. Views expressed during the industry consultative exercise were discussed with the regulators and guidance was sought on the current regulatory framework.

E: Consultation with industry regulators in mainland Europe

Consideration was given to the European distribution of the BG mussel industry and it was decided that management of the mussel industry on the Island of Ireland should not be viewed as being isolated from the rest of the European Industry. To this end representatives of the Review Group travelled to Yerseke and met with Hans van Geesbergen of the BG mussel Producers Organisation, Jacobine Van den Boomgaard-Bom and Cora Markensteijn of the Fish Board, Angelo Kouwenhoven and Saskia de Mol van Otterloo of the Fisheries Ministry, Jaap Holstein from the Association of Mussel Processors, and representatives from Krijn Verwijs and IMARES, in Yerseke. Topics covered included the overall management of the industry, the formation and financing of the Producer Organisation (PO) and nature conservation elements of the seed mussel fishery.

SECTION 2.0



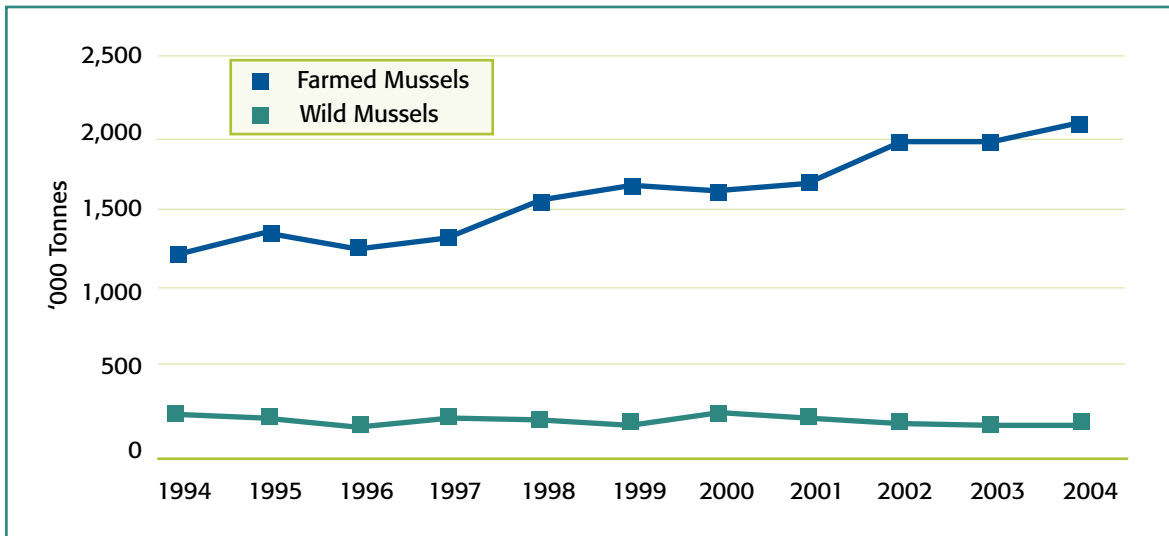
2.0

INDUSTRY PROFILE

2.1 World mussel production

Total world mussel production reached two million tonnes in 2004. Farmed mussels dominate the world production, currently accounting for around 90% of world supplies (Figure 1). Between 1994 and 2004, the average growth worldwide of farmed mussel production was 6.6% per annum, which is half that of the average growth of world seafood production, which is estimated at approximately 13% per annum.

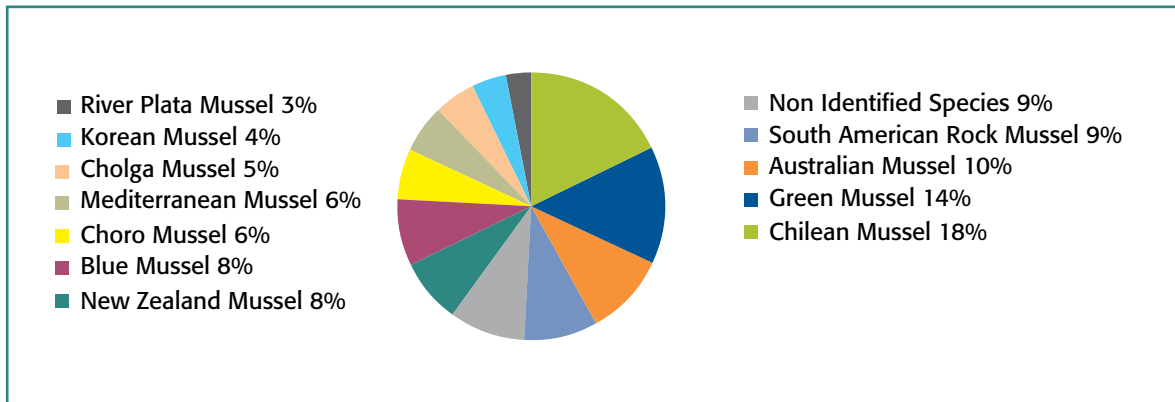
Figure 1 World mussel capture and farming production volumes



Chinese mussel production dominates world production, with 720,000 tonnes produced in 2004, representing 35% of overall world production. The next two largest producing countries, namely Thailand and Spain, together account for 28% of world production. Spanish production has been stable at around 250-300,000 tonnes per year, and can be considered to have reached its full production capacity at between 300-400,000 tonnes per annum in its present allocated farming areas. Thailand has significantly increased its production capacity over the past decade and in 2002 caught up with the Spanish output.

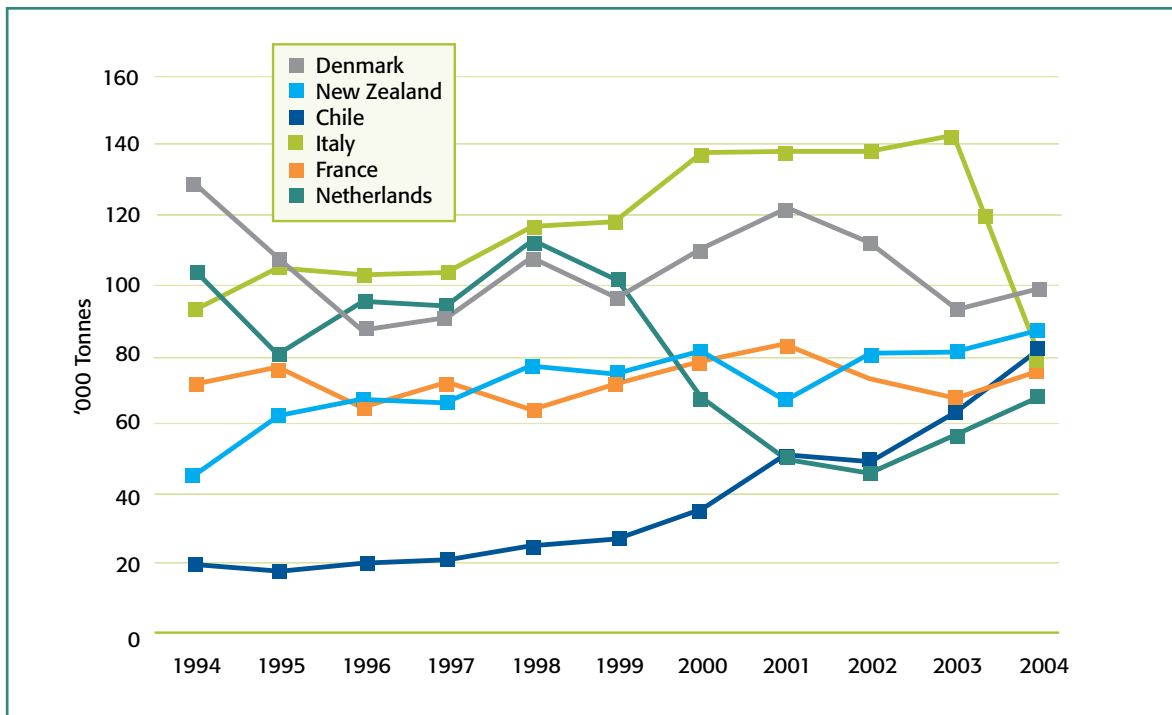
The mussel industry in Chile is also of particular relevance, as an example of an industry achieving unprecedented growth and rapid success and posing a serious challenge to the more traditional producers in Europe. By the year 2010, Chile is likely to be harvesting 160,000 tonnes annually of the country's native blue mussel. This level of production should rank Chile as the third largest producer of mussels in the world behind Spain and China. Chile is currently ranked as the world's sixth largest producer. Chilean mussel farmers aim to achieve the same success as their salmon farming cousins who in just twenty years have overtaken their Norwegian competitors to become a world leader in production. Within the last ten years alone, the annual mussel harvest has increased from 6,000 tonnes per annum to nearly 100,000 tonnes per annum of which 97% comes from farm sites in the 10th region, especially around the island of Chiloé.

Figure 2 2004 world mussel production by species

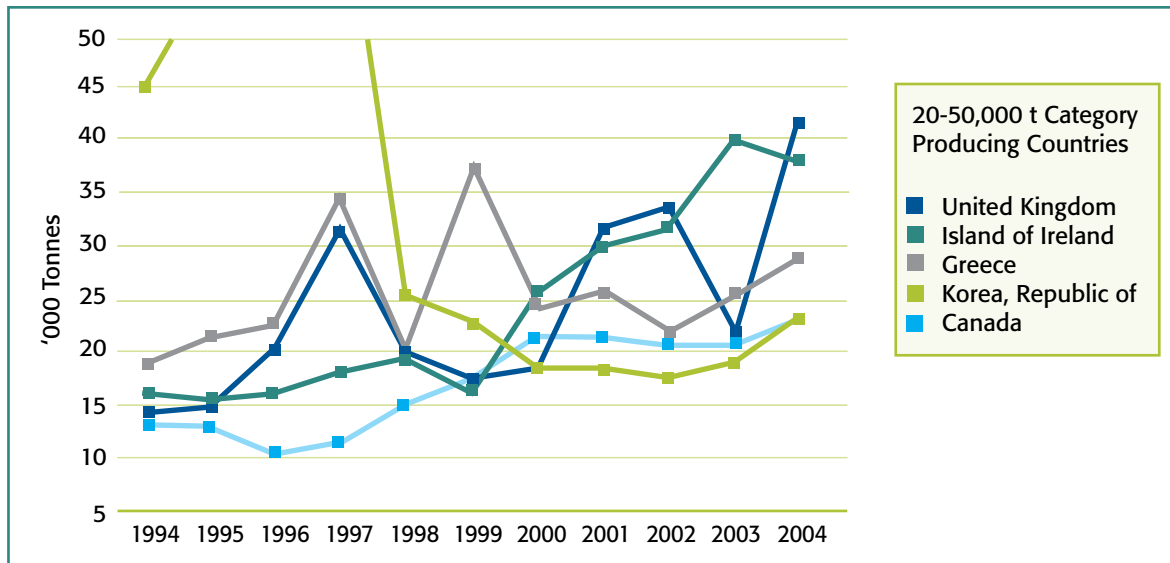


Ranking production on a world scale, in groupings of >100,000 tonnes per annum, 60-100,000 tonnes per annum and 20-50,000 tonnes per annum, the world-wide industry can be split as follows: China, Thailand and Spain are ranked in the top category as discussed above. The 60-100,000 tonnes per annum category is populated by the following six mussel producing countries: Denmark, New Zealand, Chile, Italy, France and the Netherlands. Together they represent 24% of the world production of mussels.

Figure 3 60-100 000 t category producing countries



Ireland is in the 20-50,000 tonnes category (Figure 4). Both Irish and UK production shows an increase in output over the past decade. Greek production, despite being erratic, is relatively stable over the past decade.

Figure 4 20-50,000 t category producing countries

2.2 Introduction to the BG mussel industry on the island of Ireland

2.2.1 Overview

Having looked at the world supply of mussels and seen how production on the island of Ireland fits in, the Review now goes on to examine the situation, initially analysing the seed resource on which the sector is dependent and then the on-growing element of the resource. The analysis then goes on to concentrate on the socio-economics of the sector with an in-depth look at volume and value figures both in the RoI and NI. Lastly, the Review takes a detailed look at the employment generated in the sector.

2.2.2 Brief history

The BG mussel industry on the island of Ireland developed in its initial phase using imported second-hand Dutch mussel dredgers to fish for mussel seed, primarily in the Irish Sea. These vessels were originally designed for use in smooth and sheltered waters in the Netherlands and were never very well suited to fishing in open sea conditions. The introduction of the EU safety regulations for sea fishing vessels, known as the Torremolinas Protocol, has brought about the forced obsolescence of many of these original second-hand vessels as the cost of upgrading them would be prohibitive.

In the RoI, the recent investment of €25 million (Stg £16.25 million)* in seven new mussel dredgers supported by BIM/EU grant-aid has served to underpin the economic sustainability of the BG mussel sector in terms of access to the seed mussel fishery and improved cost competitiveness. Six new dredgers entered the fleet in 2005 supported by a total EU grant amounting to €4,439,683 (Stg £2,885,794). In 2006 another new mussel dredger was added to the fleet supported by an FIGG grant of €1,185,000 (Stg £770,250). While this investment in the fleet is welcome, it tends to overshadow the fact that quite

a number of small but long established operators have withdrawn their vessels from operation due to their inability to meet safety regulations at a time when grant-aid for the renewal of the fishing fleet is prohibited under the 'state-aid' regulations.

Notwithstanding the above, the BG-mussel sector has been the most successful component, in terms of output growth, of the aquaculture industry on the island of Ireland over the past six years. In the RoI, the sector currently produces in excess of 60% of the total shellfish aquaculture production (BIM, 2005 stats). The NI BG mussel sector is some twenty years younger than its counterpart in the RoI; however it is now making a significant contribution to shellfish production, with BG mussels accounting for 96% of the total shellfish aquaculture production from NI in 2006.

* All currency conversions in this Review are calculated at a rate of €1 = £0.65.

2.3 The seed mussel element of the BG sector

2.3.1 Overview

Historically the BG mussel sector has been dependent on the supply of seed mussels harvested from wild subtidal stocks principally in the southern Irish Sea and at Skullmartin off Co Down. There have also been sporadic spat falls in and around the growing areas in Lough Swilly, the Foyle, Carlingford and Cromane. Seed settlements have also been reported off the Co Down coast at the Feathers and at Donaghadee Sound.

Wild seed mussels are harvested using dredges and relayed on licensed aquaculture sites under the control of the relevant regulatory authorities. The recent rapid expansion of the industry has created a situation where seed demand is significantly greater than the amounts that are available, allocated or actually fished (C-MAR, unpublished).

2.3.2 Main seed sources in NI

Fisheries officers working for DARD reported dredgers fishing for seed in Ballyhalbert Bay between 1998 and 2000, and although there are no records of the seed collected, it was thought to be patchy in nature. This area was closed to dredging in 2000, causing the industry to search for other sources. They found the seed bed at Skullmartin Rock later in 2000. Since then the Skullmartin bed has consistently yielded seed each year although the biomass has varied considerably. The seabed in this area consists of gullies and ridges extending from rocky outcrops inshore to macerated shell, cobbles and sand in deeper waters (C-MAR, unpublished).

2.3.3 Main seed sources in the RoI

Results from various surveys over the last thirty years have shown that the most consistent seed beds are to be found off Wicklow Head. In particular two areas east of the India Bank have had consistent seed settlement for the past eight years. In that period, 75% of mussels dredged in the Irish Sea have been taken from these sites. The area comprises numerous small beds and some larger beds. The seabed at these sites has been described as a mix of sand, mud shingle and stones with the mussels showing no distinct substrate preference (Maguire *et al*, 2007).

2.3.4 Seed input 2005

Under the current management and stock-tracking regime there are great difficulties in accurately tracking the amount of seed harvested in a given year, with harvest figures for 2005 being variously documented as being either 14,861 or 18,500 tonnes. Such discrepancy illustrates the urgent need for a stock tracking system that accurately tracks the resource, which is the foundation of the whole industry. One set of uptake results is presented in Table 1 below as an example.

2005 was considered as a poor year for mussel-spat settlement, with the volume of seed relayed being approximately 60% of the quantity relayed annually for the previous two years. This situation, in combination with prolonged closures of rope mussel farms due to biotoxins in the southwest, initiated a joint venture between these normally separate sectors of the mussel industry. This involved a number of rope mussel producers spreading their stock on licensed BG mussel sites. Approximately 3,000 tonnes was relayed to various BG mussel bays in 2005 (Gascoigne & Huntington, 2007). The results of this strategy are still being evaluated, but it has shown promise and the practice is being continued by some operators.

Table 1 Seed demand allocation and uptake in 2005 (Maguire *et al.*, 2007)

Bay	Demand (t)	Allocation (t)	Uptake (t)
Carlingford Lough	13,350	1,250	832
Wexford	6,750	4,800	140
Westport	250	250	
Waterford	4,270	1,790	250
Shannon	1,500	500	
Lough Swilly	5,750	1,540	1407
Lough Foyle	31,950	6,800	390
Cromane	7,500	1,277	2,000
Belfast Lough	20,956	5,334	8,225
Larne Lough	1,000	185	
Dundrum Bay	250	250	
Source-Skullmartin, relayed Rol			1,485
No log sheets			132
Total	93,526	23,976	14,861

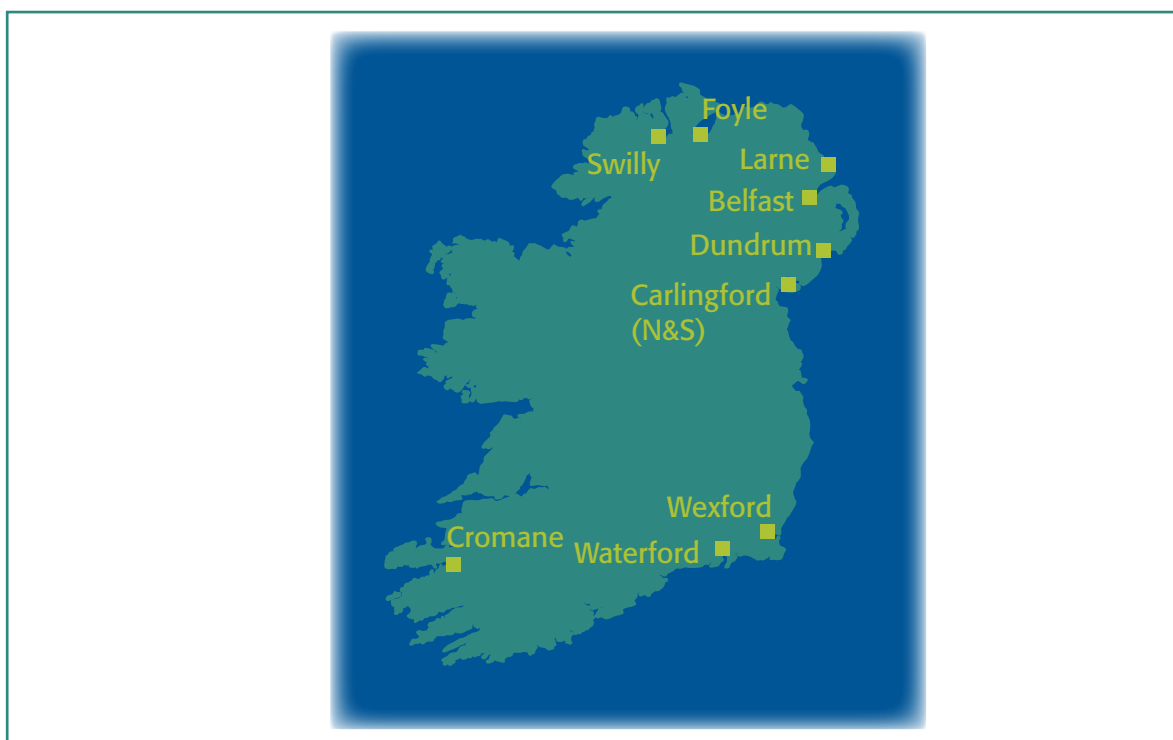
NOTE: Readers should note that everyone in the sector agreed there was a substantial degree of inaccuracy in the reporting of the seed-mussel transfers and thus the figures in the above table should be taken as indicative rather than being definitive.

2.4 The ongrowing segment of the BG mussel sector

2.4.1 Licensed aquaculture sites for BG mussel cultivation

In total over 10,000 hectares are licensed for BG mussel culture or subject to mussel orders on the island of Ireland, along with approximately 900 hectares currently under culture in Lough Foyle (Loughs Agency, pers. comm.).

Figure 5 Map of BG mussel cultivation areas around the island of Ireland (BIM 2007)



2.4.2 Production patterns

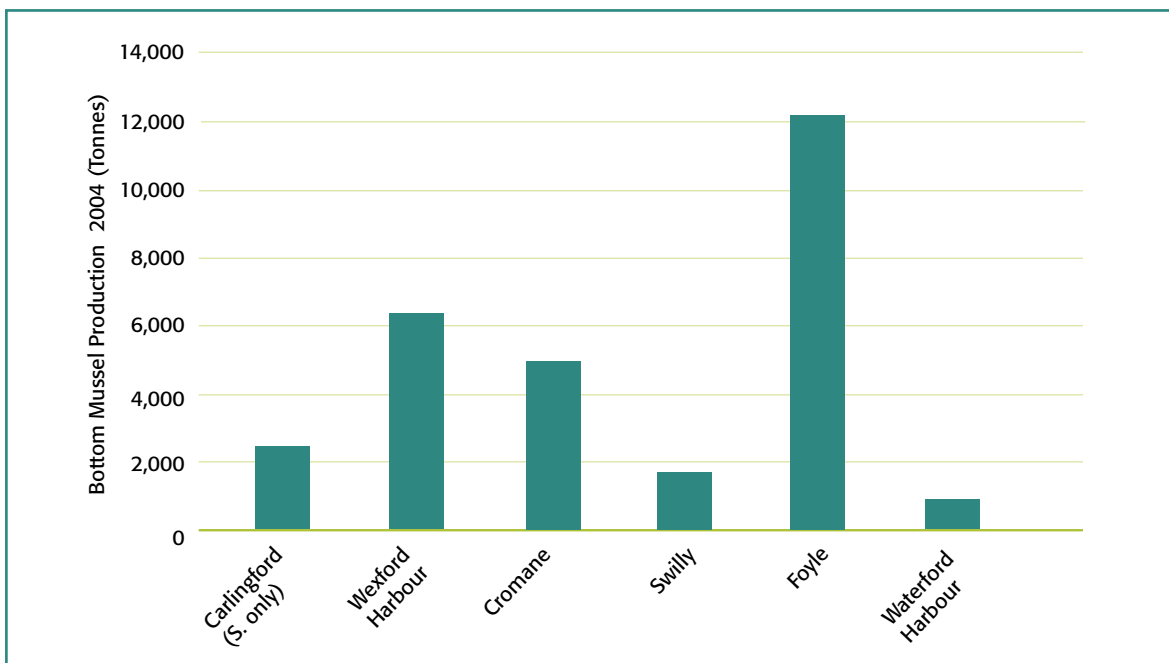
In NI, production from Belfast Lough dominates although output from Carlingford Lough is also important. Indeed, total production from Carlingford Lough, north and south, probably rivals that of Belfast Lough. Furthermore, mussels are moved between lough systems for logistical reasons, so the quantities of seed mussels entering a particular system and the quantity of finished product leaving that system for market may not always tally. For example, Carlingford Lough is a highly productive system, which is often used for 'finishing' mussels (providing a spurt of growth so that mussel reach market size quickly and in good condition) that have spent some time growing more slowly elsewhere.

In addition, mussels are sometimes moved out of Ireland before reaching market size, e.g. for ongrowing in the Netherlands. The practice of moving mussels between systems, both within and away from Ireland, has increased in recent years, coinciding with the entry of substantial Dutch investment into the industry on the island of Ireland (Gascoigne & Huntington, 2007).

BG mussel production in the main RoI and cross border lough systems from 2004 is shown in Figure 2 below. Generally, production in the main RoI lough systems is believed to be somewhat higher than from the NI lough systems. Although the importance of Lough Foyle as a site for BG mussel culture at the northern end of the island is clearly evident from the graph. In the RoI, as described for the NI jurisdiction above, mussels may be moved between sites or exported as semi-grown to the Netherlands before they reach market size (Gascoigne & Huntington, 2007).

The relative outputs from the various lough systems do change from year to year and Figure 6 should be treated as a 'snap-shot' rather than an indication of a steady state. Having said that, the more established production areas like Wexford have much less annual variability in output than for example Lough Foyle.

Figure 6 2004 BG mussel production in some of the main lough systems



2.5 The volume and value of output from the BG mussel sector on the island of Ireland

2.5.1 All-island volume and value

Ireland's BG mussel industry has increased its output volume thirty-seven-fold since its inception in 1974 (C-MAR, 2007) and the overall trend is one of increasing output. Nevertheless it is subject to annual fluctuations, for example, the volume of BG mussels harvested on the island of Ireland decreased from 36,668 tonnes in 2005 to 33,453 tonnes in 2006, representing a fall of 9%.

The trend in value terms has been upwards despite the output fall as the market value for BG mussels increased dramatically from €31.96 (Stg £20.78) million in 2005 to €50.77 (Stg £33.99) million in 2006 with the average price rising to €1,517 (Stg £986.43) per tonne over the same period.

Table 2 All-island production volume and value

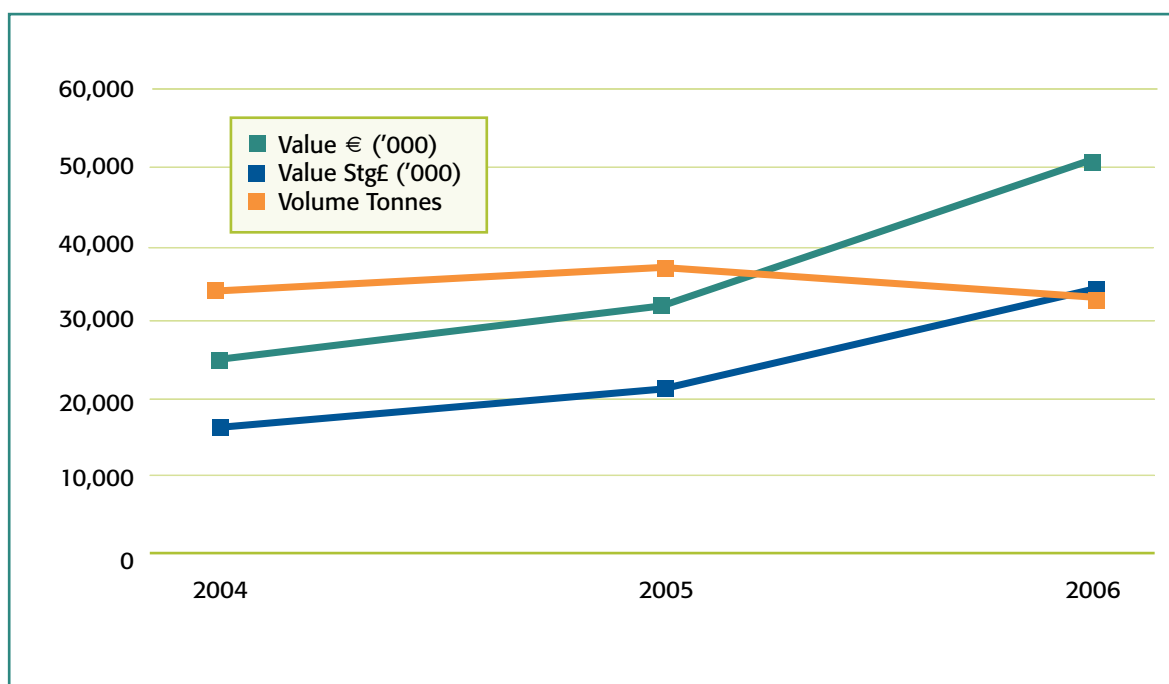
	2004	2005	2006
Volume tonnes	33,954	36,668	33,453
Value € ('000)	24,983	31,956	50,768
Value Stg€ ('000)	16,239	20,771	33,999

Given that the majority of BG mussels produced on the island of Ireland are exported in bulk to the Netherlands, it is reasonable to assume that the increasing prices observed are as a result of increasing demand from the Netherlands where there has been sharp shortfalls in production in recent years. BG mussels from the island of Ireland are needed by Dutch dealers to satisfy the demands of their traditional distribution networks into the large Belgium and German markets. This trend may be seen in the price movement set out below in Table 3 and the trends displayed graphically in Figure 7.

Table 3 BG mussel average price

	2004	2005	2006
Average price € per tonne	€735.78	€871.50	€1,517.58
Average price Stg€ per tonne	£478.26	£566.48	£986.43

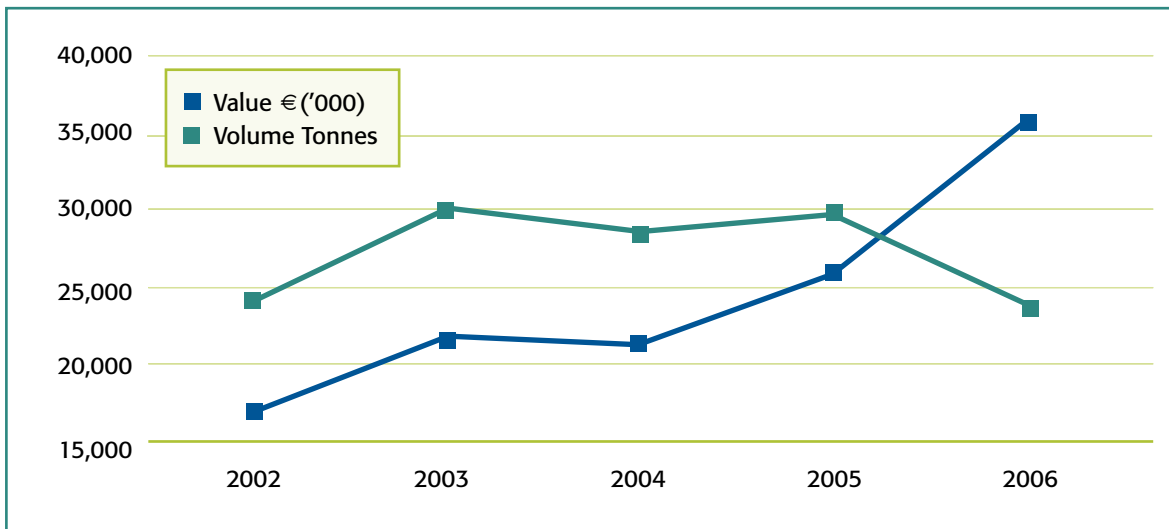
* DARD and BIM pers. comm.

Figure 7 All-island volume and value trends 2004-2006

2.5.2 Rol production volume and value

Production of BG mussels increased from 9,644 tonnes in 1999 to 30,600 tonnes in 2005. The volume of BG mussels harvested decreased from 29,510 tonnes in 2005 to 23,583 tonnes in 2006, which was a fall of 20%. Market value for BG mussels increased dramatically from €25.7 (Stg £16.71) million in 2005 to €35.78 (Stg £23.26) million in 2006 with the average price rising to €1,517 (Stg £986) per tonne (+74%).

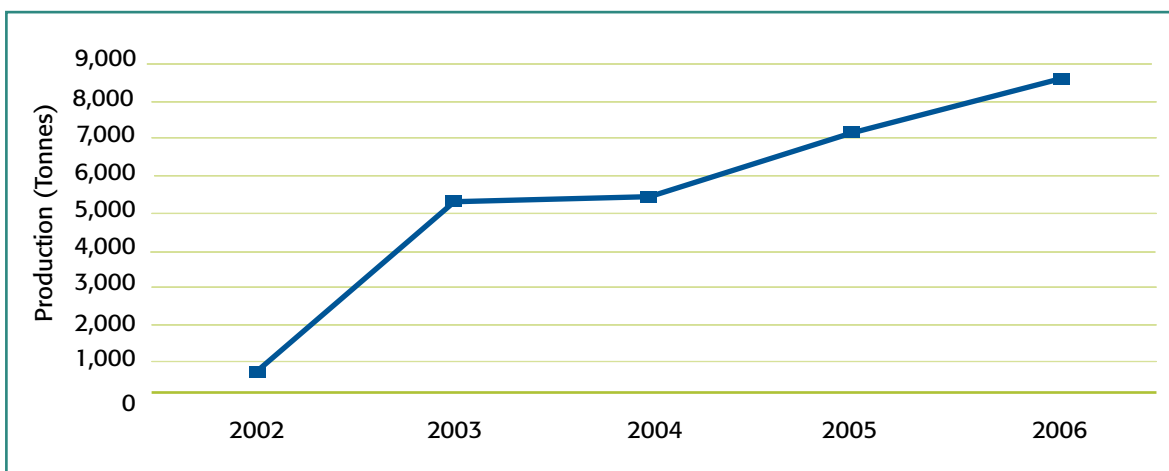
Figure 8 Rol BG mussel 5-year volume and value analysis



2.5.3 NI production volume and value

Over the last three years, BG mussel output has been increasing. In 2004 the volume of mussels produced was 5,394 tonnes valued at Stg £2.6 (€4.0) million, this increased to 9,870 tonnes valued at Stg £9.7 (€14.92) million in 2006.

Figure 9 NI BG mussel production volume 2002-2006



2.6 Employment in the BG mussel sector

2.6.1 Overview

Based on the utilisation of the island of Ireland's indigenous natural marine resource, it is an established fact that the aquaculture and fisheries industries make an enormously important contribution to regional and local development in remote rural coastal communities. In the ROI for example, *The National Spatial Strategy 2002-2020* identified the development of marine and natural resource based industries as being critical to the future prosperity of these coastal areas where there are few alternative industries (Seafood Industry Strategy Review Group, 2007).

2.6.2 All-island employment

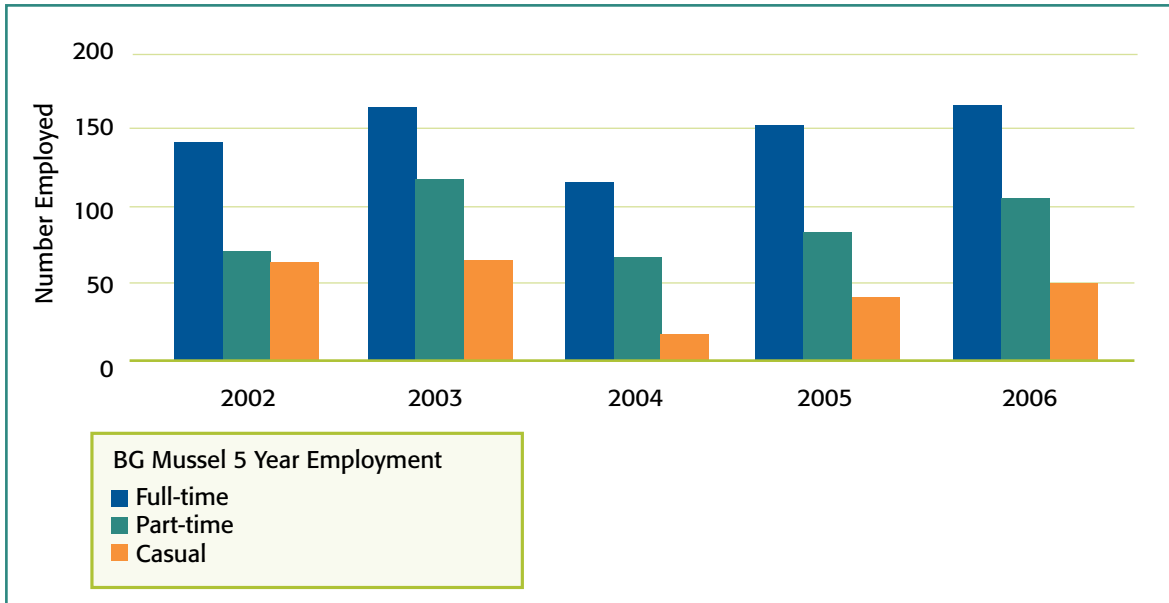
On an all-island basis the BG mussel industry has consistently shown an increase in employment levels from year to year. The industry directly employed 445 persons in 2006, of which 247 were full-time, 147 part-time and 49 casual. This represents 330 full-time equivalents (FTE), an increase of 15% over the previous year. A further point of note is that these figures do not reflect the multiple ancillary companies known to have business reliant on the success of the BG mussel industry (See Section 2.6.6).

Table 4 Estimated 'all-island' direct employment in the BG mussel sector

	Full-time	Part-time	Casual	Total	FTE
2004	194	127	19	340	261
2005	217	126	42	385	287
2006	247	149	49	445	330

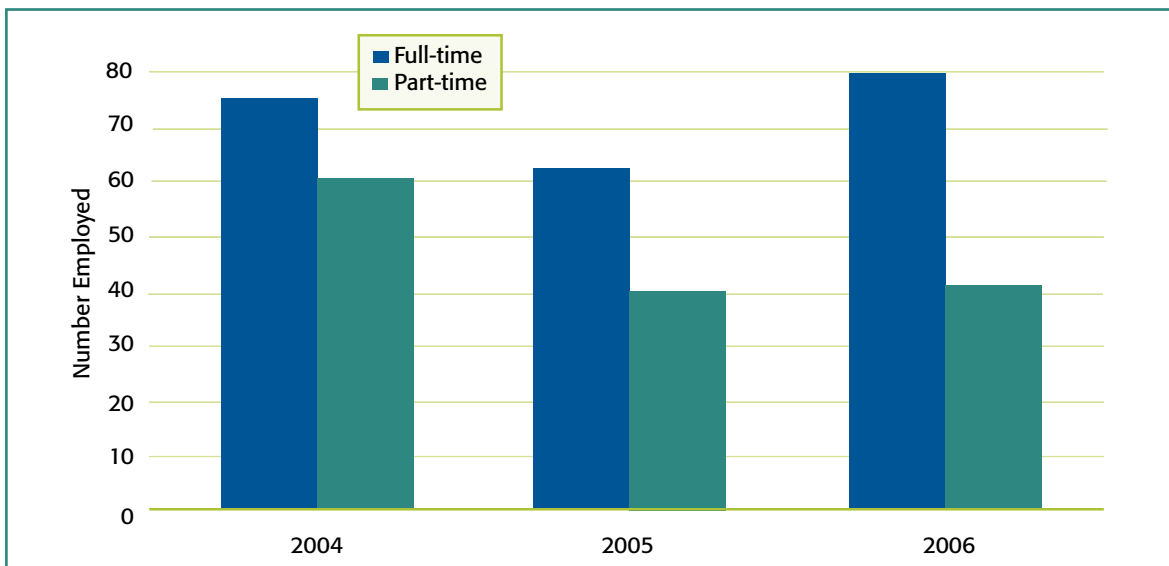
2.6.3 ROI direct employment in the BG mussel sector

The total number employed in BG mussel production in 2006 rose by 15% to 323 people. This gave an increase of 23 FTEs giving a total of 229 FTEs in 2006.

Figure 10 Employment in the BG mussel sector in RoI

2.6.4 NI direct employment in the BG mussel sector

After a direct employment level drop in 2005, the total number employed in BG mussel production in 2006 rose by 17% to 122 people. This gave an increase of 18 FTEs giving a total of 101 FTEs in 2006.

Figure 11 Direct employment in the BG mussel sector in NI

In other parts of the fisheries and aquaculture industry, a commonly applied multiplier of 1.1 (ESRI) is applied to each FTE position to give a reasonable calculation of all employment, direct and induced, created in the services sector that support the activity of BG mussel cultivation. In this case, the Review Group calculates that 693 FTEs (directly and induced) are created by the BG Mussel sector on the island of Ireland.

2.6.5 Socio-economic significance of the BG mussel sector

Further to this analysis of employment, a dependency ratio may also be used to estimate the 'trickle-down' effect of the sector into the communities where it is located. In this case the multiplier to be applied is three (Fitzpatrick Associates, 2004). This allows a calculation of the total number of people wholly or partially dependent for their income on the sector. The Review thus estimates that approximately 2079 coastal dwellers around the island of Ireland derive a portion of their income from the BG mussel sector. While indicative, this figure does demonstrate the real and in-depth impact of the BG mussel sector as a means of sustaining economic activity and acting as an engine of renewable wealth creation in some of the most remote coastal communities on the island of Ireland.

2.6.6 Future prospects of the BG mussel sector

The socio-economic importance of the sector will increase significantly as its full potential is realised. It has been postulated that circa 55,000 tonnes of product could be produced by the BG mussel sector on an all-island basis by 2013. This represents a 65% increase on the 2006 production figure of 33,453 tonnes. By necessity there will be a corresponding increase in the numbers of people employed in the sector as a result in this increase in output. The Review believes that it is reasonable to extrapolate from the 2006 figures to come up with an estimation of the likely employment in the BG mussel sector in 2013. On the basis of the extrapolation, the Review estimates an employment figure of 542 FTEs in BG mussel production.

Readers should be aware however that there may not necessarily be a direct pro-rata increase in those employed in primary production as automation and other labour saving devices may serve to reduce the manpower required to produce a tonne of mussels. Having said that, the experience around the world from the general aquaculture sector is that extra jobs tend to be created ashore in processing and services as the output reaches a critical mass that allows further value-adding, even if the 'sea-borne' element does not increase by the same amount.

Thus, using the multiplier applied earlier (of 1.1) for induced employment it is estimated that 1,138 FTEs will be created in services to support the activity. There will also be a corresponding increase to 3,414 people living in coastal areas who will be wholly or partially dependent for their income on the BG mussel sector.

The significant numbers of people engaged in the industry now, and potentially in the future, demonstrate both the current value of the sector in socio-economic terms and also show the very significant promise BG mussel farming offers towards maintaining the economic stability of the fragile peripheral communities that are struggling to survive around the island of Ireland.

SECTION 3.0



3.0

MARKETING

This section of the Review is a summary of the market investigation module, which was carried out on behalf of the BG mussel sector Review Group by Lucy Watson and Nicolas Ranninger of BIM. The full Marketing Report is attached as Appendix 2.

3.1 Introduction

Effective marketing and market-led development is the cornerstone of any progressive industry. Evidence from the FAO and other sources shows that the demand for seafood is increasing the world over and this clear and growing demand represents an opportunity for the BG mussel sector in Ireland. For example, EU seafood import dependence is currently estimated at 74%; on the domestic market, growth in the demand for seafood is outpacing consumption growth for all other protein types. The projections reliably predict that there is significant opportunity for future growth in the seafood market both at home and abroad. Mussels are an almost ideal form of seafood in marketing terms as they encompass within their product range the key characteristics of health, indulgence and convenience. This section presents a broad overview of the market analysis module of the review process, including a number of key recommendations for short-term and long-term actions, designed to maximise the value of the sector within the broader seafood sector.

3.2 The bigger seafood picture on the island of Ireland

3.2.1 Overview

Fortuitously, from the point of view of this review exercise, the government in the RoI recently commissioned a major strategic review of the seafood sector. Although the Review was principally concerned with the industry in RoI, its conclusions with regard to seafood marketing are equally valid for the whole island of Ireland.

The resultant seafood industry strategy report, *'Steering a New Course – Strategy for a Restructured, Sustainable and Profitable Irish Seafood Industry 2007-2013'* sets out a series of recommendations for the seafood industry for the period of the European Fisheries Fund (EFF) 2007 to 2013. Key to the success of the sector, in the view of the authors, is a renewed focus on market development and market-led innovation.

Specifically, the strategy stated that the Irish seafood industry must aim to:

'Capture the full potential of Irish seafood through a market focused, customer-led development strategy, supported by enhanced trade and promotional activity and the development of a robust 'Seafood Island' proposition with the capability of meeting customer demands in the future.'

In the area of market-led innovation, the authors stated that the Irish seafood industry must:

'innovate with specific focus on R&D, value-added development and the application of appropriate technology to remain competitive and profitable into the future.'

With these objectives firmly in mind, this BG mussel sector Review document takes each of the recommendations and applies them specifically to the BG mussel sector on the island of Ireland with a view to developing a visionary and highly applicable marketing plan for this growing part of the seafood industry.

A number of recommendations were made in the strategy report that have application to and can help guide the development of a marketing strategy for the BG mussel sector.

3.2.2 Recommendations of 'Steering a New Course'

Under the theme 'market development', the strategy report recommended:

- Investing further in market research and intelligence.
- Focussing marketing support in a targeted fashion on key export mussel markets in addition to examining the domestic market.
- The establishment of a 'Seafood Island' identity for seafood.

Under the theme 'market-led innovation' the strategy report recommended:

- Adopting a structured approach to providing services for commercially – focused R&D/NPD (new product development) more effectively through a dedicated 'Seafood Development Centre'.

The thrust of these recommendations also applies to the BG mussel sector, and this is reflected in the marketing recommendations made in this section of the Review.

3.3 Overview

From a marketing perspective, most of the output of BG mussels from the island of Ireland is exported in an undifferentiated bulk form and it is evident that scope exists to add significant value. Basic handling improvements such as improved grading and washing and a move from bulk bags to smaller packs would yield immediate value uplifts, while modified atmosphere packaging (MAP) and other avenues of innovation in product forms also offer further scope. Market demand for the product is solid and if that demand was backed by appropriate differentiation strategies, the Review Group is of the opinion that the value generation from the BG mussel sector on the island of Ireland could be boosted significantly.

Notwithstanding, it should be noted from the industry consultation phase (Section 5) that the operators were not especially ambitious in terms of their short-term marketing aspirations. Across the island of Ireland there is a deficit of knowledge and expertise in this area of commercial activity in the BG mussel sector, and it will be a challenge for the development agencies to up-skill the players and raise their expectations in this regard. There is a necessity for a market-led approach to achieve long-term sustainability for the sector.

3.3.1 The market dynamics affecting the BG mussel sector on the island of Ireland

Understanding competition in the market place is critical. Identifying and knowing the key players in Europe, the Dutch, Spanish and French mussel producers and their market strategies, is critical. The winners in the mussel market place are those that have aggressively built market share, moved down the experience curve and built economies of scale in operations and marketing. Traditionally in Europe, these would be the Dutch, French and Spanish industries. These industries are mature, characterised by having comparatively powerful marketing and distribution systems. These leaders are hard to dislodge unless a new entrant/competitor can introduce radically innovative products or marketing strategies.

Supply relationships are critical to producers here because so many of the markets are export focused. Traditionally mussels from the island of Ireland are sold into the Dutch and French markets. Increasingly these markets are having supply difficulties in their indigenous industries. Environmental regulation, closures due to harmful algal blooms and other factors mean that obtaining suitable supply of raw material is now a real constraint to growth, especially in the Netherlands. Producers will also become more subject to such constraints as the sector grows in scale.

Increasingly the traditional buyers of mussels from the island of Ireland are integrating backwards along the supply chain, thereby securing supply of product and obtaining important competitive advantages. Looking at the supplier/buyer relationships, in this case the bulk producer of fresh mussels selling direct to the wholesalers; it is important to understand the dynamic of this very important relationship. The power traditionally rested with the buyers; however, it is believed that the power base is shifting and producers have an opportunity to capitalise on this shift. The supplier's product is providing an increasingly important input to the buyer's business because of a shortage of raw material from the older supply sources in mainland Europe. It is evident, in the case of the BG mussel sector across the island of Ireland, that the 'buyers' are protecting their investment and dominant position in the distribution network by blurring the distinction between themselves and the growers through integration.

3.3.2 Understanding the market

As previously described, the BG mussel industry on the island of Ireland is currently focused on the fresh bulk market. Although convenient, this approach leaves it directly exposed to short-term supply and demand price fluctuations and this segment of the market is also characterised by limited customer loyalty, leading to strong price competition.

For the past number of years, the BG mussel sector here has been experiencing a market that favours producers, leading to a certain degree of complacency in marketing terms. However this dependence on a buoyant wholesale trade is risky in a market where there may be increased alternative raw material supplies of mussels coming into Europe in the medium-term. Therefore, key objectives for the coming years should be:

- To improve and diversify the product offering.
- To develop a distinct and 'valorised' identity for BG mussels from the island of Ireland.

- To improve supplier/buyer relations thus securing the key relationships in the existing market.
- To take advantage of growing consumer demand for seafood, by positioning BG mussels correctly in the market.

3.4 A proposed market development strategy for the BG mussel sector

Classically any market development strategy is broken down into a number of key themes such as: product, pricing, which markets and how to promote the product once those choices have been made. The following analysis follows that pattern.

3.4.1 The product

Product/offering segmentation in the overall BG mussel sector remains rudimentary in comparison to other food sectors, such as the well developed chicken industry. Studies on mussel consumption habits are limited and further consumer research is required in order to understand and ultimately achieve optimum segmentation. Ideally, the sector should adopt a range of product forms and offerings to selected market segments.

The following product segmentation matrix summarises the existing different product segmentation made thus far by mussel suppliers in Europe.

Table 5 Mussel segmentation matrix

	Bulk	Live	Processed	
			Fresh	Frozen
Price	X	X	X	X
Size	X	X	X	X
Meat yield	X			
Origin	X	X		
Species	X	X		
Packaging (MAP, vacuum packed)		X	X	X
Quality, environmental labels		X		
Branding		X		
Farming technique		X		

Note: "X" indicates segmentation observed in Europe.

Product segmentation is very limited. Although there is a well-developed voluntary quality assurance scheme, there are no mandatory minimum quality criteria applied to BG mussels from the island of Ireland. All sizes and meat yield levels can be found in the offering at present. This lack of differentiation is used by buyers to play down the overall market price. It is recommended that the producers be encouraged to participate in the all-island Irish Quality Mussel (IQM) assurance scheme and that the scheme be integrated with Spanish and Dutch quality norms to facilitate market access through common understanding. Improved product consistency would also be facilitated by the adoption of the proposed Industry Code of Practice as set out in Section 6.3.3.

In general the BG mussel sector should aim to expand its range of product offerings, either in the bulk market, (suggestions are presented in the table above) or through an enlargement of the value chain, i.e. live packed, prepared fresh or frozen, etc.

3.4.2 The price

The sellers market (where demand is greater than supply) observed during the past years has resulted in good bulk prices for BG mussels. Nevertheless, the price for mussels at consumer level continues to remain below other sources in most cases. This is mostly the result of lack of product and supply chain control. As the product is not generally quality differentiated at source, traders do not actively push regionally labelled product forward into the market. Most traders who are handling mussels from the island of Ireland also have their own product to sell and naturally push their own brand. Creating a brand identity and supporting that with a promotional campaign would allow improved pricing of BG mussels and would help to keep those prices stable.

3.4.3 The place

BG mussels from the island of Ireland are mainly exported to France and the Netherlands. It is only in the French market that these mussels have achieved visibility at consumer level as being from the island of Ireland. Nevertheless, even this low degree of visibility remains limited as origin and product characteristics are rarely intentionally displayed. In most cases traders simply aim to be in compliance with EU packaging regulations by indicating in the 'small print' the country of origin and whether the product is of farmed origin. It is understood that one leading Dutch supplier is going to display the IQM mark on its products to emphasise origin and this is seen as a positive development. Once the supply chain weaknesses are addressed it will be important to promote consumer awareness of the origin and quality of the mussels.

3.4.4 Appropriate promotion

Building awareness for relatively low and seasonal production volume is not an easy task and underlines the importance of choosing priority markets to avoid dilution of effort. The market profile of BG mussel exports from the island of Ireland is generally weak as most mussels are exported in bulk. In order to improve this presence and increase product visibility two main routes should be investigated:

- The development of a greater volume of finished product on the island of Ireland.
- Establishment of partnerships with buyers who are prepared to 'push' identity of origin.

Both of these routes will require the effective labelling of product and can allow inclusion of a range of information for effective product communication to consumers, including, for example, origin, product grade and quality status.

It will be critical to increase the profile and consequent market awareness of BG mussels from the island of Ireland. The proposal to develop a 'Seafood Island' identity is developed in the seafood industry strategy report and this initiative may provide a 'piggyback' for the BG mussel sector to exploit.

Previous experience has shown that market awareness can also be increased in a cost effective manner through press communication in priority markets. This, coupled with targeted inward journalist visits to production sites would emphasise the quality message. A priority should be given to this approach in the BG mussel sector on the island of Ireland in the short-term.

Product promotions are costly. In order to maximise the gain from any promotional effort it may be necessary for the promotions to target the industry as a whole.

It is, however, essential that supply meets demand if a promotional or a communication campaign is to be carried out on BG mussels. Not having a critical mass makes a strong promotional campaign difficult to carry out as it frustrates journalists, buyers and consumers if they subsequently cannot purchase or find the object of the communication campaign. It would appear therefore advisable to concentrate any campaign on markets where BG mussels from the island of Ireland have the highest market share.

3.5 Recommendations

A number of specific recommendations arise from this marketing Review.

3.5.1 Short-term

In the short-term it is recommended that:

Recommendation:

The development agencies should actively work with BG mussel operators on the island of Ireland on the promotion of labelled IQM quality assured mussels into the Dutch-supplied marketplace.

Recommendation:

The development agencies should engage in a market development programme for BG mussels from the island of Ireland in the French market place, including an awareness campaign and inward journalist visits.

3.5.2 Medium to long-term

The seafood industry strategy report identifies a probable production of 40,000 tonnes of BG mussels in RoI by 2013. It is likely that there will be a corresponding increase in production in the licensed areas in NI. The total production from the island of Ireland could reach 50,000 tonnes over the same period.

The Review Group is of the view that in the medium to long-term, the following market development issues should be pursued with regard to the BG mussel sector.

The long-term vision for the entire seafood industry should revolve around developing a strong and positive identity for seafood on the domestic market and in key international export markets. For the mussel sector in particular, the Review recognises that all mussels from the island of Ireland must aim toward developing a unique identity that is considered consistent with a quality product produced to a defined set of internationally recognised standards that represent, for example, an understood farming technique, a fresh product facilitated by frequency of landings, (same day landings) and a customer service approach that is second to none.

Recommendation:

That further investment is made in market research and intelligence.

The medium to long-term strategy to achieve increased and potentially more profitable sales of BG mussels has to be founded on the basis of relevant, commercially focused and robust market research and intelligence. For the mussel sector in particular, the key markets are the Dutch and French markets and traditionally these have been bulk buyers of mussels. Creating brand identity and promoting this in these key markets must be researched, planned and monitored. Equally, trade and promotional activity must be focused in the key markets and based on careful pre-planning involving trade and consumer-focused research.

Recommendation:

That improved services for commercially focused Research and Development/New Product Development (NPD) be provided by the relevant agencies.

The perceived lack of new seafood product offerings from the industry has been identified as a key challenge for the seafood sector in the seafood strategy report. Indeed, it has been reported as a major competitive disadvantage. For the BG mussel sector, opportunities for new product offerings should be clearly identified and supported with a customer-led market development strategy for achieving sales and growth. Inherent in any development activity of this nature is the absolute need to look at new presentation and packaging formats, new technological practices and labelling.

3.6 Summary of marketing recommendations

1. The development agencies should actively work with BG mussel operators on the island of Ireland on the promotion of labelled IQM quality assured mussels into the Dutch-supplied marketplace.
2. The development agencies should engage in a market development programme for BG mussels from the island of Ireland in the French market place, including an awareness campaign and inward journalist visits.
3. That further investment is made in market research and intelligence.
4. That improved services for commercially focused Research and Development/New Product Development (NPD) be provided by the relevant agencies.



SECTION 4.0



4.0

ENVIRONMENT

4.1 Background to BG mussel culture and its management

This section provides an overview of an environmental assessment carried out by Poseidon-Aquatic Resource Management Ltd of the BG mussel culture industry throughout the island of Ireland. The full text of the environmental assessment is included in Appendix 3. The environmental assessment was conducted within the context of the existing series of agreements and cross-border mechanisms for the management of the sector, in particular the seed fishery. Regulation of the industry is complex and it is widely recognised that there is a need for further reform to produce a cohesive, all-island administrative system.

Environmental management is driven at a number of administrative levels. For example, at the EU and national level the Habitats Directive governs the creation and management of the Natura 2000 network, as well as the emerging marine spatial planning approach of both DAFF, and the proposed UK Marine Bill. At regional level, CLAMS is an all-island initiative to integrate coastal and bay aquaculture at local levels. Other relevant initiatives include the ECOPACT environmental management framework.

4.2 Key issues for environmental sustainability

The main environmental issues associated with BG mussel culture revolve around the collection of seed mussels, the carrying capacity of growing systems and the impacts on benthic environments.

The preferred source of seed is the sub-tidal seed mussel beds. Areas of possible concern include the potential impact on other species, possible by-catch from seed mussel fisheries and impacts on the seed mussel habitats themselves. There are also concerns about possible impacts on subsequent recruitment to seed beds; however assessing the level of these impacts requires further research.

Impacts associated with exploitation of the seed mussel resource can be addressed by making optimal use of the quantities obtained. This can be done by reducing mortalities so that the overall biomass demand is reduced, and by carefully timing harvesting to balance seed size (and therefore survivability) and loss of the seedbed to erosion and predation. In addition, there are opportunities to obtain seed mussels from rope-grown operations and hatchery operations, although these are constrained by economic and logistical considerations. The proposed code of practice (Section 6.3.3) and fishing schedule (Section 6.6) will promote sustainable distribution of seed resource.

In layman's terms, the carrying capacity of BG mussel areas can be described as the point where the food requirements of the mussels start to exceed the available feed supply. At present, carrying capacity may be declining due to improved on-land wastewater treatment as well as climate change and increasing sea water temperatures. A number of studies are underway to determine carrying capacity estimates, e.g. the SMILE project in NI and UISCE in RoI. To be effective, these models will require the input of accurate relaying, production and growth rate information. Such data will be collected as part of the proposed stock tracking system (Section 6.5).

Benthic ecosystems in the culture areas are modulated by the presence and density of mussels and by the harvesting mechanisms employed. Any associated environmental impact will of course depend upon the nature of the receiving environment and its communities. It is suggested that Carlingford Lough, Lough Foyle, Wexford Harbour and Castlemaine Harbour in particular deserve careful consideration of benthic impacts before mussel licensing is extended. Work in this regard has already been started by the regulatory authorities.

Other potential environmental issues include the introduction of pest species as a result of translocation of seed mussels. In other areas (e.g. in parts of the UK, France and the Netherlands) pests such as *Crepidula fornicata* have caused significant problems. Shellfish growers and the regulatory authorities on the island of Ireland are aware of the potential risk and are taking the necessary precautions. It should be noted that overall BG mussel culture has a limited range of potential impacts relative to other forms of aquaculture e.g. visual impact, site management issues etc.

4.3 Recommendations of the environmental assessment (Appendix 3)

A number of recommendations are made within the environmental assessments. The recommendations endorse the important ongoing environmental management initiatives within the sector and highlight areas for additional consideration.

4.3.1 Appropriate assessments

As the majority of BG mussel culture areas are located within or adjacent to Natura 2000 sites, licensing is subject to appropriate assessment in accordance with Article 6 of the Habitats Directive. In RoI, a protocol has been developed and is currently being finalised by DAFF. In NI, DARD has commissioned AFBI to undertake these assessments on all licensed and proposed shellfish farms.

Recommendation:

That the competent authorities continue the assessment process.

4.3.2 The regularisation of the industry in Lough Foyle

The primary legislation (Foyle and Carlingford Fisheries Order 2007) that extends the functions of the Loughs Agency to aquaculture licensing and the regulation of mussel and native oyster shellfisheries, has been enacted in both jurisdictions. The Loughs Agency is currently developing regulations to ensure the smooth introduction of a licensing regime in Lough Foyle. A Strategic Environmental Assessment (SEA) of aquaculture licensing and regulation of mussel and native oyster shellfisheries has also been initiated.

Recommendation:

That the Commencement Orders be introduced in 2008 to implement the new regime in Lough Foyle.

4.3.3 Management of pest species

There are already controls in place designed to prevent the introduction of pest species such as such as *Crepidula* and oyster drills. Such controls should continue and should be responsive to emerging threats. An important component of the management of pest species is structured communication between the industry and regulators. The 'invasive species in Ireland' project and its marine technical working group is seen as being the most appropriate mechanism for bringing this forward, as it strongly endorses such effective communication.

Recommendation:

That the existing range of safeguards with regard to the management of pest species are maintained.

4.3.4 Carrying capacity

It must be accepted that the 'carrying capacity' of a biological system is not a fixed point – it will vary depending on the timescale over which it is measured, as well as on oceanographic conditions prevailing at the time (date, duration and size of spring bloom, strength of summer thermal stratification if any, amount of wind-driven mixing etc.) and the number of variables considered in the model. Arising from the outputs of the SMILE and UISCE projects, a much better understanding will be reached about the carrying capacity of aquaculture areas around the island of Ireland. The results will enable improved science based planning and management decision making processes.

Recommendation:

That science based planning and management decision making processes be improved.

4.3.5 Data gaps and ongoing research

As with all areas of the marine environment, significant gaps exist in knowledge about some of the potential impacts of BG mussel culture. This situation is entirely understandable given that data on subtidal ecosystems and processes is difficult and expensive to gather. Some of the data gaps are now being addressed, for example with the various carrying capacity projects. Data gaps will also be addressed through the proposed stock tracking system (Section 6).

A lack of knowledge exists in key areas of industry management. In order to effectively address these gaps, research projects should be brought forward using a coordinated approach with a greater emphasis on industry engagement. Good data on the nature and dynamics of licensed areas will allow for more structured management of sites and for informed site-by-site seed allocations, ensuring the most efficient use of the seed resource. The proposed BGMCF is an ideal mechanism for the identification and prioritisation of key areas of applied research required by the sector.

More generally, the development of research partnerships between academic institutions, management agencies and the industry has been highly successful in other areas (Netherlands, England and Wales) in answering important research questions and addressing key management concerns. Investment by the industry in partial funding of research projects (either in cash or in kind – boat time etc.) can reap benefits in improved husbandry techniques, improved management and better relationships between the industry and management.

Recommendation:

Research projects should be brought forward using a coordinated approach with a greater emphasis on industry engagement.

4.3.6 ECOPACT, CLAMS and ICZM processes

The all-island CLAMS and ECOPACT initiatives allow for the successful integration of aquaculture into the wider realm of coastal zone management, addressing issues such as environmental compliance, product quality and consumer confidence. As part of its commitment to the sustainable development of the aquaculture industry, the CLAMS process facilitates the gathering and analysis of data in relation to fish farming. This data is then made available to the local community. In addition ECOPACT helps industry to work towards the highest achievable environmental standards and to produce a top quality product in a viable and efficient manner. It covers every aspect of aquaculture operations, from husbandry, to maintenance, and the interaction of farm related activities with the surrounding environment.

As is the case in most countries, the administrative structure for planning in the marine and coastal zone tends is currently rather fragmented. This makes proactive, integrated planning in marine areas difficult. Marine policy and legislation in both jurisdictions, as well as across the EU is moving in the direction of Integrated Coastal Zone Management. The CLAMS and ECOPACT initiatives are a significant step in the preparation of the aquaculture sector to positively engage in national ICZM structures.

Recommendation:

The ongoing development of the ECOPACT, CLAMS and ICZM processes.

4.3.7 Further environmental assessment

SEA is a process that aims to integrate environmental and sustainability considerations into strategic decision making by anticipating and addressing environmental effects of proposed plans and programmes. Given that the relevant national Seafood Operational Programmes for the period 2007-2013, which incorporate aquaculture development, require SEA, it is unlikely that additional SEA will have to be carried out at lower strategic levels of application. Ultimately, the requirement for SEA will depend on the management structures adopted by the BGMSRG and how these fit with the overall management of aquaculture on the island of Ireland. The proposed fishing schedules represent a restructuring and tightening of existing administrative procedures.

The structures proposed in this Review have been provisionally screened for the requirement for SEA and it is determined that as the fishing schedules are not required by legislative, regulatory or administrative provisions, an SEA is not needed (Appendix 5).

4.3.8 The use of intertidal areas to boost seed mussel productivity

Discussion

Given the current shortfall in seed supply, using intertidal areas as a potential technique to improve the survival of seed mussel through hardening and predator avoidance was considered in the environmental assessment. The most suitable areas would seem to be where there are large inaccessible intertidal areas of low conservation or fisheries value. Intertidal use could be particularly beneficial in areas where subtidal predation is problematic for the industry. If this practice is to be pursued by the sector, the question of licensing intertidal areas must be considered. A number of advantages and disadvantages are presented in the Environmental Assessment (Appendix 3), these are summarised below.

Advantages

The key advantage of intertidal sites is that it opens up areas that have significantly lower predation rates. When seed is placed directly in the subtidal, predation can be significant. Seed placed in the intertidal experiences much lower predation rates; since densities of invertebrate predators are much lower (more or less zero in the case of starfish) and the main vertebrate predators (birds) preferentially target larger mussels. Furthermore, seed placed in the intertidal, although it grows more slowly, develops a thicker shell which affords it some protection from invertebrate predators once it is moved into the subtidal. This coupled with the weaker shells associated with rope grown and hatchery stocks, highlights a key benefit of intertidal licensing to the sustainability of the industry.

A second advantage of using intertidal areas is that it provides an additional food source for intertidal feeding birds (mainly oystercatchers but perhaps also some other important species).

Disadvantages

The obvious disadvantage of using intertidal areas for mussel culture is that it exposes these areas to all the potential environmental problems associated with existing subtidal culture.

The visual impact of mussel culture in the intertidal is much more significant than for the subtidal. Generally this manifests itself as intertidal areas which look dark grey or black due to the mussels and the build-up of organic-rich mussel mud.

Mussel culture in intertidal areas runs the risk of 'privatisation' of the foreshore, which has historically and legally been freely accessible, subject to regulations governing, for example, protected areas.

Intertidal shellfish farming has the potential to create disturbance for species which use the intertidal. This is particularly important in the context of birds, and especially as many of the areas may be designated as SPAs.

Recommendation:

Further consideration and investigation of using intertidal areas to boost seed mussel productivity should be undertaken by the BGMCF in conjunction with the relevant authorities.

4.3.9 Site specific issues

Given the geographical spread of the industry around the island of Ireland there are a number of environmental issues that are specific to individual bays or growing areas. These issues are discussed in detail in the Environmental Assessment included in Appendix 3.

Recommendation:

That the existing and emerging issue in this regard should be addressed through the work of the proposed BGMCF (Section 6.0).

4.4 Summary of environmental recommendations

1. That the competent authorities continue the appropriate assessment process.
2. That the Commencement Orders be introduced in 2008 to implement the new regime in Lough Foyle.
3. That the existing range of safeguards, with regard to the management of pest species are maintained.
4. That science based planning and management decision making processes, be improved.
5. Research projects should be brought forward using a coordinated approach with a greater emphasis on industry engagement.
6. The ongoing development of the ECOPACT, CLAMS and ICZM processes.
7. Further consideration and investigation of using intertidal areas to boost seed mussel productivity should be undertaken by the BGMCF in conjunction with the relevant authorities.
8. That existing and emerging issue in individual growing areas be addressed through the work of the proposed BGMCF (Section 6.0).

4.5 Conclusion

Given that a number of the recommendations made by the independent review of the environmental sustainability of the BG grown mussel sector are already underway, it is clear that the industry is well aware of its interaction with the natural environment and is being proactive in the continual improvement of its environmental performance. Overall, the sector has a low environmental impact, especially in the areas of visual impact, noise, odour, water, landscape and material assets. Resource use (seed allocation) and ecological impacts (benthic impacts) require a greater level of understanding and this will be progressively addressed by the proposed tracking system (Section 6.5) and fishing schedule (Section 6.6). The more structured approach to the management of licensed areas and to seed allocations as laid out in the main recommendations of the Review will enhance the effectiveness of existing and new environmental management mechanisms thereby contributing to the sustainable development of the sector.



SECTION 5.0



5.0

THE CONSULTATION PROCESS – RESULTS AND ANALYSIS

It should be noted that the views expressed in this Section and Appendix 1 are those of the industry participants and not necessarily those of the Review Group or of the other contributing authors of the Review.

5.1 Introduction

Arising from its rapid expansion in recent years, the BG mussel sector currently dominates shellfish production, by volume, on the island of Ireland. With this success has come an increasing array of pressures and challenges, which this highly fragmented sector has struggled to deal with effectively. To capture the diversity of opinion and the current state-of-the-art an in-depth consultative exercise was undertaken amongst all the major stakeholder groups as set out in Section 1.3.

5.2 Industry consultation

The industry consultative phase of the Review served to identify the views of producers as to the main issues limiting the future sustainable development of their sector. Based on the responses received it was evident that a wide range of challenges exist. To manage the industry sessions effectively, the issues were split into six core themes and 26 sub-themes as outlined in the table below.

The results of the industry consultation are summarised below and the full report is attached as Appendix 1. For clarity and ease of reference, the summary report sub-sections are set out in the same order as that followed during the consultation meetings.

Table 6 Industry consultation meetings – discussion structure

Core themes	Sub themes
Markets	<ol style="list-style-type: none"> 1. Current market and price trends. 2. Market preferences. 3. Market threats. 4. Market access. 5. New market outlets and opportunities. 6. Innovation in packaging, new product forms and supply logistics. 7. Differentiation by quality and eco-labelling. 8. Co-operative marketing structure. 9. Enhanced marketing support.
Environment	<ol style="list-style-type: none"> 1. Discussed as a single issue.
Infrastructure	<ol style="list-style-type: none"> 1. Vessel funding. 2. Shore based.
Regulation	<ol style="list-style-type: none"> 1. Licensing – boats/COC implementation issues. 2. Black boxes. 3. Licensed sites. 4. Licence conditions. 5. Management structure/regulatory support. 6. Classification and biotoxin monitoring regimes.
Husbandry	<ol style="list-style-type: none"> 1. Overcrowding. 2. Code of Practice. 3. CLAMS.
Management of the seed resource	<ol style="list-style-type: none"> 1. Basis for a management programme. 2. Opening and closing of the seed mussel fishery. 3. Issues around the movement of seed mussel. 4. Surveying for seed mussel. 5. The economics and sustainability of using mussel spat collection techniques for sourcing seed.

5.2.1 Markets

5.2.1.1 Current market and price trends

The consultees reported that traditionally the market for BG grown mussels has been strong; this is thought to be as a direct result of the opening up of the Dutch market since the late 1990s. The fate of the BG mussel sector is inextricably linked to the BG mussel industry in the Netherlands. The main market is for bulk fresh produce, going through established processing facilities in the Netherlands.

It was felt that producers must learn to concentrate less on just producing volume and concentrate more on the production of higher quality output in order to obtain the best returns. This practice has already started, however all producers need to look at this as a way forward for the industry. A general lack of produce from Dutch producers is pushing prices up as their processors seek to fill the shortfalls in raw material supply.

5.2.1.2 Market preferences

It was reported that the Dutch market prefers larger, higher meat content mussels, while the French market will take smaller mussels at a lower price. The Belgian market also prefers larger mussels. The French market is also considered to be comparatively more stable in demand terms from year to year, but in 2006, established buyers in France received a reduced volume of mussels due to better prices offered in the Netherlands. It was felt that ideally a balance of production volume both to the Netherlands and France should be achieved, so as not to have an over reliance on one market.

5.2.1.3 Market threats

The producers felt that the markets are somewhat removed from the day-to-day experience of the industry on the island of Ireland as it is an export market. Undoubtedly the major identified threat is that of cheaper product from other countries entering the market and displacing output from the island of Ireland. They feared that cheaper products made possible by better growing conditions, combined with cheaper production costs, such as labour, from other countries may impact the market. The view was expressed that the Dutch are running the risk of pricing themselves out of the market. Chilean product was identified as posing a threat to the stability of the European mussel market place. Greece was also mentioned. Cheaper Greek produce is now allegedly feeding into the Dutch market, which is a hub for all produce from the island of Ireland and as such may be a future threat. It was pointed out that cooked product forms were vulnerable because they will be in competition with cooked product from low-cost countries such as Chile. Spanish mussels were perceived as being of lower quality than those from the island of Ireland but it was feared that if they are offered at a low enough price that they may substitute our mussels in the European market place. Fresh produce from Canada and Spain is not thought to be as appealing to the customer. The Spanish were reported to have broken into the market in Belgium. Over dependence on one market may leave mussel producers here exposed in the event of market instability arising from cheaper imports. An identified strength is that the mussels produced on the island of Ireland have the advantage of being similar in characteristic to the Dutch mussel, facilitating easy entry into the Dutch-supplied market.

It was acknowledged by the industry that the market is functioning well at the moment; however over dependence on one market could become an issue in the future. It was pointed out during the consultation stage that there is no way of predicting this. The French market is thought to offer something of a safety net if necessary.

5.2.1.4 Market access

The operators expressed the view that the majority of produce from the island of Ireland is tied into the Dutch market. Again the point was made that if this market experiences any difficulties in the future, it could have a profoundly negative impact on the industry. Producers must also look to the French market. A perceived problem identified with the French market is that producers are being 'ripped off' by buyers. It was observed that an agent to look after the interests of producers from the island of Ireland in France would be very useful in day-to-day marketing terms. Dutch buyers are seen as being more reliable when it comes to paying.

5.2.1.5 New market outlets and opportunities

There was a perception amongst the producers consulted that there are not enough mussels being produced to fill existing markets at present, let alone new markets. The sentiment was expressed that there is no point in making the effort to develop new markets if the mussels are not there for existing markets now. The opinion was expressed that what is needed first is good raw material supply. It was felt that it is necessary to concentrate on the production end first.

It was pointed out that at the moment the Belgian market is controlled by the Dutch. The Dutch control the distribution networks, but it is thought that they cannot continue to control the market much as before because times have changed. There is a market for produce from the island of Ireland in Belgium but the issues are meat consistency (25-28%) and consistency of supply. The view was expressed that there is no point in cultivating a market for 30% meats if you cannot give a regular supply. A role as additional raw material suppliers to augment the Dutch production was seen as best. If home markets developed, then a processing capability may be needed on the island of Ireland, as the shelf life issue would be overcome. There was a general perception expressed that it is comparatively more difficult doing business in Italy.

5.2.1.6 Innovation in packaging, new product forms and supply logistics

Processing capacity expansion and innovation by the industry on the island of Ireland was seen as being limited by travel time. The market for processed product is 30 hours away and as such, produce is at a disadvantage due to longer travel time and shorter shelf life. Modified Atmosphere Packaging (MAP) may offer possibilities to change this.

It was felt that a reduction in seed availability might encourage further investigation into the opportunities for processing at home. An investment in processing was perceived to be a very high-risk exercise. Good mussels are produced but distance to market was against us. It was proposed that to establish a base depot in mainland Europe would allow flexible supply to supermarkets and restaurants within four hours. It was noted however that the large companies in the Netherlands would probably resist entry from the island of Ireland to the European market, and would be likely to undercut processed produce to close the

door and protect their current dominant position. The view was also advanced that if more processing was to be established here, then the price paid would have to be right (i.e. high) for growers to want to supply it.

It was reported that produce has historically been sold as being Dutch and that there is little or no product identity. In fact it was said that identity associated with the island of Ireland has historically been a turn off as the Belgian customer is more comfortable with the familiar Dutch product. This is seen as a significant challenge (weakness) for the industry.

The point was made that price fluctuations are not so pronounced in supermarkets, they occur down the supply chain. It was noted that efforts should be made to expand the home markets, as they are easily accessible. Consumers are changing their attitude to fish and shellfish, and are now willing to pay a premium for it. There was a fear expressed that if processing were to commence on the island of Ireland, that a couple of large companies would control and dominate the market. Many of the producers stated that they currently would prefer to sell bulk product to the Netherlands as there is a good margin and a fast cash turn-around. There was a strong consensus that if further processing is going to work for the industry here, it will need to be done on a collective basis and receive economic support as its processed product first enters the market place and has to battle with the established players.

5.2.1.7 Differentiation by quality and eco-labelling

The market was perceived as being quality driven but not in a formal way. Meat yields were seen as paramount and it was noted that yields are subject to variation due to environmental conditions. It was considered that a quality based labelling scheme would be of value to the industry, particularly as a means of identifying producers as being from the island of Ireland. This would also have the added benefit of limiting market access to unregulated, unregistered producers who may possibly have a harmful impact on the reputation of the established industry players. Traceability was thought to be important. A labelling scheme such as the new 'traffic light system' that promotes the health benefits of the product was also suggested as possibly having application for mussels.

Branding and selling produce as coming from the island of Ireland and or from a specific area, e.g. Wexford Mussels in Wexford and Carlingford Lough Mussels in Carlingford Lough, in local restaurants were seen as a good idea.

5.2.1.8 Cooperative marketing structures

The general view expressed was that producers prefer to sell their own produce. The indications were that Irish producers currently do not see much value in co-operative selling. Traditionally it has been up to every company to sell their own produce and that is the system that the operators were used to. Generally Irish producers did not like the idea of co-operative selling. It was felt that there was a risk that higher quality product would be disadvantaged by inferior product if the overall production was sold collectively.

5.2.1.9 *Enhanced marketing support*

It was agreed that further research into possible opportunities within the broader European market was needed. More market intelligence would allow producers to sell their product into new markets with confidence.

5.2.2 **Environment**

A number of agencies and groups were consulted with regard to the environmental aspects of the BG mussel sector in Ireland. Their views and comments are summarised in Section 4 and the full results of the consultation are included in Appendix 3.

5.2.3 **Infrastructure**

Consultation with the industry highlighted a range of infrastructural deficits that are perceived to be restricting the sustainable development of the industry.

5.2.3.1 *Vessels*

An opinion expressed at all meetings was that the mussel fleet needs further investment, and that financial assistance should be available to modernise/replace fleet while not contravening EC rules. There were a range of opinions expressed as to what sorts of boats are needed by the industry and who should be eligible for funding.

5.2.3.2 *Shore based*

At all meetings there was consensus that urgent need existed for dedicated landing facilities in every major growing area. Current facilities at Belfast Lough, Foyle, Swilly, Cromane and Wexford are not fit for purpose and pose massive safety concerns.

The facilities needed include:

1. Piers that are accessible at all stage of the tide.
2. Storage facilities for the various companies.
3. Lighting/mains electricity.
4. Cranes.
5. Waste facilities.
6. Decent access roads.

There is also frustration in a number of areas that commitments have been given to provide facilities but have not yet been built, e.g. Cromane and Greencastle.

5.2.4 Regulation

It was agreed at all meetings that if the mussel industry is to be managed on an all-island basis, then any regulatory system must also be implemented equally across the whole island.

5.2.4.1 *Licensing – boats/COC implementation issues*

In two of the meetings, a strong opinion was put forward that fishing vessel licensing was a major issue. Some producers questioned the classification of the BG mussel sector as aquaculture in EU terms, and if it is classed as such, why their boats were classed as fishing vessels and not as aquaculture service vessels.

COC implementation is also of major concern to the industry and the belief exists that it needs to be equally applied to all of the industry across the island of Ireland and in particular that inequalities in the interpretation of the Torremolinos Protocol should be ironed out between the relevant regulatory authorities across the two jurisdictions.

5.2.4.2 *Black boxes*

The industry is of the opinion that all boats licensed to fish for shellfish with a dredge should have to install a black box, regardless of the vessel size. Other views presented included the contention that the technology must be robust enough to assist enforcement. This view was put forward in the context of preventing theft or 'poaching' of mussels from licensed aquaculture sites by inshore fishing vessels.

5.2.4.3 *Licensed sites*

This was a topic that generated a wide-ranging discussion at all the consultative meetings. There was agreement in all areas that currently there is inadequate protection for stock on licensed sites, which was regarded as an unacceptable situation. The producers felt that neither the police nor the government departments were clear on where the responsibility and role for the protection of their property lay.

Another point where consensus was reached is the idea that ground that is already licensed must be used, and thus the 'use it or lose it' clause should be invoked by the relevant authorities. In the producers' view, such ground or an equivalent hectareage should then be made available to other operators, rather than being just being revoked and lost to the industry.

Other opinions expressed included the idea that ground that was the subject of repeated spat-falls should not be licensed for on-growing and that consideration should be given to taking back ground (for common exploitation) that showed this characteristic.

With regard to the number of licences currently issued and whether more should be granted, in some areas a minority of producers felt that further expansion (i.e. granting of more licences) was justified to allow new entrants. Others felt that too many people were already trying to exploit the existing seed resource and that no more on-growing licences should be issued until alternative seed resources have been found. In some cases it was suggested that it may be appropriate to licence ground for on-growing and husbandry reasons, but this extra ground should be decoupled from any rights or expectation to seed access in the Irish Sea. In that context, the view was expressed that seed availability should not always

restrict the granting of further licences as there are other reasons for wanting new ground, such as predator control, stock rotation etc., and that the 'system' should retain sufficient flexibility to cater for these needs.

5.2.4.4 Licence conditions

The industry contended at the consultative meetings that licences should have a minimum duration of 20 years, to allow for a return on investment and for the licences to have a value as collateral. This was seen as being especially important when dealing with financial institutions while attempting to raise working capital. There was also support for the idea that a 'good neighbour' clause should be placed in all BG mussel aquaculture licences to incentivise pro-bono actions, such as cooperative predator control.

Some of the other opinions expressed were that producers who break the rules governing the industry should be subject to penalties in the form of fines or a restriction in their seed mussel allocation. Also, if someone is given a licence to farm mussels they should really be a farmer and not a speculator. Thus it was felt that they should be able to demonstrate their bona fides by being able to show that they had the ability to do the job, and that they should be prepared to pledge the necessary resources as proof of their real intent.

5.2.4.5 Management structure/regulatory support

Views on the regulatory support to the industry varied significantly from area to area. When the possible future management structure was discussed however, there was consensus amongst all the consultees that:

- There should be a single expert body empowered to regulate the day-to-day operation of the industry.
- There should be a strong emphasis on enforcement otherwise any arrangements would be worthless.
- The management regime should be even handed, and should have a *modus-operandi* of active engagement with the industry.
- Inter-jurisdictional differences are seen as serious problem as they lead to inconsistencies in regulation and control effort. The view was put forward that there should be a single unified management model for the whole island, going forward.
- Personnel employed in the management regime should have an in-depth understanding of the industry. It was seen as counterproductive to the development of the industry that knowledgeable people in the government departments move every few years.
- An all-island producer organisation with 'extension of discipline' type powers could work, if it is given a lot of support and assistance in its early stages. But it was felt that movement towards this system should be gradual. It would have to be a step by step process and built up over time as trust develops.
- As a first stage a producer representative organisation could serve as a central contact point and represent the industry position in key fora.

- There was consensus that self-regulation should happen, but not in the immediate future. There should be some immediate changes to improve operational efficiency and a longer-term plan should be developed in parallel. This approach would allow for a mix of State-led regulation with a phased transition to a greater degree of industry self-regulation over time.
- There are too many vested interests for a PO to work in the short-term. The departments should retain control in the meantime, but they need to manage the industry more effectively through consistent enforcement, otherwise it will turn into a 'free for all'.
- There are too many regulatory bodies. The industry should ideally be managed by one coordinating organisation and the industry should be represented on that organisation as a first stage in moving towards self-regulation.

5.2.4.6 *Classification and biotoxin monitoring regimes*

This was a topic that elicited broadly similar views at the consultative meetings across the country. In Carlingford and Foyle it was strongly felt that the jurisdictional differences in the classification systems was a problem for the industry. Producers are more in favour of the NI system where individual sites are classified rather than whole bays. This was somewhat mirrored in the rest of the island where producers believe that a greater subdivision in sampling areas and increased sampling would lead to a greater number of 'A' areas with regard to microbial classification and that this would be beneficial from a market access point of view.

The biotoxin-monitoring regime is not currently viewed as a major issue, but it could be in the future if prolonged closures become a feature, as has happened for the rope mussel sector.

5.2.5 Husbandry

5.2.5.1 *Overcrowding*

The industry recognises that overcrowding and a consequent reduction in growth rates was a production risk for any area. Nevertheless it was felt that day-to-day, operators themselves would see the effects of this before anyone else and be able to respond accordingly by reducing stocking density. Thus they did not want to see the introduction of a standard stocking rate as there was, in their view, too much variability between sites to make such a standard meaningful and that they preferred to rely on local knowledge.

A fear was expressed that the process of estimating carrying capacity might be used to unfairly restrict the BG mussel industry by imposing unrealistic stocking limits. The view was advanced that this issue was also being addressed by new working practices, as current thinking within the industry was that a greater return could be achieved by laying less seed per hectare, yielding larger meats from a smaller volume of seed and achieving the top price for the produce.

5.2.5.2 Code of Practice

The idea of a Code of Practice was met with varying levels of support; some industry members felt that it was a brilliant idea for the advancement of the industry, others were less enthusiastic and highlighted the difficulties in developing such a code given the fragmentation within the industry. Historically it has been shown that it is very difficult for producers to work together and a small group of people invariably end up doing all the work. Nevertheless all the operators could see the value of the approach and were prepared to participate to a greater or lesser degree.

Interestingly there was unanimity about the need for a code; the contention surrounding the issue stemmed from anxiety as to the complexity of the task not its desirability.

There was agreement that areas where a Code of Practice could address would include, inter-alia: cooperative predator control; safe vessel operations; dredge sizes; stowage of dredges while on passage; waste disposal and environmentally-friendly operations. A Code of Practice was also supported as a way of presenting the industry in a favourable light during discussions with the public and environmental interests. It was felt that educating the public and environmental groups about such work practices and products would help to protect the industry in the longer-term.

5.2.5.3 CLAMS

There was strong agreement that the CLAMS process does help the image of the industry and that it does serve as a valuable contact point between the industry and other stakeholders, particularly those with negative view of the sector. But to leverage the maximum value, the consultees felt that it should be promoted and supported more by the Government Agencies, in order to make other stakeholders more aware of the point of contact and the good work being done by the CLAMS groups. There was a unanimous view that the process should also be extended to cover aquaculture operators in the Foyle.

5.2.6 Management of the seed resource

5.2.6.1 Overview

The key-limiting factor for BG mussel culture in the eyes of the industry is a shortage of seed mussels. The industry relies on a consistent settlement of mussel spat to provide seed that is then relayed and on-grown on licensed sites. Unfortunately the settlement of mussel seed varies from year to year in an unpredictable fashion (as regards volume, location and timing of settlement). Good scientific information on the volume, source, location and causes of variability of mussel recruitment in the northern and southern Irish Sea as well as within the sea Loughs is very limited; indeed the industry would contend that the real volume of the seed resource is not being accurately estimated and that current data is heavily distorted and unreliable. This paucity of scientific data makes informed decision-making about seed harvesting difficult (Gascoigne & Huntington, 2007). This has led to increasing frustration among the industry and the regulatory authorities with the lack of an agreed, knowledge based management system.

As was to be expected this was the topic that produced the most varied and lengthy discussions during the consultation exercise. Opinions expressed were too varied to present in full in this section of the main report but can be viewed in the complete consultation report in Appendix 1.

5.2.6.2 *Basis for a management programme*

There was a heated debate around this topic; however there were some areas where the industry was in agreement, and these are outlined below:

- Any management system should be based on reliable data, not on the current reported information, which was likely to be of poor quality.
- Seed which falls within Loughs (i.e. Swilly and Foyle) should be fished by licence /plot holders in those Loughs and should remain within the Loughs in question to maximise survival and output. It was contended that such a policy would give smaller producers with smaller vessels more of a fair chance. The concept also helps to avoid perceived inequalities in the current system which some members of the industry believe is favouring the large companies, who had the capability and vessels to fish the 'open sea' spat falls more efficiently. This view was qualified by the condition that if 'locally falling' seed was kept in those local area, then that the amount sourced should be offset against any 'open sea' allocation, which those operators might be given in that or a subsequent season.
- Loss of seed, through misuse, predation before fishing, or poor transportation was seen by all as a major issue. The sentiment was that the demand for seed would not be so high if people were incentivised to make the best use of what they got rather than obsessing on trying to get ever greater allocations and then losing the seed.
- The current quota or 'allocation' system was not seen as having been successful or even very useful. The view was repeatedly put forward that even if no quota system at all had been in place over the last number of years, then the actual results would have been the same regardless. This view was founded on the stated belief that the sector was really in a 'free for all' situation and that effective monitoring of what was being actually fished has not been carried out.
- There was unanimity around the view that whatever system is eventually adopted, that it will need to be transparent, and applied even-handedly. The call was for everyone to have access to the same information and have to abide by the same rules.
- Reliable tracking and recording of seed mussel after relaying is vital and real progress will not be possible until an accurate system is devised and introduced. The advent of such a system would facilitate a positive situation whereby farmers get rewarded for good performance in terms of the seed quota, which they are allocated on an on-going basis.

5.2.6.3 Opening and closing of the seed mussel fishery

This is an issue that producers feel is restricting both the sustainable development of the industry, the economic viability of the industry and the quality of life and safety of operators. The lack of a defined opening and closing times, prevent any scheduled maintenance of vessels during five months of the year, and also restricts producers in planning any activities apart from seed fishing for those five months. It also places a demand on dredger owners to have their full crews on constant standby in case of a bed being opened which is a major financial drain.

The development of a scientific all-island protocol for the assessment of seed readiness is of vital importance to the industry. This protocol should be equally applied across the whole island. In the development of such a protocol the variable survival characteristics of seed from different areas must be considered as must the appropriate response to predation on the seed beds and the occurrence of adverse weather conditions. To facilitate industry confidence in the regulatory structure the industry should have more of an input into the assessment of the 'readiness to fish' of the seed resource.

5.2.6.4 Issues around the movement of seed mussel

There was one major area of consensus and that was that the key characteristic of any future inspection regime be seen to be, even handed. An issue where there is a striking geographic divide in the opinions expressed is that of the movement of seed by road. In some meetings it was felt that it should be left up to individual operators to assess the logistics of the various transport options around seed mussel movement after fishing (i.e. road vs. sea-transport). At another meeting a diametrically opposing view was put forward and it was contended that summertime transportation of seed from the Irish Sea to other areas by lorry does not work and indeed can result in up to 90% seed mortality during transport.

With regard to the regulation of mussel movements, the industry highlighted difficulties with the health certification process. To comply with the necessity for health certification between the RoI and NI, producers reported that it can be difficult to get inspectors to sign off on the certification of seed.

There were also calls for the development of a standardised, accurate system for evaluating the 'fished seed' capacity of each boat. Currently an estimated 'flat load' approach is being used and it was felt that this is very inaccurate and arbitrary. If seed volume is to be used as the starting point in any management tool, then it will need to be sorted out quickly so as not to base the system on meaningless data.

5.2.6.5 Surveying for seed mussel

There is a belief that current arrangements for seed mussel surveying are inadequate. There was general agreement that there should be an organised all-island systematic approach to seed mussel surveying. Grid searches should be coordinated in both the bays and in the 'open waters' fishery. This effort should be coordinated by the departments, or agents acting on their behalf. All of the industry seeking seed allocation should have to contribute to the surveying effort, either financially or via a contribution in ship time. If licence holders do not have boats then they should contribute financially to assist those who are using their boats to carry out the survey. If such a central system is developed then it will have to be seen to be transparent and everyone should have access to all the available information at the same time. There were also calls for the creation of an all-island body that is independent of the industry that would have the expertise and resources to search for seed, to assess seed beds and to police the fishery.

5.2.6.6 *The economics and sustainability of using mussel spat collection techniques for sourcing seed*

This is a topic that has been subject to both scientific and industry trials. The industry view is that it is working well in some areas, but the cost of the operation may be a problem. At current market prices for BG mussels it would be worth paying €500/Stg £325 per tonne but if prices fall back, the maximum that producers could afford to pay would be €250-€300 (Stg £163-195) per tonne. Rope seed could be a useful supplementary seed source that has the added bonus of being accepted as a sustainable; however the industry is and will be predominantly reliant on the wild seed beds for the foreseeable future.

5.3 Other consultees

This section serves to give a broad overview of the responses received from the regulators, and representatives of other fisheries. Minutes and the full text of consultations received are included in Appendix 1. Also addressed are the challenges the industry must respond to, in order to develop with the good will of regulators and other stakeholders.

5.3.1 Regulators

Representatives of the Review Group and the Secretariat met separately with both the SFPA in the RoI and DARD – Fisheries Inspectorate in NI. It was felt that there is an effective working relationship between these two bodies and indeed the regulators areas of concern with the mussel industry are broadly similar in both jurisdictions. There is recognition by the regulators that on occasions the relationship with the industry has been difficult. Both control agencies expressed the view that there needs to be a shift in the operating culture of the industry towards greater regulatory compliance. It was felt that operators had failed to fully grasp the fact that they are subject to the full rigors of EU and national fisheries legislation.

In both jurisdictions there are a number of instruments used in an attempt to track seed e.g. black boxes, log sheets, gatherers documents, movement documents and annual returns, however it was acknowledged that systems have not always delivered the desired outcome. It was agreed that any management system must be based on timely accurate data and that the volume of seed fished by individuals and the destination of that seed is the foundation of the industry, and thus must be successfully measured and tracked. Thus it was acknowledged by both bodies that there is a need for the development of such a system on an all-island basis.

The difficulties with the logistics of the health certification system were acknowledged in both jurisdictions but there appears to be no easy solution to this problem. Health certification is necessary to comply with EU legislation yet there are difficulties with physically assessing loads of mussels in dredgers. It was agreed that there is a need for further discussions between the competent authorities with a view to developing a more practical and user friendly system that still complies with the relevant national and EU legislation.

The view was advanced that seed exploitation must be balanced with nature conservation. It was acknowledged that ensuring the sustainable exploitation of the seed resource is currently hindered by a lack of reliable scientific knowledge as to the dynamics of seed settlement and as to the overall volume of stock and broodstock on the ground. Both bodies felt that there needs to be tighter control over the surveying for seed mussel, to prevent surveying turning into exploitation and that a rational mechanism for coordinating the surveying effort must be established with the approval of the relevant authorities.

It is felt that the industry needed to take a more responsible attitude towards its interactions with other commercial fisheries interests in order to minimise potential conflicts.

There was agreement from the control bodies that the legislation currently governing the fishing and aquaculture industries offered sufficient powers to enable the creation of mandatory reporting arrangements and the imposition of sanctions in the event of failure to comply.

Other areas of discussion included the potential establishment of a producer organisation, conflicts with other fishing interests, aquaculture licences, the seed fishery and control techniques.

5.3.2 Representations from other fisheries interests

The overriding principle of the submissions made by the various fishery representatives is that the regulators of the BG mussel aquaculture industry and the industry itself must recognise and respect the rights of other fishery stakeholders. This logical contention is set against a background of historical conflict between the BG mussel industry and those involved in wild oyster/mussel fisheries and pot fisheries. This has led to a loss of good will, which could unnecessarily restrict the ongoing development of the BG mussel sector.

5.3.2.1 Native oyster fishery in Lough Swilly and Lough Foyle

The fishermen consulted felt that no aquaculture should take place within the limits of an oyster bed or oyster fishery. This is a principle that is supported by existing legislation yet there is a belief that historically there has been inadequate protection for oyster beds principally because the law is not being enforced. The fishermen contended that historical data should be available as to the location of the beds but they felt that this may have been disregarded or overlooked by the Departments on some occasions. They called for resource maps to be produced to an agreed protocol and endorsed by all stakeholders and regulators as a matter of urgency.

They also felt that no mussel fishing should be conducted on 'oyster ground'. If a mussel spat fall does occur on oyster ground, then they contended that the 'smaller vessels of the public fishery' should be the ones to clear it off. This, they argued, would ensure that the resource was not wasted and that the integrity of the oyster bed would not be damaged, as could happen with larger gear.

It should be noted that while this idea could be supported from the viewpoint of protecting the structure of a native oyster bed, it does open up the issue of members of a public fishery getting into the business of relaying or selling seed mussel, which is something they are not currently legally entitled to do.

5.3.2.2 Wild mussel fisheries in Lough Foyle and Carlingford Lough

The fishermen consulted made the point that this sector of the mussel industry is locally based, providing local employment and feeding money back into the local economy. They pointed out that if the wild fishery comes under 'further pressure' there is no other source of produce or livelihood for those involved. The fishermen do not object to aquaculture but they have a strong feeling that aquaculture operations have restricted their activities.

The fishermen contend that they are being unfairly restricted by not being allowed to relay seed or sell seed. This is a particular area of resentment against the aquaculture industry as it is felt that the big boats have too much freedom to remove seed from the Loughs and also to sell seed mussel. There is also a view that the seed mussel fishery is not adequately regulated. They contend that community ground should be designated in both Foyle and Carlingford and they should be allowed to fish seed and place it on this ground.

There is belief that the majority of problems can be addressed, but any decisions must be based on accurate surveys of both Foyle and Carlingford. The operators expressed some disagreement with the results of some recent surveys and contended that there must be greater liaison between the regulatory authorities and fishermen in the conduct of surveys so as to obtain trust in the results.

5.3.2.3 The experience in the Netherlands

Mussel production in the Netherlands is carried out in the Wadden Sea and the Oosterschelde estuary on leased plots, which are 7,672 hectares in size. In the Wadden Sea there are 494 plots, with the total usable ground being approximately 3,394 hectares. In the Oosterschelde estuary there is a further 317 plots, contributing a further 3,875 hectares, of which 1,997 is suitable for mussel culture. The lease areas are exploited by approximately 55 farmers (80 vessels) and controlled by the government. All transactions between mussel farmers and mussel traders are handled at the Yerseke mussel auction, by the mussel section of the Dutch Fish Product Board. Mussel farmers are organised in regional fishery organisations and they are also members of the Mussel Producers Organisation that was founded under the conditions contained within EU law.

The Dutch government role

The Ministry with responsibility for the mussel industry in the Netherlands is the Ministry of Agriculture, Nature and Food Quality. The Department of Fish is a section of the above ministry and operates its functions in accordance with a policy of aiming to support and expand a responsible fishery based on the principles of sustainability. In implementing this policy the focus is on the distribution of responsibilities in fisheries between the industry and the government and on the relationship between fisheries and nature.

Government/Industry liaison

The Dutch fishing industry is well organized. Fishermen, fish and shellfish farmers, fish processors, wholesalers and retailers, all have their own interest organisation, but in addition are also united in the Dutch Fish Product Board. Together they seek to develop a fisheries sector that lives up to its responsibilities, produces high-quality products, is economically sound and successfully faces competition on the international market.

The board operates in the area where industry and policy meet. Wishes and ideas from the industry are communicated to civil servants and politicians, to the press and to the public at large, and vice versa.

The Dutch Mussel Industry Producers Organisation

The PO plays a key role in the organisation of the market for mussels and in managing the wild seedbeds. Within the framework of governmental and EU policy, the PO organises the seed mussel fishery according to an overall management policy and annual fishing plans. The plans contain a series of measures for controlling the fishery in time and space. Vessels participating in the fishery must have a black box installed. The output from black boxes is regularly monitored. If required, the PO can impose penalties for infringements.

The PO regulations laid down in the general assembly are binding for all members and in return the PO offers several facilities that are profitable for the industry. The PO is the competent organisation in taking measures to ensure the proper management of quotas and the authority of the PO cannot easily be questioned. In establishing the PO, agreements were made for the seed mussel fishery concerning individual quotas; the period of seed fishing; closure of areas; obligations of participants; supervisions during the spat fishery and penalties and offences under the regulations.

5.4 SWOT analysis

5.4.1 Overview

To this point, the Review has given a broad description of the current status of the BG mussel industry on the island of Ireland. Before attempting to make recommendations for the management of the industry, it may help to summarise important findings in the form of a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis for the mussel industry.

Strength	Weakness
<ul style="list-style-type: none"> ■ High value, high quality product from the island of Ireland. ■ Strong market demand. ■ Good consumer perception. ■ Skilled workforce. ■ Good seed supply. ■ Optimum grow out sites. ■ Strong agency support. 	<ul style="list-style-type: none"> ■ Low production efficiency. ■ Single industry operating under two different regulatory regimes. ■ Fragmented and frustrated industry. ■ Lack of scientific consensus in key areas. ■ Gross lack of systematic data. ■ Lack of consistency in control and enforcement. ■ Lack of industry involvement in decision making.
Opportunity	Threats
<ul style="list-style-type: none"> ■ Worldwide drive to increase aquaculture output. ■ Environmentally friendly production system. ■ New markets. ■ Capitalise on perceived health benefits of eating seafood. ■ Untapped potential. 	<ul style="list-style-type: none"> ■ Ecological sustainability increasingly regarded as outweighing, social and economic sustainability. ■ Further Industry fragmentation. ■ Biotoxins and possible deterioration in inshore water quality. ■ Cheaper third country imports.

5.4.2 SWOT conclusions

In 'strength terms', the BG mussel operators are currently the most successful of all aquaculture producers on the island of Ireland, in terms of achieving the planned output expansion over the 2000 to 2006 development period. By-and-large they are a skilled and knowledgeable group of people, some of whom have been farming mussels for over thirty years.

The dredger fleet has been largely modernised in recent years giving the operators who invested in new vessels additional steaming and fishing capability. In addition the sector has a number of natural advantages in comparison to other sectors of the fishing industry. The seed mussel resource is not currently constrained by EU TAC or quota, it is found in relatively big volumes year on year, and by and large in the same localities. These characteristics combined with the traditional expertise have enabled the sector to thrive.

Producing a product that is in increasing demand is a definite strength and that is the situation that the BG mussel producers currently find themselves. The European market for BG mussels is undersupplied. The European consumer is health conscious and increasingly well off and this offers a bright and lucrative future for producers of this seafood. Thus it may be seen that there are opportunities for further growth and increased profitability.

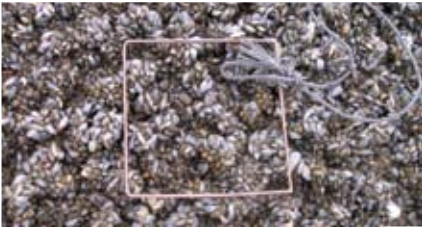
To actually realise such opportunities however, identified weaknesses within the industry must be addressed and remedied. Low production efficiency caused by high losses during fishing, transport, relaying and grow-out are costing the industry a significant amount annually and making it uncompetitive in unit cost terms. This lack of competitiveness is probably being masked by the high prices currently being paid for BG mussels. It would become a very significant issue if and when prices drop. The fact that two different regulatory regimes are administering the industry also leads to frustration both for regulators and within the industry itself. Indeed in recent times this factor alone has probably caused more dissent in the BG mussel sector than any other issue.

Threats to the sector are numerous and the operators and agencies need to be more aware of them and to plan to mitigate their likely impact. The compliance burden is increasing, particularly arising from EU environmental legislation. Dealing effectively with these legislative imperatives, such that they do not unnecessarily disrupt industry is an important issue.

The current degree of industry fragmentation is seen as a serious threat to the sector. Biotoxins that to date have not caused any problems for the BG mussel sector are a possible threat; for example, the rope mussel sector has suffered enormously as a result of bay closures.

Low cost producers such as the Chileans, who are currently supplying processed product to the market place, can be seen as posing a threat to the market in general by producing large volumes of product at comparatively low price. While the BG mussel suppliers on the island of Ireland operate in the fresh market, it could be that consumers might possibly switch to processed product if it was advertised heavily and the price was sufficiently attractive.

SECTION 6.0



6.0

RECOMMENDATIONS FOR THE ADMINISTRATIVE ARRANGEMENTS FOR THE BG MUSSEL SECTOR ON THE ISLAND OF IRELAND IN 2008 AND BEYOND

6.1 Introduction

Arising from the consultative process and learning from the experiences of the long established Dutch industry, there is a strong consensus that the administrative arrangements employed to support the Irish BG mussel sector require a radical restructuring. The clear conclusion of the SWOT analysis is that the current set of arrangements is not satisfactory. The sector is fragmented and there is a requirement for a higher level of administrative resource than is currently available. This set of circumstances is not surprising, given the complex inter-jurisdictional nature of the industry and its recent rapid expansion.

The consultation process yielded some key areas of consensus amongst the industry participants. They were prepared to accept a higher degree of regulation and also stated that they were willing to pay a contribution towards the cost of establishing a new regime. Their only real proviso in this regard was that any new system would be applied to everyone in an identical manner across all of the jurisdictions and that there would be transparency with a reasonable degree of industry participation.

The Review Group also makes the observation that the current situation is not sustainable. There is an imbalance at the core of the current system, where the unrealistic demand for wild seed mussel allocation, far above the real availability, is leading to an overemphasis being placed by the operators on the seed mussel fishery element of the business. As a consequence, not enough attention is being directed towards the rest of the production process and the use of the scarce seed mussel resource is not being optimised.

In order to address these basic shortcomings in the current structures, the Review Group adopted a radical approach. In this Section, having reviewed the outcomes of the consultation process and drawing from international best practice, the Review Group makes a number of recommendations which are intended to fundamentally transform the governance of the sector.

6.2 Overview of the proposed new arrangements

For the BG mussel sector on the island of Ireland to be competitive and sustainable there is general agreement that the end product of any restructuring should result in a set of arrangements and practices with the following characteristics:

- An all-island management regime (for both seed mussel fishing and the subsequent on-growing) that tracks the fate and performance of all stocks from the point of seed collection to sale of the end product.
- Over time, the system should give preferential access to the wild seed mussel resource to those operators who are shown to make best use of it, as defined by the guiding policy set out in the terms of reference of this Review. Thus, the annual allocation of seed mussel fishing permissions will need to be influenced by an incentive based system that rewards good practice and high productivity in the on-growing of seed mussel on licensed aquaculture plots.
- The terms and conditions of the management regime together with its operation should be transparent and enforced consistently and predictably across the whole island, notwithstanding the fact that there is more than one legal jurisdiction in operation.
- The management regime's decision-making processes should involve all the key industry stakeholders in an appropriate way; be knowledge based and market-led; commercially aware and environmentally sustainable.

- The revised arrangements should be in line with modern regulatory best practice and involve self-declaration by the operators underpinned by appropriate surveillance and audit with commensurate incentives and penalties that are clear, proportionate and consistently applied.

6.3 Discussion and recommendations to achieve management goals

6.3.1 Structural changes

It is clear both from the viewpoint of the regulators and from the operators' perspective, that the current fragmented state of the sector make it neigh impossible to manage with any acceptable degree of consensus. Self-evidently, an industry-led structure is required to provide an organised and disciplined articulation mechanism through which the regulators and policy makers can interact appropriately with the operators in the sector.

In the Netherlands this structure takes the form of a duly constituted Producer Organisation (PO). The proposition of forming an BG Mussel PO on the island of Ireland was put to the operators during the consultation phase and although the reaction was favourable in principle, there was a clear consensus that the sector was not seen as being sufficiently mature and that there was not enough 'trust in the system or each other' to form a PO immediately. Thus, the Review Group recommends the formation of an interim body, characterised by wide participation and initial government support, which could be readily converted into a fully fledged PO at a point in the future when there is sufficient consensus that the time is right.

Recommendation:

Immediately form the all-Island BG Mussel Consultative Forum (BGMCF) (The recommended timeline and approach for the formation of the BGMCF is set out in Section 7).

6.3.2 Structure of the BGMCF

It is recommended that the BGMCF should be an inclusive industry management body where policy, regulation and industry meet and interact meaningfully. To be effective, the BGMCF must have access to a continuous stream of accurate information and be properly serviced in administrative terms.

The Review Group recommends the following forum membership: regional industry representatives; IFA-Aquaculture and nominees from both departments and the Loughs Agency. Given its role as the development agency for the RoI, BIM should also attend. The forum will operate under an honorary chairman jointly agreed and appointed by the ministers from both jurisdictions.

Industry membership to the forum will be on a bay-by-bay basis, with members being invited to attend from Cromane, Waterford/Wexford, Carlingford/Dundrum, Belfast/Larne, Foyle and Swilly. The regional industry members of the forum and a deputy will be elected by a secret ballot of the licence holders within the individual bays on the basis of one licence, one vote. Industry members of the forum will hold the position for a period of three years.

From the SWOT analysis it is clear there is a lack of dedicated resources and personnel servicing the detailed administrative needs of the sector, and it was proposed to address this shortfall by the creation of a full-time professional Secretariat to service both the BGMCF and the sector generally. The Secretariat will collect, collate, analyse and disseminate all relevant information generated by the proposed stock tracking system (Section 6.5) in accordance with the requirements of data protection legislation. Thus it will operate in a confidential manner, protecting commercially sensitive information and providing key independent reports to both Departments, the Loughs Agency and as appropriate, industry elements of the BGMCF.

Recommendation:

That a dedicated Secretariat be formed immediately to service the sector and the BGMCF.

It is proposed that the Secretariat will provide an additional administrative and organisational capability and it will be the source of accurate stock performance data into the future. Although operating under the aegis of the BGMCF, it is envisaged by the Review Group that the Secretariat will operate to an explicit service contract negotiated with both Departments and the Loughs Agency.

The establishment of the Secretariat will require financial resources and the Review Group recommends that it be principally funded through a cost recovery process. Consequently the authorities in both jurisdictions will investigate the appropriate legislative basis to underpin this process. It is envisaged that the basis of the calculation of this fee may be associated with the amount of quota allocated. In its start-up phase, it may also be possible, under the EFF, for the governments in both jurisdictions to support the establishment of the BGMCF and its Secretariat by way of appropriate grant aid.

Recommendation:

That the feasibility of the introduction of a cost recovery scheme be investigated by the government departments, in the context of issuing seed mussel fishing permits and that any revenue generated be deployed to fund the activities of the BGMCF and its secretariat.

Apart from raising the necessary finance to cover the costs of an enhanced administration system, having a volume-related administrative fee will also discourage operators from seeking unrealistic tonnages in their annual allocations of seed mussel.

Given its unique position as an inter-jurisdictional aquaculture facilitation body, the Review Group recommends that the Aquaculture Initiative EEIG be tasked, at least in the first instance, with providing the Secretariat function using a modern public sector service contract as a template.

Such an approach will save time and allow the BGMCF to be formed and become operational immediately, without the need to establish any new legal, corporate or accounting structures. This will facilitate the objective of having the recommended new arrangements in place for the 2008 seed mussel fishery season. Over time, as the BGMCF heads towards the point of ultimately turning itself into a fully fledged PO, a further legal entity with an appropriate corporate structure can be developed in light of the experience which will have been gained in the interim.

Recommendation:

That the Aquaculture Initiative EEIG in the first instance, be tasked with providing the Secretariat function under the terms of an explicit service contract negotiated with both Departments and the Loughs Agency.

6.3.3 Roles and functions of the BGMCF

It is envisaged that the BGMCF will be a discussion forum for policy development, a clearinghouse for information dissemination and a coordinating body to organise necessary industry collective actions.

The BGMCF will also have the function of being a central point of contact between the industry and the regulators and to coordinate necessary collective activities such as:

- The organisation of systematic annual seed mussel surveys.
- Learning from the Dutch experience, the formulation and agreement (with the regulatory bodies) of sustainable seed mussel fishing schedules, based on the data arising from the annual surveys and the historic data bases as they are built up.
- The formulation of a code of industry best practice and its subsequent adoption and implementation by all of the operators in the sector.
- The identification and prioritisation of key areas of applied research required by the sector.
- Achieving industry 'buy-in' and ensuring relevance, by participating in negotiating changes in the administrative arrangements governing and servicing the sector on an ongoing basis.
- Engaging with other fishing interests, as highlighted by the recent difficulties in trying to get a consensus with regard to the opening of the seed mussel bed in Donaghadee Sound.

The Review Group recommends that the BGMCF will not directly participate in the administration of the allocation of annual seed mussel fishing permissions. That function will remain with the ministers in both jurisdictions. Having said that, it is envisaged that the Secretariat will provide relevant data to the regulatory authorities, as obtained from their confidential administration of a comprehensive stock-reporting programme (the details of this stock tracking and reporting system are set out in Section 6.5). The system will track the growth and survival performance of all seed mussel from the time it is first fished to the point of sale.

The Review Group recommends that the functions associated with enforcement and the application of such sanctions as are necessary from time to time remain with the Departments' own enforcement mechanisms and that the Secretariat confine itself to a role of information provider.

Recommendation:

That an appropriate and mandatory stock tracking system be developed, introduced and administered under the aegis of the BGMCF. The responsibility for commissioning this task is to lie with the Secretariat.

The Secretariat, whilst servicing the needs of the forum itself, will also have a set of separate and confidential information provision and reporting functions to the Departments and the Loughs Agency. These reports will be used to inform the seed mussel allocation process and over time, as the databases grow, to ensure sustainability through the development of accurate, knowledge-based, data-rich management techniques.

Recommendation:

That the BGMCF Secretariat be tasked with providing a confidential reporting service, consistent with FOI and data protection requirements to the Departments and the Loughs Agency in the context of seed mussel allocation, based on the data collected by the stock tracking system.

6.4 Detailed recommendations for the implementation of a revised management regime incorporating the BMGCF

6.4.1 Overview and timeline considerations

From the consultative process it is clear that the fragmented BG mussel industry is becoming increasingly frustrated with the current management regime (see Appendix 1). A recurring point of industry consensus is that the levels of trust throughout the industry is low and that if the sector is to be successfully managed on an all-island basis, then the management arrangements must be applied consistently. The current perception is that they are not and that this is undermining important industry-government relationships leading to frustration and poor levels of compliance.

The Review Group accepts the reality of this situation and has formed the view that one of the main causes of this lack of trust is that the current data on all aspects of the industry is incomplete and data has been gathered in an inconsistent way. This is understandable under the circumstances, given the recent expansion of the sector and its complex cross-jurisdictional nature. The Review Group concludes that the systematic gathering of accurate facts is the best way of bridging the gaps between the differing approaches being pursued by the operators in the sector. It is thus of paramount importance that new systematic data collection structures are put in place before the start of the 2008 seed mussel-fishing season.

Currently a range of tools and reporting arrangements are in use, attempting to track BG mussel stocks. However it is widely accepted (see the consultation report Appendix 1) that these systems have been developed over the years and are no longer fit for purpose in terms of supplying the information demands of a modern management regime that requires accurate data sets at all stages of the production from seed to harvest. A modern integrated system that captures the key data from all sources and at all the key control points in the production process is urgently required.

Thus a priority action of the BGMCF, once it is formed, will be overseeing the development of an accurate stock tracking system, which will provide the necessary science base to properly inform future management.

Recommendation:

The BGMCF to prioritise the implementation of a new mandatory stock tracking system, with a view to having the key elements in place and functioning prior to the start of the 2008 season.

This data collected by this system will underpin the new arrangements, which will incorporate the crucial factor of feedback based on stock performance. Logically, and because the current data sources are of poor quality, the system will need to run for a complete growth cycle (18 to 24 months), before its results can be used to inform adjustments in seed mussel fishing allocation. To this end the Review Group recommends that seed allocations remain at current levels for the 2008 and 2009 seed seasons or until such time as the data from the stock tracking system is available. The Review Group recognises that responsibility for the delivery of a complete dataset from the stock tracking system ultimately lies with the producers.

The data collected over that period can then be reviewed and verified in time to inform the allocations, ideally for the 2010 fishing season. The Review Group recommends, subject to cooperation from the producers, that the 2010 fishing season marks the point at which the first round of performance related adjustments are made to the annual allocations. This approach will then become an annual feature in the calculation system for seed mussel allocation.

Recommendation:

The seed mussel allocations are left static until the dataset from the stock tracking system is available.

There is an additional further refinement to the seed mussel allocation system that should be introduced into the calculation approach used in 2008 and 2009. This relates to the issue of localised seed mussel spat-falls that occur within Loughs, as distinct from the falls in the north and south Irish Sea. There was a strong consensus that such spat should be fished and relayed locally to maximise survival and yield. However, it is also acknowledged that in such cases the operators who had obtained that 'local' seed should have their Irish Sea allocation adjusted downwards by the same amount in the same or following season.

Recommendation:

That 'local' seed settlements within the confines of a particular Lough should, as a general rule, be fished and relayed in that Lough. However the operators benefiting from that spat fall should have their Irish Sea allocation reduced by the amount they gained locally, either in the same season if possible, or the following season.

It also follows logically from this recommendation that in the meantime, no measures should be taken by the governments in either jurisdiction that would have the effect of increasing the net demand for seed mussel allocations. The introduction of a licensing regime in Lough Foyle is a special case in this regard. During the consultative process there was much discussion as to the merits of issuing of further licences. Some producers called for more licences to be issued while others maintain that there are

already too many licences relative to the availability of seed mussel from any source. This is an issue that will not be resolved without accurate knowledge of the sustainable yield from the wild seed resource, the outcome of the experimental transfer of rope collected seed to the BG mussel sector and of the true fate and yield from all seed used. The stock tracking system will yield this data in time.

In light of this, the group recommends that the Departments do not issue any additional BG mussel aquaculture licence capacity subject to the processing of any current applications, during the period end 2007-2009. The Review Group does recognise the right of any applicant to have a determination, notwithstanding this recommendation, in the interim.

It should be noted that the group welcomes any efforts made by producers to obtain seed from sources other than the seed mussel fishery and it recommends that seed sourced from rope collection or other alternative means should not be set against annual allocation.

Recommendation:

To restrict any further net increase in the square area of licensed aquaculture plots for BG mussel cultivation until the end of 2009 at the earliest.

An exception to this stricture might be a situation where operators are willing to give up existing licensed ground, which they have determined through systematic trial, is unsuitable for economic BG mussel culture. They would be required to exchange such licences or parts thereof for new culture licences of a similar size or less, in more promising areas. Although the express intention of the recommendation is to limit the total area under licence, so as not to generate any further unrealistic increase in seed demand, the Review Group is mindful that the necessary process of ongoing site trialling and optimisation should not be stymied at the same time.

6.5 Recommended key characteristics of the stock tracking system

It is envisaged that the new stock tracking system will underpin the proposed new management approach to the sector. It will provide the necessary systematic basis for an incentive-led integrated seed mussel fishing allocation mechanism. The new system, once established, will provide an accurate picture of the actual volumes of seed utilised by the industry, the associated yields on a site-by-site and company-by-company basis and thus allow important management decisions to be made authoritatively, grounded in accurate data. The tracking system and its associated paper and electronic management packages must have the following characteristics:

- Due to the large volumes of data, it must facilitate both paper based and electronic reporting, storage and data manipulation, be user-friendly at the interactive interfaces, be adaptive to the changing pattern of activities of the operators and provide a ready audit trail.
- The core of the system will be a 'cards on the table' approach whereby the operators must declare their stock positions in advance and then be subject to subsequent checking and audit. It is envisaged that every licence holder will be required to submit a mandatory quarterly report on, inter-alia, the origin, volume, location and age class of all stock fished, relayed or sold associated with their aquaculture licence. This data will be submitted to the relevant departments and subsequently to the BGMCF-Secretariat where it will be confidentially collated, analysed, archived and the results disseminated as appropriate.

- The data submitted will be cross-referenced with other data sources and an appropriate sample will also be subject to both random and targeted audits to ensure compliance. Such audits will be carried out by appropriately qualified third parties drawn from a list approved by the BGMCF, with field sampling support from the relevant agencies in each jurisdiction.
- The audit process of the stock tracking system returns will incorporate a desk-based assessment of data submitted, a cross referencing with the relevant black-box system outputs and site assessments in the form of dredging and targeted dives carried out by the relevant agencies. In the event of a serious non-compliance being detected the sanction response will be determined by the relevant enforcement authorities.
- In addition to the random audits, targeted audits may also be conducted by the relevant authorities if the Secretariat has specific information concerning the activities of a particular operator, which might lead them to suspect misreporting.

Recommendation:

The Review Group recommended that DAFF, DARD, SFPA and the Loughs Agency meet on a regular basis with a view to harmonising policy and enforcement arrangements.

While the Review Group notes that the seed mussel is not an EU quota species, it is nevertheless recognises the extremely valuable contribution it makes to the fisheries sector on the island of Ireland. To underpin the sustainability of the sector it is vital that the BG mussel sector receives appropriate priority in the allocation of resources from the enforcement authorities.

Recommendation:

That the control and enforcement authorities afford the BG mussel sector a high priority in their resource planning and allocation.

6.6 Development and implementation of systematic seed mussel surveying arrangements and the use of the data generated in determining the opening and closing of the fishery via the instrument of a 'fishing schedule'

6.6.1 Overview

There is ready acknowledgment from all concerned that the current arrangements for seed mussel surveying lack consistency and are inadequate. (Appendix 1). There was agreement amongst the consultees that an effective annual survey would yield invaluable information and would serve as a basis for key management decisions. The view was that an annual survey effort needs to be carried out and that the operators themselves, under a coordinated and systematic approach, should do it on a large scale.

Not only would an annual survey target the seed mussel locations for the season to come and thus save wasteful and inefficient individual efforts, but it would also contribute to the development of an historic database, which would be very valuable from a resource management point of view. The Review Group are of the view that the BGMCF and its Secretariat should coordinate this process and oversee the necessary industry effort via an expert sub-committee comprising the necessary expertise in terms of ship management, survey techniques and data handling.

Recommendation:

That the BGMCF be tasked, via an appropriate sub-committee to design and coordinate the operation of an annual large scale seed mussel spat fall survey, together with a possible secondary targeted survey for confirmatory purposes later in the season.

There is considerable divergence in opinion, amongst the scientists who have studied the wild mussel spat-fall in the Irish Sea. The Marine Institute and Queen's University Belfast have both recently produced studies that offer conflicting advice. It may be seen that both studies were based on limited field data and although the Review Group welcomes the contributions it is not minded to be bound by the recommendations, as it is evident that more research is required.

Arising from the findings of the fact-finding trip to the Netherlands, the Review Group is of the view that the opening and closing arrangements for the fishery should be set based on the results from the annual survey and that those arrangements should be set out in a series of fishing schedules to be agreed between the BGMCF and the regulatory authorities. A copy of the template used by the Dutch mussel PO to agree terms with the Dutch government is appended to this Review as Appendix 4. The Review Group envisages that the annual 'fishing schedules' would deal with a whole range of issues, including environmental sustainability concerns, and as such the approach would both facilitate and protect the sector.

The fishing schedule would be drawn up using a standard template and it would follow an agreed protocol. The Review Group recognises that operators need to be able to plan their ship maintenance and other operations in advance and a feature of the schedule will be a defined opening date before which the fishery will not open. There would be consultation elements, both internally within the BGMCF, between the BGMCF and other fishing interests (if needed depending on the particular fishing area) and finally, the schedule would be formally accepted (with or without modifications) by the control authorities. Thus the fishing schedule will have 'buy-in' from all of the interested parties and it will provide a stable predictable platform for the operators to plan and work from.

Recommendation:

That the 'fishing schedule' approach be adopted as the appropriate model to underpin the management of the seed mussel fisheries across the jurisdictions. The Secretariat of the BGMCF would be tasked with drawing up the template and the first draft of the protocol for agreement by the BGMCF.

It should be noted that the combination of the use of the fishing schedule model and the formation of the BGMCF as a central coordinating body will overcome a number of current operational difficulties. The schedule can encompass many practical details apart from just the dates of opening and closing of a particular fishery, for example, the interests of other fishing groups and other stakeholders can also be

catered for. Difficulties, such as those encountered in trying to open the Donaghadee Sound fishery in the 2007 season, could be planned for and dealt with in advance.

The Review Group recognises that an incentive mechanism will be required to get 'buy-in' from the vessel owners into the annual survey effort and that there is a very real cost involved in conducting such an operation. It is recommended that both the incentive and the necessary financial resource be created via the proposed cost recovery scheme.

Those operators who make their vessel available will receive a discount in comparison to those operators who choose not to participate. Thus those that expend effort and cost for the greater good are in effect cross-subsidised by those that do not. The quantum of the discount and surcharge will be calculated by the survey sub-committee.

Recommendation:

That there should be a discount and a surcharge element to the cost recovery scheme which will be determined by the survey sub-committee.

It should be noted that this approach has a number of other benefits as well. Because the ship operators are receiving a financial benefit for their participation, they can also be justifiably required to openly reveal their findings to all concerned in an appropriate way via the BGMCF. Given that element, there no longer would be any incentive for a ship owner to prioritise one search area over another, as they will have access to the all search results. In turn it will not matter who searches where, as long as the survey is carried out properly. Learning from the Dutch system, the annual survey results would be collated to a standard format, incorporated into the fishing schedule and then made simultaneously available to all those who are in receipt of a seed mussel fishing allocation. The operators can then plan their fishing activities.

The Review Group envisages that a cadre of independent observers could be provided by the various control and development agencies to verify the quality of the annual survey effort.

6.7 Leveraging maximum value from the 'black-box' surveillance system

Currently all the vessels fishing for seed mussel are required to carry a special automated electronic data transmission system that tracks their vessel's location as well as other data. It is a requirement that this system is transmitting at all times. This system is known colloquially as the 'black-box', and it offers a very valuable cross-referencing source to the new stock tracking and reporting system. During the consultation process the view was widely expressed that the output from the system was not being adequately monitored and that it did offer a very powerful mechanism for general surveillance, if it was used and seen to be used properly.

The Review Group concurs with the view that the black box could be an excellent real time surveillance tool as well as a retrospective source of cross-reference to verify returns submitted by operators to the stock tracking system. Thus it is recommended that the BGMCF Secretariat subject to compliance with data protection legislation would be given access to the system and that it would be tasked with systematically archiving the data for an appropriate period for cross-referencing purposes.

Recommendation:

That the BGMCF Secretariat be given read only access to the 'black box' data subject to data protection legislation and that it is tasked with systematically archiving the data.

The Review Group also noted the comments arising from the consultation regarding the need to have the system monitored on a 24/7 basis as a real-time surveillance and control tool. This would require a heavy commitment in terms of personnel resource and the group prefers a suggestion received whereby the industry would in effect police itself. The concept would be to create a web-based, view-only interface subject to the provisions of data protection legislation, which would be password protected and which vessel owners (who were themselves black box operators) could log on to and observe the fleet. If they became aware of an irregularity then this could be reported via an established protocol and the control authorities could pursue it as necessary.

In this way the most expert participants in the system (the operators) would be in a position to observe activities and the control authorities would prioritise their limited resources to investigating actual breaches rather than being tied up in resource hungry routine surveillance. Given that the sector in the future will be managed via an agreed fishing schedule based on an 'open-book' survey, there will be no loss or advantage conferred on vessel operators by virtue of their being able to observe each other electronically.

Recommendation:

That the BGMCF Secretariat be tasked with commissioning a suitable secure web-based, view-only interface to enable the operators, (subject to compliance with the data protection legislation and other legal considerations) in the sector to electronically observe activity in the sector.

The question of the poaching of relayed stock from licensed aquaculture plots by inshore fishing vessels was raised on a number of occasions during the consultative process. To address this serious problem the Review Group is of the view that the regulatory authorities should investigate the legal and practical feasibility of requiring all boats that dredge mussels, whether from farmed or wild sources to carry a 'black box'.

Recommendation:

That the regulatory authorities should explore the possibility of extending the black box system to all vessels involved in fishing for mussels.

6.8 Legal basis for the stock reporting system

The issue of how to create a mandatory stock reporting system was discussed with senior officials, concerned with the regulation of the terms of aquaculture licences, in both jurisdictions.

There was a consensus that the standard terms and conditions attaching to the aquaculture licences currently issued in both jurisdictions gave the regulators the power to require the holders to provide reports. They were further satisfied that the licence terms also provided for the inspection of the sites and of stock records by duly nominated officers, in order to verify the contents of the stock reports submitted by the aquaculture licence holders.

Thus they were of the view that the legislation governing the issue and regulation of aquaculture licences had ample provision within their current terms and conditions to facilitate the creation of a mandatory stock reporting system, which could be subject to audit and integrated with data from the seed mussel fishery.

The licensing arrangements for Lough Foyle will contain similar provisions.

6.9 Estimation of seed mussel catches, transport methodologies, dredge type and other technical considerations

During the consultation process the issue of developing a standard method for determining loads on board mussel dredgers was raised. The point was made that there are various arrangements in place and that there is a wide degree of variation in reporting as a result.

The Review Group observed the method used by the Dutch vessel owners during the course of their best practice trip and is of the view that a version of this approach would serve well in this context. The vessel owners are already required under EU fisheries regulations to have an accurate and verified cubic capacity measurement for each of their holds. This information should be used in conjunction with the proposed standard method as set out below.

They would be required to carry a graduated metal sounding rod aboard and be able to estimate their load based on the 'depth' of seed mussel in the holds. The Review Group was of the view that allowances should not be permitted with regard to extraneous matter such as stones or other materials, as the group wishes to promote the practice of grading at the point of fishing for environmental and pest control purposes.

Recommendation:

That all seed mussel dredgers fishing around the island of Ireland should be required to carry aboard a suitably graduated sounding rod that allows for an accurate calculation of their cargo on a volume-per-unit-of-depth basis. At the completion of each fishing operation and prior to departure from the grounds, the vessel skipper would be required to perform a sounding of the holds, and enter a catch figure in the record following a standard calculation protocol. This estimate would be subject to verification on inspection by duly authorised enforcement officers.

The question of how seed mussel should be transported after dredging was discussed at some length during the consultation process. Unfortunately there was no clear consensus, other than the view that seed mussels falling inside discreet loughs should be relayed locally, as discussed above. A number of consultees were of the view that road transport should not be permitted while others were of a diametrically opposed view. The Review Group did not have access to any systematic evidence with regard to this issue, although intuitively the double handling and stress of road transport would seem likely to be disadvantageous from a subsequent survival point of view.

Thus the Review Group believes that this issue is best dealt with through the stock reporting system. If it emerges over time that there is indeed significantly lower survival and yield from seed mussel after road transportation, then the allocation to operators planning to move stock this way should be reduced over time.

A number of other important technical issues were raised by the operators during the course of the consultation process. It is the view of the Review Group that there appears to be insufficient data available to make definitive recommendations concerning these issues. Specifically, the topics were:

- The detailed technical criteria which should be used to determine when the seed mussels on a particular bed were 'ready' to be fished and thus opening the bed.
- Whether there should be a mandatory standard specification and a fixed number for the dredges used on the vessels to fish for seed mussel.
- An appropriate methodology detailing how 'new' re-laying areas should be assessed in detail.

The Review Group take the view that these issues should be dealt with through proper systematic applied research. As part of the process of drawing the sector together it would be an ideal activity for the BGMCF to engage in on behalf of its industry members. The concept would be that the BGMCF would prioritise and commission collaborative applied research projects through the research service providers, leveraging funding as appropriate from the various funds available.

Recommendation:

That the BGMSCF should form a 'technical sub-committee' that would have a remit to draw up detailed specifications for technical applied research tasks (desk based and field as appropriate) that are required to be done to support increased efficiency in the sector. The sub-committee would seek to have these tasks carried out in collaboration with the appropriate research service providers.

6.10 Summary of administrative recommendations

1. Immediately form the *All-island BG Mussel Consultative Forum (BGMCF)* (The recommended timeline and approach for the formation of the BGMCF is set out in Section 7).
2. That a dedicated Secretariat be formed immediately to service the sector and the BGMCF.
3. That the feasibility of the introduction of a cost recovery scheme be investigated by the government departments, in the context of issuing seed mussel fishing permits and that any revenue generated be deployed to fund the activities of the BGMCF and its secretariat.
4. That the Aquaculture Initiative EEIG in the first instance be tasked with providing the Secretariat function under the terms of an explicit service contract negotiated with both Departments and the Loughs Agency.
5. That an appropriate and mandatory stock tracking system be developed, introduced and administered under the aegis of the BGMCF. The responsibility for commissioning this task is to lie with the Secretariat.
6. That the BGMCF Secretariat be tasked with providing a confidential reporting service consistent with FOI and data protection requirements to the Departments and the Loughs Agency in the context of seed mussel allocation, based on the data collected by the stock tracking system.
7. The BGMCF to prioritise the implementation of a new mandatory stock tracking system, with a view to having the key elements in place and functioning prior to the start of the 2008 season.
8. The seed mussel allocations are left static until the dataset from the stock tracking system is available.
9. That 'local' seed settlements within the confines of a particular lough as a general rule should be fished and relayed in that lough. Nevertheless, operators benefiting from that spat fall should have their Irish Sea allocation reduced by the amount they gained locally, either in the same season if possible, or the following season.
10. To restrict any further net increase in the square area of licensed aquaculture plots for BG mussel cultivation until the end of 2009 at the earliest.
11. The Review Group recommends that DAFF, DARD, SFPA and the Loughs Agency should meet on a regular basis with a view to harmonising policy and enforcement arrangements.
12. That the control and enforcement authorities afford the BG mussel sector a high priority in their resource planning and allocation.
13. That the BGMCF be tasked, via an appropriate sub-committee to design and coordinate the operation of an annual large scale seed mussel spat fall survey, together with a possible secondary targeted survey for confirmatory purposes later in the season.
14. That the 'fishing schedule' approach be adopted as the appropriate model to underpin the management of the seed mussel fisheries across the jurisdictions. The Secretariat of the BGMCF would be tasked with drawing up the template and the first draft of the protocol for agreement by the BGMCF.
15. That there is a discount and a surcharge element to the cost recovery scheme, which would be determined by the survey sub-committee.

16. That the BGMCF Secretariat be given read-only access to the 'black box' data, subject to data protection legislation, and that it be tasked with systematically archiving the data.
17. That the BGMCF Secretariat be tasked with commissioning a suitable secure web-based, view-only interface to enable the operators, (subject to compliance with the data protection legislation and other legal considerations) in the sector to electronically observe activity in the sector.
18. That the regulatory authorities should explore the possibility of extending the black box system to all vessels involved in fishing for mussels.
19. That all seed mussel dredgers fishing around the island of Ireland be required to carry aboard a suitably graduated sounding rod allowing for an accurate calculation of their cargo on a volume per unit of depth basis. At the completion of each fishing operation and prior to departure from the grounds the vessel skipper would be required to perform a sounding of the holds and enter a catch figure in the record following a standard calculation protocol. This estimate would be subject to verification on inspection by duly authorised enforcement officers.
20. That the BGMSCF should form a 'technical sub-committee' that would have a remit to draw up detailed specifications for technical applied research tasks (desk based and field as appropriate) required to support increased efficiency in the sector. The sub-committee would seek to have these tasks carried out in collaboration with the appropriate research service providers.

SECTION 7.0



7.0

IMPLEMENTATION

7.1 Overview

In order to ensure a timely implementation of the complex recommendations set out in this Review, it is necessary to set out a detailed implementation plan. An appropriate plan, which assigns responsibility for each task together with the necessary timeframe for completion, is presented in this section.

It is envisaged that the BGMSCF will become the main implementation body for the recommendations once it is established. In the interim however it is recommended that an interim implementation group (IIG) is established immediately. The IIG should be a small executive grouping of no more than three appropriately experienced individuals directly appointed by the ministers in both jurisdictions. The priority tasks of the IIG would be to:

- Arrange sources of immediate bridging finance from the two government departments (or their agencies) and the Loughs Agency to enable the formation of the BGMCF.
- Develop the service contract and negotiate the appointment of the Aquaculture Initiative to provide the Secretariat function, in the first instance, funded by the bridging finance.
- Develop a multi-annual business plan including a detailed projected budget for the operation of the BGMCF and the Secretariat for five years.
- Using the business plan, calculate the necessary cost recovery fee for the 2008 season and investigate the feasibility of applying such a scheme.
- In concert with the Secretariat, immediately start the detailed commissioning process for the provision of the initial and highly time sensitive elements of the stock tracking system, such that the key data from the 2008 seed-fishing season are captured.
- Arrange the bay-by-bay elections, seek the appropriate nominations and move to form the BGMCF.
- Formally hand over responsibility to the BGMCF and dissolve the IIG.
- As an indicative time frame, the IIG should have completed its work and dissolved itself in favour of the BGMCF by the end of March 2008.

7.2 Summary tables of the recommendations

7.2.1 Overview

In the following tables the recommendations, set out in the Review have been collated under the codes of marketing (Marketing Recommendations 1-4); environment (Environmental Recommendations 1-8) and administration (Administrative Recommendations 1-20).

7.2.2 Timescales

On the principle that ‘What gets measured, gets done’, the recommendations have been tied to the following time-based system, to assist in priority setting and monitoring of implementation progress.

PRIORITY 1	Recommendations to be implemented immediately, so as to be in time for the 2008 seed season.
PRIORITY 2	Recommendations to be implemented in the short-term, which is seen as being within the calendar year of 2008.
PRIORITY 3	Recommendations to be implemented in the medium-term, which is seen as being before the end of 2009.

It is envisaged that the BGMSCF would oversee the preparation of an annual implementation report, submitted to the ministers in both jurisdictions, to track the progress of the implementation of the recommendations of this Review.

Table 7 Marketing recommendations and implementation plan

Ref	Recommendation	Responsible organisation(s)	Partners	Priority
1 Pg 40	The development agencies to actively work with BG mussel operators on the island of Ireland on the promotion of labelled IQM quality assured mussels into the Dutch-supplied marketplace.	BGMCF	Relevant development agencies	2
2 Pg 40	The development agencies to engage in a market development programme for BG mussels from the island of Ireland in the French market place, including an awareness campaign and inward journalist visits.	BGMCF	Relevant development agencies	2
3 Pg 40	That further investment is made in market research and intelligence.	BGMCF	Relevant development and funding agencies	3
4 Pg 41	That improved services for commercially focused Research and Development/New Product Development (NPD) be provided by the relevant agencies.	BGMCF	Relevant development agencies	3

Table 8 Environmental recommendations and implementation plan

Ref	Recommendation	Lead organisation(s)	Other required partners	Priority
1 Pg 45	That the competent authorities continue the appropriate assessment process.	DARD DAFF	BGMCF	2
2 Pg 45	That the Commencement Orders be introduced in 2008 to implement the new regime in Lough Foyle.	DAFF DARD Loughs Agency	Wider industry	3
3 Pg 46	That the existing range of safeguards, with regard to the management of pest species are maintained.	BGMCF	Marine Technical Working Group of the Invasive Alien Species in Ireland project	2
4 Pg 46	That science based planning and management decision making processes, be improved.	DARD BIM – Aquaculture Division	BGMCF	3
5 Pg 47	Research projects should be brought forward using a coordinated approach with a greater emphasis on industry engagement.	BGMCF	Appropriate academic Institutions BIM – Aquaculture Division	2
6 Pg 47	The ongoing development of the ECOPACT, CLAMS and ICZM processes.	BGMCF	BIM – Aquaculture Division Aquaculture Initiative EEIG	2
7 Pg 49	Further consideration and investigation of using intertidal areas to boost seed mussel productivity should be undertaken by the BGMCF in conjunction with the relevant authorities.	BGMCF	BIM –Environment and Quality Section Aquaculture Initiative EEIG	2
8 Pg 49	That existing and emerging issue in individual growing areas be addressed through the work of the proposed BGMCF (Section 6.0).	BGMCF	Wider industry	2

Table 9 Administrative recommendations and implementation plan

Ref	Recommendation	Responsible organisation(s)	Partners	Priority
1 Pg 71	Immediately form the <i>All-island BG Mussel Consultative Forum (BGMCF)</i> (The recommended timeline and approach for the formation of the BGMCF is set out in Section 7).	IIG	DARD DAFF Loughs Agency Industry	1
2 Pg 72	That a dedicated Secretariat be formed immediately to service the sector and the BGMCF.	IIG	DARD DAFF Loughs Agency	1
3 Pg 72	That the feasibility of the introduction of a cost recovery scheme be investigated by the government departments, in the context of issuing seed mussel fishing permits and that any revenue generated be deployed to fund the activities of the BGMCF and its secretariat.	DARD DAFF Loughs Agency	IIG IFA Aquaculture	1
4 Pg 73	That the Aquaculture Initiative EEIG in the first instance be tasked with providing the Secretariat function under the terms of an explicit service contract negotiated with both Departments and the Loughs Agency.	IIG	DARD DAFF Loughs Agency	1
5 Pg 73	That an appropriate and mandatory stock tracking system be developed introduced and administered under the aegis of the BGMCF. The responsibility for commissioning this task is to lie with the Secretariat.	IIG BGMCF	Wider Industry DARD – Inspectorate SFPA	1 and ongoing
6 Pg 74	That the BGMCF Secretariat be tasked with providing a confidential reporting service, consistent with FOI and data protection requirements to the Departments and the Loughs Agency in the context of seed mussel allocation, based on the data collected by the stock tracking system.	IIG BGMCF	DARD – Inspectorate SFPA Loughs Agency	1 and ongoing
7 Pg 75	The BGMCF to prioritise the implementation of a new mandatory stock tracking system, with a view to having the key elements in place and functioning prior to the start of the 2008 season.	IIG BGMCF	Industry DARD – Inspectorate SFPA	1
8 Pg 75	The seed mussel allocations are left static until the dataset from the stock tracking system is available.	DARD DAFF Loughs Agency	BGMCF Wider Industry	1 and ongoing

Ref	Recommendation	Responsible organisation(s)	Partners	Priority
9 Pg 75	That 'local' seed settlements within the confines of a particular lough should, as a general rule, be fished and relayed in that Lough. Nevertheless, the operators benefiting from that spat fall should have their Irish Sea allocation reduced by the amount they gained locally, either in the same season if possible, or the following season.	DARD DAFF Loughs Agency	BGMCF Wider industry	1 and ongoing
10 Pg 76	To restrict any further net increase in the square area of licensed aquaculture plots for BG mussel cultivation until the end of 2009 at the earliest.	DARD DAFF Loughs Agency	BGMCF Wider industry	1 and ongoing
11 Pg 77	The Review Group recommended that DAFF, DARD, SFPA and the Loughs Agency meet on a regular basis with a view to harmonising policy and enforcement arrangements.	DAFF DARD SFPA Loughs Agency	IIG BGMCF	1 and ongoing
12 Pg 77	That the control and enforcement authorities afford the BG mussel sector a high priority in their resource planning and allocation.	IIG BGMCF – Secretariat	BGMCF Wider industry DARD DAFF Loughs Agency	1
13 Pg 78	That the BGMCF be tasked, via an appropriate sub-committee, to design and coordinate the operation of an annual large scale seed mussel spat fall survey, together with a possible secondary targeted survey for confirmatory purposes later in the season.	IIG BGMCF – Secretariat	Wider industry BIM DAFF DARD Aquaculture Initiative, SFPA, Field staff	1 and ongoing
14 Pg 78	That the 'fishing schedule' approach be adopted as the appropriate model to underpin the management of the seed mussel fisheries across the jurisdictions. The Secretariat of the BGMCF would be tasked with drawing up the template and the first draft of the protocol for agreement by the BGMCF.	BGMCF	DARD DAFF Loughs Agency Wider industry	1
15 Pg 79	That there is a discount and surcharge element to the cost recovery scheme, which will be determined by the survey sub-committee.	BGMCF – Secretariat	DARD DAFF Loughs Agency	1 and ongoing
16 Pg 80	That the BGMCF Secretariat is given read-only access to the 'black box' data subject to data protection legislation and that it is tasked with systematically archiving the data.	BGMCF – Secretariat	DARD DAFF Loughs Agency	1

Ref	Recommendation	Responsible organisation(s)	Partners	Priority
17 Pg 80	That the BGMCF Secretariat be tasked with commissioning a suitable secure web-based, view-only interface to enable the operators, (subject to compliance with the data protection legislation and other legal considerations) in the sector to electronically observe activity in the sector.	BGMCF Secretariat	– BGMSCF DARD DAFF Loughs Agency	2
18 Pg 80	That the regulatory authorities should explore the possibility of extending the black box system to all vessels involved in fishing for mussels.	DARD DAFF Loughs Agency	BGMCF	1
19 Pg 82	That all seed mussel dredgers fishing around the island of Ireland be required to carry aboard a suitably graduated sounding rod allowing for an accurate calculation of their cargo on a volume per unit of depth basis. At the completion of each fishing operation and prior to departure from the grounds the vessel skipper would be required to perform a sounding of the holds and enter a catch figure in the record following a standard calculation protocol. This estimate would be subject to verification on inspection by duly authorised enforcement officers.	DARD DAFF Loughs Agency	IIG BGMCF DARD – Inspectorate SPPA	1
20 Pg 82	That the BGMSCF should form a 'technical sub-committee' that would have a remit to draw up detailed specifications for technical applied research tasks (desk based and field as appropriate) required to support increased efficiency in the sector. The sub-committee would seek to have these tasks carried out in collaboration with the appropriate research service providers.	BGMCF	Appropriate academic Institutions BIM – Aquaculture Division Marine Institute	3



APPENDIX 1.0



1.0

CONSULTATION REPORT

Bottom Grown Mussel Sector Review

*Consultation report of the industry phase
of consultation*

MAY 2007

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1.0 Introduction

As a first step in the review process it was decided to engage in an extensive consultation exercise so as to gather, insofar as possible, the views of all the interested parties with regard to the future management of the bottom mussel industry. The consultee list was compiled from data submitted by DCMNR, DARD, The Loughs Agency, BIM and the Secretariat (Appendix 1).

The consultation process comprised three strands:

1. The Secretariat of the Review Group organised a series of industry meetings around the coast (Appendix 2).
2. Written submissions were requested from both industry and interested stakeholders.
3. The Secretariat of the Review Group also organised one-to-one meetings with producers, who wished to express their views on a private basis (See Appendix 4 for private meeting attendees).

Industry meetings were structured to solicit comment on all aspects of the bottom mussel industry. A PowerPoint presentation was shown at all meetings and opinions were sought on issues raised (Appendix 6). All meetings were opened with a description of the current review process and an explanation that the chairman and Secretariat were not currently in a position to comment or answer questions, but were there exclusively to gather information.

A list of producers who attended the industry meetings is presented in Appendix 3 and a list of those who submitted written submissions is contained in Appendix 5.

This report summarises responses received as part of the Bottom Grown Mussel Sector Review. It is important to note that the opinions expressed within the summary are those of the producers and not those of the Review Group or the Secretariat, which remained neutral at all times during the process.

Responses received are organised under the broad headings of infrastructure, regulation, husbandry and management of the seed resource. It is important to note that the ordering of points does not reflect any hierarchy. Comments relating to marketing and environmental issues are being fed into the preparation of the separate modules, which are being prepared in parallel, to cover those issues.

Given the nature of the process and the broad range of opinion encountered, the views expressed are not all consistent with one another, but do attempt to capture the key sense of the substantive comments made to the group.

2.0 Summary of Consultation Responses

2.1 Infrastructure

2.1.1 Vessel funding

An opinion expressed at all meetings was that the bottom mussel fleet needs further investment; however the views on what that investment should be for were very varied. There was consensus however that the real need centered around replacement and upgrading and not around adding any further seed mussel fishing capacity to the existing fleet. There was also a good deal of misunderstanding as to what actions were permissible under the EU regulations governing state aids.

The range of opinions that were put forward at the meetings included:

- That there should be continued funding assistance made available by the state (especially the RoI) to modernise/replace vessels in the fleet.
- That the COC regime had been rushed into place in the RoI without sufficient consultation or time for the sector to plan for the consequences of its introduction and that this had given rise to great hardship for some.
- That there is a greater demand for replacement vessels than for new entries to the industry.
- There was a feeling, (not backed up by any specific examples) that there has been uneven access to funding in the past; 'when a few big companies were subsidised and others less well informed felt left out in the cold'.
- That the owners of vessels in the bottom mussel industry should be eligible for payment under the decommissioning process.
- There was a good deal of misunderstanding about the decommissioning process, whereby it was evident that some people viewed decommissioning as a funding source rather than a means of exiting the business.
- Funding for smaller vessels is required; industry members in Cromane rejected the notion that mussel dredgers have to be large (e.g. 40m or bigger). They feel that a 40% funding level should be available for small smooth water boats.
- It was felt that the RoI is taking too strict a line on fishing vessel investment by prohibiting direct funding for new boats while, allegedly, the French and Dutch are still funding aquaculture boats that supposedly carry dredges.
- On the other hand, it was strongly put to the group, in two private meetings, that if any funding measures are now put in place, such arrangements should not exclude committed expenditure by those 'who have spent their own money in the interim. People should not be disadvantaged for playing by the rules of the day and placing huge investment in boats since the COC introduction'. These consultees also expressed the view that market forces should be allowed to weed out those players who were unwilling to invest in upgraded vessels leaving more available resource for those that were.

- The view was expressed, by local growers, that Carlingford and Foyle should be treated as special cases. They felt any proposed grants and licensing structure needed to reflect the 'new start' situation when the Loughs Agency takes over. They believe that their segment of the industry has been at a historical disadvantage because of their location on the island of Ireland.
- It was generally felt that those individuals who are not willing to continue to invest in the sector should not be facilitated either to stay or to exit.

2.1.2 Shore-based infrastructure issues

At all meetings there was a consensus that there is an urgent need for dedicated landing facilities in every major growing area. Current facilities at Belfast Lough, Foyle, Swilly, Cromane and Wexford are not fit for purpose and pose both logistical and safety concerns.

The facilities needed include:

1. Piers that are accessible at all stage of the tide.
 2. Gear and forklift storage facilities for the various companies.
 3. Lighting, water and access to shore based mains electricity.
 4. Wharf-side cranes.
 5. Waste disposal facilities.
 6. Decent access roads.
- There is frustration in a number of areas where commitments have been given to provide facilities, but where they have not yet been built e.g. Cromane and Greencastle.
 - In Wexford, it was felt that the main pier redevelopment has had the effect of excluding the aquaculture industry, as a result of safety issues associated with public access to the pier, forcing them to use a temporary facility that is fast degrading. They felt that their interests had been unfairly de-prioritised as against tourism considerations.
 - Carlingford harbour apparently needs to be dredged to provide access at all stages of the tide.
 - Depuration facilities were generally not seen as an urgent priority as the view was expressed that they will only be required if the industry develops sufficiently that processing is to be done in Ireland.

2.1.3 Other issues

Other opinions (around vessels and infrastructure) expressed were that:

- That the larger vessels are a threat to the industry due to (perceived) damage caused to seed beds by the use of larger heavier gear and the fact that they carry multiple dredges.
- That there are now too many dredgers fishing the Irish Sea seed beds, in particular, and that there has been a threefold increase in the number of vessels prosecuting the fishery over the last 10 years.
- That no more boats are required to fish the Irish sea seed mussel resource and that if new boats are to be allowed into the industry, then they should be limited to 36m in length.

2.2 Regulation

The opinion was expressed at all the meetings that any regulatory system must be implemented equally across the whole island. There was a strongly held view that enforcement has not been consistent and that this situation was bringing the whole system into disrepute. The enforcement regime in the RoI was particularly criticised in this regard.

Perhaps surprisingly, the consultees actually welcomed the prospect of having strict regulation, as long as it was consistently enforced in a transparent and even-handed manner.

2.2.1 Boat licensing

In two of the meetings a strong opinion was put forward that the interpretation of certain issues around boat licensing was a major problem in the RoI. Some producers questioned what aquaculture was and if it is classed as relaying of mussels, then why their boats are classed as fishing vessels and not as aquaculture vessels. Despite being classed as fishing vessels, they pointed out that they are not legally entitled to land fish. Clarification was sought on the following issues:

- Definition of aquaculture.
- Definitions of aquaculture vessels as against fisheries vessels.
- What response the Irish government received from Europe when it queried the definitions to whether or not to allow state funding of this segment of the fleet.

Whilst making no comment, the Review Group agreed to include these queries as part of the views expressed during the consultative process.

2.2.2 COC implementation issues

There was a strong feeling at a number of meetings that if the seed resource is to be managed on an all-island basis, then COC implementation and the interpretation of the rules therein also needed to be carried out on an all-island basis, so as not to create unfair advantages. In particular, RoI-based producers felt that the MSO were imposing conditions (such as re-plating rather than doublers) which made repairs and upgrading significantly more expensive in the southern jurisdiction as compared to the north and that this was causing a serious distortion in operating conditions.

Further opinions expressed were that:

- Infrastructure problems (i.e. older boats being too expensive to bring up to standard) are being exacerbated by increasing second-hand boat prices in the Netherlands, as demand for used vessels of adequate specification exceeds supply.
- The implementation of the COC was regarded as not being consistent with its enforcement in other parts of the EU. The RoI was especially criticised in this regard. It was claimed that the cost of bringing a boat up to COC standard in the RoI was 25% greater than it would be in the UK or in other parts of Europe.
- It was also claimed that the effect of the COC system was being applied unequally even within the RoI jurisdiction. Examples were cited of people being allowed to fish on occasion without COC and licence (Cromane), while others were tied up immediately (Wexford). It was also claimed that the

individual MSO surveyors seemed to interpret the rules in an idiosyncratic manner with a wide degree of variability between what one would accept and another would not.

- The industry also had issues with the practice of issuing a brand new boat a COC for just one year, when second hand vessels were in some cases issued certificates valid for four years.
- The view was put forward (in Cromane) that vessels exclusively operating in an area that was the subject of a 'smooth waters' designation should receive a complete derogation from the COC system and only be subject to basic safety inspections.

2.2.3 Black boxes

There was a common consensus that all boats licensed to fish for bivalve shellfish with a dredge should have to install a black box, regardless of the vessel size and whether or not they were involved in aquaculture. This view was put forward in the context of preventing theft or 'poaching' of mussels from licensed aquaculture sites by inshore fishing vessels.

Other opinions expressed regarding the tracking technology included:

- That the black box requirement should be tied to the gatherer's document system.
- That the output from this technology should be made reliable and robust enough to assist enforcement, and if need be, to be used as evidence for prosecutions.
- That there was inadequate monitoring of the information coming from the black and blue box systems and that this situation was bringing the overall system into disrepute.
- That alleged inter-jurisdictional differences needed to be resolved. (Supposedly NI producers did not have to pay for their black boxes and RoI operators did).
- That black boxes were only being used to watch seed mussel fishing and that the use of the system should be extended to cover relaying and husbandry operations as well.
- That the black box system should also be used to protect stock once it is relayed on licenced aquaculture sites.
- There is a perception that the levels of enforcement are uneven between NI and the RoI whereby the RoI regime was seen as alternately either too draconian or too light weight, with insufficient consistency of application.
- That there are some practical problems with the system. It was cited that boats must be kept running to keep the box active as there is no main electricity on the pier in Wexford. This was seen as a costly and an environmentally damaging way to work.
- That technical faults are quite common and that the back up service is not available quickly enough.
- The view was expressed that the black box system could help plug the regulatory gaps but that there was a need for a dedicated monitoring service for the black boxes. Numerous hypothetical examples were given of where gaps in the system were allegedly being exploited.
- Producers did express a willingness, in principle, to help pay for the operation of a dedicated 24/7 monitoring service to protect their own interests.

2.2.4 Licensed aquaculture sites

There was a consensus that currently there is inadequate protection for stock on licensed sites, which was regarded as an unacceptable situation by the industry. The producers felt that neither the police nor the government departments were clear on where the responsibility and role for the protection of their property lay.

General opinions around issues, concerning licencing, that were expressed included:

- That ground which was the subject of repeated spat-falls should not be licensed, for on growing, to individual operators and that consideration should be given to taking back ground (for common exploitation) that showed this characteristic.
- There should be a clear protection protocol and inter-service procedure (between the fishery officers and the police) put in place to protect stock relayed on licensed sites and to allow for rapid and effective enforcement.
- That the evidence gathering system for stock theft should be brought up to date and a clear enforcement protocol should be introduced.
- It was suggested that the Loughs Agency will be the first body in the country with the specific provision to prosecute poachers of stock from licensed aquaculture sites and that these powers should apply equally all around the island.
- Concerns were also raised regarding the activities of inshore fishermen who exploit other species such as cockles, winkles and pot fishermen. Their operating on licensed bottom mussel ground was discussed. It was felt by some that an aquaculture licence should give exclusive use of the area to the licensee. Others felt that as long as the method of fishing was not disruptive to their stock that they did not mind sharing the area, as long as the other fishermen did not abuse the privilege. Jurisdiction differences in the control systems in this regard were highlighted as being of concern.
- Because of a lack of protection for stock on licensed sites, producers currently claim to have little faith in the validity of their own experiments on new ground. They say that they cannot judge if the ground has under performed or if their stock has been poached. This is, they say, creating a situation where good ground may be mistakenly misclassified, and seen as being poor for mussel relaying for the wrong reasons leading to loss of efficiency and waste of seed mussel.
- Any other activity, fishing or otherwise, which is detrimental to mussel survival and growth, should not be allowed to happen on or in close proximity to licensed ground. Ferries travelling too fast in Carlingford, and dredging activity elsewhere were cited as examples of such activity.
- That anyone caught dumping dredge waste on another persons licensed site should be penalised.

On a regional level, the following views were also expressed:

- In the Foyle it was put forward that existing producers in the area should be exclusively eligible for the first round of licences when the new system comes on stream, so as to restrict speculation and protect existing investment.
- It was felt that the licensing system was functioning reasonably well in Wexford at present. But it was contended that the DCMNR had made a number of errors when licensing the area. 'Everyone is crowded together and there is no space between sites'. (Space intentionally left unapplied for by 'responsible and knowledgeable' growers as a 'cordon-sanitaire' was supposedly opportunistically licensed to someone else) and in other cases the sites were allegedly mis-mapped and actually licenced overlapping each other.

- The DCMNR should switch from OS Grid References to a GPS system, which would be more accurate.
- The coordinates for all licenced beds should be made publicly available to the local producers in the same area, so as to aid transparency of operations and make for better relationships between neighbours.

Other opinions expressed were that:

- In some areas a minority of producers felt that further expansion (e.g. granting of more licences) was justified to allow new entrants. Others felt that too many people were already trying to exploit the Irish Sea seed resource and that no more on-growing licences should be issued until alternative seed resources have been found.
- Some producers felt that there were already too many licences and that they needed to be evaluated before any more were granted.
- In some cases it was suggested that it may be appropriate to licence ground for on-growing and husbandry reasons, but this extra ground should be decoupled from any rights or expectation to seed access in the Irish Sea. In that context the view was expressed that seed availability should not always restrict the granting of further licences as there are other reasons for wanting new ground, such as predator control, stock rotation etc., and that the 'system' should retain sufficient flexibility to cater for these needs.
- If people lose ground for reasons beyond their control, such as the natural movement of navigation channels, then they should be compensated with additional ground in another location.
- Ground that is already licensed must be used, the 'use it or lose it' clause should be invoked; this ground should then be made available to other people in the industry, rather than being just being revoked and lost to the industry.
- People who are unwilling to continue to invest in the industry, (and thus cannot work their licensed sites or fish for seed mussel by virtue of their vessels being without COC) should not be given on-going seed allocations and those that are progressive should be allowed to expand their operations.

2.2.5 Licence conditions

There was a consensus at all the meetings that:

- Licences should have a minimum duration of 20 years to allow for a return on investment and for the licences to have a value as collateral. This was seen as being especially important when dealing with financial institutions while attempting to raise working capital.
- A 'good neighbour' clause should be placed in all bottom grown mussel aquaculture licences to incentivise pro-bono actions, such as cooperative predator control.

Other opinions expressed were that:

- Producers who break the rules governing the industry should be subject to penalties in the form of fines. Revenues generated should be fed back into the system and put toward funding the black box monitoring and seed survey costs.
- A 'yellow card' system was also suggested, whereby an offending operator would be tied up for a specified period of time while the seed fishery is open in response to an infringement.
- If someone is given a licence to farm mussels they should really be a farmer and not a speculator. Thus it was felt that they should have to be able to demonstrate their bona fides by being able to show that they had the ability to do the job and that they had the necessary resources as proof of their real intent.
- That any regulatory regime that is adopted will need to be evenly enforced across both jurisdictions, otherwise it will not work effectively.

2.2.6 Regulatory support

A range of opinions were expressed on this topic, including:

- That the regulatory authorities (fishery officers) are sometimes very difficult to contact when the producers need them urgently, particularly in the RoI, and especially at weekends and out of office hours.
- The producers are sometimes unclear as to all the regulations they are supposed to operate under. It was suggested that the production of a manual explaining all the relevant regulations would assist the industry.
- In the NI jurisdiction, the Crown Estate Commissioner's lease rates were regarded as unworkable. It was felt that there should be a flat rate based on the area leased as in the RoI. It was claimed that CEC rates have been increasing by up to 500% every five years. Queries were raised as to the future arrangements between DCMNR and the crown estate over foreshore leases in the Lough Agency's areas, in light of the very large differences in the current systems that pertain from one jurisdiction to another.

2.2.7 Management structures

There was consensus amongst the consultees that:

- There should be a single expert body empowered to regulate the day-to-day operation of the industry.
- There should be a strong emphasis on enforcement otherwise any arrangements would be worthless.
- The management regime should be even handed, and should have a modus operandi of active engagement with the industry.
- Inter-jurisdictional differences are seen as a serious problem as they lead to inconsistencies in regulation and control effort. The view was put forward that there should be a single unified management model for the whole island, going forward.

- Personnel employed in the management regime should have an in-depth understanding of the industry. It was seen as counterproductive to the development of the industry that knowledgeable people in the government departments moved every few years.
- An all-island producer organisation with 'extension of discipline' type powers could work, if it is given a lot of support and assistance in its early stages. But it was felt that movement towards this system should be gradual must be a step by step process, built up over time as trust develops.
- As a first stage, a producer organisation could serve as a central contact point and represent the industry position in key fora.
- Self regulation should happen but not in the immediate future. There should be some immediate changes to improve operational efficiency and a longer-term plan should be developed in parallel. This approach would allow for a mix of government-led regulation with a phased transition to a greater degree of industry self-regulation over time.
- There are too many vested interests for a PO to work in the short-term. The departments should retain control meantime, but they need to manage the industry more effectively, otherwise it will turn into a 'free for all'.
- There are too many regulatory bodies. The industry should ideally be managed by one coordinating organisation and the industry should be represented on that organisation as a first stage in moving towards self regulation.

2.2.8 Classification and biotoxin monitoring regimes

The following views were expressed:

- That the biotoxin monitoring regimes were not viewed as a major issue at the moment, but could be in the future, if prolonged closures became a feature, as has happened in the rope mussel sector.
- That the jurisdictional differences in the systems in NI and RoI were viewed as a problem. Producers are more in favour of the NI system, where individual sites are classified rather than whole bays.
- That the systems need to be harmonised across the jurisdictions and that it needs to be more efficient from the standpoint of a commercial operator.
- Classification should be on a bed by bed basis as in NI rather than the RoI bay-by-bay basis.
- There was a fear expressed by one operator that importation of seed mussels could also lead to the importation of biotoxins to an area that did not usually see biotoxin infestations. This was an isolated concern.
- A belief was expressed that a greater subdivision in sampling areas and increased sampling would lead to a greater number of 'A' areas with regard to microbial classification and that this would be beneficial from a market access point of view.
- There is also a belief that the regulatory authorities in the RoI are restricting the industry as they are reluctant to allow areas to be classified as A. The sector believes that the DCMNR see that B areas are easier to manage from a regulatory and risk perspective and thus do not want to have more 'A' class areas.

- The regulatory authority should be more proactive in quickly notifying producers as to changes in the classification of an area.
- That there should be a clear, published protocol for the location of sampling sites for classification for each area and for the subsequent handling of the samples.

2.3 Husbandry

2.3.1 Overcrowding

There was a general consensus that overcrowding and a consequent reduction in growth rates was a risk for any area. Nevertheless, the producers felt that as the farmers they themselves would see the effects of this before anyone else and be able to respond accordingly by reducing stocking density. Thus they did not want to see the introduction of a standard stocking rate as there was, in their view, too much variability between sites to make such a standard meaningful and that they preferred to rely on local knowledge.

Other opinions expressed were that:

- Overcrowding was mostly linked to too much produce being relayed per hectare. In the past, stocking rates could have been as much as 90 tonnes per hectare, now it is felt that 20-30 tonnes stocking densities are those that are most successful but that every site is different and every farmer knows their own ground best and has their own way of running their farm.
- Carrying capacity and meats vary with environmental conditions such as substrate, seed density, seasonality, rainfall, temperature and winds.
- Carrying capacity is to some extent being addressed by new working practices. Current thinking within the industry is that a greater return can be achieved by laying less seed per hectare, yielding larger meats from a smaller volume of seed and achieving the top price for the produce.
- Overcrowding may become a problem with the issuing of new licences in certain bays that are already heavily stocked.
- There is a fear that the process of estimating carrying capacity might be used to unfairly restrict the bottom mussel industry by imposing unrealistic limits.
- *Bonamia* in Foyle and Swilly is a problem when it comes to movement of mussel stock. Protocols must be devised that are manageable for industry, and they must also be harmonised in both jurisdictions.
- If seed is spread at low densities there are higher growth rates, but there is a greater chance of it getting washed away, each site is different and there is a delicate balance on each site.

2.3.2 Code of Practice

A range of opinions were expressed:

- A COP is a good idea for the future but will be difficult given that the industry is currently young and very fragmented.
- It is very difficult for producers to work together, as a small group of people always end up doing all the work. The industry cannot even coordinate its efforts in the area of predator control.
- A COP is a brilliant idea for the advancement of the industry. It is especially needed in the area of predator control.
- A monitoring system such as that for sea lice on salmon farms would also be beneficial. If a system is to work, all producers would need to get on board, this will not be easy.
- A COP is regarded as a way for the industry to respond to 'green' campaigners.
- Boats should remain in designated channels when navigating between licensed sites, this will avoid the boats tearing up other peoples beds (Designated channels should be mapped); this should be included in a code of good practice.

2.3.3 Other

- There should be a standard dredge especially in the seed mussel fishery as in the Netherlands.
- Boats should store dredges on board the vessel when travelling out to licensed sites and when not actively fishing.
- If there was a market or reward system for green crab landing, this might give an incentive to all producers to get involved in predator control.
- Potting for crabs should not be done on top of seed but away from it, as pots can attract crabs.
- Huge amounts of seed is lost to predation, could a market be found for starfish e.g. fish meal raw material.

2.3.4 CLAMS

Opinions expressed were that:

- A well run CLAMS process would be of benefit in all areas but there is a perception that it is not always useful, particularly if there is little or no follow up.
- A CLAMS in the Foyle would be a step forward and launching the document in Carlingford might help.
- The CLAMS process helps the image of the industry and can serve as a contact point between the industry and other stakeholders, particularly those with negative view of the industry; however to be valuable it should be advertised more in order to make stakeholders aware of the point of contact.
- The situation that led to the closure of fishery in the Netherlands must not be allowed to happen here. Educating the public and environmental groups about work practices and products will help to protect the industry.

2.4 Management of the seed resource

2.4.1 Basis for a management programme

There was a heated debate around this topic; however there were some areas of common consensus:

- Any management system should be based on reliable data, not on the current reported information, which was likely to be of poor quality. The real volume of the seed resource is not being accurately estimated and that current data is heavily distorted and unreliable.
- Seed mussel is recognised as a very valuable resource and thus should not be repeatedly wasted by those producers who persist on placing it on bad ground or not looking after it.
- Seed that falls within loughs (e.g. Swilly and Foyle) should be fished by licence /plot holders in those loughs and should remain within the loughs in question to maximise survival and output. It was contended that such a policy would give smaller producers with smaller vessels more of a fair chance. The concept being to avoid the current system which it was felt was favouring the large companies that had the capability and vessels to fish the 'open sea' spat falls more efficiently. This view was qualified by the condition that if 'locally falling' seed was kept in those local area, then that the amount sourced should be offset against any 'open sea' allocation, which those operators might be given in that or a subsequent season.
- Loss of seed, through misuse, predation before fishing, or poor transportation was seen by all as a major issue. The sentiment was that the demand for seed would not be so high if people were incentivised to make the best use of what they got rather than obsessing on trying to get ever greater allocations and then losing the seed.
- The current quota or 'allocation' system was not seen as having been successful or even very useful. The view was repeatedly put forward that even if no quota system at all had been in place over the last number of years, then the actual results would have been the same regardless. This view was founded on the stated belief that the sector was really in a 'free for all' situation and that effective monitoring of what was being actually caught has not been carried out.
- There was unanimity around the view that whatever system is eventually adopted, that it will need to be transparent, and applied even-handedly. The call was for everyone to have access to the same information and have to abide by the same rules.
- Reliable tracking and recording of seed mussel after relaying is vital and that real progress will not be possible until an accurate system is devised and introduced. The advent of such a system would facilitate a positive situation whereby farmers get rewarded for good performance in terms of the seed quota, which they are allocated on an on-going basis.

Other opinions expressed were that:

- Seed beds are not being consistently managed; it was believed that the enforcement regime is more rigorous in NI as compared to the RoI.
- Effective and accurate data collection is the first thing that needs to be sorted out. It was contended that every farmer should be required to keep an accurate log book, and that someone must look at these regularly and in detail so as to get a more accurate picture of what is actually being fished.

- Any management system with a reward element that may be adopted must take adequate note of the fact environmental conditions vary from lough to lough. Some areas perform better than others with regard to meat content and meats can vary from year to year, so any new system must have a calibration element which compares 'like with like'. Thus a farmer doing his best in one 'poor' lough should not be given a lower allocation as against a poor farmer in a very high productivity lough. His performance comparison should be with his local peers. The measure should be a combination of productivity and best practice.
- There was a worry expressed that bigger companies in the industry will always win out as they are cushioned by larger number of licences and can spread their risk.
- The system of allocation of 200 tonnes of seed as initial seed allocation to new producers would not be sufficient for a new entrant to obtain bank loans. The allocation system that was developed with the intention of helping new guys to get started was actually working against them.
- The current returns system is not suitable and is too cumbersome. While it was acknowledged that most operators keep a diary, translating that informal information into a formal return form, once per year, during is very difficult.
- It would be easier if returns were made quarterly or more frequently, and that the system should be automated, specially designed and web accessible.
- The on-growing sites are never inspected to see if what is on the ground matches that which is claimed on the return form; inspections, or the credible threat of them, should be put in place to ensure accurate reporting. This would allow real tracking of the fate of seed mussel fished.
- Bigger companies may be in the position to manipulate figures for a number of years, so these figures cannot be used as a management tool at present (in the context of 'good performers' getting access to more seed) with any certainty. An audited data set, collected and cross collated with sales over an extended period, of say up to five years, is the only way to get a good idea of what is really going on the ground.
- The allocations system should be based on a consideration period of more than one year to allow an operator to recover from a bad seed year.
- Allocation of seed should only be made to those operators who can demonstrate that they have a real means of fishing it. The current system is full of dead wood and bogus allocations to people who cannot actually fish for them. This is holding the 'real' fishermen back.
- Track record should be used as a very important determinant in allowing an operator access to the seed mussel fishery. There was a perception that 'young' or relatively new entrant companies were getting large allocations of seed mussel on the basis of their having large untried sites and that this was at the expense of the established producers who were not trying to 'work the system'.
- New companies are losing vast amounts of seed because of their inexperience and use of untried ground, yet they still get large allocations. There needs to be a system based on rewards and penalties for good behaviour and consistently high productivity. This would remove the situation whereby people are getting seed year after year but are consistently failing to produce any mussels at the end.
- There have been problems in getting allocations fished; the bigger dredgers are allocated more than can be placed on their ground. Signed, binding contracts with dredger operators to fish seed, on behalf of others without boats, are difficult to organise due to mistrust about payment and an overall shortage of seed.

- The departments have reneged on promises in the past and this has left a bad feeling within the industry. If the departments are not true to their word why should industry behave any differently?
- There is no real motivation to fish seed for someone else, and as a result only those with vessels of their own will be able to stay in the business in the longer-term.
- One single body should look after allocation on an all-island basis. DARD and DCMNR have had limited success with it and this failure will be exacerbated with a third body coming to the table, e.g. the Loughs Agency.
- The system should not penalise those who have made genuine and demonstrable efforts to fish for their quota, but were nevertheless unsuccessful.
- Good performing producers should be rewarded with increased allocation.
- The Wexford industry has traditionally taken seed from the east coast. With the current pressure on this resource from other areas, the Wexford producers should be given early access to the resource.
- Wexford Producers should be allowed to take 500 tonnes each before anyone else is allowed in, this equates to 3,500 tonnes of seed. Currently everyone uses the Irish Sea as a starting point and then work back to their own areas; this is viewed as unfair to the Wexford producers. They feel that the Irish Sea seed is their local seed source and that they should be given some preferential access in recognition of their long history of operation and geographic location. In their view, operators from other areas should have to search for and fish their own local resources before coming to the Irish Sea fishery.
- Producers should exploit their own area first. Close the Irish sea to 'outsiders' for the first month of the fishery every year.
- There is no excess seed in Cromane; if seed leaves then the local industry will not survive. Seed should only be used by locals. But because seed falls intermittently and always very late in season in Cromane, the producers cannot take the risk of just sitting and hoping for all of the seed fishing season. Thus they should not be restricted to just their own area. The solution to the problem is to base the allocation on a 2-3 year cycle, linked to production cycles. Therefore if someone in Cromane gets a bumper year as a result of outside seed (Waterford/Wexford) followed by a late spat fall in Cromane, then that excess can be offset the following year in terms of a reduced allocation for that operator for the 'open sea' fishery.
- The current restriction of only fishing during daylight fishing hours (8am-6pm) is a good practice, both for seed fishery and working licensed areas, promotes good behaviour and should be retained and enforced.
- Fishing of the allocation should be limited to one load of seed per boat per day, and seed should only be fished on neap tides (the idea being to create a level playing field between large and small vessels).
- Seed mussel beds have not been adequately monitored and protected. (It was claimed that in some instances, areas had been fished out by certain rogue operators before they were officially opened to the rest of the fleet).
- Where seed spat fall areas have been inadvertently licensed, the seed tonnage fished from them is excluded from the allocations calculations. This loophole is giving the licence holder of seed spat fall areas an unfair advantage.

- Old mussel beds should be cleaned off by dredging to allow more seed settlements to fall and colonise that area. It was contended that such a practice would make more seed available.
- If the previous year was to be regarded as year 0 in the quota system, that position would unfairly disadvantage many operators, due to their boat being currently tied up for failure to comply with COC regulations.
- The seed allocation and relaying recording system should be more flexible; some producers would like to lay seed in Belfast Lough as a 'pit stop' between the southern seed beds and northern on growing sites.

2.4.2 Opening and closing of the seed mussel fishery

A common consensus was expressed on the following points:

- Producers need adequate notice of opening and closing of the seed mussel fishery, which would allow for planned maintenance on ships.
- Maintenance is very difficult within the current system as slip capacity is limited and boats need to be taken out of the water to assess what work is needed.
- Beds should be closely monitored to prevent loss to predators and by people fishing closed beds. This could be aided by the black box system.
- There should be clear criteria for opening and closing beds.
- If the resource is to be managed on an all-island basis; the two departments and the Loughs Agency need to agree on common protocols and operate to a harmonised system.
- Seed survival after dredging depends on many factors including; size, shell 'crushability', substrate, transport and the nature of the genetics of the seed source.
- The industry is very weather dependent. Bad weather conditions have been arriving earlier in the recent years and this has adversely affected the volume of seed fished. So the fishery should not be kept closed for too long at the early part of the season.
- The industry should have more of an input into the assessment of the 'readiness to fish' decision-making process concerning individual seed beds.
- Different areas yield different type of seed and they have differing survival characteristics. This phenomenon needs further elucidation. It was reported that some seed will survive very well even after being fished when small (circa 3mm) whereas other seed, even though larger, will not thrive if less than 10 to 15mm.

Other views expressed were that:

- All areas should be opened at the same time.
- Small seed should be left alone early in season and then all seed should be fished, regardless of size, at the end of the season.
- The ground should not be disturbed when seed is still settling.
- The dredge size should be standardised to prevent damage to seed beds by larger vessels using multiple very heavy dredges and causing excessive scouring.
- Expertise of the local fishermen as well as the judgement of the fishery officers must be used in making decisions whether to open or close beds.

- The size of seed is not the important thing. Shell ratio is the deciding factor that reflects seed survival. It was instanced that in Lough Foyle, good seed may have a shell weight of 47%, water 30% and meat 23%. On the other hand, the same size seed from Rosslare may have a relative shell weight of only 36% and only show a poor survival. Seed needs a minimum ratio of 40% of shell weight to be strong enough to survive dredging and subsequent transportation.
- The seed fishing season should open in April, and then closed again in mid-May for 5-6 weeks. This cycle would allow the vessels to harvest stock with high meat content from the on growing sites to be sold into the Netherlands when prices are very high. The seed fishery should then reopen around the middle of June, then close in August/September. The first opening prepares the ground ('fluffing' to follow the Dutch practice) to allow for a better seed settlement over the summer months and thus to maximise overall spat fall.
- Producers should not have to worry about sourcing seed when they should be harvesting to exploit high prices over May and June.
- The earlier seed goes onto the on growing beds the better so as to exploit the most productive growing months which are during the summer.

Alternative, and largely individual views to those expressed above, on these issues included the contention that:

- The minimum permitted size for seed before it should be allowed to be fished is 20-30mm; otherwise, this consultee believed that the seed will be washed away after it is relayed.
- The first week/tide in June and last tide of August were suggested as opening and closing dates for the seed fishery. This suggestion was based on avoiding 'discrimination' against the owners of smaller vessels as the weather was best over that period, rather than on enhanced survival or yield from the seed mussel resource.
- If boats are allowed to fish seed mussel beds too late into the year, (into or after late September) then the beds may be overexploited by the larger vessels and damaged as a result of over intensive dredging of the substrate.
- The fishermen should be allowed to decide between themselves as to when seed is ready, and that the fishery officers or other authorities should not be involved at all in the decision.
- There is enough seed in each jurisdiction to cater for the needs of the growers located in that jurisdiction. NI boats should only be allowed to take seed mussel from NI waters; Welsh boats should not be allowed into Irish waters at all and Rol boats should only take from Rol waters.

2.4.3 Issues around the movement of seed mussel

One major area of consensus was that the key characteristic of any future inspection regime should be, and be seen to be, even handed.

Other points of view put forward were that:

- It should be left up to individual operators to assess the logistics of the various transport options around seed mussel movement after fishing (e.g. road vs. sea-transport). A number of producers did not want to see restrictions being placed on transportation options whereby sea-transport was favoured over road transport in terms of allocations. Their concerns were based on the worry that this might disadvantage older slower boats as against the new high capacity vessels that have recently been added to the fleet.

- At another meeting, a diametrically opposing view put forward was that summertime transportation of seed from the Irish Sea to other areas by lorry does not work. That consultee stated that mortalities of 90% were common with this sort of system.
- There are also issues to do with loading and unloading of seed mussel for onward lorry transportation that need to be addressed. If a load contains high levels of stone, this can crush seed when loading and unloading, a gentler conveyor or elevator type system needs to be developed.
- To comply with the necessity for health certification between the RoI and NI, producers reported that it can be difficult to get inspectors to sign off on the certification of seed. The relevance of this system was called into question as it was stated that the sea fishery officers had told the fishermen that they did not really know what they were looking for in terms of diseases.
- An accurate system for evaluating the 'fished seed' capacity of each boat needs to be developed. Currently, an estimated 'flat load' approach is being used and it was felt that this was very inaccurate and arbitrary. If this was to be used as an input source as part of a management tool then it will need to be sorted out quickly so as not to base the system on meaningless data. For example, it was stated that there was no point in saying that a boat has a nominal capacity of 150 tonnes of seed mussel (when level) when in fact the real capacity is actually only 100 tonnes.

2.4.4 Surveying for seed mussel

There was a strong consensus that:

- The current arrangements for seed mussel surveying are and have been inadequate.
- That there should be an organised systematic approach to seed mussel surveying. Grid searches should be coordinated in both the bays and in the 'open waters' fishery. This effort should be coordinated by the departments or agents acting on their behalf. All of the industry seeking seed allocation should have to contribute to the surveying effort, either financially or via a contribution in ship time. If licence holders do not have boats then they should contribute financially to assist those who are using their boats to carry out the survey.
- One single all-island system is needed for all. It was felt that such a system should be organised and regulated centrally or the situation should be left open for individual operators to survey and for them to get the benefit from having preferential access to what they find.
- If a central system is developed then it will have to be seen to be transparent and everyone should have access to all the available information at the same time.
- An all-island body should be created that is independent of the industry, has expertise and resources to search for seed, to assess seed beds and to police the fishery.

Other views on this theme included the opinion that:

- Sometimes beds are very small and whoever finds it should get to keep it.
- The new large boats should be forced to go searching for new seed beds in deep water.
- There is too much reliance on Dutch opinions when there is a wealth of experience at home.
- Historically, Wexford boats used to search together. In the current climate of distrust they are now following each other around in case someone finds seed. Nobody is sharing information, so people are wastefully searching the same areas over and over again.

- The government owned research vessels should be ordered to go and look for seed.
- The west coast should be surveyed. Money should be set aside by the departments to facilitate a major expedition. It was contended that boats would go and survey if they received financial support. The belief was expressed that new seed mussel grounds had to be out there. 'Just because they have not been previously documented does not mean that new beds do not exist.'
- Black boxes could be used to monitor the boats engaged on survey work. If no seed is reported in an area that has been searched and the survey boat returns to that area subsequently to fish, then they should be immediately checked and penalised if they have seed on board.

2.4.5 Ensuring the environmental sustainability of the seed mussel fishery

A range of opinions were expressed including the view that:

- Historically reliable seed areas have been damaged by too many boats fishing them. Cultch has been removed and as a result nothing is left for the mussels to settle on.
- Loads of stones were transported north rather than seed mussel; there was a huge mortality in seed mixed with the stones and furthermore the beds were damaged as a result of the removal of so much substrate.
- No inspections of seed take place once it is fished (unless they are being shipped north); this is unsatisfactory and provides no incentive for good practice as operators can fish all and any sizes etc.
- Wexford producers feel that they should have their own exclusive area of seed mussel beds, which they would look after and not over fish.
- Other seed resources should be investigated such as those in Scottish waters, which are only a 5-6 hour steam from Belfast. This seed resource is not currently exploited. It was claimed that there is history of cooperation between different countries in this regard (e.g. the Netherlands and Germany) and it was suggested that some similar arrangements should be entered into between Ireland and Scotland. Similarly Welsh seed sources should also be looked at.

2.4.6 The economics and sustainability of using rope mussel spat collection techniques as an alternative for sourcing seed for bottom mussel cultivation

Opinions expressed on this topic were that:




- It is working well in some areas, but the cost of the operation may be a problem. At current market prices for bottom mussels it would be worth paying €500 per tonne but if prices fall back, the maximum that producers could afford to pay would be €250-€300 per tonne.
- Rope seed could be a useful alternative and a sustainable source as well; however the jury is still out on whether it will work or not.
- Seed sourced from rope mussel farms should fall outside the 'quota' system and should not be counted in any wild seed mussel allocation.

- Using rope mussel seed has proved very successful elsewhere, in the Netherlands, for example. One of the largest companies sources 90% of its seed from a rope collection system.
- Another important element for success is treating the ground before laying seed (predator removal) and the careful treatment of seed. It should be put directly into water in the hold of the boat after transport, rested until bubbling stops and then relayed, otherwise the mussels become stressed. These extra steps are expensive in terms of man hours but it is worth it when considering the improvement in return.

2.4.7 Other issues raised relating to seed mussel were that:

- People who have invested in the industry should have access to seed regardless of their level of investment.
- Seed should not be exported, and seed relaying should be controlled to prevent people laying seed at holding densities and then exporting it after a short period.
- There should be a ceiling on the amount that any one operator gets; no single producer should get greater than an allocation of 2,000 tonnes of seed mussel per annum.
- Contract fishing of seed mussel by vessel owners for licensed producers is an important means of supplementing income and should not be restricted.

APPENDIX 1 Consultees

	Invited to engage in all strands of consultation
	Invited to request individual meetings and submit written comments
	Invited to submit written comments

Mr Paul Barlow	Mr Diarmuid Keane	Mr Liam O'Connor
Mr Conor Blake	Mr Gerard Kelly	Mr Ronan O'Doherty
Mr Paddy Boyce	Mr Stephen Kelly	Mr Charlie O'Donnell
Mr Patrick Boyle	Mr Charles Kelly	Mr John Joe O'Reilly
Ms Mary K Bradley	Mr Dermot Kenny	Mr Gerald O'Reilly
Mr David Brennan	Mr Desmond Lett	Mr Tony O'Sullivan
Mr Dermot Brown	Mr Joseph Lynch	Mr Patie O'Sullivan
Mssrs Kenneth/Alan Brown	Mr Tommie Marks	Mr Michael O'Sullivan
Mr Steven Brown	Mr Shane McColl	Mr Paul O'Sullivan
Mr Timothy F Carthy	Mr Alex McCarthy	Mr John O'Sullivan
Mr Edward Carvill	Mr Arthur McCarthy	Mr Alan O'Sullivan
Mr William Casey	Mr John McCarthy	Mr Danny O'Sullivan
Mr Robert Chapman	Mr Daniel McCarthy	Mr Tony O'Sullivan
Mr Jerry Costello	Mr Frank McCarthy	Mr Sean O'Sullivan
Mr Mick Crowley	Mr John A McCarthy	Mr Brendan Quinn
Mr Brian Cunningham	Mr Terence McCarthy	Mr John Rahilly
Mr Seamus Curran & Mr J Burden	Mr Frank McCarthy	Mr Sean Ryan
Mr John Dignam	Mr Daniel McCarthy	Mr Anthony Reynolds
Mr Raymond Dougal	Mr Derek McCrudden	Mr Fintan Scallan
Mr Ruairi Dougal	Mr Hugh McCrum	Mr Noel Scallan
Mr Hugh Doyle	Mr John McDermott	Mr Michael Scannell
Mr Aidan Farren	Mr Danny McDermott	Mr Felix Sloan
Mr Richie Flynn	Mr Danny McDermott	Mr Gary Smith
Mr Liam Flynn	Mr Denis McDonald	Mr Mark Steele
Mr John P Foley	Mr Desmond McElroy	Mr John Steele
Mr Danny Gallagher	Mr Derick McGonagle	Mr Michael Sugrue
Mr Gareth Gallagher	Mr Declan McGuinness	Mr Flor Sweeney
Mr Billy Gaynor	Mr Liam McGuinness	Mr Michael Teahan
Mr Robert George	Mr Melvin McIlhinney	Mr Owen Teehan
Mr Conal Gillespie	Mr Michael McLaughlin	Mr Paul Teehan
Mr George Golden	Mr John McLaughlin	Ms Angela Teehan
Mr Paul Gormley	Mr Colum McNicholl	Mr Denis C Teehan
Mr Robert Graham	Mr Pat McNulty	Mr Niel Urey
Mr Denis Griffin	Mr Ciaran Morgan	Mr Peter Van Ysseldijk
Mr Michael Hargan	Mr Andy Mulloy	Mr Andrew Verwijs
Mr Michael Havlin	Mr Pat Mulloy	Mr Andrew Wilson
Mr Harold Henning	Mr Geno O'Connor	Mr Alan Young
Mr Alec Carlin	Mr Paul McLaughlin	Mr Keith Doherty
Mr Michael McGreevy		
Mrs Sharon Bateson	Mr Andrew Kineen	Mr Bob McMullan
Mr Patrick Boylan	Mr David Knott	Mr Sean McCarthy
Mr Craig Burton	Mr Ian Lawlor	Mr Mark McCaughan
Mr David Carlilse	Mr David Lyons	Mr Stan McIlvenny
Ms Martina Clarke	Ms Allison Marsh	Ms Elaine McLaughlin
Ms Kirstan Dunbar	Mr Peter Marshall	Mr Colin Nelson
Mr Malcolm Emery	Mr Brian Martin	Mr Sean OSuilleabhain
Mr Adrian Fitzsimons	Captain Robert McCabe	Mr John Gerard Sullivan
Mr Tommy Geoghegan	Mr Fraser McConnell	Mr Clifford Todd
Mr John Hickey	Mr Tony McCrory	Mr Colin Whooley
Mr Richard H James	Mr Alan McCulla	Captain Trevor Wright
Mr Billy Johnston	Mr Brian McJury	

APPENDIX 2 Schedule of Regional Industry Meetings

Date	Time	Area covered	Venue
Tuesday 27th February	10am-12.30pm	Belfast Lough & Larne Lough	Radisson SAS Hotel, Belfast
Wednesday 28th February	10am-12.30pm	Lough Foyle & Lough Swilly	Carlton Redcastle Hotel, Moville
Tuesday 6th March	10am-12.30pm	Dundrum Bay & Carlingford Lough	Canal Court Hotel, Newry
Thursday 8th March	10am-12.30pm	Cromane & Castlemaine	Manor Inn Hotel, Killorglin
Tuesday 13th March	10am-12.30pm	Waterford & Wexford	Brandon House Hotel, New Ross

APPENDIX 3 Attendees at Regional Industry Meetings

Attendees	Venue	Attendees	Venue
Dessie McElroy <i>C Fresh</i>	Belfast	Paul Gormley <i>C Fresh</i>	Belfast
Raymond Dougold <i>Dougold Mussels</i>	Belfast	Michael Havelin <i>Tully Shellfish Ltd</i>	Moville
John Steele <i>Foyle Fresh Seafoods</i>	Moville	Derek McCrudden <i>Ballykelly Bay Seafoods</i>	Moville
Danny McDermott	Moville	John McLaughlin <i>Donegal Seafoods Ltd</i>	Moville
Ronan O'Doherty <i>Aqua Shellfish</i>	Moville	Paul Gormley <i>Irfish</i>	Moville
Danny McDermott <i>Ballylawn Shellfish</i>	Moville	Liam McDermott <i>Foyle View Shellfish</i>	Moville
Colm McGuinness <i>LDC Shellfish</i>	Moville	Declan MCGuinness <i>LDC Shellfish</i>	Moville
Liam McGuinness <i>LDC Shellfish</i>	Moville	Paul Dougal <i>Emerald Mussels</i>	Moville
Dereck McGonagle <i>Euro Shellfish Ltd</i>	Moville	Raymond Dougal <i>Emerald Mussels</i>	Moville
Brian Cunningham <i>Cloughmore Shellfish</i>	Newry	Liam Flynn <i>Flynn Shellfish</i>	Newry
Raymond Dougal <i>Emerald Mussels Ltd</i>	Newry	Stephen Kelly <i>Carlingford Lough Mussels</i>	Newry
Liam O'Connor	Newry	Ciaran Morgan	Newry
PJ Donnelly <i>Carlingford Lough Co-op</i>	Newry	Hugh McCrum <i>Green Island Shellfish</i>	Newry
Robert Graham <i>Dundrum Bay Oyster Fishery</i>	Newry	Michael Teahan <i>Teahan partners</i>	Killorglin
John Teahan <i>Teahan Partners</i>	Killorglin	John Foley <i>Foley Teahan Shellfish Co</i>	Killorglin
John M Foley <i>Foley Teahan Shellfish Co</i>	Killorglin	Owen Teahan <i>Foley Teahan Shellfish Co</i>	Killorglin
Paul Teahan <i>Foley Teahan Shellfish Co</i>	Killorglin	Patie O'Sullivan <i>Sullivan/Teahan</i>	Killorglin
Joseph O'Sullivan	Killorglin	Michael Teahan	Killorglin
Jeremiah M Costello	Killorglin	Tony O'Sullivan <i>Cromane Mussels Ltd</i>	Killorglin
John O'Sullivan <i>Cromane Mussels Ltd</i>	Killorglin	John Rahilly	Killorglin
Geno O'Connor	Killorglin	John McCarthy	Killorglin
Frank McCarthy	Killorglin	John McCarthy	Killorglin
Arthur McCarthy	Killorglin	Dannie McCarthy	Killorglin
Sean Ryan <i>Wexford Mussels Ltd</i>	New Ross	Eddie Ryan <i>Wexford Mussels Ltd</i>	New Ross
Edward Ryan <i>Wexford Mussels Ltd</i>	New Ross	Billy Gaynor <i>Loch Garman harbour Mussels Ltd</i>	New Ross
Desmond Kenny <i>South East Shellfish Co-op</i>	New Ross	Padraig Ryan <i>Wexford Mussels Ltd</i>	New Ross
Robert Ryan <i>Wexford Mussels Ltd</i>	New Ross	Andrew B. Vervise <i>Irfish/Cfresh Mussels</i>	New Ross
Stephen Kelly <i>Crescent Seafoods</i>	New Ross		

APPENDIX 4 Private Meeting Attendees

Attendees	Venue
Raymond Dougal	Belfast
Michael & Fergal Havelin	Moville
Foyle Mussel Producers	Moville
Kenneth & Alan Brown	Moville
Paul Gormley and Dessie McElroy	Moville
Ronan O'Doherty, Dessie McElroy and John McLaughlin	Moville
Swilly Native Oyster Fishery Representatives	Moville
Foyle Native Oyster Fishery Representatives	Moville
Brian Cunningham	Newry
Carlingford Public Fishery Representatives	Newry
Arthur McCarthy	Killorglin
Foley Teahan Shellfish Company	Killorglin
Frank McCarthy & John Rahilly	Killorglin
Lett and Co. Ltd	New Ross

APPENDIX 5 Written Submissions

Written submissions were received from the following groups
Noel Scallan – N&A Scallan
RH James – NIFPO
DW Carlilse – MCA
Sean Ryan – Wexford Mussels Ltd
Michael McGreevy – Carlingford Wild Mussel Fishery

APPENDIX 6 Industry Meeting Presentations

Bottom mussel review consultative phase 2007

Guiding policy

The purpose of the regulation and management regime for the seed mussel resource shall be to ensure the sustainable exploitation of the wild mussel seed resource and to maximise the benefits derived from that resource in terms of volume and value of the mussel crop subsequently grown, harvested and processed with the objective of generating sustainable economic activity and employment in coastal communities.

Background

The Department of Agriculture, Fisheries and Food (DAFF), the Department of Agriculture and Rural Development (DARD) and the Loughs Agency have adopted this guiding policy.

They are further committed to the sustainable development of the sector as a whole on the island of Ireland. In this context sustainability is taken to encompass three core elements, which must be equally balanced. Environmental sustainability, financial sustainability and socio-economic sustainability.

The bottom grown mussel sector review group (BGMSRG)

Members

- Department of Agriculture and Rural Development (DARD) – Represented by Kenny Parker.
- The Department of Agriculture, Fisheries and Food (DAFF) – Represented by Rebecca Minch and/or John Kelly.
- Loughs Agency – Represented by Barry Fox.
- CHAIRMAN – Donal Maguire.
- SECRETARIAT – Aquaculture Initiative EEIG.

Regulatory framework of the industry

The Review is undertaken within the framework of the Voisinage Agreement, the Common Fisheries Policy and associated EU legislation, the Fisheries Amendment Act 1997 (RoI legislation) and the Sea Fisheries & Maritime Jurisdiction Act 2006 (RoI legislation), the Sea Fish (Conservation) Act 1967, as amended (UK legislation) and the Fisheries Act (Northern Ireland) 1966, as amended (NI legislation) for the bottom grown mussel sector.

The consultative phase of the review process

What we will be doing:

- Listening to the views of the industry and other stakeholders.
- Looking to the future and asking for opinions on how the sector should be structured and organised.

What we will not be doing:

- Getting involved in the day-to-day management of the sector.
- Ascribing blame or criticising any stakeholders.
- Getting bogged down in history.

Structure for the meeting

We will be seeking your views on:

1. The market prospects for bottom grown mussels.
2. Infrastructure deficits.
3. Product quality and food safety issues.
4. Best practice in bottom mussel on-growing.
5. Aquaculture licensing issues.
6. Issues surrounding the sourcing of seed mussel.
7. Future industry management structures.
8. Other issues.

The market prospects for bottom grown mussels

Comments on the current market and price trends:

Threats:

- Cheaper product from other countries.
- Market Access.

Opportunities:

- Innovation in packaging and new product forms.
- New market outlets.
- Differentiation by quality and eco-labelling.
- Enhanced marketing support.
- Cooperative marketing structures.

Infrastructure deficits

At sea:

- Vessel availability and capacity.

Shore-based:

- Landing facilities.
- Road infrastructure.
- Depuration capacity.
- Processing and handling capacity.
- Other constraints.

Product quality and food safety issues

Regulatory issues:

- Biotoxin monitoring regimes.
- Microbial water classification regimes.
- Need to have inter-jurisdictional harmonisation?

Commercial issues:

- Overcrowding and growth rates.

Best practice in bottom mussel ongrowing

- Tracking and recording of seed mussel after relaying.
- Principles of bottom mussel ongrowing site management (adoption of a COP?).
- The CLAMS process.
- Reducing environmental impact – ECOPACT.
- Positive communications around the sector.
- Reaping the benefits of compliance.

Aquaculture licensing issues

- Are the current licensing regimes adequate to underpin the future development of the sector?
- Are communications between the regulators and the industry adequate?
- Should more aquaculture licences be issued in the short-term?
- Protections that a compliant aquaculture licence holder should enjoy.
- Duration and terms and conditions attaching to licences.
- Other issues.

Issues surrounding the sourcing of seed mussel

- How should the seed mussel allocations be managed?
- Opening and closing seed mussel fisheries.
- Issues around the movement of seed mussel.
- Improved surveying for seed mussel beds.
- Ensuring the environmental sustainability of seed mussel fishing.
- The economics and sustainability of using mussel spat collection techniques for sourcing seed.
- Other issues relating to seed mussel.

Possible future industry management structures

- What structures should be created to manage and regulate the sector in accordance with the guiding policy?
- Should the Irish bottom grown mussel industry be self-regulating?

Other issues... ?



APPENDIX 2.0



2.0

MARKETING

1.0 Introduction

Effective marketing and market-led development is the cornerstone of any progressive industry. Demand for seafood is increasing the world over and this clear and growing demand must be captured. EU seafood import dependence is currently estimated at 74%. On the domestic market, growth in the demand for seafood is outpacing consumption growth for most other protein products, with significant opportunity for future growth.

The outcome of the BG mussel review public consultation process is presented in detail in this Appendix. The key recommendations from the strategy report, *'Steering a New Course – Strategy for a Restructured, Sustainable and Profitable Irish Seafood Industry 2007-2013'* are considered, and a programme for marketing mussels is developed with key objectives, targets and a timeline over the lifetime of the European Fisheries Fund 2007-2013. Central to this process is the close association and co-operative working of the relevant sections of BIM, the State agency charged with the marketing of seafood in the RoI, the industry itself and the representative organisation as necessary.

1.1 BG mussel production

This sector has been the most successful component of the aquaculture sector on the island of Ireland over the past six years. Production of BG mussels in the RoI increased from 9,644 tonnes valued at €4.2 million in 1999 to 29,510 tonnes valued at €25.7 million in 2005. The volume of BG mussels harvested decreased from 29,510 tonnes in 2005 to 23,583 tonnes in 2006, a fall of 20%. The market value of BG mussels increased dramatically from €25.7 million in 2005 to €35.78 million in 2006 with the average price rising to €1,517 per tonne (+74%).

The BG mussel industry on the island of Ireland developed in its initial phase using imported second-hand Dutch mussel dredgers to fish for mussel seed primarily in the Irish Sea. These vessels were originally designed for use in smooth and sheltered waters in the Netherlands and were never suited to fishing in open sea conditions. The introduction of new EU safety regulations for sea fishing vessels signalled the forced obsolescence of many of these second hand vessels. The recent investment of €25 million in seven new mussel dredgers supported by BIM/EU grant-aid will underpin the economic sustainability of the BG mussel sector in terms of access to seed mussel and improved cost competitiveness. Six new dredgers entered the fleet in 2005 with a total EU grant paid amounting to €4,439,683. In 2006 another new mussel dredger was added to the fleet, supported by FIFG grant of €1,185,000.

Table 1 BG mussel 5-year volume value analysis

RoI BG mussel 5-year production	2002	2003	2004	2005	2006
Volume tonnes	24,000	29,976	28,560	29,510	23,583
Value € ('000)	16,896	21,653	21,014	25,718	35,789

Figure 1 RoI BG mussel 5-year volume value analysis

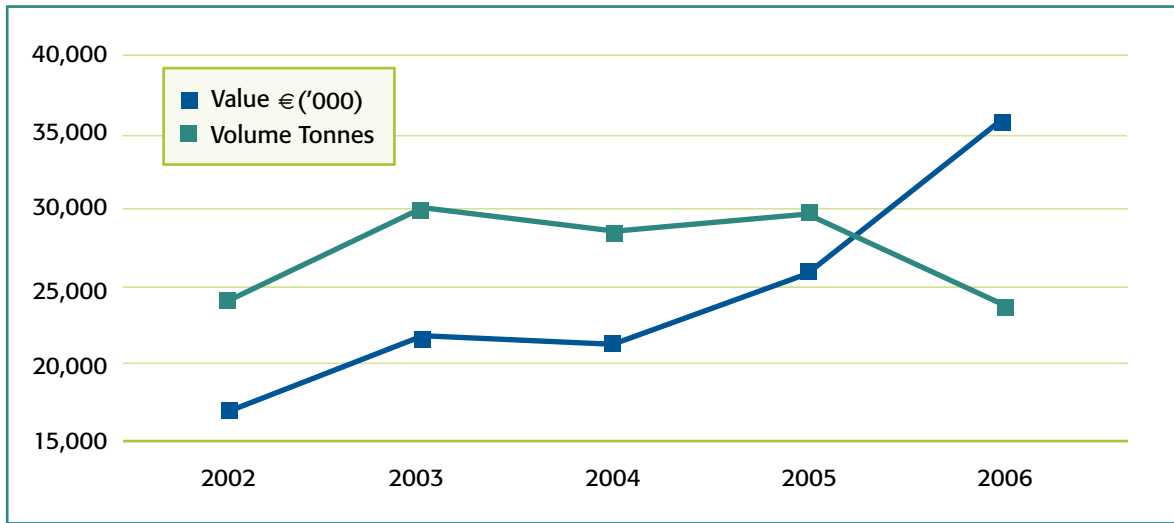
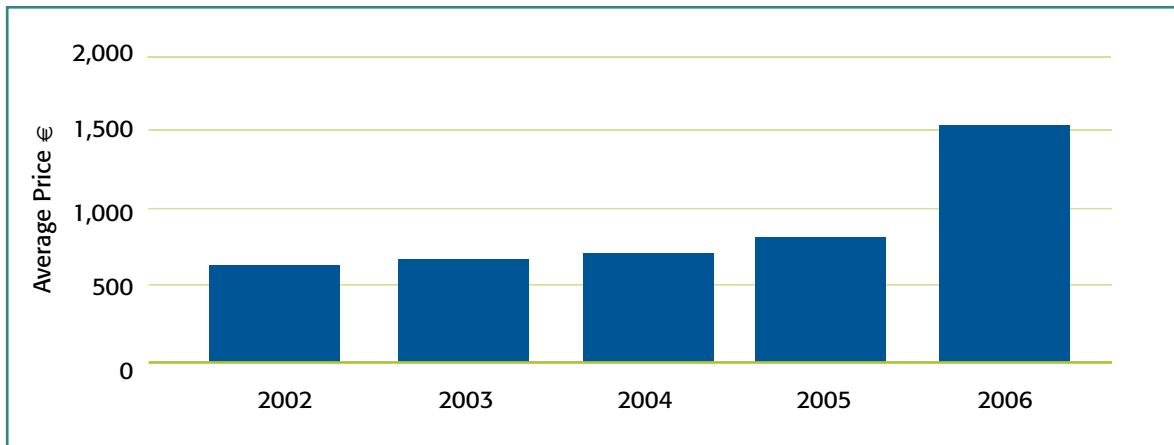


Table 2 BG mussel 5-year average price analysis

BG mussel 5-year average price	2002	2003	2004	2005	2006
Average price per tonne	€704.00	€722.34	€735.78	€871.50	€1,517.58

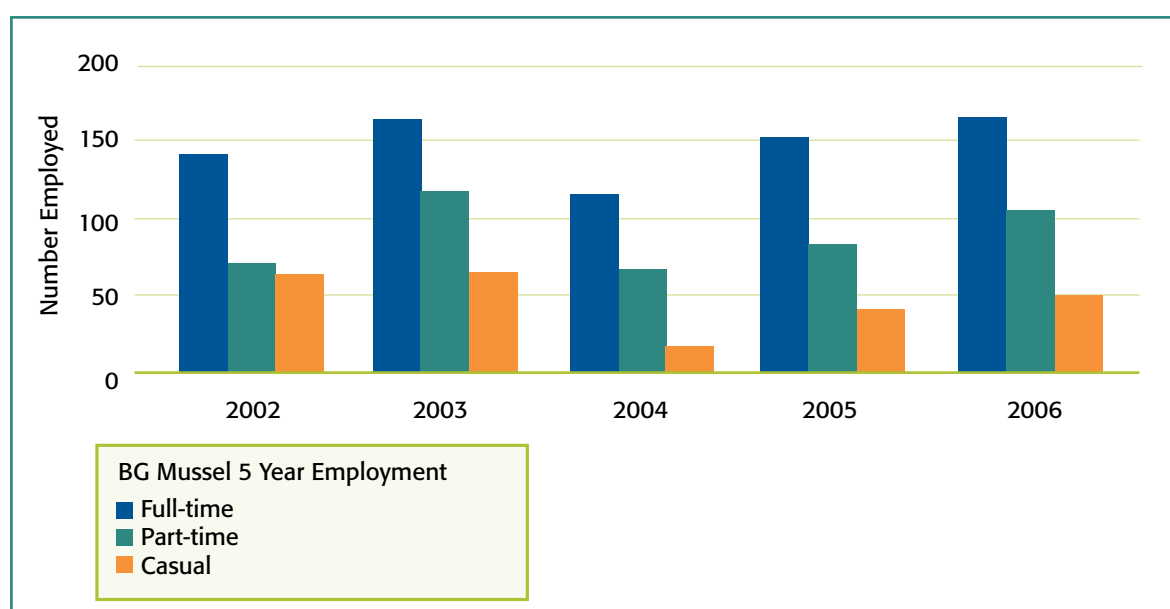
Figure 2 BG mussel 5-year average price analysis



The total number employed in BG mussel production in 2006, rose by 15% to 323 people. This gave an increase of 23 FTE giving a total of 229 FTE in 2006.

Table 3 ROI Employment in the BG mussel sector

BG mussel 5 year employment	Full-time	Part-time	Casual	Total	FTE
2002	142	72	65	279	189
2003	163	119	66	348	234
2004	118	67	19	204	155
2005	154	85	42	281	204
2006	167	107	49	323	229

Figure 3 ROI employment in the BG mussel sector

1.2 A market-led vision for the seafood industry

The seafood industry strategy report '*Steering a New Course – Strategy for a Restructured, Sustainable and Profitable Irish Seafood Industry 2007-2013*' sets out a series of recommendations for the seafood industry for the period of the European Fisheries Fund 2007-2013. Key to the success of the sector is market development and market-led innovation.

Specifically, the seafood industry must aim to:

'capture the full potential of seafood through a market focused, customer-led development strategy, supported by enhanced trade and promotional activity and the development of a robust 'Seafood Island' proposition with the capability of meeting customer demands in the future.'

In the area of market-led innovation, the seafood industry must have the:

'capability to establish a leading position in delivering market-led innovation with specific focus on R&D, value-added development and the application of appropriate technology to remain competitive and profitable into the future.'

The following individual recommendations are made, which have application to and can help guide the development of a marketing strategy for the mussel sector:

Under the theme market development:

- BIM to invest further in market research and intelligence.
- BIM to focus marketing support in a targeted fashion on key export mussel markets in addition to examining the domestic market.
- BIM to establish a 'Seafood Island' identity for seafood from the RoI.

Under the theme Market-led innovation:

- BIM to adopt a structured approach to providing services for commercially – focused R&D/NPD more effectively through BIM's Seafood Development Centre.

1.3 Learning from other industries

Product distribution is an important issue for the BG mussel sector, and learning from other sectors such as the dairy and beef industries could be beneficial to the mussel growers. The seafood industry on the island of Ireland in general does not have access to an efficient and effective distribution network. Over-reliance on intermediaries erodes profits and creates inefficiencies. It is advised that in order for the seafood industry to develop it must mimic or piggyback on the strategies employed by the dairy and beef sectors, and establish distribution solutions which will allow direct access to customers based in key markets. The BG mussel producers are themselves extremely reliant on the export market and intermediaries.

Quality

Good quality product in the market place depends on a range of interrelated factors. In the BG mussel industry, from a biological perspective, quality depends on; seed availability, type, waste allowance, fishing technique, handling, relaying, grow-out, predator removal, harvesting technique, transport method and depuration, to name but a few. Seed mussel supply is a limiting factor at the current time and for the future sustainable development of the industry. The fact that the seed supply is managed as a shared resource between the two jurisdictions makes this a complex regulation issue. Seed fishing technique, handling, holding, relay of fished seed and husbandry of relayed product as it grows out to market are critical elements of this industry. Profitability is dependent on the management of the resource in a sustainable manner and the maximising of yield from relayed product.

Further, from an infrastructural/operational point of view, ports and landing infrastructure must be examined in greater detail for the mussel sector. Access to berths and fast delivery of product to waiting trucks for dispatch to continental markets and processing facilities is critical in terms of ensuring quality and product safety.

1.4 Setting the scene

From a marketing perspective, most of the output of BG mussels from the island of Ireland is exported in an undifferentiated bulk form and there is scope to add significant value. Basic handling improvements such as improved grading and washing and a move from bulk bags to smaller packs would yield immediate value uplifts while modified atmosphere packaging (MAP) and other avenues of innovation in product forms offer scope. Market demand for the product is solid and if backed by appropriate differentiation strategies it is felt that the value generation from the sector on the island of Ireland could be significantly boosted.

Opportunities that could arise from adding value to mussels from the island of Ireland and ideas on innovation, processing, packaging/labelling and marketing are presented. Understanding competition in the market place is critical. Identifying and knowing the key players in Europe, which are the Dutch, Spanish and French mussel producers and markets, is critical for mussel producers on the island of Ireland.

The winners in the market place are those that have aggressively built market share, have moved down the experience curve and have built economies of scale in operations and marketing. Traditionally in Europe these would be the Dutch, French and Spanish industries. These industries are mature, having comparatively powerful marketing and distribution systems. These leaders are hard to dislodge unless a new entrant/competitor can introduce radically innovative products or marketing strategies.

Supply relationships are critical to producers because so much of our markets are export and dependent on successful supply relationships. Traditionally our mussels are sold into the Dutch and French markets. Increasingly these markets are having supply difficulties in their indigenous industries. Environmental regulation, closures due to harmful algal blooms and other factors mean that obtaining suitable supply of product may be a constraint to growth. Increasingly the traditional buyers of BG mussels from the island of Ireland are integrating backwards in the supply chain, thereby securing supply of product and obtaining important competitive advantages. The power traditionally has probably rested with the buyers, however, it is our belief that the power base is shifting and producers must capitalise on this shift. The supplier's product is providing an increasingly important input to the buyer's business because of shortage of product in mainland Europe.

2.0 Public Consultation Process

A series of public meetings were held around the country during March 2007 to elucidate the views and opinions of the producers. In addition, producers were invited to send in written submissions if they wanted to communicate in a more formal way. This process is consultative in nature. This piece sets out, in summary, the views presented on the theme: 'The market prospects for BG mussels'. It is presented under a number of headings as discussed at the public meetings.

The views and opinions expressed in this section are those of the people who attended the public consultation process and not necessarily those of the authors of this Review.

2.1 Comments on the current market and price trends

The market for BG mussels has traditionally been strong; this is thought to be as a direct result of the opening up of the Dutch market since the late 1990s. The fate of the BG mussel sector is inextricably linked to the BG mussel industry in the Netherlands. There was a good demand before Christmas 2006, and there were not enough BG mussels produced to fill the market. Average prices for BG mussels in 2006 were well up on previous year's prices. After Christmas 2006 there was a traditional lull and then it picked up again in April 2007. The market is for bulk fresh produce, going through established processing facilities in the Netherlands.

It is however expected there will be more seed in 2007 in the Netherlands, and as a result, it is expected that there will be a larger crop there in 2008 despite the bad weather they have experienced, which will have caused a loss of stock on the ground.

It is thought that Christmas 2007 prices for high quality mussels will be 75% of that achieved at Christmas 2006 (€2,500/tonne will drop to €1,800/tonnes). In addition, there will be an even greater reduction in the prices achieved for smaller BG mussels (65 pieces per kg). 2006 was a good year for prices, and while productivity was down by approximately 20%, the high prices achieved offset this. French prices are relatively stable.

KEY POINT 1

Producers must learn to concentrate on producing lower volumes of higher quality produce in order to obtain the best returns. This practice has already started; however all producers need to look at this as a way forward for the industry. A general lack of produce from Dutch producers is pushing prices up.

2.2 Market preferences

The Dutch prefer larger, higher meat content mussels, while the French take smaller mussels at a lower price. The Belgian market prefers larger mussels. The French market is also comparatively more stable from year to year, but in 2006, established buyers in France did not receive mussels from the island of Ireland due to better prices offered in the Netherlands.

KEY POINT 2

Ideally a balance of produce to the Netherlands and France should be achieved.

2.3 Market threats

The markets are somewhat removed from the industry on the island of Ireland as it is an export market.

Undoubtedly the major identified threat is that of cheaper product from other countries. Cheaper products made possible by better environmental growing conditions, combined with cheaper production costs, such as labour, from other countries may impact the market. The Dutch are running the risk of pricing themselves out of the market. Chilean product was identified as posing a threat to the stability of the European mussel market place. Greece was also mentioned. Greek produce is now feeding into the Dutch market which is a hub for all the produce from the island of Ireland. Cooked produce will be in competition with cooked product from countries such as Chile. Spanish mussels are perceived as being of lower quality than those produced on the island of Ireland but if they are offered at a lower price they may substitute mussels from the island of Ireland in the European market place. Fresh produce from Canada and Spain is not thought to be as appealing to the customer. The Spanish have broken into the market in Belgium. Over dependence on one market may leave BG mussel producers exposed in the event of market instability arising from cheaper imports.

KEY POINT 3

An identified strength is that BG mussel from the island of Ireland has the advantage of being similar in characteristic to the Dutch mussel, facilitating easy entry into the Dutch market. It is acknowledged that the market is functioning well at the moment; however over-dependence on one market could become an issue in the future. It was pointed out during the consultation stage that there was no way of predicting this. The French market is thought to be a safety net if necessary.

2.4 Market access

The majority of our produce is tied into the Dutch market. Again the point was made by the consultees that if this market experiences any difficulties in the future, it could have a profoundly negative impact on the industry. Producers must also look to the French market. A perceived problem identified by the consultees was that producers are being 'ripped off' by buyers in the French markets.

KEY POINT 4

An agent to look after the interests of producers on the island of Ireland in France would be very useful. Dutch buyers are more reliable when it comes to paying.

2.5 New market outlets and opportunities

Some consultees had the view that not enough mussels were being produced to fill existing markets, let alone new markets. Their view was that there is no point in making the effort to develop new markets if the mussels are not there for existing markets now and in the future. What is needed is good raw material supply. It is necessary to concentrate on the production end first.

At the moment the Belgian market is controlled by the Dutch. The Dutch control the distribution networks and markets but it is thought that they cannot continue to control the market as before, times have changed. There is a market for produce from the island of Ireland in Belgium but the issues are meat

consistency (25-28%) and consistency of supply. There is no point in cultivating a market for 30% meats if you cannot give a regular supply. If markets developed at home, then processing may be needed at home.

KEY POINT 5

There is a valuable market in Belgium, this should be looked at. At the moment the Belgian market is controlled by the Dutch.

2.6 Innovation in packaging, new product forms and supply logistics

Innovation by the industry on the island of Ireland is limited by travel time. The market for processed product is 30 hours away and as such, produce is at a disadvantage due to longer travel time and shorter shelf life. Modified Atmosphere Packaging (MAP) may offer possibilities to change this. A reduction in seed availability may encourage further investigation into the opportunities for processing at home. Processing is perceived to be a very high risk exercise. Good mussels are produced on the island of Ireland but distance to market is against us. It was proposed that to establish a base depot in mainland Europe would allow flexible supply to supermarkets and restaurants within four hours. It was noted by consultees however that the large companies in the Netherlands would resist new entrants to the European market and would undercut produce to close the door. If more processing was to establish on the island of Ireland, the price would have to be right for producers to supply it. Produce has historically been sold as Dutch; there is no product identity as such. In fact, strong product identity has historically been a turn off as the customer is comfortable with the Dutch product. This was seen by some consultees as a significant challenge (weakness) to the industry.

Price fluctuations are not so pronounced in supermarkets, they occur down the supply chain. It was noted that efforts should be made to expand the home markets as they are easily accessible. Consumers are changing their attitude to fish and shellfish, and are now willing to pay a premium for it. There is a perceived risk that if processing commences on the island of Ireland a couple of large companies will control and dominate the market. Producers may still prefer to sell bulk product to Europe. If further processing is going to work for the Industry on the island of Ireland, it will need to be done on a collective basis and receive economic support as product enters the market place.

KEY POINT 6

The establishment of a base depot in mainland Europe would allow flexible supply to supermarkets and restaurants within four hours. If more processing was established on the island of Ireland, the price would have to be right for producers to supply it. In addition, it will need to be done on a collective basis and receive economic support as product enters the market place. Efforts should be made to expand the home markets as they are easily accessible.

2.7 Differentiation by quality and eco-labelling

The market is perceived as being quality driven, and yields are subject to variation due to environmental conditions. A labelling scheme would be of value to the industry particularly as a means of identifying producers. This would also have the added benefit of limiting market access to unregulated, unregistered producers who may have a harmful impact on the reputation of the industry. Traceability is thought to be important. A labelling scheme such as the new 'traffic light system' that promotes the health benefits of

the product was highlighted as being important. Some form of differentiation will be needed in order that the island of Ireland keeps abreast of international best practice. The Dutch currently control the market, yet there are opportunities to break free of this especially since the Dutch are mixing produce from a number of countries and selling it as Dutch.

Also branding such as that achieved for the bouchot mussels was acknowledged by consultees as being linked to optimum prices and market share. It would be more economically advantageous to the industry if processing was done on the island of Ireland. Currently the value of the product is limited because the product is being sold as Dutch and French. A certified Product, from Irish waters with a strong product identity can break into markets. This needs to be supported by infrastructure improvements which leave us at most 8-16 hours travel time to the Dutch markets.

Branding and selling produce as being from the island of Ireland and/or from a specific area, e.g. Wexford BG Mussels in Wexford and Carlingford Lough BG Mussels in Carlingford Lough, in local restaurants is seen as a good idea. It is acknowledged that there are product identity and food safety issues with this. This must be pitched against the feeling among some producers that the Dutch 'own' the industry on the island of Ireland, so there is no point in trying to differentiate from their product.

KEY POINT 7

A labelling scheme would be of value to the industry particularly as a means of identifying producers. Also branding, such as that achieved for the bouchot mussels, was acknowledged as being linked to optimum prices and market share. Traceability is thought to be important. A labelling scheme such as the new 'traffic light' system that promotes the health benefits of the product was highlighted by consultees as being important. Some form of differentiation will be needed in order that the island of Ireland keeps abreast of international best practice.

2.8 Co-operative marketing structures

Producers prefer to sell their own produce. The indications are that producers do not see value in co-operative selling. Traditionally it has been up to every company to sell their own produce. Generally producers don't like the idea of co-operative selling. It was felt by consultees that the highest quality product will be 'pulled down' by inferior product. There are also some traditional factors operating in that certain areas and producers sell their product at lower prices than others. This is more of a problem when quality is poor. The idea of co-operative selling was completely dismissed, everyone is competing against everyone else for seed, and the situation is the same for markets.

KEY POINT 8

Producers prefer to sell their own produce. The indications are that producers do not see value in co-operative selling.

2.9 Enhanced marketing support

Further research into European markets is needed to allow producers to sell product with confidence.

KEY POINT 9

Additional market intelligence and support is needed.

3.0 World Mussel Production

It is widely accepted that the world's growing population, and the increasing per capita consumption of fishery products will push the overall requirement for fishery products to a total of 180 million tonnes by 2030. On the supply side, the capture fishery at best will remain static, with output expected to remain at 95 million tonnes annual production of which 60 million tonnes is destined for human consumption (FAO, 2006). It is anticipated that aquaculture production will have to increase substantially to meet demand. Currently, 45.5 million tonnes of farmed fish is produced globally per annum. While in 1980 just 9% of the fish consumed by human beings came from aquaculture, today the figure is 47%. Global aquaculture production will have to increase further from 45.5 million tonnes to approximately 80-90 million tonnes by 2030, to continue to supply up to 50% of the world's total fish requirements (FAO, 2006).

3.1 Mussel production by major producing countries

Total world mussel production reached 2 million tonnes in 2004. Farmed mussels largely dominate world production accounting for around 90% of world supplies. Between 1994 and 2004, the average growth worldwide of farmed mussel production was 6.6% per annum, half that of the average growth of world seafood production of approximately 13% per annum. In particular, the mussel industry in Chile is highlighted as an example of an industry achieving unprecedented growth and rapid success and posing a serious challenge to the more traditional producers in Europe. By the year 2010, Chile is likely to be harvesting 160,000 tonnes annually of the country's native blue mussel. This level of production should rank Chile as the third largest producer of mussels in the world behind Spain and China. Chile is currently ranked as the world's sixth largest producer. Chilean mussel farmers aim to achieve the same success as their salmon farming cousins who in just twenty years have overtaken their competitors to become a world leader in production. Within the last ten years alone the annual mussel harvest has increased from 6,000 tonnes to nearly 100,000 tonnes of which 97% comes from farm sites in the 10th region, especially around the island of Chiloé.

Figure 4 World mussel capture and farming

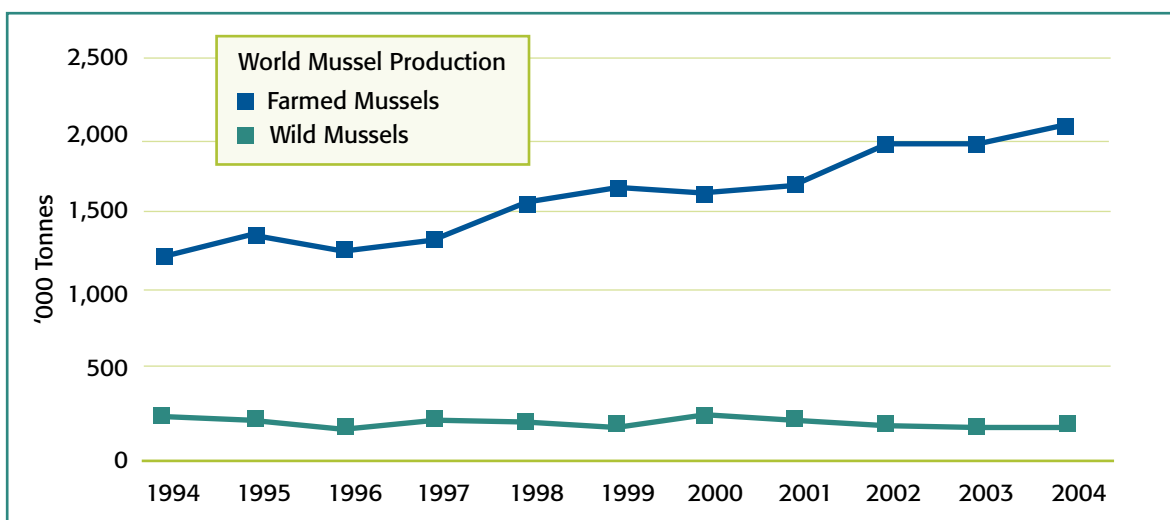
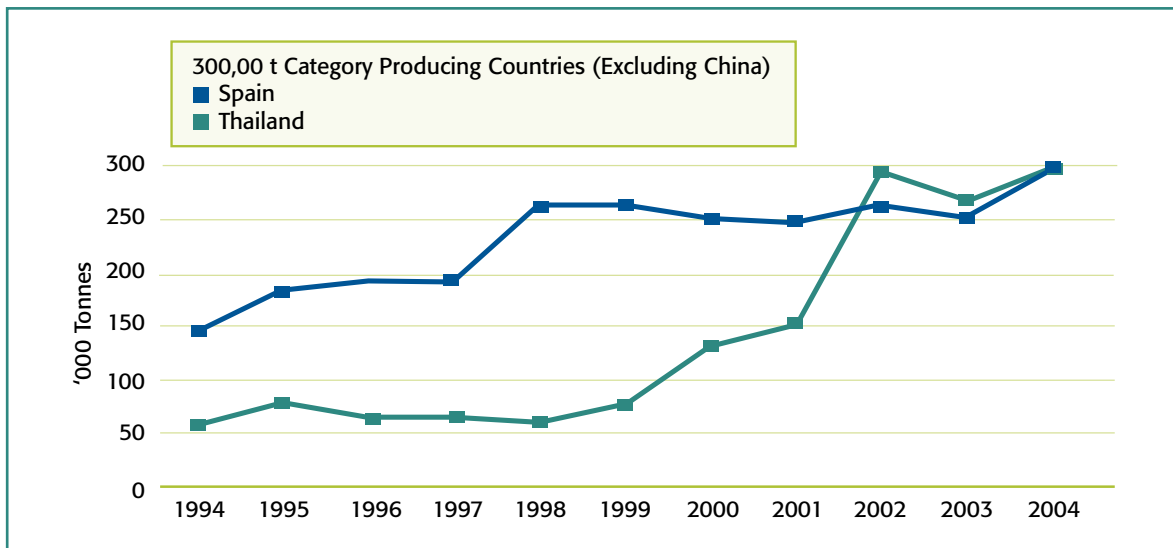
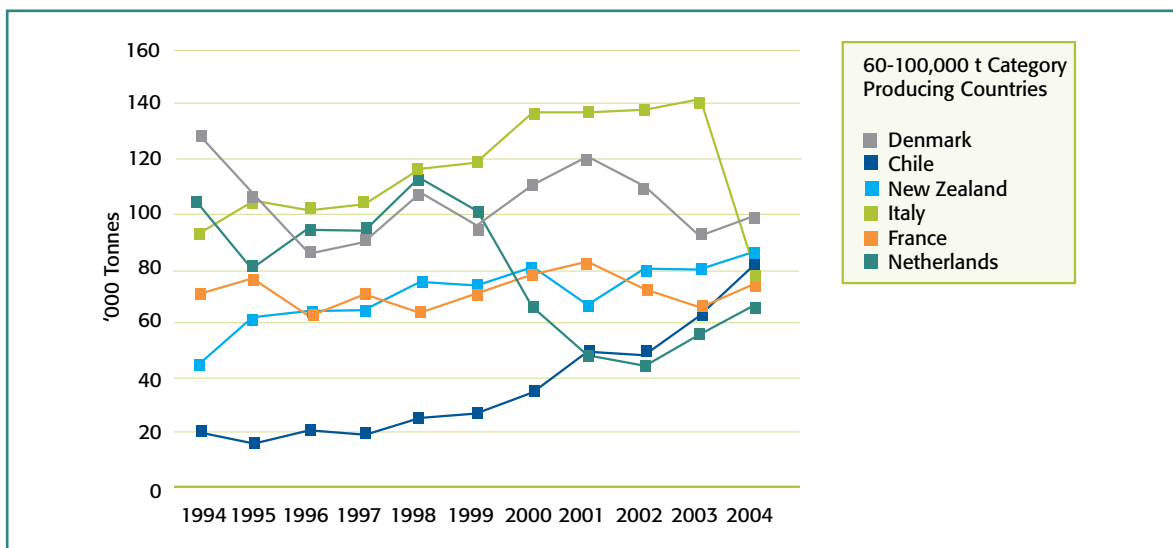


Figure 7 300,000 t category producing countries

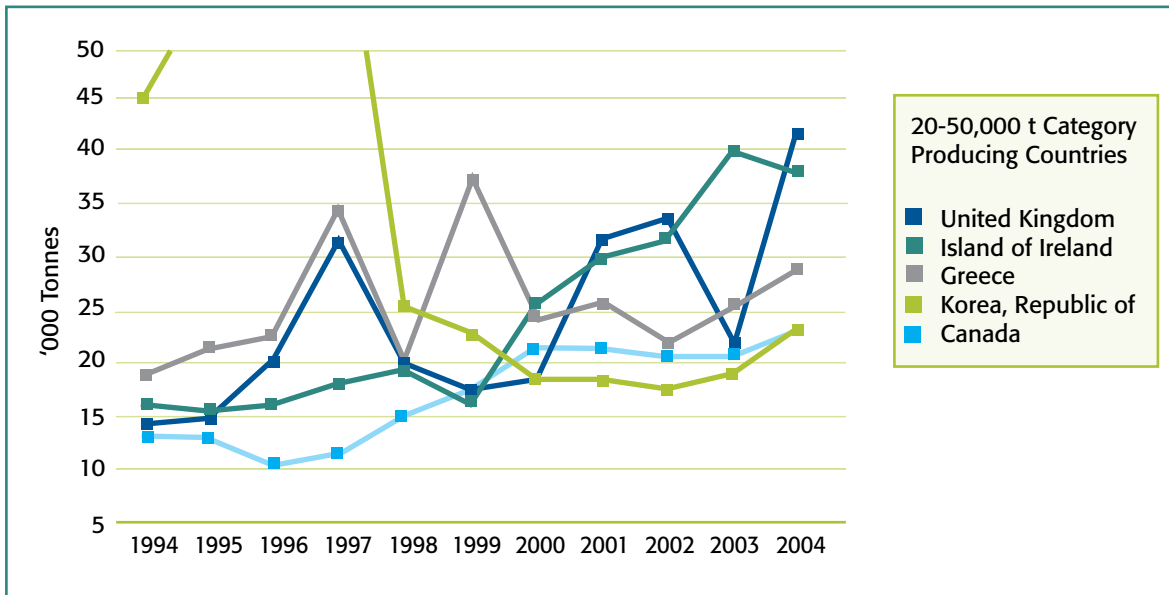


Chinese mussel production dominates world production with 720,000 tonnes produced in 2004, representing 35% of world production. The next two largest producing countries namely Thailand and Spain, together account for 28% of world production. Spanish production has been stable at around 250-300,000 tonnes per year, and can be considered to have reached its full production capacity at between 300-400,000 tonnes per annum in its present allocated farming areas. Thailand has significantly increased its production capacity over the past decade and in 2002 caught up with the Spanish production.

Figure 8 60-100,000 t category producing countries



The following six main producers namely: Denmark, New Zealand, Chile, Italy, France and the Netherlands, together represent 24% of world production of mussels. Production per country is stable at around 60-100,000 tonnes per year.

Figure 9 20-50,000 t category producing countries

In this category both Irish and UK production shows an increase in production over the past decade. Greek production, despite being erratic, is relatively stable over the past decade.

THE ISLAND OF IRELAND IN THIS CONTEXT

- It is a small producing area with a dispersed production and industry around the coastline.
- It is a new producing area with limited infrastructure facilities such as shore line access and holding areas.
- It benefits from its proximity to key markets such as France and the Netherlands.

4.0 European market description

4.1 Product segmentation

Mussels can be classified in a variety of ways, and can be supplied through a number of different supply routes. In this section we examine the European marketplace under a number of headings and look to see how the island of Ireland fits in.

Conventionally mussels are classified under three headings: live, frozen and processed. This section describes the various product categories and examines where mussels from the island of Ireland fit in this categorisation. This analysis is further expanded later when recommendations are made as to how the industry can capitalise further on this resource.

Under these headings mussel can be further described according to:

- **Species:** For example, in the European market, mussels can be segmented as the blue mussel (*Mytilus edulis*), the Mediterranean mussel (*Mytilus galloprovincialis*) and the green lipped mussel (*Perna canaliculus*).
- **Size:** For example the Dutch break down their mussel sales into the following grades: Extra Select (80 or more items/kg), Extra (70-80 items/kg), Super (60-70 items/kg), Imperial (52-60 items/kg), Jumbo (45-52 items/kg), Gold Brand (35-45 items/kg).
- **Production technique:** For example, wild mussels from Barfleur, Bouchot mussels from Normandy or rope mussels from Rol.
- **Country or area of origin:** Spanish mussels (perceived as a large shell with orange flesh) Dutch mussel (medium size shell with white colour meat).
- **Ready meals:** example Paella, pasta with mussels, cooked mussels.
- **Functional foods:** For example mussels used in the pharmaceutical sector (remains marginal).

THE ISLAND OF IRELAND IN THIS CONTEXT

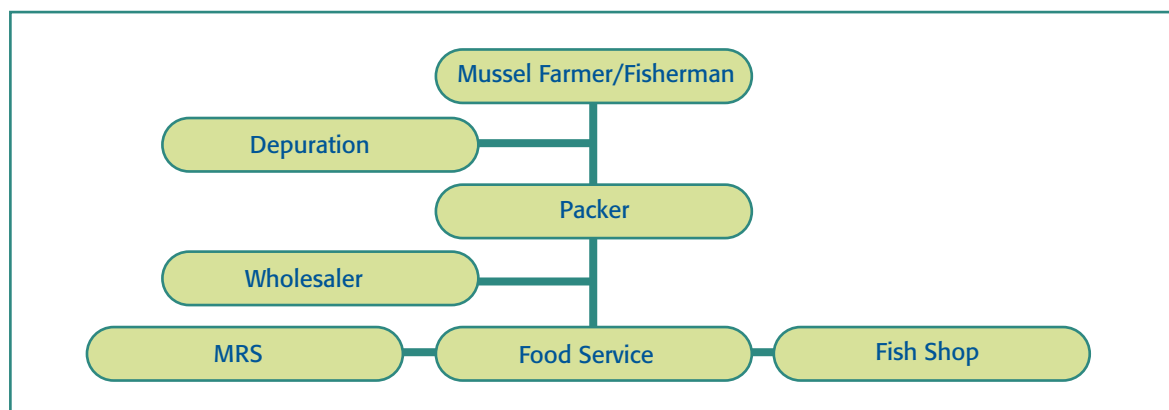
With the exception of the segmentation by species in the live bulk trade and the ready – cooked mussels in a sauce, to date very little product segmentation has developed.

4.2 Supply relationships: the supply chain and supply chain management

There are two supply chains depending on the product form, either live or prepared. Sales of live mussels are time constrained and impose a 'just in time' approach in terms of product dispatch, wholesaling, packing and final delivery to the end user. Inventory management and control can obviously be applied to product once it is processed; however for the mussel farmer who is dealing with the perishable product, it is still a matter of getting product from the sea to the processor using the 'just in time' approach.

Live mussel supply chain

Figure 10 Live mussel supply channel



The supply chain for live mussels can be summarised as follows. The mussel farmer or fisherman supplies bulk mussels to a packer who prepares the mussels for further distribution. This work consists of depurating the mussels if required, sorting of mussels from the debris and grading them by size, cleaning the mussels of fouling such as barnacles, debysing if required and final packing to customer requirements either in traditional bags or using vacuum packing or Modified Atmospheric Packaging (MAP). Packers sell their product to wholesalers who will redistribute the product to the final distributors, Multiple Retail Stores (MRS), food service and fish shops.

Since the beginning of the 1990s and with the growth of the MRS, which have squeezed the wholesaler, packers have tended to bypass the wholesalers. The MRS sell their live mussels on the traditional wet counter in bulk or at the self service shelves. In recent years there is a general trend in MRS in mature markets to increase the range and volume of sales in the self service areas. Sales in food service either take place in commercial restaurants or in collective catering services such as school canteens, hospital and company restaurants. Fish shops are the traditional form of distribution to consumers for home consumption.

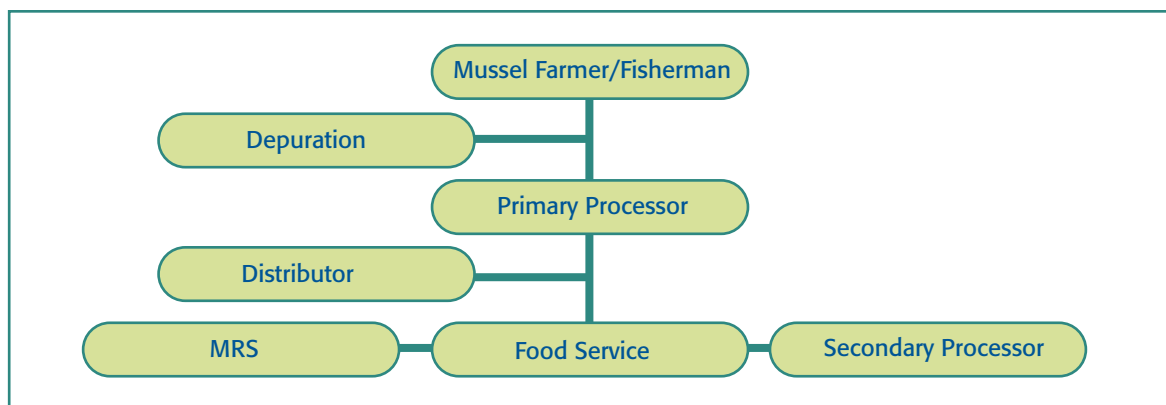
Obviously the different roles as described in the figure above can be integrated at several levels. For example, a company can have both its own production and packing facility. Also, there are signs of increasing interest in subcontracting certain activities. For example an MRS can subcontract a packer to pack product purchased directly from the producer.

THE ISLAND OF IRELAND IN THIS CONTEXT

Due mainly to logistical constraints (2 day transport to the continent and insufficient frequency), Ireland remains largely a bulk supplier to packers.

Processed mussels supply chain

Figure 11 Processed mussel supply chain



The supply chain for processed mussels can be summarised as follows. The mussel farmer or fisherman supplies the primary processor with bulk mussels. If required, the processor depurates the mussels before the cleaning and grading procedure; mussels are then processed. The main forms of processing are cooked mussel meats extraction, whole cooked mussels and half-shell cooked mussels. These products can be preserved using a large range of techniques that include, freezing, vacuum packing, pasteurisation and canning. After packing, the mussels are either sold to MRS, food service or secondary processors. The secondary processors tend to use processed mussels as a complementary product for example, for the preparation of ready meals such as paellas. Here also the companies can be vertically integrated combining several roles such as farming and processing.

THE ISLAND OF IRELAND IN THIS CONTEXT

By producing cooked frozen whole mussels, producers have been able to free themselves from the logistical constraints caused by distance to markets. Also the finished product can go directly to the food services or MRS, by-passing if required, the distributors. Nevertheless, most of the cooked frozen mussel are sourced from the rope mussel sector.

4.3 Distribution channels

The distribution channels can be broken down into two main categories:

- **Out-of-home:** consumption that takes place in commercial restaurants (individual & restaurant chains), and food services such as companies catering for staff, (schools, hospital canteens etc.).
- **In-home:** consumption involving purchases from retail stores, fish shops, street markets and direct sales from producers.

The market share of these different distribution channels can vary depending on the country concerned and tends to reflect the consumer consumption profile. Consumers from traditional markets tend to have a good knowledge of cooking and therefore the sales of mussels for home consumption tend to be higher than in other markets.

Table 4 Mussel distribution channels in key markets

Country	MRS	Food service	Fish shops & markets
France (Source CNC)	33%	50%	17%
Italy (Source AMA)	20%	70%	10%
UK (Source Seafish)	26%	63%	11%

The type of distribution channels influences the product and service requirements.

In short, home – consumption purchases require from the suppliers:

- Competitive prices/good mark-ups (35-40%).
- Volumes.
- Quality/safety, traceability.
- Quick, no delay deliveries.
- Regularity in supplies and stability in prices.
- Advance information (prices/quantities).
- Assortment.
- Product visibility.
- Consumer demands (small portions, nutritional benefits, etc.).

Out-of-home consumption requires:

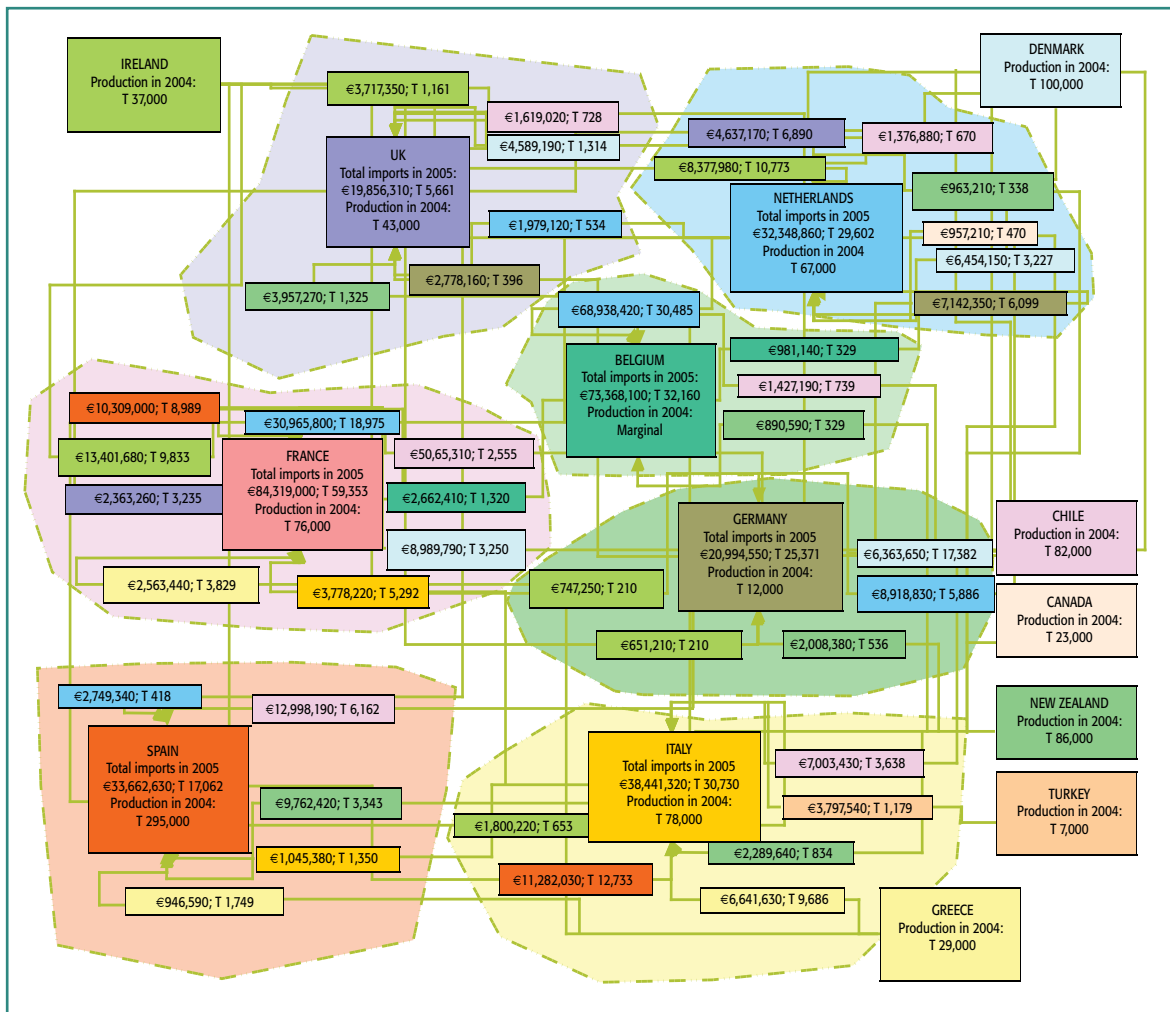
- Convenience (easy to store/to prepare, catering portion).
- Time saving.
- Safety, traceability.
- Product differentiation.

4.4 Characteristics of the European mussel market

Mussel trade in Europe is characterised by a high level of exchange between countries. This arises from the imbalance between domestic consumption and domestic production and de-seasonalised mussel consumption which does not match national production cycles.

In 2006, total imports declared by EU members reached €361 million for all forms of mussels (live, frozen & processed). 76% of these imports were between the EU member states alone and had a value of €276 million. Overall internal EU imports have been reasonably stable over the past 3 years at between €260-280 million per year.

Figure 12 European mussel imports per country of origin in 2005



How to read this figure:

Each country has a specific colour.

Each small box corresponds to imports declared into the considered market (circled in dotted points) from the country of origin (colour code). For example French imports of all forms including from the RoI reached €13 million and T 9,833.

4.5 European producers

- **Traditional producers:** Countries that produce mussels with an important domestic market but also depend on imports.
- **Net exporters:** Countries that produce mussels with a small domestic market which therefore depend on export markets.
- **Dependent of markets:** Countries that have no or little production but have an important domestic market.
- **Third countries:** Countries that are not in the EU market.

Traditional producer

This category is characterised by traditional consumption resulting from a historical production. Consumption in these markets tends to be seasonal and adapted to the seasonality of national harvesting. Consumption habits are well established with a strong preference for national production and traditional consumption either in restaurants or at home. The distribution network is adapted and efficient. The level of competition is high in these markets. The countries found in this category are: France, Spain, and Italy.

Net exporter

This category is characterised by the absence of a domestic market, thus there is a dependence on exports. With the exception of the Netherlands and Denmark, these countries have developed their production capacity relatively recently. Mussel consumption is emerging and tends to be in the ready meal format as the culinary 'know how' is weak. Mussel consumption seasonality is less present than in the previous category. With the exception of the Netherlands, the distribution network is weak and the mussel sector heavily focused on production and the bulk/convenience market. The countries found in this category are: Netherlands, Denmark, UK, RoI, and Greece.

Note: The Netherlands remains apart in this category as it benefits from an excellent distribution network and high level of value-added processing. This is the result of its proximity to Belgium, which has one of the highest mussel per capita consumptions in the world.

Dependent markets

This market is characterised by a high consumption linked to a strong dependence on imports due to the absence of national production. Belgium has one of the world's highest mussel consumption per capita levels but the configuration and short coastline is not favourable for a national production. A country found in this category is Belgium.

4.6 Third countries

New mussel producing countries have appeared over the past two decades. These countries have developed mussel farming in order to exploit their coastline potential. Often these countries benefit from cheap labour and/or strong state support, foreign technology and financial investment. They tend to export into markets with strong currencies such as the USA and the EU. The countries in this category are: New Zealand, Chile, Canada, and Norway.

4.7 Internal EU trade

Within the European Union, as seen from the figure above the level of trade between countries is high with in most cases a combined export/import trade explained by the seasonality of production (see Figure 13 European mussel harvesting seasonality). The main European imports are: France with declared imports of €84 million in 2005, Belgium €73 million, Spain €38 million and Netherlands €32 million.

Also importing countries have different sourcing attitudes dictated by:

- **The seasonality of the national harvest:** For example, France imports mussels from the island of Ireland when the bouchot mussel production comes to an end.
- **The characteristics of mussels:** For example, Spanish buyers import mussels from countries that produce the Galloprovincialis species, i.e. France, Italy and Greece.
- **Market characteristics:** For example, the Netherlands has developed a strong market in Belgium which outruns Dutch production and therefore requires imports.

THE ISLAND OF IRELAND IN THIS CONTEXT

Exports are concentrated into two main countries, France (€13 million worth of imports from the RoI) and the Netherlands (€8 million worth of imports from the RoI).

4.8 External EU trade

Whereas EU internal imports have been relatively stable over the past three years, the progression of third countries has been strong and is increasing, showing an increase of 22% in value in 2005. Among these countries the main suppliers are in order of importance: Chile, New Zealand and Turkey. The strongest progression in export value to Europe was observed to be Chile, which increased its sales by 60% in value in 2006. Exports from Canada have increased rapidly, boosted by the sales of MAP mussels packed in Canada into the Netherlands and Belgium.

Table 5 EU imports from third countries

EU25 (external trade) import statistics

UDG: mussels. European union euros

Partner country	2003	2004	2005	Market share	Change
World	46,329,740	55,486,340	67,880,230		22%
Chile	21,173,440	30,592,000	31,787,680	47%	4%
New Zealand	15,723,750	14,359,770	23,933,880	35%	67%
Turkey	5,151,300	4,269,000	3,842,070	6%	-10%
Norway	939,430	1,633,030	2,191,040	3%	34%
Canada	161,520	178,490	1,219,420	2%	583%
USA	1,234,890	1,117,120	1,151,800	2%	3%
Others	1,945,410	3,336,930	3,754,340	6%	13%

Export breakdown of key EU third country suppliers

Chilean exports

Table 6 Chilean exports all forms

Chile export statistics

UDG: mussel (all forms codes: 16059070+030731+030739)

European union euros

Partner Country	2003	2004	2005	2006	Market share	Change
World	22,532,128	32,424,611	32,352,661	51,562,725		59%
Spain	3,530,798	9,006,433	11,408,217	19,909,169	35%	57%
Italy	4,708,434	7,075,369	5,970,169	7,757,203	15%	30%
France	2,729,997	3,237,430	4,322,291	6,985,284	14%	62%
Germany	36,220	403,071	565,568	3,082,300	6%	445%
United States	1,303,798	2,281,129	2,124,872	3,078,760	6%	45%
Netherlands	589,417	1,360,276	1,146,560	2,486,831	5%	117%
United Kingdom	413,105	900,811	1,560,673	1,977,314	4%	27%
Belgium	781,056	1,681,826	1,051,868	1,469,180	3%	40%
Russia	76,502	284,346	612,328	1,018,635	2%	66%
Denmark	2,413,631	771,701	839,264	1,017,207	2%	21%
Others	5,949,170	5,422,219	2,750,851	4,780,842	9%	74%

As seen from these figures, Chilean exports are largely oriented towards Europe. In 2006, the EU accounted for over 83% of the export value. Export growth has been very strong, particularly in Spain, Germany, the Netherlands and France. Most of Chilean mussel exports are as frozen value-added product (mussel meats, half shell and whole frozen mussels). Given the rapid production growth in Chile and potential for further development, Chilean exports into Europe will continue to grow.

New Zealand exports

Table 7 New Zealand exports

*New Zealand export statistics. UDG: all mussels
Annual series: 2003-2006. European union euros*

Partner country	2003	2004	2005	2006	Market share	Change
World	66,086,317	72,228,097	90,717,613	90,911,296		
United States	26,757,922	28,645,013	33,066,339	33,127,446	36%	0%
Spain	3,288,285	4,428,814	9,035,052	7,986,814	9%	-12%
Korea South	3,679,469	4,627,553	7,922,952	7,421,759	8%	-6%
Australia	5,645,444	5,836,347	6,071,181	5,674,023	6%	-7%
United Kingdom	2,848,653	2,916,624	3,903,910	4,384,167	5%	12%
Germany	2,637,478	3,905,954	3,438,295	3,892,269	4%	13%
Hong Kong	2,623,976	2,562,258	2,999,916	3,687,539	4%	23%
Canada	2,854,951	3,004,229	3,382,570	3,684,766	4%	9%
Japan	3,721,932	3,855,047	3,108,813	3,349,355	4%	8%
Italy	1,631,039	1,604,169	2,140,347	2,143,903	2%	0%
Taiwan	1,236,926	1,330,983	1,671,780	1,656,015	2%	-1%
Netherlands	889,558	900,638	1,808,327	1,207,005	1%	-33%
Greece	804,335	724,398	845,882	1,161,583	1%	37%
Denmark	395,212	336,413	704,281	1,057,723	1%	50%
Russia	162,706	347,160	859,125	1,020,563	1%	19%
France	1,137,362	1,114,938	1,213,905	886,096	1%	-27%
Portugal	505,214	371,335	692,860	881,758	1%	27%
Malaysia	530,767	641,903	879,604	846,471	1%	-4%
Belgium	352,954	366,359	881,415	826,138	1%	-6%
Thailand	211,325	311,256	547,473	668,736	1%	22%
Singapore	539,308	793,814	947,185	638,457	1%	-33%
South Africa	714,900	681,711	502,818	533,113	1%	6%
Others	2,916,601	2,921,181	4,093,583	4,175,597	5%	2%
EU	14,775,997	16,903,534	25,237,212	25,038,293	28%	-1%

New Zealand exports its mussels world-wide to a total of 83 countries, making it probably the most widely available mussel. Its main export markets are the USA, which accounted for 36%, followed by Spain, 9% and South Korea, 8% in 2006. The EU market represented 28% of New Zealand's exports in 2006. It is interesting to note the strong export progression in typical catering markets such as the UK, Germany and Hong Kong.

Chinese exports

Table 8 Chinese exports

China export statistics. UDG: all mussels

Annual series: 2003-2006. European union euros

Partner country	2003	2004	2005	2006	Market share	Change
World	15,405,853	17,093,613	22,889,826	22,276,262		-7%
Korea South	5,113,895	3,279,149	4,740,029	7,810,486	35%	65%
Hong Kong	6,218,483	8,101,065	7,942,534	7,741,497	35%	-3%
Taiwan	1,702,236	1,629,858	2,216,070	2,762,915	12%	25%
Australia	0	246,426	1,146,695	1,501,232	7%	31%
Macau	588,435	656,866	513,851	737,316	3%	43%
Japan	1,246,911	1,054,981	246,862	594,971	3%	141%
New Zealand	0	5,970	438,336	466,007	2%	6%
United States	12,770	1,457,086	5,447,249	163,794	1%	-97%
Canada	28,298	1,225	817,810	149,310	1%	-82%
Korea North	228,440	61,793	0	110,272	0%	
Thailand	1,253	17,804	203,922	80,686	0%	-60%
Dominican Republic	7,771	36,867	0	52,160	0%	
Russia	974	0	0	38,702	0%	
Singapore	17,388	11,778	24,370	35,120	0%	44%
Malaysia	0	12,587	27,098	20,594	0%	-24%
Fiji	0	0	0	11,200	0%	
Cuba	0	41,894	0	0	0%	
Dominica	8,204	20,583	0	0	0%	
Indonesia	0	1,079	669	0	0%	-100%
Lithuania	5,971	0	0	0	0%	
Mexico	188,888	278,284	124,332	0	0%	-100%
Other Oceania N.E.S.	83	91	0	0	0%	
Panama	0	54,242	0	0	0%	
Peru	0	17,674	0	0	0%	
Puerto Rico (US)	0	20,954	0	0	0%	
South Africa	13,833	85,359	0	0	0%	
Uruguay	22,020	0	0	0	0%	

Since the EU food safety ban on Chinese mussels, there have been no exports into the EU. The main market for Chinese mussels is South Korea and Hong Kong.

THE ISLAND OF IRELAND IN THIS CONTEXT

Mussel imports are marginal, particularly from third countries with small imports reported from Chile and Norway.

4.9 Countries authorised to export to the EU

Import rules for third countries are harmonised, meaning that the same rules apply in all EU countries. For non-EU countries, the European Commission is the negotiating partner that defines import conditions and certification requirements. For most countries with existing trade, the European Commission negotiates on behalf of the 25 member states.

It is the Directorate General for Health and Consumer Protection (DG SANCO) which has responsibility for food safety in the EU and they are therefore responsible for authorising third country exports into the EU.

The formal steps are:

- Official demand from candidate country.
- Questionnaire completed by candidate country and returned to the DG SANCO.
- For aquaculture products, a residue monitoring plan must be submitted.
- EU food & Veterinary Office carry out spot checks in the candidate country.
- Based on these results, the DG SANCO proposes the listing of the country, the specific conditions under which imports are authorised and the list of approved establishments. These are then discussed with representatives of all member states.
- If the members states have a favourable opinion, the EU Commission adopts the specific import conditions, and the country is listed on <http://circa.europa.eu/irc/sanco/vets/info/data/listes/table0.html>

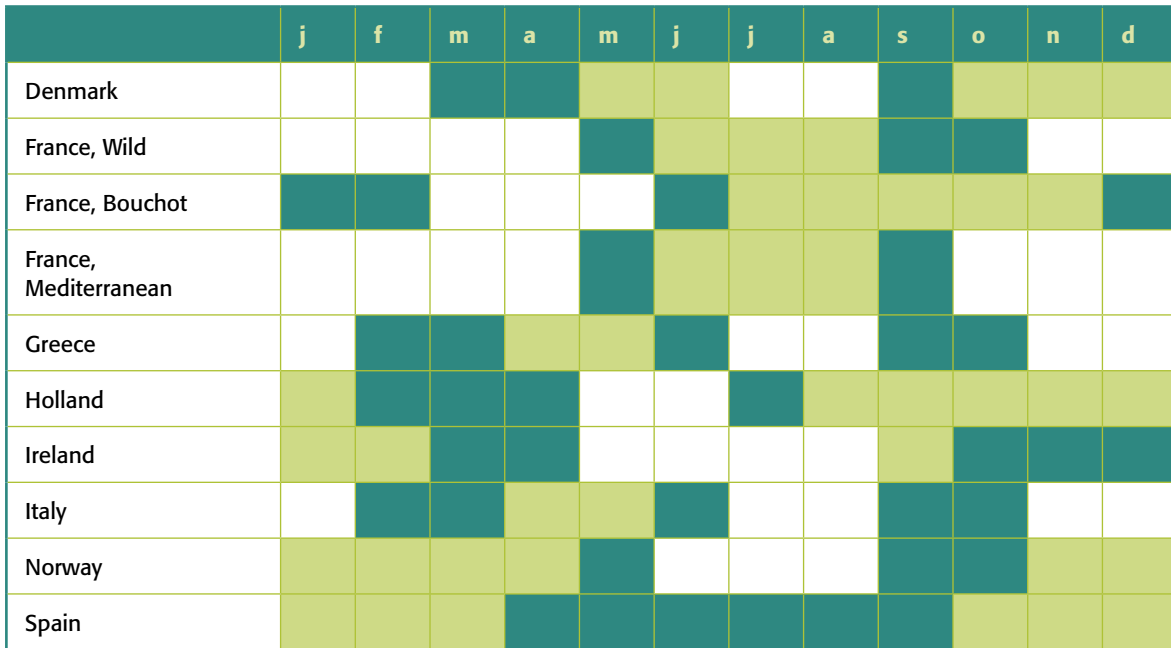
For countries outside the EU there are two published authorisation lists which concern mussel exports to the EU: **1.** Countries authorised for Fish and Shellfish Products, which may include processed mussels and **2.** Countries authorised for Live Bivalve Molluscs which may include live mussels. Countries authorised to export to the EU must also supply relevant health and veterinary certificates with all exports.

Unfortunately there is no breakdown of authorisation by product, therefore we can not find precisely which countries are authorised to export mussels. At present countries authorised to export live molluscs are: Australia; Chile; Jamaica; Japan; Morocco; New Zealand; Peru; South Korea; Thailand; Tunisia; Turkey; Uruguay and Vietnam. Eighty-seven third countries are authorised to export processed seafood to the EU.

4.10 Production seasonality

Figure 13 European mussel harvesting seasonality

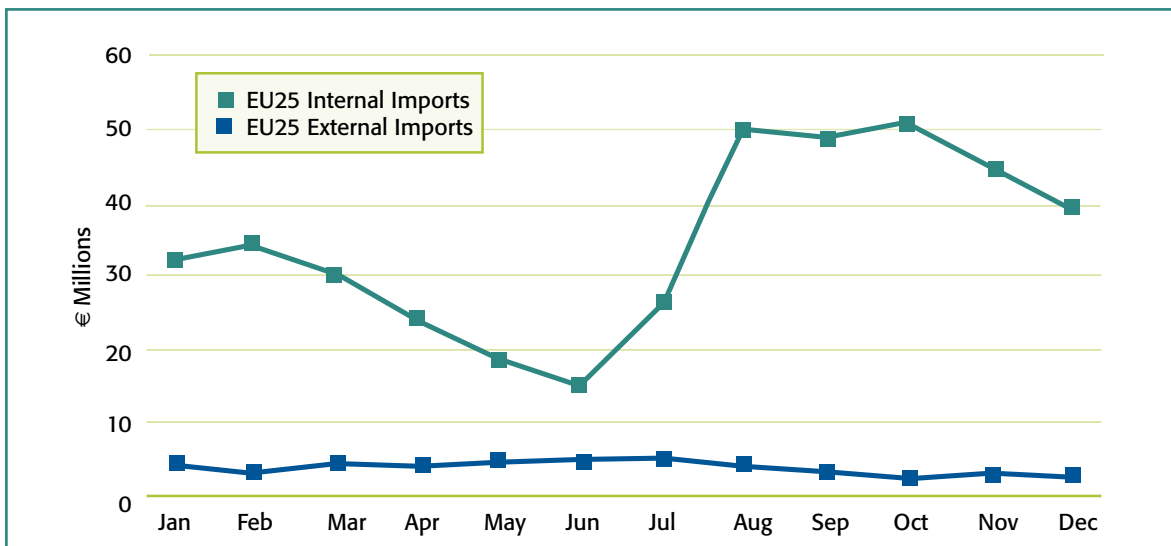
*Mussel live trade seasonality –seasonality of production
(subject to climate & market conditions). Source BIM*



□ Absence ■ Low season ■ Full season

As seen from the figure above, mussel harvesting seasonality varies from country to country. Overall we can notice that there is a tendency to harvest mussels from September to March. Trade has become established between countries in order to constantly supply the market.

Figure 14 EU monthly imports

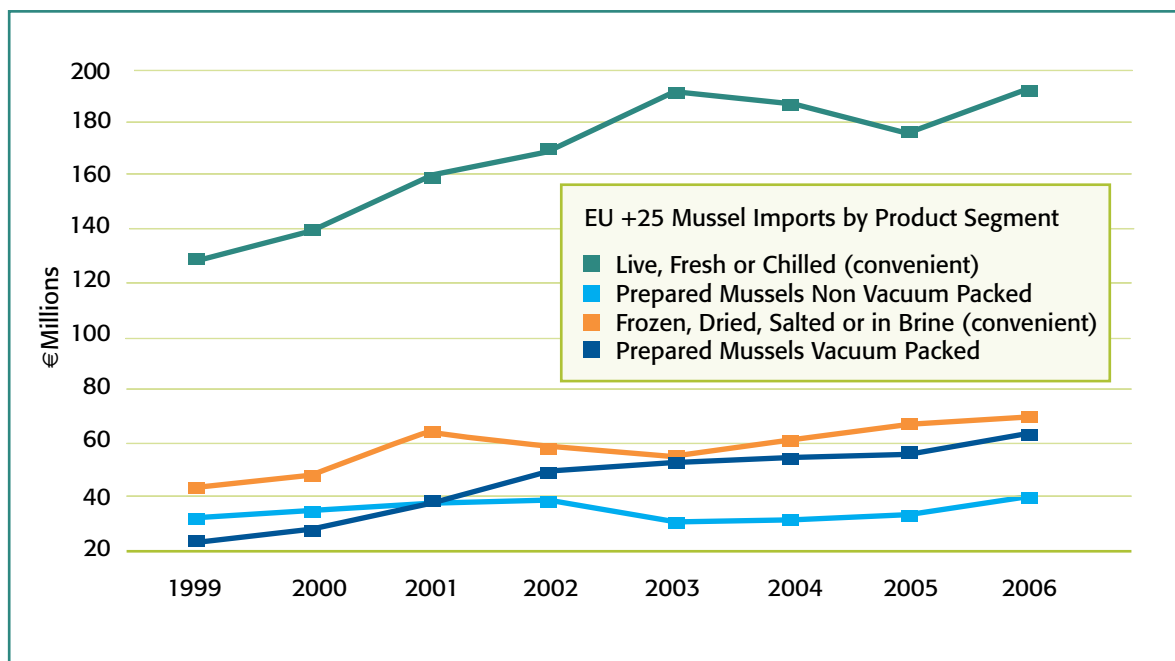


THE ISLAND OF IRELAND IN THIS CONTEXT

BG mussel harvesting occurs mainly from September/October to March/April. The harvesting period is similar to its main customers, France and the Netherlands. This is a challenge for producers supplying these markets because mussels from the island of Ireland are a complementary source of French and Dutch production rather than an alternative during reduced harvesting periods.

4.11 Product segment trends

Figure 15 EU +25 mussel imports by product segment



Between 1999 and 2006, EU+25 imports (internal + external EU) of all four categories: live fresh mussels (convenient); frozen in brine (convenient); prepared mussels vacuum and non-vacuum packed, increased by over 60% in value. Imports of live mussels dominated the market with a share of 53% and the value of imports nearly trebled.

Trend

The EU+25 imports of live mussel segment, reinforced by the sales of MAP and sub products, should remain strong and dominate the market. It is probable that there will be further development of the mussel market within the EU for prepared mussels therefore the market share of prepared mussels will increase.

Consumer profile

According to the TNS study carried out in France and the GFK study carried out in the Netherlands, the consumer profile of mussel home consumption corresponds to a lower middle class household with two or more members, of 50-65 years old.

Quality criteria applied

From trade experience, consumer quality perception of mussels can be listed as follows:

- Farming technique.
- Meat yield.
- Shell size.
- Shell colour.
- Fouling.
- Pea crabs.
- Gaping.
- Quality labels.
- Brand name.







THE ISLAND OF IRELAND IN THIS CONTEXT

Presently none of these criteria are put forward in the BG mussel market.

4.12 Product labels for mussels

In order to achieve product differentiation, mussel producers, packers and distributors have developed product labels mainly focused on quality, farming technique and origin. Many of these schemes were developed collectively by producers and their representative organisations to differentiate their product from mussel imports into their own home market. The general trend seems to be of a movement from producer/national scheme scale to an EU certified product as this gives the proposer the right to apply for EU promotional subventions.

Table 9 Example of mussel product certification

Label	Main points	Country	Product	Level
	Species: Gallo Provincialis. Farming: Bateas, limited density; size: 4 grades, meat yield >12%, shell colour, shape, etc.	Spain	Galician bateas mussels	National
	Traditional Speciality Guaranteed (TSG) covers products which have a traditional character, either in the ingredients they are made from or in the way that they are made.	France	Project: Bouchot mussels	EU
	Protected Geographical Indication (PGI) covers products where there is a geographical link during at least one of the stages of production, processing or preparation.	Spain	Project: Galician mussels	EU
	Product is certified to conform. It is not a quality label.	France	Bouchot mussels	Collective
	Traceability and food safety.	All-island of Ireland	Rope & bottom mussels	National
	Retail store private label. Traceability, specific farming technique.	France	Bouchot mussels	Private label

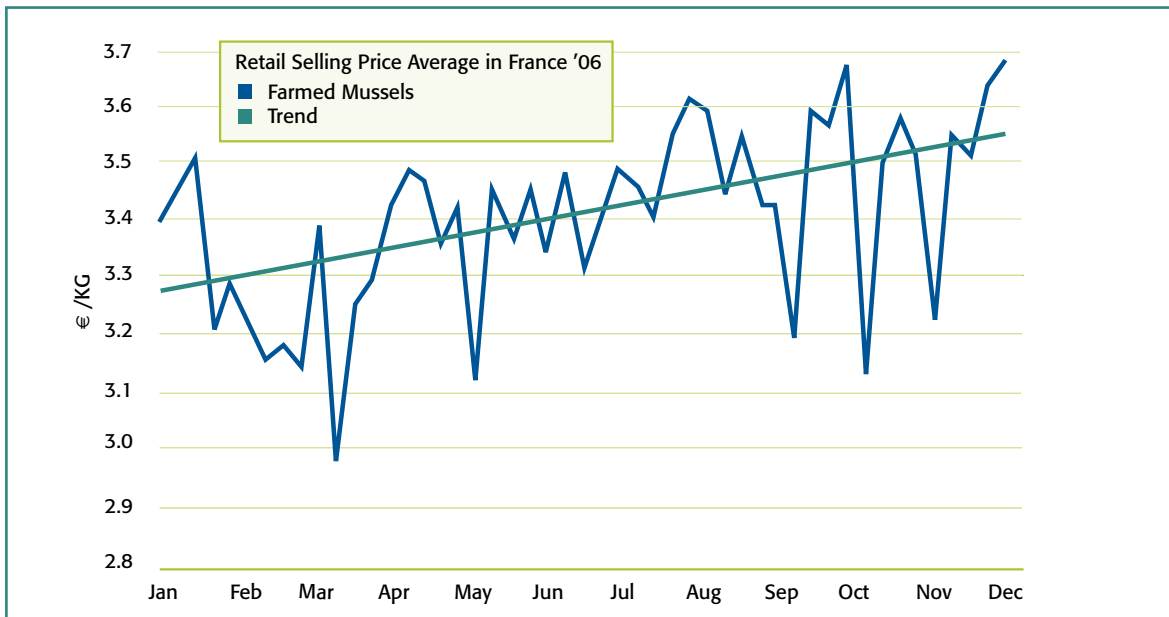
THE ISLAND OF IRELAND IN THIS CONTEXT

There is one product label recognised at national level by the Irish National Accreditation Board (INAB). This scheme doesn't distinguish farming techniques (BG mussels vs rope mussels) or quality criteria. A second layer with environmental criteria will be added towards the end of 2007.

4.13 Market Prices

General trend

Figure 16 French retail average selling prices during 2006



Prices to the French consumer increased by approximately 8% throughout 2006. This increase is the result of a drop in production of both French bouchot mussels and Dutch BG mussel.

Price details by origin and by distribution channel

Bulk prices: (source BIM, Market Comment)

- Prices ex-farm for mussels across Europe vary as a result of supply and demand, and farming technique.
- On average, bulk production prices in 2006 were around: (average and estimates 2006, source BIM Market Comment):
 - Rope mussels Italy: €0.70-0.80/kg
 - Wild BG mussels: €0.75/kg
 - Rope mussels Rol: €0.75/kg
 - BG mussels Rol: €0.80/kg for the French market
 - BG mussels Rol: €2.0/kg for the Dutch market
 - BG mussels the Netherlands: €1.60/kg*
 - Bouchot mussels: €1.60/kg

* average auction price calculated during the second half of 2006.

Packed prices: (average and estimates 2006, source BIM Market Comment)

- On average packed prices in 2006 ex. farm were:
 - Wild Barfleur mussels: €1.15/kg in traditional 15kg jute bags
€1.60/kg in MAP
 - Rol rope mussels: €1.70/kg 15kg traditional 15kg jute bags
€1.80/kg MAP
 - Bouchot mussels: €1.80-2/kg in traditional 15kg jute bags
€3/kg in MAP

Wholesale selling prices: (average 2006, French wholesale market, Rouen source SNM)

- French wild: €1.69/kg
- Mussels from the island of Ireland: €2.14/kg
- Dutch mussels: €2.50/kg
- Bouchot mussels €2.82/kg
- Spanish mussels €3.10/kg

Retail selling prices: (average and estimates 2006/07, source BIM store checks)

- French wild mussels in bulk: €2.5-2.9/kg
- Rol rope mussels: €3.20-3.55/kg MAP
- BG mussels: €3/kg
€4/kg MAP
- Dutch mussels: €3.50/kg MAP
- Bouchot mussels in bulk: €3.30/kg bulk
€4.40-4.60/kg MAP
- Spanish mussels: €4.20/kg
€3.5-4/kg MAP

THE ISLAND OF IRELAND IN THIS CONTEXT

Mussels at wholesale and retail level are poorly valued in comparison with Spanish, Dutch and Bouchot mussels. This seems to result largely from the lack of control of exporters over their mussels in the final market, i.e. foreign traders and consumers tend to prioritise their own product.

4.14 The market for BG mussels from the island of Ireland

Traditionally BG mussels from the island of Ireland were exported in bulk to the French market. In recent years due to the decline in Dutch mussel production, sales to the Netherlands have increased significantly and have now matched French purchases of BG mussels from the island of Ireland. Exporters have adapted their farming techniques in order to respond to either of the French or Dutch requirements. French buyers tend to look for small mussels (80-100 pieces per kg) with a good quality/price ratio, whereas Dutch buyers prefer bigger sizes (50-60 pieces per kg) and can afford higher prices when meat yields are good (>28%). A small proportion, probably somewhere around 1,000 tons of BG mussels exported are processed in the RoI. Over the past five years, the BG mussel industry on the island of Ireland has enjoyed good prices at producer level due to growing European demand and a slight decline in production in key producing countries.

Table 10 Mussel exports (RoI)

*UDG: Mussels, Mussels all codes
Calendar Year: 2004-2006*

Partner country	2004		2005		2006		Market share		Change	
	€	T	€	T	€	T	€	T	€	T
World	35,287,000	19,917	32,052,230	20,135	41,250,800	19,295			29%	-4%
France	16,054,230	9,439	13,978,450	8,865	14,115,470	7,136	34%	37%	1%	-20%
Netherlands	5,161,490	5,994	6,291,070	7,277	10,969,750	7,059	27%	37%	74%	-3%
United Kingdom	6,509,860	1,937	5,637,050	1,865	6,757,420	2,297	16%	12%	20%	23%
United States	2,858,500	757	1,619,810	335	3,805,000	730	9%	4%	135%	118%
Italy	2,577,710	1,050	2,269,590	888	2,930,750	1,110	7%	6%	29%	25%
Germany	1,213,310	357	1,102,410	438	1,170,320	373	3%	2%	6%	-15%
Others	911,900	383	1,153,850	467	1,502,090	590	4%	3%	30%	26%

Table 11 Mussel imports (RoI)

*UDG: Mussels, Mussels all codes
Calendar Year: 2004-2006*

Partner country	2004		2005		2006		Market share		Change	
	€	T	€	T	€	T	€	T	€	T
World	1,580,340	523	1,313,480	417	1,977,500	445			51%	7%
United Kingdom	1,217,600	384	915,590	299	1,415,620	325	72%	73%	55%	9%
France	2,910	1	22,020	8	359,130	80	18%	18%	1,531%	900%
Netherlands	780	0	22,260	6	115,990	21	6%	5%	421%	250%
Denmark	28,910	6	58,040	14	36,020	9	2%	2%	-38%	-36%
Sweden	71,230	17	46,660	11	33,350	8	2%	2%	-29%	-27%
Italy	0	0	10,920	2	13,110	0	1%	0%	20%	-100%
Germany	0	0	10,800	2	4,280	1	0%	0%	-60%	-50%
Belgium	0	0	227,190	75	0	0	0%	0%	-100%	-100%
Chile	236,470	108	0	0	0	0	0%	0%		

5.0 Marketing analysis of the BG mussel industry on the island of Ireland

5.1 Threat of new entrants

There are two levels of threat of new entrants. The most obvious new potential direct entrants into the live mussel trade are those coming into either the bulk or the packed format mussel market. In the short-term it seems unlikely that we will witness an oversupply of live mussels in the EU as production efforts are being limited by seed availability, farm site availability and the remaining absence of any major technical break through in farming techniques which will allow either an increase in the farming cycle rotation or the use of new sites (open sea farming). In the mid-term, technologies such as improved long line culture, hatchery seed production (increased availability and de-seasonalised production) and the possible development of sterile mussels could impact on the present market.

New producing countries such as Norway, Croatia and Turkey which are within the vicinity of the main European live mussel markets might exploit their mussel farming potential via their aquaculture knowledge (Norway, Turkey), logistical infrastructure (Norway) and farming sites (Turkey, Croatia) and low labour costs (Turkey, Croatia).

The second level of new indirect entrant threat resides in the event of a major switch in the market from live mussels towards processed mussels with a long shelf life. This would open the European market to world supplies and thus to competition with countries with a clear price competitive advantage; however a major change such as this in the market seems unlikely in the short-term. In the longer-term we might observe the broadening of European mussel consumption into new countries favouring processed mussels. The most probable hypothesis would therefore be an enlargement of mussel consumption to processed product rather than a consumer transfer from live mussel purchases to processed purchases. Nevertheless, the presence of cheap and largely available processed mussel would probably affect to a certain extent the market price of live mussels.

5.2 Threat of substitute products

Mussels remain largely a popular and 'inexpensive' seafood product. It seems unlikely that consumers would substitute this product. The substitution of mussel consumption by an alternative would need to be triggered by a 'food scare' such as what can happen when consumer confidence is damaged as a result of consumption of product contaminated by, for example, harmful algal bloom. Obviously EU Legislation is in place to reduce this risk and both jurisdictions have strict procedures in place in this regard.

5.3 Bargaining power of buyers

As seen in Table 1 'Mussel distribution channels in key markets', both the retail multiple stores and the food service sector, have a strong hold on the distribution of live mussels. The concentration of these two sectors within the market results in less customers for the distributors. These are in return in an unfavourable position as the buyers can easily dictate terms in the market. This logic has been pushed with the use of reverse auction by MRS who are bypassing the packers and purchasing directly from producers and subcontracting the packing.

5.4 Competitive rivalry within the industry

The level of rivalry between exporters is a consequence of the market conditions. During times of poor supply the rivalry is limited. During times of plentiful supply of product when supplier power is weakened, rivalry is higher. The fragmented industry, its distribution around the coast and the low level of cohesion amongst the producers, tends to favour buyers who play the market down, playing one supplier against another. In recent years, the good market situation and the increased linkages between buyers and producers, has served to reduce company rivalry at sales level. It should however be noted, that rivalry at primary production level for example, sourcing of seed, remains strong.

5.5 Competitive advantage

A competitive advantage is an advantage over competitors gained by offering consumers greater value, either by means of lower prices or by providing greater benefits and service that justifies a higher price.

Competitive advantage is largely based on cost rather than on product differentiation. Bottom mussels sold from the island of Ireland in bulk are perceived by customers as having a good price/quality ratio. Having said this, little effort is made within the market to identify the origin as the island of Ireland. Dutch packers tend to sell their product as Dutch packed mussels from the Atlantic north-east. French packers indicate the origin but are inclined to underpin the image of these mussels in order to promote their own mussels.

Leaving aside farming performance (i.e. crop production), RoI average labour cost and corporate tax gives the RoI an economic advantage over French, Dutch and UK farms.

Table 12 Comparison of wages and corporate tax between the RoI, France, UK and the Netherlands

	RoI	UK	France	Netherlands
Minimum wages/hour. <i>Source: OCDE 2005</i>	€7.17	€7.35	€7.55	€8.23
Corporate tax	12.5%	19 to 32.75%	34.33%	29 or 34% depending on profit level
Average labour cost/hour, social charges included. <i>Source: Eurostat 2005</i>	€17.34	€23.85	€24.39	€22.99

5.6 BG mussel value chain

Figure 17 Value chain estimate of BG mussels for the french market

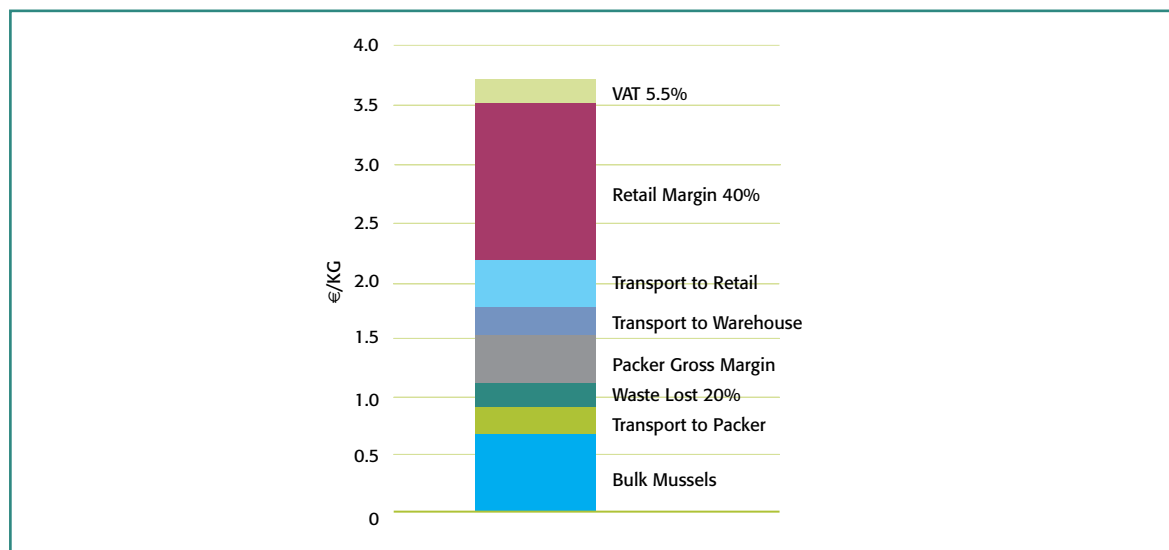


Table 13 Price construction of MAP mussels from the island of Ireland packed in France

Simulation from 2005 prices bottom mussels from the island of Ireland, MAP packed in France for french market

	€/kg	% of total price
Bulk mussels	0.7	19%
Transport to packer	0.2	5%
Waste lost 20%	0.225	6%
Packer gross margin	0.4	11%
Transport to warehouse	0.25	7%
Transport to retail	0.4	11%
Retail margin 40%	1.305	36%
VAT 5%	0.1914	5%
Selling price	3.6714	100%

The value of bulk mussels represents 19% of the final price in the French market. Total transport costs add up to €0.85/kg representing 23% of the final selling price.

It appears from the simulation proposed in Table 14, that the high transport cost of the finished product (i.e. €0.50/kg for a dry/fresh shipment of 3-5 tonnes) from the island of Ireland to the continent is a major limiting factor and would require potential MAP packing companies to reduce the packing margin.

Table 14 Price construction of MAP mussels packed in ROI*Simulation from 2005 prices*

	€/kg	% of total price
Bulk mussels	0.7	18%
Transport to packer	0.054	1%
Waste lost 20%	0.1885	5%
Packer gross margin	0.4	11%
Transport to warehouse	0.5	13%
Transport to retail	0.4	11%
Retail margin 40%	1.3455	36%
VAT 5.5%	0.19734	5%
Selling price	3.78534	100%

Unless the packer's gross margin or the transport cost between the island of Ireland and France can be reduced, mussels will not be price competitive. A further handicap is the reduction by two days of shelf life as a result of the transport required to overcome distance to market and the fact that it is not possible to supply the market on a year round basis.

5.7 BG mussels SWOT analysis

This analysis has given a broad description of today's mussel market which is relatively complex. Before attempting to make recommendations for BG mussels from the island of Ireland it may help to summarise the findings in the form of a SWOT analysis.

Figure 18 Mussel SWOT analysis

Strength	Weakness
<ul style="list-style-type: none"> ■ Nutritional and dietary qualities. ■ Taste qualities. ■ Simplicity. 	Consumer perception: <ul style="list-style-type: none"> ■ Difficult to prepare. ■ Hygiene problem. ■ Not appetising. ■ Food risk. ■ Seasonality. ■ Bay closures.
Opportunity	Threats
<ul style="list-style-type: none"> ■ Limitation of seafood resources. ■ Environmentally friendly production. ■ New consumers. ■ Ready meals. 	<ul style="list-style-type: none"> ■ Restrictive Legislation. ■ Biotoxins: DSP, PSP, ASP, AZP, " ? ". ■ Pollution (heavy metals). ■ Food scares. ■ New entrants: imports.

Source: BIM, IPSO consumer focus group

Strengths:

- Nutritional and dietary qualities associated with seafood: Omega-3 fatty acids, iodine, low calorie, protein.
- Taste qualities: simple, fleshy and soft texture, mild taste.
- Simple/easy to prepare: family dish, ordinary and inexpensive.

Weaknesses:

- Consumer perception: Despite the positive image of seafood that benefits mussels, some consumers – depending on cultural and food knowledge – perceive mussels as difficult to prepare and are concerned by potential food risks associated with bivalves such as the presence of biotoxins, virus and heavy metals.
- Seasonality: The production seasonality can lead to product displays that confuse both the trade and consumers.
- Bay closures due to the presence of biotoxins affect the mussel production cycle and mussel sales, damaging product image and consumer confidence.

Opportunities:

- A world-wide increasing seafood consumption trend coupled with reduced wild capture facilitates the substitution of declining seafood segments with mussels. It is critical to capitalise on growing popular ethical and environmental values emphasising clean and environmentally friendly farming techniques.

Threats:

- Biotoxin monitoring requirements and legislation can potentially be altered as research both on toxic chemicals/species and human toxicity advances. This results in a relatively high level of uncertainty on the legislative environment surrounding the mussel sector.
- Pollution, such as from heavy metals and PCBs can result in bay closures affecting production, product image and consumer confidence. This risk however is limited in Europe.
- Scarcity either of mussels or other bivalves can affect the global mussel market irrespective of mussel farming location.
- Opening up of new production areas as a result of entrepreneurial activity, new technologies and production techniques resulting in new entrants into the mussel market is a threat to existing suppliers.
- Mussel consumption remains low in comparison to poultry or pork. The product can be further promoted, through increased marketing/communication and the development of food solutions such as 'ready to eat' and 'ready to cook' mussels.

THE ISLAND OF
IRELAND IN
THIS CONTEXT**Leveraging our strengths**

- **Product perception:** With the exception of marginal sales of finished branded bottom mussels, we are not capitalising on the positive consumer perception for mussels, neither are we associating Ireland's positive 'green' image with its BG mussels.

Limiting the weaknesses

- **Food safety:** Both jurisdictions have a recognised biotoxin monitoring and control procedure which is not fully exploited as a marketing tool at consumer level.
- **Seasonality:** Unfortunately the seasonality of bottom production does not correspond to the European 'under-supplied' season (i.e. March to May).
- **Bay closures:** The bay closures on the island of Ireland for bottom mussels are rare.

Counteracting the threats

- **Legislative environment:** The RoI, in comparison to other European countries, through its official development and research agencies such as BIM, the MI and the ISA is well geared for research, information gathering and lobbying in the interest of the mussel sector.
- **Pollution:** The risk of a major pollution incident either from the sea or from land is limited on the island of Ireland.
- **Food scares:** As branding of BG mussels is limited, the impact of a possible food scare on mussels from the island of Ireland would be reduced as products would not be directly associated at the consumer level.
- **New entrants:** The BG mussel industry on the island of Ireland is highly dependent on demand from its two main markets, i.e. France and the Netherlands. It is devoted to the bulk market which is characterised by little customer loyalty, placing the island of Ireland in the front line from any rival foreign product. The potential for further European mussel imports from third countries is strong, particularly in frozen form. A rapid increase in the supply of price competitive mussels could by repercussion affect the live market especially within non traditional markets.

Making use of the opportunities

- **Limitation of wild seafood resource:** BG mussels are benefiting from the general decline of wild seafood resources; however this opportunity is not being sufficiently exploited through active consumer communication.
- There is no communication by the industry on the environmentally-friendly production techniques of BG mussel farming.
- **New customers:** Other than the work carried out by some processors in the RoI, there is little effort to find new customers for BG mussels. This is largely the result of the overriding focus on the bulk market.
- **Ready meals:** Processors are actively carrying out research and development; however information on the source of product and farming techniques employed is not readily available.

5.8 Recommendations

As previously described, the BG mussel industry on the island of Ireland is focused on the bulk convenient market, which leaves it directly exposed to supply and demand market trends characterised by limited customer loyalty leading to price competition.

Over recent years, the industry has been experiencing a market that favours producers; however this is risky in a market where there may be increased alternative supplies of mussels into Europe. Therefore the key objective for the coming years should be:

- To improve and diversify the product offering.
- To develop an identity for BG mussels from the island of Ireland.
- To improve supplier/buyer relations to secure existing markets.
- To take advantage of growing consumer demand.

5.9 A market development strategy

Product

Product/offering segmentation in the mussel sector remains limited in comparison to other food sectors, such as within the chicken industry. Also, studies on mussel consumption habits are rare and would be required in order to achieve optimum segmentation, thus adapting products to selected market segments. Nevertheless, in light of different product segmentation made by mussel suppliers in Europe, we can propose the following product segmentation matrix.

Table 15 Mussel segmentation matrix

	Bulk	Live	Processed	
			Fresh	Frozen
Price	X	X	X	X
Size	X	X	X	X
Meat yield	X			
Origin	X	X		
Species	X	X		
Packaging (MAP, vacuum packed)		X	X	X
Quality, environmental labels		X		
Branding		X		
Farming technique		X		

Note: "X" indicates segmentation observed in Europe.

In the context of the industry on the island of Ireland, product segmentation is limited. There are no minimum quality criteria applied to BG mussels on the island. All sizes and meat yield levels can be found. These criteria are rarely differentiated within the bulk market (with the exception of sales in the Dutch auction, Yerseke). This in turn is used by buyers to play the market down. It is recommended that a clear product grid is established that includes size and meat yield criteria with proper terminology associated with it, as with Spanish and Dutch grades. Improved product quality will be achieved by the adoption of an industry Code of Practice and quality accreditation schemes.

There is a need to expand the range of product offerings either in the bulk market (suggested routes as seen in the table above), or through an enlargement of the value chain, i.e.: Live packed prepared fresh or frozen, etc.

Price

The sellers market (demand stronger than supply) observed during the past years has resulted in good bulk prices for BG mussels from the island of Ireland; however prices for these mussels at consumer level continue to remain in most cases below other sources. This is the result of lack of product and supply chain control. As product is not quality differentiated at source, traders do not actively push product from the island of Ireland forward into the market. Most traders who are handling these mussels also have their own product to sell and naturally push their own brand. Creating a brand identity and supporting it with a promotional campaign will allow improved pricing of mussels from the island of Ireland.

Place

BG mussels from the island of Ireland are mainly exported into France and the Netherlands. It is only in the French market that these mussels have achieved a certain visibility at consumer level. However this visibility remains limited as origin and product characteristics are rarely intentionally displayed. In most cases traders are just in compliance with EU regulation indicating the country of origin and whether the product is of farmed origin. More must be done to promote consumer awareness of the origin and quality of the mussels they are purchasing.

Promotion

Building awareness for a relatively low and seasonal production volume is not an easy task and underlines the importance of choosing priority markets to avoid dilution of effort. Market presence of bottom mussel from the island of Ireland as exports is weak as most mussels are exported in bulk. In order to improve this presence and increase product visibility two main routes should be investigated:

- The development of finished product on the island of Ireland.
- Establishment of partnerships with buyers that are prepared to 'push' an identity of origin.

Both of these routes will require the effective labelling of product and can allow inclusion of a range of information for effective product communication to consumers, including, for example, origin, product grade and quality status.

It is critical to increase market awareness of mussels from the island of Ireland and for seafood generally. The proposal to develop a 'Seafood Island' identity is developed in the Seafood Industry Strategy Report '*Steering a New Course – Strategy for a Restructured Sustainable and Profitable Irish Seafood Industry 2007-2013*'.

Market awareness can be increased in a cost effective manner through press communication in priority markets. This, coupled with targeted inward journalist visits to production sites, would emphasise the quality message.

It is essential that supply meets demand if a promotional or a communication campaign is to be carried out on BG mussels from the island of Ireland. Failing the achievement of critical mass makes a strong promotional campaign difficult to carry out as it frustrates journalists, buyers and consumers who cannot purchase or find the object of the communication campaign. It would therefore appear advisable to concentrate any campaign on markets where BG mussels from the island of Ireland have the highest market share.

5.10 Seafood strategy implementation roadmap 2007-2013

The implementation roadmap for the period 2007-2013 set out in the Strategy Review document, '*Steering a new Course*' outlines a series of supportive measures that commit BIM, the other support agencies and the industry itself to market development, market-led innovation and restructuring, and development in the case of the processing sector. Where these measures may specifically apply to the mussel sector is open to interpretation and discussion. What is sure is that the specifics of the programmes mentioned must be debated by the stakeholders and it is important for the interested parties to engage and go forward while the opportunities are there.

Market development as a core theme includes a promise for further investment in market research and intelligence by the agencies subject to sufficient available funding. BIM commits to focusing marketing support in a targeted fashion on key export markets in addition to the domestic market and to the establishment of a 'Seafood Island' identity for Irish seafood.

On the core theme of market-led innovation, the agencies, including BIM, commit to adopting a structured approach to providing services for commercially focused – R&D/NPD more effectively through BIM's Seafood Development Centre. Also of interest is investment in identifying the potential usage of fish and marine biodiversity in functional foods.

The BG mussel sector on the island of Ireland is a success story and while the market is generally good, in particular in recent times, it has not achieved its full potential. The 2007-2013 period represents an opportunity for greater profitability for the sector through increased product value and market penetration arising from greater marketing effort, product differentiation, application of quality standards and eco-labelling. These initiatives, in association with a firm promise by the agencies to effectively promote mussels, will bring greater stability, surety and profitability to the sector as a whole.



APPENDIX 3.0



3.0

ENVIRONMENT

Bottom Grown Mussel Sector Review

Environment Assessment Final Report

SEPTEMBER 2007

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Acronyms

ASSG	Association of Scottish Shellfish Growers
AZMP	Aquaculture Zone Management Plan
BAP	Biodiversity Action Plan
BIM	An Bord Iascaigh Mhara
CBAIT	Cross Border Aquaculture Initiative Team
CFP	Common Fisheries Policy
CITES	Convention on International Trade in Endangered Species
CLAMS	Co-ordinated Local Aquaculture Management System
CMRM	Centre for Marine Resources and Mariculture, Portaferry
cSAC	Candidate Special Area of Conservation (now Sites of Community Importance)
DARD	Department of Agriculture and Rural Development
DCMNR	Department of Communications, Marine and Natural Resources
DoEHLG	Department of Environment, Heritage and Local Government
DPP	Director of Public Prosecutions
EC	European Commission
ECOPACT	Environmental Code of Conduct for Aquaculture Companies and Traders
EMS	Environmental Management System
EPA	Environmental Protection Agency
EU	European Union
FCILC	Foyle, Carlingford and Irish Lights Commission
FSAI	Food Safety Authority of Ireland
GIS	Geographical Information System
HAP	Habitat Action Plan
ICZM	Integrated Coastal Zone Management
IUCN	International Union for the Conservation of Nature
KG	Kilogramme
MI	Marine Institute
MLWS	Mean Low Water Spring
MPA	Marine Protected Area
MSC	Marine Stewardship Council
NMCI	National Maritime College of Ireland
NPWS	National Parks and Wildlife Service
NTZ	No Take Zone
SAC	Special Area of Conservation (under the EC Habitat Directive)
SCI	Sites of Community Importance
SBM	Single Bay Management
SEA	Strategic Environmental Assessment
SMAC	Seed Mussel Advisory Committee
SMILE	Sustainable Mariculture in northern Irish Lough Ecosystems
SPA	Special Protection Area
UCC	University College, Cork
UISCE	Understanding Irish Shellfish Culture Environments
UWT	Ulster Wildlife Trust

Glossary

Alien species: (non-native, non-indigenous, foreign, exotic, introduced, biological pollutants) are species, subspecies, or lower taxon, occurring outside their natural range (past or present) and natural dispersal potential (i.e. outside the range they occupy naturally or could not occupy without direct or indirect introduction or husbandry by humans) and includes any part, gametes or propagule of such species that might survive and subsequently reproduce.

Allowable Zone of Effect: the area (or volume) of seabed or receiving water body in which a regulatory body will allow some exceedance of the relevant environmental quality standard or some limited damage to the environment.

Anthropogenic: materials occurring in the natural environment which have originated from human activities.

Aquaculture: the rearing or culture of aquatic organisms using techniques designed to increase the production of the organisms in question beyond the natural capacity of the environment, the organisms remaining the property of a natural or legal person throughout the rearing or culture stage, up to and including harvesting.

Area of occupancy: is defined by IUCN as the area within its extent of occurrence which is occupied by a taxon, excluding cases of vagrancy.

Assimilative capacity: the ability of an area to maintain a healthy environment and accommodate wastes.

Best Environmental Practice (BEP): the application of the most appropriate combination of environmental control measures and strategies.

Biodiversity (biological diversity): the variability amongst living organisms, including the variability within species, between species and of ecosystems.

Biological carrying capacity: the maximum natural biological productivity of a body of water; if cultivated organisms (shellfish or other species which take their food from their surroundings) exceed the carrying capacity of this water body, then the biological productivity will be depleted and the natural ecosystem damaged.

Biomass (B): is the total quantity of fish in a stock and is used synonymously with stock abundance. Biomass is usually measured as a total tonnage of fish, but could be in numbers or other units to be synonymous with stock abundance.

Carrying capacity: the potential maximum production a species or population can maintain in relation to available food resources within an area.

Chemotherapeutants: compounds used by the finfish industry to treat or prevent various diseases.

Codes of Conduct: describe guidance for aquaculture operations in broad terms.

Codes of Practice: voluntary codes designed to standardise and improve the management of aquaculture.

Coordinated Local Aquaculture Management Systems (CLAMS): a structured local system implemented in the Irish Republic, that considers each bay area in the region as a separate entity and draws up a plan for each area and initiated to assure the proper utilization of each bay area for sustainable aquaculture development. It provides a mechanism not only for all aquaculture producers in a specific bay to deal with common issues together but also provides an opportunity for all stakeholders to comment on the aquaculture activities in the bay. This communication network will in turn help the growth of aquaculture in a sustainable manner in Ireland.

Depuration: holding bivalve molluscs such as mussels in sterilised sea water for 48 hours under conditions that allow them to filter normally to remove any bacteria accumulated in the gut; the sea water can be sterilised by ozone or ultra-violet light although the latter is the most common method used.

<p>Ecological footprint: the amount of natural resources required to produce one unit of farmed organisms (e.g. kgs of wild fish required to produce 1kg of farmed fish); this can also be calculated as units of area per unit of area of farmed organisms; this concept has been applied to organisms which are provided with feed during the farming process (i.e. finfish).</p>
<p>Ecosystem approach: identifying and protecting critical processes in the ecosystem and the interactions between them.</p>
<p>Ecosystem: a community of interdependent organisms, together with the environment they inhabit and with which they interact; this complex, integrated unit exists in a fine balance, so that even small changes to one part of the system can have knock-on effects on many other components of the system.</p>
<p>EN 45011: European Standard for bodies operating product certification systems.</p>
<p>Environmental footprint: the area/volume of the environment impacted by an aquaculture unit.</p>
<p>Escapes: farmed organisms which have escaped from within the confined areas where they are farmed and which may interbreed with natural populations.</p>
<p>Eutrophication: the enrichment of water by nutrients, especially compounds of nitrogen and phosphorus, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms and the quality of the water concerned.</p>
<p>Extensive systems: any system that requires neither supplementary feeding nor a direct input to support of the organisms reared.</p>
<p>FIFG (the Financial Instrument for Fisheries Guidance): Structural Funds through which the EU attempts to channel financial assistance to those regions which are less developed or in industrial decline, and to support training schemes for those seeking re-entry into employment. Will be replaced by the European Fisheries Fund (EFF) over 2007-2013.</p>
<p>Harmful Algal Blooms (HABs): concentrations of phytoplankton producing toxins which can affect human health, oxygen levels in water and which can kill or harm fish, and other vertebrate and invertebrates e.g. by damaging or clogging gills.</p>
<p>Integrated Coastal Zone Management (ICZM): a multi-user system designed to establish sustainable levels of economic and social activity in our coastal areas while protecting the coastal environment.</p>
<p>Interbreeding: mating between two individuals with different genetic traits (e.g. different species, different sub-populations of the same species).</p>
<p>Introgression: incorporation of genes from one population into another leading to the breakdown of co-adapted gene complexes and thus to homogenization of the genetic structure.</p>
<p>Invasive species: means an alien species which becomes established in natural or semi-natural ecosystems or habitat, is an agent of change, and threatens native biological diversity.</p>
<p>ISO 14001: International Standards Organisation quality standards for environmental management systems.</p>
<p>Mariculture: encompasses aquaculture in brackish and sea water as opposed to freshwater.</p>
<p>Natura 2000 sites: a network of protected areas established under the EC Habitats and Species, and Wild Birds Directives.</p>
<p>NGO: non-Governmental organisations.</p>
<p>Non-native: a species that does not originate in local waters and which has been introduced from other parts of the world by humans, either deliberately or accidentally.</p>

Precautionary principle: the principle that all responsible parties should act prudently to avoid the possibility of irreversible environmental damage in situations where the scientific evidence is inconclusive but the potential damage could be significant.

Regulating Orders: grants the right to regulate the exploitation of a shellfishery. They are designed to improve the management of natural shellfisheries.

Relaying: the sowing out of juvenile shellfish, for example scallops, for on-growing and eventual harvesting.

Restocking: the release of juvenile in mainly coastal, sea areas, lakes or rivers. and where harvesting of the resulting production is carried out by conventional fisheries (professional or recreational). In this document the term 'fisheries' will be used with the same meaning.

River Basin Management Plans: required by the Water Framework Directive, plans subject to review every six years setting out the environmental objectives for water bodies and providing a summary of the measures that are being used to achieve them.

Scar ground: intertidal and subtidal areas of exposed boulders and rocks standing clear of surrounding sand – a characteristic feature of the Solway Firth on the western border between England and Scotland. Also known as 'skears'.

Semi-intensive system: a development of the extensive system which requires supplementary feeding (and energy), depending thus both on the natural and supplied feed.

Severed Order: Sever the rights to public fishery, allowing protection of shellfish stocks owned by individuals, companies or groups of fishermen.

Shellfish: include both molluscs, such as clams, and crustaceans, such as lobsters.

Special Area of Conservation (SAC): sites designated under the Species and Habitats Directive and which are part of Natura 2000 network of protected sites.

Special Protection Area (SPA): sites designated under the Wild Birds Habitats Directive and which are part of Natura 2000 network of European protected sites.

Sustainable development: the Bruntland definition of sustainable development is "development which meets the needs of the present without compromising the ability of future generations to meet their own needs."

Transgenic: containing genetic material introduced from another species by techniques of genetic engineering.

Triploid species: normally referred to salmon; fish with three sets of chromosomes (the threads of DNA that carry genetic information) instead of the normal set of two. The extra set of chromosomes prevents development of viable eggs or sperm so, if the triploid fish escape, they can't reproduce.

Visual carrying capacity: the degree to which a particular landscape or area is able to accommodate development or change without significant effects on the character for which it is particularly valued by people or without causing an overall change to its landscape character type; this capacity will vary according to the type and nature of the development or change that is proposed.

Water Framework Directive: This substantial EC Directive requires that all inland and coastal water bodies to reach at least 'good status' by 2015. It will do this by establishing a river basin district structure within which demanding environmental objectives will be set, including ecological targets for surface waters. The Directive, therefore, sets a framework which should provide substantial benefits for the long-term sustainable management of water.

1.0 Introduction

The stated policies of the Department of Communication, Marine and Natural Resources (DCMNR) and the Department of Agriculture and Rural Development (DARD) are to ensure the sustainable exploitation of the wild seed mussel resource and the sustainable development of the mussel sector. The purpose of the regulation and management regime for the seed mussel resource is to ensure sustainability, and also to maximise the benefits derived from that resource in terms of volume and value of the mussel crop subsequently grown, harvested and processed with the objective of generating sustainable economic activity and employment in coastal communities.

DCMNR and DARD have therefore commissioned a Review to focus on the bottom grown mussel sector with the aim of producing recommendations in relation to: (i) the exploitation of the wild seed mussel resource, (ii) husbandry practices, (iii) management and regulation of the sector, (iv) marketing of produce, (v) compliance with fish health legislation, (vi) environmental sustainability, (vii) food safety and (viii) economically sustainable returns to producers and coastal communities. The bottom grown mussel sector Review will be carried out on an all-island, 32 county basis.

This particular study (TOR-5) is to review the environmental sustainability of the sector. The objective is to explore opportunities and make recommendations to improve and best utilise knowledge of the natural environment and to optimize environmental performance of the bottom grown mussel sector within the current legislative, economic, operational, technological and knowledge context.

This report first provides the background information necessary to understand the management system for bottom mussel culture on the island of Ireland. We have identified several key issues which have the potential to impact upon the environmental sustainability of bottom mussel culture on the island of Ireland, and the report discusses each issue in turn in detail. These issues are as follows: i) the availability, harvest, transport and efficient use of the seed mussel resource; ii) the carrying capacity of the coastal systems where mussel culture takes place; iii) interaction of bottom mussel culture with benthic ecosystems; iv) interaction with protected areas and species, v) genetic dilution and vi) introduction of, or interaction with, alien species.

The report focuses on the key coastal systems in which the vast majority of bottom mussel culture takes place on the island of Ireland. These are:

- i) Belfast Lough (Co Down/Co Antrim).
- ii) Carlingford Lough (Co Armagh/Co Louth/Co Down).
- iii) Castlemaine Harbour, Cromane (Co Kerry).
- iv) Dundrum Bay (Co Down).
- v) Larne Lough (Co Antrim).
- vi) Lough Foyle (Co Londonderry/Co Donegal).
- vii) Lough Swilly (Co Donegal).
- viii) Wexford Harbour (Loch Garman) (Co Wexford).
- ix) Waterford Harbour (Co Waterford).

Some mussel culture (exploratory, or with one to two operators only) takes place in areas outside those above e.g. Clew Bay; however the general conclusions of the study should hold true regardless of the individual site.

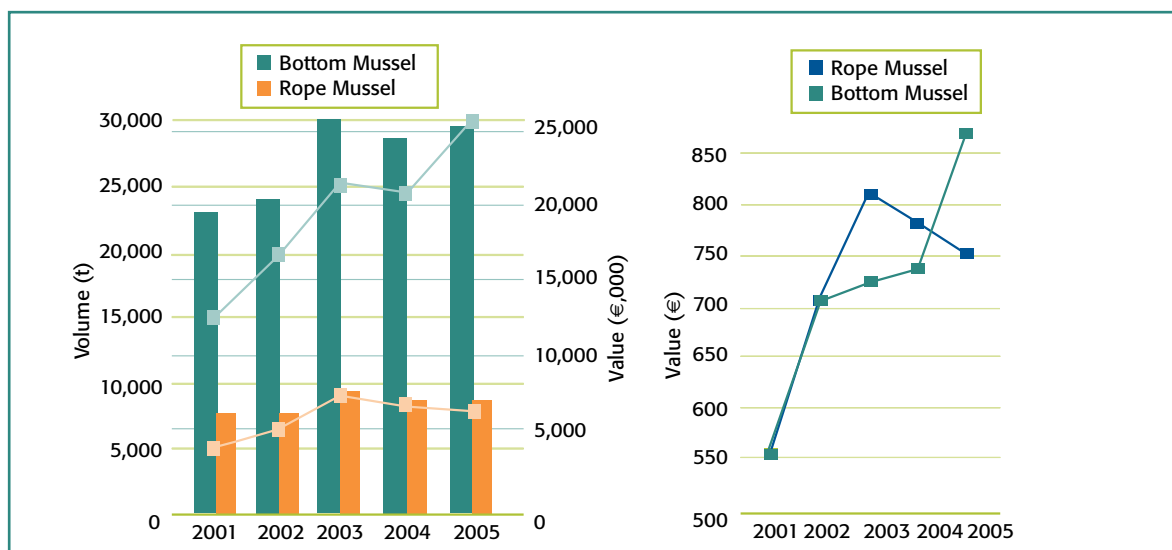
2.0 Bottom Mussel Farming on the Island of Ireland

2.1 The bottom mussel industry

Bottom mussel farming employed 401 persons over 2005, of which 230 were full-time, 144 part-time and 78 casual on the Island of Ireland. This represents around 27% of the full-time equivalent employment from shellfish aquaculture and a 38% increase from 2004.

The bottom grown mussel sector has been the most successful component of aquaculture in the ROI over the past six years. The bottom grown mussel harvest value increased by 22% to €25.7 million in 2005. Bottom mussels in 2005 were worth on average €871 per tonne and the national harvested volume increased by 3% to 29,510 tonnes (Figure 1). In NI there are currently around 68 licensed shellfish sites, of which 34 are licensed for the bottom cultivation of mussels. Shellfish production figures were similar to those for 2004 with mussels again being the main species cultivated, accounting for 7,158 t and worth around €5.3 million. Total production for the sector is valued at approximately €6 million.

Figure 1 Bottom and rope mussel volume and value in the ROI (2001-2005)



Rope and bottom mussel volume (t, bars) and value (€, lines)

A comparison of average price paid per tonne of rope and bottom mussels 2001 to 2005

Source: Brown and Deegan, 2006

In 2005, seed settlement in the Irish Sea was not as plentiful as in previous years. However, the dynamics of seed settlements are not yet fully understood and research into this area has been very much demanded. The total amount of seed relayed for on-growing in 2005 was approximately 18,500 tonnes, 60% of the quantity relayed annually for the previous two years. In 2005, the combination of poor mussel bottom spat settlement and prolonged closures of rope mussel farms due to biotoxins in the southwest initiated

a venture between both sectors of the mussel industry. This involved a number of rope mussel producers spreading their mature mussel stock on licensed bottom mussel sites. This exercise was to investigate the potential for boosting bottom mussel harvests in future years and to minimise rope farm losses resulting from slippage. Approximately 3,000 tonnes was relayed to various bottom mussel bays. The impact of six new mussel dredgers in 2005 was reduced as most of the older dredgers were excluded due to their inability to achieve certificates of compliance under the *Torremolinos Protocol*; vessel numbers in the industry dropped from 70 down to 20, although it has now increased back to around 34.

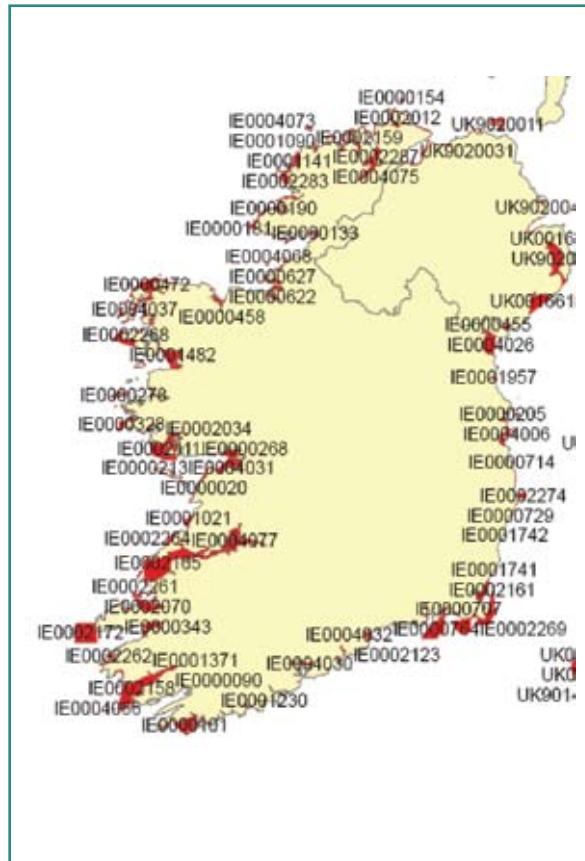
From industry returns, over 50% of the bottom mussel harvest was sold to the Netherlands and a further 25% was sent to France. Of the remaining tonnage 4% was sold within Ireland. Over 80% of the bottom mussels were sold on the fresh market (this includes live MAP).

Figure 2 Map of mussel production sites on the island of Ireland



Source: BIM

Figure 3 Marine Natura 2000 sites on the island of Ireland

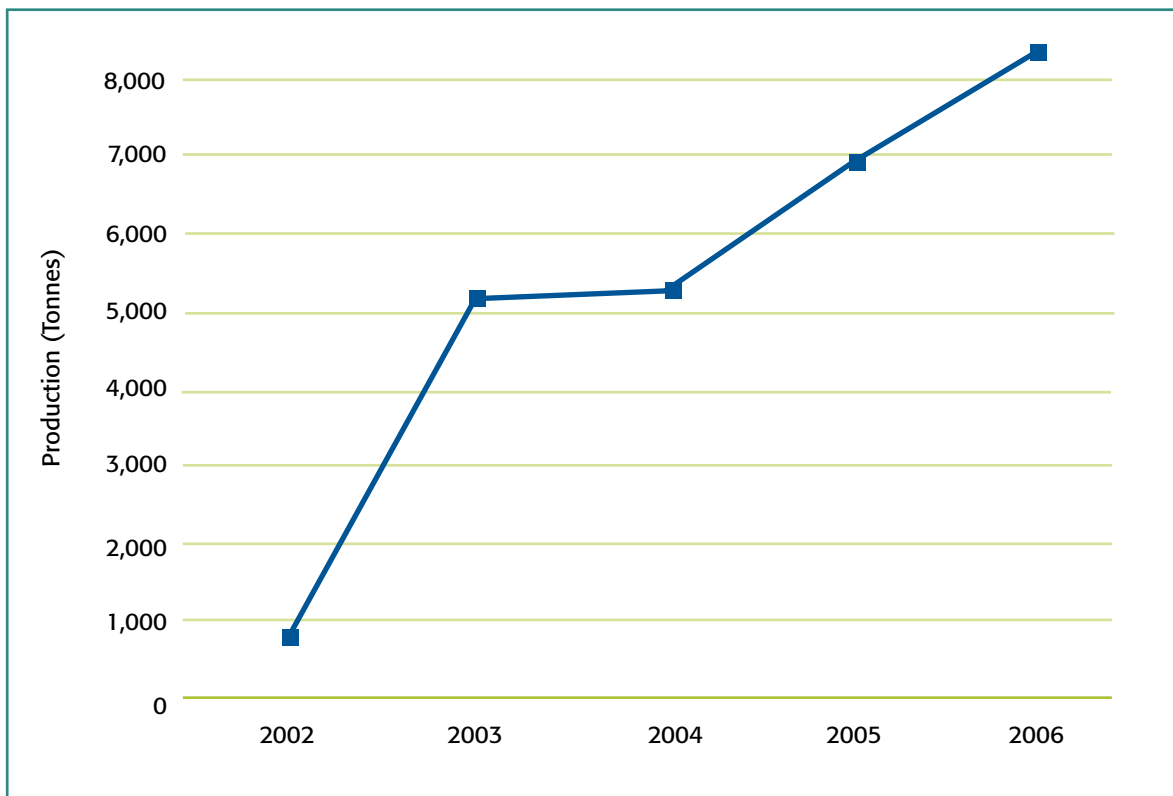


Source: BIM

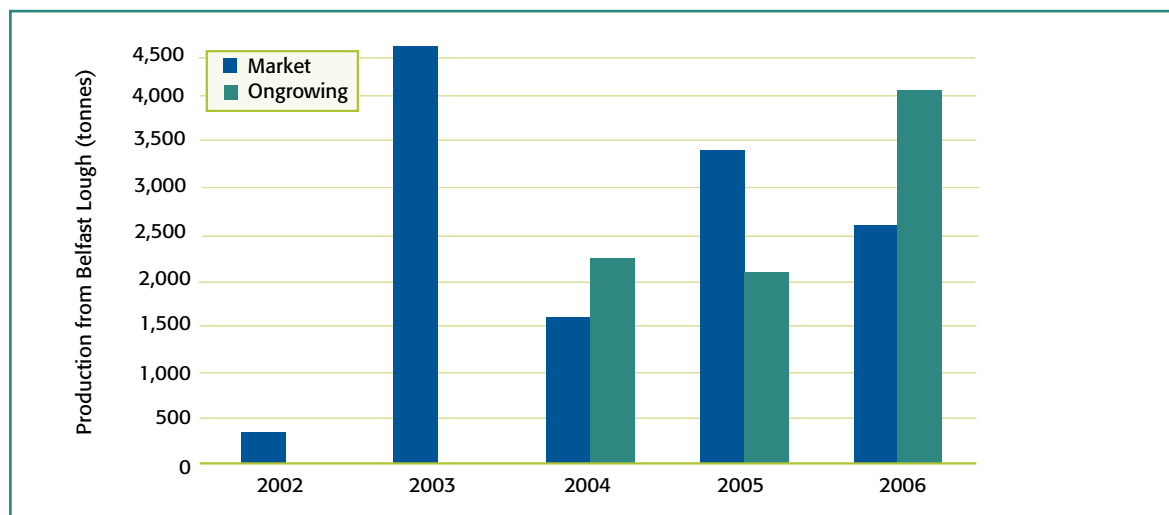
2.2 Production by area

Total production in the four main northern systems for the five years to 2006 is shown in Figure 4. Production from Belfast Lough dominates, while Carlingford Lough is also important (note that this data only includes the northern side of Carlingford Lough – total production from the system probably rivals that of Belfast Lough since production from the southern side was 2,500 tonnes in 2004). Furthermore, mussels may be moved around between systems, so the quantities of seed mussels entering the system and the quantity of finished product leaving a system for market may not always tally. For example, Carlingford Lough is a highly productive system which is often used for ‘finishing’ – providing a final spurt of growth so that mussel reach market size quickly and in good condition. In addition, mussels are sometimes moved out of Ireland before reaching market size, e.g. for ongrowing in the Netherlands. The practice of moving mussels between systems, both within and away from, the Island of Ireland, has increased in recent years with the entry of several Dutch companies into the market. It is particularly important with production from Belfast Lough, as shown in Figure 5. No data is available on production in Lough Foyle from the northern side.

Figure 4 Total production in the main Northern Ireland Systems (Belfast Lough, North Carlingford Lough, Larne Lough and Dundrum), 2002-2006

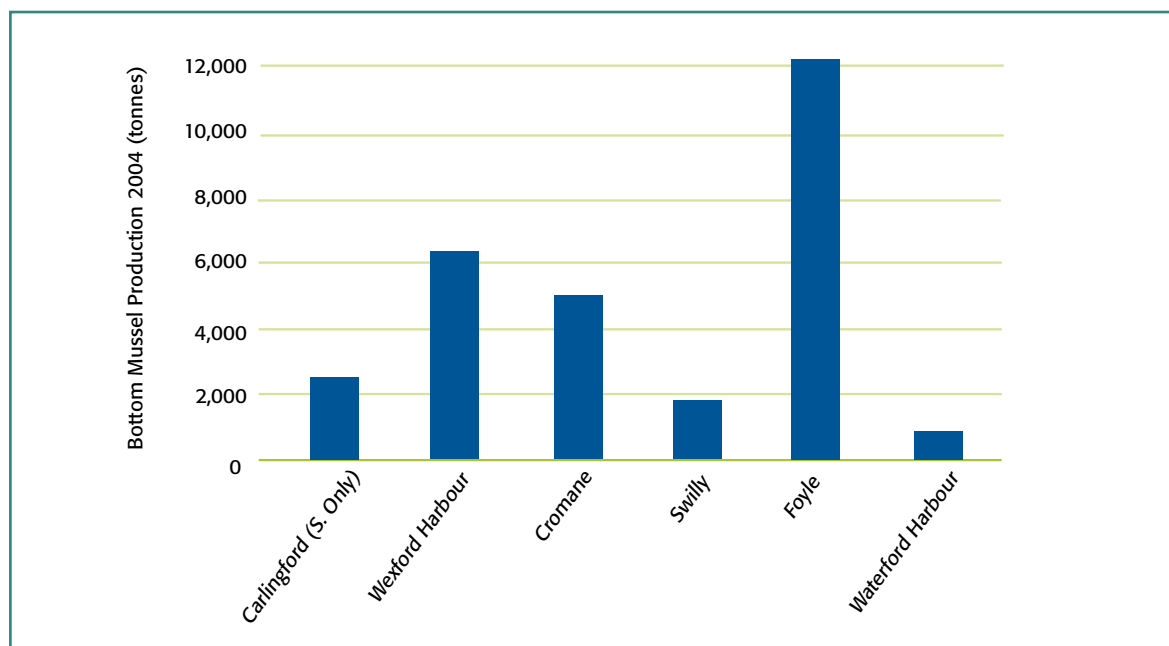


Source: DARD

Figure 5 Destination of production from Belfast Lough, 2002-2006*Direct marketing or ongrowing in another system*

Source: DARD

Bottom mussel production in the remaining systems from 2004 is shown in Figure 6¹. Generally, production in the main systems (Wexford, Cromane and Foyle) is somewhat higher than from the northern systems. The importance of the cross-border Lough Foyle as a site for bottom mussel culture is made clear from Figure 6. In the RoI, as in the NI, mussels may be moved between sites before they reach market size; this includes other southern sites, northern sites and also Dutch sites.

Figure 6 Production in the main systems, 2004

Source: BIM

¹ Lough Foyle production in 2004 was particularly high as it was the outcome of a recent major spat fall. More recent stats seem to indicate much lower production from this area (Francis O'Beirn, Marine Institute, pers. comm.).

2.3 Regulation and other issues

Regulation of this sector is complex – licences for large areas of seabed have been granted in both NI and in the RoI and the seed mussel fishery has to be managed as a shared resource between the jurisdictions. When combined with the need to consider wider public concerns for the utilisation of marine resources, the current licensing and regulatory regime is the source of considerable concern within the industry (Seafood Industry Strategy Review Group, 2006). This has prompted an overhaul of the management regime for the seed mussel fishery – there is a pressing need to review how the sector is regulated and to develop, on an all-island basis, a set of administrative arrangements that will support the sustainable development of the bottom mussel industry into the future. This is the key driver for the current study.

Leaving aside the issue of managing the seed mussel fishery itself, there are serious technical challenges facing the sector. Chief amongst these is the key issue of improving the yield from the seed mussel that is relayed. At present there is an enormous variability in the returns being experienced by operators. The more knowledgeable players make far better use of the seed they get than some of the newer entrants, which in turn has a big effect on the economics of production. A concentration on maximising the yield from relayed seed mussel, supported by the necessary training, applied research and carrying capacity studies is urgently required to ensure the sustainable future of the on-growing element of the sector. Possible changes in EU health and hygiene regulations governing the shipping of live bivalves, along with market access problems in Holland, also represent serious challenges to the sector.

At present most of the output is exported in an undifferentiated bulk form and there is scope to add significant value through both handling improvements better packaging and other avenues of innovation in product forms. Market demand for the product is solid and if backed by appropriate differentiation strategies it is felt that the value generation from the sector in Ireland could be significantly boosted.

2.4 Management of the industry

2.4.1 Seed mussel allocation and collection

Seed Mussel Advisory Committee

The Seed Mussel Advisory Committee (SMAC) is an informal advisory mechanism for joint recommendations on the management of seed. Decisions on this matter ultimately rest with DARD and DCMNR accordingly. The key task of the SMAC is to assess applications for allocations of mussel seed and advise DCMNR and DARD accordingly. The SMAC also makes recommendations to the Departments regarding dates for the opening and closure of the fishery. The evaluation by the SMAC of applications for allocations of mussel seed is based on a minimum growth cycle of two years in Irish waters. This has been put in place following consultation with the industry on the management arrangements for the fishery. SMAC previously made recommendations about individual allocations of seed mussel to producers. Since 2005, however, the pressure on the resources has lightened due to the decline in the number of vessels in the industry (due to the requirement for certificate of compliance certification) and allocations are at present based on the 2005 allocation unless producers can show a significant change to their circumstances. The allocation is not at present geographic; producers can in theory fish for seed anywhere around the island. At present seed allocation is based upon the 2005 allocations and the SMAC has been in effective limbo since then.

Regulation of the seed mussel fishery

The seed mussel fishery is regulated. A licence requirement is that vessels are fitted with a black box, which enables complete and continuous tracking, monitored by BIM, DARD, DCMNR and the Loughs Agency. This can be used to assess whether the vessel is, for example, surveying for seed, which is only permitted with approval from DCMNR or DARD, or whether it is infringing closed areas. Areas can be closed at any time, if, for example, the seed is considered to be too small to be suitable for fishing. The seed fishery itself is only open to licensed vessels on neap tides during daylight hours. Vessels can of course only fish only up to their seed allocation, although in practice this can be difficult to police.

Regulation of seed movement

The movement of seed between jurisdictions (UK, NI and RoI) requires a movement order, and inspection by a fisheries officer to ensure that alien species or disease are not being inadvertently brought into the Island of Ireland. The focus at present is strongly (and rightly) on the invasive gastropod species *Crepidula fornicata* which is present in much of the southern UK, but has not until now been recorded in Irish waters.

2.4.2 Regulation of bottom mussel culture sites

In the RoI, the licensing of areas for bottom mussel culture is carried out by DCMNR, but the Department of the Environment is a statutory consultee in the process, and can request an appropriate assessment if the areas fall within, or adjacent to a protected area. In NI, mussel beds are licensed by DARD under a similar system, and the Environmental and Heritage Service can request an appropriate assessment.

As is clear from Figure 3 above, the majority of important mussel culture sites around the island lie in or close to protected areas of some kind, and the majority of licence applications and renewals are in the future thus likely to be subject to an appropriate assessment.

2.4.3 Cross-border management: Carlingford and Foyle

Loughs Carlingford and Foyle are cross-border and therefore subject to both jurisdictions. Past experience of regulation in these systems has been markedly different, mainly due to the different shape of the two loughs. Carlingford Lough is relatively linear, with a central channel marking the border, and therefore the two regulatory regimes could function independent on each side of the channel. In Lough Foyle, the border is much harder to define, and this has meant that up till now very little regulation or control of shellfish fisheries and culture has been possible (there are, however *ad hoc* local groups which support the stewardship of resources within the Lough).

The creation of the Loughs Agency as the regulatory and licensing body for these two loughs should in the long run significantly improve management and regulation. The Loughs Agency is an agency of the Foyle, Carlingford and Irish Lights Commission (FCILC), established under the 1998 Agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of RoI. The FCILC's sponsoring Departments are DARD in NI and DCMNR in the RoI.

It is planned that Lough Foyle will be licensed as with all the other systems, while coordination of management and research in Carlingford Lough should be greatly strengthened. Work is being carried out to amend the primary legislation and progress the enactment of the Foyle and Carlingford Fisheries Act and the Foyle and Carlingford Fisheries Order, including bringing forward Regulations required for licensing of aquaculture prior to the enactment of the legislation.

2.5 Environmental management

Environmental management of aquaculture can be exerted at a number of different levels, including EU and national legislation, bay-level management and site or business specific environmental management.

2.5.1 EU and national level

EU aquaculture development policy

The European Commission (EC) recognises the importance of aquaculture as a key component of the Common Fisheries Policy (CFP) and has developed 'A Strategy for the Sustainable Development of European Aquaculture' (EC, 2002). This Strategy is coherent with the other Community's strategies, in particular with the European Strategy for Sustainable Development and the conclusions of the Göteborg European Council of 15/16 June 2001². The EU Strategy looks at aquaculture being able to "reach the status of a stable industry which guarantees long-term secure employment and development in rural and coastal areas, providing alternatives to the fishing industry, both in terms of products and employment". The EU Strategy has seven key 'actions' that are of interest to Irish bottom mussel culture, including an environmental focus on the impact of the use of alien species and guidelines for use of EIAs in aquaculture. Due to recent concerns over the ability of European aquaculture to compete with Asian and South American production (e.g. limitation of space and of water of good quality, and measures to protect public health and the environment, as well as the high Community standards), the Commission has recently instigated a consultation on the 'Opportunities for the development of community aquaculture'. This closed on 15 July 2007 – the results are unpublished as yet.

Natura 2000 Conservation

Special Areas of Conservation (SACs) are designated by Member States to meet their obligations under the EC Habitats Directive. They are areas which have been identified as best representing the range and variety within the EU of habitats and (non-bird) species listed on Annexes I and II to the Directive. In the *RoI*, the National Parks and Wildlife Service NPWS (formerly *Dúchas*, and part of the Department of the Environment Heritage and Local Government) is charged with the conservation of a range of habitats and species in Ireland under the Natura 2000 scheme. In addition Natural Heritage Areas (NHAs) form the basic designation for wildlife in Ireland. They are legally protected from the date that they are formally proposed under the Wildlife Amendment Act, 2000. Many of the designations overlap with SACs and SPAs. In NI, SACs in terrestrial areas and marine areas out to 12 nautical miles are designated under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). Protection of the marine environment

² COM(2001) 264 final

requires cross-government cooperation involving DARD, DOE, EHS and also Defra on measures to protect the local marine environment and to deliver UK fisheries marine environmental policy. All SACs on the island of Ireland are still in the process of being designated. The candidate SACs (cSACs) are now Sites of Community Importance (SCIs) arising from Commission decision (2004/813/EC) of 7th December 2004, adopting, pursuant to council Directive 92/43/EEC, the list of sites of Community importance for the Atlantic biogeographical region.

The *Birds Directive* ('Council Directive 79/409/EEC on the conservation of wild birds') complements the Habitats Directive by requiring Member States to protect rare or vulnerable bird species through designating *Special Protection Areas (SPAs)*. Together, the terrestrial and marine SPAs and SACs are intended to form a coherent ecological network of sites of European importance, referred to as Natura 2000. SPAs are classified around Europe to meet their obligations under the EC Birds Directive. These are areas of the most important habitat for rare (listed on Appendix I to the Directive) or threatened, and migratory birds within the European Union.

Water Framework Directive

The purpose of the Water Framework Directive³ is to establish a framework for the protection of inland surface waters (rivers and lakes), transitional waters (estuaries), coastal waters and groundwater. It will ensure all aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands meet 'good status' by 2015. The Directive entered into force in December 2000 and Member States had until December 2003 to transpose this into national legislation. The Directive has a series of implementation deadlines which stretch to December 2015 (the date by which environmental objectives must be met). The EC Shellfish Waters Directive (79/923/EEC), which protects the aquatic habitat of molluscs species of shellfish (oysters, mussels, cockles, scallops and clams), but not crustaceans like crabs, crayfish and lobsters⁴, will be repealed in 2013 by the EC Water Framework Directive.

The implementation of the Water Framework Directive (WFD) presents specific considerations for the operation and management of the shellfish cultivation sector. As production activities are currently almost solely located within the designated transitional or coastal waters (<1nm) so the management of the sector must be integrated with the Directive's objectives. The introduction of the WFD provides the opportunity for economically important species and hence areas to be identified. Such designations apply to both molluscan and crustacean species and this should provide additional support for the cultivation sector especially in terms of any future stock enhancement initiatives. The Shellfish Growing Waters Directive (79/923/EEC) also establishes a legal provision for the recognition of areas used to cultivate shellfish and this should be continued through the WFD when it is repealed and superseded in 2013. The designation of "economically important species" and hence areas for the cultivation sector should encompass the requirement for all cultivation operations to be classified as a 'designated shellfish water.' In the Rol, Carlingford and Cromane are among the existing 14 designated shellfish waters. An additional 54 sites are proposed for further designation. In NI Larne, Dundrum, and a proportion of the sites in Carlingford and Foyle are designated, however no sites in Belfast Lough have been designated.

³ Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy' (EU Water Framework Directive or WFD)

⁴ See <http://www.defra.gov.uk/environment/water/quality/shellfish/index.htm>

The implementation of the WFD places a requirement on the cultivation sector that the production techniques employed will maintain or work towards “Good” Chemical and ecological status of the water environment. The potential benefits to the sector through such designations seem likely to outweigh any constraints due to cultivation operations adversely affecting the ecological status of such waters. In addition, such designations recognise the interests of the sector and serve to implement the concept of Marine Spatial Planning, such as advocated under the UK Marine Bill.

UK Marine Bill and other developments in Northern Ireland

The 2005 UK Government manifesto gave a commitment to a Marine Bill that would be based on marine spatial planning and would be designed to balance conservation, energy and resource needs and protect marine and coastal ecosystems. This UK-wide Marine Bill will have considerable implications for the management of inshore areas of Northern Ireland including:

Marine spatial planning: A new system of marine spatial planning is proposed to enable a more rational organisation of the use of marine space and the interactions between its uses. This should take account of all sectors and activities and ensure an integrated approach at the land-sea interface. An agreed plan would provide a firm basis for rational and consistent decisions on licence applications (see below), and allow users of the sea to make future decisions with greater knowledge and confidence. The planning process should identify areas of particular suitability or unsuitability for certain types of activities and where possible, could identify preferred areas for or against specific types of activities. At present, there is no decision on the landward boundary of marine spatial planning – however the consultation document does specifically consider the Mean High Water Springs mark. This would enable marine spatial plans to consider all marine activities, including those specifically in the intertidal zone such as some shellfish farming, resulting in a small geographical overlap with the terrestrial planning system.

Licensing marine activities: The proposals aim to result in a licensing system which is more efficient and transparent, resulting in less risk, delay and cost to business. Three alternatives in addition to no change are considered – (1) merging the two principal licensing systems (Part 2 of FEPA and Part 2 of the Coastal Protection Act) which consider cross-cutting environmental and navigational issues; (2) simplifying the licensing processes within each sector; or (3) creating a single, integrated licensing system for all marine activities.

In NI Planning and Environmental Policy Group has lead responsibility for four of these areas; marine spatial planning, marine licensing, marine nature conservation and a marine management organisation. DARD has lead responsibility for Fisheries Management. DARD has stated that it is committed to taking any appropriate enabling powers under the Marine Bill which are relevant to the NI inshore area. The absence of Sea Fisheries Committees in NI means that parts of the Bill are not applicable, but in general, NI is fully integrated in proposals for the Bill. However, the White Paper makes clear that final decisions on the nature of marine management structures in NI will be a matter for the NI Assembly.

A recent review of inshore fisheries management in NI recommended that a single ‘Inshore Fisheries Development & Management Group’ should be established to cover the entire NI coast (Stakeholder Advisory Group to the Review of Inshore Fisheries, 2007) where DARD would be an “active adviser”. The purpose of this new group would be to (i) advise government on issues affecting inshore fisheries in NI to assist DARD in developing policies and strategies for the inshore fishery and (ii) develop (a) regional management plan(s) (rolling over a 3-5 year cycle) to implement the regional strategy for inshore waters in NI, setting clear objectives and measurable targets for management and environmental integration.

Other developments in RoI

In the RoI, the DCMNR initiated a 'Review of Coastal Management' in April 2007 to develop a strategic vision of the economic, planning and environmental aspects for future coastal development. It is likely that this will pave the way for marine spatial planning in the RoI, reflecting an accelerating trend throughout the EU.

2.5.2 Regional level

Co-ordinated Local Aquaculture Management Systems (CLAMS)

The unique Co-ordinated Local Aquaculture Management Systems (CLAMS) process is an all-island initiative to manage the development of aquaculture in bays and inshore waters throughout Ireland at a local level. In each case, the plan fully integrates aquaculture interests with relevant national policies, as well as:

- Single Bay Management (SBM) practices, which were initially introduced by salmon farmers to co-operatively tackle a range of issues, and have now been extended to all aquaculture species;
- The interests of other groups using the bays and inshore waters;
- Integrated Coastal Zone Management (ICZM) plans; and
- County Development plans.

The process has been widely adopted in a number of bays and inshore waters where aquaculture is practised around the Irish coast, as a further proactive step by fish and shellfish farmers, to encourage public consultation on their current operations and their future plans. These areas include (see Figure 7 overleaf):

1. Ballylongford (South Shannon), Co Kerry	10. Lough Swilly
2. Bannow Bay	11. Mulroy Bay, Co Donegal
3. Carlingford Lough	12. Roaringwater Bay
4. Castlemaine Harbour	13. The North Shannon Estuary
5. Clew Bay	14. Trawbreaga, Co Donegal
6. Dungarvan Harbour	15. Ardgroom, Co Kerry
7. Kilkieran Bay	16. Larne Lough
8. Killary Harbour	17. Belfast Lough
9. Killmacalogue, Co Kerry	

CLAMS allows for the successful integration of aquaculture into the coastal zone, reflecting the need to improve environmental compliance, product quality and consumer confidence. As part of its commitment to the sustainable development of the aquaculture industry, the CLAMS process facilitates the gathering and analysis of data in relation to fish farming. This data is then made available to the local community.

2.5.3 Site of business specific environmental management

ECOPACT is a relatively new initiative designed to enable the widespread adoption of environmental management systems (EMS) throughout the aquaculture industry on the island of Ireland. This in turn promotes responsible and sustainable development of fish and shellfish farming.

Developed by BIM and more recently adopted by DARD in NI, ECOPACT helps industry to work towards the highest achievable environmental standards across many aspects of their work, and to produce a top quality product in a viable and efficient manner. It covers every aspect of aquaculture, from husbandry, to maintenance, and the interaction of farm related activities with the surrounding environment. The ECOPACT manual provides a framework for fish and shellfish farmers to set up their own individually-tailored, highly effective EMS, thus helping companies to manage their operations with a reduced impact on the environment. The ECOPACT Environmental Management System has the same key characteristics as accredited standards such as ISO14001 and EMAS and can serve as a stepping stone to independent accreditation. For a sector like the aquaculture industry, which is made up of many small companies, the existing accredited EMS such as ISO 14001 and the European Union Eco-Management and Audit Scheme (EMAS) can be difficult to achieve and maintain because of the complexity and burden of administration associated with them. BIM's Environment and Quality section recognising this fact, and working with the industry, has brought forward ECOPACT as an initiative to start the process of adopting EMS on a nationwide and systematic basis. In 2004 ECOPACT was launched in NI and is now an all-island initiative.

Each member of ECOPACT has an Environmental Policy, carries out a baseline and periodic review of their activities and on the basis of this establishes a Environmental Management Programme that when followed enables continuous improvement of environmental performance. All staff are involved and encouraged to take action while top management are engaged to drive the process.

Figure 7 Co-ordinated Local Aquaculture Management Systems (CLAMS) sites on the island of Ireland



3.0 Key Issues for Environmental Sustainability

3.1 Seed mussels

The key limiting factor for bottom mussel culture in the eyes of the industry as well as many observers is a shortage of seed mussels. The industry relies on a consistent settlement of mussel spat to provide seed which is then relayed and on-grown on beds. Unfortunately the settlement of mussel seed varies from year to year in an unpredictable fashion (as regards volume, location and time of settlement), and in most years is not sufficient to meet demand. Furthermore, scientific information on the volume, source, location and causes of variability of mussel recruitment in the southern Irish Sea is very limited, making informed decision-making about seed harvesting difficult.

A recently completed project, funded under the National Development Plan Strategic Marine RTDI Programme 2000-2006 and overseen by the Marine Institute, has significantly advanced understanding of the seed resource in the Irish Sea, and is in the process of producing management recommendations. The project was led by University College Cork, with other partners including University College Dublin, Queens University Belfast, Letterkenny Institute of Technology, Galway-Mayo Institute of Technology, Aquafact International Service Ltd. and the South East Shellfish Co-op. A steering group for the project comprised of representatives from Bord Iascaigh Mhara (BIM), the Department of Communications Marine and Natural Resources and the Marine Institute and also included international experts from the UK, Netherlands and USA. The project evolved from concerns raised to the Marine Institute by BIM and industry representatives regarding the sustainability of the fishery. An overall goal of project was to introduce a science-based management system for the sustainable exploitation of seed mussels in the Irish Sea. A specific goal of the project was to identify drivers governing the distribution and abundance of the seed mussel resources in the Irish Sea. The report and recommendations are still in draft form, and at the request of stakeholders are not explicitly cited here, but much information from discussions with the sources above come from this project. The key recommendations arising from the project are discussed further below.

In general, there are several environmental issues related to the supply and use of seed mussels:

- i) Is the exploitation of seed sustainable or are natural mussel beds over-exploited for seed, to the detriment of future seed settlement?
- ii) Is the exploitation of seed mussel beds likely to have wider ecological impacts, e.g. on habitat, by-catch species or seed mussel predators such as birds, fish and invertebrates?
- iii) Is seed used in the most efficient way, to ensure that maximum benefit in terms of volume of adult mussels is obtained from the seed available?
- iv) Can alternative sources of seed be found, and what are their potential environmental impacts?
- v) Does the transport of seed have the potential to introduce harmful alien species to the mussel growing areas? The issue of alien species is discussed separately in Section 3.5.

3.1.1 Sustainability of natural seed mussel harvesting

Seed mussel beds vs. permanent mussel beds

There are, simplistically, two types of natural mussel bed. The first type is a 'permanent mussel bed' which receives regular (or periodic) spat settlement, and thus contains mussels from a range of age classes. The second is what we might term a 'seed mussel' bed – an area in which there is periodic settlement of spat, which may survive a few months or until the following winter but which is then frequently lost or dispersed by winter storms or predators, although usually the beds contain a low percentage of older age classes which do survive. The first type of mussel bed is characteristic of many areas, usually intertidal. The second type of mussel bed is characteristic of areas which are highly energetic, with mobile sediment which can erode mussels away or smother them during storms – they frequently form, for example, in strongly tidal areas such as Morecambe Bay in the UK.

Clearly, the exploitation of these two types of seed beds will have different consequences for the overall mussel population, because while permanent beds can be expected to be a source of larvae, seed mussel beds will not produce larvae, or at least to a much lesser extent, since mussels mortality in these beds is very high before mussels reach reproductive maturity. It is thus preferable to exploit these seed beds, rather than permanent mussel beds where possible (this is also preferable from the farmers' point of view, since it is more profitable to use mussels all of a similar size class). In reality, of course, natural mussel beds do not fall neatly into one class or the other. Beds may persist for several years before being eroded away, or may be partially but not fully eroded every winter. Mussels may also spawn when relatively small – even sometimes in their first year (~20 mm shell length; Gavin Burnell, UCC, pers. comm.), so even annual seed beds may have some reproductive output – the output of each individual mussel will be small but if the seed beds are large and dense enough, they may still make a significant contribution to the larval pool. The reasons behind the high variability in the age of first spawning in mussels from different sites are not well understood, but it is probably related to environmental conditions such as food supply and temperature. Nonetheless, knowledge of the age and size distribution of the harvested seed mussel beds is important in assessing the impact of harvest on the wider mussel population.

The majority of mussel seed used in the bottom culture industry on the island of Ireland comes from subtidal seed beds in the South Irish Sea. Generally, these Irish Sea seed beds are subtidal, occurring at depths between 10 and 30m and on a variety of sediment types. Nevertheless, as with seed beds elsewhere, the formation and disappearance of these beds is highly unpredictable in time and space, meaning that considerable effort has to be invested by the industry and government to locate suitable seed. The most consistent seed beds have been found off Wicklow Head, with two areas east of the India Bank having consistent settlement in most years, while other beds form more unpredictably. In recent years, around 75% of mussels dredged in the Irish Sea have been taken from these sites.

In NI, seed is found most consistently in the area around Skullmartin Rock (Co Down), also subtidally. Data on the size distribution of mussels from the seed bed in 2004 suggested that two cohorts were present, one from a recent settlement in spring 2004 (16-18mm) and one from an older settlement (26-28mm), probably in autumn 2003. Thus not all mussels are lost each year over the winter in this area, although the lack of any larger cohorts suggests that the majority are lost before reaching peak reproductive size. In addition, sporadic spatfalls occur in some of the sea loughs where bottom mussel culture also occurs, including Lough Foyle, Carlingford Lough, Belfast Lough, Lough Swilly and Cromane.

Data on the age or size distribution of mussels from the harvested beds is limited, as is data on the fate of individual mussel beds over the course of a seasonal cycle. Notwithstanding, the emphasis placed by all sources on the sporadic nature of seed occurrence in time and space, as well as the subtidal nature of the principle seed beds, suggests that they are more similar in form to the typical 'seed beds' described above than to the more permanent mussel beds. In one sense this is good news for the industry, in that it suggests that these beds are not all likely to be a significant source of recruitment (or at least, will be significant only intermittently). This means that it is likely that seed can be harvested from these beds without compromising larval supply and spat settlement in future years to any great extent. Additional information however is required on recruitment and larval supply to and from seed areas before this assessment can be confirmed or refuted. At present it is thought that at least some of the Irish Sea beds over-winter and spawn the following year, and that these might be important for larval supply to that or neighbouring sites, particularly given that larval transport is probably over shorter distances than once thought (Michael O' Cinneide and Francis O'Beirn, Marine Institute, pers. comm.).

Exploitation of intertidal seed beds

Given the limitations placed on the industry by the lack of seed, as well as concerns raised by some stakeholders about exploitation of intertidal mussel beds for seed, we felt it would be appropriate to discuss briefly the potential implications for sustainability of seed collection from the intertidal. This is carried out to some extent in Cromane at present. The wider ecological implications are discussed below.

Intertidal seed mussel beds are an important ecological characteristic of areas with a large tidal range and a large area of intertidal habitat – examples include the Waddensea in the Netherlands/Germany and also the Wash and Morecambe Bay in England. These seed beds have similar characteristics to the subtidal seed beds described above (such as those that form in the southern Irish Sea), in that they vary greatly in extent from year to year and from season to season, frequently forming in spring and summer and being eroded away in winter (Ens *et al.* 2004). Nevertheless, beds that survived the first couple of years could attain a structure which allowed them to persist for decades due to new spat fall occurring between established adult mussels – an example of a transition between the two types of mussel bed described above (Ens *et al.* 2004).

Such intertidal seed beds were heavily exploited in the Waddensea and the Wash during the 1980s. Fishing was primarily for seed mussels but also included a significant proportion of 1+ age class mussels. This fishery led to a great reduction in the extent of intertidal mussel beds due to a combination of recruitment failure and storm damage (Ens *et al.* 2004). It is now clear that the re-establishment of these mussel beds will be a slow process. One problem is that recruitment is highly sporadic (as in the Irish Sea subtidal seed beds). Secondly, once adult mussels are removed from the beds, suitable settlement substratum is also lost, so that settlement rates are lower and mortality of settled spat is higher. Thirdly, high reproductive output in *Mytilus edulis* appears to be promoted by cold winters, which are becoming less frequent (Ens *et al.* 2004). It is possible also that mussels were affected by a reduced carrying capacity in coastal systems due to a reduction in nutrient inputs (see below), as well as increased populations of some seabirds (Ens *et al.* 2004). Current legislation, in the Netherlands for example, may be attempting to retain bird populations at an unrealistic level given the decline in carrying capacity of most coastal systems due to improved water quality (G. Burnell pers. comm.).

Overall the situation is complex, but it seems that in the past, fisheries that targeted both seed and adult mussels was at least partially responsible for the recruitment failure which has led to the long-term depletion of these beds. Thus it is important to be clear whether the exploitation of seed is also likely to affect the adult mussels which act as broodstock. More information on the age/size structure of the main exploited seed areas is thus desirable.

Lower levels of harvesting on intertidal seed beds can, however, be more benign from a sustainability point of view. An experiment conducted on an intertidal mussel bed at Heysham (Lancashire, UK) removed between one quarter and one thirds of the biomass using hand rakes and shovels. Mussels in the harvested areas suffered a short-term decline in growth and condition, but after two months, there was no measurable difference in mussel density, size and condition between harvested areas and control areas. This was mainly because both harvested and control areas had been eroded by stormy weather and mussel density was drastically decreased across the bed (Gascoigne *et al.*, University of Wales Bangor, unpublished data). Thus in circumstances where the bed is likely to be eroded or lost over the winter, partial harvesting of biomass may make little difference. Thus overall, impacts depend on the nature of the mussel bed in question (permanent or transient) and the proportion of biomass harvested. Thus the collection of seed from intertidal beds needs to be regulated, as it is in the subtidal, and such mussel beds should probably be considered on a case by case basis.

3.1.2 Ecological impacts of seed mussel harvesting

The harvesting of seed mussels may have impacts on other species apart from the mussels themselves. This occurs in three main ways: (i) other predatory species may rely to a greater or lesser extent on the seed mussel beds as a source of food, (ii) species may be caught as by-catch or may be damaged by the fishing gear and (iii) physical damage to habitats. We consider these in turn below.

Impacts on predators

The importance of a mussel bed to predatory species is likely to depend significantly on the 'classification' of the bed (discussed at the beginning of Section 3.1.1 above). A permanent mussel bed may develop as the keystone of a community, which will include a variety of predatory species which live in or frequent the mussel bed and depend on it as a food source. The more transient seed beds, however, do not provide a reliable source of food to predators, since their presence is unpredictable in time and space, and generally they are not present for long enough to form the basis of a mature ecological community. Nonetheless they are used opportunistically by many predatory species.

The role of predation in mussel beds, as well as the suite of predators, also depends to a large extent on whether the mussel bed is subtidal or intertidal. Subtidal seed mussel beds are subject to very heavy predation from invertebrate species such as starfish (*Asterias rubens*), shore crabs, green crab (*Carcinus maenas*) and whelks (*Buccinum undatum*). Indeed, predation is often cited as the main reason why mussels do not naturally persist well in the subtidal (although there are exceptions), and is of course a significant problem on the subtidal cultured beds (discussed below). Vertebrate predators of subtidal seed mussels include diving ducks such as the eider duck (*Somateria mollissima*), and the common scoter (*Melanitta nigra*), as well as some flat fish (Saurel *et al.* 2004).

Intertidal mussel beds have much lower rates of predation from invertebrates, with starfish predation eliminated and rates of crab and whelk predation significantly lower (Beadman 2002, James Wilson, Deep Dock Ltd. pers. comm.); however they suffer from higher rates of predation from wading birds, particularly gulls and oystercatchers (*Haematopus ostralegus*), for which mussel beds may be an important food source.

Of these predators, the species of main conservation concern, both for subtidal and intertidal mussel beds, are the birds. The common scoter is a Red List species due to a substantial decline in numbers in recent years. This species occurs down the Irish Sea coast, including the area in which seed mussel harvesting occurs in the southern Irish Sea. It is only a winter visitor in these areas, however, so in practice is unlikely to interact with the seed mussel fishery. Furthermore, the seedbeds in the Irish Sea are found in deeper waters 20-30m which is likely beyond the range of diving ducks. The eider duck occurs around the northern Irish coast year round and thus may interact with seed mussel collection at Skullmartin, although given the transient nature of the seed resource in this area it is unlikely that the birds' food supply is significantly affected. Conversely, significant harvesting of the more 'permanent' mussel beds in the intertidal has the potential to affect intertidal birds adversely, not only through loss of food supply but also by disturbance.

By-catch

The incidental capture of other species during seed mussel dredging may have an impact on the population dynamics and sustainability of by-catch species, particularly if they themselves are subject to a fishery. The main by-catch species in seed mussel dredging are the invertebrate predators listed above – starfish, crabs and common whelks in particular, although small fish are also sometimes caught (pers. obs.). In 2003 a by-catch assessment was conducted of two seed mussel fisheries (India Bank and Rusk Bank, Davies 2003). This study, albeit limited in scale and duration, suggested that the by-catch species of most concern is the common whelk (*Buccinum undatum*). There are several reasons why impacts on this species may be of concern:

- It was the most abundant by-catch species at these two sites.
- The reproductive strategy (brooded young with no dispersive larval stage) may mean that populations are relatively distinct at small spatial scales, and the species is slow to recolonise depleted areas.
- The species is also the target of a fishery in the same area; this means that the population is subject to multiple impacts, and that the mussel seed fishery has the potential to create sustainability problems for the whelk fishery.

Some concerns have been expressed as to the stability of the whelk population in the Irish Sea (Fahy *et al.* 2005), with some changes in size distribution and biomass being attributed to fishing pressure, although there is at present no suggestion that the seed mussel fishery has contributed to this.

Physical habitat effects

Seed dredging can also compromise the potential for future settlement if it changes the nature of the substratum in seed beds, making it less suitable for spat settlement. For instance, in some seed settlement areas off Wexford and Wicklow, the substratum is reported to consist of fine sand or mud with stones and cobbles (G. Burnell, UCC, pers. comm.). It is likely in these areas that the spat settle at least initially on the

stones, so that the removal of large stones in the dredges may compromise the future suitability of the site, as well as causing significant mortality of seed in the dredging process. Nevertheless, given that the Irish Sea is a tidal medium to high energy environment, sand is the dominant substrate sediment. Seed mussels are also known to settle on sand together with bryozoans and filamentous algae which are ephemeral in nature.

3.1.3 Efficient use of seed

In order to reduce the amount of seed taken from the wild, or to maximise returns from the available seed, it is important to make the use of the seed as efficient as possible. This means minimising mortality at every stage of the harvesting and relaying process. Seed should ideally be harvested at the optimum size to minimise mortality while maximising profit. Mortality during harvesting, transport and relaying can be minimised. Mortality after relaying can be minimised. Excess seed from settlement in good years can in some cases be 'banked' to provide some continuity of supply for bad years. We discuss these ideas in turn.

Timing of harvest

If seed is harvested too small, mortality rates are very high, particularly if poor weather causes erosion of seed from the mussel lay in the early period after relaying. Anecdotally however, it seems clear that seed from different subtidal areas has different properties in this regard – some can be harvested at a small size with good survival, while some cannot. Scientifically it is not always clear why this should be, but it is widely reported across the industry.

Another consideration is the transient nature of seed beds, which can be lost during the summer as well as the winter if high density causes starvation or loss of byssal attachments (pers. obs.), poor weather causes erosion or dense populations of predators (usually starfish or crabs) find the beds. Thus the optimum date for harvesting the seed bed is a balance between on the one hand waiting for seed to reach the ideal size and on the other a constant risk of loss to erosion or predation. Experience in England and Wales suggests that this balance is usually more successfully struck by the harvesters than by dictation from the management agencies. Nevertheless, it may be that competitive forces might drive producers to harvest the seed earlier than is biologically or commercially feasible (Francis O'Beirn, Marine Institute, pers. comm.).

Management issues arise for the timing of seed harvest if there are significant delays in the opening of the fishery, so that harvesters are not able to act immediately to take seed at the optimum moment. Mussel growers in Wales, for example, frequently protest that the requirement to assess seed collection from each site and each year individually prevents them from harvesting seed in an optimally efficient way, and results in significant quantities of seed being lost to the industry each year. Thus while there is no dispute that the collection of mussel seed needs to be regulated, licensed and monitored, sustainability may be increased if the process is as fluid and efficient as possible, whilst guided by credible scientific information.

Harvesting mortality

During the process of harvesting, mortality can occur during the process of fishing, during the process of transport to the relaying site and during and just after the relaying process. Minimising mortality from these activities is largely a question of good husbandry practise, and thus out of the scope of this report, but there are again some management issues to be considered.

Dredging stones: the potential for physical habitat destruction that can arise from over-enthusiastic dredging in cobble areas has been discussed. The harvesting of large quantities of stones with the seed mussel also causes significant mussel mortality through crushing, both in the dredge and in the vessel hold during transport. It is possible that the contracting of third parties to harvest seed, with payment by weight, has encouraged a certain proportion of stones to be included with the catch, but generally it is undesirable for seed harvesters since as well as additional mortality to the seed it can damage gear.

The removal of stones can be minimised by careful harvest site selection. In some areas, however, it may be unavoidable. For these seed beds, it might be worth assessing mortality rates of seed during harvest in more detail, in order to see whether harvesting them at all is worthwhile given the potential ecological cost.

Seed transport

Mussel seed is generally transported in the dredger hold, but in some cases has been transported by truck. In either case the most important factor in minimising mortality is the length of time between harvesting and relaying, which obviously needs to be as short as possible. Thus consideration needs to be given to geography when allocating seed from a particular area to growers. Hour for hour, transport by truck will obviously cause higher mortality to seed than by boat, since there is less scope for preventing drying out and over-heating, depending on truck design; this cannot be considered good practice except in exceptional circumstances. While most of the seed used by the industry on the island of Ireland is fished from the East coast for ongrowing on the east coast, other transport patterns have been observed. The practice of temporary seed movements does occur. For example, seed is fished from Skull Martin, relayed to Belfast Lough for three months before being finally relayed in Lough Foyle (Terrence O'Carroll pers. comm.). In addition, movements of seed to Holland are also known to have occurred (Terrence O'Carroll pers. comm.).

The health of seed mussels after harvesting or transport can be tested relatively easily by assessing the rate and strength of their byssal reattachment to the substratum (more information on this technique is available from Gavin Burnell, UCC).

Post relaying mortality

Post-relaying mortality arises as a consequence of three issues: i) starvation and loss of byssus attachment if the seed is laid too densely; ii) erosion if bad weather occurs and/or if the seed is laid too sparsely and iii) predation. The first two issues are again an issue of good husbandry practice and experience, since optimum density varies from system to system, as well as with the size of the seed. Predation on newly-laid seed, on the other hand, could be significantly reduced if seed was initially laid in the intertidal rather than the subtidal. As discussed above, the main invertebrate predators (starfish and crabs) are much less dominant on intertidal mussel beds than subtidal mussel beds. These are the main predators of small

mussels, since avian predators prefer larger mussels (Caldow *et al.* 2003). Thus small mussels laid in the intertidal suffer relatively low rates of predation, since the main intertidal predators prefer larger mussels. These mussels grow more slowly, but can be relayed in the subtidal once they reach a size refuge from invertebrate predation (around 25mm shell length). In addition, in the intertidal they develop thicker shells, which also protects them from subtidal invertebrate predations. This technique thus balances the need for rapid growth with the need to minimise mortality. It is the standard technique in, for example, the North Wales industry. Of course, placing mussels on intertidal habitat has ecological implications, which are discussed below.

Seed 'banking'

An extension of this technique can be used (to some extent) to smooth out the interannual variation in seed supply which makes forward planning so difficult for the industry. During years with above average spat settlement, seed is harvested and 'banked' in the high intertidal, where it grows slowly but suffers from low mortality rates since predation rates are low. During subsequent years, this seed can be progressively moved down the intertidal into lower areas with higher growth rates, where it can be grown on to market size. The extent of seed banking should take into account the limited areas available and the possible visual impact of the process. (Note that this is not the same as the temporary 'banking' of very high densities of seed on one or a small number of beds prior to redistribution.)

Rewarding good husbandry

The means by which the limited seed resource is allocated between areas and growers has been the subject of much discussion in recent years. It is out of the scope of this report to suggest a system, but it is clear that the sustainability of the industry will much benefit from ensuring that the seed is used an efficient a way as possible. Since this depends to a large extent on good husbandry practices, it might be worth considering a system which rewards past good practice with higher future seed allocations. This might be measured, for example, as the ratio of biomass in (seed) to biomass out (mussels subsequently harvested from that seed). This figure would have to be normalised for a particular system since it is clear that some systems are more productive than others (mussels grow more rapidly in Carlingford Lough than Belfast Lough, for example). It would also require careful records to be kept since mussels may be moved between areas or sold on before reaching adult size. A drawback of this system, however, is that new businesses run by inexperienced operators may be penalised, and it may thus slow the development of the sector or allow it to stagnate.

Allocating seed according to the licenced site

At present it is difficult to tailor seed allocations precisely to the productivity of each licenced site, because data is lacking about the ecology, dynamics and carrying capacity of the main mussel growing areas. These data requirements are discussed further below. Once more data is available, it will be easier to provide a seed allocation to each grower which, with good husbandry, will make the most efficient use of each site. Bear in mind, however, that mussel growing conditions as well as seed conditions vary significantly from year to year, so a perfect match can never be expected.

3.1.4 Alternative seed sources

Seed from rope culture

In recent years, relative market prices mean that it is economic for bottom mussel growers to buy half-grown mussels from the rope mussel industry, for ongrowing on bottom mussel beds. This situation is rather odd from an economic point of view, since rope-cultured mussels are generally considered the superior product and have historically been more expensive. This situation arose through a combination of several factors: the decline in the Dutch bottom mussel industry, the historical preference of the large Dutch and Belgian markets for bottom cultured mussels, entry of Dutch companies into the industry on the island of Ireland and biotoxin events which have periodically caused closure of some important rope mussel areas in the ROI, such as Bantry Bay.

From an ecological point of view, however, it is only of concern if it precipitates the decline of the rope culture industry in favour of the expansion of the bottom mussel culture industry. Generally, rope culture is considered more environmentally benign than bottom culture: it does not have such significant benthic impacts and does not use dredging. The use of seed from rope culture removes some of the potential impacts associated with bottom mussel culture by removing the need for dredging of wild seed, as well as providing an additional market for the rope-culture industry. Thus for as long as the process is economically sustainable, there is no strong reason why rope-grown seed should not be used for bottom culture – indeed the environmental benefits are potentially significant.

Mussel hatcheries

Some experimentation has been done into spawning and growing mussel larvae in hatcheries (as with other bivalve culture systems such as oysters and scallops). Of most interest in this context is a joint project between University College Cork, the University of Wales Bangor and members of the mussel industry in Ireland and Wales which aimed to develop hatchery and culture techniques for *M. edulis*.

Unfortunately, the result of this project suggest that while biologically it is possible (although challenging) to create a mussel hatchery, the economics of this system are unlikely to work given the low price per kilo for mussels as compared with oysters and scallops⁵ (Gavin Burnell UCC, Andy Beaumont and Richard Braithwaite UWB and Deep Dock Ltd., pers. comm.).

Similarly, BIM have been involved in a mussel hatchery project for a number of years at Cantrum Point, Galway. This has seen the successful seeding of more than 8km of rope with hatchery produced seed. However, the major driving factor in the success of a mussel hatchery will be its economic viability. Hence, hatchery produced seed is unlikely to ever provide a complete solution, unless the price of mussels increases significantly but may have a role to play in supplementing other supplies.

3.1.5 Marine Institute seed mussel study

This project evolved from concerns raised to the Marine Institute by BIM and industry representatives regarding the sustainability of the bottom mussel fishery. The overall goal of project was to introduce a science-based management system for the sustainable exploitation of seed mussels in the Irish Sea, specifically by identifying drivers governing the distribution and abundance of the seed mussel resources.

⁵ For example, see frozenfishdirect.co.uk. Mussels are roughly a half to a third the price of oysters and scallops, depending on the particular products.

The project was led by University College Cork while partners in the project included University College Dublin, Queens University Belfast, Letterkenny Institute of Technology, Galway-Mayo Institute of Technology, Aquafact International Service Ltd. and the South East Shellfish Co-op. A steering group for the project comprised of representatives from Bord Iascaigh Mhara (BIM), the Department of Communications Marine and Natural Resources and the Marine Institute and also included international experts from the UK, NL and USA. A number of deliverables were provided from this project, including:

1. Literature search and review of existing biological, fisheries, survey and hydrographic data on mussel populations in the Irish Sea.
2. Studies to estimate adult reproductive cycles and spatfall patterns were implemented. The results were integrated with the output of the modelling exercise in order to verify the models and develop a detailed picture of the reproductive dynamics of the mussels.
3. Hydrographic models predicting areas of mussel recruitment. Models incorporated vertical migration patterns during planktonic life-stages.
4. Draft a management strategy to detail the optimum manner within which to effect the sustainable exploitation of the resource, including an evaluation of the hatchery option as a source of mussel seed.

Their recommendations were – in order of priority as follows:

1. Science based management of seed resource (**Recommendation 1**) – along Dutch lines (i.e. with industry cooperation and co-funding e.g. co-management); and quotas set based on annual surveys (**Recommendation 4**).
2. No harvesting permitted before late July, to allow some spawning first (**Recommendation 2**); and the location of most stable beds confirmed and these beds managed and at least partially protected (**Recommendation 3**).

3.2 Carrying capacity

3.2.1 Definition

The idea of 'carrying capacity' as regards shellfish culture encompasses several different issues. The most straightforward is simply that of space, or what might be termed 'physical carrying capacity' – when the entire bottom of a lough or inlet has been used for bottom mussel culture then for practical purposes the carrying capacity has been reached.

Before this point is reached, however, it is likely in most semi-enclosed systems that the carrying capacity has been exceeded from ecological point of view. Mussels feed by filtering phytoplankton and (to a lesser extent) particulate organic matter from the water column. Thus the amount of food available to mussel beds is dictated by the flux of food over the mussel bed, which is in turn dictated by two factors: i) food concentrations in the water and ii) the rate of physical advection of water over the mussel beds by tides and wind-driven currents. If the flux of food is insufficient to compensate for its removal from the water column by mussel feeding, mussels in the middle of dense areas will be short of food and will have higher mortality and lower growth rates. This concept of carrying capacity may be simplistically defined as the point where the food requirements of the mussels start to exceed the available food supply.

There are also broader ecosystem-level considerations. Mussel beds may remove food from the water column to the detriment of natural suspension feeding communities or species, which will then become food limited. Thus mussel culture can (in theory) cause damage to other benthic communities via food competition as well as by direct smothering, and hence cause damage to benthic communities which are not directly in the same location as the mussel beds. There is little hard data however to demonstrate this occurring in practice.

It is clearly not desirable, however, for the system to exceed this ecological carrying capacity. It is also not desirable from the point of view of efficient mussel culture, since the rate of return of adult mussels from seed will decline. Having said that, it is clear that this 'carrying capacity' is not a fixed point – it will vary depending on the timescale over which it is measured, as well as on oceanographic conditions prevailing at the time (date, duration and size of spring bloom, strength of summer thermal stratification if any, amount of wind-driven mixing etc.).

3.2.2 Assessment of ecological carrying capacity: data requirements

Ecological carrying capacity can be assessed in two ways: i) from first principles, or ii) indirectly, by examining growth and mortality rates of the mussels themselves, and changes in these rates over time and in relation to environmental variation.

Assessment from first principles

Ecological theory suggest that the ecological carrying capacity of a system for bivalve culture can be assessed by comparing three quantities: i) the bivalve clearance time C , ii) the phytoplankton turnover time P and iii) the water residence time R . C is the (notional) time that it would take for the bivalves in the system to filter the whole water column once. P is the rate at which the phytoplankton standing stock in the system renews itself (i.e. is a measure of the capacity for primary production in the system – the rate at which new food is created within the system). R is the average age of the water in the system (i.e. the rate at which new food is supplied from outside the system). In essence ecological carrying capacity starts to be exceeded if C is significantly smaller than both P and R , since at this point bivalve feeding rate starts to exceed the ability of both in situ production and advection to provide food (Officer *et al.* 1982, Dame and Prins 1998).

Assessment from mussel growth

Assessing ecological carrying capacity in this way is (even) less of an exact calculation than the one outlined above, since many factors aside from food supply can affect mussel growth and mortality rates. Nonetheless, if time to market size and yield are found to decline as the area of mussel culture expands, or during years when phytoplankton production is lower than normal, this may be an indication that carrying capacity is being exceeded. For example, the time for oysters (*Crassostrea gigas*) to reach market size in the Marennes-Oléron system in France increased from 1.5 to 4 years as the area under oyster culture expanded – a likely indication of food shortage in this system (Bacher *et al.* 1997). It is important to bear in mind, however, that other factors may confound temporal comparisons of this kind; for example husbandry techniques or seed quality may also vary over time. Somatic versus gametogenic growth as another contributing factor. Another major factor in this Marennes-Oleron example was the presence of large populations of *Crepidula fornicata*, an additional and competing major filter feeder in the system.

3.2.3 Carrying capacity: general concerns for bottom mussel culture on the island of Ireland

Two issues are of general concern as regards carrying capacity of the various systems for bottom mussel culture: i) lack of data available to calculate ecological carrying capacity (as defined above) at present; and ii) the possibility that ecological carrying capacity is declining and will continue to decline in the future.

Data availability

Assessment of carrying capacity from first principles ideally requires information about oceanographic circulation, phytoplankton dynamics and bivalve biomass for the system in question. Such information is not easy to collect (it may have to be modelled from field data) and certainly is not available for most of the systems in question (it is probably not available in most areas in which bivalve culture takes place), although some studies (now rather old) have been carried out in Carlingford Lough focusing on oyster culture – e.g. Bacher *et al.* 1997, Ferreira *et al.* 1998. Some data on mussel growth and mortality rates, yield and time to market size is likely to be collected by mussel growers but is not at present gathered together in any systematic way by management agencies. Since an (approximate) assessment of the ecological carrying capacity of each system would be of benefit to mussel license holders as well as managers, it might be worth starting a programme to collect data from mussel growers.

Changes in ecological carrying capacity over time

It is likely that the ecological carrying capacity of at least some of the key systems has changed over the last few decades. This change will have been largely driven by an increase in P – the phytoplankton turn-over time, associated with the fact that due to improved waste water processing, the nutrient loading going into many systems has decreased significantly. This is particularly true of systems with a large population in their catchment – notably Belfast Lough. If phytoplankton are nutrient limited (as they usually are in shallow systems during summer), phytoplankton growth rates can expect to have been significantly reduced.

It is also possible that ecological carrying capacity will continue to decline in the future, via a different mechanism, driven by climate change. Recent work in Wales (unpublished data, University of Wales Bangor) suggests that reduced growth rates and high mortality rates in mussels and cockles might be associated with our increasingly warm winters. When the water remains warm during the period when phytoplankton growth is light limited, bivalves and other suspension feeders may not be able to meet their metabolic requirements which are linearly related to temperature (Barbariol and Razouls 2000). Mussels are frequently in energetic deficit during winter in any case (e.g. in north Wales; Gascoigne *et al.* 2004), so this increase in mean temperature may be sufficient to significantly reduce yield. Ecological studies to confirm (or reject) this idea have still not been carried out, but the potential role of climate change is important for managers to bear in mind.

3.2.4 Carrying capacity studies systems on the island of Ireland

SMILE Project

The SMILE project (Sustainable Mariculture in northern Irish Lough Ecosystems) is a collaboration between several academic institutions and Northern Irish government to assess carrying capacity for mussels and oyster culture in the northern Irish loughs. The project has just reached completion and the tools handed over to DARD. Carrying capacity models have been developed, and the next stage is for them to be tested by comparison against actual mussel and oyster growth rates in each system over the next year or so. It is noted that it was generally accepted by the project team that further data input was required for the developed models to give a reasonable figure for carrying capacity in any one area, with prediction models viewed as more accurate for those areas with more extensive and reliable data sets. Once the model has been verified against updated empirical data, it is intended to be used as a management tool for, for example, seed mussel allocation, by the northern Irish management agencies

Studies on Carlingford Lough

Some academic work has already been carried out on Carlingford Lough (see for example Bacher *et al.* 1997 and Ferreira *et al.* 1998), focusing on assessing the carrying capacity for *Crassostrea gigas* culture (the principle is, however, the same). The conclusion of this work is broadly that the carrying capacity of Carlingford Lough for shellfish culture has not yet been reached. This is supported by the observation that Carlingford Lough is one of the most productive systems on the Island of Ireland, with high shellfish growth rates. Conversely, this might also suggest that systems with much slower growth rates than Carlingford Lough (such as Belfast Lough) are reaching or exceeding their carrying capacity. The results of the SMILE project should shed more light on this.

UISCE Project

BIM are just under halfway through the pilot phase of the UISCE (Understanding Irish Shellfish Culture Environments) project which will end in September 2008. BIM is coordinating a multidisciplinary international consortium that is modelling from the individual shellfish growth level up to the ecosystem level for oysters and mussel (bottom and rope). In understanding the complete environment of shellfish culture, production capacity can be maximised along with profit whilst minimising environmental impacts. Wexford Harbour is being studied as the pilot bay representing bottom mussel farming. The project will provide a desktop application that runs within a GIS environment and will be available to industry and regulators to model production. An important and unique addition to this study is the development of water quality modelling capability which will be linked into shellfish hygiene risk assessment.

3.2.5 Carrying capacity: conclusions

The calculation of a carrying capacity for coastal systems for mariculture is not a simple task. It requires a significant data gathering exercise to evaluation the advection and in situ production of food relative to the mussel food requirement at different time of years and under different conditions. Despite its challenges however, this issue is being addressed at a variety of levels and in a variety of sites around the

island of Ireland using well recognised academic experts and institutions in the subject from Ireland, the UK, Portugal and the US among others. It is hard to fault this approach, and it seems likely that within the next few years a much better understanding will be reached about the carrying capacity of these systems, which can be used to inform planning and management along the lines planned by, for example, the SMILE project.

Generally, the perception in the industry at present is that overall the growth of bottom mussel culture is limited not by the carrying capacity of the coastal systems so much as by the supply of seed. This perception is, however, not always shared by environmental managers, who are concerned about the extension and renewal of mussel licences without consideration for carrying capacity. This is particularly true of some systems (e.g. Belfast Lough) which are considered, rightly or wrongly, to be 'full', while at the same time have been cleaned of much of their nutrient loading (thus reducing their carrying capacity to some extent). It might be wise to suspend any extension of licensing in such system pending the results of carrying capacity models. If this is regarded as over-precautionary, then new licensing should be considered with carrying capacity explicitly in mind. Of key importance however is the integrity and accuracy of the input data. Where modelling results do not reflect the experiences of the industry, sole reliance on these mechanisms must not drive the management and licensing process. Input data derived from longer-term monitoring results should provide more reliable carrying capacity estimates and help identify anomalous input data.

Finally, this is an area where collaborations between the industry, management agencies and academics have been highly beneficial in producing high quality research. Data on, for example, mussel growth rates and yields, can be easily obtained from the industry, and it is in everyone's interest to make the industry as efficient and environmentally benign as possible. It is also in the long-term interests of the industry to cultivate good relations with management agencies, and to try to address environmental problems at an early stage, before they create problems both in terms of efficient production and in terms of licensing.

For example, the mussel industry in the Menai Strait in North Wales has developed close ties with the School of Ocean Sciences at the University of Wales Bangor (situated close to the mussel growing area). Several research projects have been co-financed by the management agencies (in this case the Countryside Council for Wales), the mussel companies and UK national research funding, to the benefit of all. As well as obtaining answers to questions of environmental concern, the mussel companies receive tax relief on their financial inputs, while the University can use the co-financing to leverage research funds which would not otherwise be available (e.g. funds such as CASE studentships which are only allocated to research projects with a private sector partner).

3.3 Interaction with benthic ecosystems

It is clear that the presence of high densities of mussels on the bottom where previously none existed will have significant effects on the benthic ecosystem. This may occur via direct smothering by mussels, but in addition, mussels transport large quantities of fine sediment from the water column to the bed as a by-product of their feeding. This build-up of sediment (usually called 'mussel mud') can also cause smothering of other benthic species, and can also significantly change the nature of the benthic substratum, and hence the habitat type. The presence of mussels on the seabed at densities greater than about 2-3 kgm² reduces the abundance and diversity of infaunal and epifaunal species, with the effect enhanced at higher mussel density (Beadman *et al.* 2004).

Furthermore, the process of mussel culture itself can cause damage to benthic ecosystems, particularly through the process of dredging. There have been extensive studies on the impact of bottom fishing gear such as dredges and trawls on benthic ecosystems, showing that in many cases they reduce benthic biomass, diversity and productivity (Jennings and Kaiser 1998, Hiddink *et al.* 2006). Particularly vulnerable are tall, brittle and/or slow-growing species such as sea fans, sea pens and other coralline species, brittle star beds (*Ophiothrix fragilis*) and calcareous algae (e.g. maerl beds), as well as species which form large structures such as honeycomb worm (*Sabellaria*) reefs. Dredging also releases a lot of suspended sediment into the water column, which can also cause smothering and reducing the ability of suspension feeding species to feed.

Bottom mussel culture has the potential to have a significant impact on benthos in terms of abundance and biomass, species identity and species diversity. Nevertheless, in some sites, the presence and harvesting of mussels in the intertidal has little or no impact on benthic diversity (at Heysham Flat in Morecambe Bay, UK; Gascoigne *et al.*, University of Wales Bangor, unpublished data). These are sites where benthic biomass and diversity is naturally very low (e.g. in compacted or mobile sand). Likewise, in the subtidal, damage from fishing gear has been shown to be minimal in areas where strong currents create a substratum of mobile sand (Hiddink *et al.* 2006). Overall, there is no guarantee that mussel dredging or relaying will cause significant damage.

Clearly, then, the specific impacts of mussel culture on benthos at a given site depend to a large extent on the habitat and species which were present before mussel culture was started at the site. Information is required on the nature of the benthos at a proposed or existing culture site before any determination of the likely impact of mussel culture can be made. Unfortunately, this data is lacking for most of the bottom mussel culture sites around the island of Ireland, making it difficult to assess the impact that bottom mussel culture has had up to now (with a few exceptions, see below). Such information needs to be gathered for any proposed new sites in order to be certain that significant benthic impacts are being avoided. Detailed data on subtidal benthic habitats and species is of course neither simple nor cheap to gather, but a short survey using a small boat and (for example) drop-down or diver-held video may reveal that the habitat is not likely to be sensitive, so that extensive scientific surveys are not required. The MESH project (Mapping European Seabed Habitats) is providing the impetus for benthic data to be collected at sites across the island of Ireland.

Information available on natural benthic habitats and species in the main systems is somewhat erratic but is summarised below:

- **Belfast Lough:** According to data from EHSNI⁶, the inner lough is muddy fine sediment, while the outer lough has a mixture of rocky and sandy substrata.
- **Lough Foyle:** According to EHSNI and a CEFAS survey from 2006 (only currently available in draft form), Lough Foyle is a mosaic of muddy and sandy substrata with some significant areas of native oyster (*Ostrea edulis*) cultch. As well one of the most important remaining populations of native oysters in the UK and Ireland, the lough contains large natural mussel beds. It is worth noting that *Bonamia ostreae* has recently been detected in the Lough.
- **Lough Swilly:** According to Cooper and O'Hagan (2002), sediment in Lough Swilly generally becomes finer along a gradient from mouth to head, from gravel and sand at the mouth, to muddy sand higher up. Some native oysters are also present in Lough Swilly.

6 http://www.ehsni.gov.uk/spec_protect/spec_protect_belfastlough.shtml

- **Carlingford Lough:** According to EHSNI, Carlingford Lough is composed mainly of fine silty or muddy sediment. An important benthic species in the lough is the sea pen *Virgularia mirabilis* which is a Northern Ireland priority species. The seagrass *Zostera marina*, a UK Biodiversity Action Plan species, is also present. The lough is due to be mapped in more detail under the Infomar project in 2008.
- **Larne Lough:** According to information from ICES, Larne Lough substrata are mainly mud or muddy sand.
- **Castlemaine Harbour:** Sand and shingle with patches of finer siltier sediment (Johnson 2005). There is an anecdotal report by Birdlife International of seagrass (*Zostera marina*) being present.
- **Wexford Harbour:** Not much information is available on the general benthic environment. Some evidence of honeycomb worm reefs (*Sabellaria alveolata*) in the vicinity according to NPWS.
- **Waterford Harbour:** Not much information at present.

It is clear from the text above that detailed benthic data is not at present widely available for most of the important mussel sites around the island of Ireland. Nevertheless, some conclusions can be drawn. Since mussels create a fine, muddy sediment, less change will occur in benthic ecosystems already dominated by fine sediments; this includes the inner (upstream) area of several of the loughs as well as all of Carlingford Lough. Conversely, Carlingford Lough contains dense populations of the sea pen *Virgularia mirabilis* which is likely to be easily destroyed by dredging. While this is not a rare species in UK terms (it occurs widely in UK waters in fine sediments, particularly in sea lochs on the west coast of Scotland as well as in some harbour areas such as Portland on the south coast) it is a priority species for NI, where it is clear that the Carlingford Lough population is an important one. Likewise, native oysters are an OSPAR and UK priority species and are likely to be sensitive to smothering by mussels. *Zostera marina* is likewise an important species (as well as an important habitat) which is likely to be damaged by bottom mussel culture, although reference to seagrass in Castlemaine Harbour was only found in one source.

Overall, this brief assessment suggests that Carlingford Lough, Lough Foyle and Castlemaine Harbour in particular deserve careful consideration of benthic impacts before mussel licensing is extended in any way, while for Wexford Harbour further information is urgently needed. One problem with the latter area is that much is already under cultivation and very little is known about the baseline conditions.

3.4 Protected areas and species

3.4.1 Protected area designations in mussel areas

The main mussel sites in both NI and the RoI all have several types of statutory designation (see Table 1). The main sites in the RoI have been designated as cSACs under Natura 2000, and are also Natural Heritage Areas (an RoI national designation). The main mussel areas in NI are not designated as SAC's but are protected as SPA's under Natura 2000 for their importance for birds. Several sites are also designated under the Ramsar Convention as wetlands of international importance; this is also mainly due to their role in supporting resident or migratory bird populations. Activities such as bottom mussel culture require an appropriate assessment for licensing in or adjacent to a protected area.

Table 1 Natura 2000 designations in the main bottom mussel sites

Site	SAC	SPA (mainly intertidal)	Ramsar
Belfast Lough	No	Yes – extended to subtidal as well	Intertidal & coast
Lough Foyle	No	Yes	East coast
Lough Swilly	Upper half	Upper half	No
Carlingford Lough	South coast	Yes	North coast
Lough Larne	No	Yes	Coast
Wexford Harbour	Yes	North side	North side
Waterford Harbour	Yes	No	No
Castlemaine Harbour	Yes	Yes	No

cSAC designations are based on rather broad habitat categorisations (for example, ‘estuaries’ or ‘large shallow inlets and bays’) so by themselves do not provide much guidance as to how specific activities within the cSAC will affect the conservation status of the protected site. It is clear that an activity (such as bottom mussel culture) which alters benthic habitat and community structure should be of concern in principle, but the specific details of how much mussel culture should be permitted and in which locations will obviously depend on site-specific management plans. Such Plans were not available to the present study, but presumably in the future will help guide the planning process, including mussel culture licensing.

SPA designations are more specific, being based on the presence of nationally or internationally important populations of particular bird species. The species in question for each SPA are listed in Table 2.

Table 2 Bird populations of international and national importance in the SPAs with significant bottom mussel culture

SPA site	International importance	National importance
Belfast Lough ¹	Redshank.	Shelduck, oystercatcher, purple sandpiper, dunlin, black-tailed godwit, bar-tailed godwit, curlew, turnstone.
Lough Foyle ¹	Whooper Swan, Light-bellied Brent Goose and Bar-tailed Godwit; total wintering bird numbers of international importance (>20,000).	Red-throated Diver, Great Crested Grebe, Mute Swan, Bewick's Swan, Greylag Geese, Shelduck, Teal, Mallard, Wigeon, Eider, Red-breasted Merganser, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Knot, Dunlin, Curlew, Redshank and Greenshank.
Lough Swilly ²	Total wintering bird numbers of international importance (>20,000).	Shelduck, teal, wigeon, ringed plover.
Carlingford Lough ¹	Sandwich Tern.	Common tern, Roseate tern ³ , Arctic tern.
Lough Larne ¹	Light-bellied Brent Geese.	Roseate tern ³ , common tern.
Wexford Harbour ²	Greater white-fronted goose.	Common scoter ³ , red-throated diver, wigeon, mallard, teal, oystercatcher, lapwing.
Castlemaine Harbour ²	Total wintering bird numbers of international importance (>20,000 in most years).	Common scoter ³ , red-throated diver, oystercatcher, wigeon, golden plover, dunlin and redshank.

¹ Data from http://www.ehsni.gov.uk/biodiversity/designated-areas/spec_protect.htm

² Data from www.birdlife.org and the RSPB

³ IUCN Red Listed species

3.4.2 Bottom mussel culture and bird conservation

Positive impacts of mussel culture on birds

Birds which are bivalve feeders can benefit from the presence of bottom mussel culture in providing an additional food source. At present, this is not likely to be significant in the above areas, since mussel culture is concentrated in the subtidal, while most of the above species feed in the intertidal or on land. Subtidal feeders such as terns and divers eat mainly fish rather than invertebrates. The only subtidal bivalve feeders in the above list that may benefit from the presence of bottom mussel culture are the diving ducks (common scoter, eider).

If mussel culture were extended into the intertidal, there is the potential for more significant benefits in terms of food supply to birds, particularly oystercatchers, which are specialist feeders on large bivalves. Anecdotal information suggests that oystercatcher numbers in the Menai Strait, for example, have increased significantly since the advent of intertidal mussel culture. Caldow *et al.* (2003) demonstrated

that curlew and redshank also benefit. Other intertidal bivalve feeders from the above list who may also benefit include grey plover, knot and ringed plover, although bivalves are not necessarily the main component of their diet.

Negative impacts of mussel culture on birds

Indirect impacts to bird populations have occurred as a result of the large-scale collection/harvesting of mussel seed for relaying and on-growing. For example, inter-tidal mussel beds in the Wadden Sea almost disappeared during the late 1980s due to a combination of collection for farms and low spat fall. This in turn had a negative impact on bird populations for which the mussels were a source of food and led to increased mortality in eider duck and reduced breeding success for oystercatchers.

The *dredging* for cultured shellfish has been found to adversely affect predators of benthic species, through either physical removal or smothering, such as the burrowing sand eel *Ammodytes* sp., which is the staple diet of many sea birds such as arctic terns, kittiwakes, puffins, great skuas and red-throated divers (Heffernan, 1999). Although collection of seed mussel from the intertidal is not widespread in Ireland, this form of collection removes a potentially important food source for intertidal bivalve feeders such as grey plover, curlew, redshank, knot, ringed plover and particularly oystercatchers. In areas with important populations of these species (i.e. particularly Lough Foyle) any such activity needs to be carefully regulated and monitored.

Predators such as diving ducks can dive to depths of up to 30 m and feed on marine invertebrates (e.g. mussels). Numbers of Eider duck are known to be increasing in areas associated with mariculture in northern Europe and have been found to alter their seasonal pattern of movements to taken advantage of farming practices due to farmed mussels being more preferable to a potential predator than wild ones. Methods employed to deter predation by birds range from the presence of dogs/scarecrows and falcons to the installation of scaring devices that utilise flashing lights or sounds e.g. recorded boat engines or loud bangs. The effectiveness varies and in some cases leads to eventual habituation by predators. Exclusion nets are generally very effective for fish cages when properly installed and maintained and have demonstrated that mortalities are reduce along with the incidence of wounding. Shooting has taken place, though it is generally illegal in EU countries. Further, it is noted that setting nets with the objective of entangling predators is illegal (Heffernan, 1999).

3.4.3 Other protected or listed species

The Irish NPWS do not list any species protected under Irish law which are likely to interact with bottom culture in any significant way, except possibly for two of the bird species (common scoter, roseate tern) already discussed above. Likewise, a list of Northern Ireland priority species under the UK Biodiversity Action Plan (from JNCC and EHS websites) do not list consider bottom mussel culture to be among the threats for any species. There are, however, two possible species for which mussel culture may be an issue; the sea pen *Virgularia mirabilis* in Carlingford Lough (discussed above under benthic impacts) and the lagoon cockle *Cerastoderma glaucum*. This latter species has its main NI population in Glynn Lagoon in Larne Lough, although there is no aquaculture activity in this vicinity.

3.4.4 Appropriate assessments

The main bottom mussel culture areas in the south are designated as SACs and licensing is therefore automatically subject to an appropriate assessment. In northern Ireland, although the protected areas are mainly confined to the shore and intertidal, mussel licensing by DARD is now also subject to an automatic appropriate assessment, and protocols are currently being developed as to how this is to work in practice. The Departments are also planning retrospective appropriate assessments of existing licenses for which AFBI have been contracted to carry out this task in NI.

It is clear from the discussion of benthic habitat impacts (above) that lack of data is a serious problem in assessing the suitability of mussel culture as a use for a particular location, as well as in assessing the sustainability of the industry as a whole. This (relatively) new structure of appropriate assessments to some extent provides an opportunity for gathering data on benthic habitats and species which up to now has not been available. At the same time, however, it is perhaps not appropriate to require small or new businesses to carry out or finance very onerous environmental studies to collect data which is not directly linked to the assessment of their own licence application. A balance needs to be struck between, on the one hand, ensuring that the data exists to draw reliable conclusions about the likely impact of mussel licensing in this particular area and, on the other hand, requiring a single business to carry out activities which should be the responsibility of the agency charged with protected area management. In practice this line is not easy to draw when you consider that the addition of individual new licenses into the system has implications for the carrying capacity of the system as a whole. However, it is clear that some types of data can be more easily gathered by non-specialists than others. A licence applicant may be able relatively easily to hire divers or equipment to take underwater photos or video of the site, which can then be reviewed by biologists in the management agency, but they will less easily be able to monitor water column nitrate or chlorophyll concentrations, for example. To address any such issues DARD have recently undertaken to carry out and finance the appropriate assessment of all aquaculture licences in NI.

3.5 Alien species

Any movement of animals from place to place raises the spectre of introducing alien species. The movement of mussel seed is no exception, and the introduction of alien species into areas with significant mussel culture is an issue of serious ecological concern. Movement of seed mussels around the coast of the island or from the UK to the island of Ireland requires a movement order. In addition, alien species may arrive in bottom mussel culture areas by other means than the movement of seed (e.g. escapee from other forms of aquaculture, boat transport etc.), but may then affect the viability and sustainability of bottom mussel culture, via, for example, competition for food, smothering or fouling.

3.5.1 Alien species in mussel seed: *Crepidula fornicata*

The most important threat to the bottom mussel industry on the Island of Ireland from alien species transported in mussel seed comes from the slipper limpet *Crepidula fornicata*. *Crepidula* is already present in high densities along the south coast of England and round the west coast as far as south Wales. It has not been mapped in Irish waters so far, but authorities (RoI and NI) are very aware of the problem and are vigilant, as far as is possible. An application to collect seed from a site in or close to an area known to contain *Crepidula* would require an appropriate assessment. In practice, very little seed comes into the island of Ireland from *Crepidula* areas, since English and Welsh authorities generally only give permission to collect seed if the business in question has beds in England or Wales, and only a few

businesses have beds in Wales and on the island of Ireland. One such business was last year refused permission to bring seed mussels from North Wales to beds in NI because the area from which they came could not be certified *Crepidula*-free. This strong policy is sensible when you consider the damage that *Crepidula* has inflicted on oyster and mussel growing areas in, for example, northern France. Unfortunately, *Crepidula* can also be transported on ship hulls and via ballast water as well as by natural spread, so vigilance in managing shipments of shellfish cannot by itself eliminate the risk of introduction, but it does probably reduce it significantly.

3.5.2 Alien species introduced by other means

The ascidian *Didemnum* sp.⁷ is known from several areas globally as a nuisance species when introduced. It is colonial and colonies spread rapidly, overgrowing everything in their path including other benthic species such as bivalves. *Didemnum* has so far been found in Ireland in two marinas (in Malahide and Carlingford) suggesting that it was brought in on the hulls of yachts. It is of concern to bottom mussel culture in particular since it can cause extensive fouling; it has caused problems for mussel culture in other mussel growing areas such as New Zealand.

The Pacific oyster *Crassostrea gigas* is an alien species of much longer standing in Ireland, which nonetheless has some potential to cause problems. In the Netherlands, for example, *C. gigas* which has naturalised from aquaculture facilities causes significant fouling and smothering on mussel beds. Likewise in north-western France, naturalised populations of *C. gigas* have significantly reduced the aquaculture carrying capacity of some bays and inlets (C Hily, Université Ouest Bretagne, pers. comm.). *C. gigas* culture has been going on for some years in Ireland without any evidence of natural recruitment but there are anecdotal reports of recent recruitment in Strangford Lough (Renee McKeown, EHS, pers. comm.) as well as Galway and Donegal Bays (F O'Beirn, Marine Institute, pers. comm.), so monitoring may be required. *C. gigas* is of course itself a species of higher market value than mussels, but it is difficult to harvest from some natural substrata (e.g. when cemented on hard rock); and of course unlike *Mytilus edulis* it is not a native species.

There is also concern about the macroalgal species *Undaria pinnatifida* which was introduced to Europe in imported oyster spat from East Asia, and secondarily on to the south coast of England on boat traffic from France. It seems likely that, as with *Didemnum*, recreational yachting is the most likely future route of introduction of the species into Ireland. No record of introduction via mussel seed exists, but it is certainly important that, for example, inspections of mussel seed from inspected areas take account of the possibility. The infected area largely coincides, or is contained within, the area infected by *Crepidula*; it may be worth preventing the import of mussel seed from this area (English Channel, northwest France) except under exceptional circumstances.

⁷ There are several species which are difficult to distinguish – see <http://woodshole.er.usgs.gov/project-pages/stellwagen/didemnum/>

3.6 Landscape and visual impact

Physical character, human activity, visual qualities and experience of place often combine to create a landscape character which is distinct across a geographic area. It is of benefit to all that the landscape and seascape environment is managed sympathetically, and with broad social, economic, cultural and environmental needs in mind. The incremental expansion of bottom-grown mussel farming on the island of Ireland will be increasingly difficult to accommodate depending on the scale of the coastline in question. Nevertheless, well located developments can positively contribute to landscape character, and create opportunities to reinforce the landscape as a working environment. With careful siting and layout, aquaculture can make a positive contribution to revitalising the landscape, for example through reusing redundant buildings and introducing an energising sense of human activity.

Compared to mussel rope culture and finfish farming, bottom-grown mussel farming has relatively little landscape and visual impact. Sub-tidal mussel beds are obviously not directly visible and are not usually marked in any way e.g. by buoys. The visual impact of mussel culture in the intertidal is more significant than for the subtidal. Generally this manifests itself as intertidal areas which look dark grey or black due to the mussels and the build-up of organic-rich mussel mud. This needs to be considered on a case-by-case basis, but may not be appropriate in areas that are important for tourism or are designated partly for their natural landscape.

Apart from the mussel beds themselves, the most visible element of bottom-grown mussel culture is the human activity that is required to service the industry. Compared to most forms of aquaculture, however, this extensive form of shellfish farming requires only intermittent husbandry as this is essentially an enhanced fishery. In many sites this activity might be welcomed as part of the traditional character of a site, although sites in SPAs might warrant a more considered approach.

3.7 Material assets and resource use

Bottom-grown mussel culture requires little specialist equipment for husbandry as this is essentially an enhanced wild fishery. No chemicals are used and the only notable equipment required are the mussel dredgers. Given the low level of activity involved (34 dredgers on the island of Ireland), and the fact that many have been upgraded to conform with the Torremolinos Protocol (for the safety of fishing vessels), the environmental impact from husbandry and operational maintenance assets are likely to be minimal.

The adoption of Environmental Management Systems provides bottom mussel farmers with a tool to manage and improve their environmental performance. ECOPACT (Environmental Code of Practice for Aquaculture Producers and Traders) is an Environmental Management System tailored for the aquaculture sector and is available to all producers both North and South on a voluntary basis. The ECOPACT manual provides a framework for reviewing all day to day activities associated with aquaculture from use of fuels and lubricants, to visual impact, environmental monitoring to waste management. It is also an important reference guide containing information such as protected species guides. All members of ECOPACT have an 'Environmental Management Programme', an 'Environmental Policy' and review their activities on an annual basis thereby facilitating the continual improvement of their operations.

Two other aspects might be considered:

1. **Capacity limits:** Mussel dredgers represent a considerable capital and recurrent expense. It is therefore important that the mussel dredging capacity lies within the overall sustainable limits of the seed supply. Should the overall capacity exceed these limits, then there may be economic pressures leading to over-exploitation.
2. **Waste management:** The waste generated from bottom-grown mussel culture is minimal due to the lack of inputs required. However the process itself in terms of transport and post-transport mortality might be considered wasteful, although this must be taken in the context of overall natural mortality. Improvements in husbandry techniques would reduce this wastage. Techniques such as (i) better relaying practice (even distribution; not too dense) and (ii) preventing the relaying of very small seed which has very high mortality (farmers usually consider a 15mm minimum size but in the Marine Institute consider this to be much smaller in reality (Michael O'Conneide and Francis O'Beirn, Marine Institute, pers. comm.)).

Such aspects could be considered monitored on an individual basis by farmers as part of their Environmental Management System.

4.0 Recommendations

In most ways, management of the bottom mussel industry in Ireland is moving rapidly in the right direction as regards environmental management and increased sustainability. Some examples of the most important positive steps are listed below (in no particular order):

- Requirement for appropriate assessments when licensing sites in or adjacent to a protected area.
- Plans for retrospective appropriate assessments of existing licences in the north.
- The creation of the aquaculture licensing system for the cross-border Loughs Agency in Carlingford Lough and particularly in Lough Foyle; plans for regularising the situation in Lough Foyle.
- Effective regulation to avoid the introduction of alien species such as *Crepidula* in seed.
- A series of research projects on the carrying capacity of the main systems, planned or in process.
- Management recommendations for seed mussels due to be released soon as an output of the Marine Institute/UCC research project (described in Section 3.1) on Irish Sea seed mussels.
- The ongoing development of the ECOPACT and CLAMS processes.

It would be pointless for this report to list as recommendations programmes and projects that are already underway, even if they are clearly addressing many of the issues raised above. Instead, we concentrate in this section on issues which are yet to be fully addressed, or issues which may be somewhat controversial; for these we consider both positives and negatives.

4.1 Data gaps

It is clear from this report that there are significant gaps in knowledge about some of the potential impacts of bottom mussel culture around Ireland. This situation is entirely understandable given that data on subtidal ecosystems and processes is difficult and expensive to gather. Some of the data gaps are now being addressed with well-thought out projects and international expertise – as for example with the various carrying capacity projects currently ongoing or starting.

Aside from points which are already being addressed, one key area that would benefit from additional data gathering would seem to be benthic mapping, since data availability on benthic habitats, biodiversity and important species is rather patchy. Again, this is not an easy task in the subtidal, but techniques such as RoxAnn (bottom discrimination system) and even drop-down video or camera can allow larger areas to be covered in more detail than was previously possible with traditional grab sampling or diver surveys. The precautionary principle dictates that due caution should be taken when licensing further areas for mussel culture especially in relation to knowledge of the benthic environment – this is particularly true in SACs and other protected areas.

A second key information requirement is the dynamics of the subtidal seed beds which supply most of the seed to the bottom mussel industry on the island of Ireland. The recent MI-run project has resulted in significant strides in understanding, but it remains to clarify the role that these seed beds play in reproduction, larval supply and recruitment. If there is a possibility that these seed beds are to some extent maintained by self-recruitment, or recruitment from other nearby beds, heavy annual harvesting could lead to recruitment failure and a loss of the resource. Clearly this must be avoided at all costs if the industry is to be sustainable in the long-term, so further research into this issue would be very valuable for the industry. It may also be valuable to institute a seed management system based on annual pre-harvest surveys, so that seed quotas can be set according to reliable information about settlement densities and patterns.

Better information on both the licenced areas and the seed resource should work synergistically together for management. Good data on the nature and dynamics of licenced areas will allow for more structured management of a site and for informed site-by-site seed allocations, ensuring the most efficient use of the seed resource.

More generally, the development of research partnerships between academic institutions, management agencies and the industry has been highly successful in other areas (Netherlands, England and Wales) in answering important research questions and addressing key management concerns. Investment by the industry in partial funding of research projects (either in cash or in kind – boat time etc.) can pay back for them in improved husbandry techniques, improved management and better relationships between the industry and management (and possibly also can be offset against tax).

4.2 Integrated coastal zone management

As is the case in most countries, the administrative structure for planning in the marine and coastal zone tends to separate different functions in different departments (nature conservation, fisheries and aquaculture, transport, infrastructure etc.). This makes proactive, integrated planning in marine areas difficult. Planning as it relates to bottom mussel culture has tended up to now to be reactive – when a mussel licence application is received it is assessed and either granted or not. Given the lack of some forms of data, as well as the patchy nature of the data and the administrative structure, it has proved difficult to integrate bottom mussel culture into a more proactive planning structure. Ideally, the decision should not be: 'Is there a reason not to grant a mussel licence in this area?' but rather: 'Is bottom mussel culture a viable use of this area, taking into account all the other possible uses (conservation, leisure, other fisheries etc.)?'

It seems clear that significant steps are already being taken in this direction. There has been, for example, the formation of the cross-border Loughs Agency to take a holistic approach to regulation and management in Carlingford Lough and Lough Foyle. Likewise, the CLAMS groups formed in bays around the island of Ireland does allow a more integrated approach to planning for these systems, at least as far as aquaculture is concerned. The all-island Review of the bottom mussel industry commissioned by BIM, of which this study is a part, will also help to place the industry in a wider context. This process could be continued and extended to develop an integrated management plan for each of the main mussel culture areas which would take into account all the major users and stakeholders in the area. It is clear that marine policy and legislation is already moving in this direction in both jurisdictions, as well as across the EU more generally.

4.3 Strategic environmental assessment

On 5th June 2001, the European Parliament and Council adopted the SEA Directive (2001/42/EC). Strategic Environmental Assessment (SEA) aims to:

- Integrate environmental decision making into plan/programme development;
- Improve plans and programmes to enhance environmental protection; and
- Increase public participation in environmental decision making.

The central purpose of SEA is to anticipate and improve the overall (or cumulative) environmental effects of proposed plans and programmes, even if the latter may individually require Environmental Impact Assessment (EIA) at a later stage. SEA may be applied across a whole sector development programme or

could be applied at bay level. It aims to anticipate the 'likely significant environmental effects' of implementing a plan and its 'reasonable alternatives', with a view to avoiding, reducing or offsetting any negative impacts. Its use can improve foresight regarding potential effects of future plans, for example on protected or environmentally sensitive sites. In the longer-term, proponents of SEA argue that it will promote a more open, transparent and evidence-based planning culture.

Three statutory environmental authorities have been designated under the SEA Regulations in ROI (i) the Environmental Protection Agency (EPA), (ii) the Department of Environment, Heritage and Local Government (DoEHLG), and (iii) the Department of Communications, Marine and Natural Resources (DCMNR). An SEA methodology applicable to ROI is available from the EPA⁸. In NI, the SEA Directive is currently implemented by the Environmental Assessment of Plans and Programmes Regulations 2004. S.I. 2004 No. 1633 (Environmental Protection). ROI Regs European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004 (S.I. 435 of 2004) together with S.I. 436 of 2004.

SEA might be applied to the bottom-grown mussel sector in a number of different ways. This might include an SEA for the whole sector or regional SEAs focusing on bay-level clusters. An SEA of the Seafood Operational Programme in ROI for the period 2007-2103 is currently being undertaken. This process could result in better practise for site selection, operational cultivation as well as engaging with the public over issues as they arise. Given that SEA is a very structured and rigorous process, any requirements for additional SEA and the level of management/administration at which it is taken (e.g. National Scale, Bay Scale) must be carefully considered. Such requirements have the potential to further hinder the licensing process. Certainly, at bay and site scale, the appropriate assessment process should be sufficient to guide licensing and its conditions.

The issue of SEA for this Review is addressed in Appendix 5.0.

4.4 Intertidal licensing

We make this recommendation with some trepidation, knowing that it will in some areas be controversial. If carried out it will require careful management and consideration of the carrying capacity of the system. Indeed in some areas it may not be appropriate – we consider the advantages and disadvantages below, which will need to be applied on a system-by-system basis (and preferably in the context of integrated planning as discussed above).

Advantages

The key advantage of licensing intertidal sites is that it opens up areas which have significantly lower predation rates. When seed is placed directly in the subtidal, predation rates from invertebrate predators can be very significant. Seed placed in the intertidal has much lower predation rates since densities of invertebrate predators are much lower (more or less zero in the case of starfish) and the main vertebrate predators (birds) preferentially target larger mussels. Furthermore, seed placed in the intertidal, although it grows more slowly, develops a thicker shell which affords it some protection from invertebrate predators once it is moved into the subtidal. Thus the licensing of intertidal areas would allow a much more efficient use of the available seed resource, by reducing the proportion lost to predation.

⁸ Downloadable from <http://www.epa.ie/downloads/advice/ea/name,13547,en.html>

A second advantage of licensing intertidal areas is that it provides an additional food source for intertidal feeding birds (mainly oystercatchers but perhaps also some other important species, listed above). Beadman *et al.* 2004 (see also Caldow 2004) use coupled energetic models of mussel growth and bird feeding to assess the impact of different management techniques on mussel yield and bird food supply. They suggest a system whereby small seed (15-20mm) is positioned initially high on the intertidal, where they are out of reach of invertebrates and not taken by oystercatchers because of their size. In this position they grow slowly and develop thick shells. After one year, they are moved into the lower intertidal where they are protected from crabs by size and their thick shells, but somewhat vulnerable to oystercatchers, for whom they form an important food source. Finally, they are moved into the subtidal for a final growth spurt to reach market size. The model suggests that access to the medium-sized mussels in the low intertidal supports high populations of oystercatchers, while yields from the industry were (theoretically) four times higher than if the mussels were permanently in the low intertidal or subtidal. Whether the results of a model work out so well in practice is of course questionable, and some loss is likely from the process of moving the stock several times, but it is unlikely that this is significant relative to the loss from predation on small mussels in the subtidal.

A third advantage of licensing intertidal areas stems from the concept of 'banking' seed. In years when spatfall is above average, seed can be kept in the high intertidal and used to smooth out supply in years when spatfall is low. This reduces unpredictability for mussel farmers and allows an effective use of all the available seed from good years. This system will need careful management, however.

Disadvantages

The obvious disadvantage of licensing intertidal areas for mussel culture is that it exposes these areas to all the potential environmental problems for the existing subtidal culture. The areas will be subject to dredging, smothering and significant alteration of substratum, habitat type, flora and fauna. These issues are considered in detail above.

Secondly, the visual impact of mussel culture in the intertidal is much more significant than for the subtidal. Generally this manifests itself as intertidal areas which look dark grey or black due to the mussels and the build-up of organic-rich mussel mud. Again this needs to be considered on a case-by-case basis, but may not be appropriate in areas which are important for tourism or are designated partly for their natural landscape.

Thirdly, licensing mussel culture in intertidal areas runs the risk of 'privatisation' of the foreshore, which has historically and legally been open access, subject to regulations governing, for example, protected areas. Conflicts between different users have to be considered very carefully, hence this should perhaps only be attempted in the context of the integrated planning system proposed above. In some areas of Wales and England, for example, intertidal mussel culture has come into conflict with cockle fisheries (Bill Cook, Chief Scientist, North-western and North Wales Sea Fisheries Committee, pers. comm.).

Fourthly, intertidal shellfish farming has the potential to create disturbance for species which use the intertidal. This is particularly important in the context of birds, and particularly since many of the areas are designated as SPAs. Disturbance from intertidal shellfish farming is mainly caused by the presence of tractors and groups of people working on the mudflats. Bird species vary greatly in their susceptibility to physical disturbance, which is likely to vary with age, season, weather, location and the degree of previous exposure. Where birds are disturbed when feeding, they are likely to move and feed elsewhere; however,

if they are disturbed when roosting, they are more likely to desert an area (Heffernan, 1999). Disturbance from intertidal shellfish culture affects few breeding birds, mainly impacting on wintering birds as intertidal flats are of major importance as a habitat for many winter bird species. Their susceptibility to disturbance is due to a number of factors, which include the condition of birds, post-migration; limited suitable habitat; harsh weather and prey accessibility in winter (Heffernan, 1999). Disturbance will be limited to low spring tides (i.e. exposure of the area between MLWN and the MLWS) but will ultimately be site specific and depend on the species of bird affected (Heffernan, 1999). This issue will have to be carefully considered at each site before intertidal licensing is agreed.

Finally, without careful management of the seed resource, inter-tidal seed banking could lead to unnecessary accumulations of seed in these areas and place more unsustainable demands on the seed resource during the annual fishing period.

Conclusions

Clearly, the licensing of intertidal areas is not a decision to be taken lightly, and needs to be considered in the context of other intertidal activities, and particularly in the context of the protected area system. The most suitable areas would seem to be where there are large intertidal areas which are largely inaccessible and not of enormous conservation or fisheries importance, and in areas where subtidal predation is particularly problematic for the industry, and where the visual impact is not too severe or not too important.

4.5 Industry representation in Northern Ireland

Whilst the sector is well developed in the north with around 68 licensed shellfish sites to date, efforts by DARD and Cross Border Aquaculture Initiative Team (CBAIT) aimed at encouraging local producers to participate in an appropriate representative organisation for the various mariculture sectors in Northern Ireland have proved unsuccessful. Government should actively encourage and facilitate the sector to participate in a representative group, so that a forum for environmental awareness building and debate can be provided. IFA Aquaculture, which is the representative body in RoI, has got members in Northern Ireland who work on a cross border basis. The work of IFA Aquaculture has been very successful on a number of issues from an Irish to an international platform.

4.6 Site and other specific issues

Carlingford Lough

Carlingford Lough is one of the most productive of all the systems on the island of Ireland for mussel culture; however, it also appears to be an unusual ecosystem for the island, particularly since it is home to a large population of the sea pen *Virgularia mirabilis*, a NI priority species. Licensing in Carlingford Lough soon will, be controlled by the Loughs Agency, rather than split between the two jurisdictions. If the status of *Virgularia* as a priority species (in NI) is to be taken seriously by the Agency, it is imperative that its current distribution and population size is mapped as a matter of urgency, and if it appears to be in decline that measures are taken to protect it against the causes of decline. These causes may well include bottom mussel culture, since the species is likely to be sensitive to benthic smothering and particularly to dredging by aquaculture and other industries in the Lough e.g. ports.

Lough Foyle

Lough Foyle contains one of the most important remaining populations of the native oyster (*Ostrea edulis*) in the UK and Ireland, although Tralee Bay is also active and important. An important and historic fishery for native oysters, which sometimes comes into conflict with the mussel industry; for example, extensive dredging breaks up the oyster cultch into finer particles which are unsuitable for oyster settlement. Several lines of argument suggest that the oyster should be given priority through appropriate zoning where there is conflict: it is again a priority species in NI, it is in decline through most of its range due to disease and competition with introduced species, the historic nature of the fishery and (more prosaically) the much higher market price of native oysters as compared to mussels. Having said that, there is some recent evidence from surveys carried out by CEFAS and the Aquaculture Initiative that the oyster fishery in Lough Foyle is overexploited, although recruitment levels seems to be remaining steady.

Belfast Lough

This is the system for which most concerns have been raised as regards overstocking and reduced carrying capacity. Certainly, great progress has been made in the last two decades in reducing nutrient inputs from Belfast city and surrounds, meaning that chlorophyll production is likely to be lower now than when the mussel industry first started. It may be worth considering suspending the granting of new licences in this system (subtidal or intertidal) pending the results of a carrying capacity study (the ongoing SMILE project, for example).

Wexford Harbour

This is the most important system for bottom mussel culture in the south, and appears to lack any information on benthic species and habitats within the harbour, either now or before the advent of mussel culture. Likewise, it has been hard to find any information on chlorophyll or food flux and carrying capacity (although a carrying capacity project is in development). Given the significant size of the industry based in Wexford, as well as the evident prosperity of some of the businesses involved, this system may be a good place to start a collaborative research project into the interaction of mussel culture and the marine environment, if the industry can be persuaded that an investment into knowledge about the system is a useful investment as regards the better management of their businesses. Relationships between aquaculture businesses and environmental management agencies are almost inevitably tense at times, but the project could be managed by a 'neutral' third party such as a university or research institute, to the benefit of all parties.

Larne Lough

Out of the systems for which nutrient data is available (Carlingford Lough, Belfast Lough, Larne Lough and Lough Foyle), Larne Lough appears to be significantly more oligotrophic than the other three, with a mean nitrogen (nitrate plus ammonia) concentration of <10 micromoles per litre, as compared with around 55-60, and a mean phosphate concentration of 0.7 as compared with 1 for Lough Foyle and ~2 for Belfast and Carlingford Loughs, according to data provided by the SMILE project. Nevertheless it is worth noting that this data relates to the outer Lough and data for the inner Lough has yet to be collected and factored into the SMILE project. This system thus may have a significantly greater potential for exceeding the carrying capacity than the other systems, and the issue of carrying capacity should therefore be borne in mind here particularly. The SMILE project will doubtless shed more light on this issue.

Shore/Green crabs (Carcinus maenas)

In some bottom mussel areas (e.g. the Menai Strait, North Wales), a fishery has developed for shore crabs, which are a significant (in some areas the most significant) predator of bottom mussels. This fishery can be a welcome diversification for small scale fishermen, although market prices are low and often the fishery needs to be subsidised by the mussel industry to be economically viable.

A small scale shore crab fishery exists in Lough Foyle and Waterford Harbour already, and mussel producers may consider extending this idea to other systems. From an environmental point of view, the fishery is likely to be benign, since shore crab populations are likely to be artificially inflated by the presence of extensive bottom mussel culture; in addition the fishery uses fixed gear (pots) which have limited by-catch and very little impact on the bottom.

Crepidula fornicata

A great deal of consideration by policy makers in Ireland has gone into how to avoid as far as possible the introduction of *Crepidula* into Ireland, since it is highly invasive and damaging where it occurs. A regime of inspection is already in place. It may also be appropriate to take a step further and avoid altogether the importation of seed from wider geographic areas which are known to contain *Crepidula*, even if the mussel bed itself has been certified *Crepidula* free by national (usually UK) authorities. Seed from the English Channel and South Wales, certified *Crepidula*-free by DEFRA and licensed for movement within the UK, has subsequently been found to contain *Crepidula*, albeit at low densities, and the risk of invasion of a previously *Crepidula*-free area was only avoided by rapid (and expensive) action by the mussel grower to remove the seed and return it to its site of origin.

APPENDIX A Terms of Reference

TOR5 – To review the environmental sustainability of the sector

The purpose of this document is to address the scope of TOR5 – To review the environmental sustainability of the sector – of the Bottom Grown Mussel Sector Review with a view to appointing an appropriate consultant to carry out the task.

The bottom grown mussel sector Review will be carried out on an all-island, 32 county basis. The guiding policy for the review states:

‘That the core objective of the regulation and management regime for the seed mussel resource shall be to ensure the sustainable exploitation of the wild mussel seed resource and to maximise the benefits derived from that resource in terms of volume and value of the mussel crop subsequently grown, harvested and processed with the objective of generating sustainable economic activity and employment in coastal communities.’

The Bruntland definition of sustainable development is ‘Development which meets the needs of the present without compromising the ability of future generations to meet their own needs.’ To this end achieving environmental sustainability requires consideration of natural resources losses and the impact of the economy on the environment through the use of the environment both as a provider of materials and as a sink for pollutants (adapted from FAO – http://www.fao.org/es/ess/mdg_kit/env_sus.asp).

Aim

To review the environmental sustainability of the sector.

Objective

Explore opportunities and make recommendations to improve and best utilise knowledge of the natural environment and to optimize environmental performance of the bottom grown mussel sector within the current legislative, economic, operational, technological and knowledge context.

As this is a review of the sector as a whole it is important to consider the key life cycle stages in bottom mussel production. These are:

- Seed collection.
- Ongrowing.
- Harvesting.
- Processing and packaging.
- Transportation.
- Retailing & Marketing.⁹

In considering environmental sustainability a number of aspects have been identified as listed below. The environmental aspects are to be examined in relation to key life cycle stages. The Review must identify and describe the environmental baseline, key impacts related to the aspect, and where relevant make

⁹ The life cycle stages being considered should take the lead from the main Review document.

recommendations to optimise environmental sustainability. Interactions between life cycle stages and aspects must also be considered. Examples of recommendations may include building awareness, improved monitoring etc. The right hand column of the table provides more detail on key elements of study for each aspect. The study should be carried out using a combination of desk study literature review, feedback from the consultative process, consultation with relevant experts and examination of best practice elsewhere.

Review section	Detail required
Environmental policy and legislative context: <ul style="list-style-type: none"> ■ Europe, RoI, UK – NI ■ Loughs Agency – Foyle Carlingford Bill ■ International agreements ■ Other relevant policies 	Details should be provided on legislation from a European to a National level (both Northern Ireland and RoI legislation). Relevant international agreements and policies should also be accounted for. The specific requirements of the sector and relevance of individual pieces of legislation at each stage of the life cycle should be stated ¹⁰ (e.g. licence required, knowledge required), together with the competent authority, points of contact.
Voluntary management & regulation	CLAMS, QSP, ECOPACT.
Current & forthcoming monitoring regimes	Including WFD integrated monitoring.
Key environmental aspects	
Nature conservation & protected areas	The main emphasis in this section should be the European Habitats directive and the requirement for Appropriate assessments. However, attention should also be paid to the status of other protected areas, e.g. NHA (RoI), ASSI (NI), and Ramsar (Intl.). Identify key protected habitat, bird and species interactions in relation to bottom mussel operations and explore potential mitigation measures.
Ecosystem interactions: <ul style="list-style-type: none"> ■ Water environment ■ Benthic environment 	Physical factors – e.g. substratum alteration, smothering, suspended solids, turbidity, hydrodynamic regime. Chemical factors – e.g. nutrients, oxygen, hydrocarbons, synthetic chemicals, heavy metals. Biological factors – e.g. community associations, non-native species, disease and parasites.
Waste, discharge, emissions	Animal by-products, operations wastes, fuel emissions.
Landscape and visual impact	Quite minimal but should be included in terms of boat appearance etc.
Material assets and resource use	Environmentally responsible boat maintenance, fuel consumption, chemical use, product packaging.

Note:

- Industry consultation for the Review is ongoing (early March 2007). Additional aspects may be included/prioritised on the basis of submissions made.
- BIM is currently involved in a Carrying Capacity project.

Timescale: 6 months Completion date: August 2007

¹⁰ Shellfish waters directive is of more relevance than animal by-products regulations.

APPENDIX B People Met and Telephone Discussions

Name	Organisation (position)
Gavin Burnell	University College Cork
Grainne O'Brien	BIM
Terence O'Carroll	BIM
Vicky Lyons	BIM
Joanne Gaffney	Aquaculture Initiative EEIG
Eugene Nixon	Marine Institute
Roslyn Stewart	EHS
Renee McKeown	EHS
Telephone	
Matt Service	AFBI (SMILE project)
Eamonn Kelly	National Parks and Wildlife

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APPENDIX D Classified Bivalve Mollusc Production Areas in Ireland (EU Hygiene Package) (October 2005)

Source: Brown and Deegan, 2006

I	II	III	IV	V	VI
Production area	Boundaries	Bed name	Species	Previous classification	Current classification
Lough Foyle	Magilligan Head to Inishown Head	All beds	Oysters Mussels	B	B
Tra Breaga	Malin Head to Dunaff Head	All beds	Oysters	A	A
Lough Swilly	Fanad Head to Dunaff Head	All beds	Mussels Oysters	B	B
Mulroy Bay	Melmore Head to Ballyhoorisky Point	All beds	Mussels Oysters	A	A
Sheephaven	Rinnfaghla Point to Horn Head	All beds	Oysters Mussels	B B	A B
Gweedore	Carrick Point to Carrickacuskame and Torglass Island to Dunmore Point	All beds	Oysters	B	B
Dungloe	Wyon Point to Burtonport Pier	Dungloe	Oysters	B	B
Traweenagh	Dooley Point to Crohy Point	All beds	Mussels Oysters	A	A
Gweebarra	Gweebarra Point to Cashelgolan Point	All beds	Oysters	A	A
Loughras Beg	Loughras Point to Gull Island	All beds	Oysters	A	A
McSwynes Bay	Carntullagh Head – Pound Point St Johns Point – Doorin Point	Bruckless	Mussels	A	A
Donegal Harbour	Area bounded to the West by a line from The Hassans to Murvagh Point	All beds	Oysters Mussels	A B	B B
	Doorin Point to Rossnowlagh Point	All other beds	Oysters Mussels	B B	B B
Drumcliff Bay	Raghly Point to Deadmans Point	All beds	Oysters Clams Mussels Cockles	A B B B	A B B B
Sligo Harbour	Deadmans Point to Killaspug Point	All beds	Oysters Clams	B	B

I	II	III	IV	V	VI
Production area	Boundaries	Bed name	Species	Previous classification	Current classification
Ballysodare Bay	Killaspug Point to Derkmore Point	All beds	Mussels	A	B
Killala Bay	Ross Point to Iniscrone Point	Sites 135, 160, 207	Oysters	A	A
Blacksod Bay	Blacksod Point to Kanfinalta Point	All beds	Oysters	A	A
Achill	Bolinglanna to the southernmost Point of Achill Beg, Kinrovar Point to Ridge Point	All beds	Mussels Oysters	B	B
Clew Bay	Area bounded to the south by 53° 52.60N and to the West by 9° 37W.2 Area bounded to the west by 09° 35.37W Area within a one nautical mile (1,852M) radius of Roskeen Point (53° 53.46N, 09° 40.10W)	Newport Bay Westport Bay Tieranaur Bay	Mussels Oysters Mussels Oysters Oysters	B B A	B B B
	Mulranny Pier to Old Head	Corrie Channel and Rosslaher beds All other beds	Mussels Oysters Mussels Oysters	BA	BA
Killary Harbour	Rusheen Point to Rossroe Quay	All beds	Mussels	B	B
Ballinakill	Renvyle Point to Cleggan Point	All beds	Oysters	A	A
Streamstown Bay	Gubarusheen Point to Omey House ruins to Ardoe	All beds	Oysters	A	A
Clifden Bay Inner	Errislanan Pier to Dooghbeg Quay (ruins)	All beds	Mussels	B	B
Clifden Bay Outer	Errislanan Point to western most Point of Turbot Island to westernmost Point of Ardmore Island and from Errislanan Point to Dooghbeg Quay (ruins)	All beds	Clams	B	B
Mannin Bay	Errislanan Point to Knock Point	All beds	Oysters	A	A
Kilkieran	Mulroa Point to Golam to Cloghmore Point	All beds	Oysters	A	A
Galway Bay	Ardfry Point to Kilcolgan Point	Mweeloon Bay	Oysters Mussels	A B	A B
	Kilcolgan Point to Deer Island to Aughinis Point Excl Kinvarra Bay	Corraduff beds	Oysters Mussels	B	B
		Clarenbridge and Killeenaran beds	Oysters Mussels Clams	BBA	ABA

	Knockapreaghaun Point to Goragh Island to Traught Point (8° 59.1W and 53° 14.8N)	Kinvarra Bay	Oysters Mussels	B	B
	Aughinis Point to New Quay	Aughinis	Oysters	B	B
	Finnivarra Point to Muckinis Point	Poulnaclough Bay	Oysters Mussels	B	B
Carrigaholt	Kiloher Head – Leck Point & Corlis Point – Beal Point	All beds	Oysters	A	A
Poulnasharry	Corlis Point to Baurnahard Point	All beds	Oysters	A	A
Shannon Estuary	Aughinis Point to Courtbrown Point	All beds	Oysters	B	B
Ballylongford	Beal Point to Knockinglas Point	All beds	Oysters	B	B
Tralee Bay	Kerry Head to Brandon Head	All beds	Oysters	B	B
Castlemaine Harbour	Inch Point to Rossbeigh Point	All beds	Oysters Mussels	B	B
Valentia River	Bray Head to Reencaheragh Point and Douglas Head to Fort Point	All beds	Oysters	B	B
Kenmare River	Lambs Head to ods Head	Ardgroom	Mussels	A	A
		Cleandra	Mussels	A	A
		Kilmakilloge	Mussels	B	B
		Sneem/Tahilla	Mussels	B	B
		All other beds	Mussels Oysters	B B	B B
Bantry Bay	Ardnakinna Point to Fair Head and Lonehort Point to Bank Harbour Area bounded to the north by a line from Gortnakilla Pier to a point at 51° 37.5N, 09° 42W to Whiddy Point west to Relane Point Sheep Head to Back Ball Head	Castletownbere	Mussels	A	A
		South Shore	Mussels Sea Urchins	A	A
		All other beds	Mussels Sea Urchins	BA	B-
Dunmanus Bay	Sheeps Head to Three Castle Head	All beds	Mussels Sea Urchins	B A	B A
Roaringwater Bay	Cousnaganniv Point to Frolic Point	All beds	Mussels	B	B

I	II	III	IV	V	VI
Production Area	Boundaries	Bed Name	Species	Previous Classification	Current Classification
Baltimore Harbour	Barrack Point to Beacon Point and Lettuce Point to Spanish Point to Grigs Point	All beds	Oysters	B	B
Sherkin North	Licensed sites	All licensed beds	Oysters	B	A
Sherkin Kinish	Drawlaun Point to Long Point	All licensed beds	Oysters	A	A
Rosscarbery	Downeen Point to Creggane Point	All beds	Oysters	B	B
Kinsale	Shronecan Point to Preghane Point	All beds	Oysters	B	B
Oysterhaven	Ballymacus Point to Kinure Point	All beds	Oysters	B	B
Cork Harbour	Between 8°16.4W and 8° 15.6W	North Channel West	Oysters	B	B
	Between 8° 14.6W and 8° 13.2W	North Channel East	Oysters	B	B
	Ahada Pier to Gold Point	Rostellan	Oysters	B	B
Ballymacoda Bay	Knockadoon Head to Knockaverry	All beds	Oysters	B	B
Dungarvan Bay	Helvick Head to Ballynacourty Point	All beds	Oysters	B	B
Waterford Harbour	Creadan Head to Hook Head	All beds	Mussels Oysters	B	B
Bannow Bay	Ingard Point to Clammers Point	All beds	Oysters	B	B
Ballyteigue Bay	Ballymadder Point to Crossfarnoge Point	All beds	Oysters	B	B
Wexford Harbour	Rosslare Point to The Raven Point	ST 1, 2, 3, 4	Mussels	C	C
		All other beds	Mussels	B	B
Malahide	Between 53° 25.4N and 53° 29.4N	All beds	Razor Clams	B	B
Skerries	Area bounded by a line from Hampton Cove to a point at 06° W, 53°36.3N to a point at 06° W, 53°34.5N to Shenick Island	All beds	Razor Clams	B	B
Gormanston/Laytown	Between 53° 38N and 53° 40N & Between 53° 41N and 53° 42N	All beds	Razor Clams	A	A
River Boyne	From Bight Navigation Mark to South Point Navigation Mark and from Lyons Navigation Mark to Aleria Navigation Mark	All beds	Mussels	B	B

APPENDIX 4.0



4.0

FISHING PLAN FOR THE SEED FISHERY IN THE WESTERN WADDEN SEA

Fishing plan for the mussel seed fishery (Spring 2007) in the sub-littoral part of the western Wadden Sea

- REGULATIONS:** The Mussel Fishery Regulations of 1998. (From the PO).
- PERIOD:** From the 8 May 2007 until quota is reached or to the 29 June 2007. The main fishing period shall be week 19, week 20, week 21 and week 22. The remaining weeks are reserved for the fishermen who did not succeed in fishing their individual quota in time.
- FISHING DAYS:** Week 19: Tuesday, Wednesday and Thursday.
Week 20: Monday, Tuesday and Wednesday.
Week 21 and 22: Tuesday, Wednesday and Thursday. Based on an evaluation of the fishery (and the registration of the catches) it will be decided if the fishery will also be opened on Monday of these weeks.
- FISH TIMES:** From 7.00am till 19.00pm.
- For Molenrak, Omdraai and Zwin (3 fishing areas) fishing is allowed based on a tidal regime. For Molenrak the tide at Harlingen harbour will be the base, For Omdraai and Zwin the tide at Den Oever (harbour) (These tides are published in a leaflet with all tides).
- These areas can be fished during the two hours after low tide till 2 hours before low tide.
- The fish times for Molenrak are as follows:
Wednesday 8th of May: From 10.36 to 1900
Thursday 9th of May: From 07.00 to 07.21 and from 11.21 to 19.00
Friday 10th of May: From 07.00 to 08.17 and from 12.17 to 19.00
Monday 14th of May: From 07.00 to 13.10 and from 17.10 to 19.00
Tuesday 15th of May: From 07.00 to 14.16 and from 18.16 to 19.00
Wednesday 16th of May: From 07.00 to 15.16
- The fish times for Zwin and Omdraai are as follows:
Tuesday 8th of May: From 08.56 to 19.00
Wednesday 9th of May: From 09.36 to 18.04
Thursday 10th of May: From 10.26 to 08.17
Monday 14th of May: From 07.00 to 11.26 and from 15.26 to 19.00
Tuesday 15th of May: From 07.00 to 12.36 and from 16.36 to 19.00
Wednesday 8th of May: From 07.00 to 13.36 and from 17.36 to 19.00
- The fish times for the weeks afterward will be sent to you together with the letter with the individual quote for these weeks.

- EXTENSIONS:** Everyone is considered to be able to fish when the fishery is open. If the fleet fishes, then weather conditions are not accepted as a reason for individuals to appeal for fishing later on, unless in the case of ship breakdown or family circumstances.
- RESEARCH AREAS:** For the study into the impact of mussel fishery on the nature value in the western Wadden Sea, ten test areas have been selected (Probus-Project 3). The positions of the test areas and associated coordinates have been incorporated in Appendix 1. These areas are excluded from the fishery. The areas are also defined by wooden-marks and yellow buoys.
- The research areas fall outside the fish plan. Recognizing the importance of these research areas, vessels are never permitted within these areas. The commission will maintain this prohibition strictly. We also require that you immediately incorporate these points into your plotter.*
- QUOTA:** Maximum 280,000 half-grown mussels, to be fished at a defined volume in 4 weeks of respectively 100,000mton, 80,000mton, 80,000mton and 40,000mton. (1mton = 1,000kg).
- Maximum 27.000 mton mussel seed, to be fished in four weeks with six groups of companies (7 to 8 ships per day).
- After two weeks this will be evaluated and the quota for the last two weeks will then be confirmed.
- LOAD SURVEYS:** To take place alongside the *Omega* (vessel) and the *Albatross* (vessel) (employees from the mussel auction will be onboard these 2 vessels to measure the quantity of seed mussels in the fishing vessel).
- Every member of the fleet, without exception, is expected to strictly observe the quotas and not to fish more than his weekly quota.
- Fishery participants must after the fishery sail to the 2 vessels mentioned above for measuring the fished quantity. Failure to do this is an offence of Article 8 of the mussel fishery regulation. During the measuring it is not allowed to have mussels in the washing hold or to cover this hold.
- SURVEY:** Before the start of the fishery a survey will be conducted to get an impression of the locations and the quality of the mussels available. A maximum of 15 vessels will be involved in this. These ships are the BRU 6, BRU 8, BRU 14, BRU 50, BRU68, TH48, YE I, YE18, YE55, YE56, YE58, YE70, YE79 as well as ZZ5 and ZZ10.
- FISHERIES AREAS:** The area defined in the Nature Conservation Act excluding the research areas.

- ONGROWING AREAS:** The fished mussels will be sown on plots in the Wadden Sea.
- OVERWINTERING STOCK:** Stock levels on plots over the winter is monitored on the basis of landing figures, the electronic pocket notebooks and the survey of all plots with a special gear for taking samples by IMARES after the autumn seed fishery 2007.
- STORM WARNINGS:** In case of storm warning the presidents of the associations in dialogue decide whether fishing will continue and may take actions such as suspending the fishery.
- MODIFICATIONS FISH PLAN:** The PO board can introduce modifications in the fish plan after each evaluation. These will be communicated before the start of the new fishing week.



APPENDIX 5.0



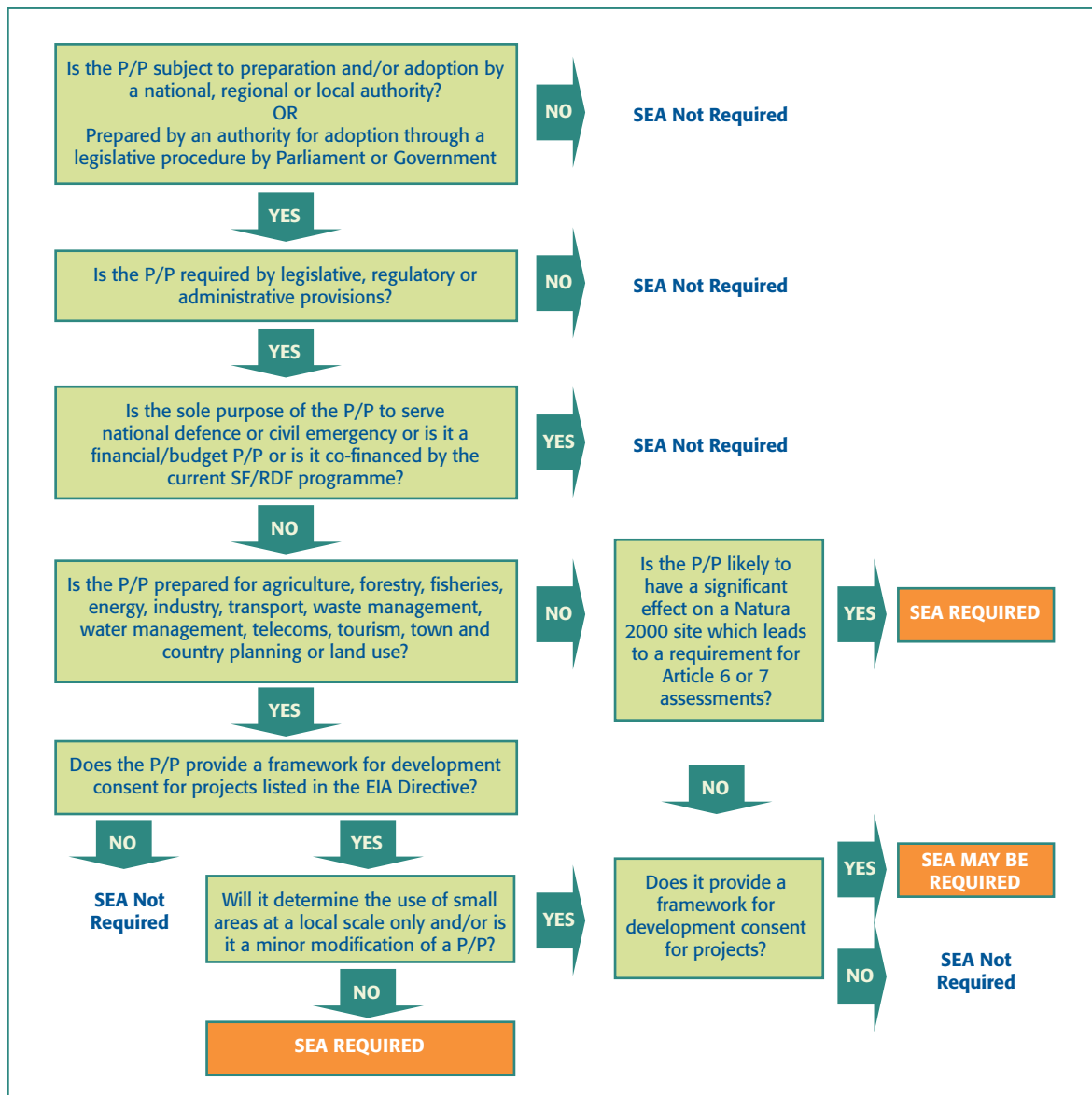
5.0

STRATEGIC ENVIRONMENTAL ASSESSMENT

SEA Screening Exercise

Given that the national Seafood Operational Programmes for the period 2007-2013, and which incorporate aquaculture development, require SEA, it is possible that additional SEA will not be required at lower strategic levels of application.

Considering the proposed structures laid out in Recommendations 6.1-6.19, the Review Group carried out a provisional SEA screening exercise. The screening methodology below is extracted from the Irish SEA guidelines (Development of Strategic Environmental Assessment (SEA) Methodologies for Plans and Programmes in Ireland (2001-DS-EEP-2/5) and is in line with other SEA screening trees. Ultimately, the requirement for SEA will depend on the management structures adopted by the BMS Review Group and how these fit with the overall management of aquaculture on the island of Ireland. The proposed fishing schedules were screened within this context. Nevertheless, as they are not embedded in legislative/regulatory/administrative provisions (see SEA tree), at this stage it appears that no SEA is required.





REFERENCES



6.0

REFERENCES

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